

**PC Server Rack
Storage Enclosure - Type 3519**

**Hardware Maintenance
Manual Supplement**

April 1997

**Use this supplement with the
PC Servers Hardware
Maintenance Manual**

**We Want Your Comments!
(Please see page 37)**



Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 41.

First Edition (May 1997)

The following paragraph does not apply to the United Kingdom or any country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This publication could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time.

This publication was developed for products and services offered in the United States of America. IBM may not offer the products, services, or features discussed in this document in other countries, and the information is subject to change without notice. Consult your local IBM representative for information on the products, services, and features available in your area.

Requests for technical information about IBM products should be made to your IBM reseller or IBM marketing representative.

© **Copyright International Business Machines Corporation 1996, 1997. All rights reserved.**

Note to U.S. Government users—Documentation related to Restricted rights—Use, duplication, or disclosure is subject to restrictions set forth in GSA ADP Schedule Contract with IBM Corp.

About This Supplement

This supplement contains the following service information for the PC Server Rack Storage Enclosure - Type 3519.

- Diagnostic information
- Parts Listing

This supplement should be used with the advanced diagnostic tests and the information in the IBM PC Servers Hardware Maintenance Manual Supplement (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 30.

Related Publications

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

For Information About	See Publication
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, and Portable Computers	IBM Mobile Systems Hardware Maintenance Manual Volume 1 (S82G-1501)
ThinkPad computers	IBM Mobile Systems Hardware Maintenance Manual Volume 2 (S82G-1502)
ThinkPad computers	IBM Mobile Systems Hardware Maintenance Manual Volume 3 (S82G-1503)
Monitors (Displays)	IBM Display Hardware Maintenance Manual (SA38-0053) IBM Monitor Hardware Maintenance Manual (S71G-4197)
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 (S41G-2927)

Contents

About This Supplement	iii
Related Publications	iv
PC Server Rack Storage Enclosure - Type 3519	1
Features	2
Diagnostics and Test Information	3
Locations	12
Symptom-to-FRU Index	24
Parts Listings (PC Server Rack Storage Enclosure - Type 3519)	25
Related Service Information	29
Safety Information	30
Laser Compliance Statement	35
Send Us Your Comments!	37
Problem Determination Tips	38
Phone Numbers, U.S. and Canada	39
Notices	41
Trademarks	41

PC Server Rack Storage Enclosure - Type 3519

Features	2
Diagnostics and Test Information	3
Power-on Self-Test	3
Power-on Sequence	4
Power Supply (FRU Number 60H8301)	4
Power Supply Shutdowns	5
SCSI IDs	6
SCSI Repeater Cards	7
Connecting Two Servers and One Storage Enclosure	8
Connecting One Server and Two Storage Enclosures	9
SCSI Termination	10
Specifications	11
Locations	12
Access Cover	13
Cable Management Arm Bracket	13
Chassis Draw Bracket	13
Controls and Indicators	14
Expansion Bays	15
Drive Bays 1 to 3	16
Hot-Swap Drives Bays 4 through 9	17
External Connectors	18
Front Door	18
Hot-Swap Drive Tray III	19
Keylock Assembly Exploded View	20
Rack Slides	20
SCSI Repeater Card	21
Slide Management Bracket	21
Voltage Setting	23
Symptom-to-FRU Index	24
Parts Listings (PC Server Rack Storage Enclosure - Type 3519)	25
System (Model R01)	26
Power Cords	27

Features

The features in the storage enclosure vary according to the model. The following is a summary of the features that are available with the PC Server Rack Storage Enclosure - Type 3519.

Expansion Bays

- Nine:
 - Six hot-swap
 - Up to three slim-high or two half-high non-hot-swap devices

Options Supported

- Up to six slim-high or three half-high hot-swap hard disk drives
- Tape autoloader
- 4/10 GB 3.5-inch DAT tape drive
- CD-ROM drive

Security Features

- Door lock
- Fan failure detection

Integrated Functions

- LED usability support
- SCSI Repeater Card:
 - One card standard
 - Supports maximum of two

Power Supply

- 200-watt with manual voltage selection (100–240 V ac)
- Built-in overload and surge protection

Hard Disk Drives

- Supports up to six hot-swap and three non-hot-swap

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 supplement and the PC Servers Hardware Maintenance Manual (part number 70H0751, form number S30H-2501-01).

The following is a list of problems and references for diagnosing the PC Server Rack Storage Enclosure - Type 3519.

Problem	Reference
Error Codes/Error Messages	Refer to the Symptom-to-FRU Index for the server that the Storage Enclosure you are servicing is connected to.
Fan Light indications	See "Controls and Indicators" on page 14 and "Symptom-to-FRU Index" on page 24.
Hot Swap Tray LED indications	See "Hot-Swap Drive Tray III" on page 19.
Power Supply Voltages	See "Power Supply (FRU Number 60H8301)" on page 4.
Setting SCSI IDs	See "SCSI IDs" on page 6.
Terminating a SCSI chain	See "SCSI Termination" on page 10.

Power-on Self-Test

When you power-on the server, it performs a series of tests to check the operation of the system, including the drives and other components of the storage enclosure. This series of tests is called the *power-on self-test*, or *POST*. If the tests indicate a problem, a message appears on the server's information panel or display.

Power-on Sequence

Note

For normal operation, power on the server; then, power on the expansion enclosure.

The expansion enclosure can be powered on without connecting it to a server. However, the expansion enclosure must be connected to a server before the drives installed in the enclosure can be used.

Power Supply (FRU Number 60H8301)

Note

Verify that the voltage-select switch is set for the correct voltage. If the voltage switch is set to the wrong position, permanent damage might occur to the rack when you power it on.

If the power-on indicator is not on, and the power-supply fan is not running, check the power cord for proper installation and continuity.

If the power cord is OK, either the power supply is defective or a defective device is causing the power supply to shut off. Check the power supply voltages.

The power supply is rated at 200 watts. Too many devices (adapters or hard disk drives) can cause power consumption to exceed 200 watts and cause the power supply to shut down. See "Power Supply Shutdowns" on page 5. Remove adapters or devices to determine if this is the cause.

If the voltages are incorrect, replace the power supply.

DASD Connectors P1, P2, P3, P4, P5, P6, P7, P8



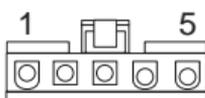
-Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	1	+11.52V	+12.6V
3	4	+4.8V	+5.25V

Aux SCSI Board Power Connectors P9, P10



-Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
2	1	+11.52V	+12.6V
3	4	+4.8V	+5.25V

Switch Board Connector P11



-Lead Pin	+Lead Pin	V dc Minimum	V dc Maximum
5	4	+11.52V	+12.6V
5	3	+4.8V	+5.25V

Power Supply Shutdowns:

If the power supply shuts down, or *appears* to fail at power-on, you might have one of the following problems:

- Too many devices are set to start instantly. See “Setting the Motor-Start Jumper” on page 414 in the PS/2 Hardware Maintenance Manual.
- There are too many large-capacity devices installed (such as hard disk drives). The nominal operating current of the devices installed collectively exceeds the available current of the power supply. See the “Personal System/2 Installation Planning” guide (form number S41G-2927) for more information.

Also ensure that the fans operate when the machine is powered on.

Note

Verify that the voltage-select switch (if applicable) is set for the correct voltage.

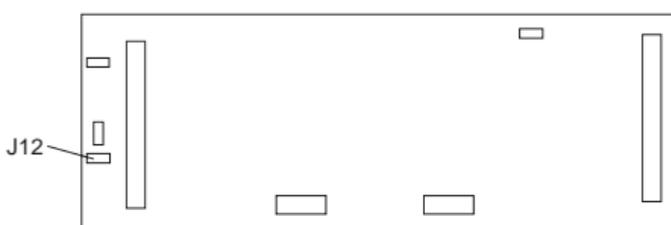
SCSI IDs: Each SCSI device installed in the storage enclosure must have a unique SCSI identifier (ID). This unique ID enables the SCSI controller to recognize the device. This SCSI ID also prevents two devices from attempting to send or receive data on the SCSI bus at the same time. IBM PC Server SCSI controllers use ID 7. Therefore, you must not assign ID 7 to any device that you install in the storage enclosure. SCSI devices support the following IDs:

- Narrow devices support SCSI IDs 0 to 6.
- Wide devices support 0 to 6 or 8 to 15.

When you install a hot-swap drive, the backplane behind bays 4 through 9 automatically assigns the drive its SCSI ID. However, when you install a drive in bays 1 through 3, you must set a unique SCSI ID for the drive that does not conflict with any of the IDs that the backplane assigns to drives in bays 4 through 9.

Depending on the setting of the SCSI ID address jumper (J12) on the rear of the backplane, the backplane sets the SCSI IDs for bays 4 through 9. SCSI IDs 8 to 13 are the default IDs for the hot-swap drives. SCSI IDs 0 to 5 are also available for the hot-swap drives.

The SCSI ID address jumper, a pin block with four pairs of pins (J12), is located on the rear of the backplane. The default, cover installed on the HI ID N pins, sets the addresses to HI.



The backplane sets the SCSI IDs for bays 4 through 9 as follows:

LO Settings		HI Settings (default)	
Bay	SCSI ID	Bay	SCSI ID
4	0	4	8
5	1	5	9
6	2	6	10
7	3	7	11
8	4	8	12
9	5	9	13

The following table summarizes the jumper settings for the SCSI ID address jumper (J12).

Jumper Position	Description
<p>LO</p> <p> SYS RST</p> <p> ID REV</p> <p> HI ID N</p> <p> HP PULSE N</p> <p>J12</p>	<p>No cover installed on the HI ID N pins, sets SCSI IDs to LO.</p>
<p>HI</p> <p> SYS RST</p> <p> ID REV</p> <p> HI ID N</p> <p> HP PULSE N</p> <p>J12</p>	<p>Sets SCSI IDs to HI. Use this setting, cover installed on the HI ID N pins, when you install narrow non-hot-swap devices and the configuration requires you to define some non-hot-swap devices with high IDs. This is the default setting.</p>

Refer to the documentation that came with the drive for information about setting its SCSI ID.

If the storage enclosure is attached to a RAID adapter, refer to the information that came with the adapter for SCSI ID requirements.

SCSI Repeater Cards

Note

If you connect the storage enclosure to a non-disk-array server, the SCSI bus must be dedicated to the storage enclosure. That is, you cannot connect other devices to the SCSI bus.

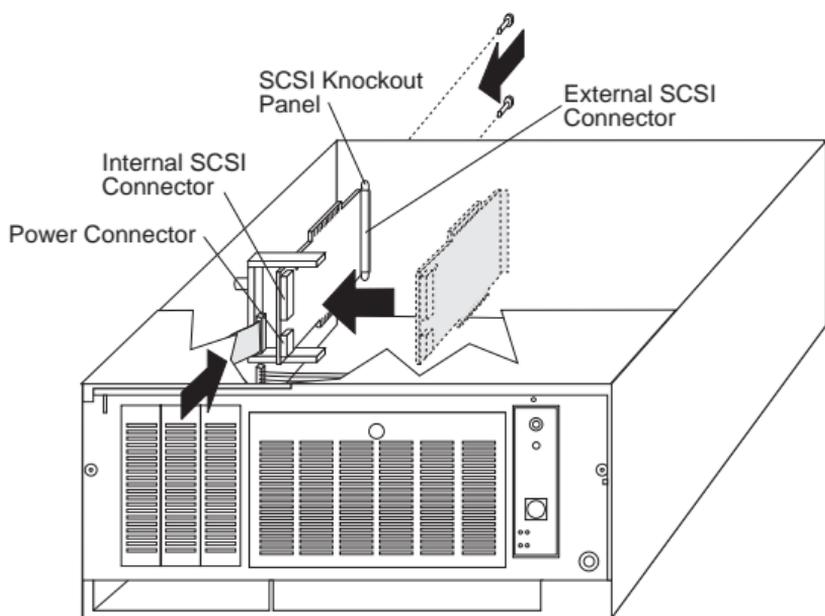
The storage enclosure comes equipped to connect to one server. To connect:

- Two servers and one storage enclosure, see “Connecting Two Servers and One Storage Enclosure” on page 8.
- One server and two storage enclosures, see “Connecting One Server and Two Storage Enclosures” on page 9.

Connecting Two Servers and One Storage Enclosure

Enclosure: To install a second SCSI Repeater Card to connect two servers and the storage enclosure, do the following.

1. Set the SCSI ID address jumper on the backplane of the storage enclosure to HI. See “SCSI IDs” on page 6 for information on the SCSI ID address jumper.
2. Assign a unique SCSI ID to the SCSI controller of each server. For example, if the SCSI controller in both servers is set to 7, set the SCSI ID of one SCSI controller to 6.
3. Install the SCSI Repeater Card in the expansion enclosure.
4. Connect the power cable to the SCSI Repeater Card.
5. Connect one end of the SCSI option cable to the internal SCSI connector on the SCSI Repeater Card; then, connect the other end of the cable to the backplane on the storage enclosure.



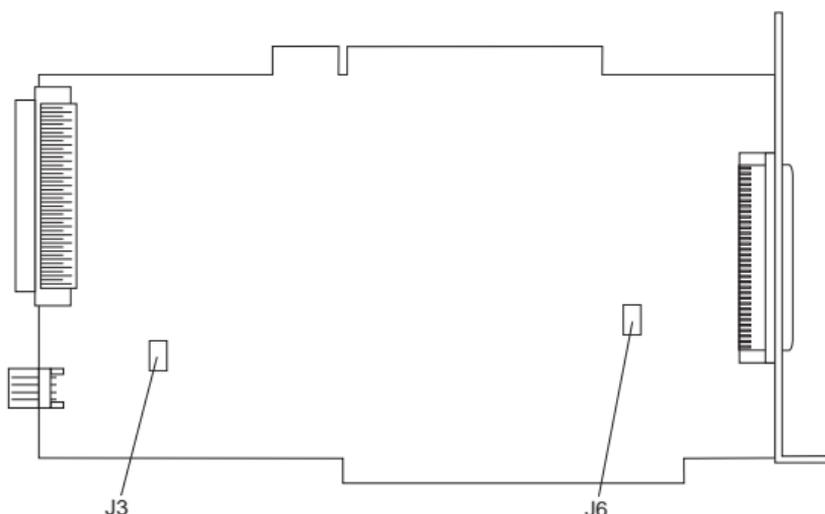
Connecting One Server and Two Storage Enclosures

Note

You must have a Y-cable available for connecting the server and storage enclosures. The Y-cable can be ordered from an IBM marketing representative or an IBM reseller.

To connect the storage enclosure to one server and another storage enclosure, do the following.

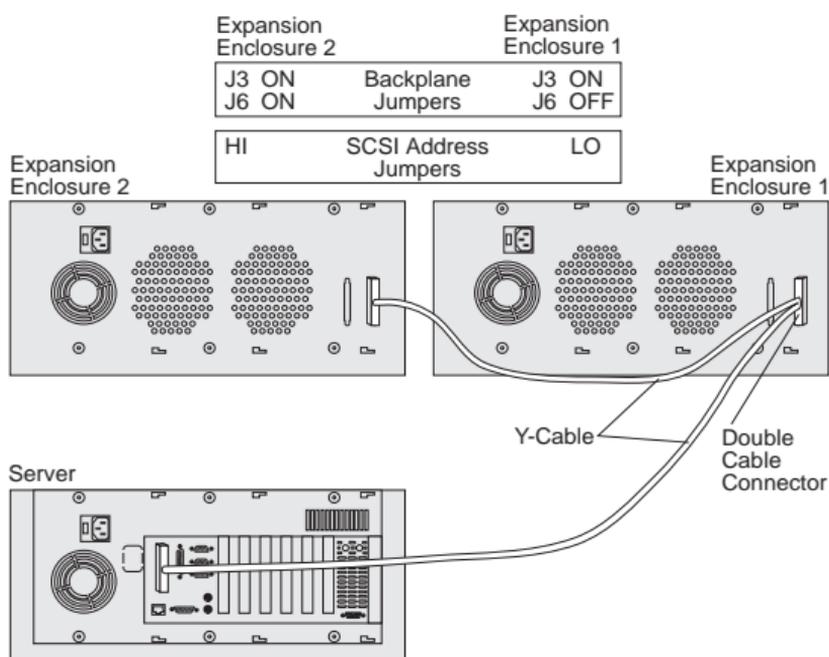
1. Set jumpers (J3 and J6) on the SCSI Repeater Card.



The default settings for both jumpers is ON (covers on each jumper). The following table summarizes the jumper settings for the SCSI Repeater Card jumpers.

Jumper	Description
J3	Leave the jumper in the ON position.
J6	<ul style="list-style-type: none">• Use the OFF position (cover removed) to connect the storage enclosure to the double connector of a Y-cable.• Use the ON position (cover in place) in all other cases.

- Set the SCSI ID address jumpers on the backplanes of the storage enclosures. See “SCSI IDs” on page 6 for information on the SCSI ID address jumpers. The following illustrates cabling and jumper setting requirements.



The storage enclosures can contain a maximum of twelve slim-high, or six half-high hot-swap drives.

SCSI Termination

Termination ensures that the quality of the signal is maintained throughout the SCSI chain. If you chain SCSI devices in bays 1 through 3, the backplane automatically sets termination for all devices. The backplane also automatically sets termination for hot-swap drives.

Before you install a SCSI device, set the termination to DISABLED. On some devices, you will need to remove jumpers. Refer to the information that came with the device for instructions.

Specifications

Size

- Depth: 465 mm (18.3 in.)
- Height: 216 mm (8.5 in.)
- Width: 482 mm (19.0 in.)

Weight

- Typical storage enclosure as shipped: 17 kg (37.5 lb)

Environment

- Air temperature:
 - Storage Enclosure on:
10° to 35° C
(50° to 95° F)
Altitude: 0 to 914 m (3000 ft.)
 - Storage Enclosure on:
10° to 32° C
(50° to 90° F)
Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
 - Storage Enclosure off:
10° to 43° C
(50° to 110° F)
Maximum Altitude: 2133 m (7000 ft.)
- Humidity:
 - Storage Enclosure on:
8% to 80%
 - Storage Enclosure off:
8% to 80%
- Maximum altitude: 2133 m (7000 ft)

Electrical Input

- Sine-wave input (50 to 60 Hz) is required
- Input voltage:
 - Low range:
 - Minimum: 90 V ac
 - Maximum: 137 V ac
 - High range:
 - Minimum: 180 V ac
 - Maximum: 265 V ac
 - Input kilovolt-amperes (kVA) approximately:
 - Minimum configuration as shipped: 0.08 kVA
 - Maximum configuration: 0.52 kVA

Total Power Available for Drives

- Nominal Operating Current allowed:
 - +5 V dc line: 5.3 A
 - +12 V dc line: 5.0 A

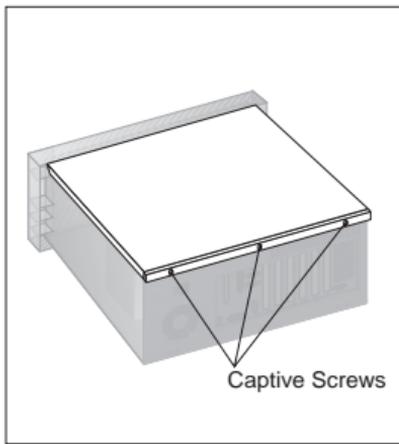
Heat Output

- Approximate heat output in British Thermal Units (Btu) per hour:
 - Minimum configuration:
350 Btu (102 watts)
 - Maximum configuration:
860 Btu (251 watts)

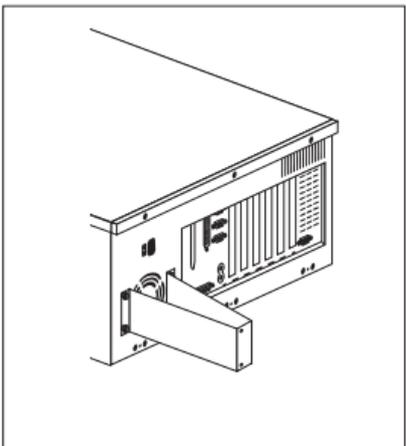
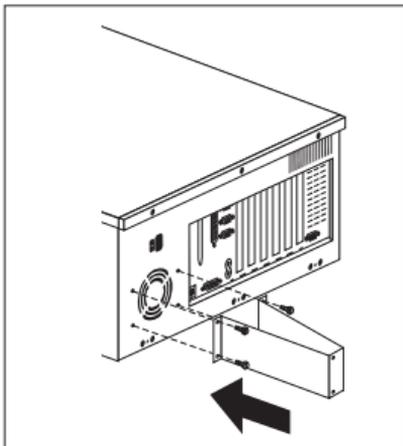
Locations

- “Access Cover” on page 13.
- “Cable Management Arm Bracket” on page 13.
- “Chassis Draw Bracket” on page 13.
- “Controls and Indicators” on page 14.
- “Expansion Bays” on page 15.
- “External Connectors” on page 18.
- “Front Door” on page 18.
- “Hot-Swap Drive Tray III” on page 19.
- “Keylock Assembly Exploded View” on page 20.
- “Rack Slides” on page 20.
- “SCSI Repeater Card” on page 21.
- “Slide Management Bracket” on page 21.
- “Voltage Setting” on page 23.

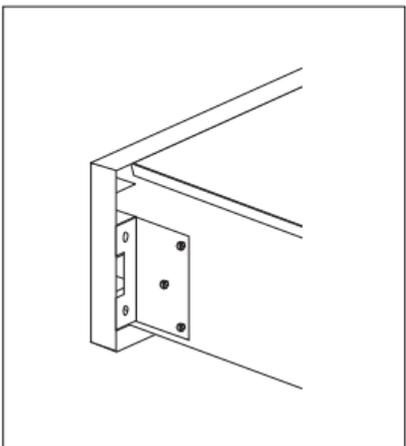
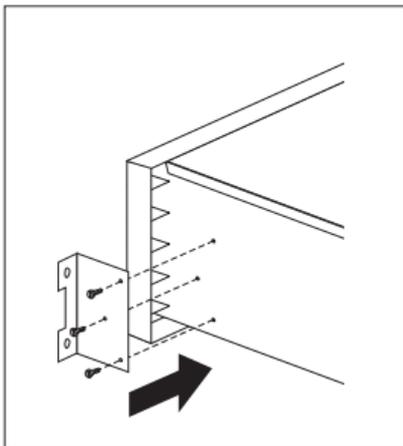
Access Cover



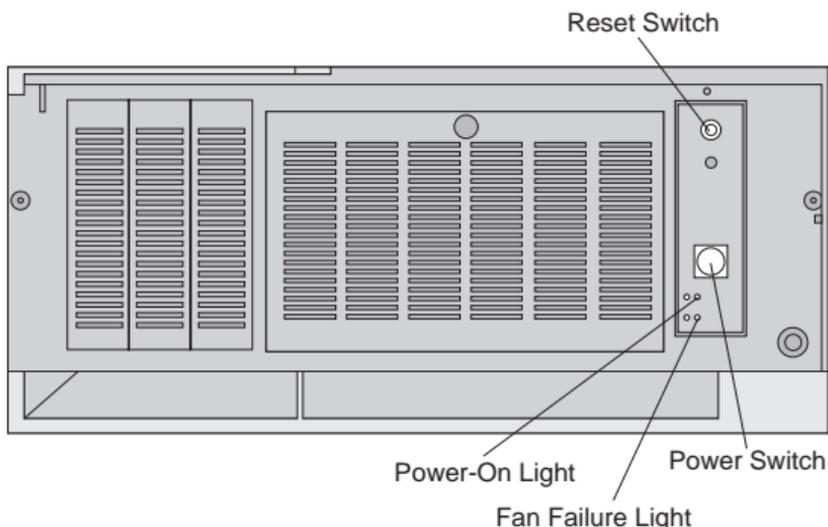
Cable Management Arm Bracket



Chassis Draw Bracket



Controls and Indicators

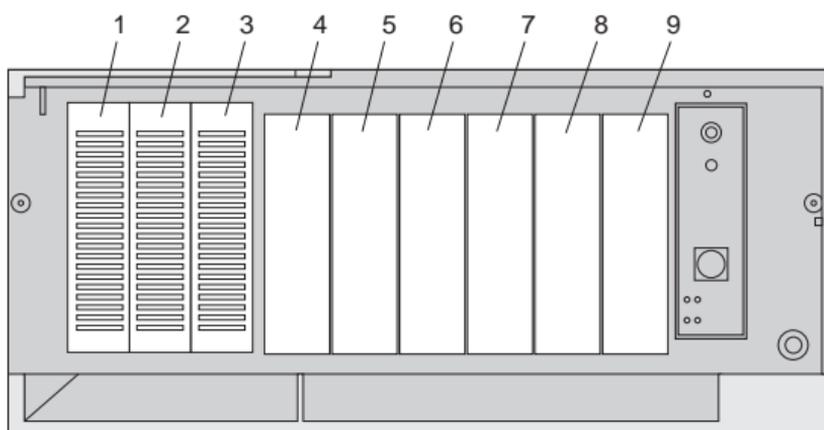


Reset Switch:	Use to cancel the fan failure warning buzzer.
Power Switch:	Use to power the storage enclosure on and off. To power-on the storage enclosure, press the Power switch momentarily, and the Power On indicator will illuminate in approximately one second.
Power-On Light:	This green LED lights when the storage enclosure is powered on by pressing the Power switch.
Fan Failure Light:	This amber LED lights if one or more of the internal fans fail. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">Note</p> <p>If one or more fans remain idle, a warning buzzer sounds. Press the Reset switch to silence the warning buzzer.</p> </div>

Attention

The storage enclosure produces heat. Fans in the storage enclosure pull in fresh air and force out hot air. Operating the storage enclosure with an idle fan can cause overheating, which might result in a malfunction or damage.

Expansion Bays



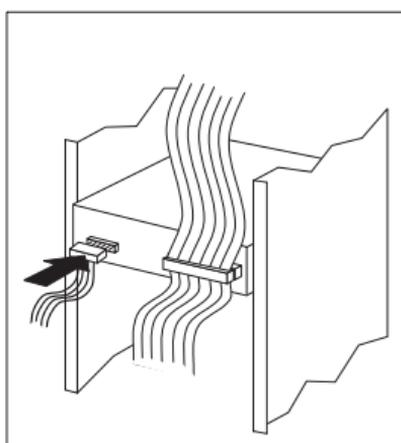
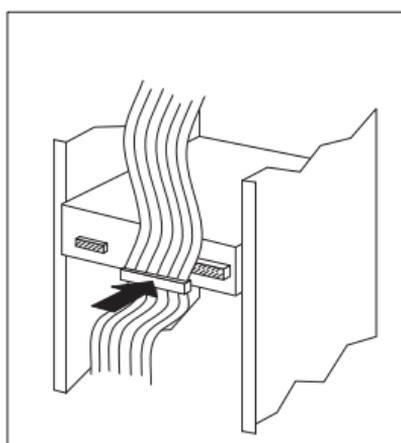
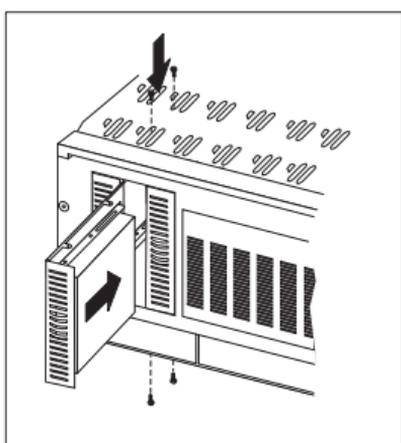
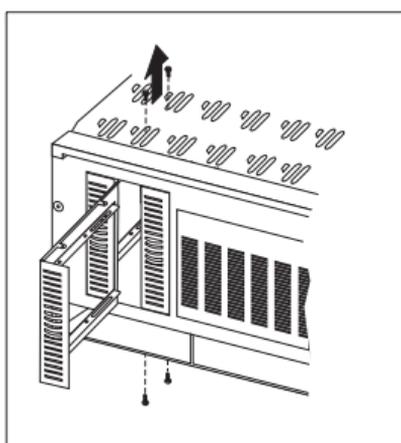
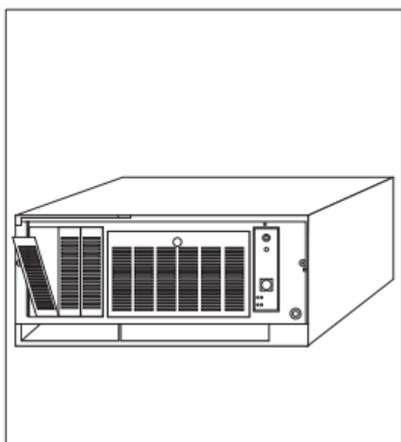
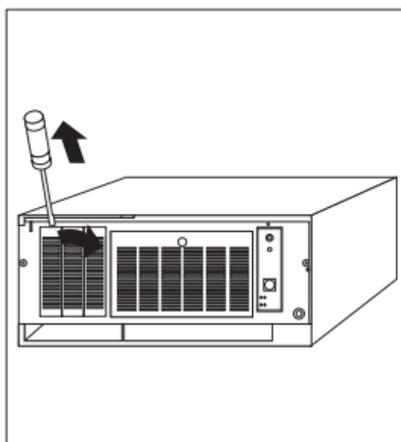
Bay	Drive Width	Drive Type	Drive Height
1 – 3	3.5-inch 5.25-inch	Removable media drive ¹ , hard disk drive ²	41.3 mm (1.6 in.)
4 – 9	3.5-inch	Hot-Swap ³	25.4 mm (1.0 in.) 41.3 mm (1.6 in.)

Notes:

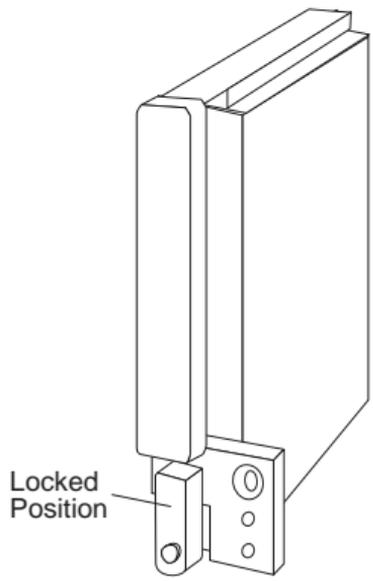
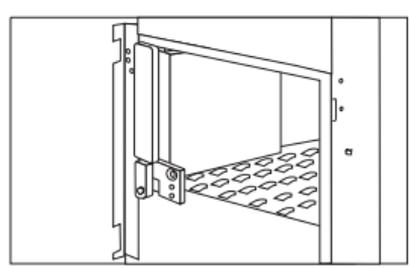
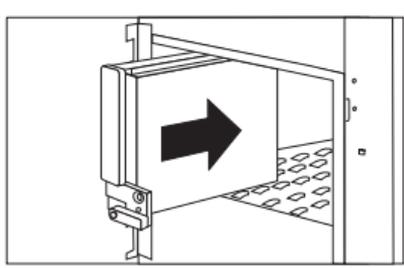
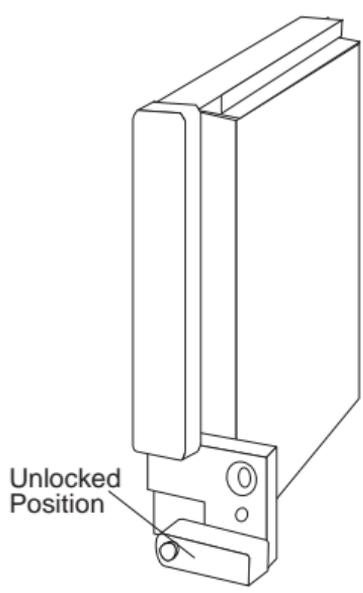
1. Removable media includes CD-ROMs, optical discs, and tape.
2. You can install a maximum of two 41.3 mm drives.
3. A 41.3 mm drive installed in bays 4 through 9 occupies two bays.

Table 1. Maximum Allowable Drive Sizes

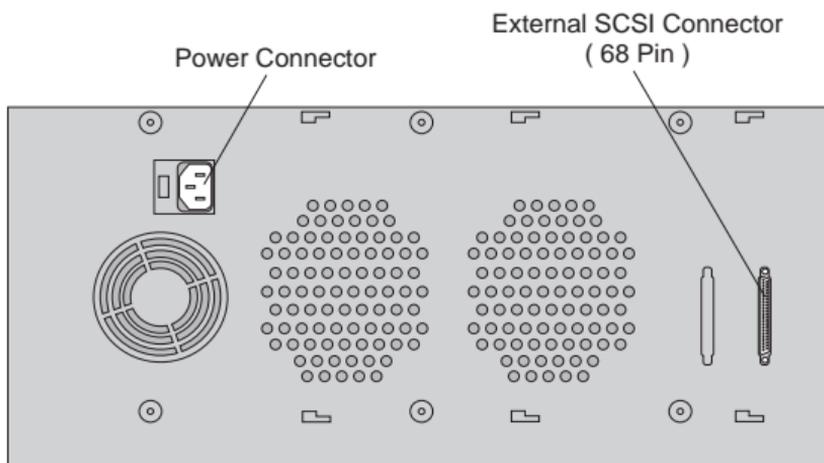
Drive Bays 1 to 3



Hot-Swap Drives Bays 4 through 9



External Connectors

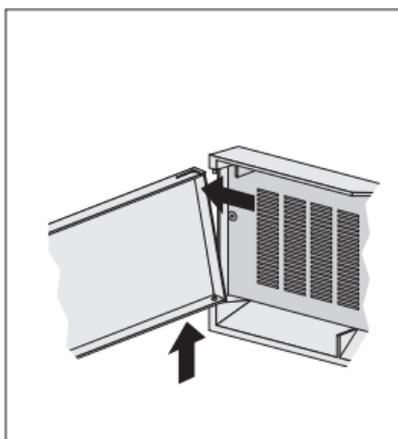
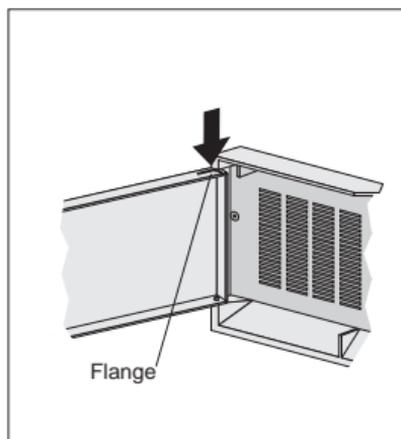


Note

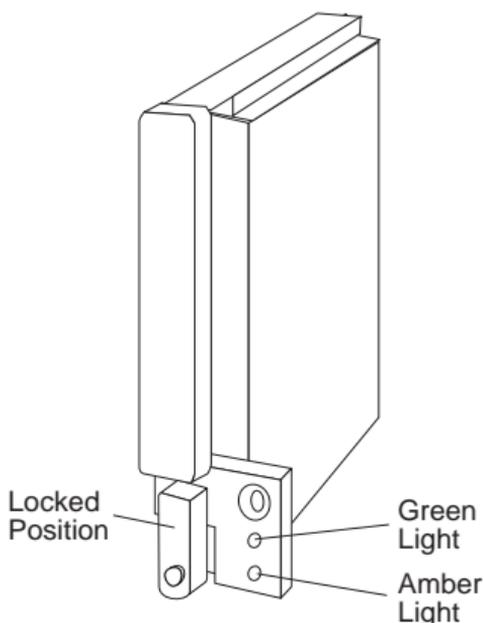
See "SCSI Repeater Cards" on page 7 for information on external connector requirements.

Power Connector:	The storage enclosure power cable connects here.
External SCSI Connector:	A SCSI cable attaches here, and connects to the external SCSI connector on the server. For disk-array servers, the cable connects to the external SCSI connector on a RAID adapter.

Front Door



Hot-Swap Drive Tray III

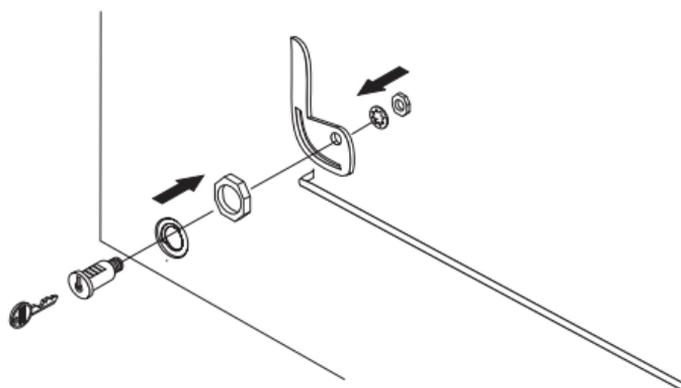


Green	Amber	Description
On	Off	Drive tray is powered on; the hard disk drive is inactive; and the drive should <i>not</i> be removed.
Blinking	Off	The hard disk drive is inactive. The hot-swap drive can be removed safely. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center;">Note</p> <p>This indication will only appear if the expansion enclosure is attached to a RAID adapter.</p> </div>
On	On or Blinking	The hard disk drive is in use, and should <i>not</i> be removed.
Off	Off	The drive is defective, or no power is being supplied to the drive. The hot-swap drive can be removed safely. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center;">Attention</p> <p>Press the small switch on the drive before you remove the drive.</p> </div>

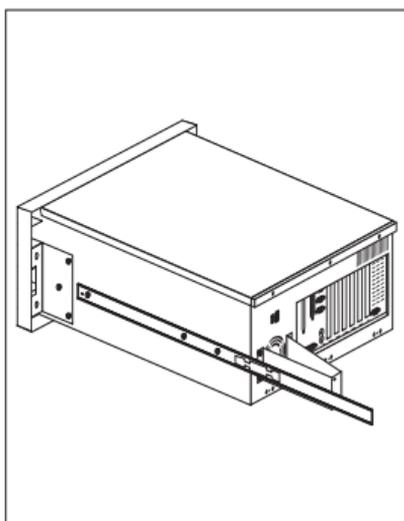
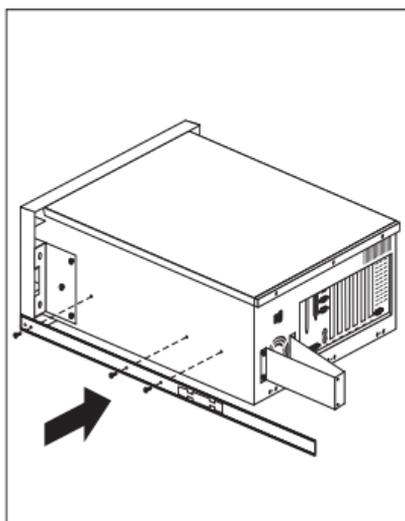
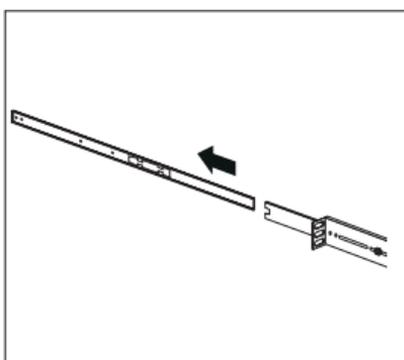
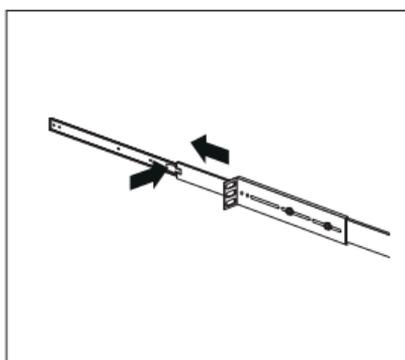
Notes

1. Each hot-swap drive that you plan to install must have a hot-swap drive tray III attached.
2. Trays are available for two drive types: narrow and wide. The narrow tray supports 8-bit drives; the wide tray supports 16-bit drives.

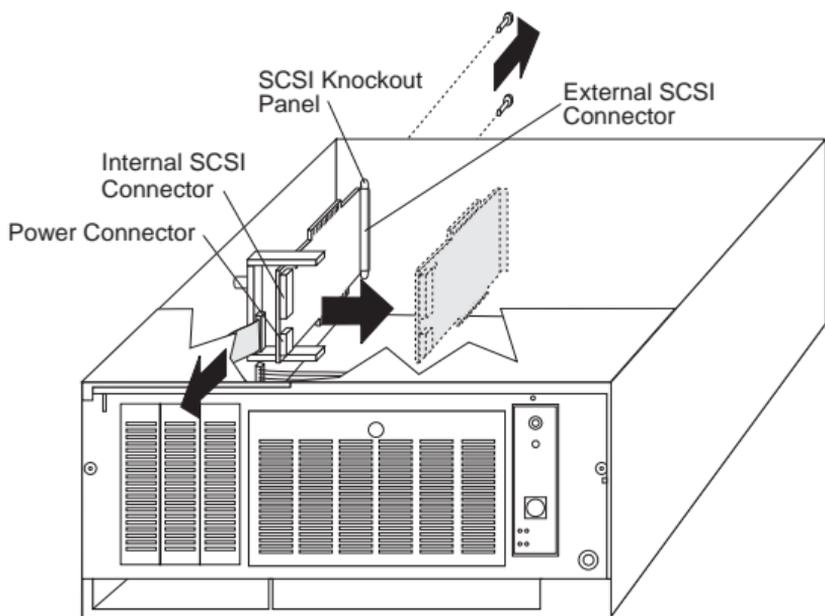
Keylock Assembly Exploded View



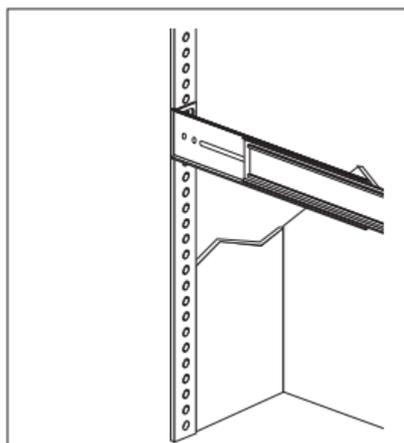
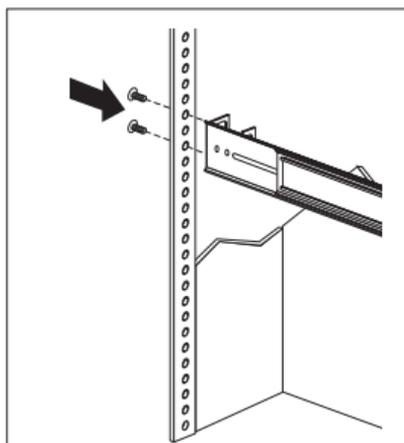
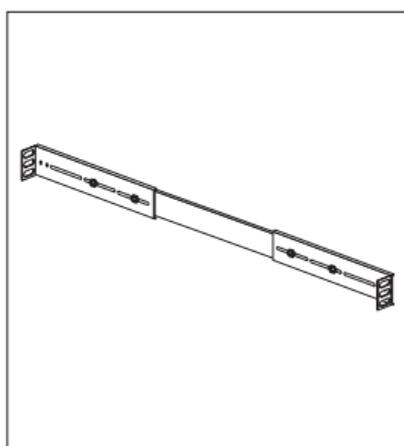
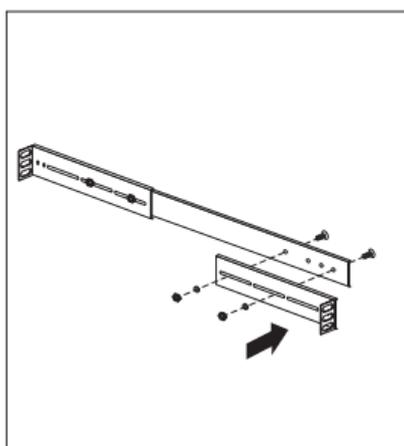
Rack Slides

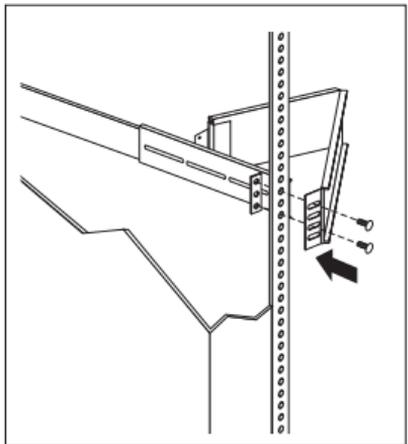
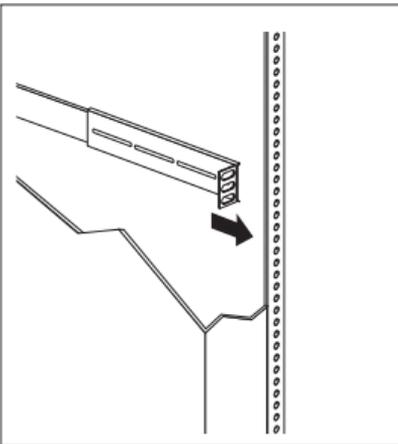
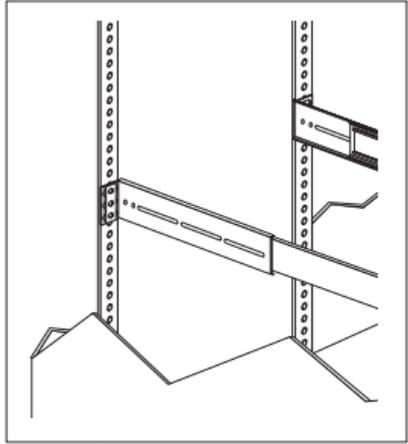
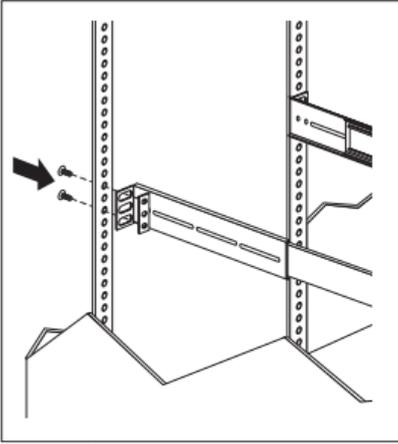
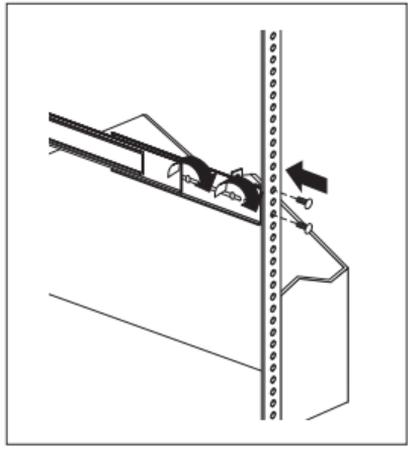
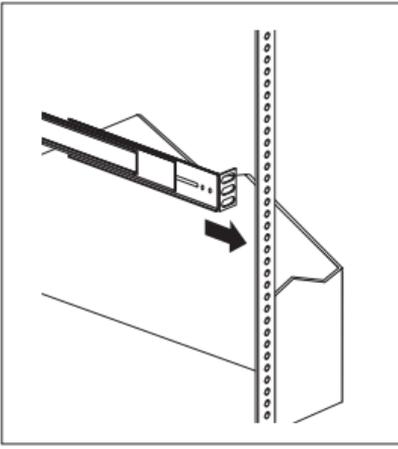


SCSI Repeater Card



Slide Management Bracket



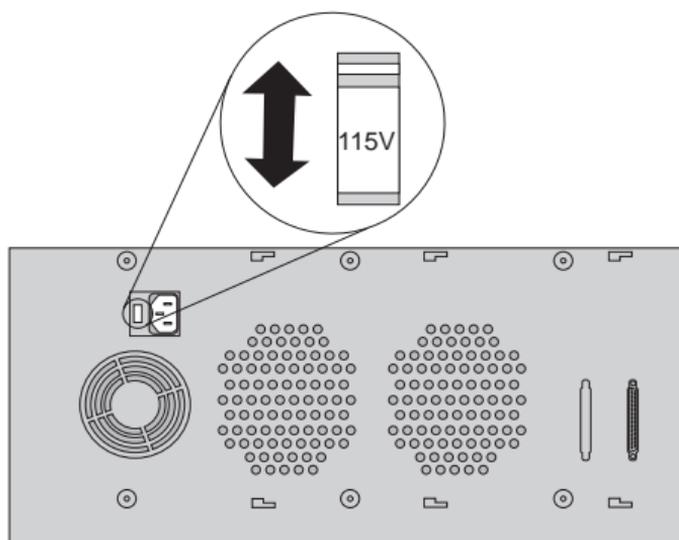


Voltage Setting

Attention: If you set the voltage switch to the wrong position, you might permanently damage your storage enclosure when you turn it on.

- If the voltage range in your country is between 100 and 127 volts, check to see that 115 is visible. (Use the 115-volt setting in the U.S. and Canada.)
- If the voltage range in your country is between 200 and 240 volts, check to see that 230 is visible.

To adjust the voltage setting, slide the switch to the correct position.



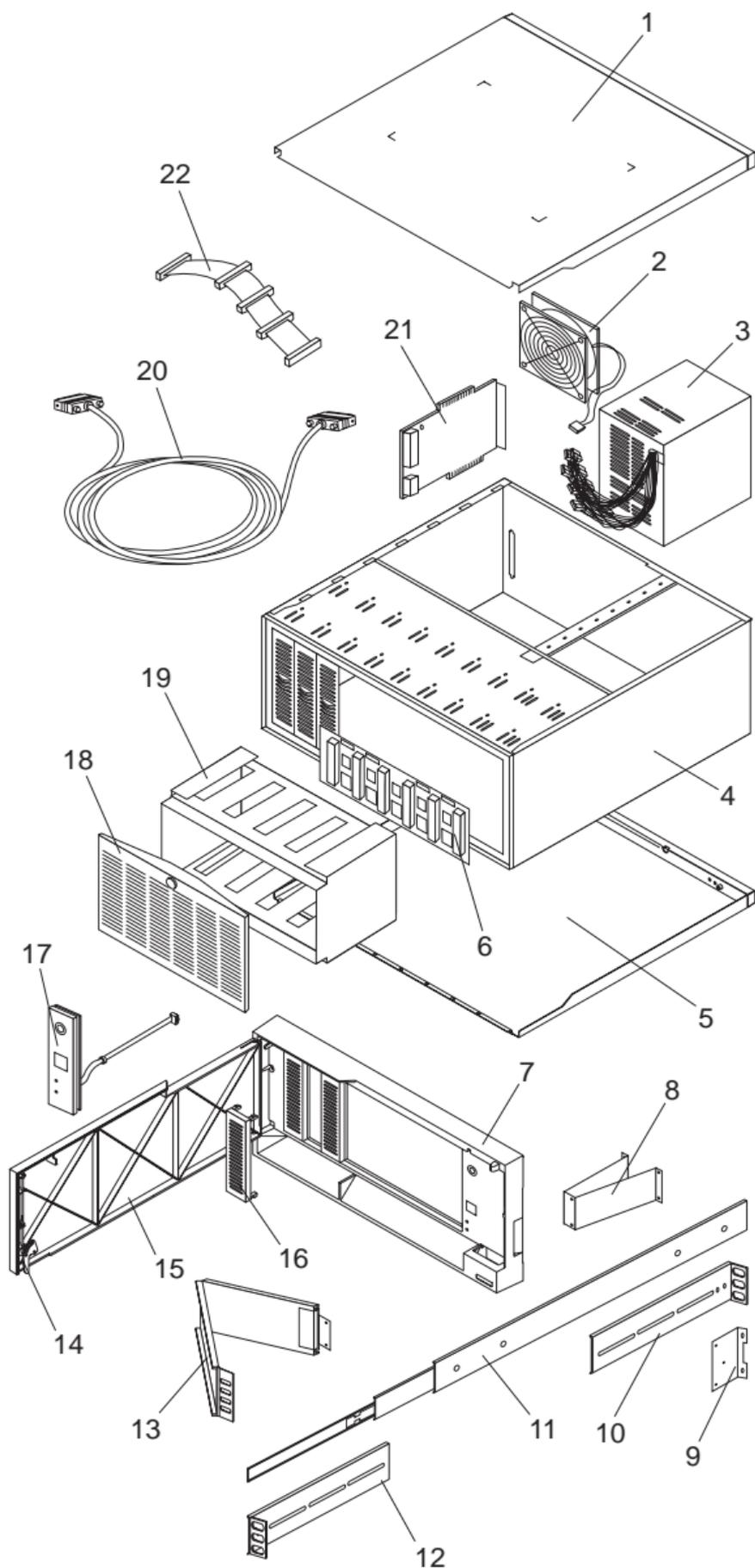
Symptom-to-FRU Index

This index supports the PC Server Rack Storage Enclosure - Type 3519.

The Symptom-to-FRU Index lists symptoms and the possible causes. The most likely cause is listed first. Use this Symptom-to-FRU Index to help you decide which FRUs to have available when servicing the rack enclosure.

Symptom	FRU/Action
Expansion Enclosure will not power-on.	<ol style="list-style-type: none">1. Check voltage switch, power cord, power source and cables.2. Check the Power Supply , see "Power Supply (FRU Number 60H8301)" on page 4.
Fan Failure buzzer sounds, Fan Failure LED lights, or one or more of the internal fans is not operating. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"><p style="text-align: center;">Attention</p><p>Do not operate the expansion enclosure unless all fans are working properly.</p></div>	<ol style="list-style-type: none">1. Fan2. Power Supply
SCSI Repeater Card that was just installed does not work.	<ol style="list-style-type: none">1. Check termination (See "SCSI Termination" on page 10.)2. Repeater Card3. SCSI Adapter that the repeater card is connected to.
SCSI Repeater Card that used to work does not work now.	<ol style="list-style-type: none">1. Check termination (See "SCSI Termination" on page 10.)2. Repeater Card3. SCSI Adapter that the repeater card is connected to.
SCSI device that used to work does not work now.	<ol style="list-style-type: none">1. Check SCSI ID settings (See "SCSI IDs" on page 6.)2. Check termination (See "SCSI Termination" on page 10.)3. SCSI Device4. Repeater Card5. SCSI Adapter that the repeater card is connected to.

Parts Listings (PC Server Rack Storage Enclosure - Type 3519)



System (Model R01)

Index	System (PC Server Rack Storage Enclosure - Type 3519) Model R01	FRU No.
1	Access Cover with Rear Bezel	72H2643
2	Fan Assembly 120 mm with Connector	60H9308
3	200W UV PFC Power Supply Assembly	60H8301
4	Base Frame Assembly	60H9283
5	Access Cover with Rear Bezel	72H2643
6	Hot-Plug Backplane	06H8576
7	Front Bezel Rack	60H8300
8	Cable Management Arm Bracket	72H2674
9	Chassis Draw Bracket	72H2676
10	Slide Management Bracket	72H2655
11	Rack Slides	72H2653
12	Slide Management Bracket	72H2655
13	Cable Management Arm	72H2657
14	Keylock with Keys	33F8433
15	Front Door Assembly Rack	60H8308
16	5.25-Inch Blank Bezel	76H3451
17	LED/On/Off Switch Cable Assembly	60H8302
18	Hot-Swap Door Assembly	60H9284
19	DASD Tray	06H2652
20	4.3 m 68/68 Cable	76H0501
21	SCSI Repeater Card	93H6409
22	Internal SCSI Cable 5X	60H8304
	Miscellaneous Parts Kit	55H8179
	PC Server Label	60H8306
	Power Cords (See, "Power Cords" on page 27.)	
	Push Catch and Bracket	60H9285

Power Cords

PC Server Rack Storage Enclosure - Type 3519

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

Safety Information	30
General Safety	30
Electrical Safety	31
Safety Inspection Guide	32
Handling Electrostatic Discharge-Sensitive Devices	34
Grounding Requirements	34
Laser Compliance Statement	35
Send Us Your Comments!	37
Problem Determination Tips	38
Phone Numbers, U.S. and Canada	39
Notices	41
Trademarks	41

Safety Information

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

Laser Compliance Statement

Some IBM Personal Computer models are equipped from the factory with a CD-ROM drive. CD-ROM drives are also sold separately as options. The CD-ROM drive is a laser product. The CD-ROM drive is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the drive is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a CD-ROM drive is installed, note the following.

CAUTION:

Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

O uso de controles, ajustes ou desempenho de procedimentos diferentes daqueles aqui especificados pode resultar em perigosa exposição à radiação.

凡未在这里指明的任何控制用法、调整、行为，都会导致严重后果。

Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites.

Werden Steuer- und Einstellelemente anders als hier festgesetzt verwendet, kann gefährliche Laserstrahlung auftreten.

Az itt előírt eljárásoktól, beállításoktól és vezérlésektől eltérni a lézersugárzás veszélye miatt kockázatos !

L'utilizzo di controlli, regolazioni o l'esecuzione di procedure diverse da quelle specificate possono provocare l'esposizione a

Использование элементов настройки и выполнение процедур иных, чем указано здесь, может привести к опасному радиационному облучению.

Použitie kontrôl, úprav alebo iných vykonaní od iných výrobcov, ako je v tomto špecifikované, mohlo by mať za následok nebezpečenstvo vystavenia sa vyžiarovaniu.

El uso de controles o ajustes o la ejecución de procedimientos distintos de los aquí especificados

puede provocar la exposición a radiaciones peligrosas.

Opening the CD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive. **Do not open.**

Some CD-ROM drives contain an embedded Class 3A or Class 3B laser diode. Note the following.

DANGER:

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

Radiação por raio laser ao abrir. Não olhe fixo no feixe de luz, não olhe diretamente por meio de instrumentos óticos e evite exposição direta com o feixe de luz.

开启时会有激光发射时，请勿盯视激光光束，请勿直接查看视觉仪器，并且避免直接接触在激光光束之中。

Rayonnement laser si carter ouvert. Évitez de fixer le faisceau, de le regarder directement avec des instruments optiques, ou de vous exposer au rayon.

Laserstrahlung bei geöffnetem Gerät. Nicht direkt oder über optische Instrumente in den Laserstrahl sehen und den Strahlungsbereich meiden.

Kinyitáskor lézersugár ! Ne nézzen bele se szabad szemmel, se optikai eszközökkel. Kerülje a sugárnyalábbal való érintkezést !

Aprendo l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici e evitare l'esposizione diretta al fascio.

Открывая, берегитесь лазерного излучения. Не смотрите на луч, не разглядывайте его с помощью оптических инструментов, а также избегайте прямого воздействия лазерного луча.

Keď je laserová jednotka otvorená. Vyhnite sa priamemu pohľadu a nehládte priamo s optickými nástrojmi do lúča a vyhnite sa priamemu vystaveniu lúčov.

Radiación láser al abrir. No mire fijamente ni examine con instrumental óptico el haz de luz. Evite la exposición directa al haz.

Send Us Your Comments!

We want to know your opinion about this manual (part number 84H7202). 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 38.

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
800-465-6600	Customer Relations
905-316-6666	Customer Relations - Toronto
800-465-6666	Customer Service Dispatch
800-263-2769	Customer Service Parts
800-465-2222	Customer Support Center (ISC)
416-443-5701	Customer Service Repair Center
800-465-7999	HelpClub Registration
800-465-7999	IBM Direct
905-513-3367	IBM Certification Administrator
905-316-2683	IBM Certification Coordinator Mail to: 50 Acadia Drive Markham, Ontario L3R 0B3
800-465-3299	IBM HelpFax
905-316-3299	IBM HelpFax - Toronto
800-565-3344	IBM HelpPC
800-268-3100	IBM Information Network Support
800-268-3100	IBM Information Network Support - Toronto
800-387-8343	IBM PC Service Partners
800-663-7662	Lexmark Product Information
800-263-2769	Parts Orders, Exchange or Emergency
416-443-5808	Parts Regular Orders, Exchange
(Fax)	
416-443-5755	Parts Orders, Inquiries
514-938-3022	PC Co Bulletin Board - Montreal
905-316-4255	PC Co Bulletin Board - Toronto
604-664-6464	PC Co Bulletin Board - Vancouver
204-934-2735	PC Co Bulletin Board - Winnipeg
800-661-7768	PS Marketing Support (PSMT)
800-465-1234	Publications Ordering
905-316-4148	Service Management Support
905-316-4100	Service Management Support
(Fax)	
905-316-4150	Service Manager
905-316-4100	Service Manager
(Fax)	
905-316-4872	Service Quality Programs
905-316-4100	Service Quality Programs
(Fax)	
800-661-2131	Skill Dynamics (Education)
800-565-3344	PS/1 Warranty Customer Helpline
800-387-8483	PS/1 Warranty Service (DOAs)
416-443-5835	Warranty Claim Fulfillment
(Fax)	
905-316-2445	Warranty Claim Reimbursement
905-316-3515	Warranty Claim Reimbursement
(Fax)	
416-443-5778	Warranty Claim Parts Inquiry
800-505-1855	Warranty Provider Support Hotline
800-267-7472	Warranty Service, ThinkPad

Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

Business Partner	EduQuest
HelpCenter	HelpClub
HelpFax	IBM
OS/2	Personal System/2
PS/1	PS/2
PS/ValuePoint	Skill Dynamics
ThinkPad	SystemXtra

The following terms are trademarks of other companies:

Frame	Frame Technology, Inc.
Lexmark	Lexmark International, Inc.



Part Number: 84H7202

Printed in U.S.A.

S84H-7202-00

