

2212 Access Utility



Service and Maintenance Manual

2212 Access Utility



Service and Maintenance Manual

Note

Before using this information and the product it supports, be sure to read the general information under Appendix D, "Notices" on page D-1, and safety information in "Safety Notices" on page D-7.

Second Edition (January 1999)

This edition applies to the IBM 2212 Access Utility and Access Integration Services V3.2.

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About This Manual

This manual provides the information needed to:

- Analyze a problem or symptom
- Restore normal operation to the IBM 2212 Access Utility (*IBM 2212*)
- Exchange any of the removable parts of the IBM 2212
- Run standalone and operational diagnostics

Who Should Read This Manual

This manual is for the use of the person servicing the Access Utility.

Hardcopy Publications Shipped with the 2212

These documents are shipped in hardcopy and are also contained on the *Access Integration Services Configuration Tool and Documentation* CD-ROM, SK2T-0435, in softcopy form:

Planning

GA27-4215-01 *2212 Access Utility Introduction and Planning Guide*

This book explains how the 2212 fits into a network and what features and options it offers.

Installation

GA27-4216-01 *2212 Access Utility Installation and Initial Configuration Guide*

This booklet explains how to set up the IBM 2212, perform initial configuration, and correct some problems that might occur during installation.

GX27-4048-00 *2212 Access Utility Hardware Configuration Quick Reference*

This reference card is used for entering and saving configuration information such as IP and MAC addresses.

Configuration

GC30-3830-05 *Configuration Program User's Guide*

This book discusses how to use the Access Integration Services Configuration Program.

Diagnostics and Maintenance

GY27-0362-01 *2212 Access Utility Service and Maintenance Manual*

This book provides instructions for diagnosing problems with and repairing the IBM 2212.

Safety

SD21-0030 *Caution: Safety Information—Read This First*

This book provides translations of caution and danger notices applicable to the installation and maintenance of a 2212.

Softcopy Publications Shipped on the CD-ROM

The following list shows the books that support the Access Integration Services program. They are shipped with the IBM 2212 on the *Access Integration Services Configuration Tool and Documentation* CD-ROM, SK2T-0435. Hardcopy versions of the books can be purchased separately.

Operations and Network Management

SC30-3988-00 *Access Integration Services Software User's Guide*

This book explains how to use the 2212 command-line user interface to configure and monitor the network interfaces and link-layer protocols shipped with the 2212.

SC30-3989-00 *Access Integration Services Using and Configuring Features*

This book explains how to configure and monitor features of the 2212 such as bandwidth reservation, WAN restoration, and WAN reroute.

SC30-3990-00 *Access Integration Services Protocol Configuration and Monitoring Reference, Volume 1*

SC30-3991-00 *Access Integration Services Protocol Configuration and Monitoring Reference, Volume 2*

These books describe how to access and use the Access Integration Services command-line user interface to configure and monitor the routing protocol software shipped with the product.

They include information about each of the protocols that the device supports.

SC30-3682-10 *Event Logging System Messages Guide*

This book contains a listing of the error codes that can occur, along with descriptions and recommended actions to correct the errors.

Publications on the Internet

The publications that ship in hardcopy and CD-ROM are also available on the World Wide Web at:

<http://www.networking.ibm.com/did/2212bks.html>

Ordering IBM Publications

In the USA, you can order IBM publications by calling 1 800 879-2755. Within or outside the USA, you can order IBM publications through the IBM Publications Direct Catalog on the World Wide Web at:

<http://www.elink.ibm.com/pb1/pb1>

IBM translates many publications into a variety of languages. The publication you need may be available in your language.

Obtaining Updates and Corrections

You can obtain updated versions of the software and product information from IBM's Web pages.

Software updates are at:

<http://www.networking.ibm.com/support/downloads/2212>

Product information and updates are at:

<http://www.networking.ibm.com/2212/2212prod.html>

Summary of Changes

Changes to the 2212 hardware publications include details for the 1xx chassis.

Chapter 1. Problem Determination

Both hardware and software (operational code and configuration) problems can affect the IBM 2212 Access Utility (*IBM 2212*).

Generally, errors that occur **before** the operational code is loaded are hardware-related. Light emitting diodes (LEDs) on the front and back of the IBM 2212 indicate how the hardware components are functioning. Errors that occur **after** the operational code is loaded indicate problems with the operational code or configuration file. Various diagnostics programs, error logs and procedures in Appendix C, "Common Tasks" on page C-1 exist to help with code problem determination.

This manual is chiefly concerned with **diagnosing and correcting problems associated with hardware**.

Where to Begin

First, familiarize yourself with the LEDs as described in the following sections. Then go to "MAP 0100: Basic Verification" on page 1-8 to begin the troubleshooting process.

Reset Button

You can use the reset button on the 2212 system card to reset the operational software; however, it must be pressed and held for **at least 6 seconds**. Otherwise, if the reset button is pressed and held **less than 6 seconds**, the memory contents will be dumped if dumping has been enabled via **talk 6** in the command-line interface. It will also reboot the 2212 if reboot has been enabled via **talk 6** in the command-line interface. If reboot has **not** been enabled, the 2212 will hang until it has been powered off and on. It is recommended that reboot always be enabled on the 2212.

LED Indicators

The IBM 2212 has a number of light-emitting diodes (LEDs) that indicate how the unit is functioning. The following sections describe what each LED indicates.

System Card LEDs

The PCI Mezzanine Card (PMC) adapter slot, each integrated WAN port, and the service port on the system card have their own set of green and yellow LEDs. Additionally, the system card has a green and yellow LED for overall system card status.

During a power-on reset (POR), the green and yellow system card status and service port LEDs turn on and blink in different combinations to reflect the component that is being loaded and tested. Once the IBM 2212 has been loaded and tested successfully, the system status card green LED is lit to indicate that the device is operational¹. The sections that follow reflect problems that can occur after successful load and test.

¹ A simple configuration will load within 1.5 minutes. More complex configurations or those including APPN will take longer.

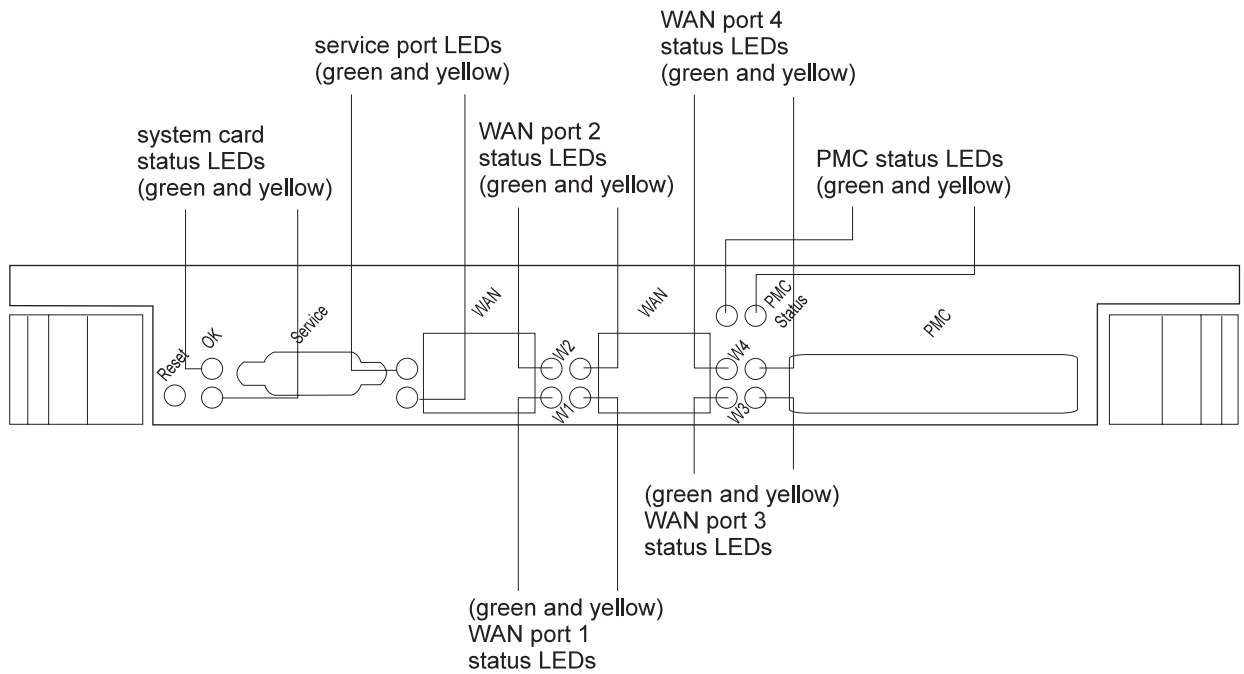


Figure 1-1. System Card LEDs

Table 1-1. System card LEDs

LED	Color	Meaning
System card status	Green	On - System card is operating normally. Off - Waiting for power on or the operational code to be loaded.
	Yellow	On - System card has a fault.
Service port	Green	On - The port hardware is operating normally. Off - DRAM may be defective. Use the instructions in the <i>2212 Service and Maintenance Manual</i> to access the 2212 Bootstrap Menus and display the Bootstrap error log.
	Yellow	On and system card status yellow LED On - Service port defective. Replace system card. Off - No problem detected.
Integrated WAN port	Green	On - Port is up (configured, enabled, and operating normally), testing (undergoing self-test), or down. Check status of corresponding integrated WAN port yellow LED to determine state of port. Off- Port is not configured or is disabled.
	Yellow	On - Port has a hardware fault. Blinking - The port has an I/O failure, has detected a network failure, or is not connected to a live network. If the port is connected to a live network and the yellow LED is blinking, use the MAPs in the <i>2212 Service and Maintenance Manual</i> to isolate. Off - Port is up or testing. No problem detected.
PMC adapter	Green	On - PMC adapter is up (configured, enabled, and operating normally), testing (undergoing self-test), or down. Check status of corresponding PMC yellow LED to determine state of adapter. Off - PMC adapter is up or testing. No problem detected.
	Yellow	On - PMC adapter has a hardware fault or is not seated correctly. Blinking - The adapter has an I/O failure, has detected a network failure, or is not connected to a live network. If the adapter is connected to a live network and the yellow LED is blinking, use the MAPs in the <i>2212 Service and Maintenance Manual</i> to isolate. Off - PMC adapter is up or testing. No problem detected.

Adapter Port LEDs

Each adapter port has LEDs to indicate the port's condition as described in the following sections.

Note: There are also LEDs on the rear of the IBM 2212 that indicate the status of the adapter in the corresponding slot. See "Additional Slot-Status LEDs" on page 1-7.

4-Port WAN, ISDN, and Token-Ring Port LEDs

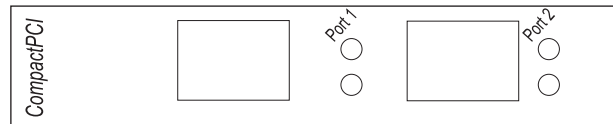


Figure 1-2. Port LEDs for ISDN and Token-Ring Adapters

Table 1-2 (Page 1 of 2). Adapter port LEDs

LEDs	Meaning
4-Port WAN Adapter LEDs	
Green	On - Port is up (configured, enabled, and operating normally), undergoing self-testing, or down. Off - Port is not configured or is disabled. Note: The 4-port WAN adapter has no yellow LEDs
ISDN Adapter Card LEDs	
Green	On - Port is up (configured, enabled, and operating normally), undergoing self-testing, or down. Check the status of the corresponding ISDN port yellow LED to determine the state of the port. Off - Port is not configured or is disabled.
Yellow	On - Port has a hardware fault. Blinking - Port has an I/O failure, has detected a network failure, or is not connected to a live network. If the port is connected to a live network, use the MAPs in the <i>2212 Service and Maintenance Manual</i> to isolate. Off - Port is up or testing. No problem detected.
Token-Ring PMC/Adapter Card LEDs	
Green on, yellow off	Adapter is enabled and operational.
Green off, yellow on	Adapter self-diagnostic tests failed due to a problem with the adapter.
Green off, yellow blinking	The adapter is closed due to an undetected error. One of the following conditions exist: <ul style="list-style-type: none"> • May have been closed by the network administrator. • The adapter open operation failed. • The adapter detected a wire fault. Check the cable. • The adapter failed the auto-removal test. <p>If one of these conditions occurs, see the <i>IBM Token-Ring Network Problem Determination Guide</i>, SX27-3710.</p>

Table 1-2 (Page 2 of 2). Adapter port LEDs

LEDs	Meaning
Green on, yellow blinking	The adapter has detected beaconing on the Token Ring. If this condition occurs, see the <i>IBM Token-Ring Network Problem Determination Guide, SX27-3710</i> .
Green blink, yellow off	Card hardware is operational. The port has been disabled.
Alternating green blink, yellow blink	Waiting for configuration of the card to be initialized or for the card to be inserted into the Token Ring.
Green off, yellow off	The adapter is not receiving power or the adapter is initializing.

Ethernet Port LEDs

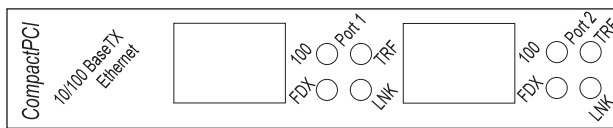


Figure 1-3. Ethernet CPCI Adapter Card LEDs. LEDs for the Ethernet PMC adapter differ.

Table 1-3. Ethernet Adapter Port LEDs

LEDs	Meaning
LNK (green)	Link LED On - The port is successfully connected to an Ethernet segment. Off - A cable is not plugged into the Ethernet port.
TRF (blinking green)	Traffic LED On - Frames are being transmitted or received on the Ethernet port. Off - No frames are being transmitted or received on the Ethernet port.
FDX (green)	Full-duplex LED On - The Ethernet port is running in full-duplex mode. Off - The Ethernet port is running in half-duplex mode.
100 (green)	100-Mbps LED On - The Ethernet port is running in 100-Mbps mode. Off - The Ethernet port is running in 10-Mbps mode.

Additional Slot-Status LEDs

The LED panel on the rear of the IBM 2212 has one green and one yellow LED per slot. These indicate the condition of the card in the respective slot.

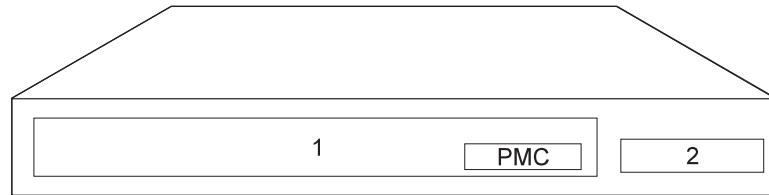


Figure 1-4. Slot Numbering on the IBM 2212, Models 1xx

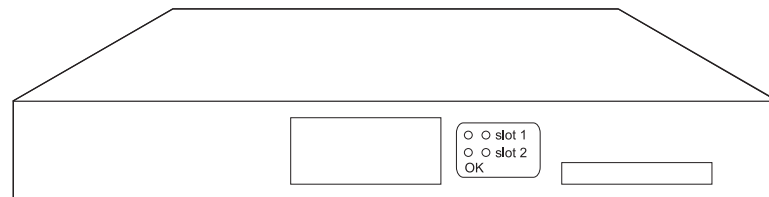


Figure 1-5. Slot Status LEDs on the Rear of the IBM 2212, Models 1xx

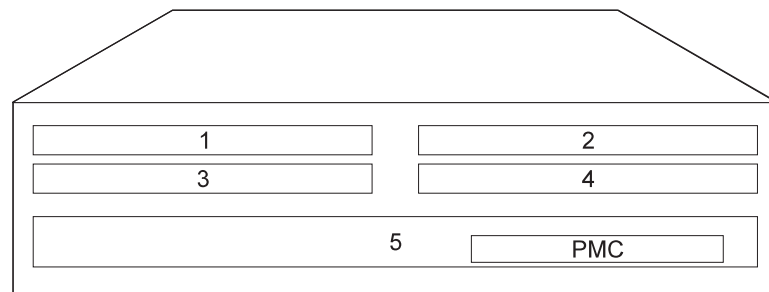


Figure 1-6. Slot Numbering on the IBM 2212, Models 4xx

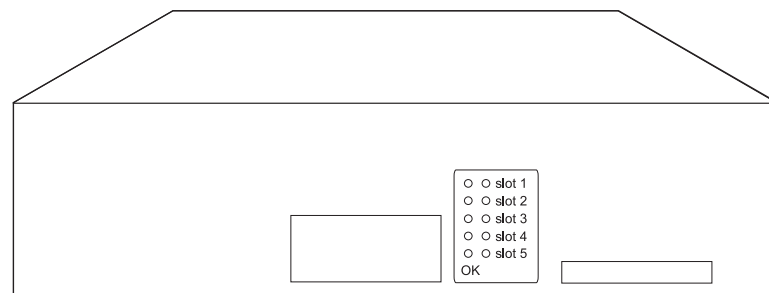


Figure 1-7. Slot Status LEDs on the Rear of the IBM 2212, Models 4xx

Table 1-4. Additional LEDs

LEDs	Meaning
OK (green) - on	Card is operational.
Yellow - off	No problem detected.
OK (green) - off	Card has a fault.
Yellow - on	Reseat the adapter and reboot. Replace the adapter if the problem is not corrected. See “Exchanging a CPCI Adapter” on page 2-6.
OK (green) - off	No card installed in the slot.
Yellow - off	

Maintenance Analysis Procedures

MAP 0100: Basic Verification

001

- On the IBM 2212:
 - Plug in the power cord.
 - Within three minutes, check the status of the LEDs on the front of the IBM 2212 using Table 1-5 on page 1-9.
 - Attach a service terminal to the service port. See Chapter 3, “Accessing the 2212” on page 3-1.
 - If the service terminal display is unreadable, refer to “MAP 0110: Service Terminal Display Unreadable” on page 1-14.

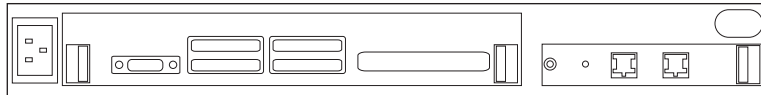


Figure 1-8. Front of IBM 2212, Models 1xx

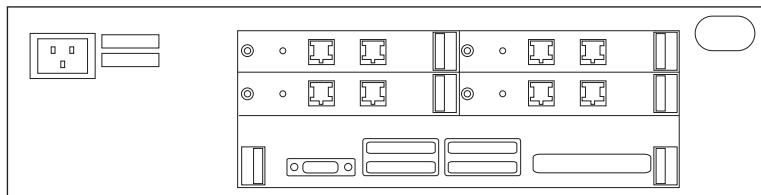


Figure 1-9. Front of IBM 2212, Models 4xx

Table 1-5 on page 1-9 shows the desired status of the LEDs. The LEDs on the IBM 2212 should have the following status when operating normally. See “LED Indicators” on page 1-2 for diagrams of the IBM 2212’s LEDs.

Table 1-5. LED Status When IBM 2212 is Operational

LED	Color	Status
System card status	Green	On
System card status	Yellow	Off
I/O port LEDs	Green	On
I/O port LEDs	Yellow	Off
System card PMC	Green	On
System card PMC	Yellow	Off
Adapter slot status LEDs ¹	Green	On
Adapter slot status LEDs ¹	Yellow	Off

Note: ¹Adapter slot status LEDs are on the side opposite the cable connectors. Both adapter slot LEDs will be off if no adapter is installed in the slot.

Table 1-6 shows messages that may appear at the operator console attached to the IBM 2212 to indicate a problem.

Table 1-6. Console Messages

Message	Comments
Testing memory slot y - Fail: error code	Replace the DRAM in the slot shown as y in this table. See "Exchanging a DRAM Feature" on page 2-9.

Are all LEDs OK?

Yes No

002

Go to Step 004.

003

The IBM 2212 should be functioning. If it is not, call 1-800-IBM-SERV.

004

– In Table 1-7 on page 1-10, select the LED status that fits your situation.

Table 1-7. LED Status and Required Actions

LED Status	Action
LEDs on the Front of the 2212 (See "LED Indicators" on page 1-2)	
All LEDs are off.	Step 005 on page 1-10
I/O port yellow LED is on or blinking.	Step 011 on page 1-11
System card status yellow LED is on.	Step 014 on page 1-12
PMC slot yellow LED is on.	Step 015 on page 1-12
System card status LEDs and service port LEDs are blinking	LED card problem. Remove cover, check the LED card connectors, and reboot. (See Chapter 2, "Removal and Replacement Procedures" on page 2-1.) If the LEDs are still blinking on a 1xx model, replace the chassis (PN 85H4738). (See "Installing a Model 1xx Chassis without a Hard File" on page 2-12 or "Installing a Model 1xx Chassis with a Hard File" on page 2-13.) If the LEDs are still blinking on a 4xx model, replace the chassis (PN 86H2690). (See "Installing a Model 4xx Chassis without a Hard File" on page 2-20 or "Installing a Model 4xx Chassis with a Hard File" on page 2-21.)
Service port yellow LED is on and green LED is off; system card status green LED is on and yellow LED is off.	A DRAM SIMM is defective. Go to Chapter 4, "Using the IBM 2212 Bootstrap Menus" on page 4-1 to access the Bootstrap Menus and display the Bootstrap error log. Then look up the error code in Chapter 5, "Bootstrap Error Codes" on page 5-1 to determine which DRAM to replace. Then, see "Exchanging a DRAM Feature" on page 2-9.
LEDs on the Back of the 2212 (See "Additional Slot-Status LEDs" on page 1-7)	
Adapter slot status yellow LED is on.	Step 008 on page 1-11
Adapter slot status green LED is off and yellow LED is off, and an adapter is in the slot.	Reseat the adapter and reboot. Replace the adapter if the problem is not corrected. (See "Exchanging a CPCI Adapter" on page 2-6)

005

– **All LEDs off** indicates that the 2212 is not receiving power. Perform the following tests:

1. Check that the power cable is correctly connected to the ac power outlet and power supply.
2. Unplug the power cable from the outlet, remove the cover, and check the internal cable connections.

If you found no problems, replace the chassis. See "Installing a Model 1xx Chassis without a Hard File" on page 2-12 or "Installing a Model 1xx Chassis with a Hard File" on page 2-13, or "Installing a Model 4xx Chassis without a Hard File" on page 2-20 or "Installing a Model 4xx Chassis with a Hard File" on page 2-21.

(Step **005** continues)

005 (continued)

Are any LEDs on now?

Yes No

006

Call 1-800-IBM-SERV.

007

Restart the verification procedure. Go to Step 001 on page 1-8.

008

– A **yellow** adapter slot status LED on the back of the 2212 is on.

The adapter is defective. Replace the adapter. (See “Exchanging a CPCI Adapter” on page 2-6.)

Does this correct the problem?

Yes No

009

Call 1-800-IBM-SERV.

010

Restart the verification procedure. Go to Step 001 on page 1-8.

011

A yellow LED for an I/O port is on or blinking. Is the yellow LED blinking?

Yes No

012

– **I/O port yellow LED is on.** The adapter is defective. Replace it. (See “Exchanging a CPCI Adapter” on page 2-6.) Restart the verification procedure. Go to Step 001 on page 1-8.

013

– **I/O port yellow LED is blinking**

There is a network or 2212 problem. Check the following in the order listed:

- A cable could be unplugged. Verify that the cables are securely plugged in.
- Status of the network and the software configuration for the interface.
 1. Contact the network administrator and determine if the network is experiencing problems.
 2. At the command-line interface, check the errors being logged for the I/O port interface and the status of the interface:
 - To check the status of the interface, see “Displaying the Status of An Interface” on page C-13.

For a more detailed status of the interface, at the GWCON (+) prompt, use the **network interface#** command to display network statistics for

the interface. Refer to the *Access Integration Services Software User's Guide* and see the monitoring chapter associated with the network interface.

- To view the errors being logged for the interface, access the command-line interface's error logging system (ELS) and display the errors for the interface type. (See "Displaying the Error Logging System (ELS) Messages for an Interface" on page C-7 to access the ELS.)
- The adapter hardware (I/O drivers or receivers for example) could be defective. Using the operational diagnostics, run an interactive test with a wrap plug, if available, on the I/O port. See "Testing the Adapters" on page 6-7 to run the diagnostics.

Correct any problem that you find. Restart the verification procedure. Go to Step 001 on page 1-8.

014

The yellow system card status LED is on. Is the green system card status LED blinking?

Yes No

015

Is a PMC yellow LED on?

Yes No

016

If the yellow system card status LED is on, the system card is defective. Replace it. See "Exchanging a System Card" on page 2-7. Restart the verification procedure. Go to Step 001 on page 1-8.

017

- Using the instructions in "Exchanging a PMC Adapter" on page 2-4, steps 1 through 8, reseal the PMC card.
 - If the LED is still on, replace the PMC card using the instructions in "Exchanging a PMC Adapter" on page 2-4.
-

018

- Either the code is corrupt, or the hard file or compact flash is defective. The 2212 will load an **abbreviated** code image from the system card, and then boot to the SVC> prompt. At the SVC> prompt, type **list** to determine if the active bank is corrupt.

If the active bank is **not** corrupt, go to Chapter 4, "Using the IBM 2212 Bootstrap Menus" on page 4-1 to access the Bootstrap Menus and display the Bootstrap error log. Then look up the error code in Chapter 5, "Bootstrap Error Codes" on page 5-1. If error code 05000101 has been logged, replace the hard file or compact flash. (See "Installing a Hard File Upgrade Feature in a Model 1xx Chassis" on page 2-15, or "Installing a Hard File Upgrade Feature in a Model 4xx Chassis" on page 2-23, or "Exchanging a Compact Flash Feature" on page 2-10.) Then, restart the verification procedure. Go to Step 001 on

page 1-8. If error code 05000101 has **not** been logged, from the SVC> prompt, TFTP new operational code onto the 2212. (See “Updating the Operational Code” on page C-21.)

If the active bank **is** corrupt, type **set** and set the other bank to active. Then, type **reboot**. After three minutes, the green system card status LED should be on and the yellow LED should be off. If the green system card status LED is still blinking and the yellow system card status LED is still on, from the SVC> prompt, TFTP new operational code onto the 2212. (See “Updating the Operational Code” on page C-21.)

After three minutes, the green system card status LED should be on and the yellow LED should be off. Does this correct the problem?

Yes No

019

- **Replace the hard file or compact flash.** See “Installing a Hard File Upgrade Feature in a Model 1xx Chassis” on page 2-15, or “Installing a Hard File Upgrade Feature in a Model 4xx Chassis” on page 2-23, or “Exchanging a Compact Flash Feature” on page 2-10. Restart the verification procedure. See Step 001 on page 1-8.

020

1. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.) Then, type **writes** to write the new operational code to the system card flash. Enter the software bank (A,B) to load from and press **Enter**.
2. Type **writeboot** to write the new bootstrap code to the system card flash. Enter the software bank (A, B) to load from and press **Enter**.

Restart the verification procedure. See Step 001 on page 1-8.

MAP 0110: Service Terminal Display Unreadable

Symptom Explanation	Conditions That Could Cause This Symptom
While you are diagnosing a problem, a terminal attached to the service port of the IBM 2212 displays random characters instead of readable text.	<ul style="list-style-type: none">• Incorrect configuration setting of the terminal or IBM 2212 service port speed.• Incorrect terminal/device (ac) grounds.• Defective, incorrectly shielded, or incorrectly grounded EIA 232 cable between the terminal and the IBM 2212.• Defective terminal or terminal emulator.• High ambient electromagnetic interference (EMI) levels.• Power line disturbances.• Defective IBM 2212 system board.

001

(Active state is indicated by the green system card status LED on and the yellow system card status LED off.)

Does the IBM 2212 go to the active state within three minutes of resetting or powering on?

Yes No

002

Go to Step 001 on page 1-8.

003

Go to Step 004.

004

– Press the space bar to display the console prompt.

Is a readable message displayed on the service terminal?

Yes No

005

– Go to Step 007.

006

– Go to Step 010 on page 1-15.

007

(Step **007** continues)

007 (continued)

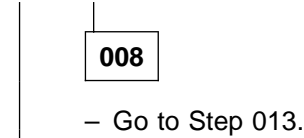
- The console configuration may be incorrect or the cable may be loose. Verify that the cable is securely attached to the service port. Then, make sure the ASCII terminal or emulator is configured according to the attributes described in "ASCII Terminal and Setup Attributes" on page 3-3. Next, verify that the baud rate of the ASCII terminal matches the baud rate configured for the 2212 service port. If you are unable to determine the correct baud rate, perform the following steps:

1. Set the terminal to a baud rate of 2400.
2. Press the space bar and then press **Enter** to restart the terminal or terminal emulator.

If the terminal still does not display a readable message, reset the baud rate and restart the terminal for each of the following speeds: 9600, 14 400, 19 200, 28 800, 38 400, 57 600, 115 200.

Is a readable message displayed on the service terminal?

Yes No



009

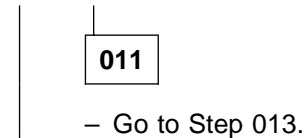
- Restart the verification procedure. Go to Step 001 on page 1-8.
-

010

The terminal should now operate correctly.

Is the terminal functioning correctly?

Yes No



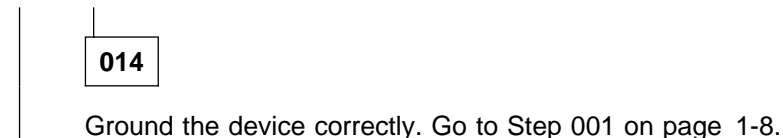
012

- Go to Step 001 on page 1-8.
-

013

Is the terminal or the IBM 2212 grounded correctly?

Yes No



015

(Step **015** continues)

015 (continued)

Is the EIA 232 cable between the terminal and the IBM 2212 grounded correctly and shielded?

Yes No

016

Ground or shield the cable correctly or replace the cable. Go to Step 001 on page 1-8.

017

Is the terminal or the terminal emulator functioning correctly?

Yes No

018

Replace the terminal or the terminal emulator. Go to Step 001 on page 1-8.

019

Is the IBM 2212 in an area with high ambient electromagnetic interference?

Yes No

020

Are there power line disturbances?

Yes No

021

- **The IBM 2212 system card is defective.** Replace the system card using the instructions in "Exchanging a System Card" on page 2-7. Go to Step 001 on page 1-8.

022

Install an uninterruptible power supply to minimize the effects of the power fluctuations. Go to Step 001 on page 1-8.

023

Move the IBM 2212 to a more isolated area. Go to Step 001 on page 1-8.

Service Kit (PN 04H8169)

The optional service kit (FC 2533) provides wrap plugs for IBM 2212 interfaces. The wrap plugs cannot be purchased individually. You must purchase the entire kit. See "Assembly 8: Service Wrap Plug Kit (not illustrated)" on page A-15 for a list of the wrap plugs provided

Chapter 2. Removal and Replacement Procedures

This chapter provides the following information on removal and replacement procedures:

- Preparatory information that applies to all the removal and replacement procedures (see “Before You Start”).
- Descriptions of the individual part removal and replacement procedures (see “Part Exchange Directory” on page 2-2).

For an overall perspective on the parts and their positioning relative to each other and the chassis, see Appendix A, “Parts Listing” on page A-1.

Note: Most of the removal and replacement procedures show diagrams of Models 40H and 40F. Unless otherwise noted, the procedures apply for all models of the IBM 2212.

Before You Start

Before you begin any removal or replacement activity, review the list of equipment you will need, read the common safety precautions and then proceed.

Equipment You Need

You need the following equipment to remove and replace features in the IBM 2212:

- 4-mm nut driver
- 4-mm right-angle socket wrench or open-ended wrench
- Flat-blade screwdriver
- Screw starter (optional)

Safety Precautions



Danger: Before you begin to install this product, read the safety information in *Caution: Safety Information—Read This First*, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.

Note: For translations of safety notices, see “Safety Notices” on page D-7.

Disconnecting the Power Cord

Note: Disconnecting the power cord will disrupt users in your network. Consult the network administrator before disconnecting the power cord.

Disconnect the power cord from the ac power outlet and then from the IBM 2212.

Reconnecting the Power Cord

Connect the power cord to the IBM 2212 and then to the ac power outlet.

Handling Static-Sensitive Devices

Certain components, such as the system board, adapters, and memory modules, can be damaged by static electricity discharge. These components are shipped in an antistatic bag to prevent such damage. An electrostatic discharge (ESD) protection device must be used when handling these components.

Take the following precautions:

- Do not remove the component from the antistatic bag until you are ready to replace a component in the IBM 2212.
- With the component still in its antistatic bag, touch the metal frame of the machine.
- Hold the component by its edges. Avoid touching solder joints or pins.
- Handle the components carefully in order to prevent permanent damage.

Part Exchange Directory

Important

The parts for the IBM 2212 are **not** hot pluggable. You must remove power from the IBM 2212 when replacing any FRU.

Each time you change a part, carefully record its location and check that the attached cables are correctly labeled and reconnected.

In Table 2-1, find the part you want to exchange and go to the procedure indicated.

Table 2-1. Part Exchange

Part Name	Go to
CPCI adapter	"Exchanging a CPCI Adapter" on page 2-6
PMC adapter	"Exchanging a PMC Adapter" on page 2-4
System card	"Exchanging a System Card" on page 2-7
DRAM	"Exchanging a DRAM Feature" on page 2-9
Compact Flash	"Exchanging a Compact Flash Feature" on page 2-10
Hard file	"Installing a Hard File Upgrade Feature in a Model 1xx Chassis" on page 2-15 or "Installing a Hard File Upgrade Feature in a Model 4xx Chassis" on page 2-23
Chassis for Models 1xx	"Removing and Returning a Model 1xx Chassis with and without a Hard File" on page 2-11 and "Installing a Model 1xx Chassis without a Hard File" on page 2-12 or "Installing a Model 1xx Chassis with a Hard File" on page 2-13
Chassis for Models 4xx	"Removing and Returning a Model 4xx Chassis with and without a Hard File" on page 2-11 and "Installing a Model 4xx Chassis without a Hard File" on page 2-20 or "Installing a Model 4xx Chassis with a Hard File" on page 2-21

Removing and Reinstalling the Cover

Removing the Cover

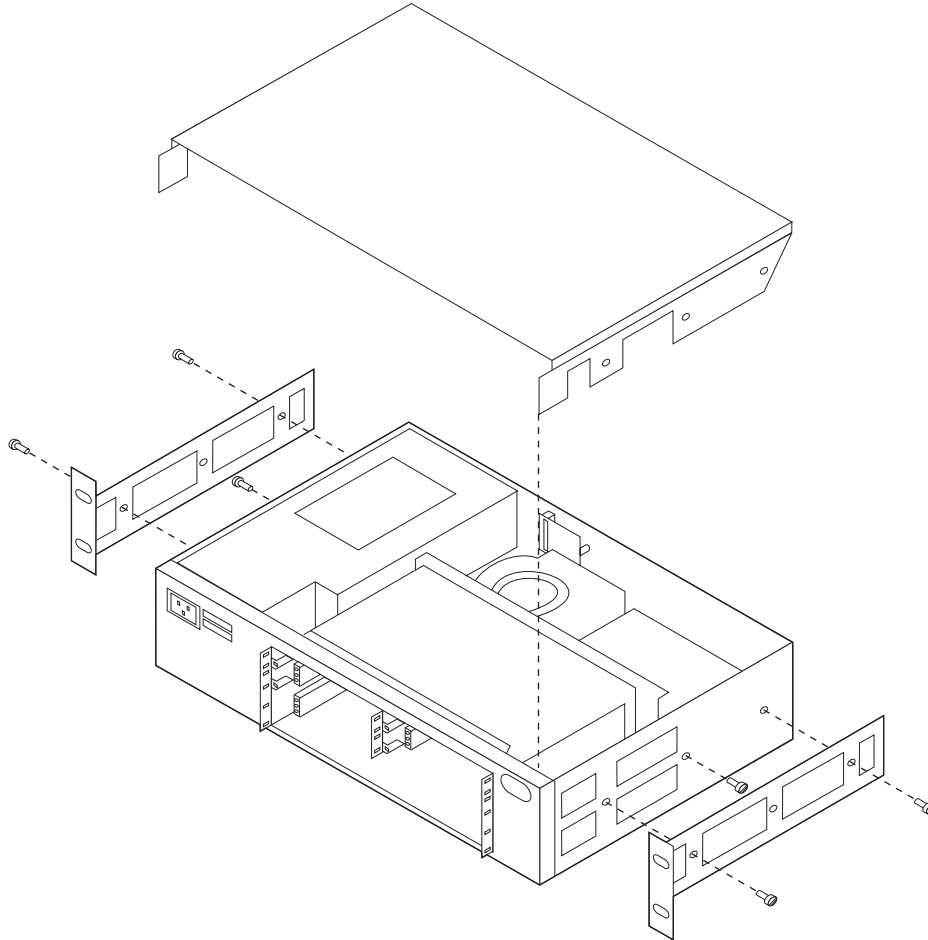


Figure 2-1. IBM 2212 Cover

1. If the IBM 2212 is not installed in a rack, continue with step 2. To remove the IBM 2212 from a rack:
 - a. Remove the two screws from each side bracket that attach the rack-mounting brackets to the rack.
 - b. Put these screws in a safe place.
 - c. Place the IBM 2212 on a flat surface.
2. Remove the cover of the IBM 2212:
 - a. There are three screws on each side of the IBM 2212: the screw in the center helps secure the cover and the two screws at either end secure the mounting bracket.

If this IBM 2212 is not mounted in a rack and the mounting brackets have been removed, you need only remove the screw in the center on each side. If this IBM 2212 is mounted in a rack, remove the three screws from each side.
 - b. Pull up on the cover from the rear of the IBM 2212. Remove the cover and put it aside.
3. Return to the procedure you were following.

Reinstalling the Cover

To reinstall the cover:

1. From the rear of the IBM 2212, slide the cover toward the front, making sure that the side pieces are inside the chassis. As the locator tabs approach the front of the machine, press down on the front of the cover so that the tabs slide into their slots.
2. Press down on the cover at the rear of the machine until it snaps into place.
3. If this IBM 2212 is installed in a rack, insert and tighten the three screws on each side that secure the rack-mounting bracket and the cover.

If this IBM 2212 is not installed in a rack and the rack-mounting brackets were removed, insert and tighten the screw in the center of each side.

If the IBM 2212 was installed in a rack, follow these instructions to reinstall it; otherwise, return to the procedure you were following.

To reinstall the IBM 2212 in the rack:

1. Gather the rack-mounting screws.
2. Hold the IBM 2212 in position in the rack and start the lower of the two screws that will secure the left bracket.
3. On the right side, align the lower screw hole and start the lower screw.
4. Tighten the two screws that are started and install the upper screws securing each bracket.
5. Return to the procedure you were following.

Exchanging a PMC Adapter

Refer to "Handling Static-Sensitive Devices" on page 2-2 before exchanging a PMC Adapter.

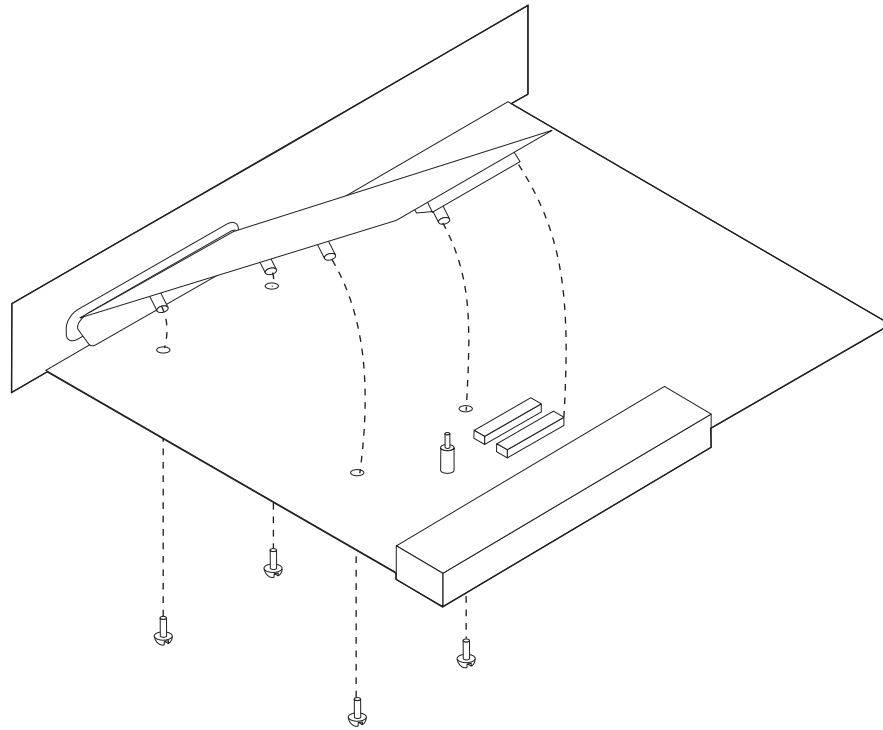


Figure 2-2. PMC Adapter

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the system card using the instructions in steps 2 through 3 in “Exchanging a System Card” on page 2-7.
3. To remove a PMC Adapter from the system board:
 - a. Remove the four screws that attach the PMC Adapter to the bottom of the system board.
 - b. Gently raise the PMC Adapter from the rear of the system card and slide it out of the slot at the front of the system card.
4. Slide the new PMC Adapter into the slot at the front of the system card.
5. Lower the adapter so that the PMC Adapter connectors are aligned with the sockets on the system card. Apply slight pressure to the PMC Adapter until it is seated firmly.
6. Insert the four screws through the bottom of the system board into the PMC Adapter and tighten them.
7. Reinstall the system card using the instructions in steps 7 through 8 in “Exchanging a System Card” on page 2-7.
8. Power on the IBM 2212 by plugging in the power cord.
9. Verify the LEDs. See “LED Indicators” on page 1-2.
10. Notify the network administrator that you are finished repairing the IBM 2212.

Exchanging a CPCI Adapter

Refer to “Handling Static-Sensitive Devices” on page 2-2 before exchanging a CPCI Adapter.

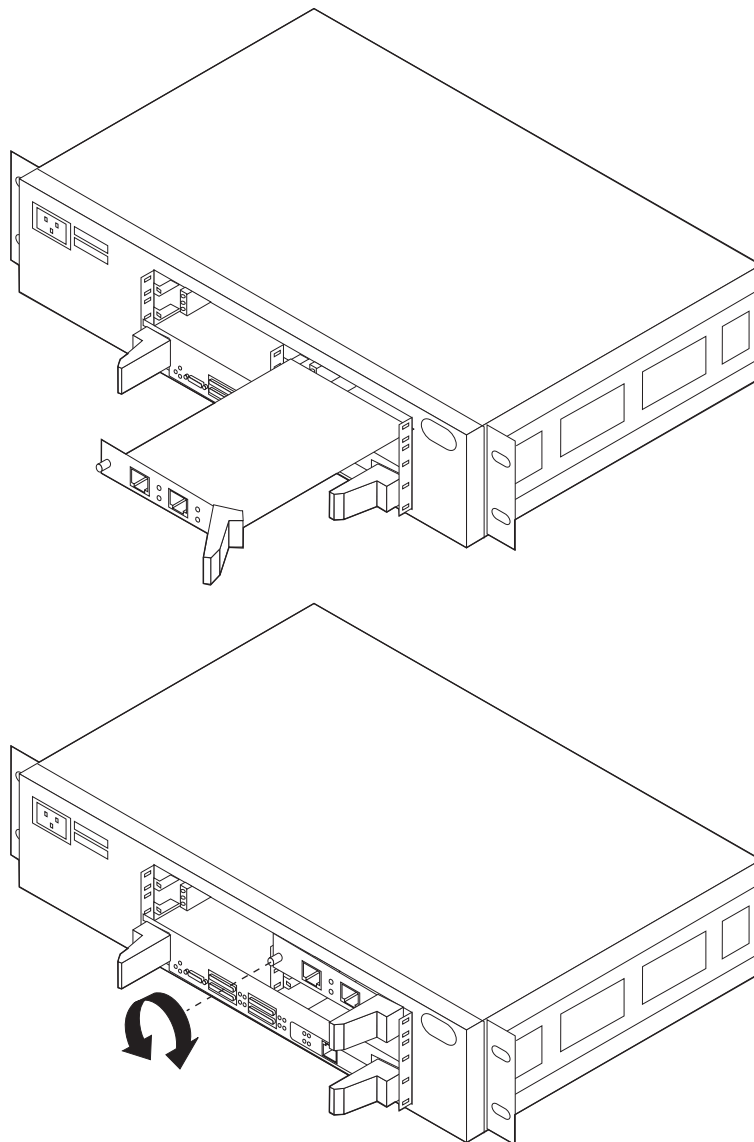


Figure 2-3. Inserting a CPCI Adapter

Note: If you are removing a CPCI Adapter but are not installing another, be sure to follow the directions in “Removing and Deleting an Adapter” on page C-7.

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the cables from the CPCI Adapter. You may want to label each cable as you disconnect it for ease of reconnection.
3. The CPCI Adapter is secured with one lever and a thumbscrew. To remove this adapter, you turn the thumbscrew counterclockwise and release the lever. To release the lever, push out on it.

Remove the adapter from the IBM 2212 and return as indicated in the warranty for your country.

4. Slide the new adapter along the grooves in the slot. You must secure the lever by pushing the lever inward, and then turn the thumbscrew clockwise.

5. Reattach the cables to the CPCI Adapter.
6. Power on the IBM 2212 by plugging in the power cord.
7. Verify the LEDs. See “LED Indicators” on page 1-2.
8. Notify the network administrator that you are finished.

Exchanging a System Card

Refer to “Handling Static-Sensitive Devices” on page 2-2 before exchanging a system card.

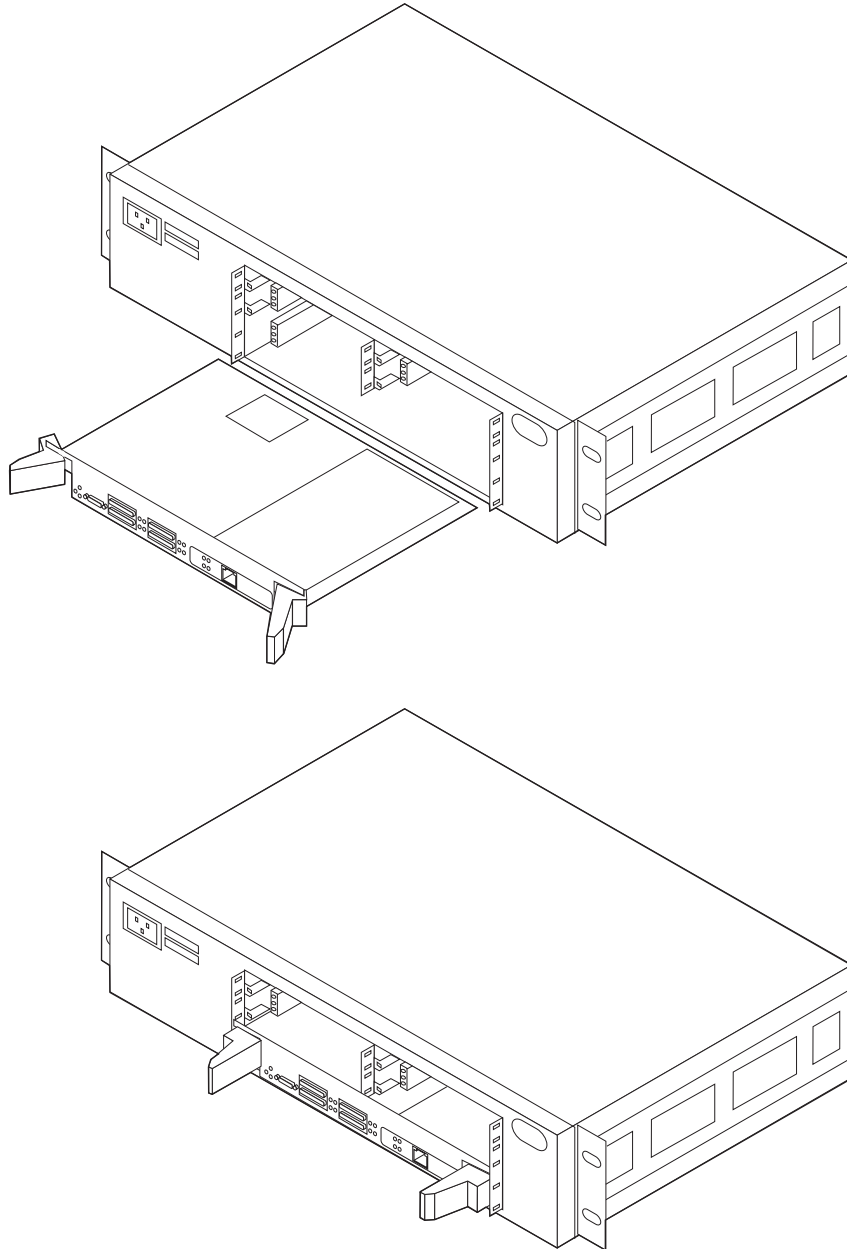


Figure 2-4. Exchanging a System Card

1. Remove power from the IBM 2212 by unplugging the power cord.

2. Remove the cables from the system card. You may want to label each cable as you disconnect it for ease of reconnection.
3. The system card is secured with two levers. To remove this adapter, release both levers by pushing outward on them.

Remove the card from the IBM 2212.

4. Remove and keep the following from the system card:
 - DRAM (See “Exchanging a DRAM Feature” on page 2-9)
 - PMC adapter (See “Exchanging a PMC Adapter” on page 2-4)
 - Compact flash, if compact flash is installed on the system card. (See “Exchanging a Compact Flash Feature” on page 2-10)
5. Return the system card as indicated in the warranty for your country
6. Install the DRAM, PMC adapter, and Compact Flash components on the new system card.
7. Slide the new card along the grooves in the slot and secure the two levers. To lock the card into place, pull each lever inward.
8. Reattach the cables to the system card.
9. Power on the IBM 2212 by plugging in the power cord.
10. Verify the LEDs. See “LED Indicators” on page 1-2.
11. Connect an ASCII terminal or PC with ASCII terminal emulation software configured to use 19.2 Kbps line speed, and access the SVC> prompt. See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.
12. At the SVC> prompt:
 - Use the **describe** command to list the contents of the banks on the hard file or compact flash. Choose a bank to make active.
 - Use the **set** command to set the active bank and configuration file (config). After typing **set** and pressing **Enter**, you will be prompted for the rest of the information. Until you reboot, this bank will be in the pending state.
 - Use the **writeos** command to copy the abbreviated software (used as the recovery image) from the pending bank on the hard file/compact flash to the new system card flash. See “Updating the Operational Code” on page C-21.
 - Use the **writeboot** command to copy the bootstrap code from the pending bank on the hard file/compact flash to the new system card flash. See “Updating the Operational Code” on page C-21.
 - Use the **interface** command to reconfigure the interface to dump over if you want to use the network dump facility.
 - Use the **bootmode** command and choose **normal boot from disk**.
 - Use the **dump** command to reconfigure the dump information. After typing **dump** and pressing **Enter**, you will be prompted for the rest of the information.
 - Use the **baudrate** command to reset the baudrate for the 2212 service port if you wish to use a speed other than 19.2 Kbps. After typing **baudrate** and pressing **Enter**, you will be prompted for the rest of the information.
 - Unplug and plug the power cord on the 2212.
13. Notify the network administrator that you are finished.

Exchanging a DRAM Feature

Refer to “Handling Static-Sensitive Devices” on page 2-2 before exchanging a DRAM feature.

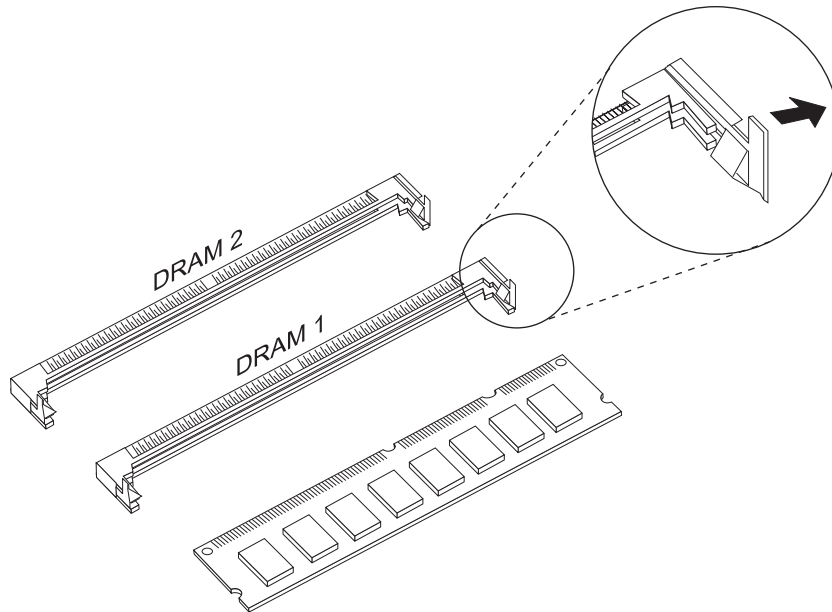


Figure 2-5. DRAM Feature

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the system card using the instructions in steps 2 through 3 in “Exchanging a System Card” on page 2-7.
3. To remove the DRAM, use your thumbnail or a small non-metallic device to gently pull the spring latch away from each end of the DRAM. Gently tilt the DRAM away from the center of the system card and remove the DRAM from its connector socket and return as indicated in the warranty for your country.
4. Remove the new DRAM from its packaging. Handle it by the ends without touching the components or gold connection tabs.
5. Insert the DRAM into its slot by placing it, connector-edge down, into its socket. Applying slight pressure to the top edge, push the DRAM toward the center of the system card until it snaps into place.
6. Reinstall the system card using the instructions in steps 7 through 8 in “Exchanging a System Card” on page 2-7.
7. Power on the IBM 2212 by plugging in the power cord.
8. Verify the LEDs. See “LED Indicators” on page 1-2.
9. Notify the network administrator that you are finished.

Exchanging a Compact Flash Feature

Refer to “Handling Static-Sensitive Devices” on page 2-2 before exchanging a Flash Feature.

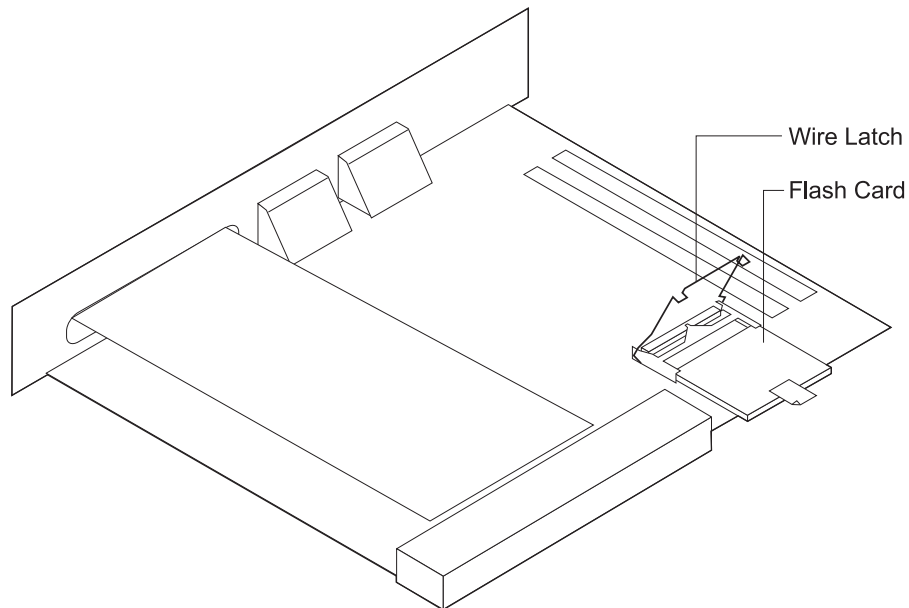


Figure 2-6. Compact Flash Feature

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the system card using the instructions in steps 2 through 3 in “Exchanging a System Card” on page 2-7.
3. Raise the wire latch securing the Flash Feature.
4. Grasp the tab attached to the Flash Feature and pull the card from its socket.
5. Remove the new Flash Feature from its packaging, being careful to handle it by its edges.
6. Slide the new Flash Feature into its slot, applying slight pressure until the connector is attached to the socket.
7. Lower the wire latch and snap it into place.
8. Reinstall the system card using the instructions in steps 7 through 8 in “Exchanging a System Card” on page 2-7.
9. Power on the IBM 2212 by plugging in the power cord.
10. The compact flash is shipped formatted and without code. Therefore, you must load operational software and configuration files onto the compact flash. To do so,
 - a. Connect an ASCII terminal or PC with ASCII terminal emulation software to the service port. (See Chapter 3, “Accessing the 2212” on page 3-1)
 - b. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3)
 - c. From the SVC> prompt:
 - 1) TFTP code and configuration files from your network server to the compact flash. (See “Transferring Files Using TFTP” on page C-18) If there is no backup copy of the configuration files on a network server, the 2212 must be reconfigured.

- 2) Using the **copy** command available at the SVC> prompt, copy the contents into the other bank on the compact flash.
 - 3) If you changed the boot settings (for example, boot from system card flash), use the **bootmode** command and choose normal boot from disk.
 - 4) Type **reboot**.
 - 5) Verify the LEDs. See “LED Indicators” on page 1-2.
11. Notify the network administrator that you are finished repairing the IBM 2212.

Removing and Returning a Model 1xx Chassis with and without a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in “Removing the Cover” on page 2-3.
3. Remove and keep:
 - The CPCI adapter using the instructions in “Exchanging a CPCI Adapter” on page 2-6.
 - The hard file, if one is installed. To do so,
 - a. Remove from the bottom of the chassis the four screws attaching the hard file to the chassis.
 - b. Disconnect the IDE cable and the power cable from the hard file. Lift out the hard file.
 - The system card and its components using the instructions in “Exchanging a System Card” on page 2-7.
4. Reinstall the cover on the chassis using the instructions in “Reinstalling the Cover” on page 2-4.
5. Record and keep the serial number from the chassis. When you receive a new chassis you will need to reference this serial number.
6. Return the chassis as indicated in the warranty and maintenance agreement for your country.

Removing and Returning a Model 4xx Chassis with and without a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in “Removing the Cover” on page 2-3.
3. Remove and keep:
 - The CPCI adapter using the instructions in “Exchanging a CPCI Adapter” on page 2-6.
 - The hard file, if one is installed. To do so,
 - a. Reposition the chassis so that the back of the chassis rests on the countertop. The front of the chassis should be facing the ceiling. With one hand supporting the hard file, remove from the bottom of the chassis the four screws attaching the hard file to the chassis.
 - b. Lift out the hard file.
 - The system card and its components using the instructions in “Exchanging a System Card” on page 2-7.
4. Reinstall the cover on the chassis using the instructions in “Reinstalling the Cover” on page 2-4.
5. Record and keep the serial number from the chassis. When you receive a new chassis you will need to reference this serial number.

6. Return the chassis as indicated in the warranty and maintenance agreement for your country.

Installing a Model 1xx Chassis without a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. **Connect the DC power cable to the backplane at the 6-pin connection. Connect the blower and fan connector cables to the backplane at either 2-pin connection. (See Figure 2-7 on page 2-13.)**
4. Reinstall the cover on the new chassis using the instructions in "Reinstalling the Cover" on page 2-4.
5. Install the system card and adapters.
6. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, "Accessing the 2212" on page 3-1.
7. Power on the IBM 2212 by plugging in the power cord.
8. Access the SVC> prompt. See "Accessing the Service Recovery Prompt (SVC>)" on page C-3.
9. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The serial number is printed on the IBM 2212. For instructions on entering the serial number into the VPD, see "Entering Vital Product Data" on page C-13.
10. Type **reboot**.
11. Verify the LEDs. See "LED Indicators" on page 1-2.
12. Reference the serial number recorded from the old chassis and write this serial number on a label. Also write the chassis model number on the label. Post this label on the exterior of the new chassis.
13. Notify network administrator that you are finished.

Installing a Model 1xx Chassis with a Hard File

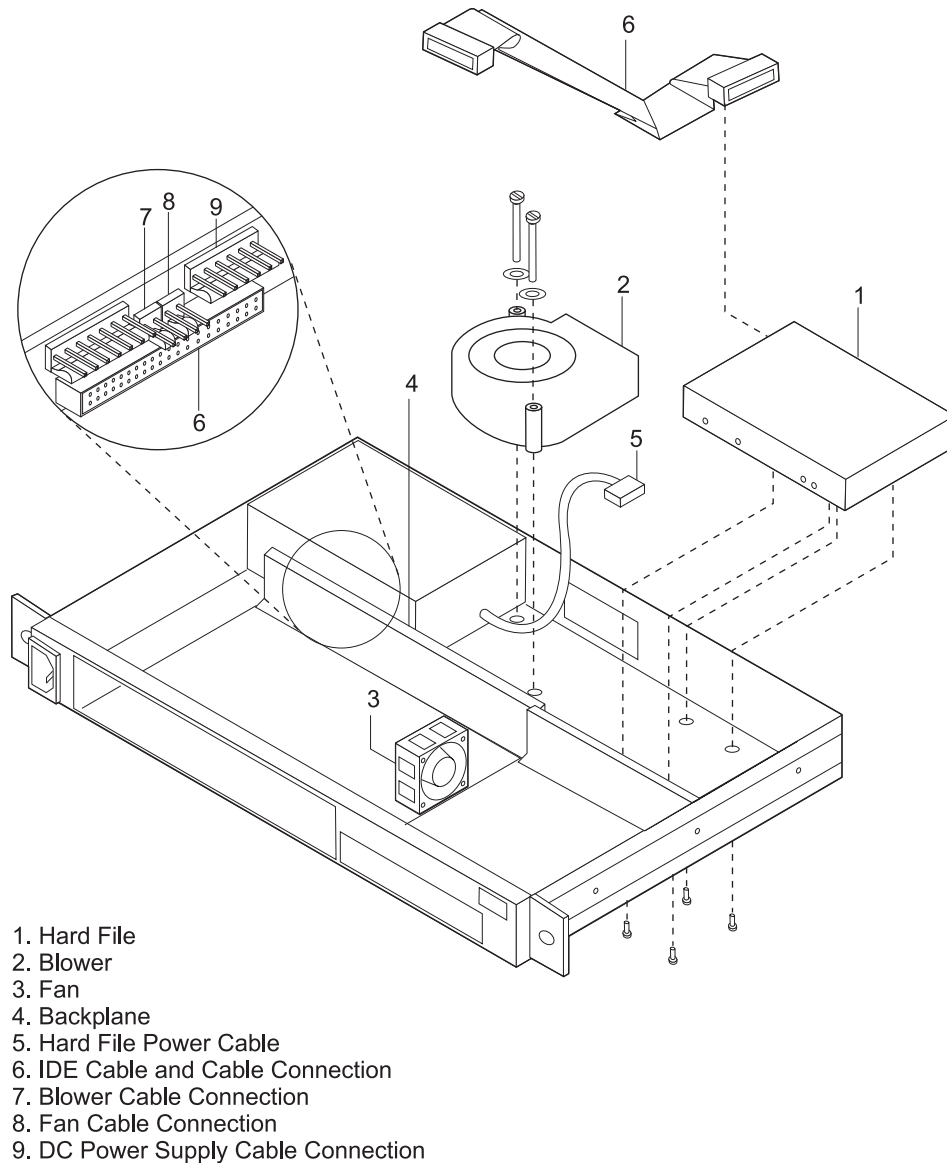


Figure 2-7. Model 1xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. Connect the hard file IDE (flat ribbon) cable to the backplane and route as shown in Figure 2-7.
4. Ensure the ribbon cable does not route over the blower. The ribbon cable should route between the blower and backplane.
5. Connect the DC power cable to the backplane at the 6-pin connection. Connect the blower and fan connector cables to the backplane at either 2-pin connection.
6. Connect the hard file power cable and IDE cable to the hard file.
7. Attach the hard file to the base of the chassis with its four screws.
8. Reinstall the cover on the chassis using the instructions in "Reinstalling the Cover" on page 2-4.

- | 9. Install the system card and adapters.
- | 10. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, "Accessing the 2212" on page 3-1.
- | 11. Power on the IBM 2212 by plugging in the power cord.
- | 12. Access the SVC> prompt. (See "Accessing the Service Recovery Prompt (SVC>)" on page C-3.)
- | 13. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The serial number is printed on the back of the IBM 2212. For instructions on entering the serial number into the VPD, see "Entering Vital Product Data" on page C-13.
- | 14. Type **reboot**.
- | 15. Verify the LEDs. See "LED Indicators" on page 1-2.
- | 16. Reference the serial number recorded from the old chassis and write this serial number on a label. Also write the chassis model number on the label. Post this label on the exterior of the new chassis.
- | 17. Notify the network administrator that you are finished.

Installing a Hard File Upgrade Feature in a Model 1xx Chassis

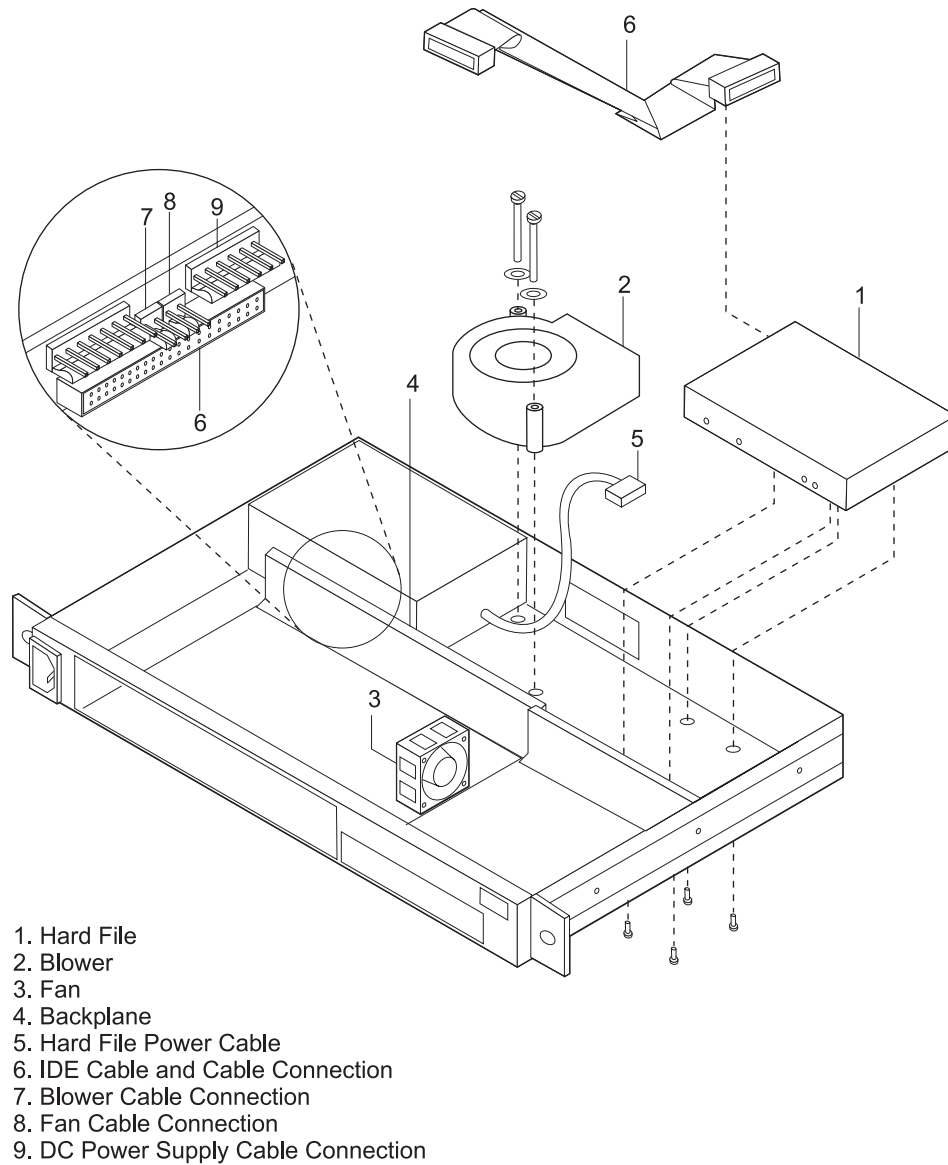


Figure 2-8. Model 1xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. The IBM 2212 supports only one hard drive or compact flash. The IBM 2212 will not operate if both the hard drive and compact flash are present. To change your drive feature from compact flash to hard file you must first remove the compact flash. Refer to "Handling Static-Sensitive Devices" on page 2-2 before removing the compact flash feature.

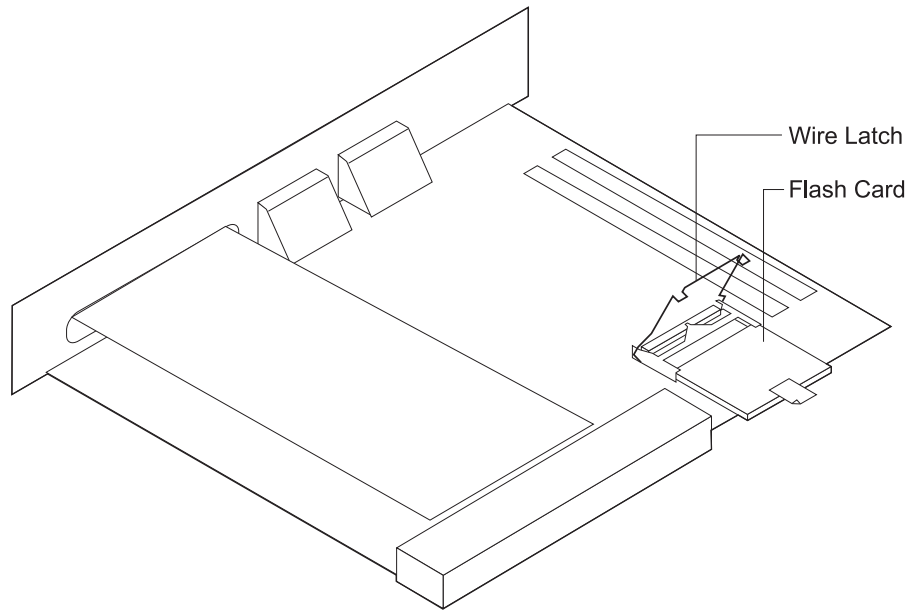


Figure 2-9. Compact Flash Feature

4. Remove the system card using the instructions in steps 2 through 3 in “Exchanging a System Card” on page 2-7.
5. Raise the wire latch securing the compact flash feature.
6. Grasp the tab attached to the compact flash feature and pull the card from its socket.
7. Disconnect the DC power cable, and blower and fan connector cables from the backplane.

Note: The DC power cable connects to the backplane at the 6-pin connection. The blower and fan connector cables connect to the backplane at either 2-pin connection. Use a flat-head screwdriver and gently pry the cable from the backplane. **Do not pull on the wires.**
8. Connect the hard file IDE (flat ribbon) cable to the backplane and route as shown in Figure 2-8 on page 2-15.
9. Ensure the ribbon cable does not route over the blower. The ribbon cable should route between the blower and backplane.
10. Reconnect the DC power cable to the backplane at the 6-pin connection. Reconnect the blower and fan connector cables to the backplane at either 2-pin connection.
11. Verify that the new hard file jumper is set to master. See the labeling on the hard file for help on verifying that the jump is set to master.
12. Connect the new hard file to the IDE cable and the power cable.
13. Attach the hard file to the base of the chassis with its four screws.
14. Reinstall the cover on the chassis using the instructions in “Reinstalling the Cover” on page 2-4.
15. Install the system card and adapters.
16. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, “Accessing the 2212” on page 3-1.
17. Power on the IBM 2212 by plugging in the power cord.
18. The hard file is shipped without code. Therefore, you must load operational software and configuration files on the hard file. To do so,

- | a. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.)
- | b. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The serial number is printed on the back of the IBM 2212. For instructions on entering the serial number into the VPD, see “Entering Vital Product Data” on page C-13.
- | c. From the SVC> prompt:
 - | 1) TFTP code and configuration files from your network server to the hard file. (See “Transferring Files Using TFTP” on page C-18.) If there is no backup copy of the configuration files on a network server, the 2212 must be reconfigured.
 - | 2) Using the copy command available at the SVC> prompt, copy the contents into the other bank on the hard file. (See “Copying a File Using the Copy Command” on page C-16.)
 - | 3) If you changed the boot settings (for example, boot from system card flash), use the bootmode command and choose normal boot from disk. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.)
 - | 4) Type **reboot**.
 - | 5) Verify the LEDs. See “LED Indicators” on page 1-2.
- | 19. The IBM 2212 model number has now changed from a 10F to a 10H. Write the new model number on a label. Post this label on the exterior of the chassis, covering the old model number.
- | 20. Notify the network administrator that you are finished.

Replacing a Suspect Hard File in a Model 1xx

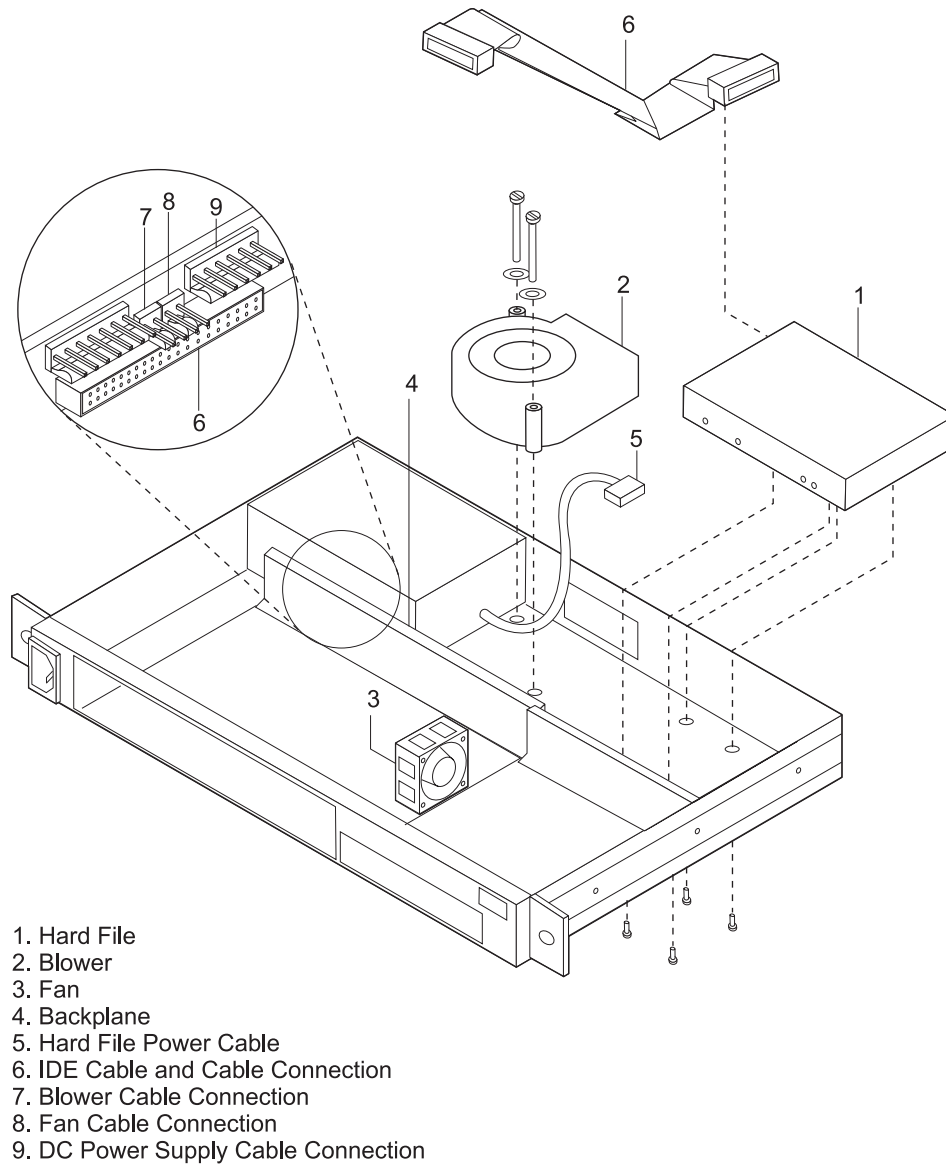


Figure 2-10. Model 1xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. Remove from the bottom of the chassis the four screws attaching the hard file to the chassis.
4. Disconnect the IDE cable and the power cable from the hard file. Lift out the hard file. Return the hard file as indicated in the warranty and maintenance agreement for your country.
5. If the hard file IDE (flat ribbon) cable is not suspect, jump to step 7 on page 2-19.
6. If the hard file IDE cable is suspect:
 - a. Disconnect the DC power cable, and blower and fan connector cables from the backplane.

Note: The DC power cable connects to the backplane at the 6-pin connection. The blower and fan connector cables connect to the backplane at either 2-pin connection. Use a flat-head screwdriver and gently pry the cables from the backplane. **Do not pull on the wires.**

- b. Disconnect the hard file cable from the backplane and return it with the hard file as indicated in the warranty for your country.
 - c. Connect the new hard file cable to the backplane, reconnect the DC power cable, blower, and fan connectors to the backplane.
7. Verify that hard file jumper is set to master. See the labeling on the hard file for help on verifying that the jumper is set to master.
 8. Connect the new hard file to the IDE cable and the power cable, and route as shown in Figure 2-10 on page 2-18.
 9. Ensure the ribbon cable does not route over the blower. The ribbon cable should route between the blower and backplane.
 10. Attach the hard file to the base of the chassis with its four screws.
 11. Reinstall the cover of the IBM 2212 using the instructions in “Reinstalling the Cover” on page 2-4.
 12. Install the system card and adapters.
 13. Power on the IBM 2212 by plugging in the power cord.
 14. The hard file is shipped without code. Therefore, you must load operational software and configuration files on the hard file. To do so,
 - a. Connect an ASCII terminal or PC with ASCII terminal emulation software to the service port. (See Chapter 3, “Accessing the 2212” on page 3-1.)
 - b. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3)
 - c. From the SVC> prompt:
 - 1) TFTP code and configuration files from your network server to the hard file. (See “Transferring Files Using TFTP” on page C-18.) If there is no backup copy of the configuration files on a network server, the 2212 must be reconfigured.
 - 2) Using the **copy** command available at the SVC> prompt, copy the contents into the other bank on the hard file.
 - 3) If you changed the boot settings (for example, boot from system card flash), use the **bootmode** command and choose normal boot from disk.
 - 4) Type **reboot**.
 - 5) Verify the LEDs. See “LED Indicators” on page 1-2.
 15. Notify the network administrator that you are finished.

Installing a Model 4xx Chassis without a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Install the system card and adapters.
3. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, "Accessing the 2212" on page 3-1.
4. Power on the IBM 2212 by plugging in the power cord.
5. Access the SVC> prompt. See "Accessing the Service Recovery Prompt (SVC>)" on page C-3.
6. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The serial number is printed on the back of the IBM 2212. For instructions on entering the serial number into the VPD, see "Entering Vital Product Data" on page C-13.
7. Type **reboot**.
8. Verify the LEDs. See "LED Indicators" on page 1-2.
9. Reference the serial number recorded from the old chassis and write this serial number on a label. Also write the chassis model number on the label. Post this label on the exterior of the new chassis.
10. Notify the network administrator that you are finished.

Installing a Model 4xx Chassis with a Hard File

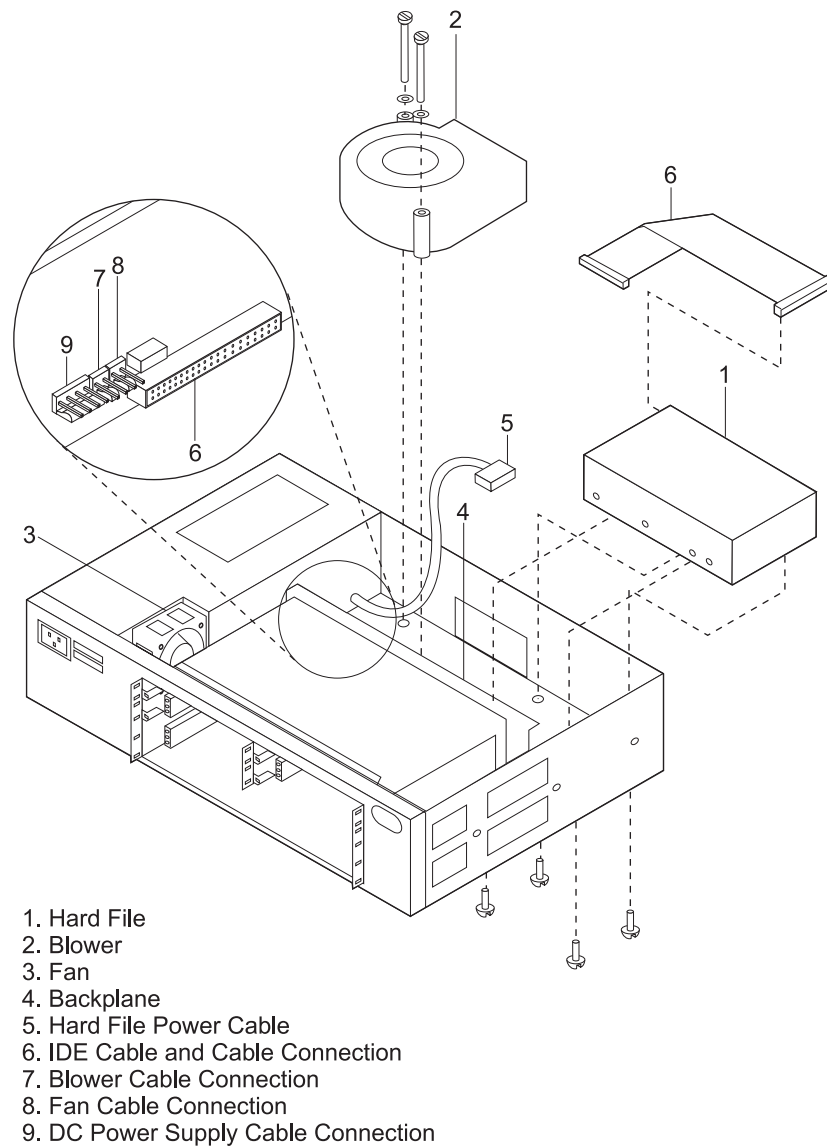


Figure 2-11. Model 4xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. Remove from the top of the blower the 2 screws that attach the blower to the chassis. Depending on the blower model, the blower may have a wired connector on one screw. Remove the screw and washer from the connector. Lift out the screws and washers, and set aside.
4. Lift out the blower and set it on top of the power supply.
5. Connect the hard file IDE (flat ribbon) cable to the backplane. Route the hard file cable so it lies flat under the blower. (See Figure 2-11.)
6. Reinstall the blower to the chassis with the screws and washers. If the blower has a connector, reattach the connector to the screw before reinstalling the blower.
7. Attach the hard file to the base of the chassis with its four screws.

- | 8. Reinstall the cover of the IBM 2212 using the instructions in “Reinstalling the Cover” on page 2-4.
- | 9. Install the system card and adapters.
- | 10. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, “Accessing the 2212” on page 3-1.
- | 11. Power on the IBM 2212 by plugging in the power cord.
- | 12. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.)
- | 13. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The serial number is printed on the back of the IBM 2212. For instructions on entering the serial number into the VPD, see “Entering Vital Product Data” on page C-13.
- | 14. Type **reboot**.
- | 15. Verify the LEDs. See “LED Indicators” on page 1-2.
- | 16. Reference the serial number recorded from the old chassis and write this serial number on a label. Also write the chassis model number on the label. Post this label on the exterior of the new chassis.
- | 17. Notify the network administrator that you are finished.

Installing a Hard File Upgrade Feature in a Model 4xx Chassis

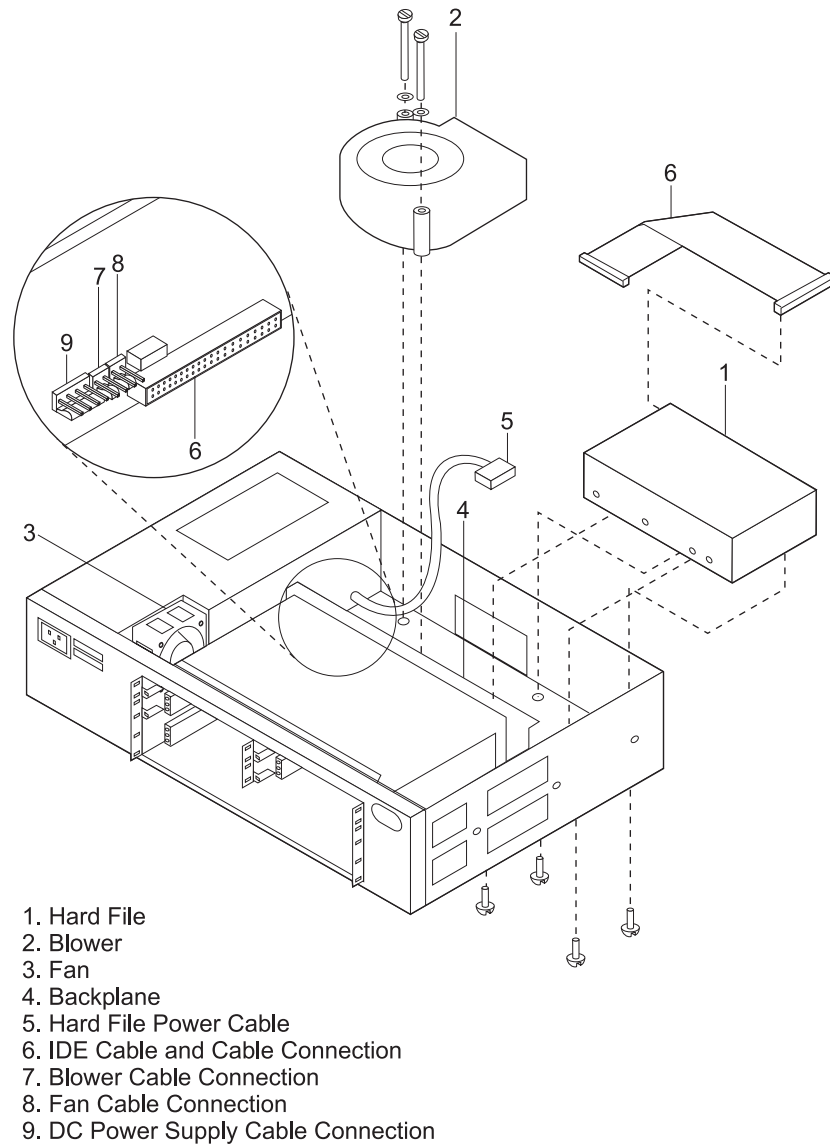


Figure 2-12. Model 4xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. The IBM 2212 supports only one hard drive or compact flash. The IBM 2212 will not operate if both the hard drive and compact flash are present. To change your drive feature from compact flash to hard file you must first remove the compact flash. Refer to "Handling Static-Sensitive Devices" on page 2-2 before removing the compact flash feature.

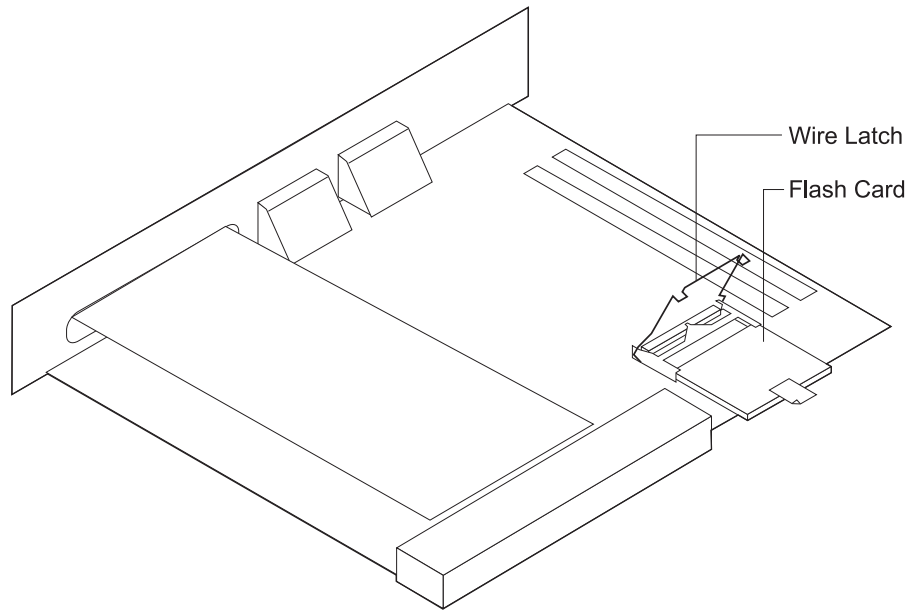


Figure 2-13. Compact Flash Feature

4. Remove the system card using the instructions in steps 2 through 3 in "Exchanging a System Card" on page 2-7.
5. Raise the wire latch securing the compact flash feature.
6. Grasp the tab attached to the compact flash feature and pull the card from its socket.
7. Remove from the top of the blower the 2 screws that attach the blower to the chassis. Depending on the blower model, the blower may have a wired connector on one screw. Remove the screw and washer from the connector. Lift out the screws and washers, and set aside.
8. Lift out the blower and set it on top of the power supply.
9. Connect the hard file IDE (flat ribbon) cable to the backplane. Route the hard file cable so it lies flat under the blower. (See Figure 2-12 on page 2-23.)
10. Reinstall the blower to the chassis with the screws and washers. If the blower has a connector, reattach the connector to the screw before reinstalling the blower.
11. Verify that the new hard file jumper is set to master. See the labeling on the hard file for help on verifying that the jumper is set to master.
12. Connect the new hard file to the IDE cable and the power cable.
13. Attach the hard file to the base of the chassis with its four screws.
14. Reinstall the cover on the chassis using the instructions in "Reinstalling the Cover" on page 2-4.
15. Install the system card and adapters.
16. Attach an ASCII terminal to the IBM 2212 as described in Chapter 3, "Accessing the 2212" on page 3-1.
17. Power on the IBM 2212 by plugging in the power cord.
18. The hard file is shipped without code. Therefore, you must load operational software and configuration files on the hard file. To do so,
 - a. Access the SVC> prompt. (See "Accessing the Service Recovery Prompt (SVC>)" on page C-3.)

| b. Enter into Vital Product Data (VPD) the serial number of the defective IBM 2212 chassis. The
| serial number is printed on the back of the IBM 2212. For instructions on entering the serial
| number into the VPD, see “Entering Vital Product Data” on page C-13.

| c. From the SVC> prompt:

| 1) TFTP code and configuration files from your network server to the hard file. (See “Transferring
| Files Using TFTP” on page C-18.) If there is no backup copy of the configuration files on a
| network server, the 2212 must be reconfigured.

| 2) Using the copy command available at the SVC> prompt, copy the contents into the other bank
| on the hard file. (See “Copying a File Using the Copy Command” on page C-16.)

| 3) If you changed the boot settings (for example, boot from system card flash), use the bootmode
| command and choose normal boot from disk. (See “Accessing the Service Recovery Prompt
| (SVC>)” on page C-3.)

| 4) Type **reboot**.

| 5) Verify the LEDs. See “LED Indicators” on page 1-2.

| 19. The IBM 2212 model number has now changed from a 40F to a 40H. Write the new model number on
| a label. Post this label on the exterior of the chassis, covering the old model number.

| 20. Notify the network administrator that you are finished.

Replacing a Suspect Hard File in a Model 4xx

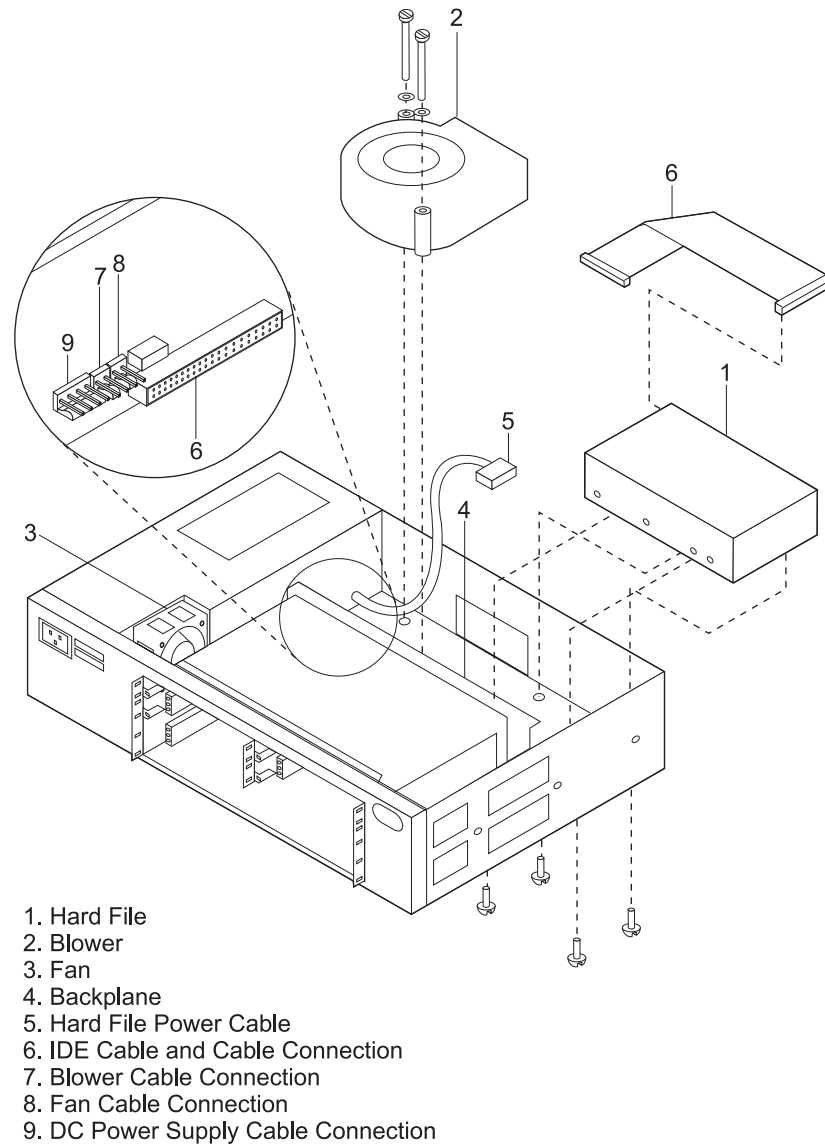


Figure 2-14. Model 4xx Chassis with a Hard File

1. Remove power from the IBM 2212 by unplugging the power cord.
2. Remove the IBM 2212 cover, using the instructions in "Removing the Cover" on page 2-3.
3. Reposition the chassis so that the back of the chassis rests on the countertop. The front of the chassis should be facing the ceiling. With one hand supporting the hard file, remove from the bottom of the chassis the four screws attaching the hard file to the chassis.
4. Disconnect the IDE cable and the power cable from the hard file. Lift out the hard file. Return the hard file as indicated in the warranty and maintenance agreement for your country.
5. If the hard file IDE (flat ribbon) cable is not suspect, jump to step 7 on page 2-27.
6. If the hard file IDE cable is suspect:

- a. Remove from the top of the blower the 2 screws that attach the blower to the chassis. Depending on the blower model the blower may have a wired connector on one screw. Remove the screw and washer from the connector. Lift out the screws and washers, and set aside.
 - b. Disconnect the hard file cable from the backplane and return it with the hard file as indicated in the warranty or maintenance agreement for your country.
 - c. Connect the new hard file cable to the backplane. Route the hard file cable so it lies flat under the blower.
 - d. Reinstall the blower to the chassis with the screws and washers. If the blower has a connector, reattach the connector to the screw before reinstalling the blower.
7. Verify that hard file jumper is set to master. See the labeling on the hard file for help on verifying that the jumper is set to master.
 8. Connect the new hard file to the IDE cable and the power cable. (See Figure 2-14 on page 2-26.)
 9. Attach the hard file to the base of the chassis with its four screws.
 10. Reinstall the cover of the IBM 2212 using the instructions in “Reinstalling the Cover” on page 2-4.
 11. Install the system card and adapters.
 12. Power on the IBM 2212 by plugging in the power cord.
 13. The hard file is shipped without code. Therefore, you must load operational software and configuration files on the hard file. To do so,
 - a. Connect an ASCII terminal or PC with ASCII terminal emulation software to the service port. (See Chapter 3, “Accessing the 2212” on page 3-1.)
 - b. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3)
 - c. From the SVC> prompt:
 - 1) TFTP code and configuration files from your network server to the hard file. (See “Transferring Files Using TFTP” on page C-18.) If there is no backup copy of the configuration files on a network server, the 2212 must be reconfigured.
 - 2) Using the **copy** command available at the SVC> prompt, copy the contents into the other bank on the hard file.
 - 3) If you changed the boot settings (for example, boot from system card flash), use the **bootmode** command and choose normal boot from disk.
 - 4) Type **reboot**.
 - 5) Verify the LEDs. See “LED Indicators” on page 1-2.
 14. Notify the network administrator that you are finished.

Chapter 3. Accessing the 2212

This chapter explains how to access, either locally or remotely, the 2212's operational and configuration software. The network administrator or the IBM Support Center can access the 2212 locally or remotely for configuration or diagnostics.

Access Methods

The 2212 software must be configured as part of the installation process. Therefore, you have to access the software in one of the following ways:

- Remote dial-in (using telephone lines) through a modem attached to the EIA-232 service port using an ASCII or Serial Line Internet Protocol (SLIP) connection. See Figure 3-2 on page 3-2. "Modem Settings" on page 3-2 lists the modems that have been tested for use with the 2212.
SLIP is a method for sending IP packets, instead of ASCII data, across a serial link. (You cannot use SLIP to access the bootstrap menus)
- Locally through a null-modem adapter and serial cables supplied with this product that are attached to the EIA-232 service port using an ASCII or SLIP connection. See Figure 3-1.

Physical Attachment	Line Protocol	Access Protocol	Default IP Addresses
Service port + null modem Service port + external modem	Asynchronous characters	ASCII terminal emulation	Not applicable
	SLIP	Telnet	2212 = 10.1.1.2 Workstation = 10.1.1.3
Any IP network interface (not an option for the initial configuration of the 2212)	IP	Telnet	No defaults

An ASCII connection requires an ASCII terminal or a workstation running an ASCII terminal emulator. SLIP requires that Transmission Control Protocol/Internet Protocol (TCP/IP) that supports SLIP be running on your workstation.

Once the 2212 is up and running in the network, you can access the 2212 by telnetting from a network-connected workstation that is attached to any of the 2212's IP-capable network interfaces. The network interface could be on a LAN adapter or WAN adapter since all of them support IP routing. The Telnet workstation could be locally or remotely connected.

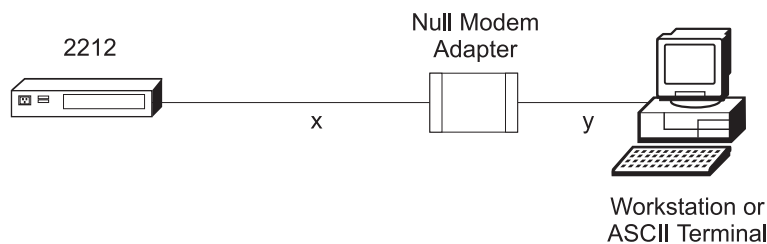


Figure 3-1. Local Terminal Connection to the EIA-232 Service Port

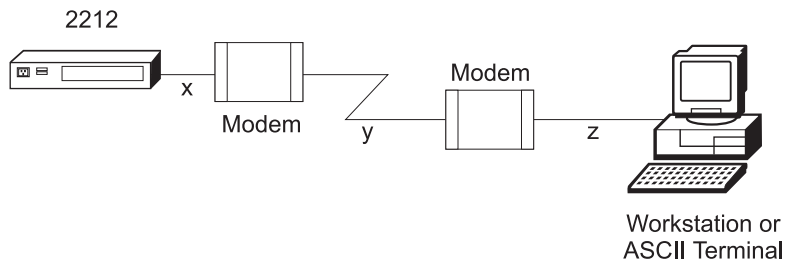


Figure 3-2. Remote Terminal Connection to the EIA-232 Service Port

SLIP Addresses

The default SLIP IP addresses are:

For the workstation:

10.1.1.3

For the IBM 2212:

10.1.1.2

For instructions about installing SLIP, refer to the documentation for your version of TCP/IP.

Service Port Default Settings

These are the default settings for the serial port:

Speed 19.2 Kbps
Parity None
Data Bits 8
Stop Bits 1

The service port speed may be configured for the following bit rates; however, the speed must match the speed configured for the ASCII terminal. See “Changing the Service Port Speed” on page C-8 for instructions on setting the 2212 service port speed.

Note: For the initial configuration of the 2212, you must use 19.2 Kbps. As part of the initial configuration, you can change the line speed of the service port. See “Changing the Service Port Speed” on page C-8.

- 2400
- 9600
- 14 400
- 19 200
- 28 800
- 38 400
- 57 600
- 115 200

Modem Settings

The following modems have been tested for use with the IBM 2212:

- IBM 7852, Model 400
- Zoom/FaxModem 56Kx
- Atlas 33.6 External PC Data/Fax Modem.

| For instructions on setting-up these and possibly other modems to operate with your IBM 2212, see the
| general information technical tips available at:

<http://www.networking.ibm.com/support/2212>

Attaching an ASCII Terminal

Attach an ASCII terminal or emulator (with the appropriate emulation software) to provide local or remote access to the 2212. When locally attaching a terminal to the 2212 service port, the speed (baud rate) configured for the service port must match the speed of the connected terminal (x and y in Figure 3-1 on page 3-1). When connecting a 2212 to a remote terminal by two modems connected by telephone lines (x, y and z in Figure 3-2 on page 3-2), the following rules must be followed:

- If the modems are running at a speed of 9600 or lower and they do **not** support hardware compression, the 2212 service port speed and the terminal speed must match the modems' line speed.
- If the modems are running at a speed of 9600 or lower and they support hardware compression, the 2212 service port speed and the terminal speed should be higher than the modems' line speed; however, 57 600 and above may be too fast for line speeds below 9600.
- If the modems are running at a speed higher than 9600 and they support hardware compression, the 2212 service port speed and the terminal speed should be higher than the modems' line speed. For modems running at speeds between 14 400 and 33 600, it is recommended that the 2212 service port and the terminal be set to 57 600.

ASCII Terminal and Setup Attributes

The DEC VT100 ASCII terminal is supported, as well as devices, such as personal computers, that are configured to emulate it. Configure a VT100 with:

- No parity
- 8-bit word length
- 1 stop bit
- See page 3-2 for the supported speeds. The terminal speed must match the serial port speed.

The following terminals are also supported:

- IBM 3101 Display Terminal
- IBM 3151 ASCII Display Station
- IBM 3161 ASCII Display Station

Configure these terminals as shown in "Setup Attributes."

Setup Attributes

IBM 3101 Setup Attributes: Use Figure 3-3 on page 3-4 to determine the settings for the setup attributes for the IBM 3101 ASCII terminal.

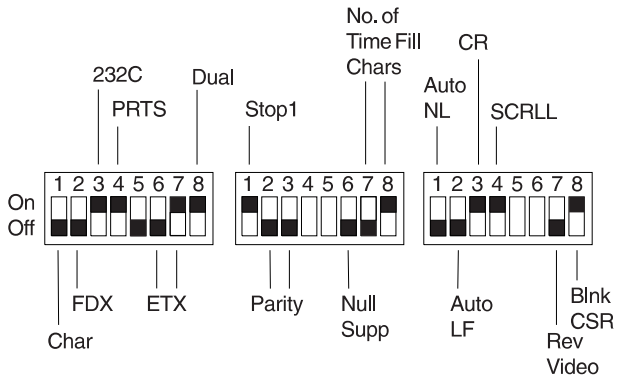


Figure 3-3. Setup Attributes for the IBM 3101 Display Terminal

See page 3-2 for the supported speeds. The terminal speed must match the serial port speed.

IBM 3151 Setup Attributes: Activate setup mode in the IBM 3151 terminal by pressing the **Ctrl** and **Setup** keys. The Ctrl key is located on the lower left of the keyboard. The Setup key is located on the upper right of the keyboard.

Use Table 3-2 to help you determine the settings for the setup attributes. Save the setup information by highlighting the **Save** function using the cursor keys.

Exit by pressing the **Ctrl** and **Setup** keys.

Table 3-2. Setup Attributes for the IBM 3151

Attribute	Setting
Machine Mode	3151
Scroll	JUMP
Auto LF	OFF
Line Wrap	OFF
Operating Mode	ECHO
Word Length (bits)	8
Stop Bit	1
Turnaround Character	CR
Line Control	IPRTS
Break Signal (ms)	500
Send Null Suppress	ON

See page 3-2 for the supported speeds. The terminal speed must match the serial port speed.

IBM 3161 Setup Attributes: Activate setup mode in the IBM 3161 terminal by pressing the **Ctrl** and **Setup** keys. The Ctrl key is located on the lower left of the keyboard. The Setup key is located on the upper right of the keyboard. The terminal displays a setup attribute panel.

Change the attributes by moving the cursor to the various fields and typing over the information in the field. Use Table 3-3 on page 3-5 to help you determine the settings for the setup attributes.

Press **Send** to save the attributes on this panel.

Table 3-3. Setup Attributes for the IBM 3161

Attribute	Setting
Machine Mode	3161
Operating Mode	ECHO
Interface	RS-232C
Line Control	IPRTS
Turnaround Character	CR
Stop Bit	1
Word Length (bits)	8
Response Delay (ms)	100
Break Signal (ms)	500

See page 3-2 for the supported speeds. The terminal speed must match the serial port speed.

You now need to set up additional attributes for the 3161. To set up the additional attributes:

1. Press **Select** to display the attribute selection bar.
2. Change the values on the selection bar to match the values in Table 3-4. To move between selections while on a selection bar, press **Tab**. To change a value for an attribute, press the space bar.
3. Press **Send** to accept the current values for the attributes on the selection bar.
4. Continue with step 2 until you have set all the attributes in Table 3-4.
5. Press **Select** after the last selection bar to exit the 3161 setup function.

Table 3-4. Additional Setup Attributes for the IBM 3161

Attribute	Setting
Enter	Send
Return	Field
New Line	CR
Tab	Field
Line Wrap	On
Auto LF	Off
Send Null	On
Insert	Space
Trace	All
CRT Saver	No
Scroll	On
Print	Viewport
Print Null	On
Print EOL	On
Line End	CR-LF
Send	Line

Bringing Up a Command Line Console

After you have connected your console to the IBM 2212, and have powered on the console and the IBM 2212, you will see a sequence of informational status messages. When you see the prompt `Please press the space bar to obtain the console, press the space bar to attach the IBM 2212 to your session.` The system acknowledges this action with the message `Console granted to this interface, and by displaying a command prompt after the code loading is complete.`

If you are at an IBM 2212 that has never been configured, the system presents the command prompt `Config (only)>`. You can then proceed with the initial configuration. If the 2212 has been configured adequately, the system presents the `OPCON` command prompt `*`.

If the 2212 determines during the boot process that the operational code on the hard file or compact flash is unusable, it will boot to the service recovery function (SVC> prompt). The full operational code is not loaded and only the commands needed to restore the 2212 hard file or compact flash to an operational state are available. The SVC> prompt can also be manually accessed as described in “Accessing the Service Recovery Prompt (SVC>)” on page C-3. See the *Access Integration Services Software User's Guide* for a complete list of the commands.

Managing the Operational and Configuration Software

Operational Software: The IBM 2212 comes from the factory with two copies of its operational software loaded on its hard file or compact flash and an abbreviated copy (for recovery in case the software or hard file/compact flash is bad) on the system card flash.

- If the operational software needs an upgrade or replacement, you have to reload it. See “Updating the Operational Code” on page C-21 for instructions on updating the operational software.
- If the operational code on the hard file or compact flash fails, the recovery version on system card flash is automatically booted.
- If the IBM 2212 fails when a new version of the operational software is activated, the backup versions can be restored. See “Restoring a Backup Version of Code” on page C-18 for instructions.
- If the bootstrap (stored in system card flash) needs updating, use the procedure in “Updating the Bootstrap Code on System Card Flash” on page C-21.

Configuration Software: The IBM 2212 is capable of storing on its hard file or compact flash four copies of configuration information for each copy of operational software. Binary configuration files can be created using the Configuration Program. These files can be uploaded to the IBM 2212. Configuration can also be done by attaching an ASCII terminal to the IBM 2212's service port or telnetting into the 2212 after the initial configuration is complete, and accessing the command-line interface.

Changes to the configuration are activated immediately, after a user-configured timed interval, or at the next restart or reload. See the *Access Integration Services Software User's Guide* to determine the configuration parameters that are activated immediately. See the *Configuration Program User's Guide* for instructions on using the Configuration Program to activate configuration changes at timed-intervals.

Chapter 4. Using the IBM 2212 Bootstrap Menus

The IBM 2212 bootstrap tests the 2212 system card and hard file/compact flash components. The IBM 2212 bootstrap menus are used to determine the cause of any problem detected during the tests, and bring the 2212 back to an operational state.

Accessing the Bootstrap Menu requires that a console be directly attached to the service port or that a remote console be running ASCII terminal emulation (the bootstrap menus do not support SLIP), and the boot process be stopped at a specific point. To access the Bootstrap Menus:

1. Attach a console to the service port as described in “Attaching an ASCII Terminal” on page 3-3.
2. Force a reboot by unplugging and plugging the power cord, or by typing **reload** at the OPCON (*) prompt or **reboot** at the SVC> prompt.
3. The IBM 2212 will begin its boot process. When the message <<Press CTRL-C to access menus>> is displayed, press **Ctrl-C** on the terminal keyboard to stop the boot process. The Bootstrap Menu should appear. If the Bootstrap Menu does not appear:
 - a. Make sure your console is connected to the serial port on the IBM 2212.
 - b. Unplug and plug the power cord again.

Note: Make sure the screen size for your terminal emulation software is set to 80 columns by 24 rows.

From the Bootstrap Main Menu (as shown in Figure 4-1), you can choose from several services. To make your selection, type in the number of your choice. The following sections explain these services and provide instructions for using the associated panels:

- “Using the Bootstrap Utilities” on page 4-2.
- “Selecting the Boot Mode” on page 4-6.
- “Selecting POST Mode” on page 4-7.
- “Issuing a Reset” on page 4-8.

```
2212 System Bootloader
Version 1.0
(C) Copyright IBM Corporation, 1998 All Rights Reserved.
                          Bootstrap Main Menu

Select one:
  1. Bootstrap Utilities
  2. Select Boot Mode
  3. Select POST Mode

  9. Issue Reset

      Enter option:
```

Figure 4-1. Main Menu Panel

Using the Bootstrap Utilities

To use the utilities:

1. Select **Bootstrap Utilities** from the main menu.
2. A menu listing the available utilities is displayed (see Figure 4-2).

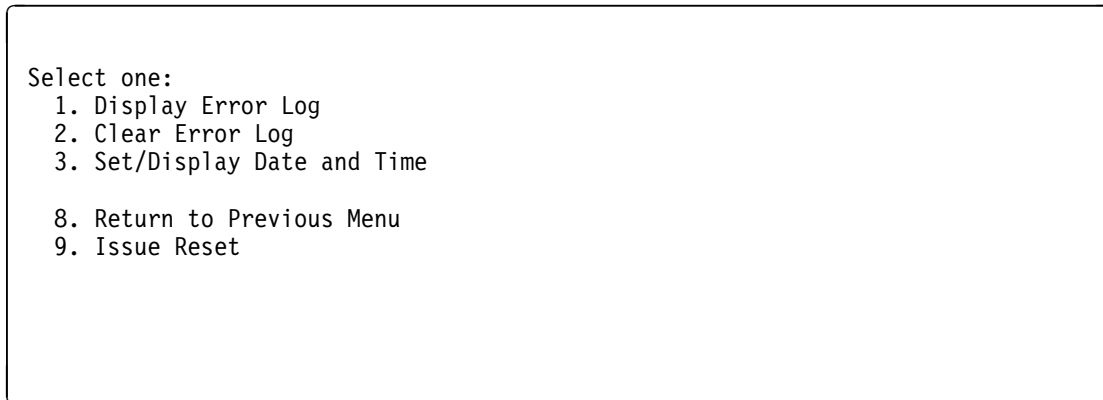


Figure 4-2. Bootstrap Utilities Selection Panel

3. Make your selection. You will be prompted for additional information, and messages are displayed to indicate that the task was performed.

The following sections describe the panels associated with the Bootstrap Utilities.

Displaying the Error Log

The Bootstrap Error Log is resident on the system card (not on the hard file or compact flash). It contains errors detected by the bootstrap.

1. Select **Display Error Log** from the Bootstrap Utilities menu.
2. The Bootstrap Error Log is displayed (see Figure 4-3). See Chapter 5, "Bootstrap Error Codes" on page 5-1 for an explanation of the data that appears in the Error Code field.

Bootstrap Error Log					
Error Code	Expected	Received	Address	Date	Time
-----	-----	-----	-----	-----	-----
01000006	55AA55AA	55AF55AA	00004000	12/19/98	05:00
-- Press Space to Continue --					

Figure 4-3. Bootstrap Error Log Panel

Clearing the Error Log

1. Select **Clear Error Log** from the Bootstrap Utilities panel.
2. The error log is cleared and the information shown in Figure 4-4 is displayed.

```
Enter option:  
Error log cleared  
  
-- Press Space to Continue --
```

Figure 4-4. Clearing the Bootstrap Error Log Panel

Setting or Displaying the Date and Time

1. Select **Set/Display Date and Time** from the Bootstrap Utilities panel.
2. The following panel is displayed.

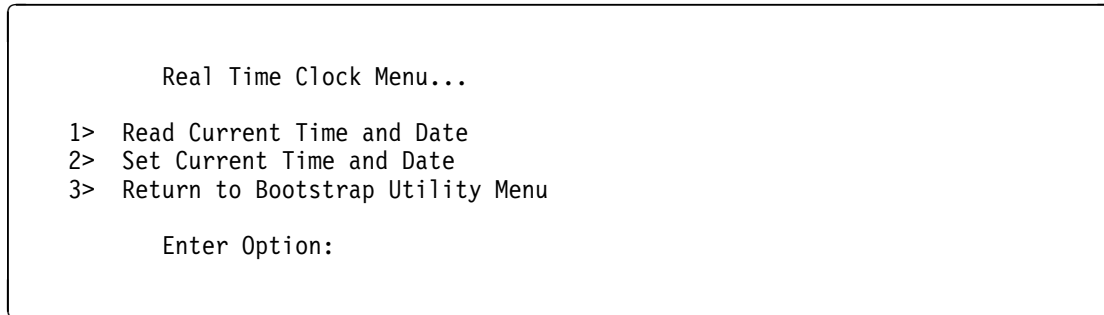


Figure 4-5. Set/Display Date and Time Panel

Select one of the options.

Read Current Time and Date Displays the time and date currently set for the 2212.

Set Current Time and Date Displays prompts that let you change the time and/or date currently set for the 2212.

Follow the prompts that will appear according to the option you selected.

Selecting the Boot Mode

This function allows you to select the device to boot from and the interface to boot to. To select a boot sequence:

1. Select **Select Boot Mode** from the main menu.
2. The Boot Sequence Selection Menu is displayed as shown in Figure 4-6.

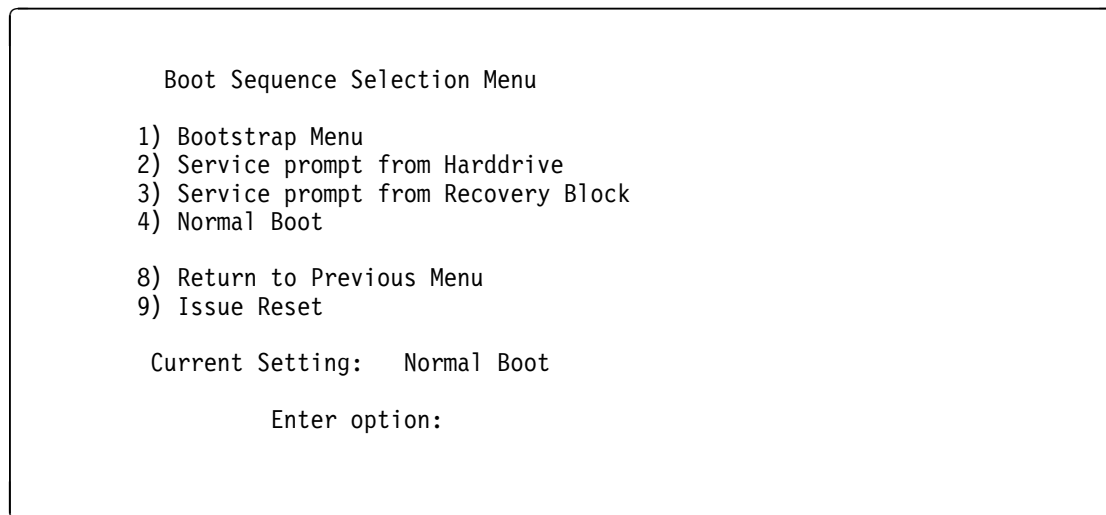


Figure 4-6. Boot Sequence Selection Menu

3. Select one of the options.

Bootstrap Menu Selecting this option causes the 2212 to boot to the Bootstrap menus. The 2212 will continue to boot to the Bootstrap menus until you select a different boot mode.

Service Prompt from Harddrive/Compact Flash Selecting this option causes the 2212 to boot to the service recovery menus (SVC>) and load the operating system from the hard file/compact flash. The full operational code is not loaded.

Service Prompt from Recovery Block Selecting this option causes the 2212 to boot to the SVC> prompt and load an *abbreviated* version of the operational code from the system card flash (the *recovery block*). Use this option if the operational code on the hard file/compact flash is corrupted.

Normal Boot Selecting this option causes a normal boot of the full operational code, including the router code, from the active bank on the hard file/compact flash.

Return to Previous Menu Selecting this option causes the 2212 to return to the Bootstrap Main Menu.

Issue Reset Selecting this option causes the 2212 to behave as if the device has been unplugged and replugged: system card and hard file or compact flash diagnostics are run and the 2212 software is loaded. The 2212 software that is loaded and the interface that the 2212 boots to (OPCON (*), SVC>, or Bootstrap Menus) depend on the current boot mode setting.

Selecting POST Mode

1. Select **Select POST Mode** from the main menu.
2. A menu listing the following options is displayed (see Figure 4-7).

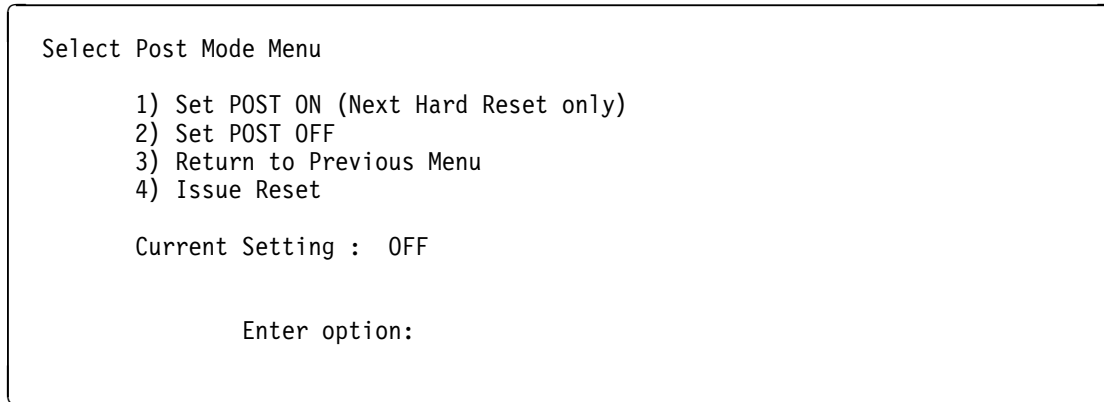


Figure 4-7. Post Mode Selection Panel

Set POST ON (Next Hard Reset only) Selecting this option causes the 2212 to run system card power-on self-test (POST), including an extensive memory test, the next time you select **Issue Reset** from the bootstrap menus. This selection is active **only** for the next reset.

Set POST OFF Selecting this option causes the 2212 to skip POST and boot to the operational code as quickly as possible.

Return to Previous Menu Selecting this option displays the Bootstrap Main Menu.

Issuing a Reset

Selecting **Issue Reset** from any of the Bootstrap menus causes the 2212 to behave as if the device has been unplugged and replugged: system card and hard file or compact flash diagnostics are run and the software is reloaded. The 2212 software that is loaded and the interface that the 2212 boots to (OPCON (*), SVC>, or Bootstrap Menu) depend on the current boot mode setting.

Chapter 5. Bootstrap Error Codes

This appendix contains explanations of the error codes that can be contained in the bootstrap error log (see "Displaying the Error Log" on page 4-3).

Error Code	FRU Involved	Description
00010106	System Card	Processor dual-port RAM failure: replace system card
00010206	System card	Processor register read/write data miscompare: replace system card
00020101	System card	Programmable logic device 1 (PLD1) revision level read fail: replace system card
00030101	System card	PLD2 revision level read fail: replace system card
00030206	System card	PLD2 register read/write fail: replace system card
00030301	System card	PLD2 watch-dog timer failed to decrement: replace system card
00040101	System card	UART no transmit: replace system card
00040102	System card	UART no receive: replace system card
00040106	System card	Uart wrap data miscompare: replace system card
00050101	System card	Real-time clock NVRAM battery failure: replace system card
00050202	System card	Real-time clock is not running: replace system card
00050306	System card	Real-time clock NVRAM read/write data miscompare: replace system card
00060106	System card	I2C NVRAM read/write data miscompare: replace system card
00070101	System card	On-card flash reset failure: replace system card
00070206	System card	On-card flash read/write data miscompare: replace system card
00080106	System card	Host bridge-chip read/write data miscompare: replace system card
00090106	System card	PCI to ISA bridge read/write data miscompare: replace system card
01000106	Slot 1 memory	Data storage read/write data miscompare (pattern test): replace DRAM in slot 1.
01000206	Slot 1 memory	Data line read/write data miscompare (walking one test): replace DRAM in slot 1
01000306	Slot 1 memory	Address line read/write data miscompare (address test) : replace DRAM in slot 1
02000106	Slot 2 memory	Data storage read/write data miscompare (pattern test): replace DRAM in slot 2
02000206	Slot 2 memory	Data line read/write data miscompare (walking one test): replace DRAM in slot 2
02000306	Slot 2 memory	Address line read/write data miscompare (address test): replace DRAM in slot 2
030000FF	Slot 1 or 2 memory	Not enough operational memory found: reseal DRAMs. If problem persists, replace the DRAM.
05000101	Primary drive	Drive initialization failure: replace the hard file/compact flash
05000201	Primary drive	Operational software file not found: see Step 018 on page 1-12
05000202	Primary drive	Unable to load the operational software: see Step 018 on page 1-12
05000203	Primary drive	Operational software CRC failure: data corrupt: see Step 018 on page 1-12

Chapter 6. Using Diagnostics

Diagnostics for the IBM 2212 can be invoked from OPCON (the * prompt) when the 2212 is operating normally, or from the Service Recovery (SVC>) prompt when the 2212 is experiencing problems. You can run the IBM 2212 diagnostics using the local terminal connection or from the Support Center using a remote connection.

This chapter describes general procedures for invoking diagnostics and includes sample screens.

Overview of Diagnostic Functions and Status Information

Diagnostics are available to test each adapter. In some cases, you may also be able to test individual ports of multi-port adapters. These tests execute concurrently with normal operation on other adapters and ports.

You can use the following types of diagnostic pages:

- **Device List** to show a summary list of devices.
- **Device Status and Control** to allow you to disable and test a device
- **Test Results** to present the results of the test for a device.
- **Test Options** to allow you to choose specific testing options for a device.
- **Setup for Loop Test** to prompt for the presence of diagnostic aids such as wrap plugs.
- The **Restore from Loop Test** to prompt you to remove diagnostic aids that have been installed prior to testing.

Many of the diagnostic pages have help information that provides definitions of the status fields and testing options.

These diagnostics operate in a multi-tasking environment that allows several diagnostic processes to be active at the same time. The Diagnostic Control Program controls which test processes are active and which one has access to the user interface.

When you make a selection from the Device Status and Control Page for a device, a separate testing process is started that runs independently of the other diagnostic menus. You can then go back to the Device List page or exit the diagnostic menus, returning later to view the results of the test.

When an active test process wants to report results or obtain information from you, the diagnostic status for the device will change to MESSAGE. When you select the device on the Device List page, the testing process will be given access to the console interface and the message will be displayed.

Note: It is necessary to “refresh” the Device List and Device Status and Control pages in order to see the changing status of active test processes.

Starting Diagnostics

The following example shows how to access the IBM 2212 diagnostics:

1. Unplug and replug the IBM 2212 to force it to reboot.
 - If the IBM 2212 is operating normally, it will automatically boot to OPCON (the * prompt).
 - If the IBM 2212 is experiencing problems with the operating code, it will boot to the SVC> prompt. Additionally, you may be asked to manually access the SVC> prompt. To manually access it, see “Accessing the Service Recovery Prompt (SVC>)” on page C-3.

Then, at either prompt, type **diags** and press **Enter**.

2. The Diagnostic Menu appears (Figure 6-1). To make your selection, type in the number of your choice and press **Enter**.

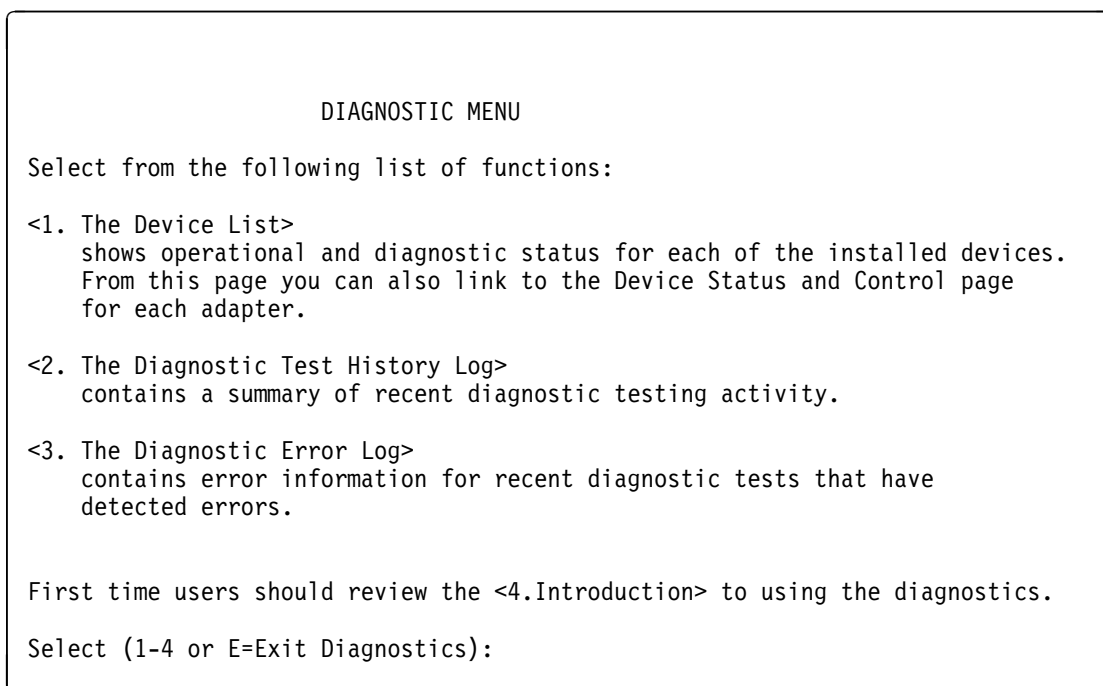


Figure 6-1. Diagnostics Main Menu

3. Select **<1. The Device List >** to view a list of installed devices. The Device List panel (similar to the one in Figure 6-2 on page 6-3) appears.

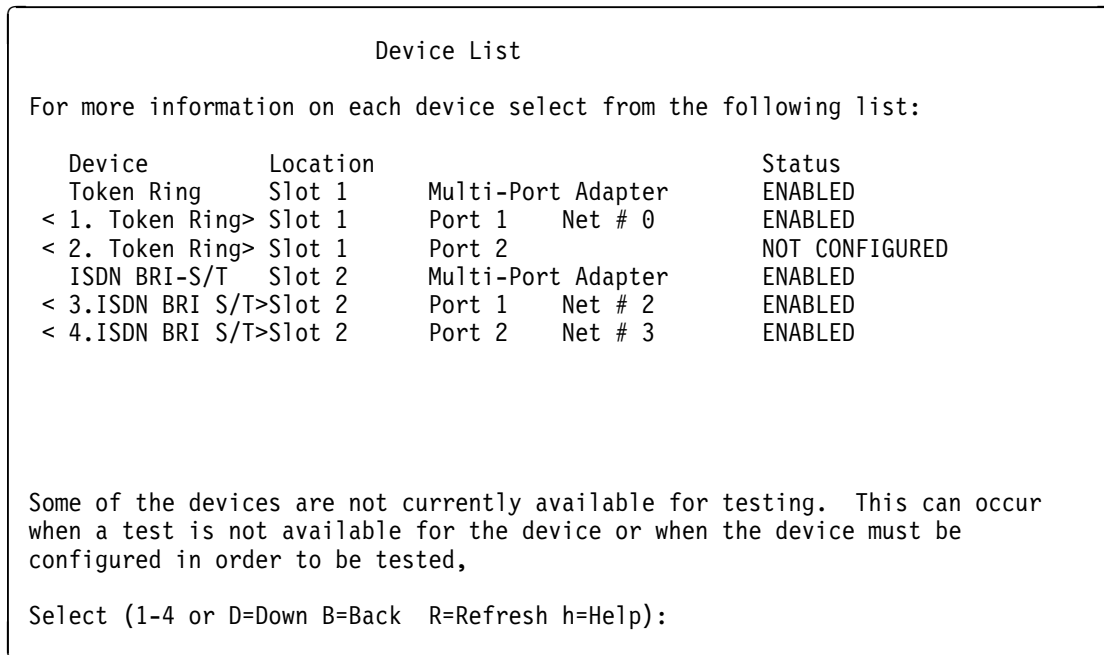


Figure 6-2. Sample of Device List Panel Showing Interfaces

The Device List is the starting point for running a test. It also provides a check to determine if all of the installed devices are being recognized by the 2212.

The Device List includes a summary status for each device. The devices that are testable or that have additional status available can be selected. Selecting a device will then display the Device Status and Control page for that device.

The Status displayed for a device may have the following values:

- ENABLED** Device is enabled for normal operation. For multi-port devices this means that at least one port is enabled. Diagnostic tests cannot be run until the device has been disabled.
- ENABLE PENDING** Waiting for completion of Enable request.
- Special** Device is in a special state that is explained on the Device Status and Control Page.
- DISABLED** Device is Disabled. Diagnostic testing can now be performed. For multi-port Devices this means that all ports are disabled.
- DISABLE PENDING** Waiting for completion of Disable request.
- MESSAGE** Select the device to view and respond to the message.
- TESTING** The device is being tested.
- NOT CONFIGURED** The device is not configured for normal operation.
- MIS CONFIGURED** The configuration does not match the physical device.
- HARDWARE ERROR** A Hardware Error has been detected which prevents further use of the device.
- DIAGNOSTICS** Diagnostics are running on the device. When diagnostics have completed for the device, the state (of configured devices) will automatically return to DISABLED. For devices that are not

configured, the state will return to NOT CONFIGURED when testing is complete.

4. If you select the Token-Ring interface (<1. **Token Ring**> on the Device List panel), the Device Status and Control panel for the Token-Ring adapter appears (Figure 6-3).

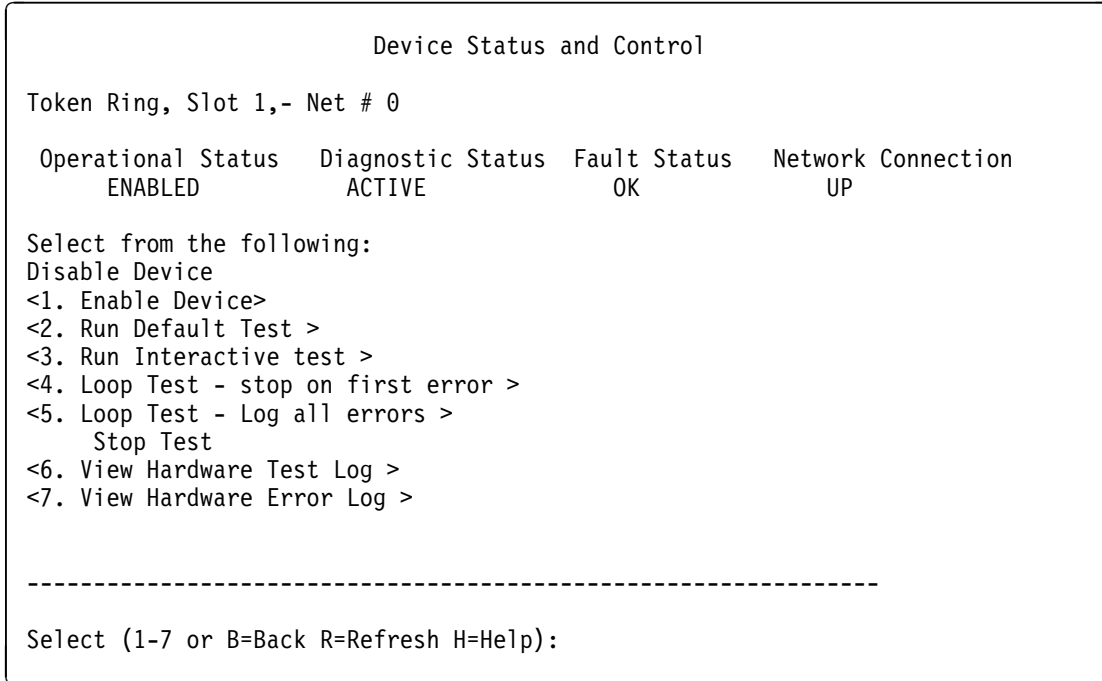


Figure 6-3. Device Status and Control Panel (Device Disabled)

The Device Status and Control Page displays status and a menu of actions for the selected device. The status fields that are displayed are dependent on the characteristics of the device.

The menu items that are active on the Device Status and Control panel are dynamically determined depending on the state of the device (that is, whether it is enabled, disabled, or testing).

In this example, the device is enabled. The Disable Device choice and all of the choices to start a test are active and can be selected. If the device were disabled, it would need to be enabled before testing.

- When the Device Status and Control panel is displayed (and the status for the device is ENABLED), you can disable the device by selecting the Disable option.
- When testing is complete, the device can be enabled using the diagnostic menus or using the router's **talk 5** commands.
- After the message: Diagnostic Test for **adapter_x** has status available appears, select **Refresh** to show the status information for a device.

The status fields which are displayed for most devices have the following meanings:

- **Operational Status**

ENABLED The device is enabled for normal operation. For multi-port devices this means that at least one port is enabled.

ENABLED PENDING Waiting for completion of Enable request.

See Note The device is in a special state that is explained on the Page.

DISABLED The device is Disabled. Diagnostic testing can now be performed. For multi-port Devices this means that all ports are disabled.

DISABLE PENDING Waiting for completion of Disable request.

DIAGNOSTICS A configured device is being used by the diagnostics.

NOT CONFIGURED The device is not configured for normal operation.

MIS CONFIGURED The configuration does not match the physical device.

HARDWARE ERROR A hardware error has been detected that prevents further use of the device.

- ***Diagnostic Status***

INACTIVE Diagnostic for the device is not running.

TESTING A testing process for the device is active and the device is being tested.

LOOP AND LOG A testing process for the device is active and will loop and log any errors until stopped.

LOOP UNTIL ERROR A testing process for the device is active and will loop until an error occurs or it is stopped.

MESSAGE A testing process for the device is active and it is waiting for user input.

- ***Fault Status***

OK The last test of the device completed without error.

ISOLATED A hardware failure has been detected and isolated to the device.

NON-ISOLATED A problem has been detected, but the failure may be external to the device. This most often occurs with network adapters that have external cables, modems, or LAN connections. Running a diagnostic of the adapter with a wrap plug attached can usually determine if the adapter has failed.

UNKNOWN No test results are currently available for the device.

- ***Network Connection***

UP The network connection is established.

DOWN A network connection cannot be detected.

TESTING The router is attempting to determine if a network connection exists.

UNKNOWN The state of a network connection cannot be determined at this time.

N/A Network Status does not apply to this device.

Explanation of menu choices

While all of the menu choices are displayed for each device, only those that are appropriate for the current state of the device will be active for selection.

Enable Device

The device will be enabled for normal operation. This performs the same function as the **enable** or **test** commands available at the router's monitoring (talk 5) prompt (+).

Disable Device

The device is taken out of its normal operational state. If this menu option is available, then the device must be disabled before any diagnostic test can be started. This performs

the same function as the **disable** command available at the router's monitoring (talk 5) console.

Run Default Test

This starts a test which assumes that the device is set up for normal operation. For communication adapters this means that it has a cable attached and is connected to the network.

Run Interactive Test

This starts a test which will present an additional menu of options such as cable attachment and wrap plugs can be specified.

Stop Looping Test

Stops a looping test. Depending on the length of each test loop, this could take up to a minute.

Loop Test - stop on first error

This starts a looping test that will stop when the first error is detected. A menu of additional test options may be presented before the loop is started.

Loop Test - Log all errors

This starts a looping test that will loop until a "Stop Test" request is made. All detected errors are logged. A menu of additional test options may be presented before the loop is started.

View Test History Log

Displays a history of recent diagnostic tests that have been executed.

View Hardware Error Log

Displays a list of errors detected by diagnostic tests.

5. Type **E** and press **Enter** to exit the diagnostic menus and return to the command line interface prompt (*).

Testing the Adapters

These tests for the adapters help to determine whether or not the adapter is functioning correctly. In addition, some adapters may have additional tests such as wrap plug and cable tests.

Complete the following steps to test a faulty or newly installed adapter:

- Unplug and then plug the IBM 2212 power cord.
- Run diagnostics on the adapter using the instructions in “Starting Diagnostics on the Adapter”.

Refer to “Overview of Diagnostic Functions and Status Information” on page 6-1 for additional information on the use of IBM 2212 diagnostics.

Starting Diagnostics on the Adapter

The following example gives a *sample sequence* with sample screens for running the diagnostics. The selections that you see during your test may be different.

Before running the test, be sure you **disable the adapter**. See “Suspend Traffic on an Adapter Port” on page C-8 for instructions.

1. Start diagnostics. See “Starting Diagnostics” on page 6-2.
2. The Diagnostic Menu (see Figure 6-1 on page 6-2) appears. To make a selection, type in the number of your choice and press **Enter**.
3. Type **1** and press **Enter** to access the Device List Page.
4. Select a device to test. The following menu appears:

```

                                     Screen 1 of 1
                                Device Status and Control

10/100 Mb Ethernet PMC Adapter, Slot 5, Net # 0

Operational Status  Diagnostic Status  Fault Status  Network Connection
      DISABLED           INACTIVE           OK           UNKNOWN

Select from the following:
  Disable Device
  < 1. Enable Device >
  < 2. Run Default Test >
  < 3. Run Interactive Test >
  < 4. Loop Test - stop on first error >
  < 5. Loop Test - Log all errors >
      Stop Looping Test
  < 6. View Test History Log >
  < 7. View Hardware Error Log >

Select (1-7 or  B=Back R=Refresh status H=Help ):

```

5. Select the number to run an interactive test. The following menu appears:

Testing the Adapters

```
Screen 1 of 1

Select Test Setup

10/100 Mb Ethernet PMC Adapter, Slot 5, Net # 0

Operational Status Diagnostic Status Fault Status Network Connection
DIAGNOSTICS MESSAGE OK UNKNOWN

This device may be tested with or without a wrap plug.
* < 1. Start testing without a wrap plug. >
* < 2. Start testing with a wrap plug installed. >

Select (1-2 or B=Back ):
```

6. Label and disconnect the cable for the adapter. Type **1** and press **Enter** if you are not installing an external wrap plug. If you choose 2, you must install an external wrap plug on the adapter.
7. This is a long-running test. The Device Status and Control Menu is displayed again. Note that the Diagnostic Status is TESTING. This indicates that the tests are running and will take about three minutes to complete.

```
Screen 1 of 1

Device Status and Control

10/100 Mb Ethernet PMC Adapter, Slot 5, Net # 0

Operational Status Diagnostic Status Fault Status Network Connection
DIAGNOSTICS TESTING OK UNKNOWN
0%

Select from the following:
  Disable Device
  Enable Device
  Run Default Test
  Run Interactive Test
  Loop Test - stop on first error
  Loop Test - Log all errors
  Stop Looping Test
  < 1. View Test History Log >
  < 2. View Hardware Error Log >

Select (1-2 or B=Back R=Refresh status H=Help ):
```

8. Wait until a message similar to the following is displayed: Diagnostic Test for 10/100 Mb Ethernet PMC Adapter has status available. Then reconnect the network cable to the adapter. Select **r** to refresh and view the results of the test. In this example, the system reports test completion with no errors. If the test fails, you will receive a message directing further action.

Screen 1 of 1

Test Results

10/100 Mb Ethernet PMC Adapter, Slot 5, Net # 0

Operational Status	Diagnostic Status	Fault Status	Network Connection
DISABLED	INACTIVE	OK	UNKNOWN

The Test Completed with No Errors.

9. Select **b** to return to the Device Status and Control Menu.

Testing the Adapters

Appendix A. Parts Listing

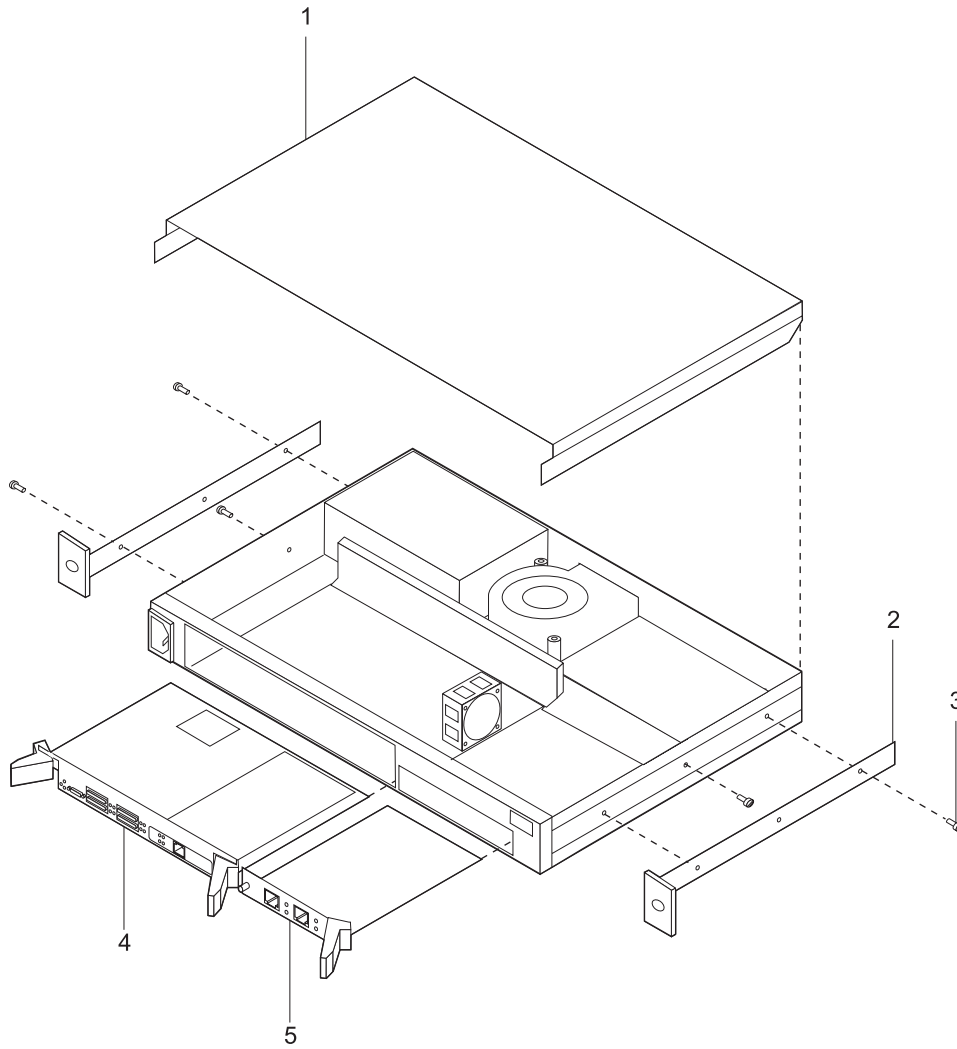
This parts listing contains reference drawings and a corresponding index for all field-replaceable parts. The index provides the part number, the quantity required (units), and a description of the part.

The following list provides additional information about the parts assembly index.

NP: (Non-Procurable) in the Units column indicates that the part is non-procurable and that the individual parts or the next higher assembly should be ordered.

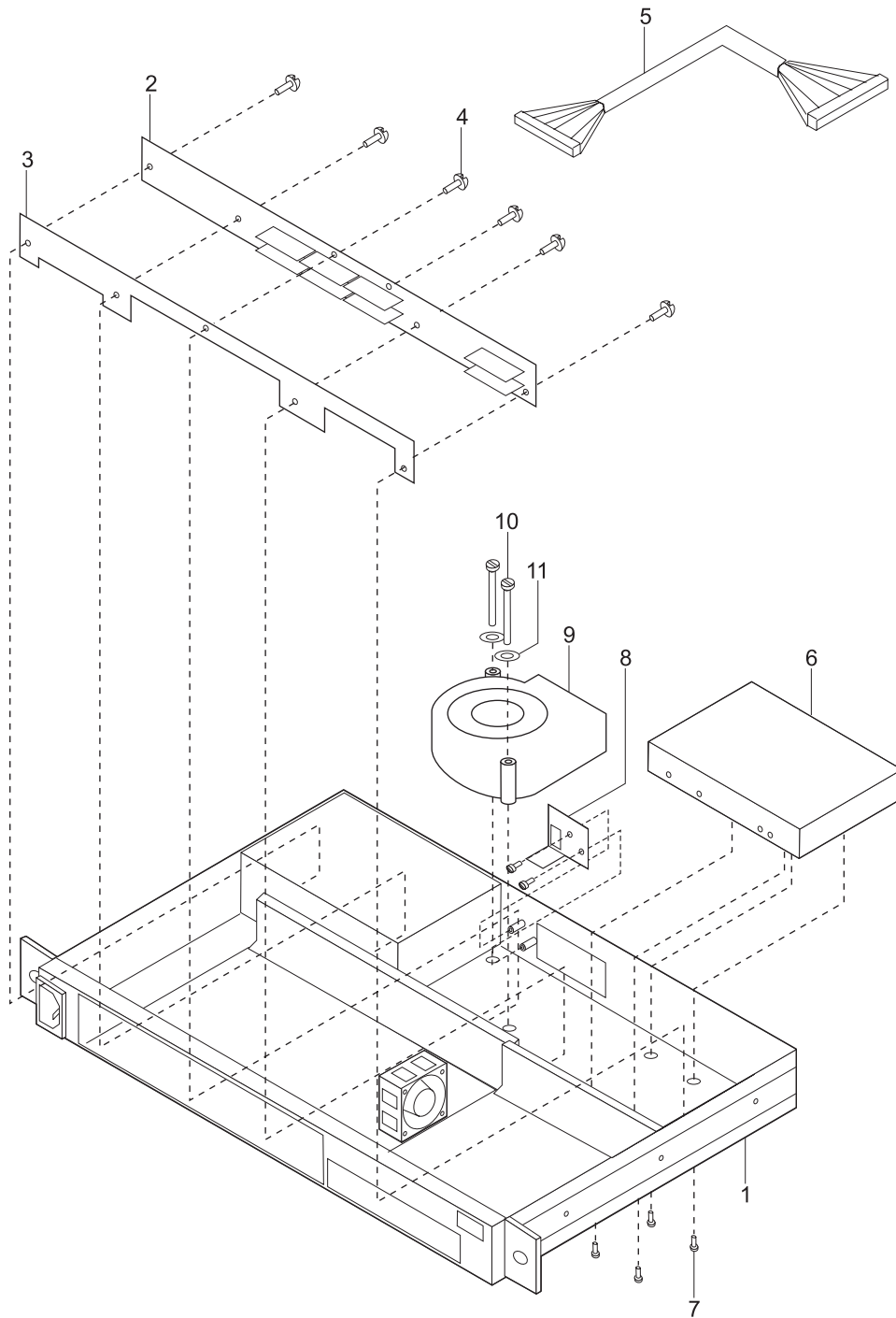
NR: (Not Recommended) in the Units column indicates that the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.

Assembly 1: Final Assembly, IBM 2212, Models 1xx



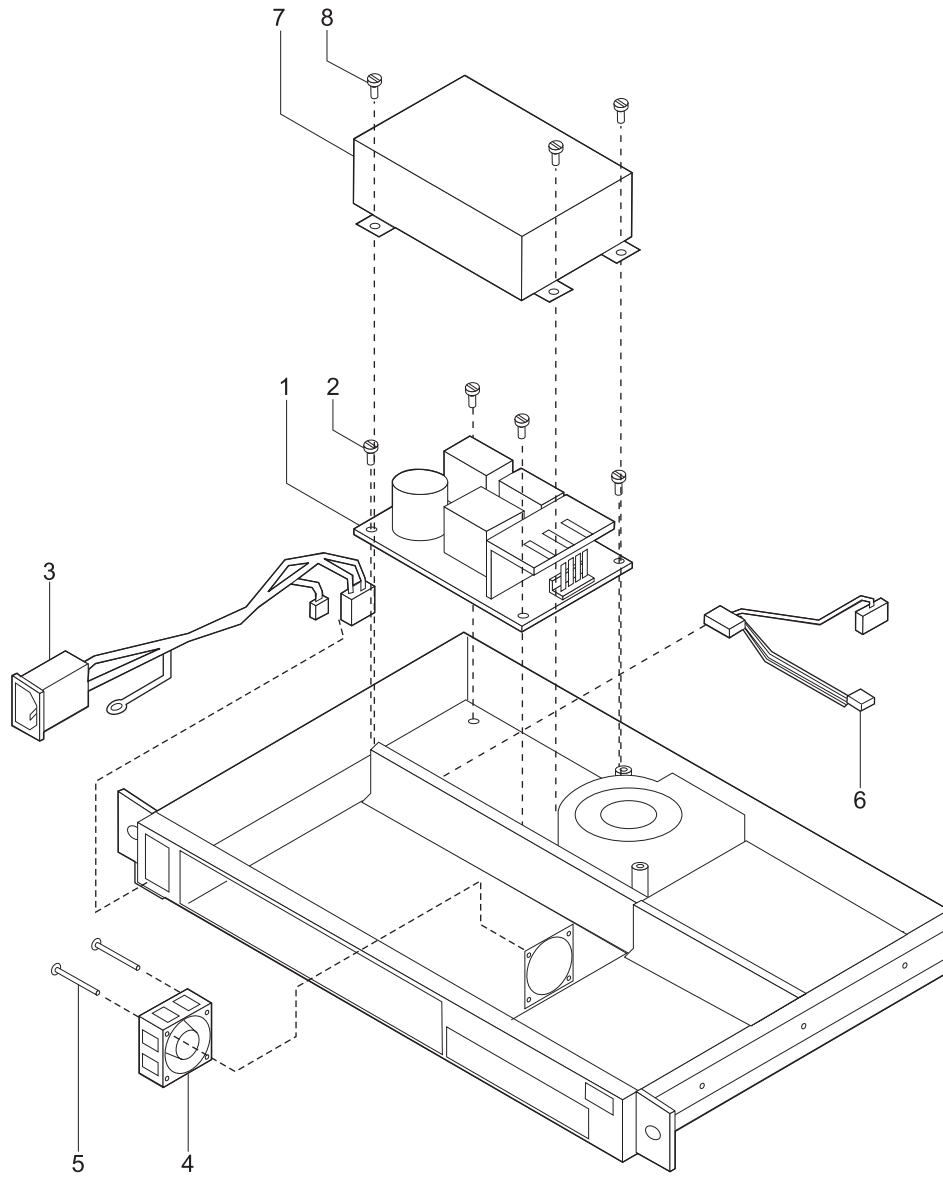
Asm- Index	Part Number	Units	Description
1-			IBM 2212, Models 1xx
-1	86H2039	1	• Cover, Top
-2	86H2053	2	• Bracket, Mounting
-3	92G8546	6	• Screw, Mounting Brackets
-			•
-4	85H4716	1	• System Card
-			•
-5	85H4707	1	• 1-Port Token Ring PMC Adapter -- FC 3101
-	85H4708	1	• 1-Port 10/100 Ethernet PMC Adapter-- FC 3102
-	85H4710	1	• 4-Port WAN CPCI Adapter-- FC 3103
-	85H4711	1	• 2-Port ISDN BRI-U CPCI Adapter-- FC 3104
-	85H4712	1	• 2-Port ISDN BRI-S/T CPCI Adapter-- FC 3105
-	85H4713	1	• 1-Port ISDN PRI T1/J1 CPCI Adapter-- FC 3106
-	85H4714	1	• 1-Port ISDN PRI E1 CPCI Adapter-- FC 3107
-	85H4684	1	• 2-Port ISDN PRI T1/J1 CPCI Adapter-- FC 3108
-	84H4685	1	• 2-Port ISDN PRI E1 CPCI Adapter-- FC 3109
-	85H4686	1	• 2-Port Token Ring CPCI Adapter-- FC 3110
-	85H4737	1	• 2-Port 10/100 Ethernet CPCI Adapter-- FC 3111
-			
-			Hardware - Not illustrated
-	85H4703	1	• 1xx Chassis
-		1	• 48M Flash Card --FC 3131
-	85H4738	1	• Flash Card Wire Latch
-		1	• 32 MB SIMM--FC 3132
-		1	• 64 MB SIMM--FC 3133

Assembly 2: Final Assembly, IBM 2212, Models 1xx



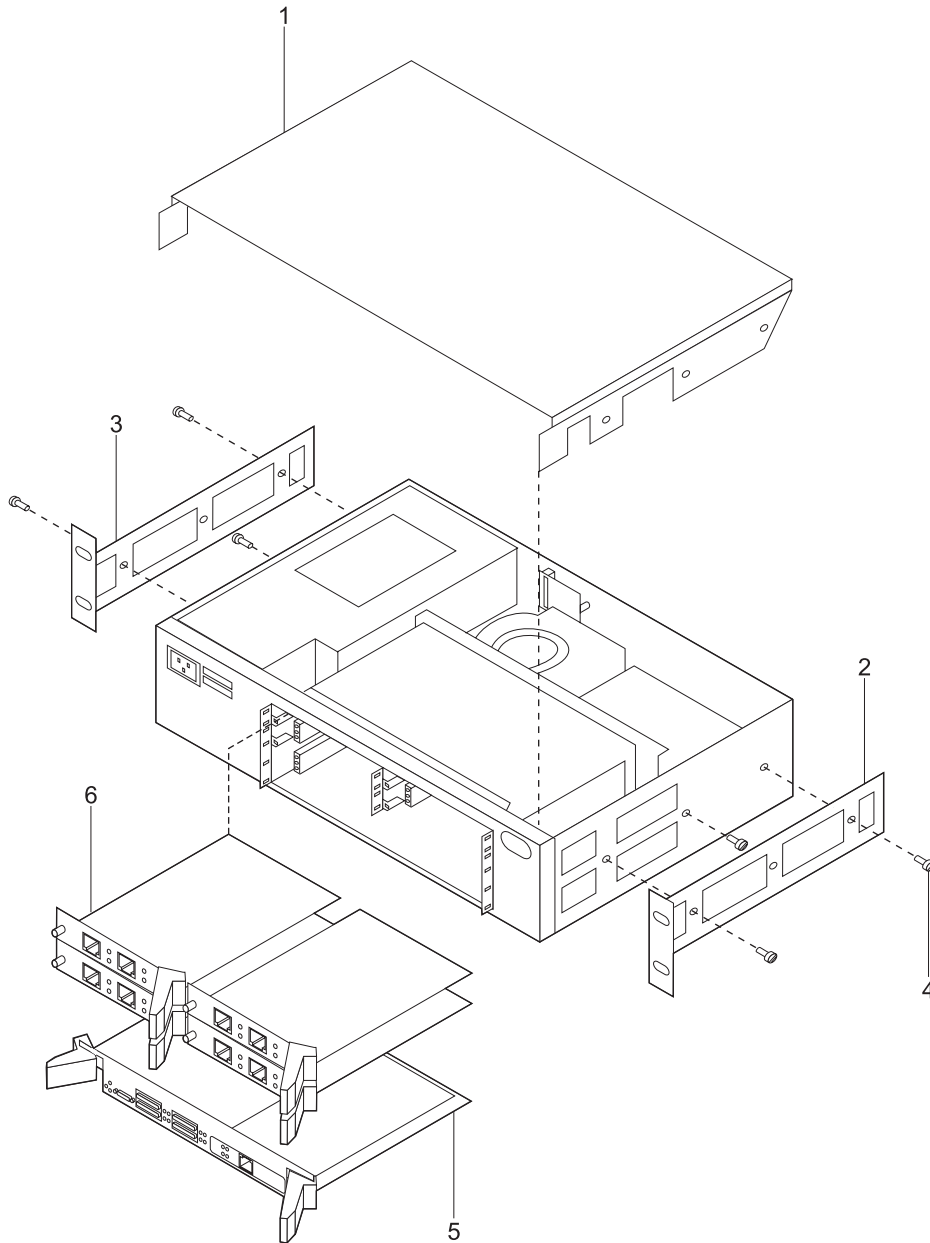
Asm- Index	Part Number	Units	Description
2-			IBM 2212, Models 1xx
-1	86H2045	1	• Base Assembly
-2	85H4718	1	• Backplane
-3	86H2672	1	• • Insulator
-4	1624744	6	• • Screws
-5	30L6091	1	• Cable, Hard File
-6	85H4706	1	• Hard File-- FC 3130
-7	72H2752	4	• • Screw
-8	25L5623		• LED Card Assembly
-9	85H4709	1	• Blower Assembly
-10	25L5450	2	• • Blower Screws
-11	1622344	2	• • Lockwasher

Assembly 3: Final Assembly, IBM 2212, Models 1xx



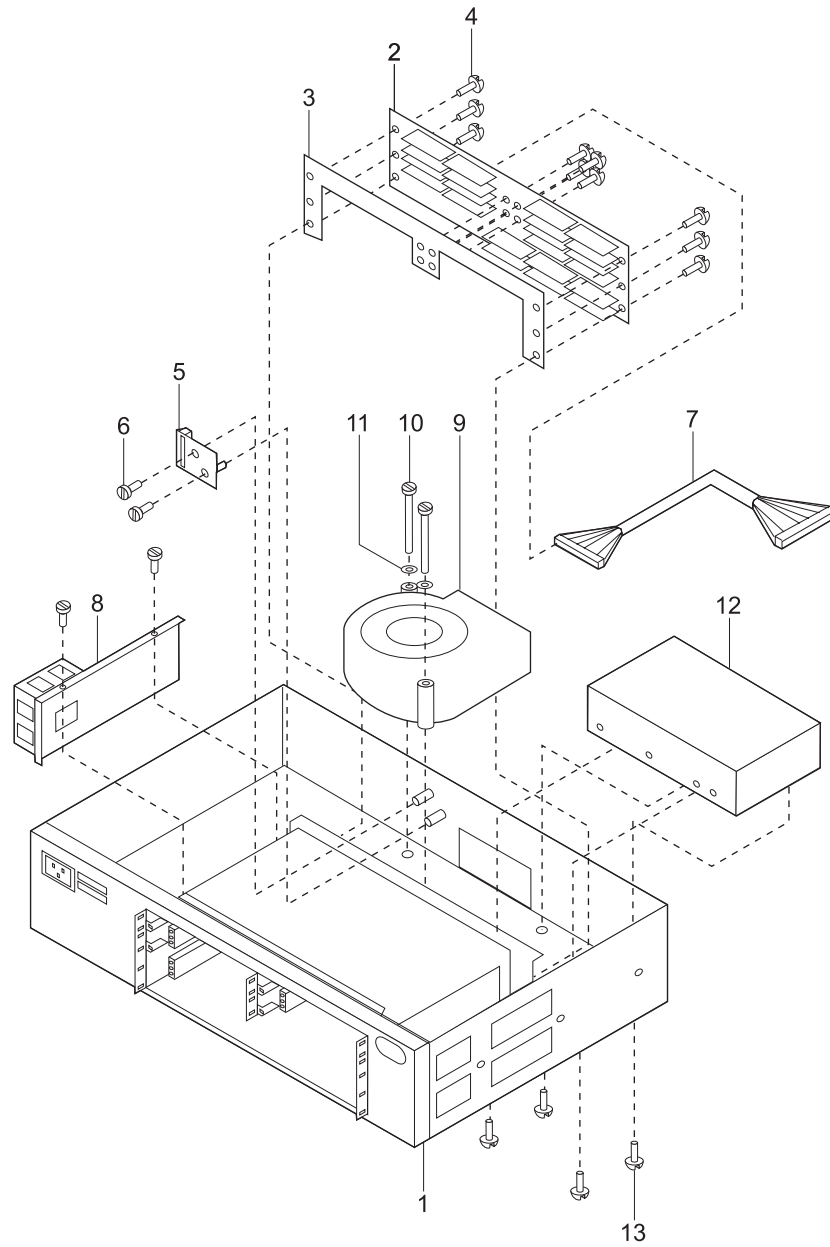
Asm- Index	Part Number	Units	Description
3-			IBM 2212, Models 1xx
-1	85H4704	1	• Power Supply
-2	33G3907	4	• Screws
-3	86H2047	1	• Cable, AC
-4	85H4700	1	• Fan Assembly
-5	1621177	2	• • Screws
-6	30L6096	1	• Cable, DC Power
-7	30L6097	1	• Power Supply Cover
-8	72H2752	4	• • Screws

Assembly 4: Final Assembly, IBM 2212, Models 4xx



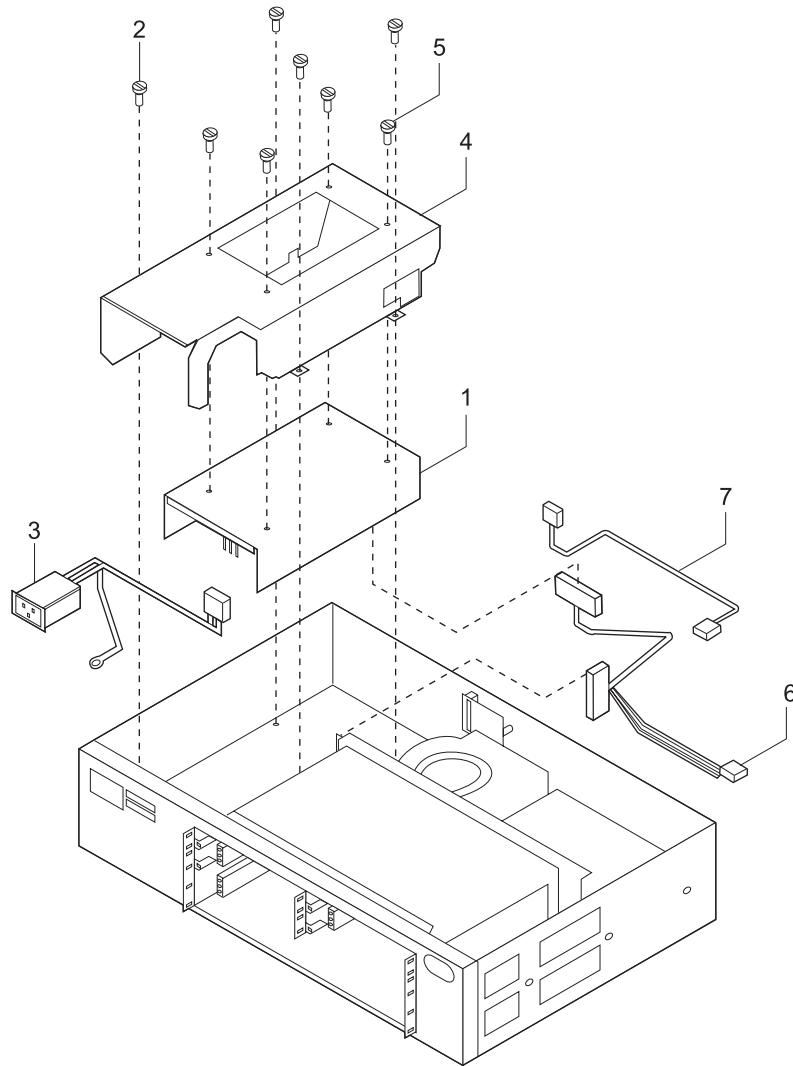
Asm- Index	Part Number	Units	Description
4-			IBM 2212, Models 4xx
-1	01L1925	1	• Cover, Top
-2	01L1927		• Bracket, Side B
-3	01L1928		• Bracket, Side A
-4	92G8546	6	• Screws, Mounting Brackets
-			•
-5	85H4716	1	• System Card
-			•
-6	85H4707	1	• 1-Port Token Ring PMC Adapter -- FC 3101
-	85H4708	1	• 1-Port 10/100 Ethernet PMC Adapter-- FC 3102
-	85H4710	1	• 4-Port WAN CPCI Adapter-- FC 3103
-	85H4711	1	• 2-Port ISDN BRI-U CPCI Adapter-- FC 3104
-	85H4712	1	• 2-Port ISDN BRI-S/T CPCI Adapter-- FC 3105
-	85H4713	1	• 1-Port ISDN PRI T1/J1 CPCI Adapter-- FC 3106
-	85H4714	1	• 1-Port ISDN PRI E1 CPCI Adapter-- FC 3107
-	85H4684	1	• 2-Port ISDN PRI T1/J1 CPCI Adapter-- FC 3108
-	84H4685	1	• 2-Port PRI E1 CPCI Adapter-- FC 3109
-	85H4686	1	• 2-Port Token Ring CPCI Adapter-- FC 3110
-	85H4737	1	• 2-Port 10/100 Ethernet CPCI Adapter-- FC 3111
-			
-			Hardware - Not illustrated
-	85H4703	1	• 4xx Chassis
-	85H4731	1	• 48M Flash Card --FC 3131
-	85H4738	1	• Flash Card Wire Latch
-	85H4407	1	• 32 MB SIMM--FC 3132
-	85H4410	1	• 64 MB SIMM--FC 3133

Assembly 5: Final Assembly, IBM 2212, Models 4xx



Asm- Index	Part Number	Units	Description
5-			IBM 2212, Models 4xx
-1	86H2685	1	• Base Assembly
-2	86H2032		• Backplane
-3	86H2694		• • Insulator
-4	1624744	10	• • Screws
-5	25L5624		• LED Card Assembly
-6	33G3907	4	• • Screws
-7	30L6091		• Cable, Hardfile
-8	85H4701		• Fan/Bracket Assembly
-9	85H8838		• Blower
-10	25L5450	2	• • Blower Screws
-11	1622344	2	• • Lockwashers
-12	85H4706		• Hard File--FC 3130
-13	72H2752	4	• • Screws

Assembly 6: Final Assembly, IBM 2212, Models 4xx



Asm- Index	Part Number	Units	Description
6-			IBM 2212, Models 4xx
-1	85H4705		• Power Supply
-2	33G3907	4	• • Screws
-3	30L6095		• Cable, AC Power
-4	30L6097		• Cover, Power Supply
-5	72H2752	4	• • Screws
-6	30L6096		• Cable, DC Power
-7	30L6098		• Cable, DC Sense

Assembly 7: Data Cables (not illustrated)

Asm- Index	Part Number	Units	Description
7-	04H8180	1	EIA-232 Modem Attach --FC 2321
-	04H8181	1	EIA-232 DTE--FC 2322
-	04H8182	1	V.35 Modem Cable--FC 2351
-	04H8183	1	V.35 Direct Attach--FC 2352
-	04H8184	1	V.36 Cable--FC 2361
-	04H8186	1	X.21 Cable--FC 2211
-	38H5339	1	X.21 DTE Cable--FC 2212
-	04H8187	1	Cable Adapter V.35 French DCE--FC 2703
-	30L6525	1	ISDN PRI RJ-48 J1 Cable--FC 2323
-	30L6526	1	ISDN PRI E1--FC 2324
-	30L6529	1	ISDN PRI E1 Cable for Australia--FC 2325
-	85H4420	1	Console Cable Kit
-	85H4421		<ul style="list-style-type: none"> • Console Cable
-	02L2378		<ul style="list-style-type: none"> • Null Modem Adapter

Assembly 8: Service Wrap Plug Kit (not illustrated)

Asm-Index	Part Number	Units	Description
8-	30L6530		Service Kit--FC 2533
-	04H8210		• Token-Ring Wrap Plug
-	10H5593		• CCITT X.21 Wrap Plug (DTE)
-	21H4811		• Ethernet 10/100 Wrap Plug
-	25L4749		• ISDN PRI T1 & E1 Wrap Plug
-	60G3909		• EIA-232 Wrap Plug
-	60G3914		• EIA-232 Wrap Plug (DTE)
-	60G3911		• CCITT V.35 Wrap Plug (DCE)
-	60G3915		• CCITT V.35 Wrap Plug
-	60G3912		• CCITT V.35 Wrap Plug
-	60G3910		• CCITT X.21 Wrap Plug
-	60G3913		• RVX Wrap Plug
-	60G1474		• ISDN Basic Rate Interface Male Wrap Plug
-	60G1475		• ISDN Basic Rate Interface Inline Adapter
-	7385015		• • Bag
-	60G1474		• • Male Wrap Plug
-	60G1475		• • Inline Adapter
-	74G0687		• 9-to-25-Pin Converter

Appendix B. Hardware Characteristics

Physical Specifications

The dimensions of the IBM 2212 are as follows:

Width

440 mm (17.3 in.) without rack-mounting flange
480 mm (18.9 in.) with rack-mounting flange

Depth

305 mm (12 in.)

Height

Models 1xx: 44.4 mm (1.75 in.), or 1U
Models 4xx: 89 mm (3.5 in.), or 2U

Weight

Models 1xx weigh approximately 4.54 kg (10 lb) when fully populated.

Models 4xx weigh approximately 8 kg (18 lb) when fully populated

Service Clearances

You must leave free space for service around the machine as follows:

Front 750 mm (30 in.)

Sides No clearance required

Rear No clearance required

Airflow

A blower and a fan are installed in each unit and generate the following airflow:

- 2212 Models 1xx: 0.24 m³/min.
- 2212 Models 4xx: 0.50 m³/min.

Operating Environment

Temperature 10°C to 40.6°C (50°F to 105°F)

Relative Humidity 8% to 80%

Max Wet Bulb 27°C (80°F)

Lightning Protection

The power supplies of the IBM 2212 are protected against lightning.

Contact an electrical contractor to determine if lightning protection is needed for your power distribution system.

CPCI Adapter Specifications

Compact peripheral component interconnect (CPCI) adapter slots are 5.25-in (133 mm or 3U) wide

Performance

Driven by a Motorola MPC860 with a PowerPC processor core, the 2212 provides the power needed to meet the demands required of a multiservices platform. Additionally, with support for up to 128 MB of DRAM, the IBM 2212 extends the functions of the popular IBM 2210 with support for even larger, more complex network configurations.

See the Internet at <http://www.networking.ibm.com/2212/2212perf.html> for 2212 performance details.

Power Supply

The 2212 power supply uses a voltage sensing system that converts line current of 100-240 volts ac, 50/60 Hz single-phase to dc input as required by the system card, the adapters and the fan.

Models 1xx provide a power supply capacity of up to 35-W.

Models 4xx require 208 W input power and provide 150-W output.

Power Supply Requirements

For Models 1xx of the IBM 2212, the ac power source must be able to supply:

- 100 to 240 V ac (nominal voltage)
- 50 or 60 Hz
- Single phase
- 0.125 kVA power
- 40 amps peak inrush current for one quarter cycle per supply

For Models 4xx of the IBM 2212, the ac power source must be able to supply:

- 100 to 240 V ac (nominal voltage)
- 50 or 60 Hz
- Single phase
- 0.3 kVA power
- 40 amps peak inrush current for one quarter cycle per supply

Power Cord Characteristics

The ac power cord is shielded and is supplied with a country-dependent plug. For each of the cords listed in Table B-1, find its plug type in Figure B-1 on page B-4 by comparing *index* numbers. The index number is displayed below each plug type in Figure B-1.

Table B-1 (Page 1 of 2). Power Cords and Power Plug Standards

Index	Feature Code	Part Number	Countries	Power Cord	Plug Standard
1	8846	1838578	Bolivia, Brazil, Ecuador, Canada, Japan, Peru, Philippines, Taiwan, Thailand, Venezuela, United States	10 A, 250 V, 2.7 m (9 ft)	NEMA WD-1 6-15P

Table B-1 (Page 2 of 2). Power Cords and Power Plug Standards

Index	Feature Code	Part Number	Countries	Power Cord	Plug Standard
2	8835	6952303	Bolivia, Brazil, Canada, Colombia, Ecuador, Japan, Mexico, Panama, Peru, Philippines, Saudi Arabia, South Korea, Taiwan, United States (except Chicago), Venezuela	10 A, 125 V, 2.7 m (9 ft)	NEMA WD-1 5-15P
2	8837	1838579	United States (Chicago)	10 A, 250 V, 1.8 m (6 ft)	NEMA WD-1 6-15P
2	8836	6952304	United States (Chicago)	10 A, 125 V, 1.8 m (6 ft)	NEMA WD-1 5-15P
2	8848	13F9968	Thailand — inline plug only	10 A, 250 V, 1.8 m (6 ft)	NEMA WD-1 5-15P
3	8838	13F9988	Austria, Belgium, Brazil, China, Finland, France, Germany, Greece, Indonesia, Macao, Netherlands, Norway, Portugal, Saudi Arabia, South Korea, Spain, Sweden, Turkey	10 A, 250 V, 2.7 m (9 ft)	CEE7 VII
4	8840	14F0042	Brunei, China, Hong Kong, India, Ireland, Kuwait, Malaysia, Singapore, South Africa, United Arab Emirates, United Kingdom	10 A, 250 V, 2.7 m (9 ft)	BS 1363
5	8842	14F0060	Switzerland, Liechtenstein	10 A, 250 V, 2.7 m (9 ft)	SEV 24507
6	8844	14F0078	Chile, Italy	10 A, 250 V, 2.7 m (9 ft)	CEI 23-16
7	8839	14F0006	Denmark	10 A, 250 V, 2.7 m (9 ft)	Normblad 4
8	8841	14F0096	Israel	10 A, 250 V, 2.7 m (9 ft)	SII-32-1971
9	8845	13F9948	Argentina, Australia, Brazil, China, Colombia, New Zealand, Paraguay, Uruguay	10 A, 250 V, 2.7 m (9 ft)	AS 3112-1981 NZS 198
10	8843	14F0024	Bangladesh, Myanmar, Pakistan, South Africa, Sri Lanka	10 A, 250 V, 2.7 m (9 ft)	SABS 164 BS 563

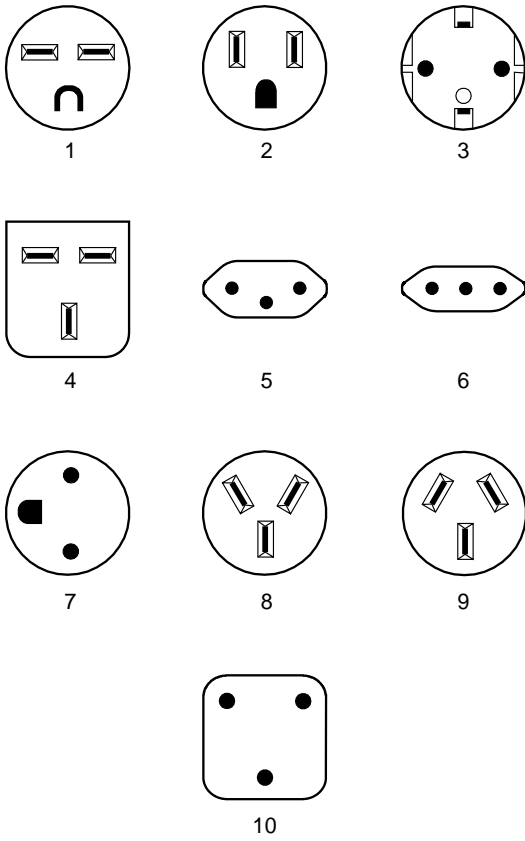


Figure B-1. Power Cord Plugs by Country

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This appendix provides a series of questions and answers dealing with common IBM 2212 installation, operation, and maintenance tasks, with suggestions as to where to find further help in performing them.

Accessing the Bootstrap Menu

Question What are the bootstrap menus? How do I access them?

Answer The bootstrap is microcode running on the 2212 that tests the basic functions of the system card and the hard file/compact flash, and then loads the operational code. The bootstrap menus display errors detected by the bootstrap and provide system card and hard file/compact flash problem determination tools, which are used primarily by service personnel.

Accessing the bootstrap menus requires that a console be attached to the 2212 service port, and the boot process be stopped at a specific point.

To access the bootstrap menus:

1. Either unplug and plug the power cord, or type **reload** at the OPCON (*) prompt on the console.
2. The 2212 will begin its boot process. When the message <<Press CTRL-C to access menus>> is displayed, press **Ctrl-C** on the terminal keyboard to stop the boot process. The bootstrap main menu will appear.

Note: You cannot use SLIP to access the bootstrap menus.

Accessing the OPCON Command Line Interface

Question How do I access OPCON (*)?

Answer After you have connected your console to the IBM 2212 and have powered on the console and the IBM 2212, you will see a sequence of informational status messages. When you see the prompt Please press the space bar to obtain the console, press the space bar to attach the IBM 2212 to your session. The system acknowledges this action with the message Console granted to this interface, and by displaying the OPCON command prompt on the console after the code loading is complete.

Note: If you are at an IBM 2212 that has never been configured, the system presents the command prompt Config (only)>. Otherwise, you will see the OPCON (*) prompt.

Accessing OPCON from the Bootstrap Menu

Question How do I access the OPCON command line interface from within the bootstrap?

Answer From the Boot Sequence Selection Menu, select **Normal Boot**, then select **Issue Reset**. The OPCON prompt * is displayed after the system boots.

The command line interface is described in the *Access Integration Services Software User's Guide*.

Accessing OPCON from SVC>

Question How do I access the OPCON command line interface from within the service recovery function (SVC>)?

Answer From the SVC> prompt, type **Bootmode**, then select **3. Normal Boot From Disk** and press **Enter**. Next, type **reboot** and press **Enter**. The OPCON prompt * is displayed after the system boots.

Navigating Through the OPCON Command Line Interface

Question How do I use the commands in the Command Line Interface?

Answer The structure of the interface is shown in Figure C-1.

The *Access Integration Services Software User's Guide* describes the entire command line interface. The basic prompts that you use are the:

- * prompt, which is the OPerating CONsole (OPCON) prompt, the initial entry point to the command line interface
- Config> prompt, which is used for configuration changes
- + prompt, which is known as monitoring or GWCON.
- Config Only> prompt, which is used for initial configuration. The IBM 2212 boots to this prompt if it has not been configured. You cannot access GWCON (+) from the Config Only> prompt.

The basic commands are:

- Type **?** and press **Enter** at any time to view a list of possible commands.
- Type **exit** and press **Enter** to return to the + prompt and to the Config> prompt.
- Press the **Ctrl-p** keys to return to the * prompt.

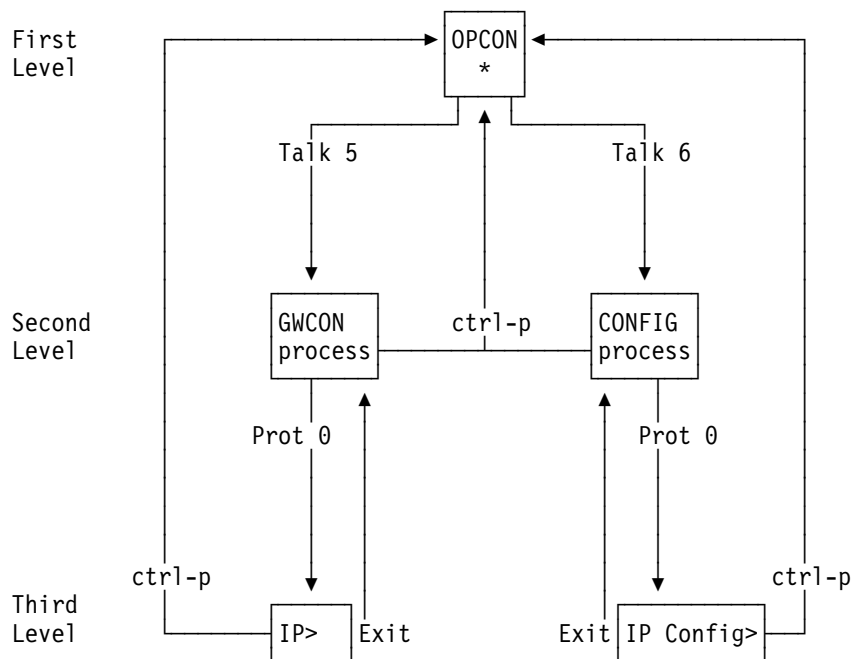


Figure C-1. Structure of the Command Line Interface with the protocol command (Prot) as an example

Accessing the Service Recovery Prompt (SVC>)

Question How do I access the SVC> prompt?

Answer There are two ways depending on whether the 2212 is operating normally, or in recovery mode.

- In normal operational mode, to access the SVC> prompt:
 1. Either unplug and plug the power cord on the 2212, or type **reload** at the OPCON (*) prompt.
 2. Press and **hold** the space bar when you see the message Please press the space bar to obtain the console. The console will display the following message:

```
Please press the space bar to obtain the console.  
Console granted to this interface  
  
Space bar was pressed during IPL.  
Do you wish to enter the service menu?(Y/N)  
(in 10 seconds, N will be defaulted)  
  
Service Console  
svc>
```

3. Press **y** within 10 seconds.

To display a list of available commands, type **?** at the SVC> prompt.

- From the Bootstrap Menus (your IBM 2212 is in recovery mode), to access the SVC> prompt:
 1. Select **Issue Reset**.
 2. Press and **hold** the space bar when you see the message Please press the space bar to obtain the console. The console will display the following message:

```
Please press the space bar to obtain the console.  
Console granted to this interface  
  
Space bar was pressed during IPL.  
Do you wish to enter the service menu?(Y/N)  
(in 10 seconds, N will be defaulted)  
  
Service Console  
svc>
```

3. Press **y** within 10 seconds.

To display a list of available commands, type **?** at the SVC> prompt.

Adapter Tasks

Adapter Status / LED States

Question How do I check the state of the adapters in my IBM 2212?

Answer LEDs on the front and rear of the IBM 2212 indicate the status of the adapter. (See “Adapter Port LEDs” on page 1-5 and “Additional Slot-Status LEDs” on page 1-7.)

Adding an Adapter After Initial Configuration

Question How do I add an adapter after the IBM 2212 has been initially configured?

Answer Install the adapter using the instructions accompanying the feature. Either use the Configuration Program and download the updated configuration to the 2212, or follow these steps to configure adapters using the 2212's OPCON command line interface (* prompt).

1. Access the OPCON command line interface (* prompt). See "Accessing the OPCON Command Line Interface" on page C-2.
2. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. Enter **add device** *type of device*.

To see a list of device choices, type **add device ?**.

The following two steps do not apply when a dial-circuit device is being added.

4. Enter the device slot number. If you add a PMC adapter or configure a Model 10F or 10H, you will not be prompted for a slot number.
5. If you are adding an interface on a single-port adapter, go to step 6. Otherwise, continue with this step.
Enter the port number. The range of port numbers supported depends on the multi-port adapter type.
6. Make a note of the interface number to which this port is assigned and the net number. If you configure a WAN interface and wish to use a data-link type other than PPP, you must use the **set data-link** *data-link type* command to change the data-link type to any of the data-link protocols available on your IBM 2212 (frame relay, X.25, and SDLC for example).
7. Enter at the Config> prompt **net** *net number* to access interface-unique configuration commands. Refer to the *Access Integration Services Software User's Guide* for a description of the supported interface commands.
8. Enter **exit** after configuring the interface.
9. Use the **protocol** command at the Config> prompt to configure protocols on the interface. Refer to Volume 1 and Volume 2 of the *Access Integration Services Protocol Configuration and Monitoring Reference* for a description of the supported commands for each protocol.
10. Type **exit** to get the Config> prompt.
11. Repeat steps 3 through 10 if you have a multi-port adapter and you want to have more than one interface defined on the adapter.
12. Enter **write** to save your changes.
13. Press **Ctrl-p** to return to the OPCON (*) prompt.
14. Type **restart** at the OPCON (*) prompt.

Adding an Adapter at Initial Configuration

Question How do I add an adapter to the software configuration when the IBM 2212 is being initially configured?

Answer First, perform installation of the 2212 and install any additional adapters into the 2212.

When the IBM 2212 is initially installed, it does not have any software configuration. The operating system will put you at the Config only> prompt.

1. Enter **add device** *type of device*

Note: These steps create only the interface. You must use the **net** command to configure characteristics unique to that interface (for example, T/R, Ethernet, PPP, FR, SDLC, X.25). You also need to use the **protocol** command to configure protocols on the interface. If you configure a WAN interface and wish to use a data-link type other than PPP, you must use the **set data-link** *data-link type* command to change the data-link type to any of the data-link protocols available on your IBM 2212 (frame relay, X.25, and SDLC for example).

To see a list of device choices, type **add device ?**.

The following two steps do not apply when a dial-circuit device is being added.

2. Enter the device slot number. If you add a PMC adapter or configure a Model 10F or 10H, you will not be prompted for a slot number.
3. If you are adding an interface on a single-port adapter, go to step 4. Otherwise, continue with this step.

Enter the port number. The range of port numbers supported depends on the multi-port adapter type.
4. Make a note of the interface number to which this port is assigned and the net number.
5. Enter at the Config> prompt **net** *net number* to access interface-unique configuration commands. Refer to the *Access Integration Services Software User's Guide* for a description of the supported interface commands.
6. Enter **exit** after configuring the interface.
7. Use the **protocol** command to configure protocols on the interface. Refer to Volume 1 and Volume 2 of the *Access Integration Services Protocol Configuration and Monitoring Reference* for a description of the supported commands for each protocol.
8. Repeat steps 1 to 4 if you have a multi-port adapter and you want to have more than one interface defined on that adapter.
9. Type **write** to save the changes.
10. **Restart** the IBM 2212 to make the configuration changes active.

Disabling an Adapter Port

Question How do I disable a configured adapter port to prevent the operational code from bringing up the adapter?

Answer

1. Access the OPCON command line interface (* prompt). See "Accessing the OPCON Command Line Interface" on page C-2.
2. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. Type **list device**.
4. Make a note of the interface number of the port you wish to disable.
5. Type **disable interface** *interface number*.
6. Type **write** to save your changes. The next time the 2212 is rebooted, the interface will be disabled.

You can also disable an adapter port from the GWCON (+) prompt. It will remain disabled until you restart or reload the 2212 or resume traffic.

1. Access the OPCON command line interface (* prompt). See “Accessing the OPCON Command Line Interface” on page C-2.
2. Type **talk 5** and press **Enter** to reach the + prompt. If the + prompt does not appear, press **Enter** again.
3. Type **disable interface** *interface number*. The configuration changes take place immediately.

For details of this procedure, refer to the *Access Integration Services Software User's Guide*.

Displaying the Error Logging System (ELS) Messages for an Interface

Question How do I display ELS messages?

Answer

1. At the OPCON prompt (*), enter the **talk 5** command. The GWCON (+) prompt will be displayed.
2. At the + prompt, type **event**. The ELS> prompt will be displayed.
3. At the ELS> prompt, type **display subsystem** *subsystem_name*. For example, to display the errors logged for a Token-Ring interface, type ELS> **display subsystem tkr all**. To get a list of subsystem names, type **display subsystem ?**. Also refer to the *Access Integration Services Software User's Guide*.
4. Press **Ctrl-p** to display the OPCON (*) prompt.
5. Type **talk 2**. The messages will begin to scroll by on the screen. To interpret the messages, use the ELS Messages Guide, which is on the *Access Integration Services Configuration Tool and Documentation* CD-ROM.
6. Type **Ctrl-p** to exit talk 2.

Enabling an Adapter Port

Question How do I enable a configured adapter port that was disabled using **disable interface** from the Config> prompt (in “Disabling an Adapter Port” on page C-6)?

Use this procedure to enable the port the next time that you reboot the 2212.

Answer

1. Access the OPCON command line interface (* prompt).
2. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. Type **list device**.
4. Make a note of the interface number of the port you wish to enable.
5. Type **enable interface** *interface number*.
6. Type **write** to save your changes. The next time the 2212 is rebooted, the interface will be enabled.

For details of this procedure, refer to the *Access Integration Services Software User's Guide*.

Removing and Deleting an Adapter

Question How do I remove and delete an adapter from the configuration?

Answer

1. Access the OPCON command line interface (* prompt).
2. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. Type **list device**.
4. Write down the interface numbers of all the interfaces configured for the adapter you wish to delete.
5. Type **delete interface** *interface number* for each interface you recorded.

Note: The system *renumbers* the interfaces after an interface is deleted. Therefore, if you are deleting more than one interface, the interfaces will be renumbered each time you delete one. For example, if there are 0 through 7 interfaces on your IBM 2212, and you wish to delete Token-Ring interface 4 and Token-Ring interface 5, after you delete interface 4, the system will renumber what was previously interface 5 to interface 4.

6. Type **write** to save your changes.
7. Type **restart** to make the configuration changes active.

For details of this procedure, refer to the *Access Integration Services Software User's Guide*.

Resume Traffic on an Adapter Port

Question How do I resume traffic on a configured adapter port (that was disabled in “Suspend Traffic on an Adapter Port” or “Disabling an Adapter Port” on page C-6)?

Answer

1. Access the OPCON command line interface (* prompt).
2. Type **talk 5** and press **Enter** twice to reach the + prompt.
3. Type **interface**.
4. Make a note of the interface number of the adapter port you wish to enable.
5. Type **test** *interface number*.

Note: If you use the **test** command to enable an interface that has been configured at the Config> prompt (from **talk 6**) as disabled, when you reboot the 2212, the interface will be disabled again. Therefore, you should use the Config> **enable interface** command to ensure that the interface is enabled the next time a reboot does occur.

For details of this procedure, refer to the *Access Integration Services Software User's Guide*.

Suspend Traffic on an Adapter Port

Question How do I disable a configured adapter port to suspend traffic?

Answer

1. Access the OPCON command line interface (* prompt).
2. Type **talk 5** and press **Enter** twice to reach the + prompt.
3. Type **interface**.
4. Make a note of the interface net number of the adapter port that you want to disable.
5. Type **disable interface** *net number*.
6. Press the **Ctrl-p** keys to return to the * prompt.

Changing the Service Port Speed

Question How do I change the service port's speed?

Answer

The 2212 service port is shipped with the speed set to 19.2 Kbps. To change the service port speed, perform the following steps:

1. Either Telnet into the 2212 over one of its network interfaces, or attach an ASCII terminal to the 2212 service port as described in Chapter 3, "Accessing the 2212" on page 3-1.
 - If you Telnet into the 2212, use the following procedure documented for the OPCON (*) prompt.
 - You can use either of the following procedures if you attach an ASCII terminal to the service port.
2. Access either the SVC> prompt (see "Accessing the Service Recovery Prompt (SVC>)" on page C-3) or the OPCON (*) prompt (see "Accessing the OPCON Command Line Interface" on page C-2). From the SVC> prompt:
 - a. Type **baudrate**. You will be prompted for the rest of the information.

From the OPCON (*) prompt:

- a. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
- b. From the Config> prompt, type **set baudrate** and enter the speed.

Note: You must reconfigure the speed of the ASCII terminal to match the service port speed to enter any further commands.

Disabling Dumping

Question How do I disable dumping of memory contents on the 2212?

Answer The IBM 2212 can be set up to dump the contents of memory to the hard file if the 2212 contains one, or a network server attached to the same LAN as the IBM 2212 in the unlikely event of a complete system failure. If dumping is enabled, using this selection will cause the IBM 2212 **not** to dump at the next system failure. The following sections describe the various methods for disabling dumping on the IBM 2212.

Disable Dumping from OPCON

To disable dumping:

1. Type **talk 6** or **t 6** at the OPCON (*) prompt and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
2. Type **disable dump-memory** or **dis dump** at the Config> prompt
3. You will be prompted by the following message to confirm:

Disable system memory dumping? [no]: **yes**

Disable Dumping from SVC> Prompt

You can also disable dumping from the SVC> prompt.

1. Access the Service Recovery Interface as described on page "Accessing the Service Recovery Prompt (SVC>)" on page C-3.
2. At the SVC> prompt, type **dump**.

3. You will be prompted for the rest of the information as shown in the following example.

```
Dump is currently enabled.  
Do you want to disable dump (Y/N)? Y
```

Enabling Dumping

Question How do I enable dumping of memory contents on the 2212?

Answer The IBM 2212 can be set up to dump the contents of memory without intervention from anyone in the unlikely event of a complete system failure.

The IBM 2212 can be configured to dump memory locally to the hard file if the 2212 contains one, or dump over the network to a file on a LAN-attached server if preconfigured by the customer to do so. It can also be configured to dump once and stop, dump three times and stop, or dump continuously. Once the dump is successful, the IBM 2212 attempts to restart. Depending upon the failure of the IBM 2212, it cannot always restart. In this case, you should restart it manually and call a service person who will dial into the IBM 2212 to determine the nature and the causes of the failure.

The following sections describe the various methods for enabling dumping on the 2212.

Enable Dumping from OPCON

To enable dumping, enter the following commands at the `Config>` prompt.

- First, you must enable system rebooting by typing **enable reboot-system**.
- Next, type the **set dump save-mode** and **set dump enable-mode** commands to change or keep the current settings.
- Then, type the **set dump target** command to specify where the system memory contents will be written. Valid targets are the 2212 hard file, if one is present, or a remote host on a LAN. If the target is a remote host on a LAN, then IP and TFTP parameters of both the local LAN interface and the remote host are required, along with whether or not the file is to be transferred via TFTP as compressed or uncompressed data. You will be prompted for the information as shown in the following examples.
- Finally, to enable dumping, type **enable dump-memory** at the `Config>` prompt. You will see the message:

```
Current System Dump Status:  
System dump is currently enabled.  
Number of existing dump files: 3
```

If you wish to delete the existing dump files, issue the **delete dump-files** command.

Config> **set dump save-mode**

Current System Dump Settings:

Re-enable System Dump following the next system dump.
Save the last 3 (most recent) dump files.

Do you want to change system dump save-mode to
save the first (initial) dump files ? (Yes, No): [No] **Yes**

Current System Dump Settings:

Re-enable System Dump following the next system dump.
Save the first 3 (initial) dump files, then disable system dump.

Current System Dump Status:

System dump is currently enabled.
Number of existing dump files: 2

Config> **set dump enable-mode**

Current System Dump Settings:

Disable System Dump following the next system dump.
Save the last 3 (most recent) dump files.

Do you want to change system dump enable-mode to
re-enable System Dump following the next system dump ? (Yes, No): [No] **Yes**

Current System Dump Settings:

Re-enable System Dump following the next system dump.
Save the last 3 (most recent) dump files.

Current System Dump Status:

System dump is currently enabled.
Number of existing dump files: 2

Config> **set dump target**

Current System Dump Target Settings:

Dump Target: Remote Host on Network

Local Interface Settings:

Device Type: **Ethernet**

Slot Number: **1**

Port Number: **1**

IP address: **9.9.9.6**

Net Mask: **255.255.255.0**

Remote Host Settings:

IP address: **15.110.33.99**

Remote Filename: **/oracle/appndmp**

Remote file will be compressed and "0.cmp", "1.cmp", or "2.cmp" will be
appended to the end of the filename.

Do you want to change the System Dump Target ? (Yes, No): [No] **Yes**

Enter Dump Target (D-Disk or N-Network): [N]? **N**

Setting Dump Target to "Network".

Set or Change settings for dumping to the Network ? (Yes, No): [No] **Yes**

Enter Local LAN Interface Type (E-Eth or T-Tkr): [E]?

Enter Slot Number (1-5): [1]?

Enter Port Number (1-2): [1]?

Enter Local IP Address: [9.9.9.6]? **15.110.33.99**

Enter Local Netmask: [255.255.255.0]? **255.255.248.0**
Enter Remote IP Address: [15.110.33.99]?
Remote Path and File name: **/oracle/appndmp**
Enter Path and File name (32 chars max):
Enter File Compression Mode (C-Comp or U-Uncomp): [C]? **U**
Do you want to save your changes ? (Yes, No): [No] **Yes**

New System Dump Target Settings:

Dump Target: Remote Host on Network
Local Interface Settings:
Device Type: Ethernet
Slot Number: 1
Port Number: 1
IP address: 15.110.33.99
Net Mask: 255.255.248.0
Remote Host Settings:
IP address: 15.110.33.99
Remote Filename: /oracle/appndmp
Remote file will be uncompressed and "0.unc", "1.unc", or "2.unc" will be appended to the end of the filename.

Enable Dumping from SVC> Prompt

You can also enable dumping from the SVC> prompt. Access the Service Recovery Interface as described in "Accessing the Service Recovery Prompt (SVC>)" on page C-3. Then, type **dump**. You will be prompted for the rest of the information, as shown in the following example.

```
svc> dump
This command enables or disables system dump and
selects the dump target as disk or remote host.

Dump is currently enabled.
Do you want to disable dump ?
n
Dump is currently enabled.
Dump Target: Remote Host on Network.
Enter Dump Target (Disk or Network or  to keep current value):

Remote Host settings:
IP address: 9.9.9.1
Remote Filename: /tmp/dump_to_host
Remote file will be compressed and "0.cmp", "1.cmp", or "2.cmp" will be
appended to the end of the filename.

Do you want to set or change the remote dump parameters ?
y
Press  to save current setting.

Enter IP address (0.0.0.0 form):
15.110.33.99
Enter remote path and filename (32 chars max):
/oracle/appndmp
Enter Remote File Compression Mode (Compressed or Uncompressed):
Compressed
Remote Host settings:
```


IP address: 15.110.33.99
Remote Filename: /oracle/appndmp
Remote file will be compressed and "0.cmp", "1.cmp", or "2.cmp" will be appended to the end of the filename.

Do you want to save the new network dump parameters ?

y

Remote Host settings:

IP address: 15.110.33.99
Remote Filename: /oracle/appndmp
Remote file will be compressed and "0.cmp", "1.cmp", or "2.cmp" will be appended to the end of the filename.

You must reboot in order for these changes to take effect.

Entering Vital Product Data

Question How do I enter vital product data (VPD) information?

Answer You can enter VPD information from the SVC> prompt. See "Accessing the Service Recovery Prompt (SVC>)" on page C-3. Then, type **vpd**. You will be prompted for the rest of the information.

Getting Up-to-Date IBM 2212 Information

Question How can I find the most current information about the IBM 2212?

Answer Point your web browser to <http://www.networking.ibm.com/2212/2212prod.html>

Getting Software Updates from the Web

Question How can I find the most current IBM 2212 code from the web?

Answer Point your web browser to <http://www.networking.ibm.com/support/downloads/2212>. Download the files onto your server. Use the TFTP procedure (see "Transferring Files Using TFTP" on page C-18) or Zmodem procedure (see "Transferring Files Using Zmodem" on page C-20) to load them onto the IBM 2212.

Interface Tasks

Displaying the Status of An Interface

Question How do I display the status of an interface?

Answer

1. To check the status of the interface, access the OPCON prompt (*). (See "Accessing the OPCON Command Line Interface" on page C-2)
2. Type **talk 5** and press **Enter**.
3. Type **interface** to determine the interface number associated with the I/O port.
4. Type **interface #**. The status of the interface, including error counts, will be displayed.

Displaying a List of Configured Interfaces

Question How do I display a list of configured interfaces?

Answer

1. Access the OPCON prompt (*). (See “Accessing the OPCON Command Line Interface” on page C-2)
2. Type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. Type **list dev**.
4. Press **Ctrl-p** to return to the OPCON (*) prompt.

Displaying the Operational State of the Interfaces

Question How do I display the state of an interface (for example, up, down, disabled)?

Answer

1. Access the OPCON prompt (*). (See “Accessing the OPCON Command Line Interface” on page C-2)
2. Type **talk 5** and press **Enter** to reach the + (monitoring) prompt. If the + prompt does not appear, press **Enter** again.
3. Type **configuration**.
4. Press **Ctrl-p** to return to the OPCON (*) prompt.

Verifying IP Connectivity

Question How do I verify that a given IP address is accessible from the 2212?

Answer

1. Access the command line interface (the * prompt).
2. Type **talk 5** and press **Enter** twice to reach the + prompt.
3. Type **protocol** and press **Enter**.
4. Type **ip** and press **Enter**. The prompt changes to IP>.
5. Type **ping IP address value** and press **Enter**. Press **Enter** to stop the ping process.
6. Type **exit** at the IP> prompt and press **Enter**. The prompt changes to +.
7. Press **Ctrl-p** to return to the OPCON (*) prompt.

Managing Operational Code and Configuration Files

To help you manage operational software upgrades and configurations, the IBM 2212 has a software change management feature. This utility enables you to determine which operational software file and configuration file are active while the IBM 2212 is running. It also has a service recovery interface that enables you to perform many of the same tasks.

Reconfiguring

You might find it difficult to detect problems caused by configuration errors. A configuration error can initially appear to be a hardware problem because the 2212 will not start or data will not flow through a

port. In addition, problems with configuration may not result in an error initially; an error may occur only when specific conditions are encountered or when heavy network traffic occurs.

If you cannot resolve a problem after making a few changes to your configuration or after restoring the active configuration file, it is recommended that you generate a new configuration. Too many changes to a configuration often compound the problem, whereas you can usually generate and test a new configuration within a few hours.

Backing Up the Active Configuration

Question How do I use the OPCON command-line interface to backup the active configuration?

Answer You can backup the active configuration file by using the command-line interface to copy a configuration file to an available bank, and then lock the bank to protect the file. To do so, issue the following commands:

1. From the OPCON prompt *, type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
2. At the Config> prompt:
 - a. Type **boot**.
 - b. Type **copy configuration**. You will be prompted for the following information as shown in the example.
 - Source bank (A or B)
 - Source configuration file (1, 2, 3, or 4). Up to four configuration files can be associated with each bank.
 - Destination bank (A or B)
 - Destination for configuration file (1, 2, 3, or 4)

```
Boot config> copy config

Copy FROM Bank number? A
Copy FROM Config number? 1
Copy TO Bank number? B
Copy TO Config number? 1
```
 - c. To prevent the device from overwriting the selected configuration, type **lock**.
You will be prompted for the source bank (A or B) and the source configuration file. These locations are the destination bank and the configuration you specified in the step 2b.
 - d. Optionally, you can use the **add** command to add a description of the backup configuration file.

Checking the Software and Configuration File Level

Question How do I check the level of software loaded on my 2212?

Answer To check the *level of the operational software image* stored in the 2212, access the Boot config> prompt or the SVC> prompt, and then type **describe**. The Product ID, microcode version number, release number, maintenance number, PTF, Feature, and RPQ numbers and the date of the operational software image are displayed.

To display **information on a configuration file** loaded on the 2212, access the Boot config> prompt or the SVC> prompt, and then type **list**. For each configuration file that is loaded, its bank, internal location (for example, CONFIG 1), version, and level is displayed.

Copying a File Using the Copy Command

Question How do I copy a load image or configuration file from one bank in the 2212 to another?

Answer

The **copy** command allows you to copy a load image or configuration file from one location on the hard file or compact flash to another. This command allows you to change the status as well. The file that you copy always receives the status of the storage area that it is copied to.

From the OPCON (*) prompt:

1. At the OPCON (*) prompt, type **talk 6**. The Config> prompt will be displayed.
2. At the Config> prompt, type **boot**. The Boot config> prompt will be displayed.
3. At the Boot config> prompt, to copy a configuration file, type the following commands:

```
Boot config> copy config
```

```
Copy FROM Bank number? A  
Copy FROM Config number? 1  
Copy TO Bank number? B  
Copy TO Config number? 1
```

To copy a load image, at the Boot config> prompt, type **copy load**. You will be prompted for the source bank (A or B) and destination bank (A or B).

From the SVC> prompt:

1. Access the SVC> prompt. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3).
2. At the SVC> prompt, type **copy**. You will be prompted for the rest of the information, as shown in the following example.

```
svc>copy  
BankA ---+----- Description -----+----- Date -----+  
IMAGE - PENDING 10 Feb 1998 17:46  
CONFIG 1 - AVAIL 10 Feb 1998 17:46  
CONFIG 2 - AVAIL 09 Jan 1998 10:40  
CONFIG 3 - AVAIL 06 Jan 1998 15:46  
CONFIG 4 - PENDING * 02 Jan 1998 11:51  
+----- BankB -----+-----Description -----+----- Date -----+  
IMAGE - AVAIL 14 Feb 1998 15:38  
CONFIG 1 - AVAIL * 03 Feb 1998 14:43  
CONFIG 2 - AVAIL 22 Jan 1998 13:43  
CONFIG 3 - AVAIL 06 Jan 1998 17:25  
CONFIG 4 - AVAIL 26 Jun 1998 09:48  
  
Load or Config? c  
Enter source bank : a  
Enter source config <1-4>: 3  
Enter destination bank : b  
Enter destination config <1-4>: 3  
/hd0/sys0/CONFIG2 --> /hd0/sys1/CONFIG2  
Copy configuration commmand successful!
```

If you copy an image, the same rules apply except that image files can be copied only from bank to bank. These steps describe how the copy of an image affects the image that was previously in the bank:

1. The copy overwrites the image that was previously in the bank.
2. The copy acquires the status of the image that was previously in the bank.

Erasing Files

Question How do I erase the contents of a bank in the 2212?

Answer

To erase a file, at the `Boot config>` prompt or the `SVC>` prompt, type **erase**, and then follow the prompts.

If you select a file to erase with a status of `CORRUPT` or `NONE`, the erase option is discontinued.

Note that the following rules apply to erasing files from the IBM 2212:

- Image files that are not `ACTIVE` can be erased anytime
- `ACTIVE` image files **cannot** be erased
- `ACTIVE` configuration files **cannot** be erased

Getting a Configuration File from a Workstation to the 2212

Question How do I get a file from the workstation on which the configuration program is running to the 2212?

Answer To get a configuration file from the workstation on which the configuration program is running to the 2212, you have the following options:

- Attach the workstation to an IP network that can be used to reach the 2212.

In this case, the workstation must be running TCP/IP and the communications feature of the configuration program is used to establish direct communications between the configuration program and the 2212. When you use the Send option of the configuration program's communications feature, the configuration data is sent to the 2212 using SNMP packets. After all of the configuration data has been sent, you can use the communication feature's restart router option. This causes the 2212 software to be reloaded and initialized using the new configuration data immediately. Alternately, you can use the communication feature's timed config option to set a time when the 2212 will be reloaded with the new configuration.

- Attach the workstation to the same IP network as the 2212. In this case, the workstation must be running TCP/IP and support TFTP in addition to the configuration program. To transfer a configuration file from the workstation to the 2212, see "Transferring Files Using TFTP" on page C-18.
- Attach the workstation to the 2212's service port. In this case, you can either use TFTP over SLIP (which requires TCP/IP to be running on the workstation) or Zmodem to transfer to the 2212 configuration files which were created by the configuration program and stored on the workstation. The TFTP and Zmodem functions are not part of the configuration program support. They are separate applications which must be available on the workstation. To transfer a configuration file from the workstation to the 2212 using TFTP, see "Transferring Files Using TFTP" on page C-18. To use Zmodem to transfer a configuration file from the workstation to the 2212, see "Transferring Files Using Zmodem" on page C-20.
- If the workstation cannot communicate with the 2212 directly using one of the options described previously, use some mechanism (such as diskette) to get configuration files created by configuration program to a network server that is attached to the same IP network as the 2212, or to a PC that is attached to the 2212's service port. In the first

case, use TFTP to transfer the configuration files from the network server to the 2212. In the second case, use TFTP over SLIP or Zmodem to transfer the configuration files from a PC to the 2212.

Restoring a Backup Version of Code

Question How do I restore a backup version of operational code or a configuration file?

Answer You can restore the backup version of code from either the Boot Config> prompt or the SVC> prompt. Use the SVC> prompt when you cannot access the normal operational console.

1. To access the Boot Config> prompt, at the OPCON prompt (*), type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again. At the Config> prompt, type **boot**.

Access the SVC> prompt as described on page "Accessing the Service Recovery Prompt (SVC>)" on page C-3.

2. At either prompt, type the **set** command and follow the prompts to select the previously active code bank and configuration.
3. From the Boot Config> prompt, type **reload**. From the SVC> prompt, type **reboot**.

Transferring Files Using TFTP

Question How do I TFTP operational code and configuration files onto the 2212?

Answer Use TFTP to transfer software code loads and configuration files from a workstation or server to the IBM 2212. You will need to substitute your own values for the IP address and path, which are given as examples. The number of bytes received is also an example. You can use TFTP from the SVC> prompt or the OPCON (*) prompt as described in the following sections.

Note: You transfer the files to banks within the IBM 2212. The banks represent the directories that have been created automatically; you do not have to be concerned about transferring the files to a particular directory within the IBM 2212.

TFTP File Transfer using the Operating Software

1. From the OPCON prompt (*), type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
2. Type **boot** and press **Enter**. The Boot config> prompt is displayed.
3. To get the software code load, type **tftp get load mod**. To get a configuration file, enter **tftp get config**.

You cannot overwrite a currently active bank image or configuration file.

4. When prompted, specify the IP address of the TFTP server.
5. When prompted, specify the path/file name for the code load or config file.
6. When prompted, specify the bank in which you want the code load or config file written. If you are transferring a config file, you are prompted for the config file (1 through 4) in which you want to transfer the configuration data.

The following example shows a software code load:

```

* talk 6
Config> boot
Boot config>tftp get load mod
Boot config>tftp get load mod
+----- BankA -----+----- Description -----+----- Date -----+
IMAGE - AVAIL                                10 Aug 1998 16:03
CONFIG 1 - AVAIL *      cc_158e              10 Aug 1998 16:06
CONFIG 2 - NONE                                10 Aug 1998 16:49
CONFIG 3 - NONE
CONFIG 4 - NONE
+----- BankB -----+----- Description -----+----- Date -----+
IMAGE - ACTIVE                                10 Aug 1998 13:23
CONFIG 1 - AVAIL      cc_158e              10 Aug 1998 13:23
CONFIG 2 - ACTIVE *   cc_158e              11 Aug 1998 10:21
CONFIG 3 - NONE
CONFIG 4 - NONE
+-----+-----+-----+
* - Last Used Config      L - Config File is Locked

```

```

Auto-boot mode is enabled.
Specify the server IP address (dotted decimal): [1.2.3.4] 10.10.10.99
Specify the remote modules directory: :(u/bin/) /tftpboot/2212a
Select the destination bank: (A,B): [A] a

```

```

TFTP SW load modules
get: /tftpboot/2212a/LML.ld
from: 10.10.10.99
to: bank A.
TFTP transfer of /hd0/sys0/LML.ld complete, size=6318 status: OK
TFTP transfer of /hd0/sys0/os.ld complete, size=740936 status: OK
TFTP transfer of /hd0/sys0/snmp.ld complete, size=243980 status: OK
TFTP transfer of /hd0/sys0/sysect.ld complete, size=154409 status: OK
TFTP transfer of /hd0/sys0/initblk.ld complete, size=66022 status: OK
TFTP transfer of /hd0/sys0/tkflash.ld complete, size=131558 status: OK
TFTP transfer of /hd0/sys0/diags.ld complete, size=228496 status: OK
TFTP transfer of /hd0/sys0/router.ld complete, size=5849916 status: OK
TFTP transfer of /hd0/sys0/router.ld complete, size=5849916 status: OK
TFTP transfer of /hd0/sys0/nstation.ld complete, size=632700 status: OK
TFTP transfer of /hd0/sys0/appn.ld complete, size=3004451 status: OK
TFTP transfer of /hd0/sys0/tn3270e.ld complete, size=142874 status: OK
TFTP transfer of /hd0/sys0/encrypt.ld complete, size=1867 status: OK
TFTP transfer of /hd0/sys0/LMX.ld complete, size=1044 status: OK

```

```

Operation completed successfully.
Boot config>

```

7. Type the **set** command to cause the bank and config file that you just transferred the code load or configuration data into to become active at the next reload/restart. You will be prompted for the destination source bank and configuration file. Until you reload the 2212, the state of the bank is pending.
8. Type **reload** if you transferred new operational code. Type **restart** if you transferred a new configuration file.

TFTP File Transfer using the Service Recovery Interface (SVC): Use the Service Recovery Interface (SVC>) to transfer new software onto the 2212 only if you are replacing the hard file or compact flash, or the software on both banks A and B is corrupted and you are replacing it. To use TFTP at the SVC> prompt, follow these steps:

1. Access the SVC> prompt. See “Accessing the Service Recovery Prompt (SVC>)” on page C-3.
2. Type **interface** to define the 2212 LAN interface and IP address over which to transfer the files.
3. At the SVC> prompt, type **TFTP** and press Enter.
4. Specify whether you want to TFTP a software code load (load) or a configuration file (config). You will be prompted for the rest of the information. The following example shows a software code load.

```

svc>tftp

-----BankA-----+----- Description -----+----- Date -----+
IMAGE - PENDING                                10 Feb 1998 17:46
CONFIG 1 - AVAIL                               10 Feb 1998 17:46
CONFIG 2 - AVAIL                               09 Jan 1998 10:40
CONFIG 3 - AVAIL                               06 Jan 1998 15:46
CONFIG 4 - PENDING *                          02 Jan 1998 11:51
+----- BankB -----+----- Description -----+----- Date -----+
IMAGE - AVAIL                                  03 Feb 1998 14:42
CONFIG 1 - AVAIL *                             03 Feb 1998 14:43
CONFIG 2 - AVAIL                              22 Jan 1998 13:43
CONFIG 3 - AVAIL                              06 Jan 1998 17:25
CONFIG 4 - AVAIL                              26 Jun 1998 09:48
+-----+-----+-----+-----+-----+-----+
Load or Config?
Specify the server IP Address: 1.1.1.4
Specify the remote directory: /u/2212/swload
Enter destination bank : b

tftping load modules... please be patient.

```

5. Type the **set** command to cause the bank and config file that you just transferred the code load or configuration data into to become active at the next reboot. You will be prompted for the destination source bank and configuration file. Until you reload the 2212, the state of the bank is pending.
6. Type **reboot**.

Transferring Files Using Zmodem

Question How do I use Zmodem to transfer operational code and configuration files onto the 2212?

Answer

Access the SVC> prompt. From the SVC> prompt, type **zmodem**. You will be prompted to specify the bank for the image files or the bank and the config number for the configuration files that you transfer. The interface for transferring is designed so that you cannot overwrite any ACTIVE file.

For transfers via modem, each load module must be separately named and transferred individually.

Note: When using Zmodem to transfer a multiple load module image (several files ending in .ld), **you must** transfer each of the modules one by one to get the entire load module image.

When an entire load image has transferred, the status of the bank will change from CORRUPT to AVAIL. Transfer file LML.lid first. Unless you see an information message ERROR WRITING FILE appear, assume each individual transfer has been successful.

Updating the Bootstrap Code on System Card Flash

Question How do I update the bootstrap code stored on system card flash?

Answer

1. Access the SVC> prompt as described on page “Accessing the Service Recovery Prompt (SVC>)” on page C-3.
2. Type the **writeboot** command to write the bootstrap to system card flash from the specified software load bank.
3. Type **reboot**.

Updating the Operational Code

Question How do I update the operational code?

Answer To update operational code when the 2212 is operating normally:

1. Access the OPCON prompt (*). See “Accessing the OPCON Command Line Interface” on page C-2.
2. From the OPCON prompt (*), type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
3. At the Config> prompt, type **boot**. The Boot config> prompt will be displayed.
4. At the Boot config> prompt, type **TFTP get load mod** to get an operational load image from a server to the IBM 2212. See “TFTP File Transfer using the Operating Software” on page C-18 for instructions on using TFTP. The operational code on the hard file or compact flash will be updated.

To update operational code when the 2212 is operating in recovery mode:

To update the operational code on hard file or compact flash, from the SVC> prompt, type **TFTP** to get an operational load image from a server to the IBM 2212. See “TFTP File Transfer using the Operating Software” on page C-18 for instructions on using TFTP from SVC>.

To update the operational code on system card flash:

1. Access the SVC> prompt as described on page “Accessing the Service Recovery Prompt (SVC>)” on page C-3.
2. Type the **writeos** command to write the a new version of operational code to the system card flash from the specified software load bank. The system prompts you for the bank from which to write the operational code.
3. Type **reboot**.

Using the Configuration Program’s Communications Feature to Manage Configuration Files

Question How do I use the Configuration Program's communications feature and Send option to manage configuration files?

Answer For optimal configuration management, it is recommended that you use the Configuration Program and its configuration database to manage all your IBM 2212 configuration files.

The design of change management facilitates good control of the configuration files. Keeping the ACTIVE file and the file that is stored in the configuration database the same assures that a copy of the ACTIVE file is always available.

When you use the Send option of the Configuration Program's communications feature to send a new configuration to the IBM 2212, the new configuration is written to the ACTIVE bank and overwrites the file located in the position just below the currently ACTIVE configuration. The new configuration is PENDING if a time is set for a reset. If the configuration file is sent without a specified time for the reset to occur, it gets AVAIL status.

For example, suppose that CONFIG 2 is ACTIVE. The new configuration file is written to CONFIG 3. It has a status of PENDING if a reset time is associated with it; if not, it has a status of AVAIL.

If the file has a status of PENDING, CONFIG 2 becomes AVAIL and CONFIG 3 becomes ACTIVE when a reset occurs. The next file that is sent from the Configuration Program will be placed in CONFIG 4. If a reset time is associated with the file, it will have the PENDING status and will become ACTIVE when the next reset occurs. If another file is then sent, it is placed in CONFIG 1 because the currently ACTIVE file is now in CONFIG 4. This arrangement results in a circular queue.

If the downloaded file has a status of AVAIL, a reset does not change its status. If another file is sent down, it overwrites that file because the ACTIVE file has not changed and the newly downloaded file always occupies the location just behind the ACTIVE file.

Example of Sending a File from the Configuration Program: For example, suppose that this is the view of the software that is displayed by the `list` command:

```
Boot Config> list
```

```
BANK A                               BANK B
IMAGE - ACTIVE                       IMAGE - AVAIL
CONFIG 1 - ACTIVE                     CONFIG 1 - AVAIL
CONFIG 2 - AVAIL                      CONFIG 2 - AVAIL
CONFIG 3 - NONE                       CONFIG 3 - AVAIL
CONFIG 4 - NONE                       CONFIG 4 - NONE
```

The Configuration Program sends a config file to BANK A, CONFIG 2. If you use the restart router option of the Configuration Program's communications feature, the 2212 performs a reset immediately and reinitializes using the new configuration.

After these actions, the IBM 2212 configuration looks like this:

```
BANK A                               BANK B
IMAGE - ACTIVE                       IMAGE - AVAIL
CONFIG 1 - AVAIL                     CONFIG 1 - AVAIL
CONFIG 2 - ACTIVE                     CONFIG 2 - AVAIL
CONFIG 3 - NONE                       CONFIG 3 - AVAIL
CONFIG 4 - NONE                       CONFIG 4 - NONE
```

CONFIG 1 has become AVAIL and CONFIG 2 has become ACTIVE.

If the Configuration Program were now used to send down a new configuration to the IBM 2212 and the file were not marked to be loaded at any specified time, the view of the software in the IBM 2212 would look like this:

BANK A	BANK B
IMAGE - ACTIVE	IMAGE - AVAIL
CONFIG 1 - AVAIL	CONFIG 1 - AVAIL
CONFIG 2 - ACTIVE	CONFIG 2 - AVAIL
CONFIG 3 - AVAIL	CONFIG 3 - AVAIL
CONFIG 4 - NONE	CONFIG 4 - NONE

After this action, CONFIG 3 is AVAIL. The new configuration file has been loaded in this location.

Note: You should exercise caution here because any on-board configuration changes could result in overwriting the CONFIG 3 file. Because the configuration file in CONFIG 3 was sent down without any time specified for resetting the server, it is currently not in use. It can be overwritten either when another file is sent from the Configuration Program or when a file is saved using the **write** command from the command line interface. You can use the **copy** command to move it to another location to protect it (see “Copying a File Using the Copy Command” on page C-16) or use the **lock** command to keep the configuration file from being overwritten.

Viewing the Files

Question How do I display the state of the operational software image and configuration files stored on the 2212?

Answer To use the **change management tool in the command line interface** to view the operational software image and the configuration files, follow these steps:

1. From the OPCON prompt (*), type **talk 6** and press **Enter** to reach the Config> prompt. If the Config> prompt does not appear, press **Enter** again.
2. Type **boot** and press **Enter**. You will see the prompt Boot config>.
3. Type **list** and press **Enter**. You will see a list similar to this one:

```
Boot config> list
```

BANK A	BANK B
IMAGE - ACTIVE	IMAGE - AVAIL
CONFIG 1 - ACTIVE	CONFIG 1 - AVAIL
CONFIG 2 - AVAIL	CONFIG 2 - AVAIL
CONFIG 3 - NONE	CONFIG 3 - NONE
CONFIG 4 - NONE	CONFIG 4 - NONE

Each bank represents one image of the operational code. The images stored in BANK A and BANK B are stored on the hard file or compact flash. The Configs represent the configuration files that are stored with each bank. *IMAGE* refers to the status of the operational software and *CONFIG* refers to the status of the configuration files.

The possible IMAGE and CONFIG status:

ACTIVE This file is currently loaded in active memory and is running on the IBM 2212.

Note: The status of this file can be changed only by resetting the IBM 2212.
If a config or an image is active, it is locked and cannot be overwritten or erased.

AVAIL This is a valid file that can be made active.

CORRUPT	This file was damaged or was not loaded onto the IBM 2212 hard file or compact disk completely.
PENDING	This file will be loaded and become active the next time the IBM 2212 is reloaded.
LOCAL	This file will become active at the next reset. This reset will cause the currently ACTIVE file to become PENDING. LOCAL is a status that makes a file ACTIVE only for one reset of the IBM 2212.

Only one bank at a time contains an ACTIVE image. Only one configuration file is ACTIVE and it must be within the ACTIVE bank.

To use the **Service Recovery Interface** (SVC>), to view the operational software and configuration files, follow these steps:

1. Access the SVC> prompt as described on page "Accessing the Service Recovery Prompt (SVC>)" on page C-3.
2. Type **list**. See step 3 on page C-23 in the previous section for an explanation of the information displayed on the terminal. You can also type **describe** at the SVC> prompt to identify the levels of code on your 2212.

Resetting the IBM 2212

Question How do I reset the operational software on the IBM 2212?

Answer The 2212 operational software can be reset in the following ways:

- Unplug and replug the 2212 power cord.
- Press and hold for 6 seconds the reset button on the system card. If the reset button is pressed and **held for 6 seconds**, the 2212 will behave as if it has been powered off and back on: component tests are run and the operational code is reloaded.

Note: If the reset button is pressed and **held less than 6 seconds**, the memory contents will be dumped if dumping has been enabled via **talk 6** in the command-line interface. It will also reboot the 2212 if reboot has been enabled via **talk 6** in the command-line interface. If reboot has **not** been enabled, the 2212 will hang until it has been powered off and on. It is recommended that reboot always be enabled on the 2212.
- Both the OPCON (*) prompt and Config only> prompt support the **reload** and **restart** commands. From either prompt, type **reload** or **restart** and press **Enter**.

The **reload** command causes the 2212 to behave as if it has been powered off and back on: system card and hard file or compact flash component tests are run and the operational code is reloaded.

The **restart** command activates configuration changes, operational code is not reloaded and diagnostic tests are not run. You cannot use **restart** to initialize a new version of the operational code.

Note: The Config only> prompt appears when no config file is active. Lack of an active config file indicates that an active configuration has become corrupted or that the IBM 2212 is not configured.
- From the Bootstrap Menus, choose the **issue reset** option. The **issue reset** option on the Bootstrap Menus causes the 2212 to behave as if it has been powered off and back on: system card and hard file or compact flash component tests are run and the operational code is reloaded. See Chapter 4, "Using the IBM 2212 Bootstrap Menus" on page 4-1.

- At the SVC> prompt, type **reboot**. This causes the 2212 to test the system card and hard file or compact flash components and reload the operational software on the hard file or compact flash.

Note: The software that is loaded and interface the 2212 boots to are determined by the current boot mode setting. To change the boot mode setting, access the SVC> prompt and use the **bootmode** command. (See “Accessing the Service Recovery Prompt (SVC>)” on page C-3 .)

Running Quick Configuration

Question How do I run the Quick Configuration program?

Answer First, make sure each adapter has been added. See “Adding an Adapter at Initial Configuration” on page C-5. Then, at the Config (only) or Config> prompt, enter **qc**.

Viewing Hardware and Software Vital Product Data

Question How do I view vital product data (VPD)?

Answer

1. Access the OPCON (*) prompt. (See “Accessing the OPCON Command Line Interface” on page C-2)
2. At the OPCON prompt, type **talk 6**.
3. Type **list vpd** to view the IBM 2212 hardware and software VPD.

Appendix D. 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 IBM's 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 that does not infringe any of IBM's intellectual property rights 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 user's responsibility.

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Electronic Emission Notices

The shielded power cord that accompanies the 2212 Access Utility is required to comply with FCC Class A, Industry Canada Class A, EN 55022 Class A, CISPR22 Class A, and VCCI Class A emission requirements. Consult your IBM authorized dealer for a replacement shielded power cord if needed. IBM cannot accept responsibility for any interference caused by using an unshielded power cord.

Federal Communications Commission (FCC) Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors and a shielded power cord (IBM part numbers 6952303 and 6952304 for 125 volts; IBM part numbers 1838578 and 1838579 for 250 volts) must be used in order to meet FCC emission limit. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité aux normes d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This product is a Class A Information Technology Equipment and conforms to the standards set by the Voluntary Control Council for Interference by Technology Equipment (VCCI). In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づきクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

CISPR22 Compliance Statement

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

The shielded power cord that accompanies the product is required to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. IBM cannot accept responsibility for any interference caused by using an unshielded power cord.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese Class A Warning Statement

警告使用者：
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

European Union (EU) Electromagnetic Compatibility Statement

Operation with Unshielded Twisted Pair on RJ-45 Ports: This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

The shielded power cord that accompanies the product is required to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Consult your IBM authorized dealer for a replacement shielded power cord if needed. IBM cannot accept responsibility for any interference caused by using an unshielded power cord.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die IBM Deutschland Informationssysteme GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2:

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.
--

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

EN 50082-1 Hinweis: "Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern."

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den IBM Handbüchern angegeben, zu installieren und zu betreiben.

Operation with Shielded Twisted Pair Category 5 Cable on RJ-45 Ports: This is an EN-55022 Class-B product with properly shielded and terminated Category 5 cables and connectors attached to those adapter cards with RJ-45 connectors. Otherwise, it is EN-55022 Class A.

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die IBM Deutschland Informationssysteme GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2:

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse B.
--

EN 50082-1 Hinweis: "Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern."

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den IBM Handbüchern angegeben, zu installieren und zu betreiben.

Telecommunication Notices

The product bears the Telecom CE mark (CE 168 X) for ISDN Basic Rate complying with I-CTR3 (Bridging measures) as per the European directive 91/263/EEC (TTE directive). The product bears the Telecom CE mark (CE 168 X) for: V.24/V.28,V36 and X.21 electrical interfaces complying with NET 1 and with NET 2 physical level. ISDN Basic Rate complying with I-CTR3 (Bridging measures) as per the European directive 91/263/EEC (TTE directive).

FCC Part 68 Compliance Information:

Features and optional adapters for the IBM 2212 comply with Part 68 of the FCC rules. The label included on the adapter tray contains, among other information, the FCC registration number and Ringer Equivalence Number (REN), if applicable for this equipment. If requested, provide this information to your telephone company.

The IBM 2212 adapters include:

- 2-Port ISDN BRI-U CPCI Adapter, with interface code 021S5, service code 6.0F, and jack type RJ45.
- 1-Port ISDN PRI T1/J1 CPCI Adapter, with interface code 04DU9-1SN, service code 6.0F, and jack type RJ48C.
- 2-Port ISDN PRI T1/J1 CPCI Adapter, with interface code 04DU9-1SN, service code 6.0F, and jack type RJ48C.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have those devices ring when your number is called. In most, but not all areas, the sum of the RENs of all devices should not exceed five (5.0). To be certain of the number of devices you may connect to your line, as determined by the REN, you should call your local telephone company to determine the maximum REN for your calling area.

If the IBM 2212 causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, in the United States, call IBM at **1-800-IBM-SERV**. In Canada, call IBM at **1-800-465-6600**.

No repairs can be performed by the customer.

Industry Canada Information:

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. Industry Canada does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electrical inspection authority, or electrician, as appropriate.

AVIS : L'étiquette d'Industrie Canada permet d'identifier un équipement homologué. Cette homologation signifie que cet équipement satisfait certaines exigences en matière de protection, d'exploitation et de sécurité du réseau de télécommunications. Industrie Canada n'offre aucune garantie que le fonctionnement de cet équipement soit à la satisfaction de l'utilisateur.

Avant d'installer cet équipement, l'utilisateur doit s'assurer qu'il a la permission de le raccorder aux installations de l'entreprise de télécommunications. L'installation de cet équipement doit aussi se faire selon un mode de raccordement acceptable. Dans certains cas, le câblage interne de l'entreprise associé au service individuel offert par une ligne d'abonné peut être prolongé au moyen d'un connecteur homologué (prolongateur de téléphone). Le client devrait être informé que la conformité de son équipement aux conditions susmentionnées n'est pas une prévention contre la dégradation du service dans certaines situations.

Toute réparation d'un équipement homologué devrait être effectuée par un service de maintenance canadien autorisé qui a été désigné par le fournisseur. Toute réparation ou modification d'équipement faite par l'utilisateur, ou tout mauvais fonctionnement, pourrait entraîner la déconnexion de cet équipement par l'utilisateur à la demande de l'entreprise de télécommunications.

Pour sa protection personnelle, l'utilisateur devrait s'assurer que les mises à la terre des services publics électriques, des lignes téléphoniques et du système interne des canalisations d'eau à tuyaux métalliques, advenant leur présence, sont interconnectées. Dans les zones rurales, il s'agit-là d'une précaution particulièrement importante à prendre.

ATTENTION : Toute tentative de connexion par l'utilisateur est à déconseiller. Il est préférable de communiquer avec le responsable de l'inspection en électricité ou un électricien, selon le cas.

United Kingdom Compliance Statement

STATEMENT OF COMPLIANCE

The United Kingdom Telecommunications Act 1984. This equipment is approved under General Approval Number NS/G/1234/J/100003

for indirect connections to the public telecommunications systems in the United Kingdom.

Trademarks

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

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Other company, product, and service names may be trademarks or service marks of others.

Safety Notices



Danger: Before you begin to install this product, read the safety information in *Caution: Safety Information—Read This First*, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.



Caution: This unit contains a non-replaceable lithium battery. The unit should be returned to the nearest IBM-authorized dealer for proper disposal.



Gevaar: Voordat u begint met de installatie van dit produkt, moet u eerst de veiligheidsinstructies lezen in de brochure *PAS OP! Veiligheidsinstructies—Lees dit eerst*, SD21-0030. Hierin wordt beschreven hoe u elektrische apparatuur op een veilige manier moet bekabelen en aansluiten.



Waarschuwing: Deze eenheid bevat een lithiumbatterij die niet kan worden verwijderd. U kunt de gebruikte eenheid voor verwerking als klein chemisch afval terugbrengen naar een geautoriseerde IBM-dealer.



Perigo: Antes de começar a instalar este produto, leia as informações de segurança contidas em *Cuidado: Informações Sobre Segurança—Leia Isto Primeiro*, SD21-0030. Esse folheto descreve procedimentos de segurança para a instalação de cabos e conexões em equipamentos elétricos.



Perigo: Esta unidade contém uma bateria de Lítio não-substituível. A unidade deve ser retornada à IBM; entre em contato com o atendimento (011) 889-8986 para obter informações de como enviá-la pelo correio.

危險：安裝本產品之前，請先閱讀
"Caution: Safety Information--Read
This First" SD21-0030 手冊中所提
供的安全注意事項。這本手冊將會說明
使用電器設備的纜線及電源的安全程序。



注意：



本部件帶的鋰電池不可更換。所以，應將它退回到與您最近的 IBM 授權經銷商處，以便妥善處理。



Opasnost: Prije nego što počnete sa instalacijom produkta, pročitajte naputak o pravilima o sigurnom rukovanju u upozorenje: Pravila o sigurnom rukovanju - Prvo pročitaj ovo, SD21-0030. Ovaj privitak opisuje sigurnosne postupke za priključivanje kabela i priključivanje na električno napajanje.

Pozor



Ova jedinica sadrži litijevu bateriju koja se ne zamjenjuje. Stoga, radi ispravnog uklanjanja, jedinicu treba vratiti najbližem IBM ugovornom partneru.



Upozornění: než zahájíte instalaci tohoto produktu, přečtěte si nejprve bezpečnostní informace v pokynech „Bezpečnostní informace“ č. 21-0030. Tato brožurka popisuje bezpečnostní opatření pro kabeláž a zapojení elektrického zařízení.

Pozor:



Tato jednotka obsahuje nevyměnitelnou lithiovou baterii. Jednotka musí být zlikvidována v souladu s místními předpisy.



Fare! Før du installerer dette produkt, skal du læse sikkerhedsforskrifterne i *NB: Sikkerhedsforskrifter—Læs dette først* SD21-0030. Vejledningen beskriver den fremgangsmåde, du skal bruge ved tilslutning af kabler og udstyr.



Litiumbatteri: Denne enhed indeholder et litiumbatteri. Batteriet må ikke udskiftes. Enheden skal kasseres i overensstemmelse med gældende miljøbestemmelser for litiumbatterier.



Gevaar Voordat u begint met het installeren van dit product, dient u eerst de veiligheidsrichtlijnen te lezen die zijn vermeld in de publikatie *Caution: Safety Information - Read This First*, SD21-0030. In dit boekje vindt u veilige procedures voor het aansluiten van elektrische apparatuur.




Waarschuwing: Deze eenheid bevat een lithiumbatterij die niet kan worden verwijderd. U kunt de gebruikte eenheid voor verwerking als klein chemisch afval terugbrengen naar een geautoriseerde IBM-dealer.





VAARA: Ennen kuin aloitat tämän tuotteen asennuksen, lue julkaisussa *Varoitus: Turvaohjeet—Lue tämä ensin*, SD21-0030, olevat turvaohjeet. Tässä kirjasessa on ohjeet siitä, miten sähkölaitteet kaapeloidaan ja kytketään turvallisesti.





Varoitus: Tämä yksikkö sisältälitiumpariston, jota ei voi vaihtaa. Yksikkö tulee palauttaa valtuutetulle IBM-jälleenmyyjälle, joka huolehtii sen asianmukaisesta hävityksestä.

 **Danger:** Avant d'installer le présent produit, consultez le livret *Attention : Informations pour la sécurité — Lisez-moi d'abord* SD21-0030, qui décrit les procédures à respecter pour effectuer les opérations de câblage et brancher les équipements électriques en toute sécurité.


 **Pile au lithium:** Cette unité contient une pile au lithium non remplaçable. Pour la mise au rebut de cette pile, renvoyez l'unité à votre partenaire commercial IBM.


 **Vorsicht:** Bevor mit der Installation des Produktes begonnen wird, die Sicherheitshinweise in *Achtung: Sicherheitsinformationen—Bitte zuerst lesen,* Form SD21-0030. Diese Veröffentlichung beschreibt die Sicherheitsvorkehrungen für das Verkabeln und Anschließen elektrischer Geräte.


 **Achtung:** Diese Einheit enthält eine Lithiumbatterie, die nicht ausgetauscht werden kann. Diese Einheit sollte zur ordnungsgemässen Entsorgung an den zuständigen IBM Händler zurückgegeben werden.

 **Vigyázat:** Mielőtt megkezdi a berendezés üzembe helyezését, olvassa el a *Caution: Safety Information— Read This First*, SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, milyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozásakor illetve csatlakoztatásakor.


Figyelem!

 A készülék lítium eleme nem cserélhető. Kérjük az elemet a legközelebbi IBM disztribútornál leadni.


 **Pericolo:** prima di iniziare l'installazione di questo prodotto, leggere le informazioni relative alla sicurezza riportate nell'opuscolo *Attenzione: Informazioni di sicurezza — Prime informazioni da leggere* in cui sono descritte le procedure per il cablaggio ed il collegamento di apparecchiature elettriche.

 **Attenzione:** All'interno di questa unità è contenuta una batteria al litio non sostituibile. Per lo smaltimento, riportare tale unità al più vicino rivenditore IBM.

危険： 導入作業を開始する前に、安全に関する小冊子SD21-0030 の「最初にお読みください」(Read This First)の項をお読みください。

 この小冊子は、電気機器の安全な配線と接続の手順について説明しています。

注意

 このユニットには取り外しのできないリチウム・バッテリーが使われています。ユニットを廃棄する時は最寄のIBM製品取扱いディーラーにユニットごとお持ちください。

위험: 이 제품을 설치하기 전에 반드시
"주의: 안전 정보-시작하기 전에"
(SD21-0030) 에 있는 안전 정보를
읽으십시오.



주의:



본 장치에는 대체 불가능한 리튬 배터리가 포함되어 있습니다. 적절한 폐기를 위해 본 장치는 가까운 IBM 공인 딜러사에 반납하여야 합니다.



Fare: Før du begynner å installere dette produktet, må du lese sikkerhetsinformasjonen i *Advarsel: Sikkerhetsinformasjon — Les dette først*, SD21-0030 som beskriver sikkerhetsrutinene for kabling og tilkobling av elektrisk utstyr.



ADVARSEL: Denne enheten inneholder et litumbatteri som ikke kan byttes ut. Når enheten skal kastes, bør den leveres hos en autorisert IBM-forhandler.



Uwaga:

Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją:
"Caution: Safety Information - Read This First", SD21-0030.

Zawiera ona warunki bezpieczeństwa przy podłączeniu do sieci elektrycznej i eksploatacji.

Uwaga:



Jednostka ta posiada niewymienialną baterię litową. Jednostka powinna zostać zwrócona do najbliższego przedstawiciela firmy IBM w celu właściwej likwidacji.



Perigo: Antes de iniciar a instalação deste produto, leia as informações de segurança *Cuidado: Informações de Segurança — Leia Primeiro*, SD21-0030. Este documento descreve como efectuar, de um modo seguro, as ligações eléctricas dos equipamentos.



CUIDADO: Esta unidade contém uma bateria de lítio não substituível. A unidade deve ser enviada ao concessionário autorizado IBM mais próximo, para destruição de acordo com as normas apropriadas.



ОСТОРОЖНО: Прежде чем устанавливать этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочсть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.

Внимание:



В устройстве - несъемная литиевая батарейка. Для утилизации верните его ближайшему дилеру IBM.

Nebezpečnosť: Pred inštaláciou výrobku si prečítajte bezpečnostné predpisy v

Výstraha: Bezpečnostné predpisy - Prečítaj ako prvé, SD21-0030. V tejto brožúrke sú opísané bezpečnostné postupy pre pripojenie elektrických zariadení.



Výstraha:

Táto jednotka obsahuje nevymeniteľnú lítiovú batériu. Táto jednotka by mala byť vrátená najbližšiemu autorizovanému obchodnému zástupcovi na vhodné použitie.



Pozor: Preden začnete s inštaláciou tohto produktu preberite poglavje: "Opozorilo: Informácie o varovaní - preberí pred uporabo," SD21-0030. To poglavje opisuje pravilne postopke za kabliranje,



Svarilo:

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Glossary

This glossary includes terms and definitions from:

- The *IBM Dictionary of Computing* (New York; McGraw-Hill, Inc., 1994).
- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036. Definitions are identified by the symbol (A) after the definition.
- The *Information Technology Vocabulary* developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- The Network Working Group Request for Comments: 1208.

The following cross-references are used in this glossary:

Contrast with: This refers to a term that has an opposed or substantively different meaning.

Synonym for: This indicates that the term has the same meaning as a preferred term, which is defined in its proper place in the glossary.

Synonymous with: This is a backward reference from a defined term to all other terms that have the same meaning.

See: This refers you to multiple-word terms that have the same last word.

See also: This refers you to terms that have a related, but not synonymous, meaning.

A

A. Ampere.

ac. Alternating current.

active. (1) Operational. (2) Pertaining to a node or device that is connected or is available for connection to another node or device.

Advanced Peer-to-Peer Networking (APPN) network node. A node that offers a broad range of end-user services and that can provide the following:

- Distributed directory services, including registration of its domain resources to a central directory server
- Topology database exchanges with other APPN network nodes, enabling network nodes throughout the network to select optimal routes for LU-LU sessions based on requested classes of service
- Session services for its local LUs and client end nodes
- Intermediate routing services within an APPN network

agent. A system that assumes an agent role.

analog. (1) Pertaining to data consisting of continuously variable physical quantities. (A)
(2) Contrast with *digital*.

ANSI. American National Standards Institute.

AppleTalk. A network protocol developed by Apple Computer, Inc. This protocol is used to interconnect network devices, which can be a mixture of Apple and non-Apple products.

APPN node. Advanced Peer-to-Peer Networking (APPN) node.

attachment unit interface (AUI). In a local area network, the interface between the medium attachment unit and the data terminal equipment within a data station. (I) (A)

AUI. Attachment unit interface.

autonomous system (AS). A group of networks and routers that use the same interior gateway protocol and for which one administrative authority has responsibility.

B

Bc. Committed burst size.

Be. Excess burst size.

bootstrap. (1) A short program that is permanently resident or easily loaded into a computer and whose execution brings a larger program, such as an operating system or its loader, into memory. (A) (2) To execute a bootstrap. The term "bootstrapping" is also used for translating a compiler by using itself or a previous

version as the translator. (A) (3) Synonym for initial program load.

bps. Bits per second.

bridge. A functional unit that interconnects multiple LANs (locally or remotely) that use the same logical link control protocol but that can use different medium access control protocols. A bridge forwards a frame to another bridge based on the medium access control (MAC) address.

bridging. In LANs, the forwarding of a frame from one LAN segment to another. The destination is specified by the medium access control (MAC) sublayer address encoded in the destination address field of the frame header.

broadband. A large frequency band allowing different kinds of transmissions, such as coded voice, video, and data, at the same time.

BSC. Binary synchronous communication.

C

CAS. Channel associated signaling.

CCITT. International Telegraph and Telephone Consultative Committee. This was an organization of the International Telecommunication Union (ITU). On 1 March 1993 the ITU was reorganized, and responsibilities for standardization were placed in a subordinate organization named the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-TS). "CCITT" continues to be used for recommendations that were approved before the reorganization.

CCS. (1) common channel signaling (2) change control server.

CDB. Configuration database.

CES. Circuit emulation service.

channelization. The process of breaking the bandwidth on a communication line into a number of channels, possibly of different size. Also called *time division multiplexing* (TDM).

CIR. Committed information rate.

circuit. (1) One or more conductors through which an electric current can flow. See *physical circuit* and *virtual circuit*. (2) A logic device.

circuit switching. (1) A process that, on demand, connects two or more data terminal equipment (DTEs) and permits the exclusive use of a data circuit between

them until the connection is released. (I) (A) (2) Synonymous with *line switching*.

CMIP. Common Management Information Protocol.

CMIS. Common Management Information Services.

CMOT. CMIP over TCP/IP.

CNM. Communication network management.

configuration. (1) The manner in which the hardware and software of an information processing system are organized and interconnected. (T) (2) The devices and programs that make up a system, subsystem, or network.

connection. In data communication, an association established between functional units for conveying information. (I) (A)

CP. Control point.

CRC. Cyclic redundancy check.

D

data circuit. (1) A pair of associated transmit and receive channels that provide a means of two-way data communication. (I) (2) See also *physical circuit* and *virtual circuit*.

Notes:

1. Between data switching exchanges, the data circuit may include data circuit-terminating equipment (DCE), depending on the type of interface used at the data switching exchange.
2. Between a data station and a data switching exchange or data concentrator, the data circuit includes the data circuit-terminating equipment at the data station end, and may include equipment similar to a DCE at the data switching exchange or data concentrator location.

data circuit-terminating equipment (DCE). In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. (I)

Notes:

1. The DCE may be separate equipment or an integral part of the DTE or of the intermediate equipment.
2. A DCE may perform other functions that are usually performed at the network end of the line.

data link control (DLC). A set of rules used by nodes on a data link (such as an SDLC link or a token ring) to accomplish an orderly exchange of information.

data link switching (DLSw). A method of transporting network protocols that use IEEE 802.2 logical link control (LLC) type 2. SNA and NetBIOS are examples of protocols that use LLC type 2. See also *encapsulation* and *spoofing*.

data terminal equipment (DTE). That part of a data station that serves as a data source, data sink, or both. (I) (A)

data terminal ready (DTR). A signal to the modem used with the EIA 232 protocol.

dc. Direct current.

DCD. DC distribution (module).

DCE. Data circuit-terminating equipment.

DC48. DC power input type -48V.

dependent LU requester (DLUR). An APPN end node or an APPN network node that owns dependent LUs, but requests that a dependent LU server provide the SSCP services for those dependent LUs.

device. A mechanical, electrical, or electronic contrivance with a specific purpose.

digital. (1) Pertaining to data that consist of digits. (T)
(2) Pertaining to data in the form of digits. (A)
(3) Contrast with *analog*.

DLCI. Data link connection identifier.

DLS. Data link switching.

DLUR. Dependent LU requester.

DTE. Data terminal equipment. (A)

DTMF. Dual-tone modulation frequency.

DTR. Data terminal ready.

E

E&M. Earth & mark.

EIA. Electronic Industries Association.

EIA unit. A unit of measure, established by the Electronic Industries Association, equal to 44.45 millimeters (1.75 inches).

EIA 232. In data communications, a specification of the Electronic Industries Association (EIA) that defines the interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE), using serial binary data interchange.

Electronic Industries Association (EIA). An organization of electronics manufacturers that advances the technological growth of the industry, represents the views of its members, and develops industry standards.

encapsulation. In communications, a technique used by layered protocols by which a layer adds control information to the protocol data unit (PDU) from the layer it supports. In this respect, the layer encapsulates the data from the supported layer. In the Internet suite of protocols, for example, a packet would contain control information from the physical layer, followed by control information from the network layer, followed by the application protocol data. See also *data link switching (DLSw)*.

ESF. Extended status flags.

Ethernet. A 10-Mbps baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission. Ethernet uses carrier sense multiple access with collision detection (CSMA/CD).

ELS. Event Logging System

F

FAT. File allocation table.

fax. Hardcopy received from a facsimile machine. Synonymous with *telecopy*.

flash memory. A data storage device that is programmable, erasable, and does not require continuous power. The chief benefit of flash memory over other programmable and erasable data storage devices is that it can be reprogrammed without being removed from the circuit board.

FR. Frame relay.

FRAD. Frame relay access device.

frame relay. (1) An interface standard describing the boundary between a user's equipment and a fast-packet network. In frame-relay systems, flawed frames are discarded; recovery comes end-to-end rather than hop-by-hop. (2) A technique derived from the integrated services digital network (ISDN) D channel standard. It assumes that connections are reliable and dispenses with the overhead of error detection and control within the network.

frequency. The rate of signal oscillation, expressed in hertz.

FRFH. Frame relay frame handler.

FRTE. Frame relay terminal equipment.

FRU. Field replaceable unit.

FTP. File Transfer Protocol.

G

gateway. (1) A functional unit that interconnects two computer networks with different network architectures. A gateway connects networks or systems of different architectures. A bridge interconnects networks or systems with the same or similar architectures. (T) (2) In the IBM Token-Ring Network, a device and its associated software that connect a local area network to another local area network or a host that uses different logical link protocols.

Gbps. Gigabits per second (1 000 000 000 bits per second).

GUI. Graphical user interface.

H

HDLC. High-level data link control.

high-level data link control (HDLC). An access service used over data networks. It uses a non-real-time connection.

HDLC-like data link control, for example:

- Synchronous data link control (SDLC) used with SNA, or
- Link access procedure for D-channel (LAP-D) used with ISDN.

high-performance file system (HPFS). In the OS/2 operating system, an installable file system that uses high-speed buffer storage, known as a cache, to provide fast access to large disk volumes. The file system also supports the coexistence of multiple, active file systems on a single personal computer, with the capability of multiple and different storage devices. File names used with the HPFS can have as many as 254 characters.

high-performance routing (HPR). An addition to the Advanced Peer-to-Peer Networking (APPN) architecture that enhances data routing performance and reliability, especially when using high-speed links.

hot pluggable. Refers to an hardware component that can be installed or removed without disturbing the operation of any other resource that is not connected to, or dependant on, this component.

HPDT. High-Performance Data Transfer.

HPFS. High-performance file system.

hub (intelligent). A wiring concentrator, such as the IBM 8260, that provides bridging and routing functions for LANs with different cables and protocols.

I

IDNX. Integrated Digital Network Exchange.

IEEE. Institute of Electrical and Electronics Engineers.

impedance. The combined effect of resistance, inductance, and capacitance on a signal at a given frequency.

integrated services digital network (ISDN). A digital end-to-end telecommunication network that supports multiple services including, but not limited to, voice and data.

Note: ISDNs are used in public and private network architectures.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics, as appropriate. The concept includes the specification of the connection of two devices having different functions. (T) (2) Hardware, software, or both, that links systems, programs, or devices.

Intermediate Session Routing (ISR). A type of routing function within an APPN network node that provides session-level flow control and outage reporting for all sessions that pass through the node but whose end points are elsewhere.

International Organization for Standardization (ISO). An organization of national standards bodies from various countries established to promote development of standards to facilitate international exchange of goods and services, and develop cooperation in intellectual, scientific, technological, and economic activity.

internet. A collection of networks interconnected by a set of routers that allow them to function as a single, large network. See also *Internet*.

Internet. A worldwide network connecting users through autonomous networks in industry, education, government, and research. The Internet network uses Internet Protocol (IP). The major Internet services include electronic mail, FTP, telnet, World Wide Web, and electronic bulletin boards (Usenet). For network interconnection and routing, and Transmission Control Protocol (TCP) for end-to-end control. (A)

Internet Protocol (IP). A connectionless protocol that routes data through a network or interconnected networks. IP acts as an intermediary between the higher protocol layers and the physical network. However, this protocol does not provide error recovery and flow control and does not guarantee the reliability of the physical network.

Internetwork Packet Exchange (IPX). The network protocol used to connect Novell's servers, or any workstation or router that implements IPX, with other workstations. Although similar to the Internet Protocol (IP), IPX uses different packet formats and terminology.

IP. Internet Protocol.

IPX. Internetwork Packet Exchange.

ISDN. Integrated services digital network.

ISM. IBM Solution Manager.

ISMD. IBM Software Manufacturing and Delivery.

ISO. International Organization for Standardization.

ISR. Intermediate session routing.

ITU-T. International Telecommunication Union - Telecommunication (replaces CCITT).

K

Kbps. Kilobits per second (1000 bits per second).

kVA. kilovolt amperes.

L

LAN. Local area network.

LAPD. Link access procedure for D-channel.

LBO. Line build out.

LCS. Logical channel station.

LED. Light-emitting diode.

LIC. Line interface coupler.

Line build out. The voltage level on the RJ-45 connector that terminates your ISDN line at the IBM 2212. LBO accounts for the distance between the IBM 2212 and the telco, the quality of the line, and the intermediate amplification as specified in dB.

line switching. Synonym for *circuit switching*.

link. The combination of the link connection (the transmission medium) and two link stations, one at each end of the link connection. A link connection can be shared among multiple links in a multipoint or token-ring configuration.

link connection. The physical equipment providing two-way communication between one link station and one or more other link stations; for example, a telecommunication line and data circuit-terminating equipment (DCE). Synonymous with *data circuit*.

LMI. Local management interface.

local. Pertaining to a device accessed directly without use of a telecommunication line.

local area network (LAN). (1) A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. (T) (2) A network in which a set of devices are connected to one another for communication and that can be connected to a larger network. See also *Ethernet* and *token ring*. (3) Contrast with *metropolitan area network (MAN)* and *wide area network (WAN)*.

M

MAN. Metropolitan area network.

Management Information Base (MIB). (1) A collection of objects that can be accessed by means of a network management protocol. (2) A definition for management information that specifies the information available from a host or gateway and the operations allowed. (3) In OSI, the conceptual repository of management information within an open system.

MB. Megabyte (1 000 000 bytes).

Mbps. Megabits per second (1 000 000 bits per second).

metropolitan area network (MAN). A network formed by the interconnection of two or more networks which may operate at higher speed than those networks, may cross administrative boundaries, and may use multiple access methods. (T) Contrast with *local area network (LAN)* and *wide area network (WAN)*.

MIB. (1) MIB module. (2) Management Information Base.

modem (modulator/demodulator). (1) A functional unit that modulates and demodulates signals. One of the functions of a modem is to enable digital data to be transmitted over analog transmission facilities. (T) (A)

(2) A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

MPC. Multi-Path Channel.

MPC+. High-Performance Data Transfer (HPDT) Multi-Path Channel.

ms. Millisecond (1/1000 second).

N

network. (1) A configuration of data processing devices and software connected for information interchange. (2) A group of nodes and the links interconnecting them.

network architecture. The logical structure and operating principles of a computer network. (T)

Note: The operating principles of a network include those of services, functions, and protocols.

network management. The process of planning, organizing, and controlling a communication-oriented data processing or information system.

NIC. Network Information Center.

NMS. Network management station.

NNI. Network-to-network interface.

non-return-to-zero change-on-ones recording (NRZ-1). A recording method in which the ones are represented by a change in the condition of magnetization, and zeros are represented by the absence of change. Only the one signals are explicitly recorded. (Previously called *non-return-to-zero inverted*, NRZI, recording.)

NRZ-1. Non-return-to-zero change-on-ones recording.

NSAP. Network service address point.

NSC. Network Support Center.

NVDM. NetView Distribution Manager/6000.

O

OSI. Open systems interconnection.

P

packet loss ratio. The probability that a packet will not reach its destination or not reach it within a specified time.

packet mode operation. Synonym for *packet switching*.

packet switching. (1) The process of routing and transferring data by means of addressed packets so that a channel is occupied only during transmission of a packet. On completion of the transmission, the channel is made available for transfer of other packets. (1)
(2) Synonymous with *packet mode operation*. See also *circuit switching*.

PBX. Private branch exchange.

PCM. Pulse code modulation.

PDH. Plesiochronous digital hierarchy.

permanent virtual circuit (PVC). In X.25 and frame relay communications, a virtual circuit that has a logical channel permanently assigned to it at each data terminal equipment (DTE).

physical circuit. A circuit established without multiplexing. See also *data circuit*. Contrast with *virtual circuit*.

PM. Presentation Manager.

PMF. Parameter Management Frame.

PNP. Private numbering plan.

Point-to-Point Protocol (PPP). A protocol that provides a method for encapsulating and transmitting packets over serial point-to-point links.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached. Synonymous with *socket*. (3) The representation of a physical connection to the link hardware. A port is sometimes referred to as an adapter; however, there can be more than one port on an adapter. There may be one or more ports controlled by a single DLC process. (4) In the Internet suite of protocols, a 16-bit number used to communicate between TCP or the User Datagram Protocol (UDP) and a higher-level protocol or application. Some protocols, such as File Transfer Protocol (FTP) and Simple Mail Transfer Protocol (SMTP), use the same well-known port number in all TCP/IP implementations. (5) An abstraction used by transport protocols to distinguish among multiple destinations within a host machine.

PPP. Point-to-Point Protocol.

private branch exchange (PBX). A private telephone exchange for transmission of calls to and from the public telephone network.

problem determination. The process of determining the source of a problem; for example, a program component, machine failure, telecommunication facilities, user or contractor-installed programs or equipment, environmental failure such as a power loss, or user error.

PRS. Primary reference source.

PSN. Public switched network.

PSTN. Public switched telephone network.

PTM. Packet transfer mode.

PVC. Permanent virtual circuit.

Q

QoS. Quality of service.

R

rack. A metallic structure, with a standard 19-inch width, that houses Nways Switch hardware elements: logic subrack with modules, fan boxes, and power subrack with power units.

real-time processing. The manipulation of data that are required, or generated, by some process while the process is in operation. Usually the results are used to influence the process, and perhaps related processes, while it is occurring.

RETAIN. Remote Technical Assistance Information Network.

ring. See *ring network*.

ring network. (1) A network in which every node has exactly two branches connected to it and in which there are exactly two paths between any two nodes. (T)
(2) A network configuration in which devices are connected by unidirectional transmission links to form a closed path.

route. (1) An ordered sequence of nodes and transmission groups (TGs) that represent a path from an origin node to a destination node traversed by the traffic exchanged between them. (2) The path that network traffic uses to get from source to destination.

router. (1) A computer that determines the path of network traffic flow. The path selection is made from

several paths based on information obtained from specific protocols, algorithms that attempt to identify the shortest or best path, and other criteria such as metrics or protocol-specific destination addresses. (2) An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer. Contrast with *bridge* and *gateway*. (3) In OSI terminology, a function that determines a path by which an entity can be reached.

routing. (1) The assignment of the path by which a message is to reach its destination. (2) In SNA, the forwarding of a message unit along a particular path through a network, as determined by parameters carried in the message unit, such as the destination network address in a transmission header.

RSC. Remote Support Center.

RSF. Remote Support Facility.

RT. Real time.

S

s. Second.

SDH. Synchronous digital hierarchy.

SDLC. Synchronous Data Link Control.

SDT. Structured data transfer.

Serial Line Internet Protocol (SLIP). A TCP/IP protocol used on a point-to-point connection between two IP hosts over a serial line (for example, an RS/EIA-232 connection into a modem over a telephone line).

In an NBBS network, the SLIP is used over a connection between an Nways Switch administration station (NAS) and an IBM Network Support Center (NSC).

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SLA. Serial link architecture.

SLIP. Serial Line Internet Protocol.

SNA. Systems Network Architecture.

SNMP. Simple Network Management Protocol.

socket. The abstraction provided by the University of California's Berkeley Software Distribution (commonly called Berkeley UNIX or BSD UNIX) that serves as an endpoint for communication between processes or applications.

source route bridging. In LANs, a bridging method that uses the routing information field in the IEEE 802.5 medium access control (MAC) header of a frame to determine which rings or token-ring segments the frame must transit. The routing information field is inserted into the MAC header by the source node. The information in the routing information field is derived from explorer packets generated by the source host.

spoofing. For data links, a technique in which a protocol initiated from an end station is acknowledged and processed by an intermediate node on behalf of the final destination. In IBM 6611 data link switching, for example, SNA frames are encapsulated into TCP/IP packets for transport across a non-SNA wide area network, unpacked by another IBM 6611, and passed to the final destination. A benefit of spoofing is the prevention of end-to-end session timeouts.

SRC. System reference code.

STM-1. Synchronous transport module-1.

SW. Switch (module).

SWRD. Switch redrive (module).

synchronous. (1) Pertaining to two or more processes that depend upon the occurrence of specific events such as common timing signals. (T)
(2) Occurring with a regular or predictable time relationship.

Synchronous Data Link Control (SDLC). A discipline conforming to subsets of the Advanced Data Communication Control Procedures (ADCCP) of the American National Standards Institute (ANSI) and High-level Data Link Control (HDLC) of the International Organization for Standardization, for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop. (I) Contrast with *binary synchronous communication (BSC)*.

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions. (I) (A)

Systems Network Architecture (SNA). The description of the logical structure, formats, protocols, and operational sequences for transmitting information

units through, and controlling the configuration and operation of, networks. The layered structure of SNA allows the ultimate origins and destinations of information, that is, the end users, to be independent of and unaffected by the specific SNA network services and facilities used for information exchange.

T

TCP. Transmission Control Protocol.

TCP/IP. Transmission Control Protocol, Internet Protocol.

TDM. Time division multiplexing.

Telnet. In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the user's display station were locally attached. Telnet uses the Transmission Control Protocol as the underlying protocol.

TFTP. Trivial File Transfer Protocol.

time division multiplexing (TDM). See *channelization*.

TN3270. An informally defined protocol for transmitting 3270 data streams over Telnet.

token. (1) In a local area network, the symbol of authority passed successively from one data station to another to indicate the station temporarily in control of the transmission medium. Each data station has an opportunity to acquire and use the token to control the medium. A token is a particular message or bit pattern that signifies permission to transmit. (T) (2) In LANs, a sequence of bits passed from one device to another along the transmission medium. When the token has data appended to it, it becomes a frame.

token ring. (1) According to IEEE 802.5, network technology that controls media access by passing a token (special packet or frame) between media-attached stations. (2) A FDDI or IEEE 802.5 network with a ring topology that passes tokens from one attaching ring station (node) to another. (3) See also *local area network (LAN)*.

Transmission Control Protocol (TCP). A communications protocol used in Internet and in any network that follows the U.S. Department of Defense standards for internetwork protocol. TCP provides a reliable host-to-host protocol between hosts in packet-switched communications networks and in interconnected systems of such networks. It assumes that the Internet protocol is the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communications protocols that

support peer-to-peer connectivity functions for both local and wide area networks.

Transmission Control Protocol/Internet Protocol (TCP/IP). A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

transparent bridging. In LANs, a method for tying individual local area networks together through the medium access control (MAC) level. A transparent bridge stores the tables that contain MAC addresses so that frames seen by the bridge can be forwarded to another LAN if the tables indicate to do so.

Trivial File Transfer Protocol (TFTP). In the Internet suite of protocols, a protocol for file transfer that requires minimal overhead and minimal capability. TFTP uses the connectionless datagram delivery services of the User Datagram Protocol (UDP), which allows hosts that have no disk storage to implement TFTP in read-only memory (ROM) and use it to boot themselves.

U

UDP. User Datagram Protocol.

UNI. User network interface (protocol).

UTP. Unshielded twisted pair.

V

V ac. Volts alternating current.

V.24. In data communications, a specification of the CCITT that defines the list of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE).

V.25. In data communications, a specification of the CCITT that defines the automatic answering equipment and parallel automatic calling equipment on the General Switched Telephone Network, including procedures for disabling of echo controlled devices for both manually and automatically established calls.

V.35. In data communications, a specification of the CCITT that defines the list of definitions for interchange circuits between data terminal equipment (DTE) and

data circuit-terminating equipment (DCE) at various data rates.

V.36. In data communications, a specification of the CCITT that defines the list of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) at rates of 48, 56, 64, or 72 kilobits per second.

version. A separately licensed program that usually has significant new code or new function.

virtual circuit. (1) In packet switching, the facilities provided by a network that give the appearance to the user of an actual connection. (T) See also *data circuit*. Contrast with *physical circuit*. (2) A logical connection established between two DTEs.

virtual connection. In frame relay, the return path of a potential connection.

VPD. Vital product data.

W

WAN. Wide area network.

wide area network (WAN). (1) A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan area network, and that may use or provide public communication facilities. (T) (2) A data communications network designed to serve an area of hundreds or thousands of miles; for example, public and private packet-switching networks, and national telephone networks. Contrast with *local area network (LAN)* and *metropolitan area network (MAN)*.

X

X.21. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for a general-purpose interface between data terminal equipment and data circuit-terminating equipment for synchronous operations on a public data network.

X.25. An International Telegraph and Telephone Consultative Committee (CCITT) recommendation for the interface between data terminal equipment and packet-switched data networks. See also *packet switching*.

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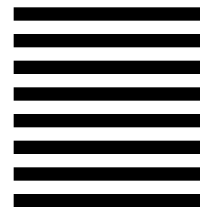
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