2210 Nways Multiprotocol Router

Service and Maintenance Guide

IBM

2210 Nways Multiprotocol Router

SY27-0345-06

Service and Maintenance Guide

┌─── **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 "Electronic Emission Notices" on page D-1.

└──┘

Seventh Edition (November 1998)

This edition applies to the IBM 2210 Nways Multiprotocol Router.

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About This Manual

This manual provides service information for the IBM 2210 Nways Multiprotocol Router (hereafter referred to as the *IBM 2210*).

Who Should Read This Manual

The intended user of this book is the person responsible for servicing the IBM 2210.

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Planning and Installation

Introduction and Planning Guide	Installation and Initial Configuration Guide
GA27-4068	GC30-3867

Configuration

Configuration Program User's Guide

GC30-3830

Configuration Program READ.ME
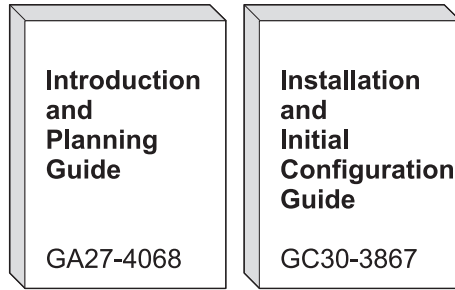
Configuration Help

Diagnostics/ Maintenance

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Operations and Network Administration

Software User's Guide	Protocol Configuration and Monitoring Reference Vol. 1 & 2	Using and Configuring Features	Event Logging System Messages Guide
SC30-3681	SC30-3680 SC30-3865	SC30-3992	SC30-3682
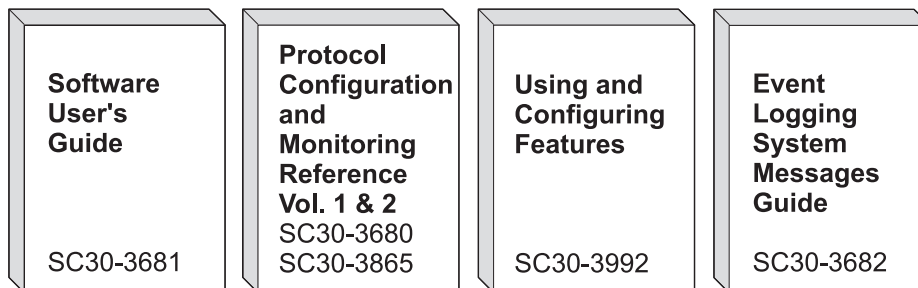
Figure   0-1. IBM 2210 Nways Multiprotocol Router Library Overview

Library Description

Introduction and Planning

GA27-4068   *IBM 2210 Nways Multiprotocol Router Introduction and Planning Guide*

This book is shipped with the 2210. It explains how to prepare for your network and for installation.

This book provides translations of danger notices and other safety information.

GC30-3867   *IBM 2210 Nways Multiprotocol Router Installation and Initial Configuration Guide*

It explains how to prepare for installation, install the 2210, perform an initial configuration, and verify that the installation is successful.

This book provides translations of danger notices and other safety information.

Diagnostics and Maintenance

SY27-0345   *IBM 2210 Nways Multiprotocol Router Service and Maintenance Manual*

This book is shipped with the 2210. It provides instructions for diagnosing problems with and repairing the 2210.

Operations and Network Management

SC30-3681   *Software User's Guide for Multiprotocol Routing Services*

This book explains how to:

- Configure, monitor, and use the IBM Multiprotocol Routing Services software shipped with the router.

- Use the Multiprotocol Routing Services command-line router user interface to configure and monitor the network interfaces and link-layer protocols shipped with the router.

SC30-3680   *Protocol Configuration and Monitoring Reference Volume 1 for Multiprotocol Routing Services*

SC30-3865   *Protocol Configuration and Monitoring Reference Volume 2 for Multiprotocol Routing Services*

These books describe how to access and use the Multiprotocol Routing Services command-line router user interface to configure and monitor the routing protocol software shipped with the router.

They include information about each of the protocols that the devices support.

SC30-3682   *IBM Nways 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.

SC30-3992   *Using and Configuring Features for Multiprotocol Routing Services*

This book details how to configure and use the features for Multiprotocol Routing Services. These features include bandwidth reser-

vation, WAN restoral, WAN reroute, DIALs, and Network Address Translation (NAT).

Configuration

Online help   The help panels for the Configuration Program assist the user in understanding the program functions, panels, configuration parameters, and navigation keys.

GC30-3830   *Configuration Program User's Guide for Multiprotocol Routing Services*

This book discusses how to use the Configuration Program.

GG24-4446   *IBM 2210 Nways Multiprotocol Router Description and Configuration Scenarios*

This book contains examples of how to configure protocols using IBM Multiprotocol Routing Services.

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 an IBM 2210.

Library Ordering Information

All 2210 publications can be ordered separately.

These publications are shipped in hardcopy with the 2210:

IBM 2210 Nways Multiprotocol Router Introduction and Planning Guide

IBM 2210 Nways Multiprotocol Router Installation and Initial Configuration Guide

IBM 2210 Nways Multiprotocol Router Service and Maintenance Manual

Configuration Program User's Guide for Multiprotocol Routing Services

Caution: Safety Information - Read This First

These publications are shipped with the Configuration Program in softcopy on a CD-ROM:

IBM 2210 Nways Multiprotocol Router Introduction and Planning Guide

IBM 2210 Nways Multiprotocol Router Installation and Initial Configuration Guide

IBM 2210 Nways Multiprotocol Router Service and Maintenance Manual

Software User's Guide for Multiprotocol Routing Services

Protocol Configuration and Monitoring Reference Volume 1 for Multiprotocol Routing Services

Protocol Configuration and Monitoring Reference Volume 2 for Multiprotocol Routing Services

IBM Nways Event Logging System Messages Guide

Using and Configuring Features for Multiprotocol Routing Services

IBM Multiprotocol Routing Services and IBM 2210 Softcopy Library

Obtaining Softcopy Information

Softcopy BookManager READ library information is available for many of the 2210 publications in the *IBM Networking Systems Softcopy Collection Kit.* To place a single order for the CD-ROM, use form number SK2T-6012.

Yearly subscriptions to the *IBM Networking Systems Softcopy Collection Kit*, product number 5636-PUB, are available through your branch office representative. Order feature code 2003 and media code 5003 for CD-ROM format.

System Library Subscription Service

The 2210 publications are available via the System Library Subscription Service (SLSS). Use machine type 2210 and program number 5765-B86 to receive 2210 publications.

Visit Our Web Site

Visit the IBM 2210 Web site at `http://www.networking.ibm.com/220/220prod.html` for:

- Storage Estimator
- Performance testing results
- Configuration programs and MRS code
- Publications
- Questions and answers

Summary of Changes

Changes to the *IBM 2210 Nways Multiprotocol Router Service and Maintenance Manual* include:

- The 8-Port Dial Access Adapter
- Access and Configuration Methods

The technical changes and additions are indicated by a vertical line (|) to the left of the change.

Chapter 1. Models, Indicators, and FRUs

Use the illustrations in this chapter for reference when:

- Diagnosing problems with the IBM 2210
- Repairing the IBM 2210

Models of the IBM 2210

The ports of the different models of the IBM 2210 are shown below. The 12x models shown in each illustration differ only in the amount of DRAM and flash memory they contain.
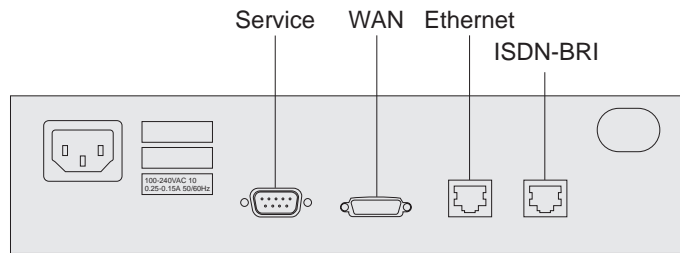
Figure   1-1. Models 1Sx and 1Ux
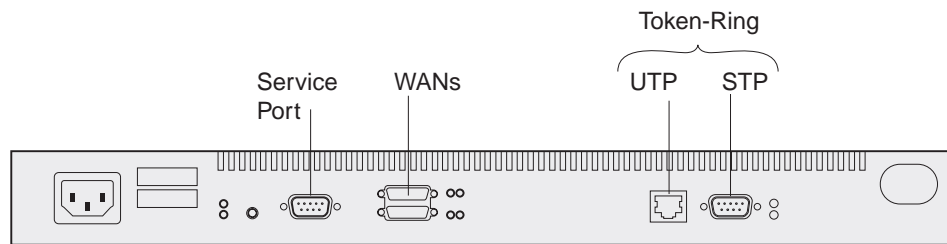
Figure   1-2. Model 12T
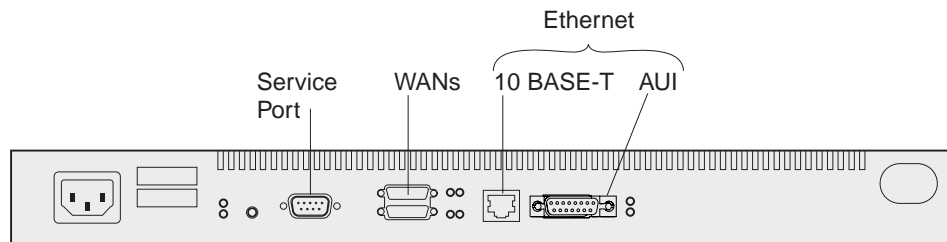
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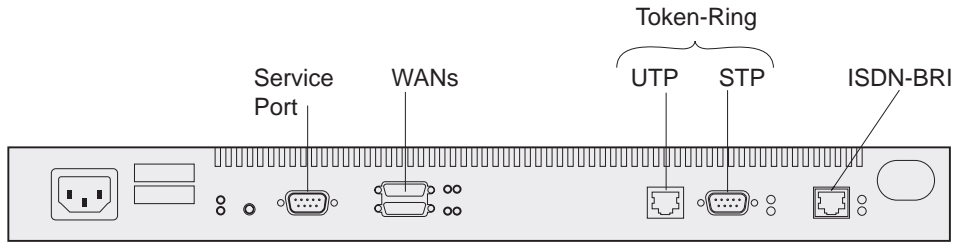
Figure   1-4. Model 127
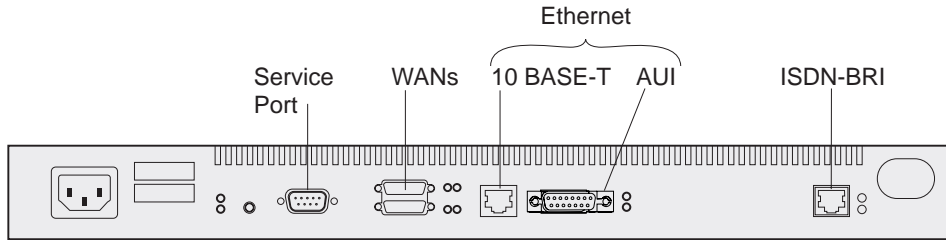
Figure   1-5. Model 128
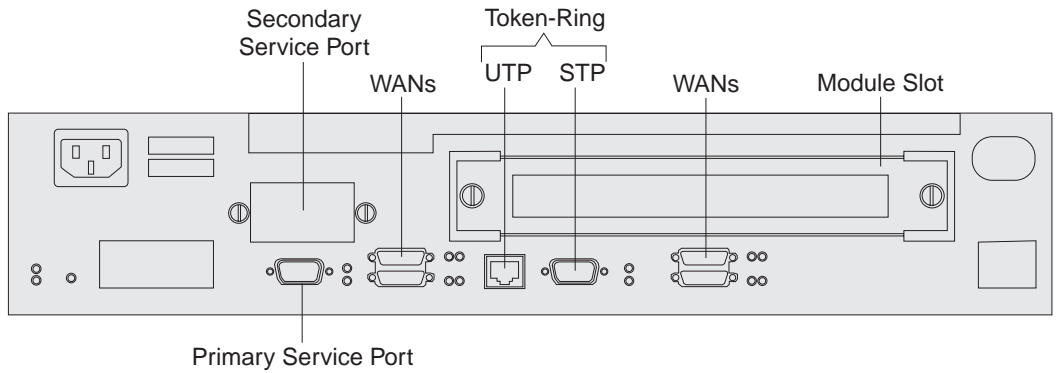
Figure   1-6. Model 14T
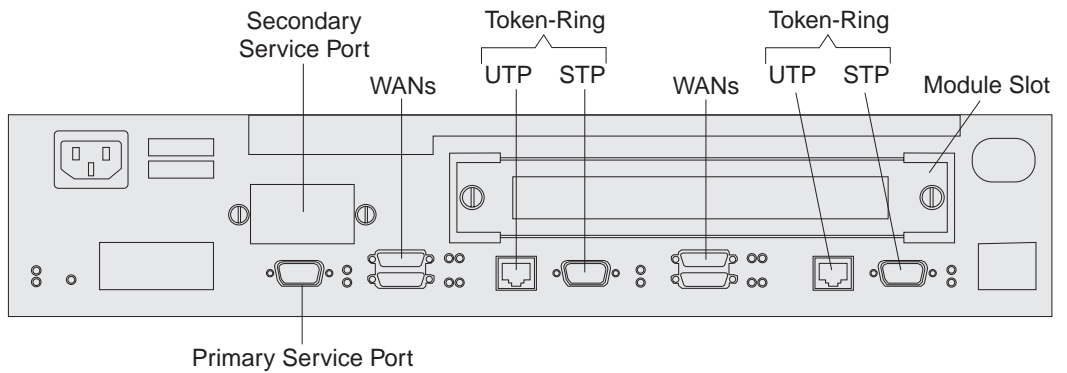
Figure   1-7. Model 24T
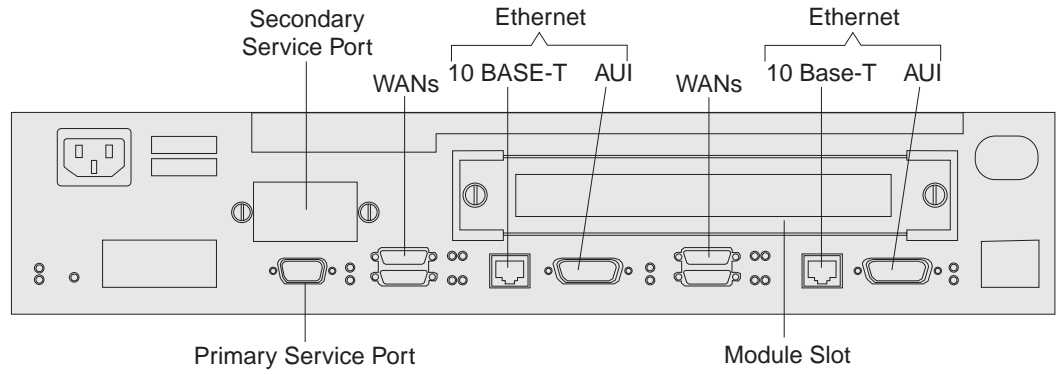
Figure   1-8. Model 24E
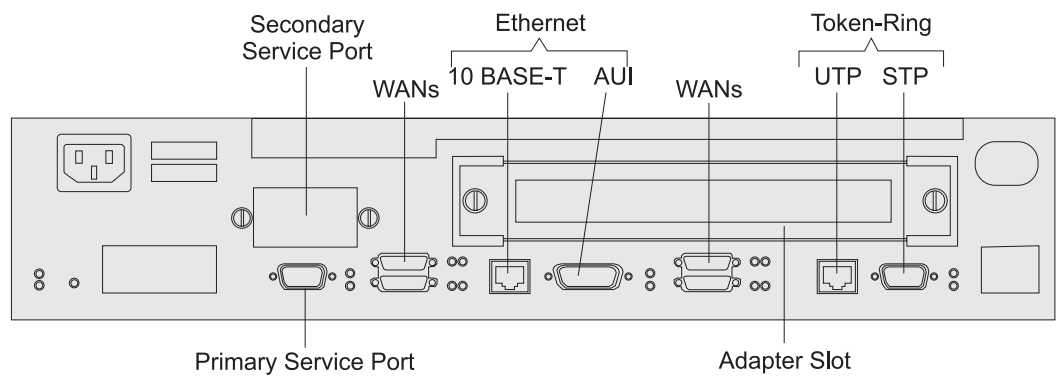
Figure   1-9. Model 24M
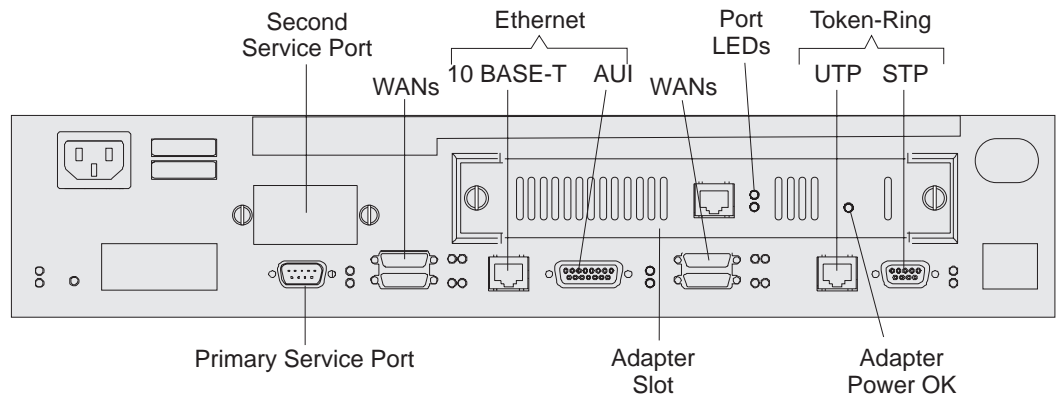
Figure   1-10. Model 24M with an Optional Adapter Installed

Second
Service Port   4/8 Modem Card   Adapter Power LED
            WANs   Adapter Fault LED

Primary Service Port

UTP   STP   WANs   UTP   STP
Token-Ring   Token-Ring
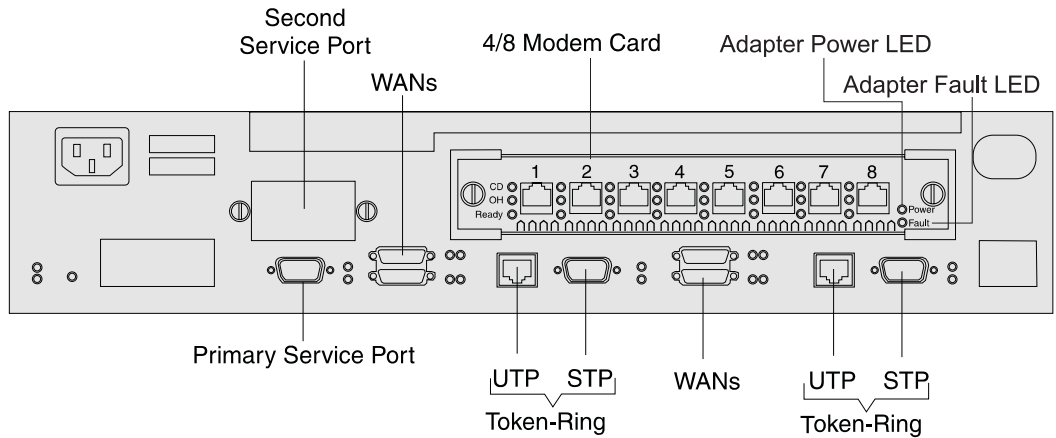
Figure 1-11. Model 24M with the 4-port Dial Access Modem Card Installed

Indicators on the IBM 2210

The IBM 2210 has green and amber light-emitting diodes (LEDs) that indicate the
status of the system and of individual ports.

  * Green indicates normal operation.
  * Amber indicates the presence of a problem.

The indicators appear on the side of the IBM 2210 containing the ports and are
duplicated on the side that is opposite the ports. This arrangement allows the cus-
tomer to use either side as the "front."

Figure 1-12 shows the indicators that appear on the side of the IBM 2210 con-
taining the ports. Note that this illustration shows Model 12T; the port LEDs on
different models are tailored to the particular ports supported.

OK   Service   WAN   UTP   STP   Token Ring
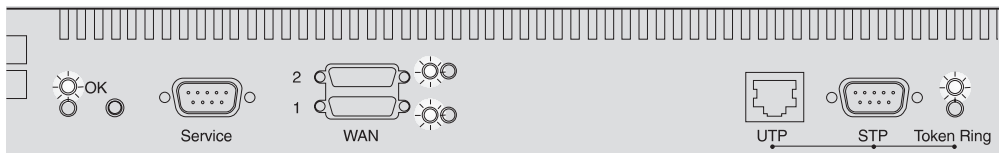
Figure 1-12. LEDs on Port Side of Models 12T

Figure 1-13 shows the indicators on the side of the IBM 2210 that is opposite the
ports.

OK   WAN 1   WAN 2   Token Ring
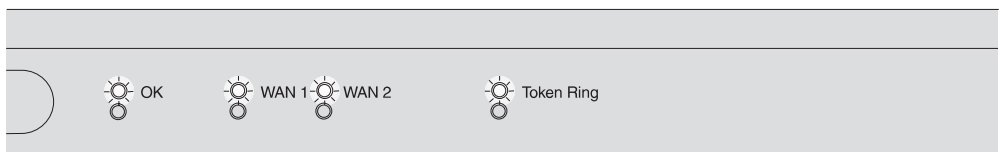
Figure 1-13. LEDs on the Side Opposite the Ports for Models 12T

Reset Button

The reset button, shown in Figure 1-14, works in this fashion:

- If you press it, you will reload the operational code.
- If you press it within 10 seconds of powering on, you will start the Extended POST. See "Extended POST" on page 3-1 for more information.
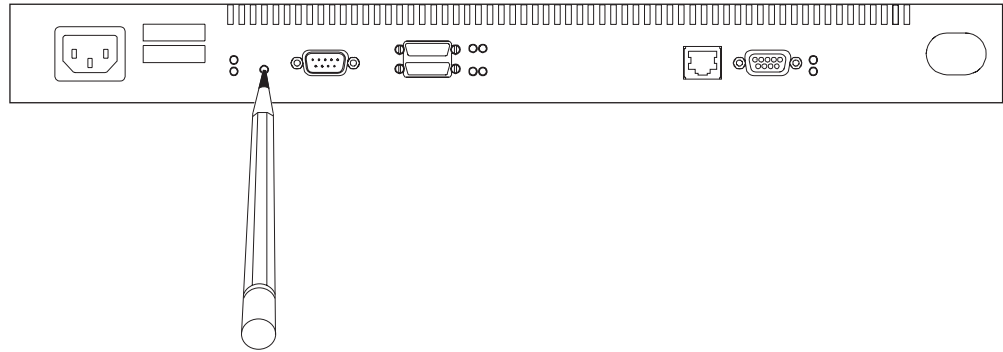
Figure 1-14. Reset Button

The reset button is recessed to prevent accidental activation. Use a pen or pencil to press it.

Inside Views

FRUs in the IBM 2210 12x Models
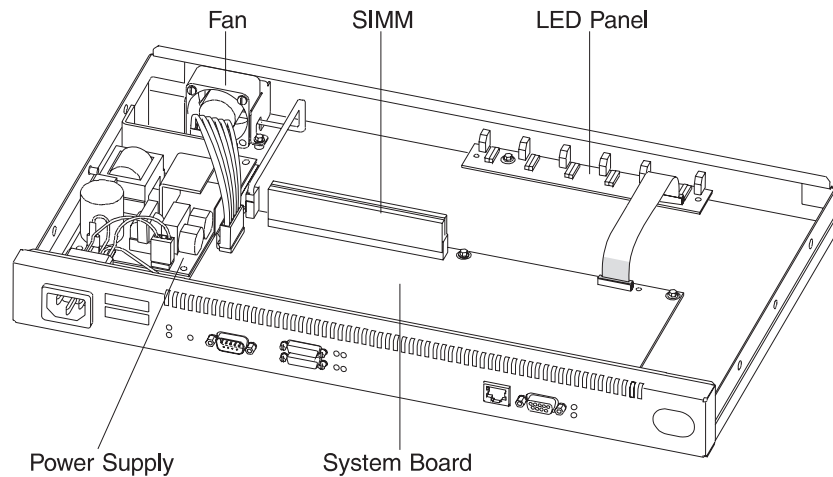
Figure 1-15. View without Cover (12x Models)

FRUs in the IBM 2210 x4x Models

Fan

Power Supply

Modem or Sevice
Port Card

LED Panel

DRAM
SIMM

Flash SIMM

System Board
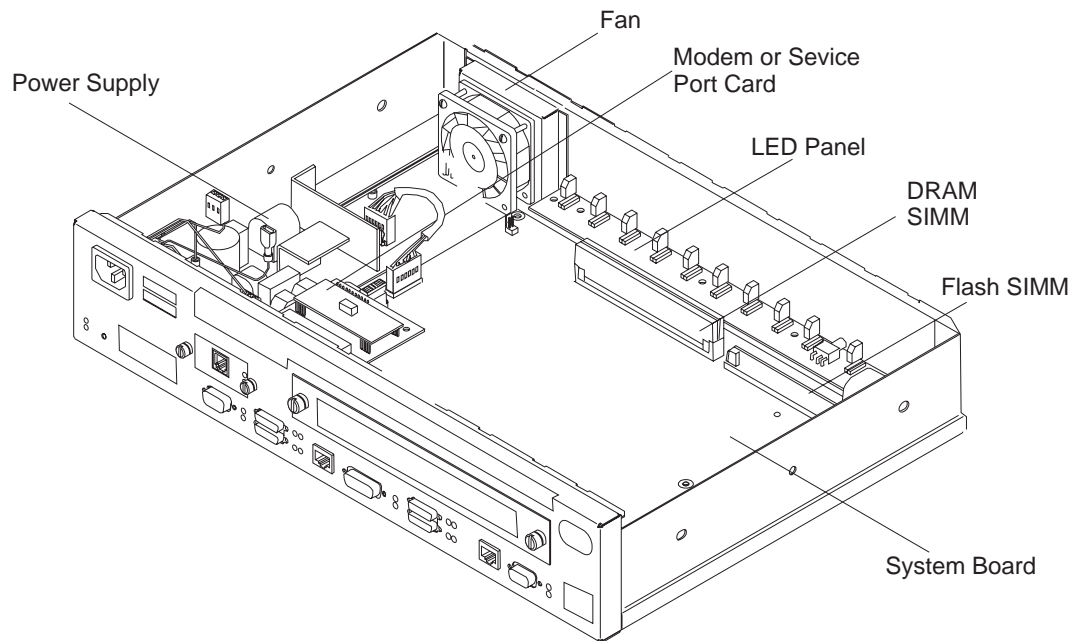
Figure   1-16. View without Cover (24x Models)

Cables in the IBM 2210 12x Models

Fan Cable   LED Panel Cable

AC Power   AC Power   Power Supply
Ground   Cable   Cable
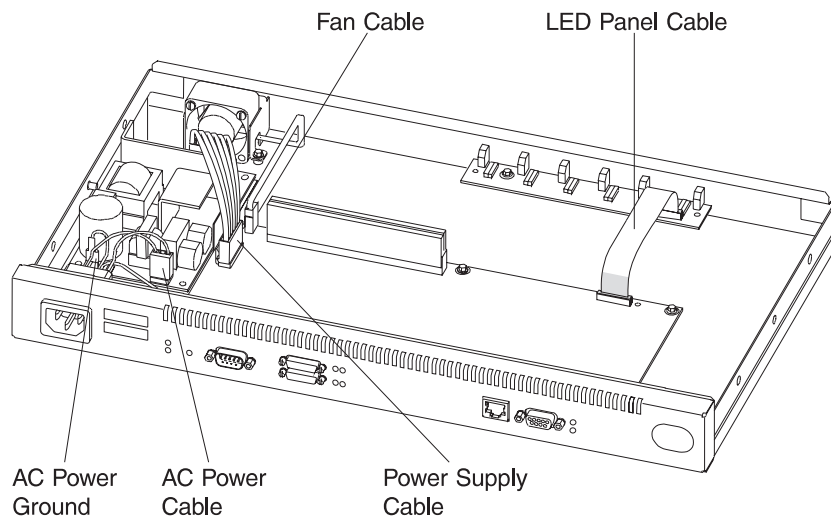
Figure   1-17. View of Cable Connections (12x Models)

Cables in the IBM 2210 x4x Models 1-7

Power Supply Cable

Fan Cable

Reset Cable

LED Panel Cable

AC Power Ground

AC Power Cable
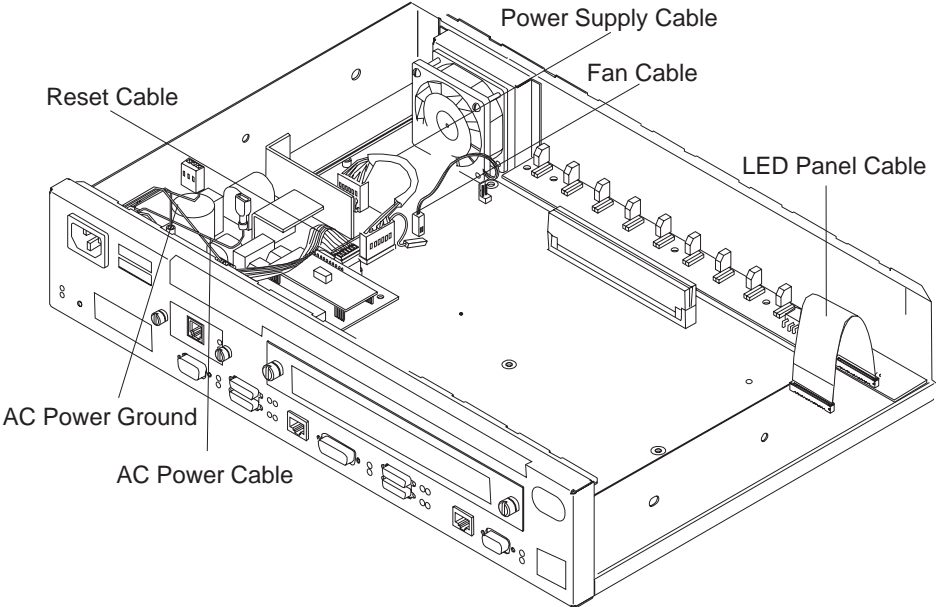
Figure   1-18. View of Cable Connections (24x Models)

Chapter 2. Problem Determination

Use the maintenance analysis procedures (MAPs) in this chapter when the IBM 2210 is not operating normally.

Before using the MAPs, read these notes:

- Review the diagnostic instructions in Chapter 3, "Diagnostics" on page 3-1.

- When a MAP instructs you to replace a field-replaceable unit (FRU), see Chapter 4, "Removal and Replacement Procedures" on page 4-1.

- Chapter 1, "Models, Indicators, and FRUs" contains reference material and illustrations that you may wish to consult while using the MAPs.

| **Note:** Box images that support the DIALs Server Function require certain PROM
| Load/Dump Program versions. Models 12x require PROM Load/Dump revision
| level 1.6 or higher. If you have an earlier version you must order a PROM
| upgrade. Models x4x require revision level 2.20 or higher. The code is available on
| the Web at: `http://www.networking.ibm.com/support/downloads/2210`

MAP 0100: Start

001

- – Gather problem determination information from the customer.
- – Find the symptom in Table 2-1 and take the appropriate action.

Table 2-1. Initial Symptoms

Symptom	Action
All LEDs stay on.	Replace the system board.
An amber LED is on or blinking.	Go to "MAP 0120: LEDs Indicate a Fault" on page 2-4
No LEDs on one or both sides of the IBM 2210 are on.	Go to "MAP 0130: No LEDs Are On" on page 2-8
One LED is not working.	Go to "MAP 0140: One LED is Not Working" on page 2-10
Fan is not running.	Go to Step 005 on page 2-11.
There is a communication problem between the IBM 2210 and a network, that is, one or more ports are not working though the machine is powered on.	If no LEDs are on, go to "MAP 0130: No LEDs Are On" on page 2-8
	If any amber LED is on or blinking, go to "MAP 0120: LEDs Indicate a Fault" on page 2-4
	If the LEDs do not indicate a fault, go to "MAP 0110: Communication Problem" on page 2-3
The service port is not working. The service port amber LED is on or blinking.	Go to "MAP 0160: Service Port on 12x Model Is Not Working" on page 2-13 for a 12x model. Go to "MAP 0170: Primary Service Port on 14T or 24x Model Is Not Working" on page 2-14 for a 14T or 24x model.
The IBM 2210 is experiencing intermittent or data throughput problems.	Go to "MAP 0150: Intermittent Problem Isolation" on page 2-11
The service terminal display is unreadable.	Go to "MAP 0190: Service Terminal Display Unreadable" on page 2-17.
The second service port is not working. The second service port amber LED is on or blinking.	Go to "MAP 0180: Second Service Port Is Not Working" on page 2-15.
The optional adapter is not working. The green adapter status LED is off.	Go to "MAP 0200: Optional Adapter or Dial Access Adapter Is Not Working" on page 2-21.
The Dial Access Adapter is not working. The green adapter status LED is off or the amber adapter status LED is on or blinking.	Go to "MAP 0200: Optional Adapter or Dial Access Adapter Is Not Working" on page 2-21.

MAP 0110: Communication Problem

| 001 |

– Make sure that:

- The fan is clear of any obstructions.
- The room temperature is within limits (5° to 41°C [50° to 104°F])

Did you find a problem?
Yes   No

| 002 |

Continue with Step 004.

| 003 |

Resolve the problem. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 004 |

Is the fan running?
Yes   No

| 005 |

Replace the fan. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 006 |

– Run the System Extended Diagnostics. For assistance, go to "Operational Diagnostics" on page 3-2. If you are unable to resolve the problem, contact your next level of support.

MAP 0120: LEDs Indicate a Fault

Diagnose a problem reported by the LEDs in the following sequence:

1. Use Table 2-2 to diagnose the error conditions reported by the system LEDs, because these take precedence over the port LEDs. (For example, if the system amber LED is on, it does not matter which port LEDs are on.)

   Note: Throughout this manual, the term *system LEDs* refers to the green (OK) and amber LEDs on the left side of the IBM 2210.

   This table is valid after power-on or Extended POST completes.

2. If the system LEDs appear to indicate no problem, go to Step 001 in the MAP.

Table 2-2. System LED States

Green	Amber	Action
On	Off	Router loaded and operational.
On or Off	On	Replace the system board.
Off	Blinking	Replace the DRAM SIMM.
On	Blinking	There is no router load module available, no boot configuration has been entered, or the configured boot path is not available. Additional information can be obtained by attaching a service terminal to the IBM 2210. If the problem cannot be resolved locally, call the network administrator.
Blinking	On	Replace the flash SIMM on models 14T and 24x. For 12x models, refer to "MAP 0160: Service Port on 12x Model Is Not Working" on page 2-13.
Blinking	Blinking	Load in process.

001

Did this LED state result from powering on the IBM 2210 normally?
Yes   No

> **002**
>
> – Go to Step 004

003

– Go to Step 019 on page 2-6.

004

Did this LED state result from running the Extended POST?
Yes   No

> **005**
>
> – Go to Step 007 on page 2-5.

| 006 |

– Go to Step 012.

| 007 |

Run an external wrap test on the port. For assistance, go to "Operational Diagnostics" on page 3-2.

Is the port amber LED blinking?
Yes   No

> | 008 |
>
> There is a problem with the software or with the network. Contact your next level of support for instructions about reviewing the system error log.

| 009 |

Were the wrap plugs installed correctly during the Extended POST?
Yes   No

> | 010 |
>
> Repeat the Extended POST using the wrap plugs correctly. Take any action that is indicated.

| 011 |

Replace the system board. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 012 |

Is an amber port LED blinking?
Yes   No

> | 013 |
>
> Go to Step 023 on page 2-6.

| 014 |

– If this is the primary service port on the 14T and 24x models, continue at "MAP 0170: Primary Service Port on 14T or 24x Model Is Not Working" on page 2-14.

– If this is the secondary service port on the 14T or 24x models, continue at "MAP 0180: Second Service Port Is Not Working" on page 2-15.

– If this is an optional adapter, continue at "MAP 0200: Optional Adapter or Dial Access Adapter Is Not Working" on page 2-21.
(Step **014** continues)

MAP 0120 (continued)

014 (continued)

Was a wrap plug installed on this port before you ran Extended POST?
Yes No

> **015**
>
> Repeat the Extended POST using a wrap plug for this port. For assistance,
> go to Chapter 3, "Diagnostics" on page 3-1.
>
> **Is the amber LED for this port on or blinking?**
> **Yes No**
>
> > **016**
> >
> > Go to Step 023.
>
> **017**
>
> Replace the system board. Then, go to "MAP 0210: Verify Operation" on
> page 2-23.

018

Replace the system board. Then, go to "MAP 0210: Verify Operation" on
page 2-23.

019

Is the amber system LED on or blinking?
Yes No

> **020**
>
> Run the System Extended Diagnostics. For assistance, go to "Operational
> Diagnostics" on page 3-2.
>
> **Did you find a problem?**
> **Yes No**
>
> > **021**
> >
> > Contact your next level of support for instructions about reviewing the
> > system error log.
>
> **022**
>
> Resolve the problem. Then, go to "MAP 0210: Verify Operation" on
> page 2-23.

023

(Step **023** continues)

023 (continued)

Find the fault condition exhibited by this IBM 2210 in Table 2-2 on page 2-4.

Perform the action indicated. Then, go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0130: No LEDs Are On

001

Are the LEDs on the opposite side of the unit on?
Yes   No

> | **002** |
> |---|
>
> Go to Step 008.

003

Are the LEDs on the port side on?
Yes   No

> | **004** |
> |---|
>
> Replace the system board. Then, go to "MAP 0210: Verify Operation" on page 2-23.

005

Remove the cover using the instructions in "Removing the Cover" on page 4-2.

Is the cable connecting the system board to the LED panel securely seated?
Yes   No

> | **006** |
> |---|
>
> Seat the cable. Go to "MAP 0210: Verify Operation" on page 2-23.

007

Replace the LED panel. Then, go to "MAP 0210: Verify Operation" on page 2-23.

008

Is the fan running?
Yes   No

> | **009** |
> |---|
>
> Make sure that:
>
> - The IBM 2210 is plugged into the wall outlet.
> - The wall outlet has the correct voltage.
> - The line voltage at the end of the power cord is correct.
>
> (Step **009** continues)

009 (continued)

Did you find a problem?
Yes   No

> **010**
>
> Replace the power supply. Then, go to "MAP 0210: Verify Operation"
> on page 2-23.

011

Correct the problem, then, go to "MAP 0210: Verify Operation" on
page 2-23.

012

Replace the system board. Then, go to "MAP 0210: Verify Operation" on
page 2-23.

MAP 0140: One LED is Not Working

| 001 |

– Stop the IBM 2210 by unplugging the power cord from the power outlet.

– Plug the IBM 2210 power cord back into the power outlet.

All LEDs should be on for 0.5 seconds after power-on.

Were all the LEDs on?
Yes   No

     | 002 |

     Is the defective LED on the port side of the IBM 2210?
     Yes   No

          | 003 |

          Is the cable connecting the system board to the LED panel
          securely seated?
          Yes   No

               | 004 |

               Seat the cable. Go to "MAP 0210: Verify Operation" on
               page 2-23.

          | 005 |

          Replace the LED panel. Then, go to "MAP 0210: Verify Operation" on
          page 2-23.

     | 006 |

     Replace the system board. Then, go to "MAP 0210: Verify Operation" on
     page 2-23.

| 007 |

The problem is not with the hardware. Call your next level of support.

MAP 0150: Intermittent Problem Isolation

| 001 |

– Make sure that:

- All cables are attached correctly.
- The room temperature is not outside the limits [5° to 41°C (50° to 104°F)].

Did you find a problem?
Yes   No

| 002 |

Continue with Step 004.

| 003 |

Resolve the problem. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 004 |

Is the fan running?
Yes   No

| 005 |

Are any of the LEDs on? Check the LEDs on both sides of the IBM 2210.
Yes   No

| 006 |

Make sure that:

- The IBM 2210 is plugged into the wall outlet.
- The wall outlet has the correct voltage.
- The line voltage at the end of the power cord is correct.

Did you find a problem?
Yes   No

| 007 |

Replace the power supply. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 008 |

Correct the problem. Then, go to "MAP 0210: Verify Operation" on page 2-23.

| 009 |

(Step **009** continues)

MAP 0150 (continued)

009 (continued)

Replace the fan. Then, go to "MAP 0210: Verify Operation" on page 2-23.

010

Run the System Extended Diagnostics. For assistance, go to "Operational Diagnostics" on page 3-2.

Did you find a problem?
Yes   No

011

Contact your next level of support for instructions about reviewing the system error log.

012

Resolve the problem. Then, go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0160: Service Port on 12x Model Is Not Working

```
┌─────┐
│ 001 │
└─────┘
```

Run the Extended POST using a wrap plug in the service port. For assistance, go
to Chapter 3, "Diagnostics" on page 3-1.

Is the system green LED blinking and the system amber LED on?
Yes   No

```
    ┌─────┐
    │ 002 │
    └─────┘
```

   There is a problem with the attached device or its cable.

```
┌─────┐
│ 003 │
└─────┘
```

Replace the system board. Then, go to "MAP 0210: Verify Operation" on
page 2-23.

MAP 0170: Primary Service Port on 14T or 24x Model Is Not Working

001

Run the Extended POST using a wrap plug in the service port. For assistance, go to Chapter 3, "Diagnostics" on page 3-1.

Is the service port amber LED on or blinking?
Yes   No

002

There is a problem with the attached device or its cable.

003

Replace the system board. Then, go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0180: Second Service Port Is Not Working

| 001 |

Is the service port green LED on?
Yes No

| 002 |

Check the connection to the system board.

Is the service port seated correctly in the socket?
Yes No

| 003 |

Seat the service port in the socket firmly.

Is the problem corrected?
Yes No

| 004 |

Go to Step 007.

| 005 |

Go to "MAP 0210: Verify Operation" on page 2-23.

| 006 |

Go to Step 007.

| 007 |

Run the Extended POST using a wrap plug in the service port. For assistance, go to Chapter 3, "Diagnostics" on page 3-1.

Is the service port green LED on?
Yes No

| 008 |

Go to Step 010.

| 009 |

Problem is corrected. Go to "MAP 0210: Verify Operation" on page 2-23.

| 010 |

(Step **010** continues)

MAP 0180 (continued)

010 (continued)

Is the service port amber LED blinking?
Yes   No

> **011**
>
> **Is the service port amber LED on?**
> **Yes   No**
>
> > **012**
> >
> > Make sure the service port is seated correctly.
> >
> > **Is the service port seated correctly?**
> > **Yes   No**
> >
> > > **013**
> > >
> > > Seat the service port correctly and then go to Step 007 on page 2-15.
> >
> > **014**
> >
> > Go to Step 016.
>
> **015**
>
> Replace the system board. Then, go to "MAP 0210: Verify Operation" on page 2-23.

016

Replace the service port. Then, go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0190: 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 2210 displays random characters instead of read-able text.	• Incorrect configuration setting of the terminal or 2210 service port. • Incorrect terminal/device (ac) grounds. • Defective, incorrectly shielded, or incorrectly grounded RS EIA 232 cable between the terminal and the 2210. • Defective terminal or terminal emulator. • High ambient electromagnetic interference (EMI) levels. • Power line disturbances. • Defective 2210 system board.

001

Does the IBM 2210 go to the active state within 2 minutes of resetting or pow-ering on?

Active state is indicated by the green system LED on and the amber system LED off.
Yes   No

> **002**
>
> Go to Step 004

003

Go to Step 007 on page 2-18

004

Is the bootstrap monitor active with the green system LED on and the amber system LED blinking?
Yes   No

> **005**
>
> Go to "MAP 0100: Start" on page 2-2.

006

The bootstrap monitor cannot find a boot path. You must correct the boot problem before you can correct the display problem

– Press the service terminal break key sequence and press **Enter**.

A typical terminal break key sequence for PC terminal emulators is **Alt-b**. Most ASCII terminals have a **Break** key (often used in conjunction with the **Ctrl** key). (Step **006** continues)

MAP 0190 (continued)

006 (continued)

– Press **Ctrl-c** at the service terminal.

The 2210 autobauds to the terminal speed. The > prompt should be displayed at this time.

The terminal speed is not saved and the next time the 2210 is reset or powered off, the service port will use the old speed.

– Continue at Step 001 on page 2-17 when you have resolved the boot problem.

007

– Press the service terminal break key sequence and press **Enter**.

You should try this a number of times before proceeding.

A typical terminal break key sequence is **Alt-b**.

– Press **Ctrl-p** at the service terminal.

Is a readable message displayed on the service terminal?
Yes   No
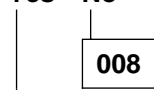
     008

     – Go to Step 010

009

– Go to Step 013 on page 2-19

010

– Press **Reset** and wait for the system green (OK) and amber LEDs to start blinking or the system green (OK) to come on and the amber LED to be blinking.

– Press the service terminal break key sequence and press **Enter**.

– Press **Ctrl-c** at the service terminal.

The terminal displays the > prompt.

– Enter **uc** at the prompt.

The 2210 displays the hardware configuration. The first line shows the auto-baud speed and the configured service port baud rate, if they are different.

Note: The **uc** command is not available for the 14T and 24x models.

Are different auto-baud and configured speeds displayed?
Yes   No
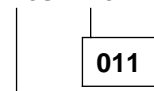
     011

     – Go to Step 013 on page 2-19.

012

(Step **012** continues)

012 (continued)

– Set the terminal to the configured console baud rate displayed.

– Press the service terminal break key sequence and press **Enter**.

This action causes the 2210 to auto-baud.

– Enter **Ctrl-c**.

The > prompt should be displayed. If the console baud rate is satisfactory, you can reboot the 2210 and the terminal will work. If the console baud rate is unsatisfactory and you want to change the rate:

1. Enter **bc** at the > prompt and select an IBD boot module.

2. Wait for the Config (only)> prompt to be displayed.

3. Enter **set baudrate 0** at the Config (only)> prompt.

4. Set the terminal to the desired baud rate.

5. Press the terminal break key sequence and press **Enter** to force the 2210 to auto-baud to the new terminal speed.

Note: When using a terminal emulator, you might have to stop and restart the emulator when switching speeds for the emulator to display correctly.

– Continue at Step 013.

013

The terminal should now operate correctly and the new terminal speed has been saved.

Is the terminal functioning correctly?
Yes   No

> **014**
>
> – Go to Step 016

015

– Go to Step 027 on page 2-20

016

Is the terminal or the IBM 2210 grounded correctly?
Yes   No

> **017**
>
> Ground the device correctly. Go to "MAP 0210: Verify Operation" on page 2-23.

018

(Step **018** continues)

MAP 0190 (continued)

018 (continued)

Is the RS 232 cable between the terminal and the IBM 2210 grounded correctly and shielded?
Yes   No

> **019**
>
> Ground or shield the cable correctly or replace the cable. Go to "MAP 0210: Verify Operation" on page 2-23.

020

Is the terminal or the terminal emulator functioning correctly?
Yes   No

> **021**
>
> Replace the terminal or the terminal emulator. Go to "MAP 0210: Verify Operation" on page 2-23.

022

Is the IBM 2210 in an area with high ambient electromagnetic interference?
Yes   No

> **023**
>
> **Are there power line disturbances?**
> **Yes   No**
>
> > **024**
> >
> > The IBM 2210 system board is defective.
> >
> > Replace the system board. Go to "MAP 0210: Verify Operation" on page 2-23.
>
> **025**
>
> Install an uninterruptible power supply to minimize the effects of the power fluctuations. Go to "MAP 0210: Verify Operation" on page 2-23.

026

Move the IBM 2210 to a more isolated area. Go to "MAP 0210: Verify Operation" on page 2-23..

027

Go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0200: Optional Adapter or Dial Access Adapter Is Not Working

Note: See Figure 1-10 on page 1-3 or Figure 1-11 on page 1-4 for position of adapter status LED.

001

Is the adapter green status LED on?
Yes   No

> **002**
>
> **Is the adapter firmly seated in the riser?**
> **Yes   No**
>
> > **003**
> >
> > Seat the adapter firmly in the riser, then go to Step 001.
>
> **004**
>
> **Is the power cable connected correctly to the riser card, and the riser card seated firmly in the socket?**
> **Yes   No**
>
> > **005**
> >
> > Connect the cables correctly and make sure the riser card is firmly in the socket.
>
> **006**
>
> Test the power supply.
>
> **Is the power supply OK?**
> **Yes   No**
>
> > **007**
> >
> > Replace the power supply.
> >
> > – Go to "MAP 0210: Verify Operation" on page 2-23.
>
> **008**
>
> Replace the riser card.
>
> Go to "MAP 0210: Verify Operation" on page 2-23.

009

(Step **009** continues)

MAP 0200 (continued)

009 (continued)

Is this the Dial Access Adapter?
Yes   No

> **010**
>
> Replace the adapter, then go to "MAP 0210: Verify Operation" on page 2-23.

011

Is the amber status LED on or blinking?
Yes   No

> **012**
>
> Replace the adapter, then go to "MAP 0210: Verify Operation" on page 2-23.
>
> **Note:** The Dial Access Adapter feature has two 4-port Dial Access Modem Cards and a Dial Access Base Adapter. Any of these cards could be failing. Replace the cards one at a time and retry.

013

Power down, reseat the adapter, and reinstall.

Is the amber status LED light still on or blinking.
Yes   No

> **014**
>
> Go to "MAP 0210: Verify Operation" on page 2-23.

015

Do you have the maintenance terminal (PC) needed to run diagnostics?
Yes   No

> **016**
>
> Power down and replace the Dial Access Adapter. Then go to "MAP 0210: Verify Operation" on page 2-23.

017

Run the diagnostics program. Look at the error code to determine which 4-port Dial Access Modem Card to replace.

Power down and replace the appropriate 4-port Dial Access Modem Card. Then go to "MAP 0210: Verify Operation" on page 2-23.

MAP 0210: Verify Operation

```
┌─────┐
│ 001 │
└─────┘
```

Reinstall the covers of the IBM 2210.

Is an ASCII terminal attached to the IBM 2210?
Yes   No

```
        ┌─────┐
        │ 002 │
        └─────┘
```

Run the Extended POST. For assistance, go to Chapter 3, "Diagnostics" on page 3-1.

Is any amber LED on or blinking?
Yes   No

```
            ┌─────┐
            │ 003 │
            └─────┘
```

Go to Step 007.

```
    ┌─────┐
    │ 004 │
    └─────┘
```

Go to "MAP 0120: LEDs Indicate a Fault" on page 2-4.

```
┌─────┐
│ 005 │
└─────┘
```

Run the System Extended Diagnostics. For assistance, go to "Operational Diagnostics" on page 3-2.

Did the diagnostics complete with no trouble found?
Yes   No

```
        ┌─────┐
        │ 006 │
        └─────┘
```

Perform the action indicated by the diagnostics.

Run the System Extended Diagnostics again, taking any action that is indicated. If you are unable to resolve the problem, contact your next level of support.

```
┌─────┐
│ 007 │
└─────┘
```

Return the IBM 2210 to the customer.

Chapter 3. Diagnostics

The IBM 2210 diagnostic programs test the system hardware and detect hardware problems. The diagnostic routines include three types of tests:

- Power-on self-test (POST)
- Extended POST
- Menu-driven diagnostics

The diagnostic package includes service aids that may be used to display the diagnostic logs and to view the vital product data (VPD).

Note: When using a locally attached terminal to run the IBM 2210 diagnostic programs, the service port line speed must be set to 9600 bps. This setting is a constant and cannot be changed.

Diagnosing Hardware Problems

Running the diagnostics requires complete control of the IBM 2210.

Attention: Do not shut down the IBM 2210 without the knowledge and permission of the customer. Contact the customer's system administrator before shutdown.

Power-On Self-Test

The power-on self-test (POST) provides a basic confidence test of the IBM 2210 processor, memory, and interfaces.

Starting the POST

The POST runs automatically whenever the IBM 2210 is powered on. If the machine is already powered on and you want to execute the POST:

1 Stop the IBM 2210 by unplugging the power cord from the power outlet.

2 Plug the IBM 2210 into the power outlet.

3 If the system green (**OK**) LED is off and the system amber LED is on after about 2 minutes, run the Extended POST.

Extended POST

It is possible to run an extended POST that does not require attachment of a terminal. Extended POST allows you to test memory more extensively than normal POST. Follow these steps to run diagnostics without a terminal:

1 Stop the IBM 2210 by unplugging the power cord from the power outlet.

2 Disconnect the cables from the ports.

3 Plug the IBM 2210 into the power outlet. Wait for a port green LED to flash (2 to 3 seconds) and then push the reset button once. (See Figure 1-14 on page 1-5.)

4 If the Extended POST has completed successfully:

- The green LEDs for the system (**OK**) and for any port with wrap plugs will be on.
- The port amber LEDs will be off (or blinking if no wrap plug is installed).

For the 12x models, the system (**OK**) green LED blinking with the system amber LED on indicates that the service port external wrap test has failed.

5 To run the extended POST again, press the reset button after 2 minutes.

6 To end extended POST, power off the IBM 2210 by unplugging the power cord from the power outlet.

7 Be sure to remove any wrap plugs from the IBM 2210 before applying power to reload the router. Do not leave wrap plugs on unused ports.

Above references to wrap plugs do not apply if an internal wrap is performed during extended POST. An internal wrap is performed if the following levels of boot code are installed:

- IBM 2210 12x models if you have the boot code level 1.62 or higher.

- IBM 2210 models 1S4, 1S8, 1U4, and 1U8 if you have the boot code level 1.32 or higher.

- IBM 2210 x4x models if you have the boot code level 2.40 or higher.

Operational Diagnostics

To run the menu-driven operational diagnostics, attach an ASCII terminal to the IBM 2210. If no terminal is available, run the Extended POST, as described in "Extended POST" on page 3-1.

If an ASCII terminal is already attached to the IBM 2210, continue with "Running the Diagnostics." Otherwise, go to Appendix A, "Access Methods and Attaching an ASCII Terminal" on page A-1 for instructions.

Note: Because running the diagnostics requires complete control of the IBM 2210, be sure to notify the customer's system administrator before shutdown.

Running the Diagnostics

You can execute the diagnostics:

- Immediately after attaching an ASCII terminal

- When an ASCII terminal is already attached and the router user interface is in operation.

Immediately After Attaching an ASCII Terminal.: To start the diagnostics immediately after attaching a terminal:

1 If the IBM 2210 is not already unplugged, unplug it from the power outlet.

2 To start the diagnostics, plug the power cord into the outlet and, when the green system LED is on and the amber system LED is blinking, or both green and amber system LEDs are blinking, press **Ctnl-c**.

3 The greater-than sign (>) will appear on the display.

4 Type **diag** and press **Enter**.

5 The Diagnostic Main Menu will appear after the System Diagnostics run.

While the Router User Interface Is In Operation: To start the diagnostics while the router user interface is in operation:

1 Press **Ctnl-p**. An asterisk (∗) will appear.

2 Type **reload** and press **Enter**.

3 Press **Ctnl-c**. The greater-than sign (>) will appear on the display.

4 Type **diag** and press **Enter**.

5 The Diagnostic Main Menu will appear.

Diagnostic Main Menu: The Diagnostic Main Menu has the following options:

- *System Diagnostics* tests the processor, the memory, and the communication ports through an internal wrap.
- *System Extended Diagnostics* executes the System Diagnostics tests plus external wrap tests of all ports.
- *WAN/LAN Wrap Menu* allows you to run a wrap test on a specific port. From this menu you can also test the cable attached to a port. After you select this option, additional menus will help you define the test.
- *Diagnostic Utilities* provides access to service aids. After you select this option, an additional menu will allow you to choose a specific service aid. See "Service Aids" on page 3-4 for more information.

If a diagnostic test fails, a message will be displayed giving:

- A description of the test that failed
- A return code
- An action to take

The return code provides additional information that may be requested by the next level of support.

When you are ready to exit from the diagnostics, type **x** and press **Enter** at the main menu. The POST will run.

Diagnosing Software Problems

In order to diagnose software problems, you need to capture as much information about the problem as possible and call your software support center. The software support center will guide you through the steps needed to collect data relating to a problem; these steps may include examination of the log, trace, and dump. Service personnel dealing with software problems should record the symptoms of the problem.

Possible symptoms of a software problem:

- A component stops operating and hardware diagnostics do not identify a hardware problem
- System stalls
- A severe drop occurs in system performance
- Data is incorrectly transmitted
- A system does not receive data that was correctly transmitted

Service Aids

Service aids are utility programs that provide additional diagnostic assistance. The service aids for the IBM 2210 are for use under the direction of support personnel. They allow you to:

- Display the diagnostic log
- Display the vital product data (VPD)

Display Diagnostic Log

Diagnostic information is stored in a hexadecimal dump format.

Display Vital Product Data (VPD)

For the 12x models, the VPD for this machine is displayed in a hexadecimal format.

For the 14T 1Sx, 1Ux, and 24x models, the VPD for this machine is displayed in character format.

Chapter 4. Removal and Replacement Procedures

Note: Before installing the IBM 2210, be sure to read "Electronic Emission Notices" on page D-1.

This chapter contains replacement procedures for the following FRUs:

- System board
- Single in-line memory module (SIMM)
- Power supply
- Fan
- LED panel
- The following features for models 14T and 24x:
  - Adapter Enablement Feature
  - Optional adapters:
    - 1-port 25-Mbps ATM Interface Adapter
    - 1-port ISDN Basic Rate Interface Adapter
    - 4-port S/T ISDN BRI Adapter
    - 4-port U ISDN BRI Adapter
    - 1-port E1-120 Ohm ISDN PRI Adapter
    - 1-port T1/J1 ISDN PRI Adapter
    - 4-port Dial Access Adapter
    - 8-port Dial Access Adapter
    - 4-port Dial Access Modem Card Upgrade feature
    - 4-port WAN Concentration Adapter
    - 8-port WAN Concentration Adapter
  - Optional second service port card
    - 14.4-Kbps Modem Card
    - EIA-232 Service Port Card
  - 4 MB Additional Flash Feature
  - 8 MB Additional Flash Feature
  - 16 MB DRAM Memory Expansion Feature
  - 32 MB DRAM Memory Expansion Feature

Note: Any procedure without a specific model number can be used on all models. Any figures for those procedures will show a 12x model for illustration purposes.

Before you begin, inspect the IBM 2210 for unsafe conditions. Use *Electrical Safety for IBM Service Representatives*, S229-8124, to guide you through this inspection.

DANGER

> An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the IBM 2210 or the devices that attach to the IBM 2210. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.
>
> Before installing or removing signal cables, ensure that the power cord for the IBM 2210 is unplugged.
>
> When possible, use one hand to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.
>
> During an electrical storm, do not connect or disconnect any cables.

Note: For translations of this safety notice, see "Safety Notices" on page D-6.

Handling Static-Sensitive Devices

Certain components, such as planars 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 2210.
- With the component still in its antistatic bag, touch the metal frame of the IBM 2210.
- Hold the component by its edges. Avoid touching solder joints or pins.
- Handle the components carefully in order to prevent permanent damage.

Cover

Removing the Cover

DANGER

> Hazardous voltages exist inside this machine when it is powered on. Anytime you service this unit with the cover off, be sure to unplug the power cord.

Note: For translations of this safety notice, see "Safety Notices" on page D-6.

1 Unplug the power cord from the outlet.

2 If the IBM 2210 is installed in a rack, remove the screws attaching the IBM 2210 to the rack.

3 Remove the two screws that attach the mounting brackets to either side of the IBM 2210. Then remove the center screw that attaches the cover to the side of the IBM 2210. Note the position of the mounting bracket ears as you remove the mounting brackets.
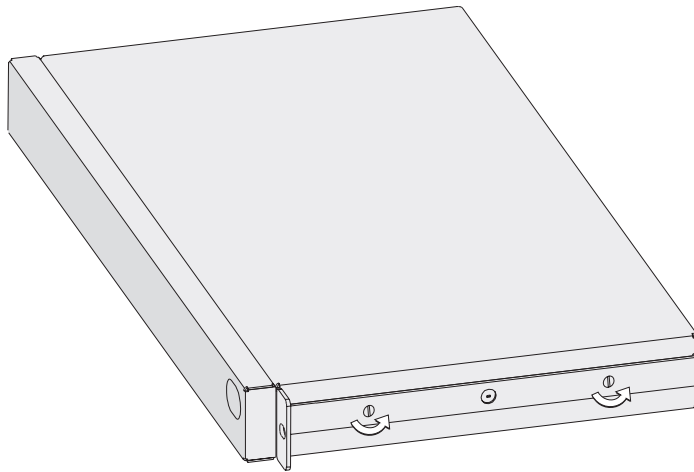
Figure   4-1. Removing the Side Screws

4 Position the IBM 2210 so that the port side is facing you. From this position, lift the rear portion of the cover and slide it away from you.
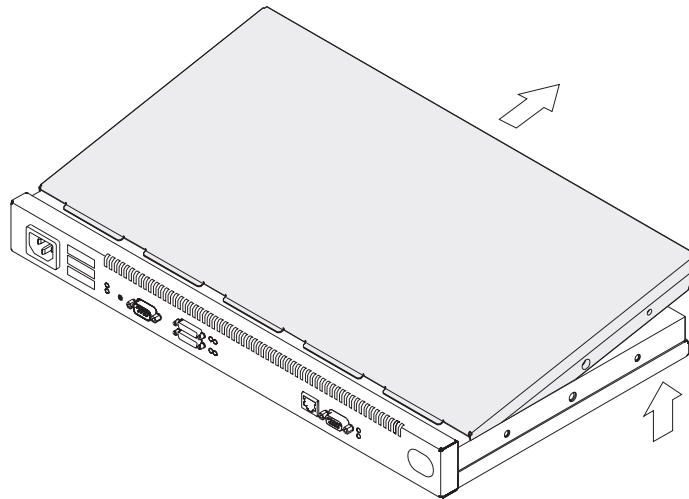
Figure   4-2. Removing the Cover

5 Be sure to store the mounting brackets and screws with the cover.

Reinstalling the Cover

1 Position the IBM 2210 so that the port side is facing you. From this position, elevate the rear portion of the cover and slide it onto the IBM 2210.
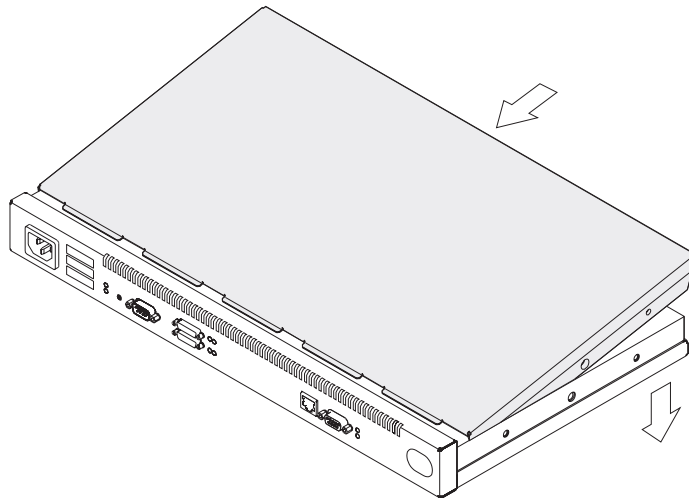
Figure 4-3. Replacing the Cover

2 Replace the screws that attach the cover and mounting brackets to each side of the machine. Be sure that the screw with the Phillips head is installed in the middle hole.
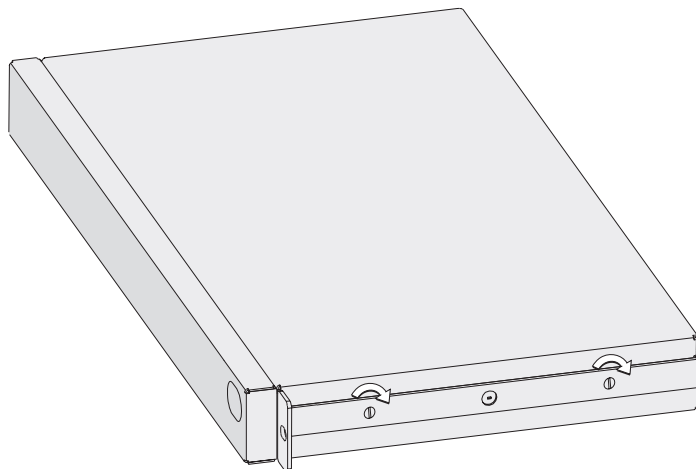
Figure 4-4. Replacing the Screws and Mounting Bracket

3 If the IBM 2210 was mounted in a rack, return it to the rack.

4 Plug the power cord into the outlet.

System Board

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or installing a system board.

Removing the System Board for 12x Models
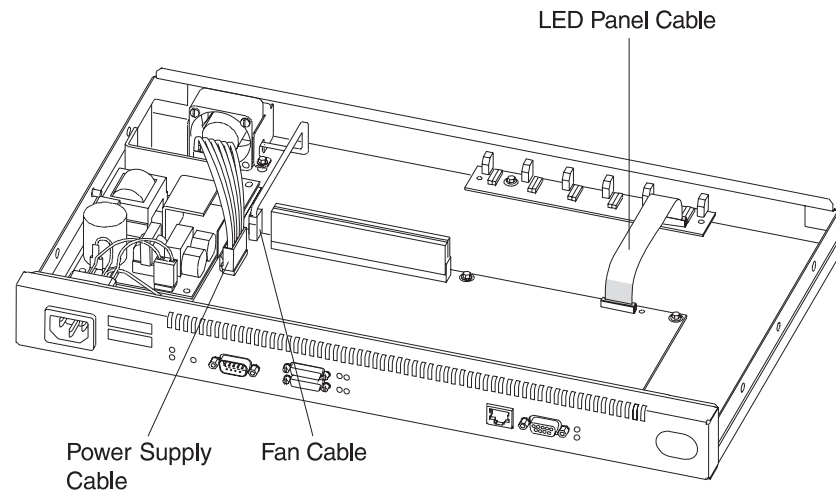
Figure 4-5. Cables Attached to the System Board (12x Models)

1 Remove the power supply cable connector by pulling out the retaining clips with your fingers or a screwdriver and then rocking the connector from front to back as you pull up.

2 Remove the fan cable by rocking it from front to back as you pull up.

3 To remove the LED panel cable, use a screwdriver on either side of the connector to lift the blue retaining latch. Pull the cable from the latch. Note as you remove this cable that the blue coloring on the end of the cable faces the blue latch.

4 Remove the system board retainer screws using a nut driver. Figure 4-6 on page 4-6 and Figure 4-7 on page 4-6 show the locations of the retainer screws for system boards that do and do not support ISDN.

Figure 4-6. Non-ISDN System Board (12x Models)
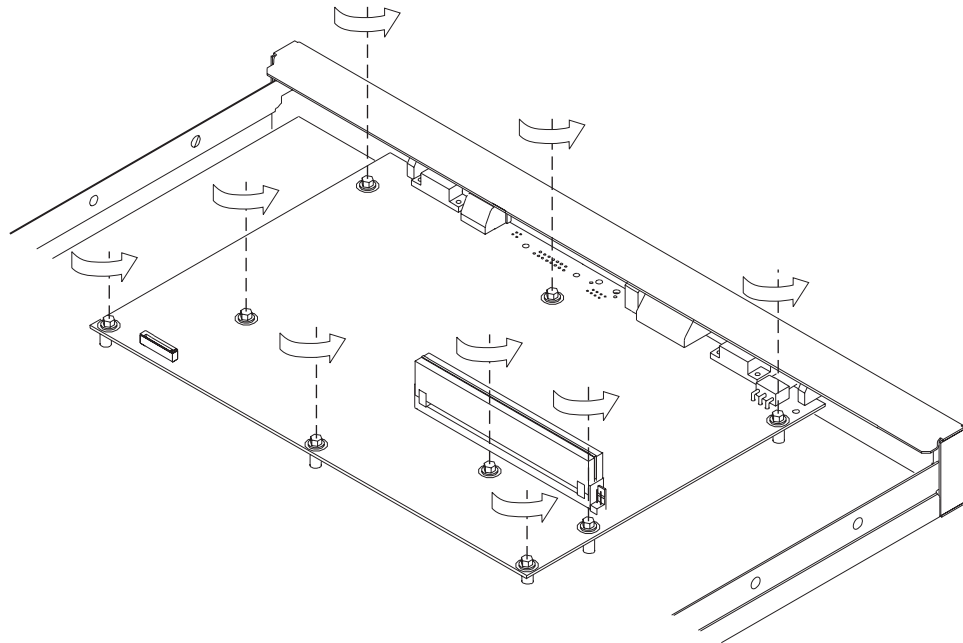
Figure 4-7. ISDN System Board

5 Using a nut driver, remove the hex screws from the service port and from the token-ring port, if present on this IBM 2210.

6 If you have an Ethernet port, remove both screws from the bracket on the port, noting the position of the bracket as you remove it.

Figure 4-8. Ethernet Port (12x Models)

7 With a screwdriver, remove the remaining slotted screws that attach the WAN
ports to the front panel.

8 You will transfer the single in-line memory module (SIMM) from this system
board to the new one. Go to "Removing the Dynamic Random Access
Memory (DRAM) SIMM for 12x Models" on page 4-15 for instructions for
removal. After you remove the SIMM, lift the system board out of the unit.

Replacing the System Board for 12x Models

1 Place the system board in the IBM 2210.

2 Go to "Replacing the DRAM SIMM for 12x Models" on page 4-16 for
instructions on replacing the SIMM. Then, continue with step 3.

3 Replace the system board retainer screws using a nut driver. Figure 4-9 and
Figure 4-10 on page 4-8 show the locations of the retainer screws for
system boards that do and do not support ISDN.
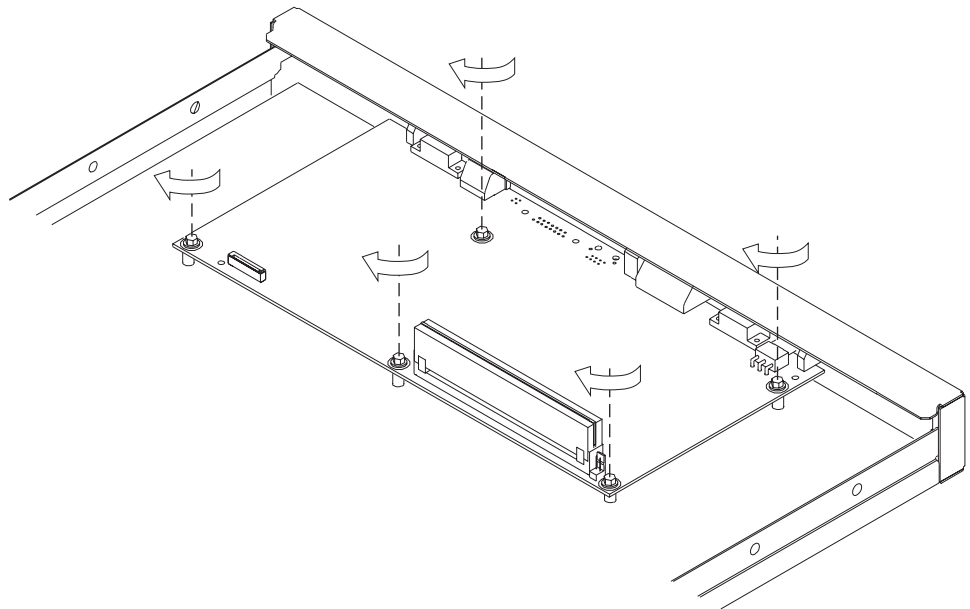
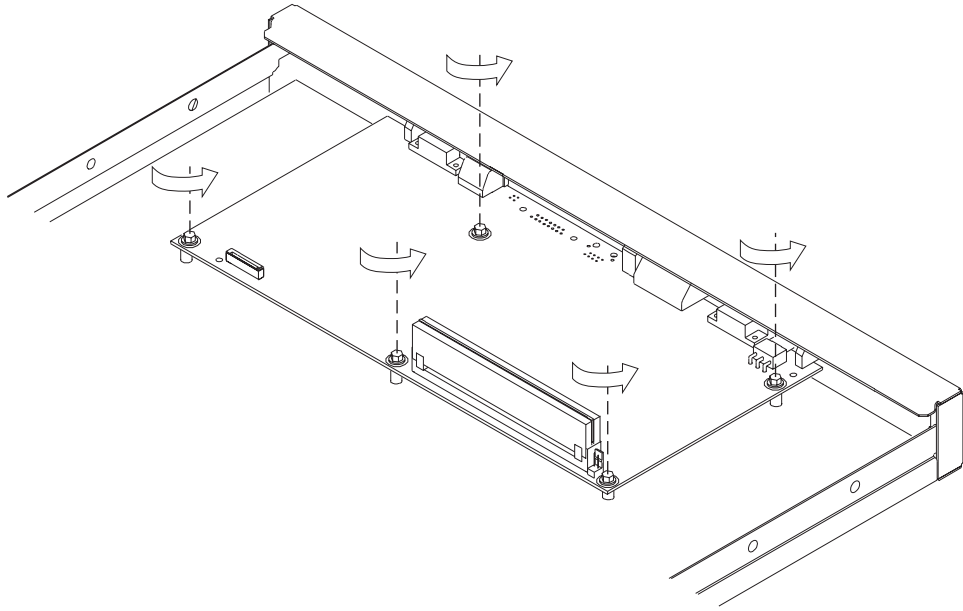*Figure 4-9. Non-ISDN System Board (12x Models)*
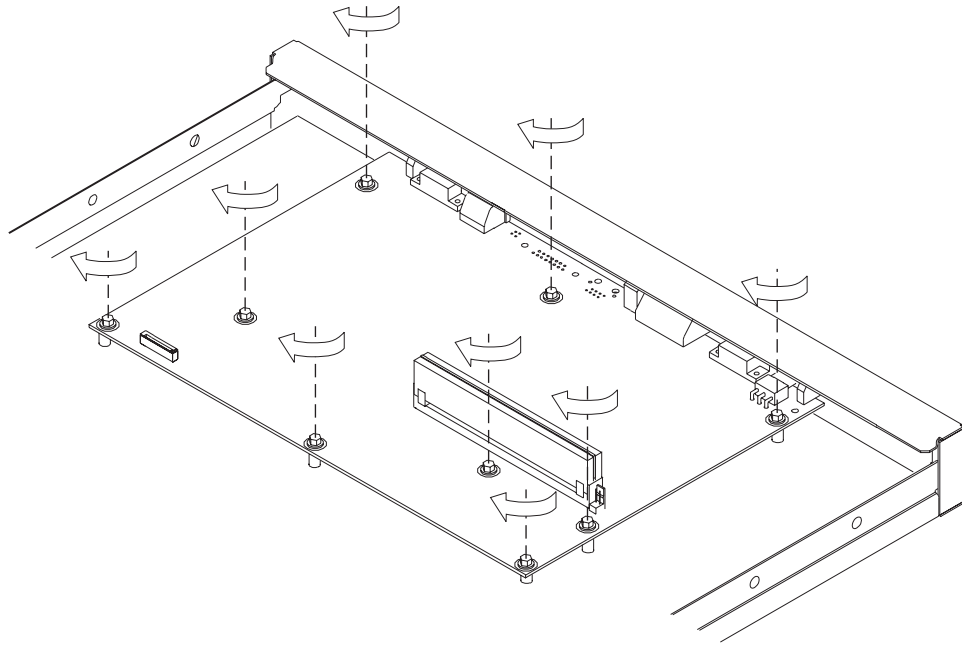
Figure 4-10. ISDN System Board (12x Models)

4 Using a nut driver, replace the hex screws in the service port and in the token-ring port, if present on this IBM 2210.

5 If you have an Ethernet port, replace the bracket. See Figure 4-8 on page 4-7 for reference.

6 Replace the remaining slotted screws that attach the WAN ports to the front panel.
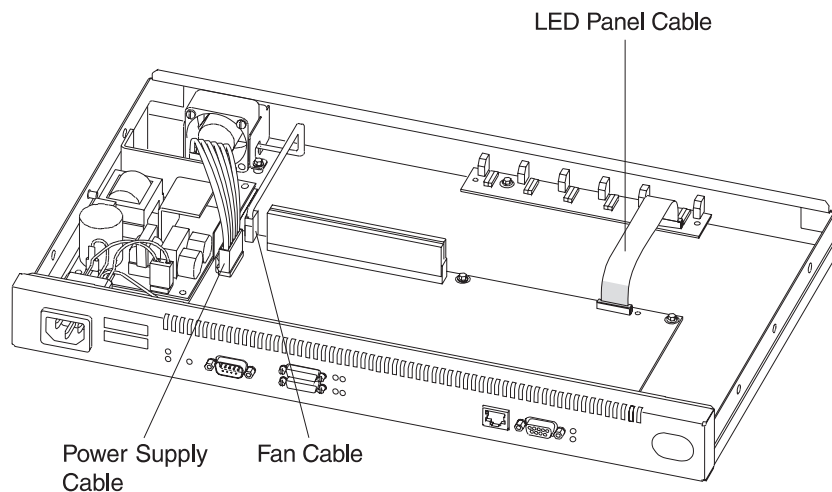
Figure 4-11. Attach Cables to the System Board (12x Models)

7 To attach the LED panel cable, slide the cable into the connector making sure that the blue coloring on the end of the cable faces the blue latch. Be sure to slide the cable into the latch as far as possible. Press down on the blue retaining latch to secure the cable.

8 Attach the fan cable by pressing firmly down until it clicks into place.

9 Position the power supply cable connector so that the side of the connector with the tabs faces the retaining clips. Then, press firmly down until it clicks into place.

10 Reinstall the cover. See "Reinstalling the Cover" on page 4-4 for instructions.

Note: The customer must reload operational code and configuration information after the system board is replaced.

Removing the System Board for 14T and 24x Models
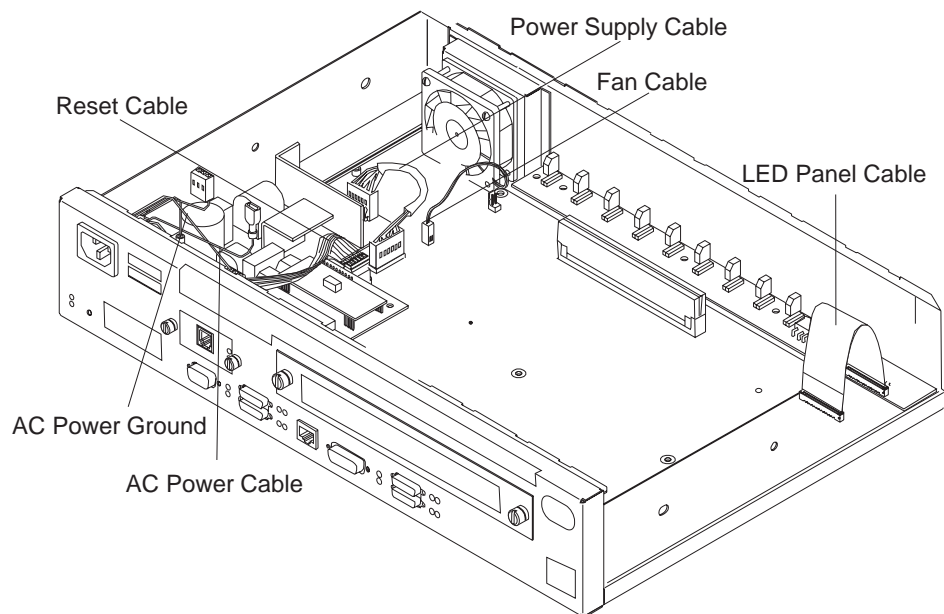
Figure 4-12. Cables Attached to the System Board - 14T Model
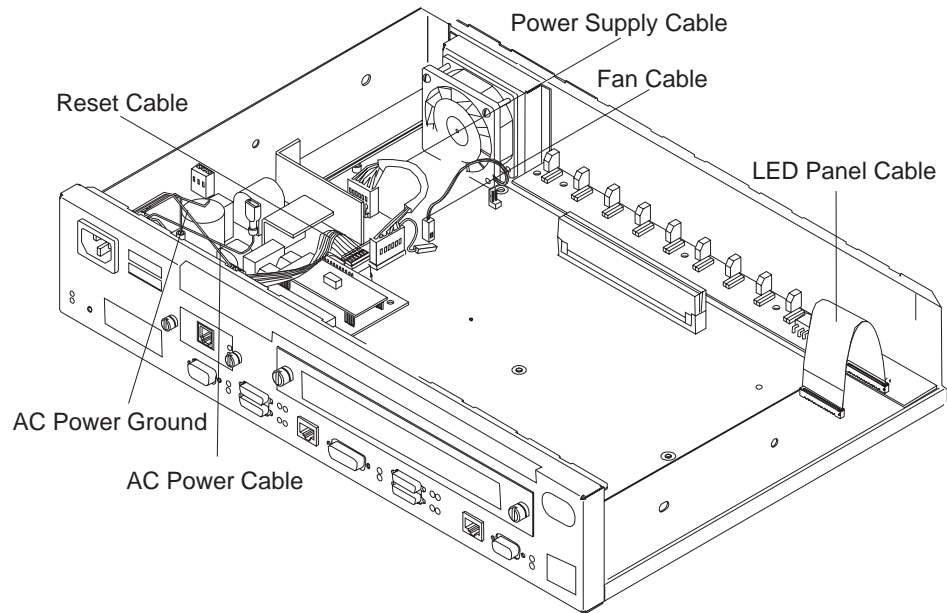
Figure 4-13. Cables Attached to the System Board - 24x Models

1 Remove any optional adapters, if installed. See "Removing the Optional Adapter" on page 4-38 for the removal procedure.

2 Remove the power supply cable connector by pulling out the retaining clips with your fingers or a screwdriver and then rocking it from front to back as you pull up.

3 Remove the fan cable by rocking it from front to back as you pull up.

4 Remove the reset card cable from the system board.

5 Remove the Adapter Enablement Feature, if installed. See "Removing the Adapter Enablement Feature" on page 4-36 for the removal procedure.

6 Remove the LED panel cable by using a screwdriver on either side of the connector to lift the blue retaining latch. Pull the cable from the latch. Note as you remove this cable that the blue coloring on the end of the cable faces the blue latch.

7 Remove the second service port, if one is installed. See "Removing the EIA 232 Service Port Feature in Models 14T and 24x" on page 4-40 or "Removing the 14.4 Kbps Modem Port Feature in Models 14T and 24x" on page 4-41 for the appropriate procedure.

8 Remove the system board retainer screws using a nut driver. Figure 4-14 on page 4-11 shows the location of the retainer screws.
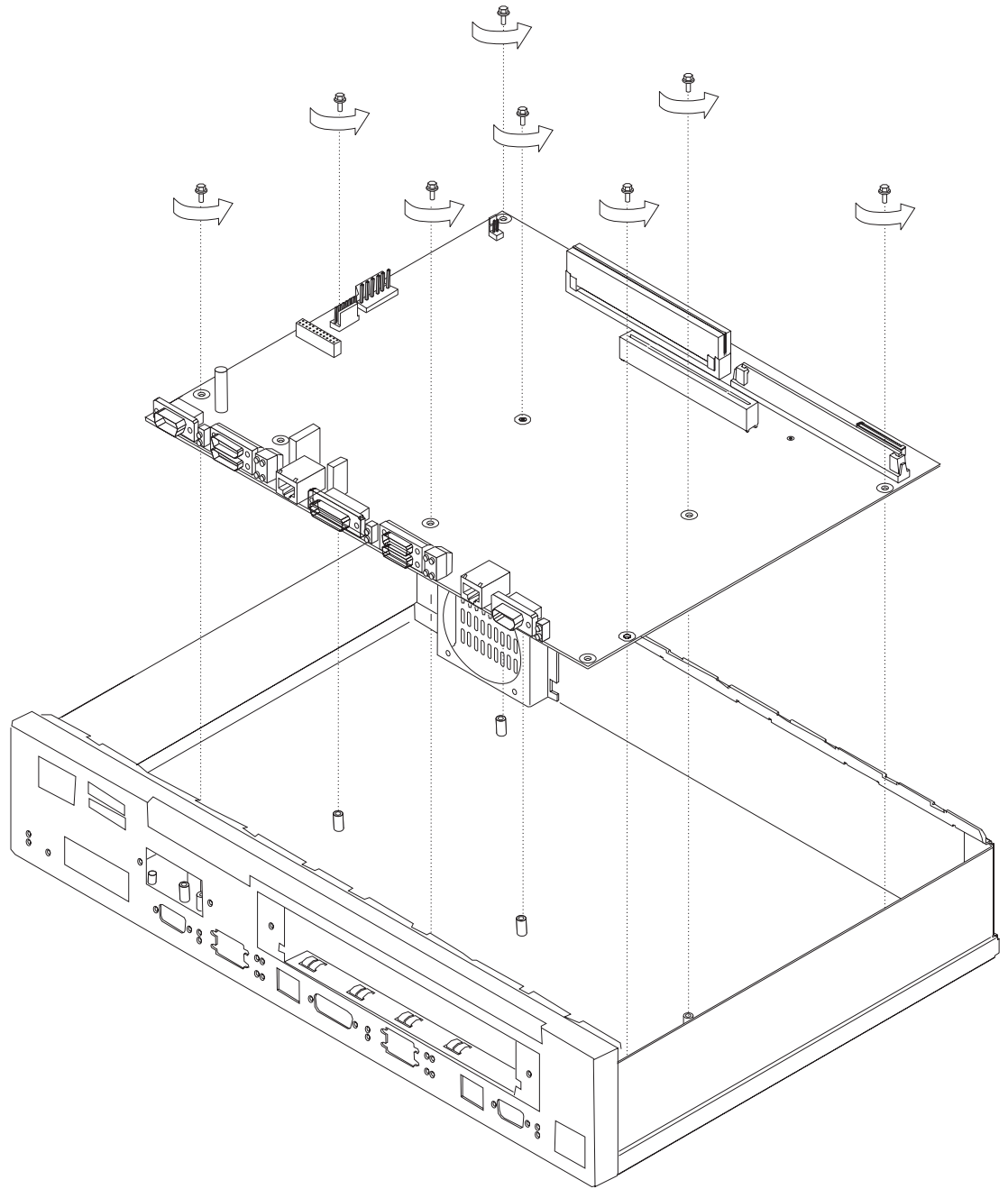
Figure 4-14. Retainer Screws on 14T and 24X Models

9 Using a nut driver, remove the hex screws from the service port and from the token-ring ports, if present on this IBM 2210.

10 Remove both screws from the bracket on the Ethernet ports, if present on this IBM 2210, noting the position of the bracket as you remove it.
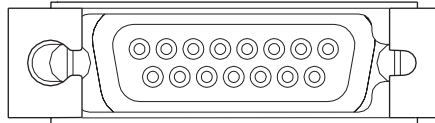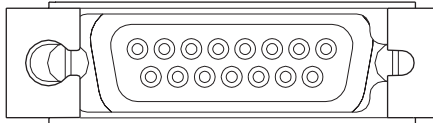
Figure 4-15. Ethernet Port

11 Using a screwdriver, remove the remaining slotted screws that attach the WAN ports to the front panel.

12 You will transfer memory modules from this system board to the new one. Go to "Removing the Dynamic Random Access Memory (DRAM) SIMM for 12x Models" on page 4-15 and "Removing the Flash and DRAM SIMMs in Model 14T and 24x" on page 4-17 for instructions for removal. After you remove the memory, lift the system board out of the unit.

Replacing the System Board for 14T and 24x Models

1 Place the system board in the IBM 2210.

2 Go to "Replacing the DRAM SIMM for 12x Models" on page 4-16 and "Installing the Flash and DRAM SIMMs in Models 14T and 24x" on page 4-18 for instructions on replacing the memory. Then, continue with step 3.

3 Use a nut driver to replace the system board retainer screws. Figure 4-16 on page 4-13 shows the location of the retainer screws.
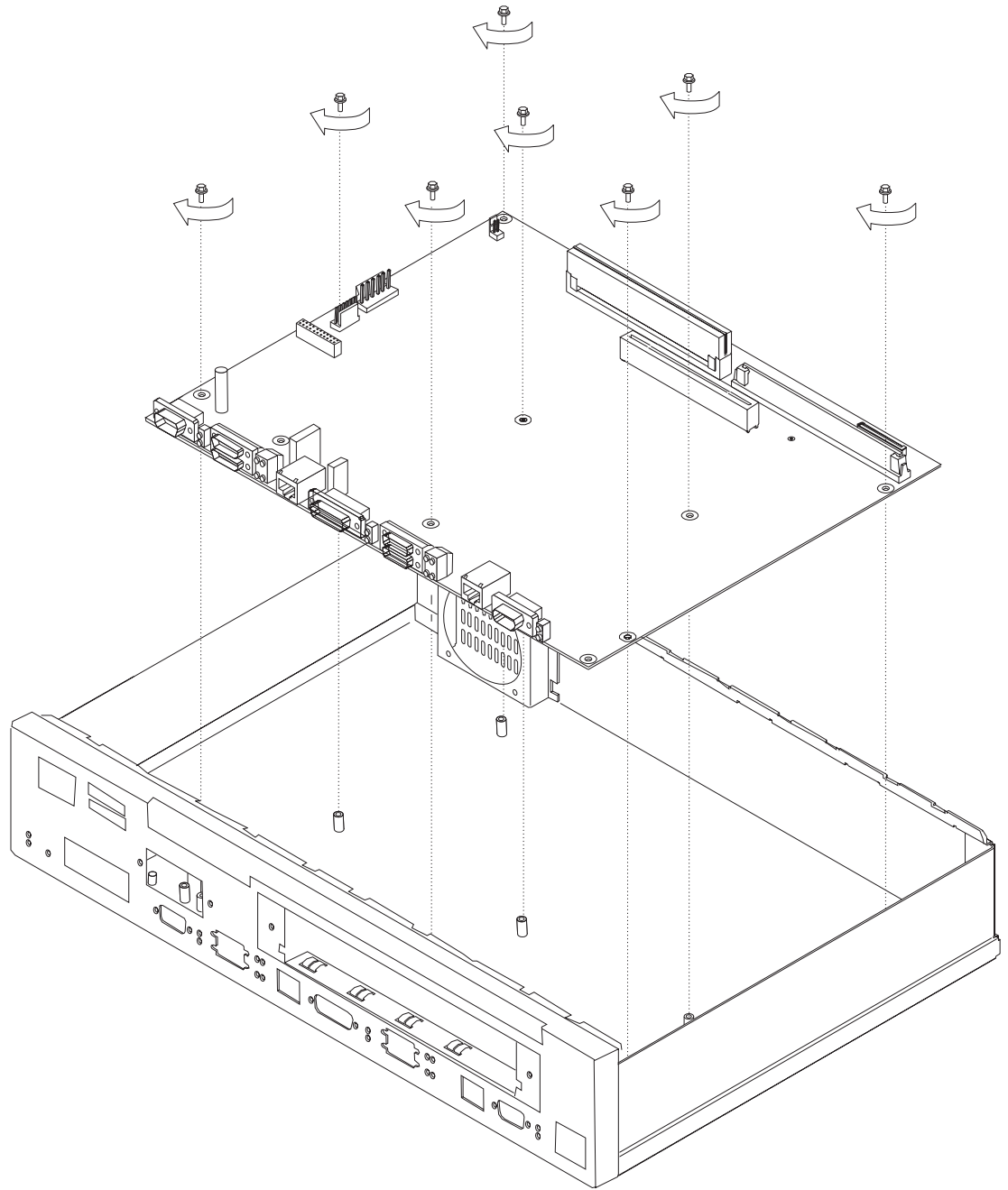
Figure 4-16. System Board Retainer Screws (14T and 24x Models)

4 Using a nut driver, replace the hex screws in the service port and in the token-ring port, if present on this IBM 2210.

5 Replace the bracket on the Ethernet port, if present. See Figure 4-8 on page 4-7 for reference.

**6** Replace the remaining slotted screws that attach the WAN ports to the front panel.
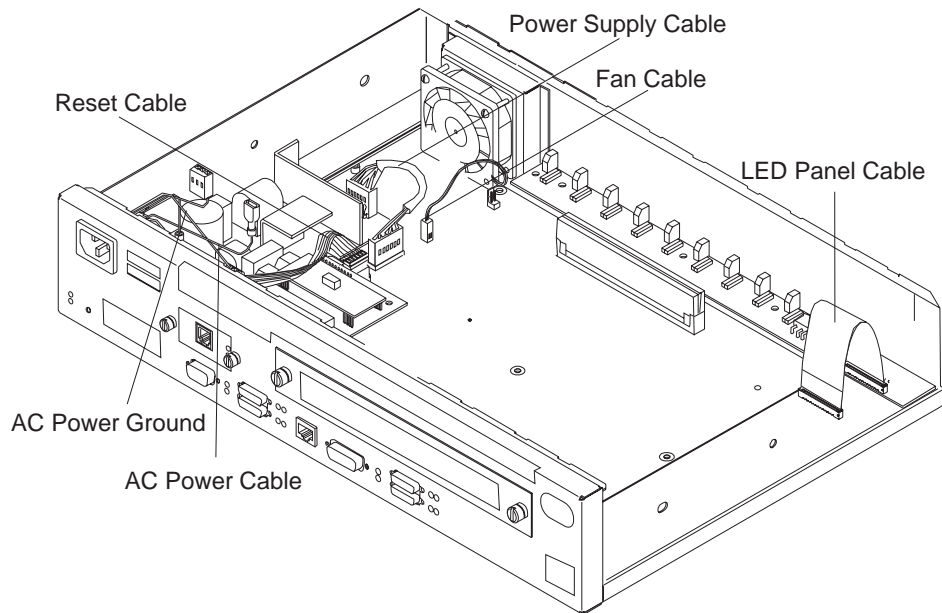
Figure   4-17. Attach Cables to the System Board - 14T Models
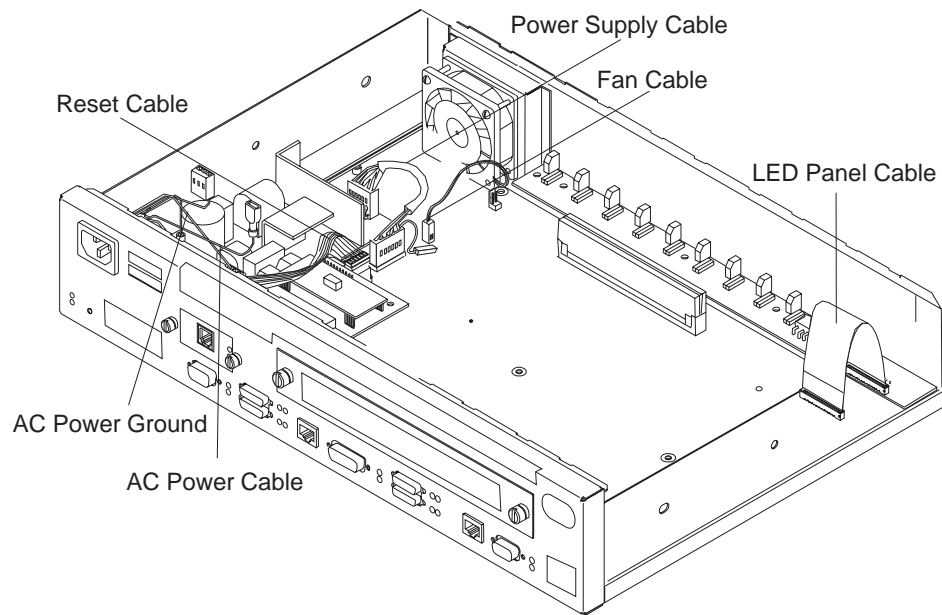
Figure   4-18. Attach Cables to the System Board - 24x Models

7 To attach the LED panel cable, slide the cable into the connector making sure that the blue coloring on the end of the cable faces the blue latch. Be sure to slide the cable into the latch as far as possible. Press down on the blue retaining latch to secure the cable.

8 Replace the Adapter Enablement Feature, if installed. See "Installing the Adapter Enablement Feature" on page 4-35 for the installation procedure.

9 Attach the reset card cable to the system board.

10 Attach the fan cable by pressing firmly down until it clicks into place.

11 Position the power supply cable connector so that the side of the connector with the tabs faces the retaining clips. Then, press firmly down until it clicks into place.

12 Reinstall the cover. See "Reinstalling the Cover" on page 4-4 for instructions.

Note: The customer must reload operational code and configuration information after the system board is replaced.

Single In-line Memory Module (SIMM)

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or installing a SIMM.

Removing the Dynamic Random Access Memory (DRAM) SIMM for 12x Models

Note: The figures in this procedure are based on the 12x models. The location of the DRAM socket is similar in the other models and the procedures are identical.
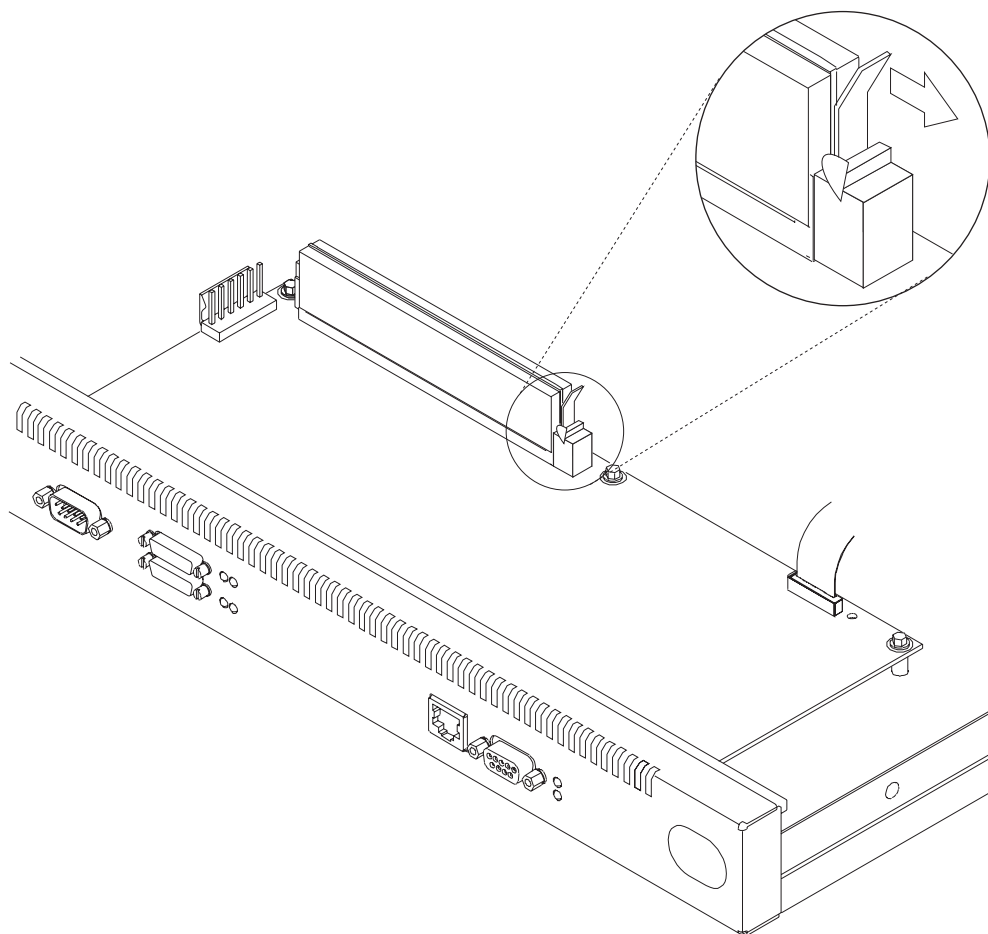
Figure 4-19. Removing the DRAM SIMM in 12x Models

1 Push back the retaining tabs located at each end of the SIMM socket. The SIMM will fall forward.

2 Remove the SIMM by gently pulling it toward you.

Replacing the DRAM SIMM for 12x Models
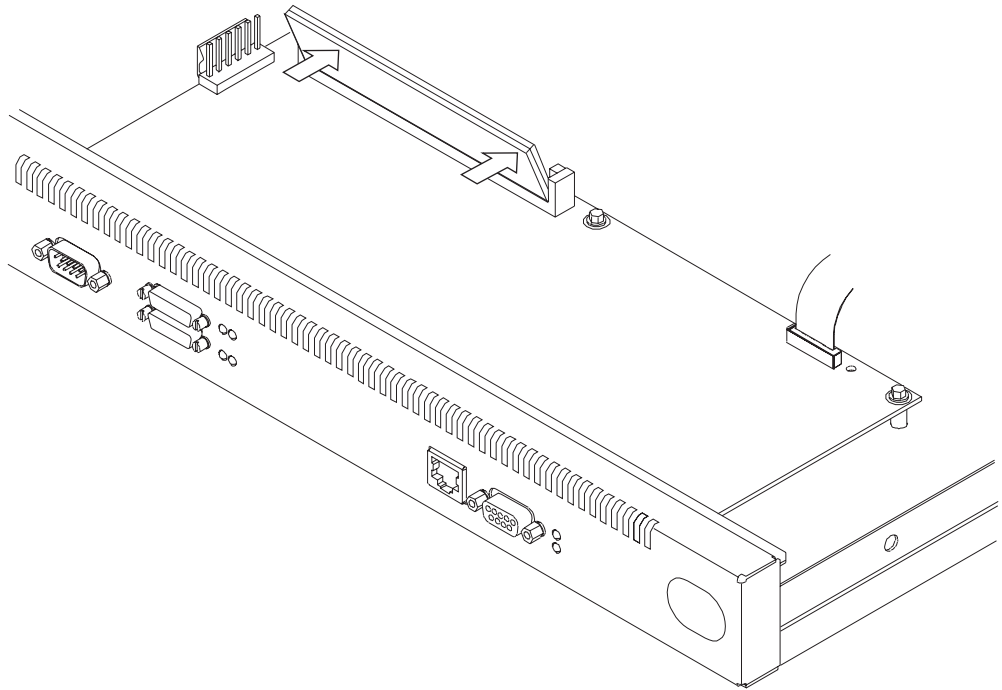
Figure   4-20. Replacing the DRAM SIMM in 12x Models

1 Tilt the top of the SIMM toward you and slide it into the retainer.

2 Press the SIMM backward until the retaining tabs are holding it securely.

Removing the Flash and DRAM SIMMs in Model 14T and 24x
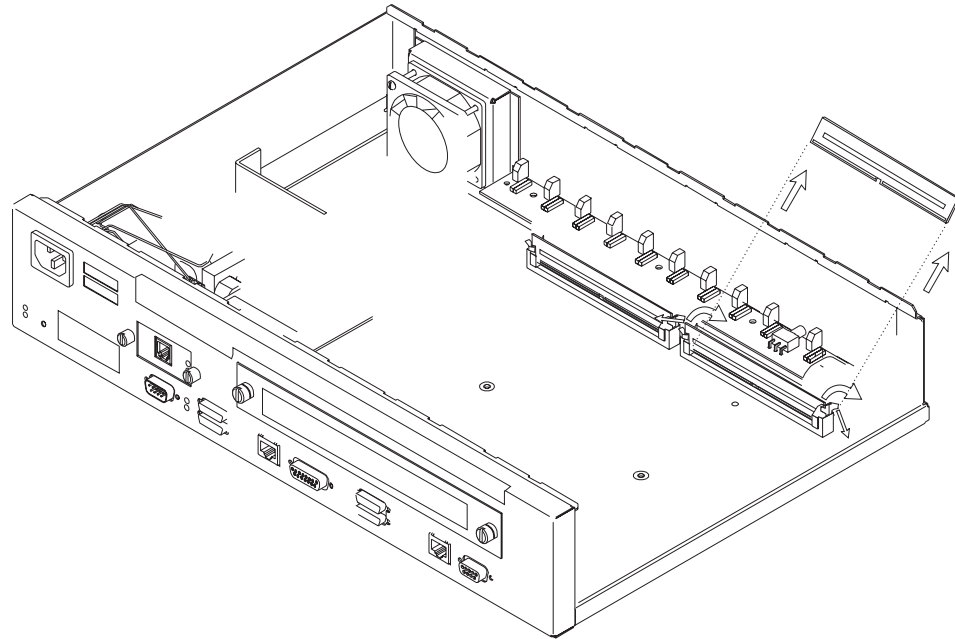
Figure   4-21. Removing the Flash SIMM (14T and 24x Models)

1 Remove the cover from the IBM 2210 as described in "Removing the Cover" on page 4-2.

2 Push back the retaining tabs located at each end of the SIMM socket. The SIMM will fall backwards.

3 Remove the SIMM by gently pulling it away from you.

4 Replace the cover on the IBM 2210 as described in "Reinstalling the Cover" on page 4-4.

5 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Installing the Flash and DRAM SIMMs in Models 14T and 24x

| **Note:** When using 32 MB of memory with a 14T or 24x model you must be at
| revision level 2.34 or higher of the PROM Load/Dump Program.

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or
installing a flash SIMM.
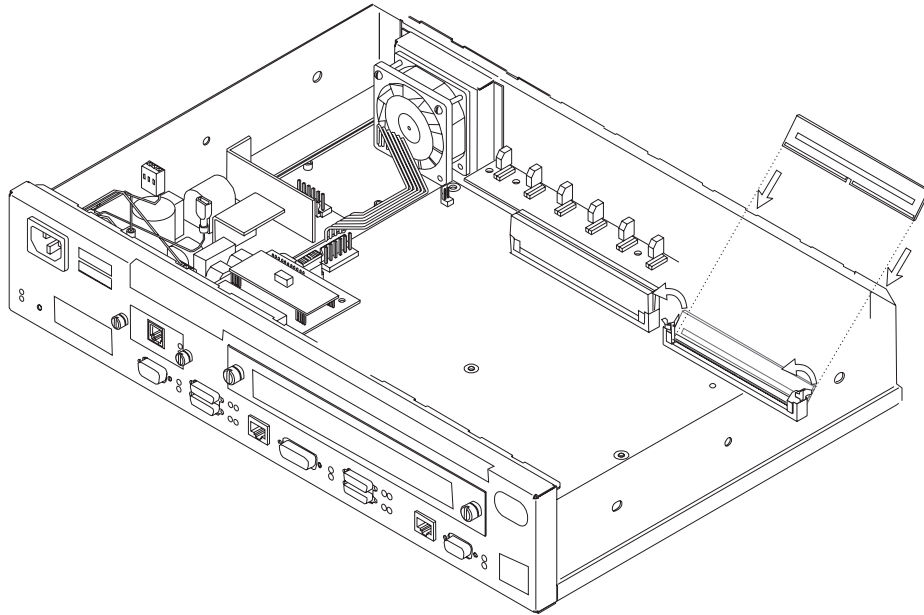
Figure 4-22. Installing the Flash SIMM (14T and 24x Models)

1 Remove the cover from the IBM 2210 as described in "Removing the Cover"
on page 4-2.

2 Tilt the top of the SIMM away from you and slide it into the retainer.

3 Press the SIMM forward until the retaining tabs are holding it securely.

4 Replace the cover on the IBM 2210 as described in "Reinstalling the Cover"
on page 4-4.

5 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify
Operation" on page 2-23.

Power Supply

Removing the Power Supply for 12x Models
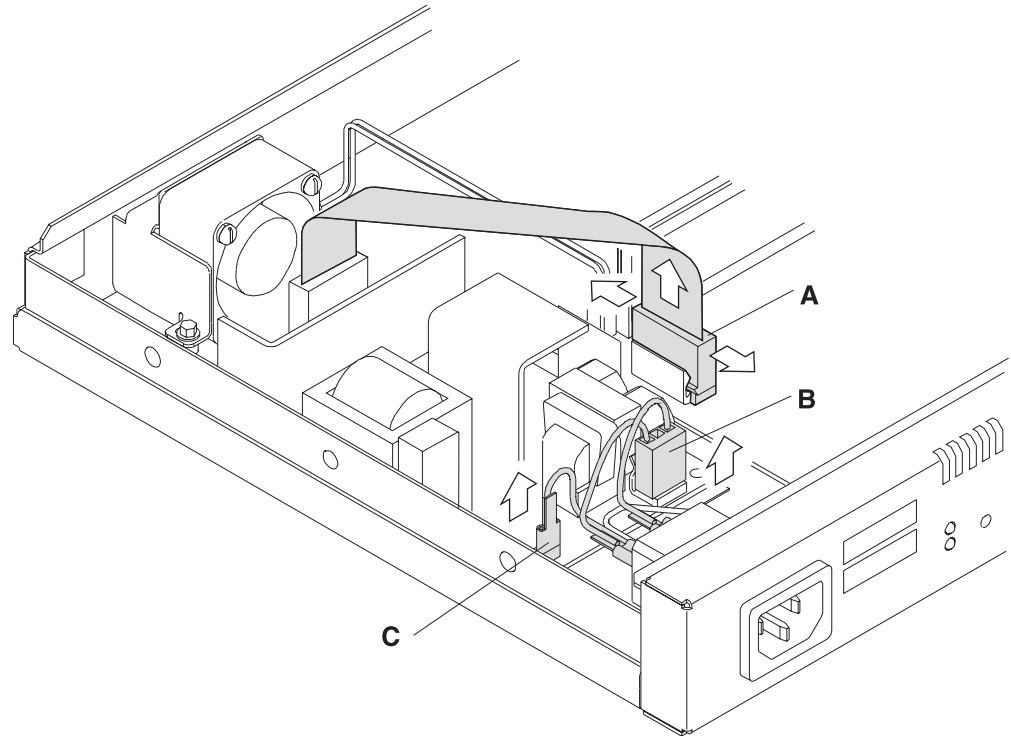
Figure   4-23. Connections to the Power Supply (12x Models)

1 Remove the connector to the system board (**A**) by pulling out the retaining clips with your fingers or a screwdriver and then rocking the connector from front to back as you pull up.

2 Remove the connector to the ac power source (**B**).

3 Remove the spade lug terminal ground for the ac power source (**C**), using needle-nose pliers.

Regulator
Protection
Tab
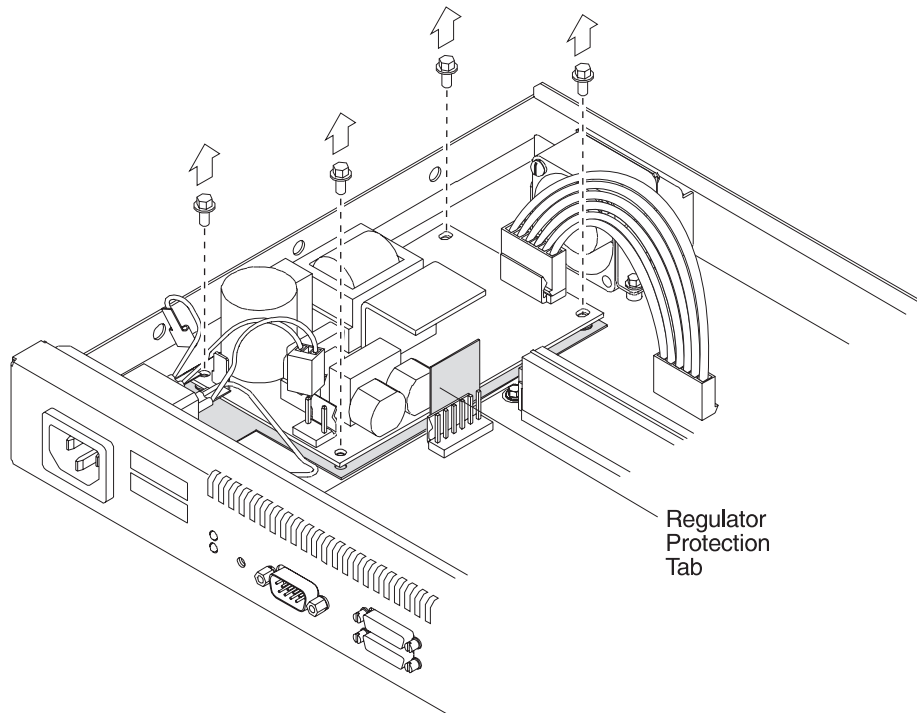
Figure   4-24. Removing the Screws from the Power Supply (12x Models)

4 Remove the four corner hex screws from the power supply.

5 Lift the power supply out of the system unit. Be sure to leave the insulator in place when you remove the power supply and note the position of the regu-lator protection tab.

Replacing the Power Supply for 12x Models
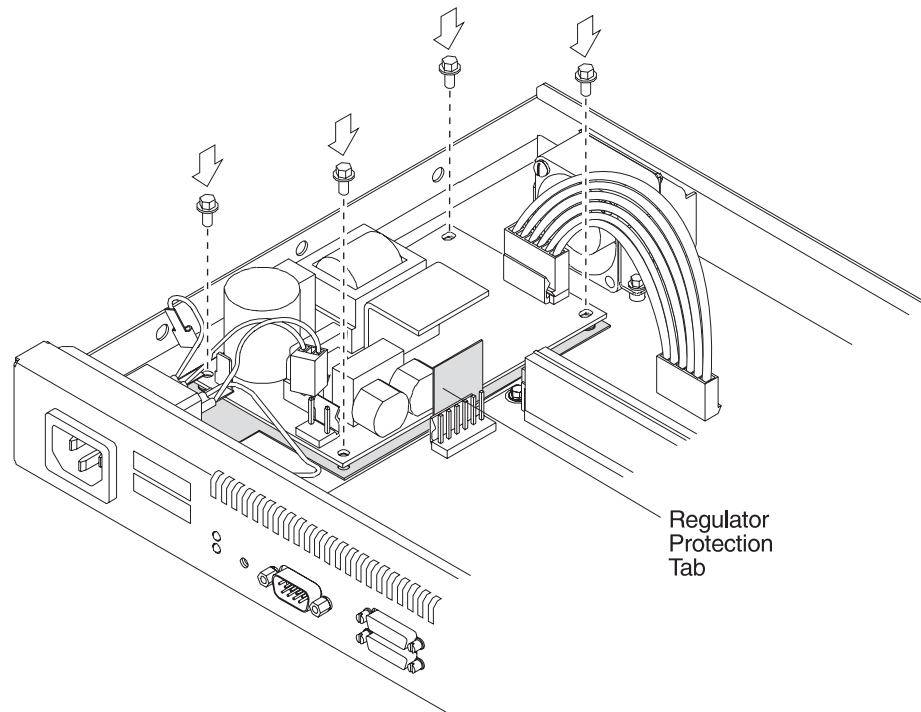
Figure   4-25. Replacing the Corner Screws (12x Models)

1 Place the power supply on top of the insulator, being sure the regulator protection tab is perpendicular to the base of the unit. Replace the four hex screws.
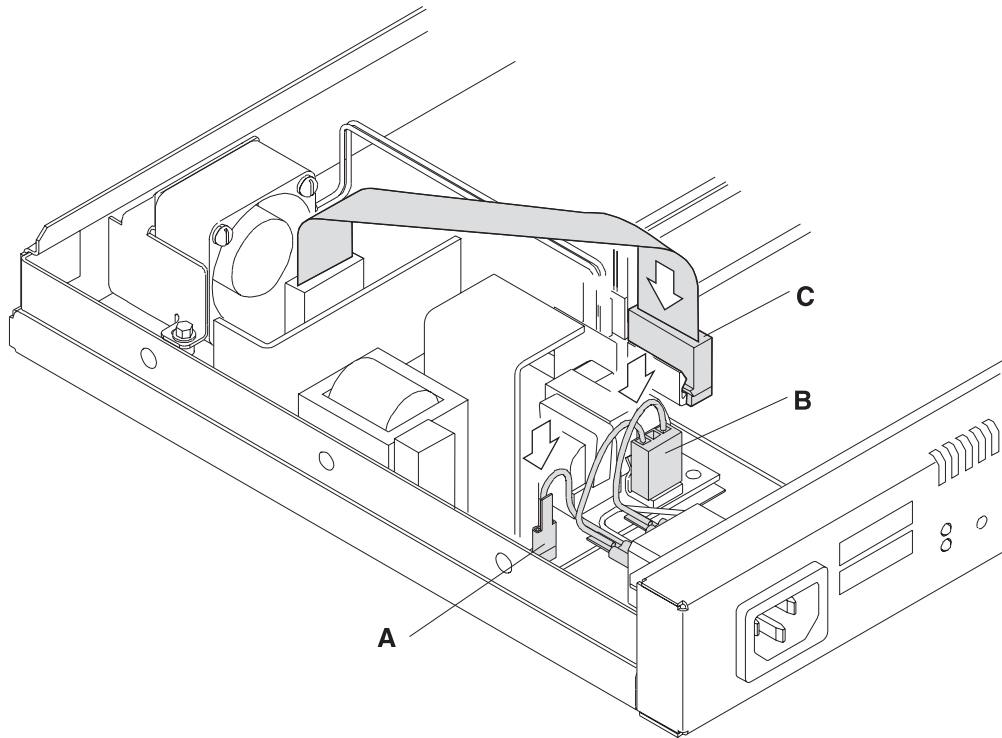
Figure   4-26. Connections to the Power Supply (12x Models)

2 Replace the spade lug terminal ground (**A**).

3 Replace the connector to the ac power source (**B**).

4 Position the connector to the system board (**C**) so that the side of the con-
nector with the tabs faces the retaining clips. Then, press firmly down until it
clicks into place. Be sure it is firmly seated.

Removing the Base Power Supply for 14T and 24x Models

To remove the power supply:

1 Remove the screws that attach the power supply cover to the chassis as
shown in Figure 4-27 on page 4-23.
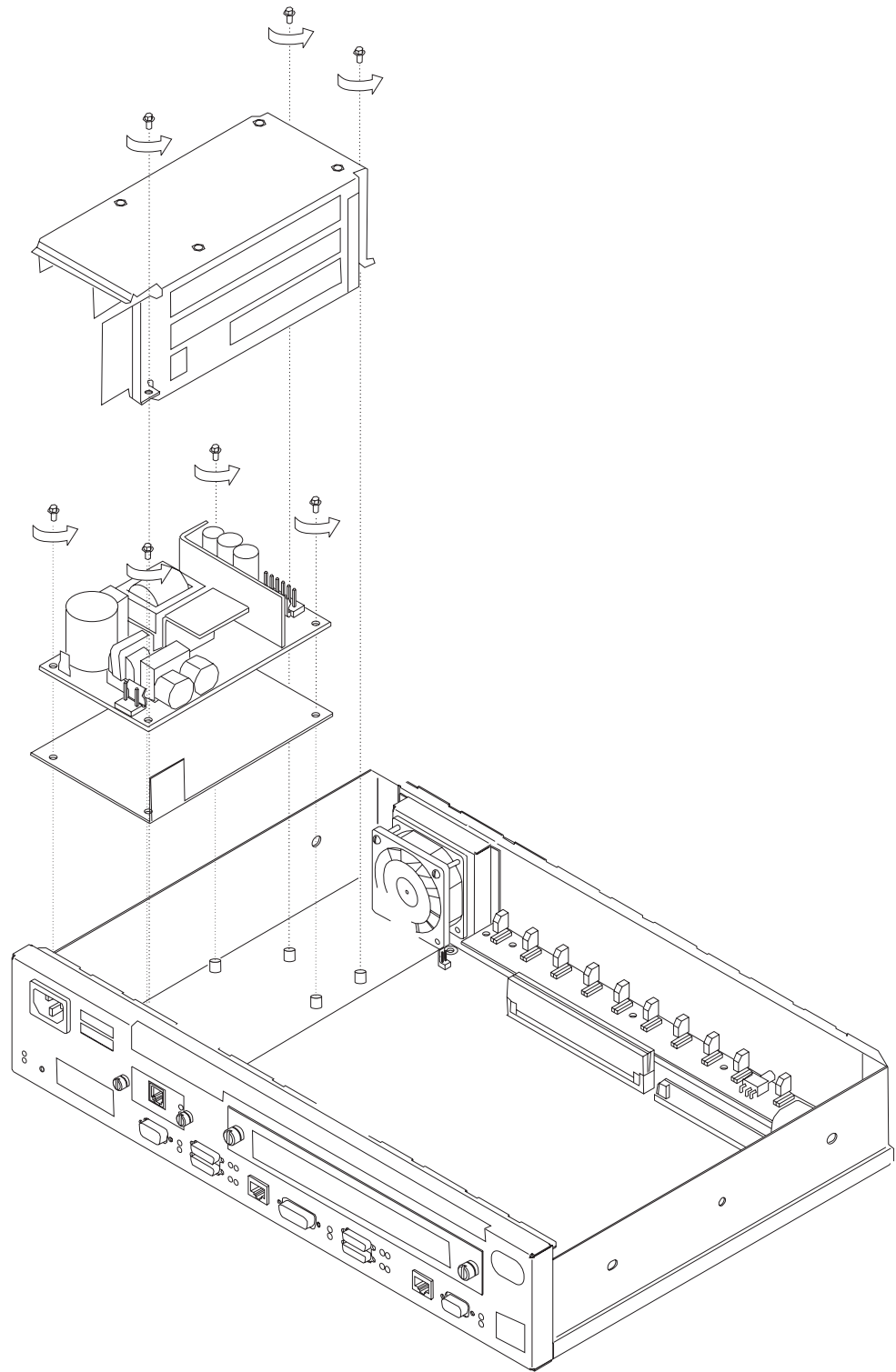
Figure   4-27. Removing the Screws from the Power Supply (14T and 24x Models)

2 Remove the connector to the system board by pulling out the retaining clips
with your fingers or a screwdriver and then rocking it from front to back as
you pull up.
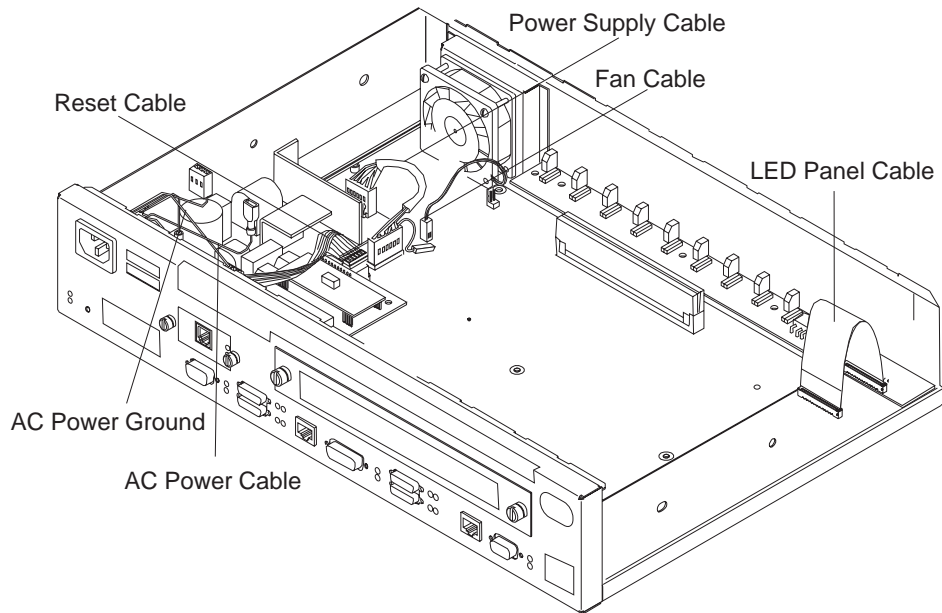
Figure 4-28. Connections to the Power Supply (14T and 24x Models)

3 If the Adapter Enablement Feature feature is installed, remove the connector to the adapter riser card.

4 Remove the power supply cover by sliding the cover toward the fan until the leading edge of the cover clears the front panel, then lifting.

5 Remove the connector from the adapter power supply, if installed, to the ac power source.

6 Remove the connector to the ac power source.

7 Remove the four corner hex screws from the power supply.

8 Lift the power supply out of the system unit. Be sure to leave the insulator in place when you remove the power supply and note the position of the regulator protection tab.

Replacing the Power Supply for 14T and 24x Models

1 Place the power supply on top of the insulator, being sure the regulator protection tab is perpendicular to the base of the unit. Replace the four hex screws.
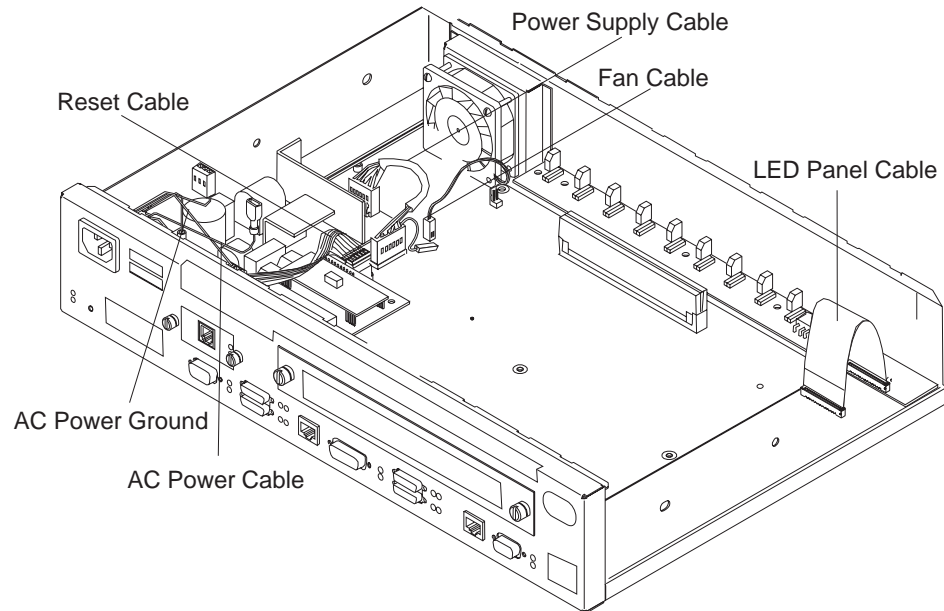
Figure   4-29. Connections to the Power Supply (14T and 24x Models)

2 Replace the connector to the ac power source.

3 Replace the connector from the adapter power supply, if installed, to the ac power source.
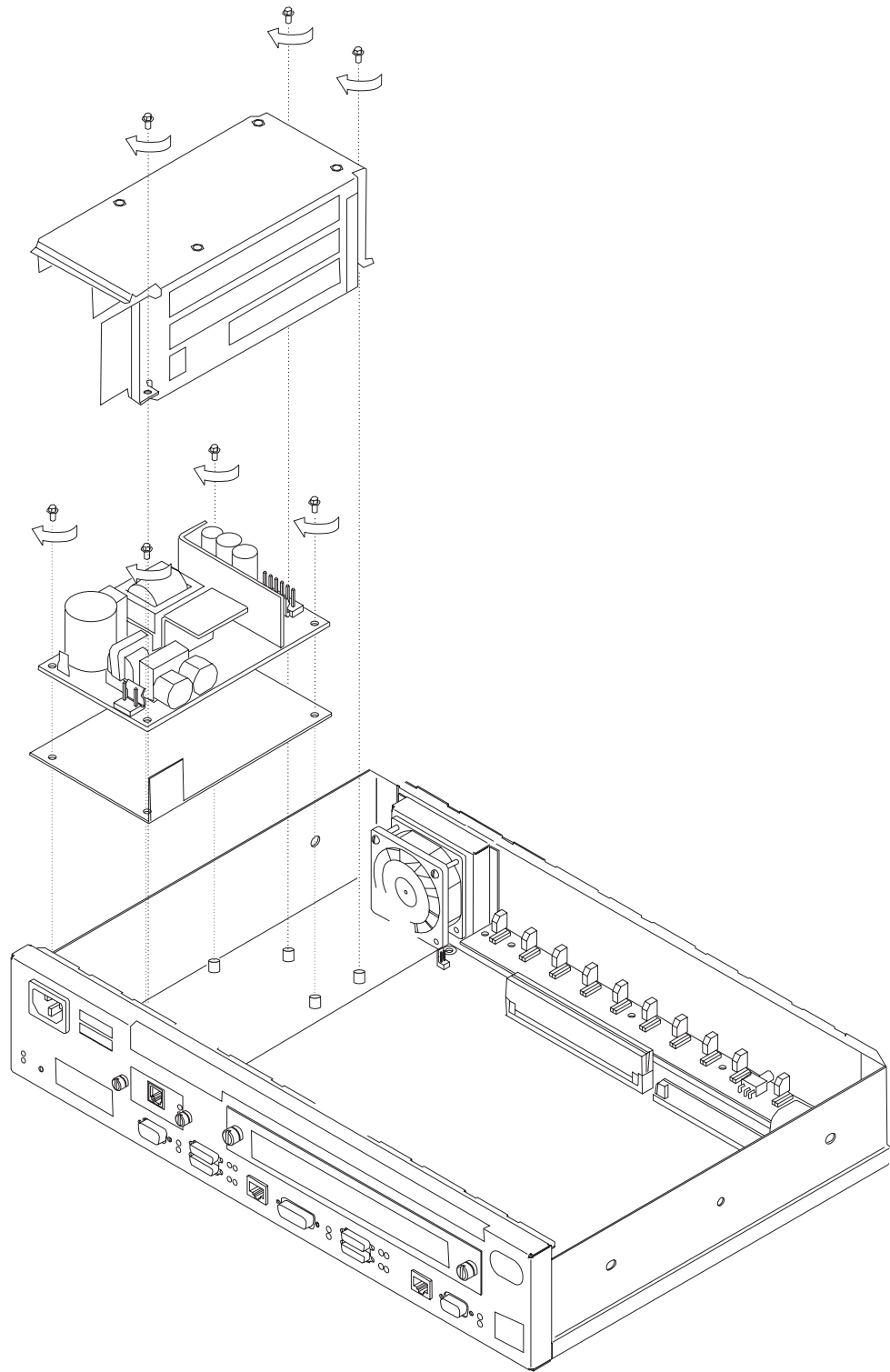
Figure   4-30. Replacing the Power Supply Cover

4 Replace the power supply cover over the power supply by sliding the cover forward until the leading edge is beneath the front panel. Make sure that the reset card cable is beneath the cover and not between the cover and the front panel.

Also make sure that the connectors feed through the space between the side and rear of the cover and the connectors without the jumpers are connected to the power supplies.

5 Replace the screws that attach the power supply cover to the chassis as shown in Figure 4-30 on page 4-26.

6 If the Adapter Enablement Feature is installed, position the connector to the adapter riser card so that the side of the connector with the tabs faces the retaining clips. Then, press firmly down until it clicks into place. Be sure it is firmly seated.

7 Position the connector to the system board so that the side of the connector with the tabs faces the retaining clips. Then, press firmly down until it clicks into place. Be sure it is firmly seated.

8 If the Adapter Enablement Feature is installed, connect the jumpers between the base power supply and the adapter power supply together.

Fan

Note: For the 14T and 24x models, removing the power supply cover will ease the fan removal process. Instructions on removing and replacing the power supply cover are contained in "Removing the Base Power Supply for 14T and 24x Models" on page 4-22 and "Replacing the Power Supply for 14T and 24x Models" on page 4-25.

Removing the Fan
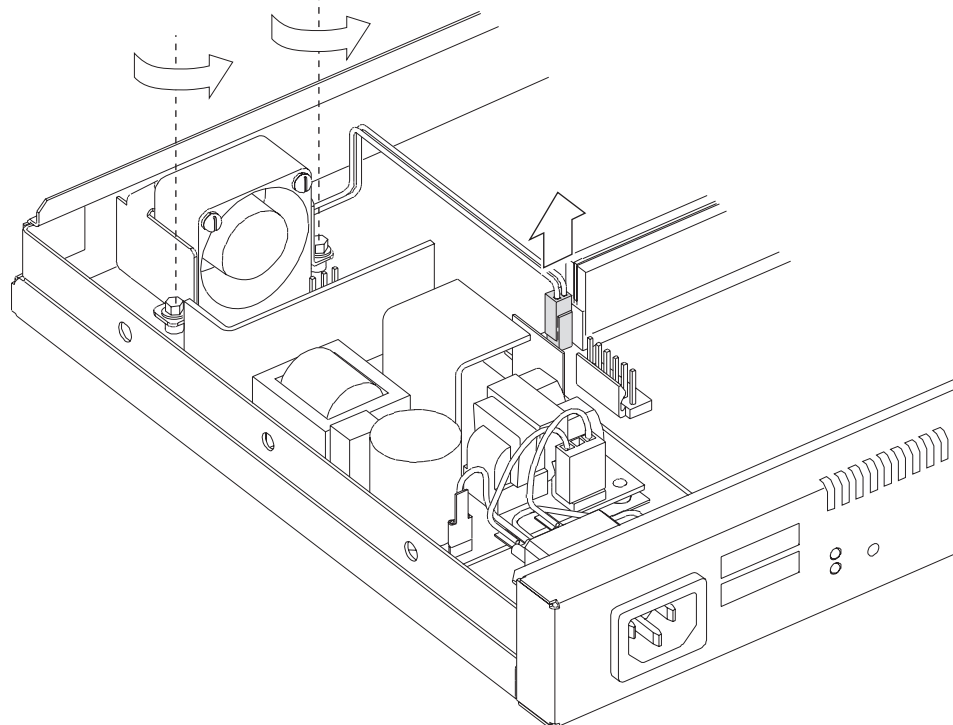
Figure 4-31. Removing the Fan

1 Remove the connector to the system board by rocking it from front to back as you pull up.

2 Remove the screws from the mounting bracket that encases the fan on the 12x models. On the 14T and 24x models, remove the screws that attach the fan to the rear of the IBM 2210 chassis.

3 Lift the fan from the system unit.

Replacing the Fan
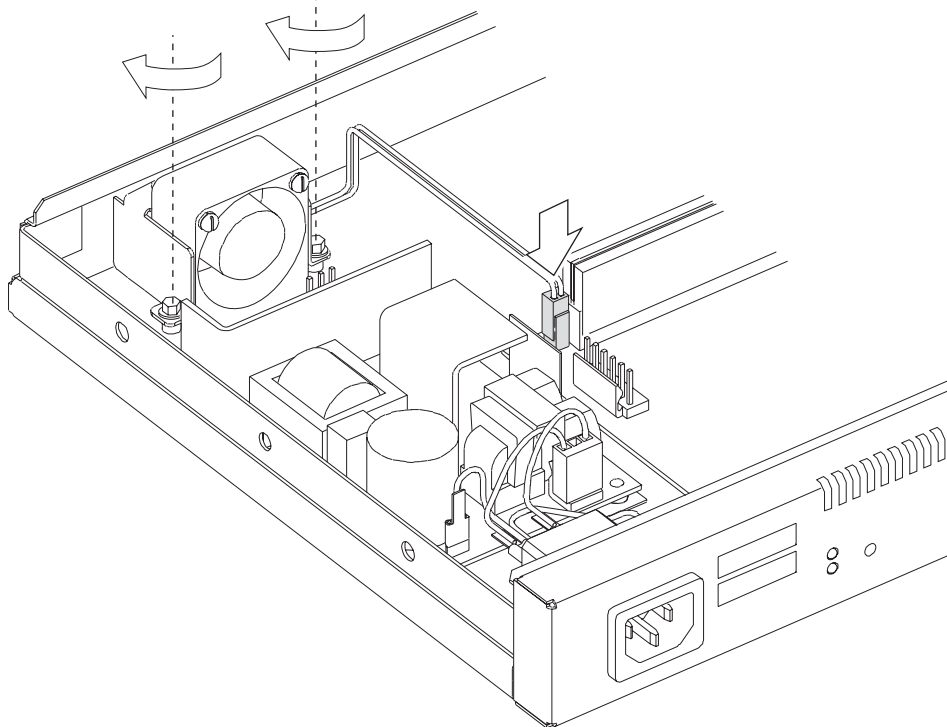
Figure 4-32. Replacing the Fan

1 Place the fan in the system unit, making sure that it is positioned so that it fits tightly against the wall of the IBM 2210 and the cable faces the center of the machine.

2 Replace the screws that attach the fan to the bottom of the machine on the 12x models. On the 14T and 24x models, replace the screws that attach the fan to the rear of the IBM 2210 chassis.

3 Attach the connector to the system board by pressing down firmly until it clicks into place.

LED Panel

Removing the LED Panel for 12x Models
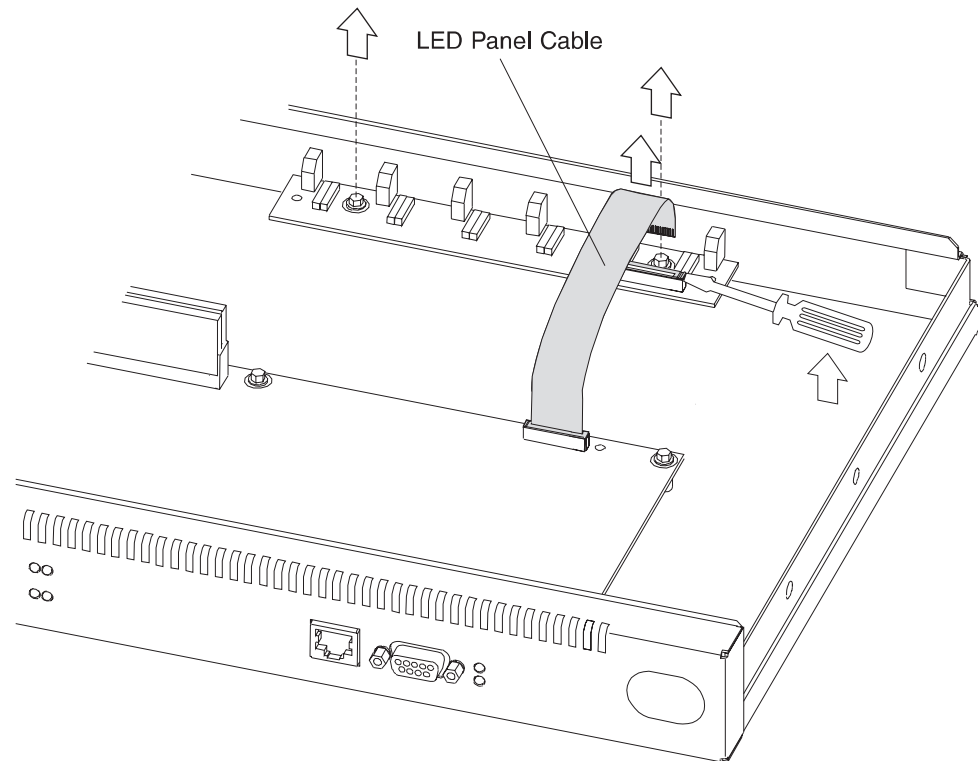
Figure   4-33. Removing the LED Panel (12x Models)

1 To remove the LED panel cable, use a screwdriver on either side of the connector to lift the blue retaining latch. Pull the cable from the latch. Note as you remove this cable that the blue coloring on the end of the cable faces the blue latch.

2 Remove the two screws that attach the LED panel to the floor of the machine.

3 Slide the LED panel toward the center of the machine until the bulbs clear the wall of the system unit.

Replacing the LED Panel for 12X Models

LED Panel Cable
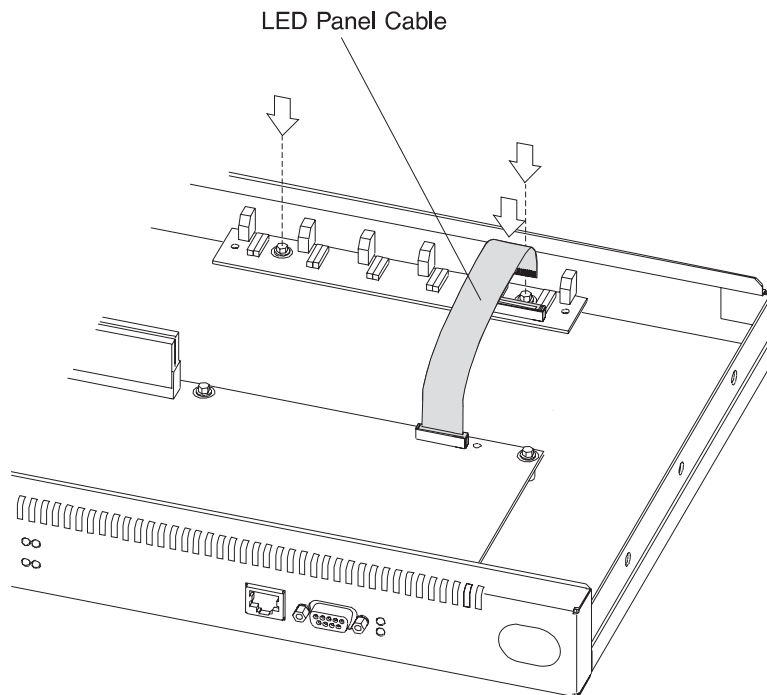
Figure   4-34. Replacing the LED Panel (12x Models)

1 Slide the LED panel into place, making sure the LED bulbs fit into the openings on the wall of the machine.

2 Replace the two screws that attach the LED panel to the floor of the machine.

3 Attach the LED panel cable by sliding the cable into the connector, making sure that the blue coloring on the end of the cable faces the blue latch. Be sure to slide the cable into the latch as far as possible. Press down on the blue retaining latch to secure the cable.

Removing the LED Panel for 14T and 24x Models
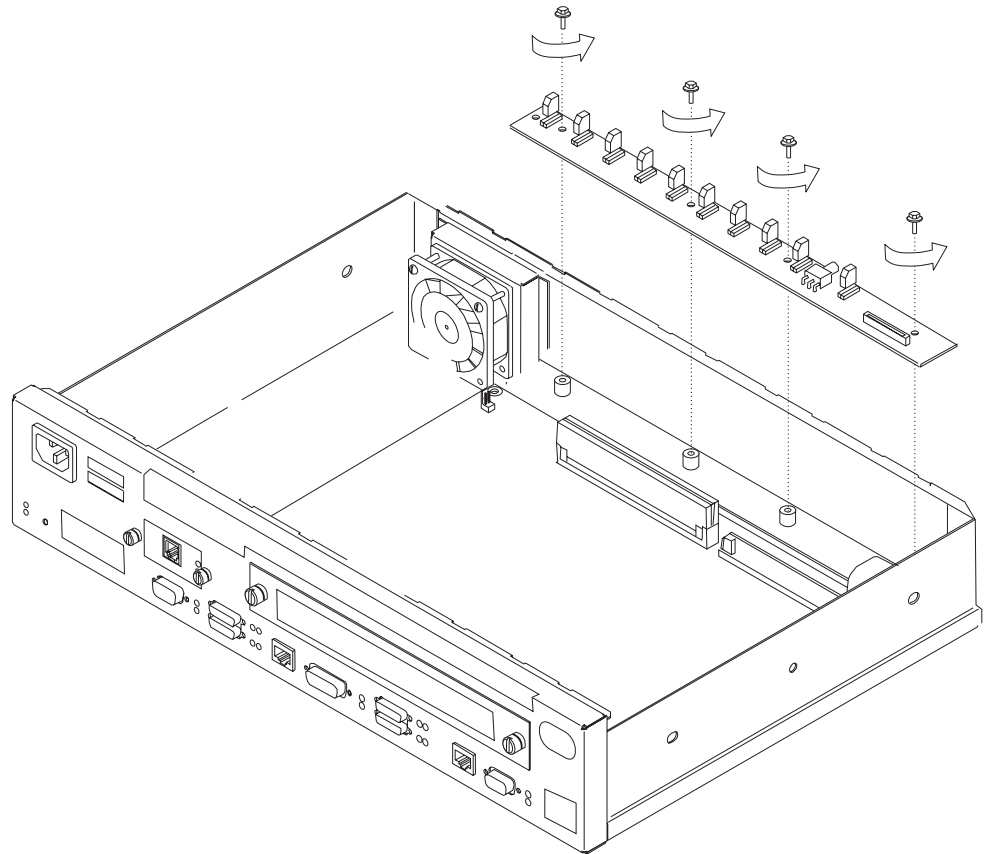
Figure   4-35. Removing the LED Panel (14T and 24x Models)

1 To remove the LED panel cable, use a screwdriver on either side of the con-
nector to lift the blue retaining latch. Pull the cable from the latch. Note as
you remove this cable that the blue coloring on the end of the cable faces the
blue latch.

2 Remove the four screws that attach the LED panel to the floor of the
machine.

3 Slide the LED panel toward the center of the machine until the bulbs clear
the wall of the system unit.

Replacing the LED Panel for 14T and 24X Models
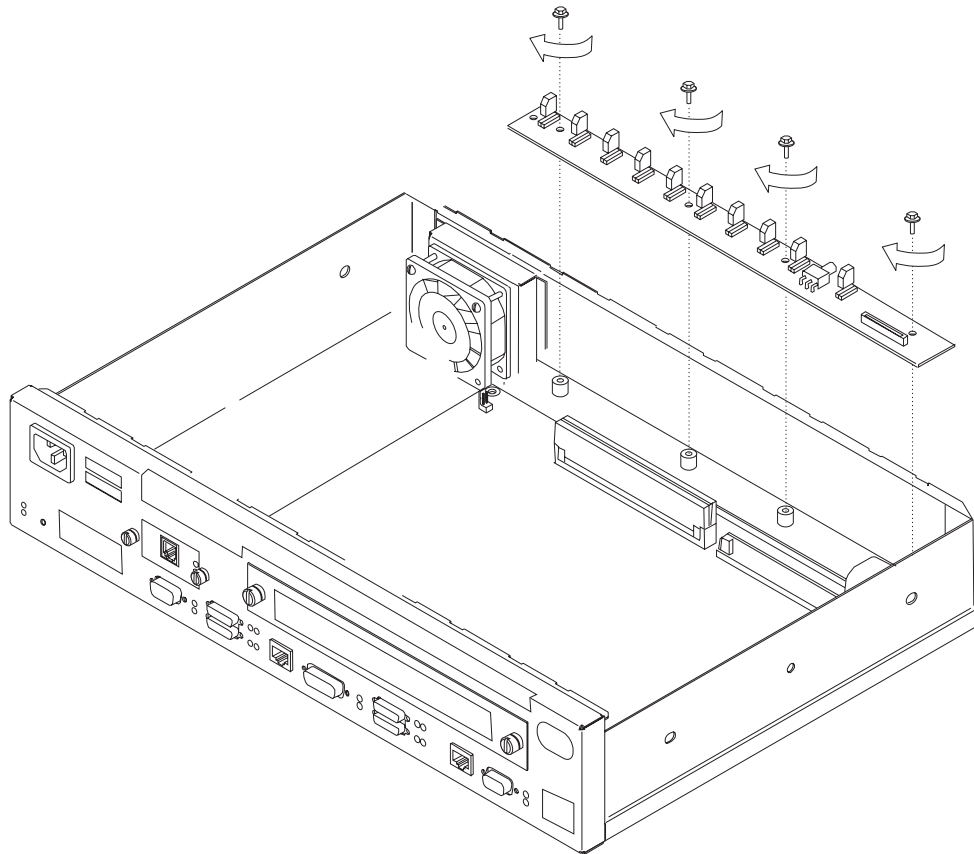
Figure 4-36. Replacing the LED Panel (14T and 24x Models)

1 Slide the LED panel into place, making sure the LED bulbs fit into the openings on the wall of the machine.

2 Replace the four screws that attach the LED panel to the floor of the machine.

3 Attach the LED panel cable by sliding the cable into the connector, making sure that the blue coloring on the end of the cable faces the blue latch. Be sure to slide the cable into the latch as far as possible. Press down on the blue retaining latch to secure the cable.

Installing An Optional Adapter in Models 14T and 24x

Installing an optional adapter in a model 14T or 24x requires that the IBM 2210 Adapter Enablement Feature be already installed. To determine that the feature is installed, remove the faceplate, look into the opening, and look for the guide rails.

Note: If you are installing a 4- or 8-port Dial Access Adapter with the x4x model you must have or install the PROM Load/Dump Program revision level 2.40 or higher.

Note: If you are replacing one adapter type with a different adapter type and you are not using the configuration program, use the **talk 6 delete interface** command

| to delete any virtual interfaces, for example, dial circuits, associated with the
| adapter prior to removing the adapter. The **talk 6 delete interface** command
| deletes the interface you explicitly state in the command line. The interface in
| current use will not be deleted unless you specify that interface name in the
| command line.

If the guide rails are visible, the feature is installed and you can continue the installation at "Installing Optional Adapters" on page 4-36.

If the guide rails are not visible, you should begin the installation at "Installing the Adapter Power Supply."

Installing the Adapter Power Supply

1 Remove the cover as directed in "Removing the Cover" on page 4-2, if not already removed.

2 Remove the power supply cover and keep the three fastening screws. See "Removing the Base Power Supply for 14T and 24x Models" on page 4-22 for detailed instructions.

3 Turn over the cover.

4 Place the insulator inside the top of the cover.

5 Place the power supply on the insulator and fasten it in position to the top of the power supply cover using the four securing screws.

6 Attach the dc power cable to the power supply and feed the cable through the access slot.

7 Attach the ac power cable to the power supply and replace the cover over the existing power supply, using the original screws. Make sure that the lip of the cover goes under the lip of the frame.

Assembling the Riser Card

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or installing the riser card to the system board.
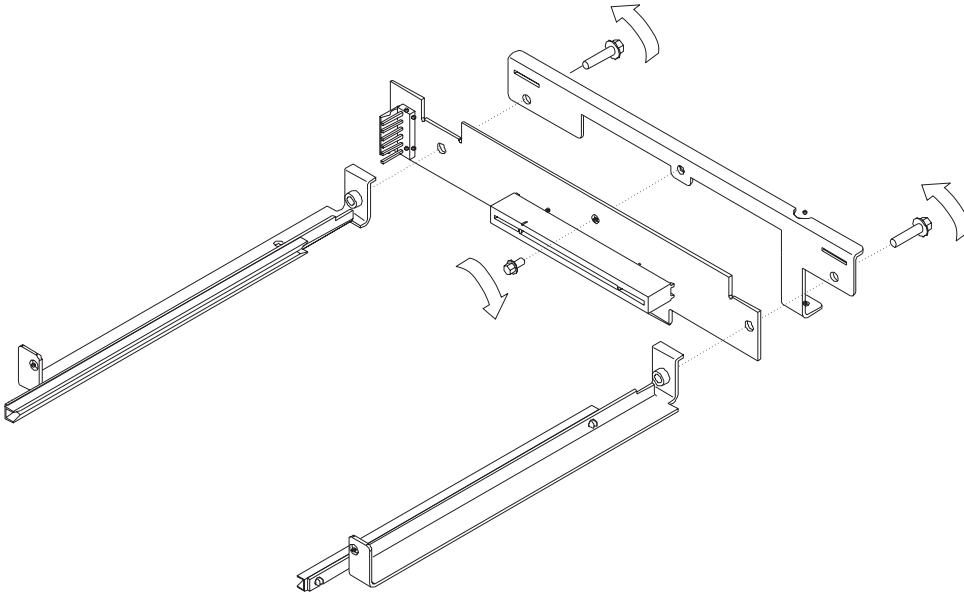
Figure 4-37. Assembling the Riser Card

1 Attach the riser card Assembly with the supplied screw to the riser brace as shown in Figure 4-37.

2 Attach the left guide assembly to the riser brace.

3 Attach the right guide assembly to the riser brace.

Note: Position the guide assemblies as far from each other as possible before tightening screws.

Installing the Adapter Enablement Feature
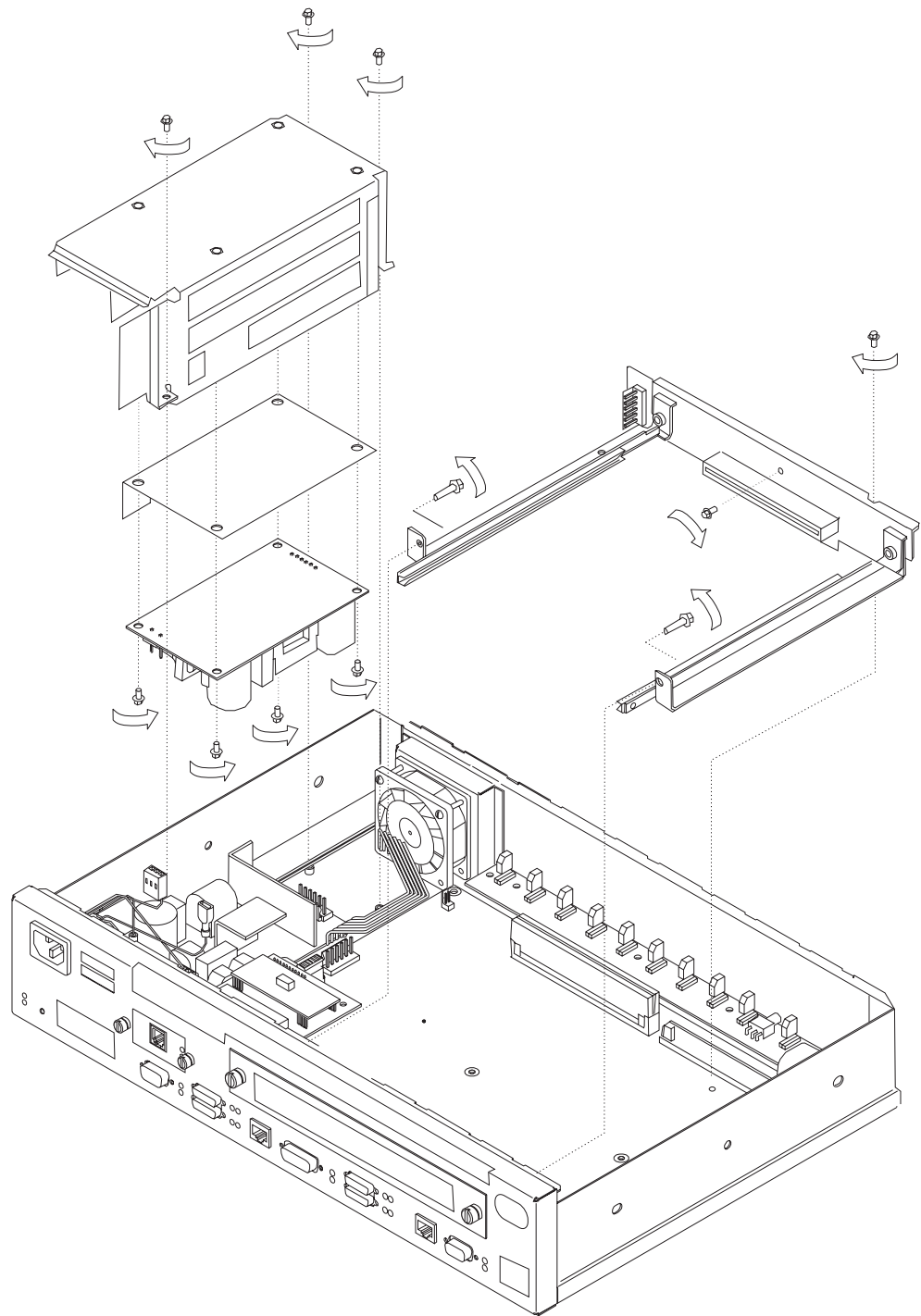
Figure   4-38. Installing the Adapter Enablement Feature

1 Carefully place the assembly in position and plug the riser card assembly into the socket on the system board.

2 Fasten the rear of the assembly to the system board using the supplied screw.

3 Fasten the front of the assembly to the front frame using the supplied screws.

4 Insert an optional adapter into the module slot to ensure the adapter fits into the assembly correctly.

5 Tighten all screws on the assembly.

6 Attach the dc power cable to the connector on the left-hand side of the riser card assembly. Make sure the connector with the jumper is connected to the riser card.

7 Connect the jumpers between the base power supply and the adapter power supply together.

8 Replace the IBM 2210 cover as described in "Reinstalling the Cover" on page 4-4.

9 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Removing the Adapter Enablement Feature

1 Remove the IBM 2210 cover as described in "Removing the Cover" on page 4-2.

2 Detach the dc power cable from the connector on the left-hand side of the riser card assembly.

3 Remove the front screws of the assembly from the front frame.

4 Remove the screw that fastens the rear of the assembly to the system board.

5 Carefully lift the assembly and riser board out of the socket on the system board.

6 Remove the adapter power supply from the power supply cover.

Installing Optional Adapters

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or installing any of the optional adapters.
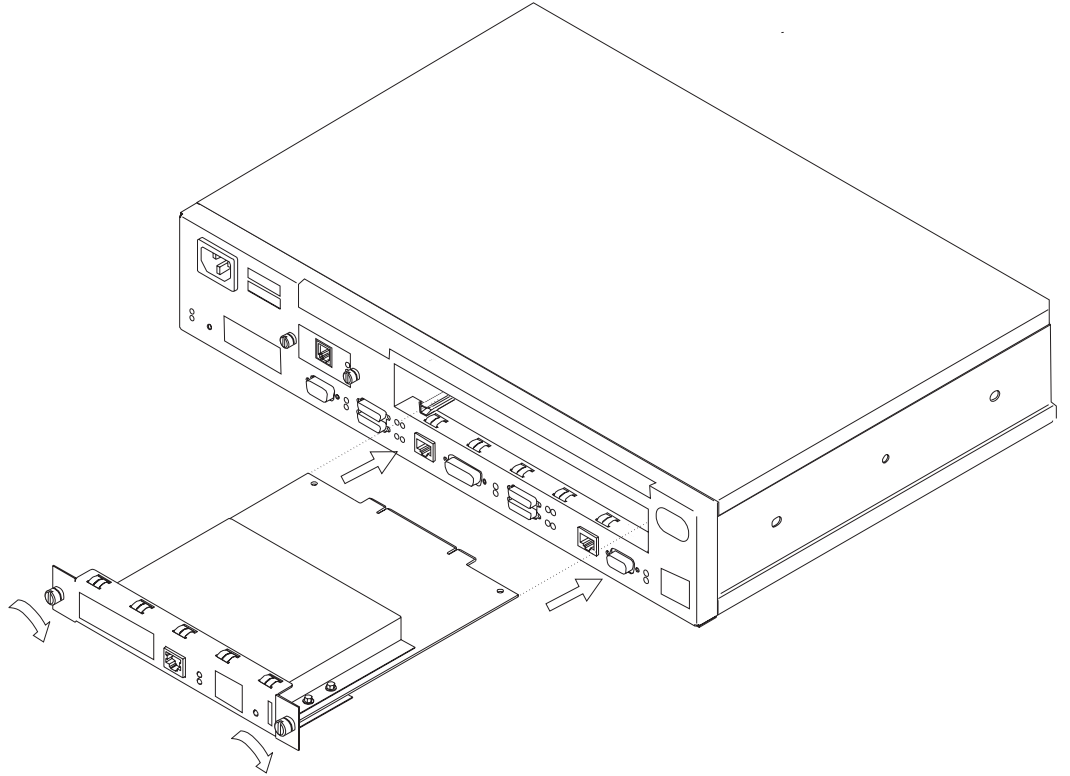
Figure 4-39. Installing the Optional Adapter (Actual adapter may appear different)

1 Unplug the power cord.

2 Remove the blank faceplate by loosening the two screws and pulling the plate toward you.

3 Check to ensure that the Adapter Enablement Feature is installed. Look inside the module slot and ensure that the guide rails for the card are present.

If the guide rails are not visible, an authorized service representative must install the Adapter Enablement Feature. If you have not ordered the Adapter Enablement Feature, you should do so before proceeding.

If the feature is not installed, refer to the *IBM 2210 Nways Multiprotocol Router Service and Maintenance Manual*.

4 Remove the adapter from the antistatic bag.

5 While holding the adapter carefully by the front plate insert it into the opening. Make sure that the edges of the adapter line up with the guide rails.

6 Press the adapter into the slot.

7 Secure the adapter in place by tightening the screws.

8 Plug the power cord into the outlet.

9 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Removing the Optional Adapter
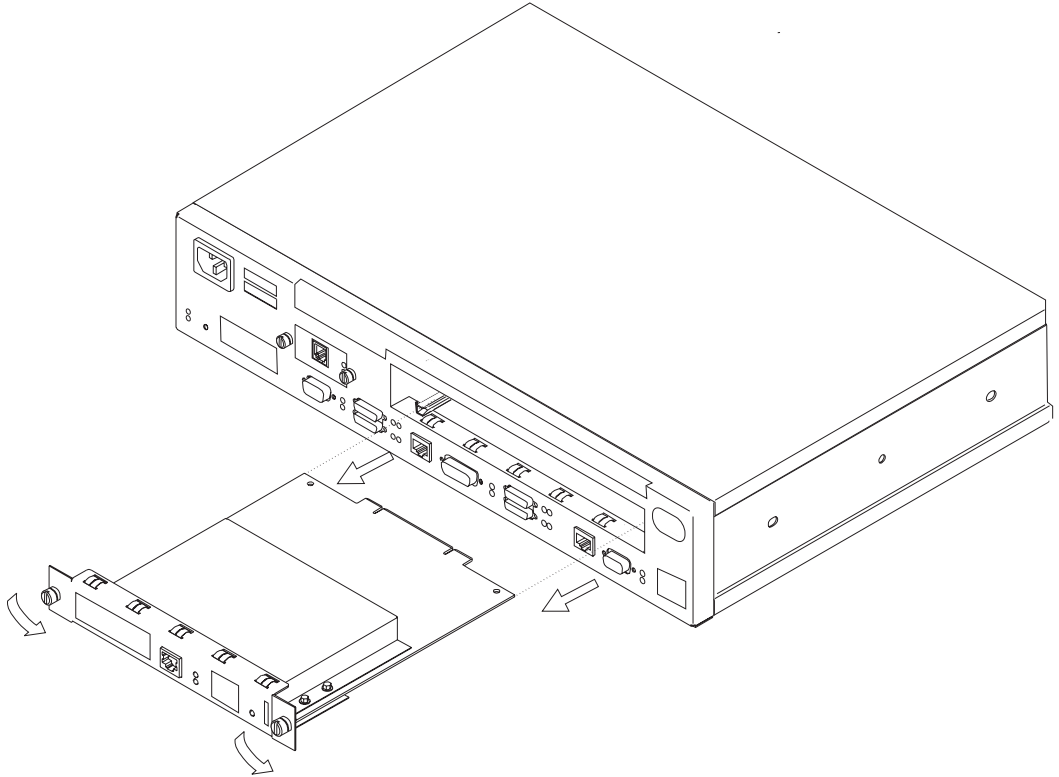
Figure   4-40. Removing the Adapter (Actual adapter may appear different)

1 Unplug the power cord.

2 Remove the screws holding the adapter in place.

3 Remove the adapter by gently pulling it toward you.

4 Replace the blank faceplate or install new adapter and tighten the two screws.

5 Plug the power cord into the outlet.

6 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Installing a Second Service Port in Models 14T and 24x

Refer to "Handling Static-Sensitive Devices" on page 4-2 before removing or installing a second service port card.

Installing the EIA 232 Service Port Feature in Models 14T and 24x
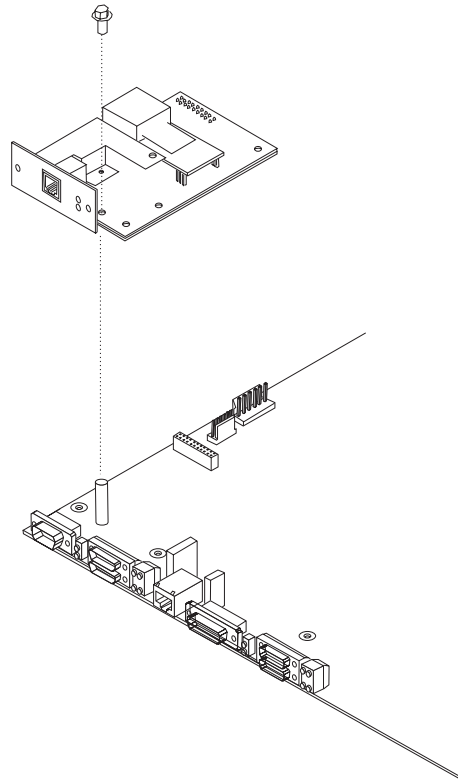
Figure   4-41. Installing the EIA 232 Service Port Feature

1 Remove the cover from the IBM 2210 as described in "Cover" on page 4-2.

2 Remove the blank Service Port faceplate by unscrewing the two screws.

3 Save the faceplate and screws.

4 Insert the EIA 232 Service Port Feature connection into the connector on the system board.

5 Using the two screws from the blank faceplate secure the front of the Service Port Card faceplate to the frame of the IBM 2210.

6 Fasten the middle of the EIA 232 Service Port Feature to the standoff on the system board using the supplied Philips-head screw.

7 Replace the cover as described in "Reinstalling the Cover" on page 4-4.

8 Verify that the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Removing the EIA 232 Service Port Feature in Models 14T and 24x

1 Remove the cover from the IBM 2210 as described in "Cover" on page 4-2.

2 Remove the two screws that secure the EIA 232 Service Port Feature to the IBM 2210 frame.

3 Remove the Philips-head screw that attaches the middle of the EIA 232 Service Port Feature to the standoff on the system board.

4 Remove the EIA 232 Service Port Feature connection from the system board.

5 Lift the EIA 232 Service Port Feature out of the IBM 2210 chassis.

Installing the 14.4 Kbps Modem Port Feature in Models 14T and 24x
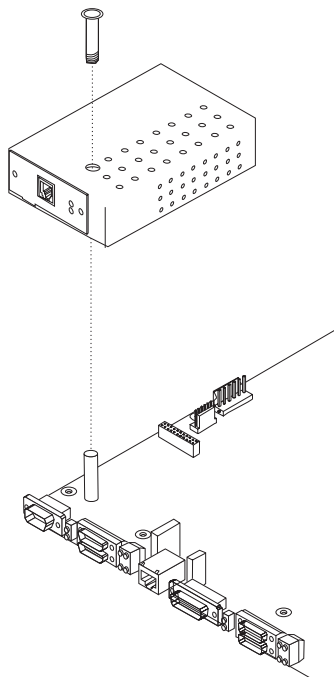
Figure 4-42. Installing the 14.4 Kbps Modem Port Feature

1 Remove the cover from the IBM 2210 as described in "Cover" on page 4-2.

2 Remove the blank Service Port faceplate by unscrewing the two screws.

3 Save the faceplate and screws.

4 Insert the 14.4 Kbps Modem Port Feature connection into the connector on the system board.

5 Attach the 14.4 Kbps Modem Port Feature to the system board by inserting the alignment post through the top of the modem and screwing in the post.

6 Using the two screws from the blank faceplate secure the front of the Modem Card faceplate to the frame of the 2210.

7 Replace the cover as described in "Reinstalling the Cover" on page 4-4.

8 Verify the IBM 2210 is functioning correctly by using "MAP 0210: Verify Operation" on page 2-23.

Removing the 14.4 Kbps Modem Port Feature in Models 14T and 24x

1 Remove the cover from the IBM 2210 as described in "Cover" on page 4-2.

2 Remove the two screws that secure the 14.4 Kbps Modem Port Feature to the IBM 2210 frame.

3 Unscrew the alignment post and remove it from the modem.

4 Remove the 14.4 Kbps Modem Port Feature connection from the system board.

5 Lift the 14.4 Kbps Modem Port Feature out of the IBM 2210 chassis.

Upgrading the 4-Port Dial Access Adapter Using the 4-Port Dial Access Modem Card Feature

Note: This procedure assumes that you have a 4-port Dial Access Adapter installed in your IBM 2210.
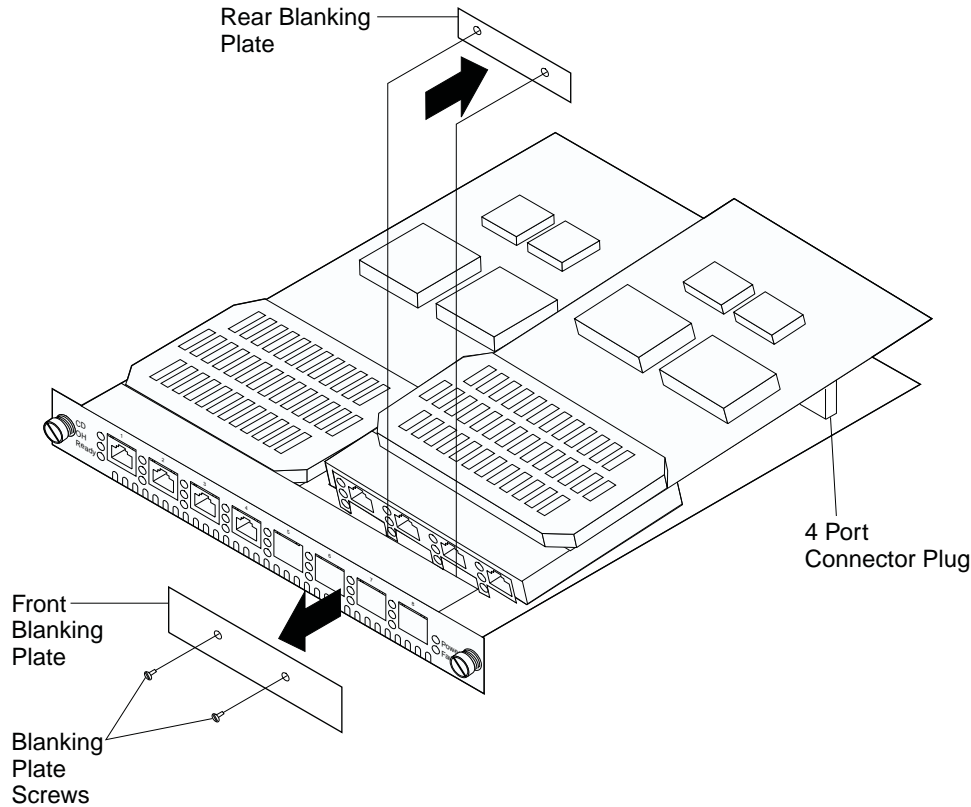
Figure 4-43. Upgrading the 4-Port Dial Access Adapter

To upgrade the 4-port Dial Access Adapter with a new 4-port Dial Access Modem Card:

1. Remove the Dial Access Adapter from the 2210 as described in "Removing the Optional Adapter" on page 4-38.
2. Remove the 4-port Dial Access Modem Card from the anti-static bag.
3. Place the bag on a flat surface and place the Dial Access Adapter that you removed from the IBM 2210 on top of the bag.
4. Using a flat-blade screwdriver, remove the blanking plate from the Dial Access Adapter faceplate and store in a safe place. You will need to replace this if the 4-port Dial Access Modem Card is removed from the adapter.
5. Angle the upgrade such that the RJ-11 jacks align with the ports on the faceplate.
6. Align the 4-port connector plug on the 4-port Dial Access Modem Card and the connector receptacle on the Dial Access Adapter.
7. Press firmly on the 4-port Dial Access Modem Card over the words **PRESS HERE TO INSERT**.
8. Using a nut driver, secure the 4-port Dial Access Modem Card in place with the three (3) screws provided.
9. Reinstall the Dial Access Adapter as described in "Installing Optional Adapters" on page 4-36.

10. Store the antistatic bag in a safe place. You will need this if you remove the adapter from the IBM 2210.

Removing the 4-Port Dial Access Modem Card

To remove the 4-port Dial Access Modem Card from the Dial Access Adapter:

1. Remove the adapter from the IBM 2210 as described in "Removing the Optional Adapter" on page 4-38.
2. Using a nut driver, remove the three screws securing the 4-port Dial Access Modem Card.
3. Grasp the 4-port Dial Access Modem Card upgrade by the connector next to the words **PRESS HERE TO INSERT**.
4. Lift and wiggle the connector until the 4-port Dial Access Modem Card plug comes free of the Dial Access Adapter socket.
5. Replace the 4-port Dial Access Modem Card as described in "Upgrading the 4-Port Dial Access Adapter Using the 4-Port Dial Access Modem Card Feature" on page 4-42, if desired.
6. Reinstall the Dial Access Adapter as described in "Installing Optional Adapters" on page 4-36.

Appendix A. Access Methods and Attaching an ASCII Terminal

To run the menu-driven diagnostics, you must attach an ASCII terminal to the service port of the IBM 2210. This chapter explains how to access the IBM 2210's operational and configuration software. The chapter also lists the ASCII terminals that are supported and provides information about setup attributes.

Access Methods

The IBM 2210 software must be configured as part of the installation process. Therefore, you have to access the software in one of the following ways:

- 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 connection. See Figure A-1.

- Remotely using dial-in (over telephone lines) through a modem attached to the EIA-232 primary service port or the secondary service port, if installed. You can also use an ASCII connection. The secondary service port can be either an EIA-232 Service Port Feature or a 14.4 Kbps Modem Port Feature. See Figure A-2 on page A-2 and Figure A-3 on page A-2.

Table   A-1. User Console Attachment Options

Physical Attachment	Line Protocol	Access Protocol	Default IP Address
Service port + null modem Service port + external modem	Asynchronous characters	ASCII terminal emulation	Not applicable
Any IP network interface	IP	Telnet	No defaults

An ASCII connection requires an ASCII terminal or workstation running an ASCII terminal emulator.

Once the IBM 2210 is operational in the network, you can access the IBM 2210 by Telnetting from a network-connected workstation. This workstation must be attached to any of the IBM 2210's IP-capable network interfaces. The network interface can be on a LAN adapter or WAN adapter because both support IP routing. The Telnet workstation can be locally or remotely connected.
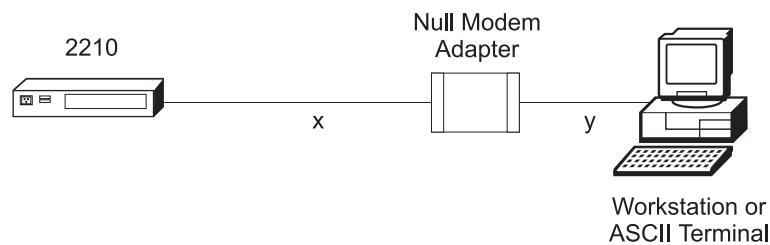
Figure   A-1. Local Terminal Connection to the EIA-232 Service Port
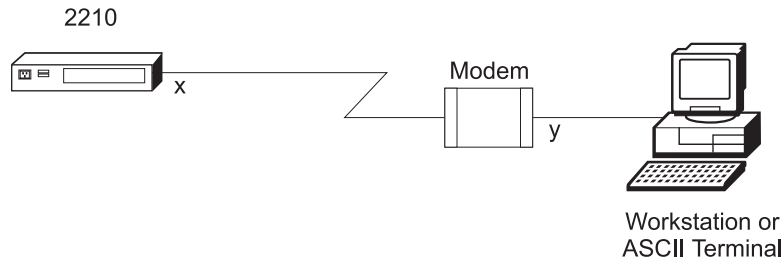
Figure A-2. Remote Connection to 14.4 Kbps Modem Port Feature (14T and 24x Models)
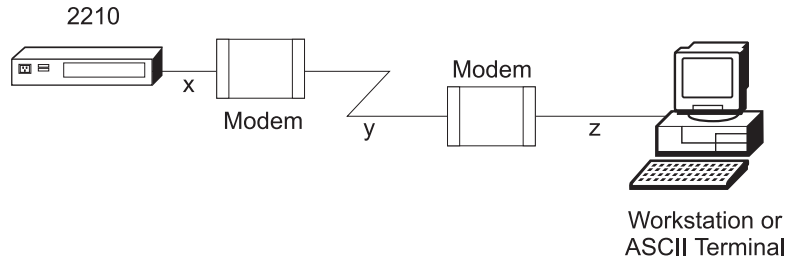
Figure A-3. Remote Terminal Connection to the Primary or Secondary EIA-232 Service Port

Service Port Default Settings

These are the default settings for the serial port:

Speed   9600 bps
Parity   None
Data Bits 8
Stop Bits 1

You can configure the service port speed for the following bit rates; however, the speed must match the speed configured for the ASCII terminal. The IBM 2210 also supports auto-baud.

300
1200
2400
4800
9600
19 200
38 400

Modem Support

Modem Requirements

The modem must be connected to the service port on the IBM 2210, use asynchronous operation, and be compatible with the Attention (AT) command set. A modem connected to a 2210 service port must be configured with the following characteristics:

- No echo
- Suppress results code
- Auto-answer

- Hardware (RTS/CTS) flow control
- Modem DTE speed fixed to match 2210 service port speed (9600 recommended).

Consult your modem documentation on how to configure and save these settings.

Remote Connection for Service

To resolve a problem with your IBM 2210, IBM service personnel may request permission to establish a temporary, remote connection to the IBM 2210. In most situations, the IBM service personnel will not be at a remote workstation that is connected to your IP network. Consequently, remote access must be established using a modem. Whenever you authorize IBM service personnel to establish such a remote connection, you must:

- Connect and configure the modem before the remote service session can begin

- Provide the service personnel with the telephone number of a modem connected to the service port of the target IBM 2210 or to a modem that is connected to the service port on an IBM 2210 that is on the same network as the target IBM 2210

- Provide service personnel with the password or other necessary information for access to any security protection features

Modem Settings

The following modems have been tested for use with the IBM 2210:

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 2210, see: `http://www.networking.ibm.com/support/2210`

Attaching an ASCII Terminal to the Service Port

Attach an ASCII terminal or emulator (with the appropriate emulation software) to the service port to provide local or remote access to the IBM 2210 as shown in Figure A-4 on page A-4.
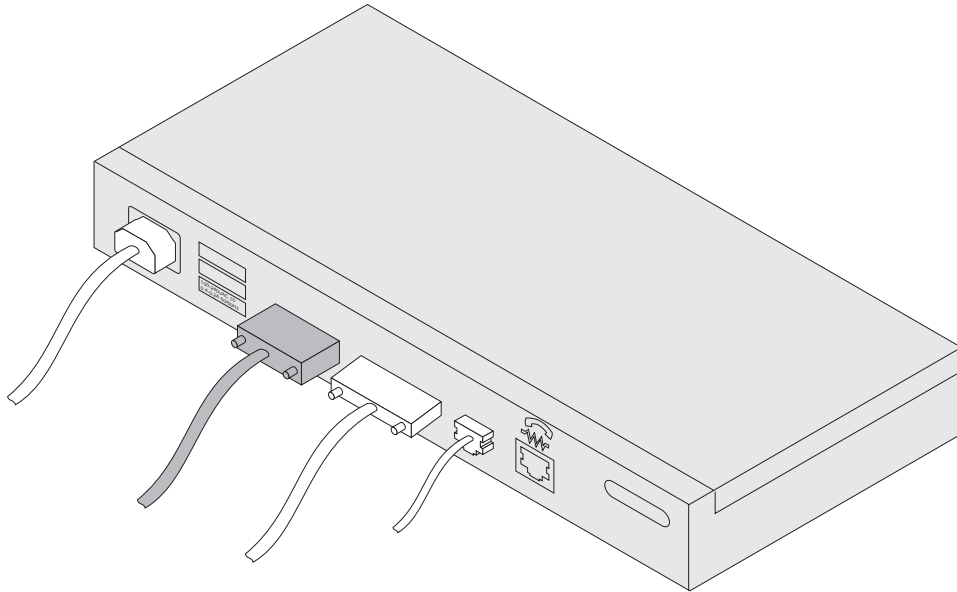
Figure   A-4. Attaching an ASCII Terminal to the Service Port

When locally attaching a terminal to the IBM 2210 service port, the speed (baud rate) configured for the service port must match the speed of the connected terminal if the IBM 2210 has been configured to use a specific baud rate. If the IBM 2210 is configured for auto-baud the IBM 2210 learns the ASCII terminal's line speed when the user types the terminal break key sequence and presses Enter. A typical break key sequence for PC terminal emulators is Alt-B (refer to the terminal emulator documentation). Most ASCII terminals have a **Break** key (often used in conjunction with the **Ctrl** key).

Note: When using a locally attached terminal to run the IBM 2210 diagnostic programs, the service port line speed must be set to 9600 bps. This setting is a constant and cannot be changed.

When connecting a IBM 2210 to a remote terminal by two modems connected by telephone lines, you must follow these rules:

- If the modems are running at a speed of 9600 or lower and they do *not* support hardware compression, the IBM 2210 service port speed and the terminal speed must match the modems' line speed.

- If the modems are running hardware compression, the IBM 2210 service port speed and the terminal speed should exceed the modems' line speed.

Note: The IBM 2210 service port can be damaged by static electricity discharge. It is shipped with a plastic port cover to prevent such damage. Remove the plastic cover when you are attaching a terminal and store it in a safe place. When you disconnect the terminal, reinstall the plastic cover.

ASCII Terminals and Setup Attributes

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

- No parity
- 8-bit word length
- 1 stop bit

- 300 bps–38.4 Kbps bit rate
- 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 A-5 to determine the settings for the setup attributes for the IBM 3101 ASCII terminal.
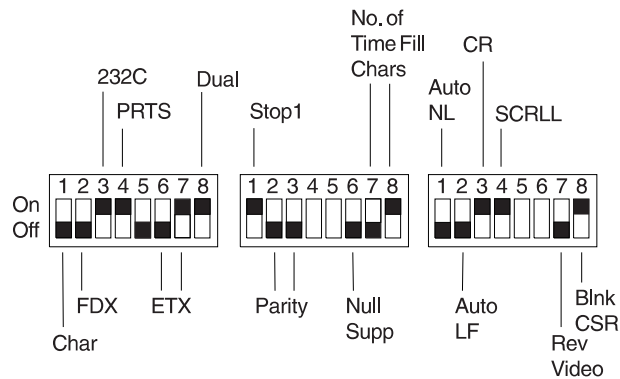
Figure A-5. Setup Attributes for the IBM 3101 Display Terminal

The 2210 can use this terminal at all bit rates (in bps) up to 19 200. 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 A-2 on page A-6 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 A-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

Supported bit rates (in bps) are:

- 1200
- 2400
- 4800
- 9600
- 19 200
- 38 400

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 A-3 to help you determine the settings for the
setup attributes.

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

Table A-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

Supported bit rates (in bps) are:

- 1200
- 2400
- 4800
- 9600
- 19 200

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 A-4.

   To move between selections while on a selection bar, press **Tab**. To change a value for an attribute, press the spacebar.

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 A-4.

5. Press **Select** after the last selection bar to exit the 3161 setup function.

Table A-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

If you are at an IBM 2210 that has never been configured, the system presents the command prompt `Config (only)>`. You can then proceed with the initial configuration. If the IBM 2210 has been configured sufficiently, the system presents the OPCON command prompt (*).

Configuration Methods

The IBM 2210 supports four types of configuration methods:

- Quick Configuration

  Quick Configuration allows you to configure selected devices, bridging protocols, and routing protocols without entering a separate configuration environment to use the Configuration Program. After creating a minimal configuration, you must transfer a complete configuration to the IBM 2210 using TFTP or the configuration program's communications feature. To use Quick Configuration for the initial configuration, you must attach an ASCII terminal to the IBM 2210.

- EasyStart

EasyStart mode automatically downloads the configuration of the router from a
BOOTP server. During the process, the router displays the `EasyStart>` prompt
and ELS messages that track the process. See the *Software User's Guide for
Multiprotocol Routing Services* for more information about EasyStart.

- Configuration Program

  The Configuration Program allows you to configure the IBM 2210 completely
  once Quick Configuration has taken place. The Configuration Program is run
  on a stand-alone workstation and has a graphical user interface. Once you
  have established remote access to the IBM 2210, you can transfer the com-
  plete configuration using TFTP or the send option of the configuration
  program's communication feature. The configuration program's communication
  feature uses SNMP to send the configuration data to the IBM 2210. It also has
  a restart router option that restarts the IBM 2210 and initializes it with the new
  configuration data.

  Alternatively you can use the communication feature's timed configuration
  option to program a time at which the IBM 2210 will be restarted with the new
  configuration. For more information, see the *Configuration Program User's
  Guide for Multiprotocol Routing Services*.

- Command Line Interface

  The IBM 2210's command line interface allows you to configure the router com-
  pletely. You can access the command line interface by using one of the access
  methods described in "Access Methods" on page A-1. You must use quick
  configuration to perform a basic IP configuration and restart the IBM 2210
  before you can Telnet to access the command line interface.

Use either the IBM Multiprotocol Routing Services command line interface or the
Configuration Program for Multiprotocol Routing Services to make changes to con-
figuration parameters.

Appendix B. Service Kit

This appendix identifies by part number the items contained in the service kit for the IBM 2210. The service kit, PN 04H8169, is stocked as a branch office tool. Service personnel should obtain a kit for their use when servicing this machine.

Table   B-1. Parts in Service Kit

Part	Part Number
ATM 25MB wrap plug	42H0540
EIA 232-D/V.24 modem-attach wrap plug	60G3909
EIA 232-D/V.24 direct-attach wrap plug	60G3914
Ethernet with AUI connection wrap plug	71F1167
Ethernet with 10BASE-T connection wrap plug	04H8210
ISDN Basic Rate Interface male wrap plug	60G1474
ISDN Basic Rate Interface inline adapter	60G1475
ISDN Primary Rate Interface wrap plug	57G8097
Service port 9-to-25 pin converter	74G0687
Token Ring with UTP connection wrap plug	04H8210
Token Ring with 9-pin D connection wrap plug	6165899
V.35 direct-attach wrap plug	60G3915
V.35 modem-attach wrap plug	60G3911
V.36 wrap plug	60G3912
WAN	60G3913
X.21 (DTE) wrap plug	10H5593
X.21 wrap plug	60G3910

The wrap plug for the Token Ring with UTP connection or Ethernet with 10BASE-T connection is similar in appearance to the wrap plug for ISDN. You can discriminate between them by looking for an "L" on the side of the wrap plug for Token Ring and Ethernet.

Use the 9-to-25 pin converter with the EIA 232-D/V.24 modem-attach plug to wrap the service port.

Appendix C. 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.

Listed below is additional information about the parts assembly index.

SIMILAR ASSEMBLIES: If two assemblies contain a majority of identical parts, they are broken down on the same list. Common parts are shown by one index number. Parts specific to one or the other of the assemblies are listed separately and identified by description.

AR: (As Required) in the Units column indicates that the quantity is not the same for all machines.

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.

R: (Restricted) in the Units column indicates that the part has a restricted availability.

INDENTURE: The indenture is marked by a series of dots located before the parts description. The indenture indicates the relationship of a part to the next higher assembly. For example:

Indenture	Relationship of Parts
(No dot)	MAIN ASSEMBLY
(One dot)	• Detail parts of a main assembly
(One dot)	• Subassembly of the main assembly
(Two dots)	• • Detail part of a one-dot subassembly
(Two dots)	• • Subassembly of a one-dot subassembly
(Three dots)	• • • Detail part of a two-dot subassembly

Assembly *n*: EXAMPLE ASSEMBLY

Asm–Index	Part Number	Units	Description
n–0		1	Cover Asm.Rear-Red
–0		1	Cover Asm.Rear-White
			For Next Higher Assembly,See 1-2
–1	5373637	1	• Seal,Top
–2	5356429	2	• Clip,Retaining
–3	2513013	3	• Liner,Cover
–4	1847630	R	• Finger Stock Asm
–5	1847602	NR	• • Channel,Finger Stock
–6	5373639	AR	• Seal,Bottom
–7	5356429	2	• Clip,Retaining
–8		NP	• Cover,Rear,Without Paint
–9	416629	2	• Screw,Panel

Assembly 1: Final Assembly – 12x Models
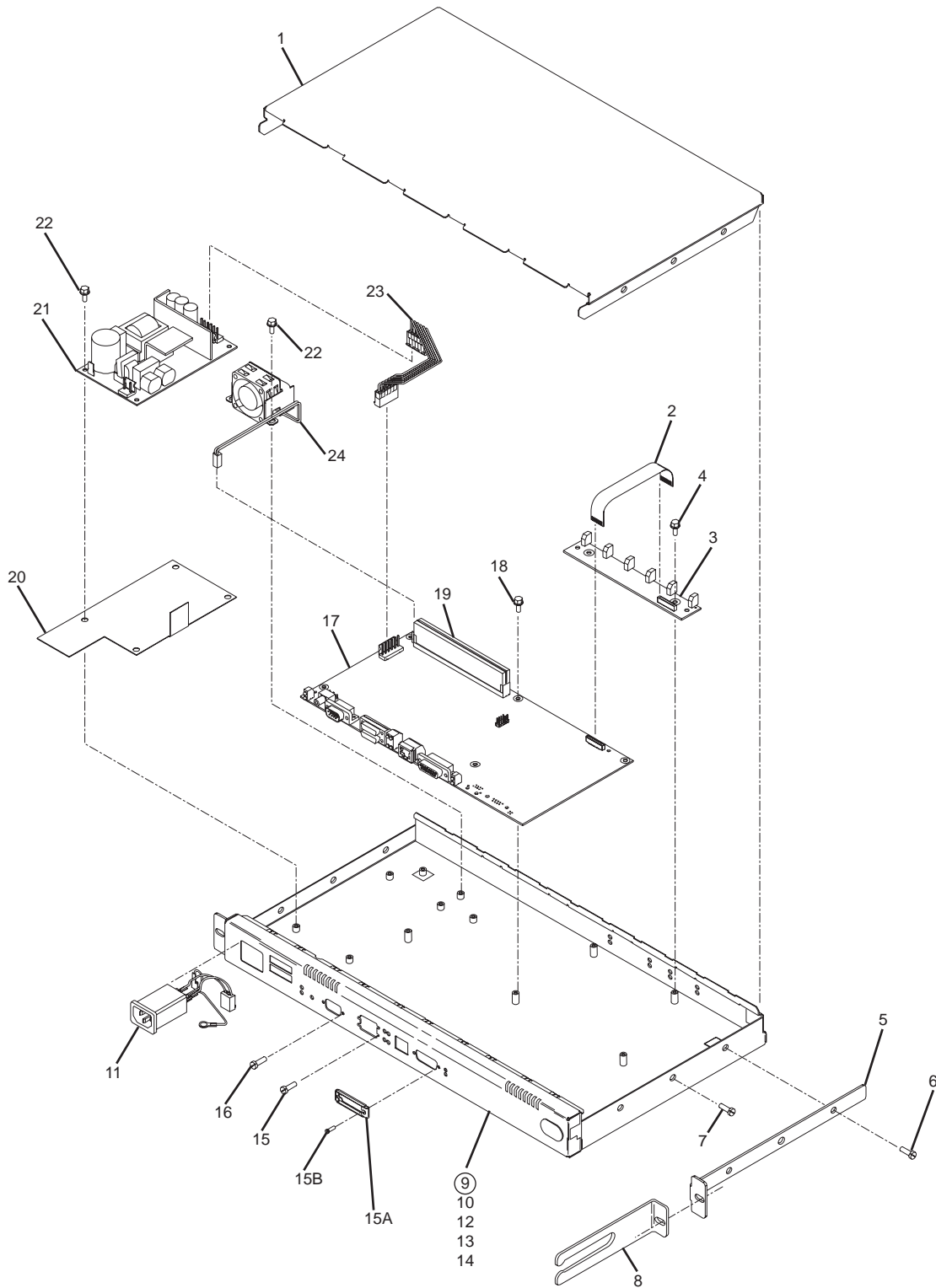
AMF0P001

Asm–Index	Part Number	Units	Description
1–1		NP	Final Assembly
–1		NP	• Cover, Top
–2	4H7060	1	• Cable, LED Panel
–3	4H8201	1	• LED Panel, Models 121, 123, and 12T
–3	4H8202	1	• LED Panel, Models 122, 124, and 12E
–3	4H8203	1	• LED Panel, Models 125 and 127
–3	4H8204	1	• LED Panel, Models 126 and 128
–4	1624743	2	• Screw, Hex, M3 X 6 Lg
–5	92G8547	2	• Bracket, Mounting
–6	92G8546	4	• Screw, M4 X 8 Lg
–7	4H7088	2	• Screw, M4 X 6 Lg
–8	92G8549	1	• Bracket, Cable Management
–9	4H8211	1	• Chassis, Model 121
–9	4H8212	1	• Chassis, Model 122
–9	4H8213	1	• Chassis, Model 123
–9	4H8213	1	• Chassis, Model 12T
–9	4H8214	1	• Chassis, Model 124
–9	4H8214	1	• Chassis, Model 12E
–9	4H8215	1	• Chassis, Model 125
–9	4H8216	1	• Chassis, Model 126
–9	4H8217	1	• Chassis, Model 127
–9	4H8218	1	• Chassis, Model 128
–10		NP	• • Cover, Chassis, Models 121, 123, and 12T
–10		NP	• • Cover, Chassis, Models 122, 124, and 12E
–10		NP	• • Cover, Chassis, Models 125 and 127
–10		NP	• • Cover, Chassis, Models 126 and 128
–11		NP	• • Cable, AC Connector
–12	1622346	1	• • Washer, Lock Ext T- 4.3 ID X 0.5 Th
–13	1622318	1	• • Washer, Lock Spr- 4.1 ID X 0.9 Thk
–14	1622403	1	• • Nut, Hex-M4 X 7 Flw X 3.2 Thk
–15	73G3485	4	• Screwlock- 4-40
–15A	73G4036	1	• Slide, Ethernet
–15B	73G4037	2	• Screw, 4-40
–16	62X0388	2	• Screwlock, 4-40
–17	72H3627	1	• System Board, Model 121
–17	4H8192	1	• System Board, Model 122
–17	72H3628	1	• System Board, Model 123
–17	72H3628	1	• System Board, Model 12T
–17	4H8194	1	• System Board, Model 124
–17	4H8194	1	• System Board, Model 12E
–17	4H8195	1	• System Board, Model 125
–17	4H8196	1	• System Board, Model 126
–17	4H8197	1	• System Board, Model 127
–17	4H8198	1	• System Board, Model 128
–18	1624743	AR	• Screw, Hex, M3 X 6 Lg
–19	4H8189	1	• SIMM- 4 Meg
–19	4H8190	1	• SIMM- 8 Meg
–19	41H7107	1	• SIMM- 16 Meg

Assembly 1: (continued)
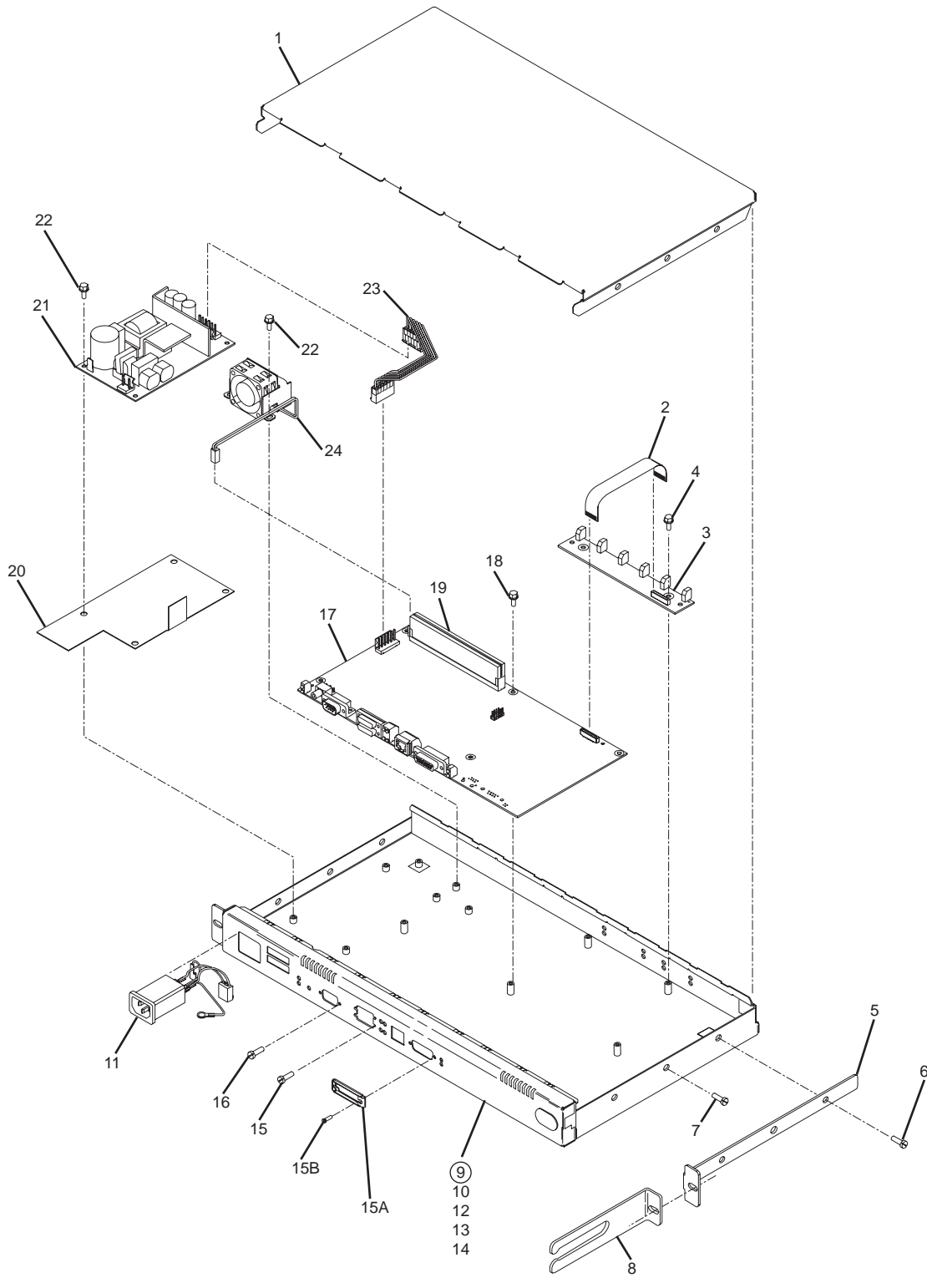
AMF0P001

Asm–Index	Part Number	Units	Description
1–1		NP	Final Assembly
–20	74G0039	1	• Insulator
–21	4H8199	1	• Power Supply Asm
–22	1624743	6	• Screw, Hex, M3 X 6 Lg
–23	72H3623	1	• Cable, DC
–24	4H8200	1	• Fan Asm
–25	4H8169	1	• Wrap Plug Service Kit (Not Illustrated)

Assembly 2: Final Assembly, — 14T Model
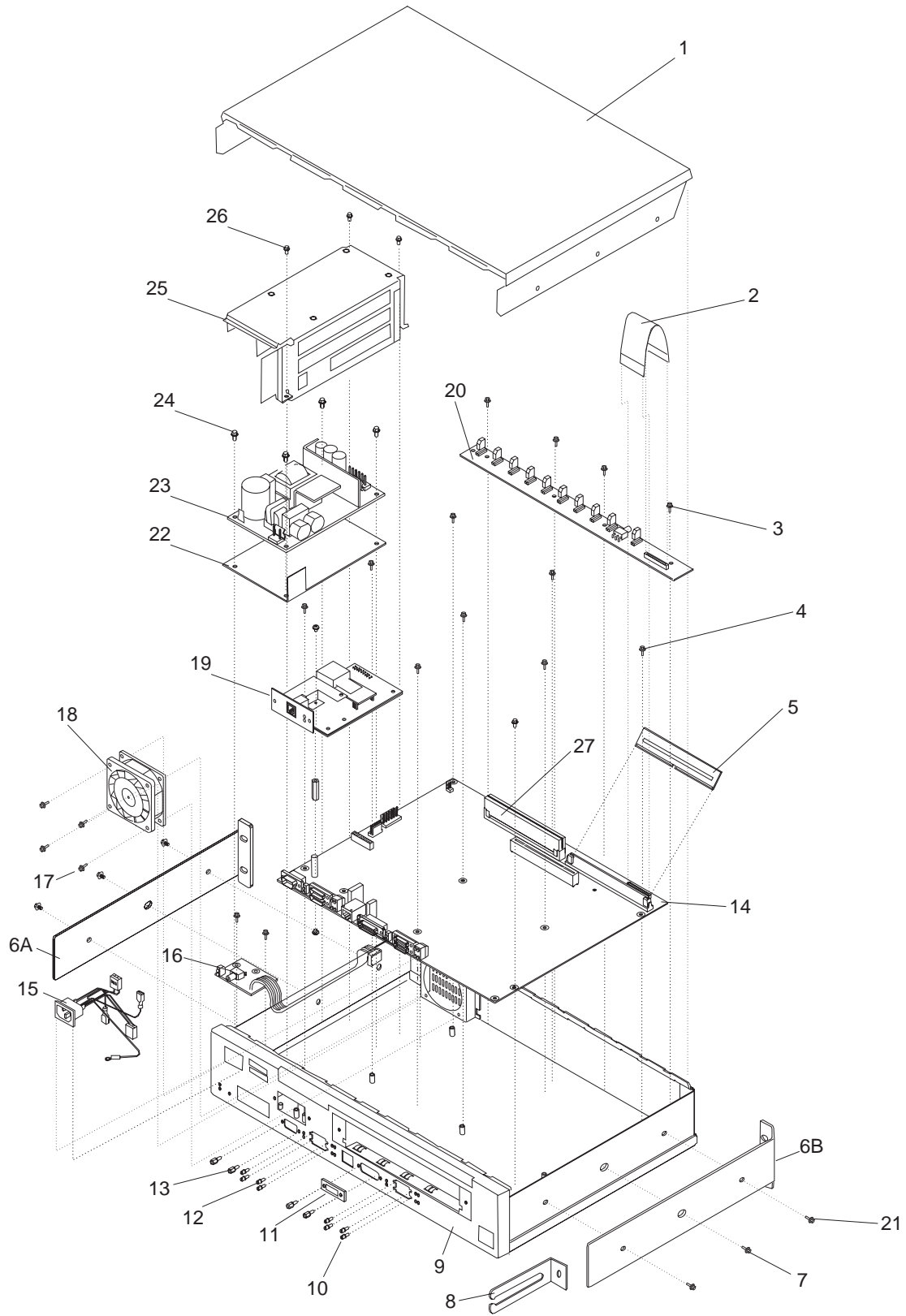
Asm–Index	Part Number	Units	Description
2–2		NP	Final Assembly
–1		NP	• Cover, Top
–2	13H8412	1	• Cable, LED Panel
–3	1624743	4	• Screw, Hex,M3 X 6 Lg
–4	1624743	9	• Screw, Hex,M3 X 6 Lg
–5	41H7108	1	• • Flash SIMM - 4 MB
–5	72H5029	1	• • Flash SIMM - 8 MB
–6A	13H8803	1	• Bracket, Mounting - Left
–6B	13H8804	1	• Bracket, Mounting - Right
–7	4H7088	2	• Screw, M4 X 6 Lg
–8	92G8549	1	• Bracket, Cable Management
–9	41H7111	1	• Chassis - Frame Top and Bottom
–10	73G3485	4	• Screwlock- 4-40
–11	73G4036	1	• Slide
–12	73G3485	4	• Screwlock- 4-40
–13	73G4037	4	• Screw, 4-40
–14	41H7082	1	• System Board
–15	13H8805	NP	• Cable, AC Connector
–16	41H7103	1	• Reset Card Assembly
–17	92G8546	4	• Screw, M4 X 8 Lg
–18	41H7110	1	• Fan Asm
–19	41H7104	1	• • Service Port, EIA-232 DTE
–19	41H7105	1	• • Service Port, 14.4 Kbps Modem
–20	41H7101	1	• LED Panel
–21	92G8546	4	• Screw, M4 X 8 Lg
–22	13H8807	1	• Power Supply Insulator
–23	41H7109	1	• Power Supply
–23	55H7477	1	• • DC Power Supply Cable (not shown)
–24	1624743	4	• Screw, Hex, M3 X 6 Lg
–25	13H8806	1	• Power Supply Cover
–26	1624743	4	• Screw, Hex, M3 X 6 Lg
–27	04H8189	1	• • DRAM SIMM - 4 MB
–27	04H8190	1	• • DRAM SIMM - 8 MB
–27	41H7107	1	• • DRAM SIMM - 16 MB
–27	55H7492	1	• • DRAM SIMM - 32 MB

Assembly 3: Final Assembly — 24x Models
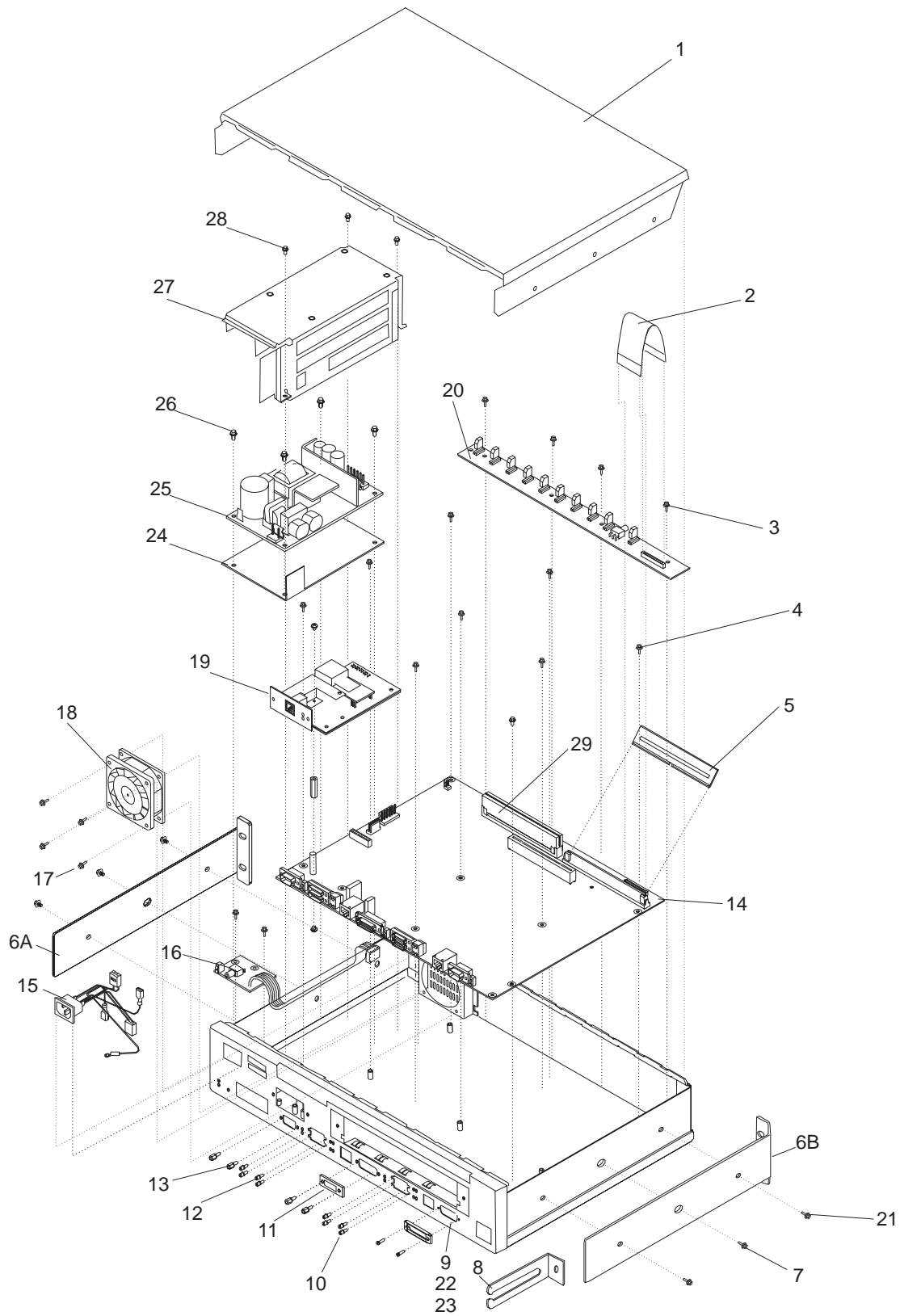
Asm–Index	Part Number	Units	Description
3–3		NP	Final Assembly
−1		NP	• Cover, Top
−2	13H8412	1	• Cable, LED Panel
−3	1624743	4	• Screw, Hex, M3 X 6 Lg
−4	1624743	9	• Screw, Hex, M3 X 6 Lg
−5	41H7108	1	• • Flash SIMM- 4 MB
−5	72H5029	1	• • Flash SIMM- 8 MB
−6A	13H8803	1	• Bracket, Mounting - Left
−6B	13H8804	1	• Bracket, Mounting - Right
−7	4H7088	2	• Screw, M4 X 6 Lg
−8	92G8549	1	• Bracket, Cable Management
−9	41H7112	1	• • Chassis - Frame Top and Bottom Model 24T
−22	41H7113	1	• • Chassis - Frame Top and Bottom Model 24E
−23	41H7114	1	• • Chassis - Frame Top and Bottom Model 24M
−10	73G3485	4	• Screwlock- 4-40
−11	73G4036	1	• Slide, Ethernet
−12	73G3485	4	• Screwlock- 4-40
−13	73G4037	4	• Screw, 4-40
−14	41H7083	1	• • System Board, Model 24T
−14	41H7084	1	• • System Board, Model 24E
−14	41H7085	1	• • System Board, Model 24M
−15	13H8805	NP	• Cable, AC Connector
−16	41H7103	1	• Reset Card Assembly
−17	92G8546	4	• Screw, M4 X 8 Lg
−18	41H7110	1	• Fan Asm
−19	41H7104	1	• • Service Port, EIA-232 DTE
−19	41H7105	1	• • Service Port, 14.4 Kbps Modem
−20	41H7102	1	• LED Panel
−21	92G8546	4	• Screw, M4 X 8 Lg
−24	13H8807	1	• Power Supply Insulator
−25	41H7109	1	• Power Supply
−25A	55H7477	1	• • DC Power Supply Cable (not shown)
−26	1624743	4	• Screw, Hex,M3 X 6 Lg
−27	13H8806	1	• Power Supply Cover
−28	1624743	4	• Screw, Hex,M3 X 6 Lg
−29	04H8189	1	• • DRAM SIMM - 4 MB
−29	04H8190	1	• • DRAM SIMM - 8 MB
−29	41H7107	1	• • DRAM SIMM - 16 MB
−29	55H7492	1	• • DRAM SIMM - 32 MB

Assembly 4: Final Assembly — Adapter Enablement Feature
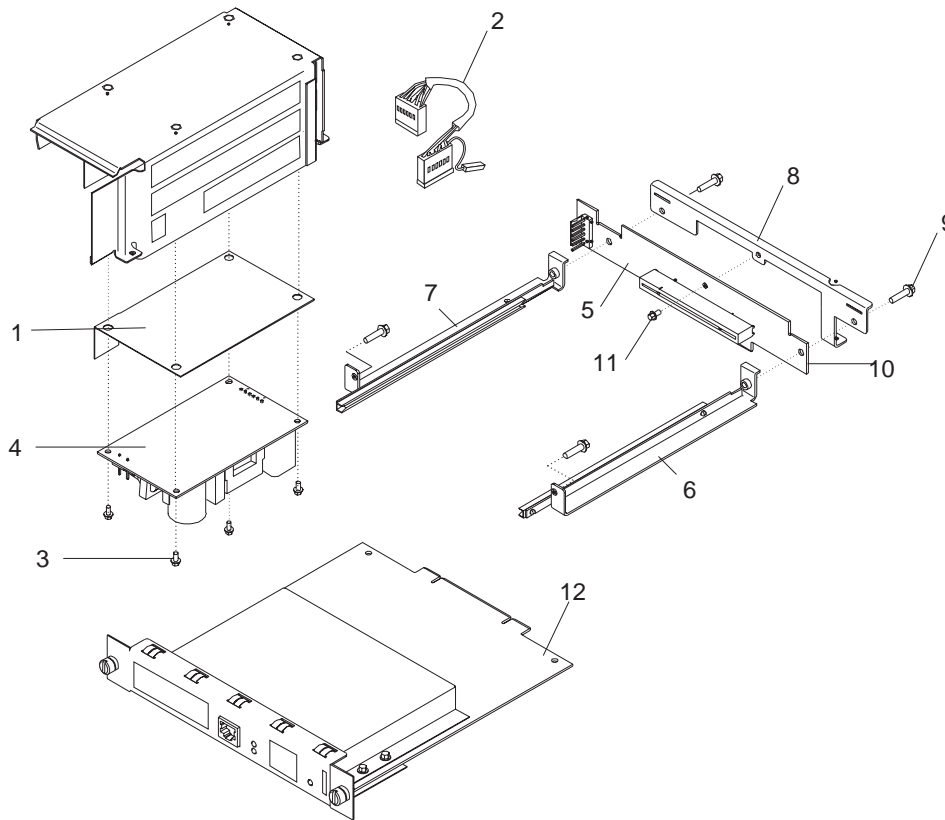
Asm–Index	Part Number	Units	Description
4–4		NP	Final Assembly
–1	13H8807	1	• Power Supply Insulator
–2	55H7477	1	• DC Power Supply Cable
–3	1624743	4	• Screw, Hex, M3 X 6 Lg
–4	41H7109	1	• Power Supply
–5	41H7119	1	• Riser Card Assembly
–6		NP	• • Guide Assembly, Right
–7		NP	• • Guide Assembly, Left
–8		NP	• • Riser Card Brace
–9	1624769	AR	• • Screw, Fixing,M4
–10		NP	• • Riser Card
–11	1624743	AR	• • Screw, Hex, M3 X 6 Lg
–12		1	• Optional Module
–	85H7770	AR	• • 25 Mbps ATM Interface Adapter (not shown)
–	41H7120	AR	• • ISDN Basic Rate Interface Adapter
–	55H7509	AR	• • E1-120 Ohm ISDN PRI Adapter (not shown)
–	41H7106	AR	• • T1/J1 ISDN PRI Adapter (not shown)
–	41H9109	AR	• • 4-port WAN Concentration Adapter (not shown)
–	55H7491	AR	• • 8-port WAN Concentration Adapter (not shown)
–	85H7783		• • 4-port S/T ISDN BRI Adpater
–	72H5063		• • 4-port U ISDN BRI Adpater
–	72H5038		• • 4-port Dial Access Daughter Card
–	72H5037		• • Dial Access Base Card

Assembly 5: Cable Assemblies

Asm–Index	Part Number	Units	Description
5–3	60G3902	1	Cable, V.35 Feature
–4	60G3903	1	Cable, V.35 (DTE) Feature
–5	60G3904	1	Cable, V.36 CCITT Feature
–6	60G3906	1	Cable, X.21 CCITT Feature
–7	10H5591	1	Cable, X.21 DTE Feature
–8	1749352	1	Cable Adapter, V.35 French DCE Feature
–9	6339098	1	Cable, STP Token Ring Feature
–10	10H5569	1	Cable, Console
–11	10H5570	1	Adapter, Null Modem
–12	41H9082	1	Cable, RJ-45 Category 5
–13	55H7756	1	Cable, Modem Attach, EIA-232 DCE
–14	60G3901	1	Cable, Direct Attach, EIA-232 DTE
–15	85H3509	1	Cable, ISDN PRI RJ-48 T1
–16	57G8042	1	Cable, ISDN PRI RJ-48 J1
–17	80G3984	1	Cable, ISDN PRI E1 30M
–18	85H7778	1	Cable, ISDN PRI RJ-48 J1, 15M
–20	86H0774	1	Cable, RJ-45 Category 5 - 4M

Assembly 6: Final Assembly, IBM 2210, Models 1Sx and 1Ux

Service   WAN   Ethernet

ISDN-BRI

100-240VAC 10
0.25-0.15A 50/60Hz
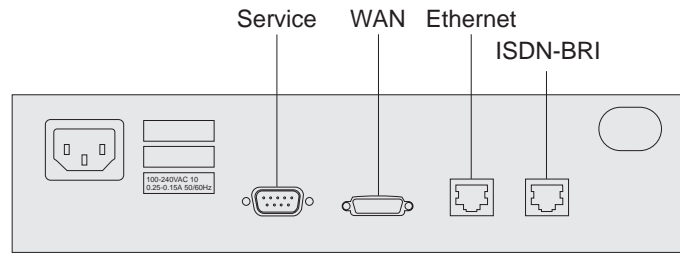
Asm–Index	Part Number	Units	Description
6–6		1	Final Assembly
−1	85H7990		• Model 1U4
−2	85H7791		• Model 1U8
−3	85H7792		• Model 1S4
−4	85H7793		• Model 1S8

Appendix D. Notices

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Electronic Emission Notices

Notices for Models 12x, 14T, and 24x

Federal Communications Commission (FCC) Statement

Note: 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 must be used in order to meet FCC emission limits. 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 conform à la norme NMB-003 du Canada.

Notices for Models 1Sx and 1Ux
Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. 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 B Emission Compliance Statement

| This Class B digital apparatus complies with Canadian ICES-003.

Avis de conformité aux normes d'Industrie Canada

| Cet appareil numérique de la classe B est conform à la norme NMB-003 du
| Canada.

Notices for All Models

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 inter-
ference 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
基づくクラス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。

European Community (CE) Mark of Conformity Statement

This product is in conformity with the protection requirements of EC Council Direc-
tive 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.

Properly shielded and grounded cables and connectors must be used in order to
reduce the potential for causing interference to radio and TV communications and
to other electrical or electronic equipment. Such cables and connectors are avail-
able from IBM authorised dealers. IBM cannot accept responsibility for any interfer-
ence caused by using other than recommended cables and connectors.

A Declaration of Conformity with the requirements of the Directive has been signed
by IBM Spain, Division of Fabricacion, 46185 La Pobla de Vallbona, Valencia,
Spain.

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).

This product has been tested and found to comply with the limits for Class B Infor-
mation Technology Equipment according to CISPR 22 / European Standard EN
55022. The limits for Class B equipment were derived for typical residential envi-
ronments to provide reasonable protection against interference with licensed com-
munication devices.

Dieses Gerät ist berechtigt in Übereinstimmung mit dem deutschen EMVG vom 9.Nov.92 das EG-Konformitätszeichen zu führen. Der Außteller der Konformitätserklärung ist die IBM Spain, Division of Fabricacion, 46185 La Pobla de Vallbona, Valencia, Spain.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse B.

Notice about Lithium Battery
The IBM 2210 contains a non-replaceable lithium battery that, if disposed of improperly, can cause a fire, an explosion, or a severe burn. At the end of the life of this machine, return the IBM 2210 to IBM or dispose of it according to local regulations.

U.K. Safety Approval
The IBM 2210 is manufactured to the International Safety Standard EN 60950 and as such is approved in the U.K. under the General Approval number NS/G/1234/J/100003 for indirect connection to the public telecommunication network.

Telecommunication Notices

FCC Part 68 Compliance Information
Features and optional adapters for the IBM 2210 comply with Part 68 of the FCC rules. The label included on the bottom of the IBM 2210 and the top of the features and adapters contains, among other information, the FCC registration number and Ringer Equivalence Number (REN) for this equipment. If requested, provide this information to your telephone company.

The features and adapters include:

- 14.4 Kbps Modem Port Feature with REN # .6B and jack type RJ-11.
- T1/J1 ISDN PRI Adapter with interface code 04DU9-1SN, service code 6.0N and jack type RJ-48C.
- ISDN Quad BRI Adapter - U with interface code 021S5 service code 6.0F and jack type RJ-49C.
- Dial Access Adapter with REN # .6B and jack type RJ-11.

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 2210 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.

The load number assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the load numbers of all the devices does not exceed 100. The load number of the 14.4 Kbps Modem Port Feature is 05.

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.

Le NUMÉRO DE CHARGE (LN) attribué à chaque dispositif du terminal sert à indiquer le pourcentage de la charge totale qui doit être connecté à une ligne d'abonné utilisée par ce dispositif, afin de prévenir toute surcharge. Par terminaison de ligne, on entend toute combinaison de dispositifs qui satisfait l'exigence selon laquelle le total des NUMÉROS DE CHARGE de tous les dispositifs n'est pas supérieur à 100.

NUMÉRO DE CHARGE DE CETTE UNITÉ (14.4 Kbps Modem Port Feature) : 05

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.

Danger:
Hazardous voltages exist inside this machine when it is powered on. Anytime you service this unit with the cover off, be sure to unplug the power cord.

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 electrische apparatuur op een veilige manier moet bekabelen en aansluiten.

Gevaar:
Er bevindt zich gevaarlijke spanning binnenin deze machine, wanneer ze is ingeschakeld. Telkens als u onderhoud uitvoert op deze eenheid, met de behuizing verwijderd, moet u het netsnoer loskoppelen.

⚠

Danger: Avant de procéder à l'installation de ce produit, lisez d'abord les consignes de sécurité dans la brochure *ATTENTION: Consignes de sécurité—A lire au préalable,* SD21-0030. Cette brochure décrit les procédures pour câbler et connecter les appareils électriques en toute sécurité.

Danger:
Une tension dangereuse existe dans cette machine lorsqu'elle est branchée. Déconnectez toujours le cordon d'alimentation avant de retirer le couvercle, lorsque vous effectuez des procédures de maintenance.

⚠

Opasnost: Prije nego sto pŏcnete 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 priključrivanje kabela i priključivanje na električno napajanje.

OPASNO
Unutar ovog uredjaja prilikom njegovog uključivanja u mrežu nastaje opasan napon. Svaki put kad radite s ovim uredjajem s otvorenim poklopcem morate biti sigurni da mrežna žica nije spojena s priključnicom.

⚠

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.

Pericolo:
Quando la macchina è alimentata, vi sono tensioni pericolose all'interno. Ogni volta che si effettuano interventi di manutenzione, se il coperchio non è inserito, scollegare il cavo di alimentazione.

⚠

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

Vorsicht:
Bei eingeschaltetem Gerät liegen im Innern gefährliche Spannungen an. Sicherstellen, daß bei Arbeiten an der geöffneten Maschine der Netzstecker gezogen ist.

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.

Perigo:
Este equipamento, quando ligado, apresenta tensões perigosas no seu interior. Sempre que proceda a assistência nesta unidade com a cobertura retirada, certifique-se que o cabo de alimentação da unidade se encontra desligado.

Peligro: Antes de empezar a instalar este producto, lea la información de seguridad en *Atención: Información de Seguridad — Lea Esto Primero,* SD21-0030. Este documento describe los procedimientos de seguridad para cablear y enchufar equipos eléctricos.

Peligro:
Aun cuando está apagada, hay voltajes peligrosos en esta máquina. Siempre que dé servicio a esta máquina sin la cubierta, asegúrese de desenchufar el cable de alimentación.

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.

Fare:
Det er farlig spenning inni maskinen når den er slått på. Hver gang du utfører service på maskinen mens dekselet er tatt av, må du huske på å trekke ut nettkabelen.

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.

Vaara:

Virran ollessa kytkettynä koneen sisällä on vaarallisia jännitteitä. Muista aina irrottaa verkkojohto, jos huollat konetta sen suojakannen ollessa irrotettuna.

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.

Fare!

Der er høj spænding i denne maskine, når den er tændt. Træk derfor altid netledningen ud, når enheden skal efterses.

Varning — livsfara: Innan du börjar installera den här produkten bör du läsa säkerhetsinformationen i dokumentet *Varning: Säkerhetsföreskrifter— Läs detta först,* SD21-0030. Där beskrivs hur du på ett säkert sätt ansluter elektrisk utrustning.

Varning — livsfara:

Farliga spänningar i maskinen när den är påslagen. Se till att nätkabeln är urkopplad innan du öppnar enheten.

ОПАСНОСТ
Пред да почнете да го инсталирате овој продукт, прочитајте
ja информацијата за безбедност:
"Предупредување: Информација за безбедност: Прочитајте го
прво ова", SD21-0030.
Оваа брошура опишува безбедносни процедури за каблирање
и вклучување на електрична опрема.

ОПАСНОСТ
Опасни напони постојат внатре во оваа машина кога е таа
вклучена на напон.
Секогаш кога ја сервисирате оваа машина без поклопецот,
не заборавете да го откачите кабелот за електрично
напојување.

Nebezpečenstvo: Pred inštaláciou výrobku si prečítajte
bezpečnosté predpisy v
Výstraha: Bezpeč osté predpisy - Prečítaj ako prvé,
SD21 0030. V tejto brožúrke sú opísané bezpečnosté
postupy pre pripojenie elektrických zariadení.

NEBEZPEČENSTVO!

Keď je zariadenie pripojené na sieť, je vo vnútri nebezpečné
napätie. Pred každým zásahom do odkrytého zariadenia je
potrebné sa presvedčiť, že prívodný kábel je odpojený od siete.

危險：

　　開始安裝此產品之前，請先閱讀安全資訊。

注意：

　　請先閱讀 - 安全資訊 SD21-0030

　　此冊子說明插接電器設備之電纜線的安全程序。

危險：

當此機器的電源打開時，機器內部的電壓有危險性。因此每次
您要打開機器

危險：　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。

危險：

電源投入中は、内部に危険な電圧がかかっています。カバーを開けて
保守作業をする場合は、必ず電源コードを抜いてから行ってください。

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

위험:

기계를 켤때 위험한 전압이 흐를 수 있으니 조심하십시오.

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:
Existem voltagens perigosas no interior desta máquina quando ela está ligada. Toda vez que você for fazer a manutenção desta unidade com a tampa aberta, certifique-se de desconectar o cabo de força.

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.

Danger:

Tension dangereuse à l'intérieur de la machine lorsque celle-ci est sous tension. Avant toute intervention à l'intérieur, débranchez le cordon d'alimentation.

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.

NEBEZPEČÍ!

Když je zařízení připojeno k síti, je uvnitř nebezpečné napětí. Před každým zásahem do odkrytého zařízení je třeba se přesvědčit, že je přívodní kabel od sítě odpojen.

 Vigyázat: Mielôtt 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.

VESZÉLY!

Bekapcsolt állapotban a gépen belül veszélyes feszültségek lépnek fel. Amikor a készüléket eltávolított fedél mellett javítja, feltétlenül húzza ki a hálózati csatlakozózsinórt.

Uwaga:
Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją: "Caution: Safety Information - Read This First", SD21-0030.
Zawiera ona warunki bezpieczeństwa przy podłączaniu do sieci elektrycznej i eksploatacji.

Uwaga wysokie napięcie!

Przed zdjęciem obudowy, należy wyłączyć przewód zasilający z gniazdka.

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。

危險：

本機器電源開啓時有高壓電。
如需打開機蓋維修機器，請務
必先把電源線的插頭拔掉。

Pozor: Preden zaènete z instalacijo tega produkta
preberite poglavje: ′Opozorilo: Informacije
o varnem rokovanju-preberi pred uporabo,″
SD21-0030. To poglavje opisuje pravilne
postopke za kabliranje,

Nevarnost:

Visoka napetost pri vključeni napravi!
Pri servisiranju odprte naprave, se prepričajte,
da je naprava izključena iz omrežja.

ОСТОРОЖНО: Прежде чем инсталлировать этот
продукт, прочтите Инструкцию по технике безо-
пасности в документе ″Внимание: Инструкция по
технике безопасности -- Прочесть в первую очередь″,
SD21-0030. В этой брошюре описаны безопас-
ные способы каблирования и подключения элект-
рического оборудования.

Осторожно:

При включенном питании в устройстве имеется напряжение, опасное
для жизни. При обслуживании устройства со снятой крышкой отсое-
дините кабель питания.

UL Notices

Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

Use caution when installing or modifying telephone lines.

Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.

Do not use the telephone to report a gas leak in the vicinity of the leak.

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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 the reader to multiple-word terms that have the same last word.

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

A

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.

Address Resolution Protocol (ARP). A protocol that dynamically maps between Internet addresses, baseband adapter addresses, X.25 addresses, and token-ring adapter addresses on a local area network.

American National Standards Institute (ANSI). An organization consisting of producers, consumers, and general interest groups, that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States. (A)

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

American National Standards Institute (ANSI). An organization consisting of producers, consumers, and general interest groups, that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States. (A)

AppleTalk. The routing architecture used to interconnect Apple computers or workstations. AppleTalk groups nodes (hosts) into physical networks corresponding to local area network (LAN) segments or bridged LANs and it allows the logical grouping of hosts (regardless of network boundaries) into AppleTalk zones. See also *zone*.

ARP. Address Resolution Protocol.

ASCII (American Standard Code for Information Interchange). The standard code, using a coded character set consisting of 7-bit coded characters (8-bit including parity check), that is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters. (A)

Note: IBM has defined an extension to ASCII code (characters 128–255).

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.

auto-baud. Automatic baud rate detection. A process by which a receiving device determines the speed, code level,and stop bits of incoming data by examining the first character, usually a preselected sign-on character. Auto-baud allows the receiving device to accept data from a variety of transmitting devices operating at different speeds without needing to establish data rates in advance.

B

baud. (1) A unit of signaling speed equal to the number of discrete conditions or signal events per second; for example, one baud equals one-half dot cycle per second in Morse code, one bit per second in a train of binary signals, and one 3-bit value per second in a train of signals each of which can assume one of eight different states. (A) (2) In asynchronous transmission, the unit of modulation rate corresponding to one unit interval per second; that is, if the duration of the unit interval is 20 milliseconds, the modulation rate is 50 baud. (A)

BIOS. Basic Input/Output System.

bits per second (bps). The rate at which bits are transmitted per second. Contrast with *baud*.

bootstrap. (1) A sequence of instructions whose execution causes additional instructions to be loaded and executed until the complete computer program is in storage. (T) (2) A technique or device designed to bring itself into a desired state by means of its own action, for example, a machine routine whose first few instructions are sufficient to bring the rest of itself into the computer from an input device. (A)

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. The forwarding of a frame from one local area network segment to another. The destination is based upon the medium access control (MAC) sublayer address encoded in the destination address field of the frame header.

buffer. (1) A portion of storage used to hold input or output data temporarily. (2) A routine or storage used to compensate for a difference in data rate or time of occurrence of events, when transferring data from one device to another. (A)

C

C. Celsius.

cache. (1) A special-purpose buffer storage, smaller and faster than main storage, used to hold a copy of instructions and data obtained from main storage and likely to be needed next by the processor. (T) (2) To place, hide, or store in a cache. (3) An optional part of the directory database in network nodes where frequently used directory information can be stored to speed directory searches.

component. Hardware or software that is part of a functional unit.

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

connector. A means of establishing electrical flow.

customer-replaceable unit (CRU). An assembly or part that a customer can replace in its entirety when any of its components fail. Contrast with *field replaceable unit (FRU)*.

D

data terminal equipment (DTE). (1) That part of a data station that serves as a data source, data sink, or both. (I) (A) (2) Equipment that sends or receives data, or both.

dc. Direct current.

DCE. Data circuit-terminating equipment.

DECnet. A network architecture that defines the operation of a family of software modules, databases, and hardware components typically used to tie Digital Equipment Corporation systems together for resource sharing, distributed computation, or remote system configuration. DECnet network implementations follow the Digital Network Architecture model.

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*.

display station. (1) A physical device that can be used as multiple logical consoles. (2) An input/output device containing a display screen and an attached keyboard that allows a user to send information to or receive information from the system. See also *terminal* and *workstation*.

DRAM. Dynamic Random Access Memory.

drop. A cable that leads from a faceplate to the distribution panel in a wiring closet. When the IBM Cabling System is used with the IBM Token-Ring Network, a drop can form part of a lobe. See also *lobe.*

DTE. Data terminal equipment. (A)

dump. (1) Data that has been dumped. (T) (2) To copy the contents of all or part of virtual storage for the purpose of collecting error information.

E

EC. European community.

EIA. Electronic Industries Association.

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.

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.

electrostatic discharge (ESD). An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry.

EMC. Electromagnetic compatibility.

ESD. Electrostatic discharge.

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).

F

F. Fahrenheit.

faceplate. A wall-mounted or surface-mounted plate for connecting data and voice connectors to a cabling system.

FCC. Federal Communication Commission.

feature code. A code used by IBM to process hardware and software orders.

field replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails. In some cases, a field replaceable unit may contain other field replaceable units.

FRU. Field replaceable unit.

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.

H

host. In the Internet suite of protocols, an end system. The end system can be any workstation; it does not have to be a mainframe.

I

IBM Disk Operating System (DOS). A disk operating system based on MS-DOS** that operates with all IBM-compatible personal computers.

IBM Token-Ring Network. A baseband local area network with a ring topology that passes tokens from Token-Ring adapter to Token-Ring adapter.

IEEE. Institute of Electrical and Electronics Engineers.

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.

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 Packet Exchange (IPX). The routing protocol used to connect Novell's servers or any workstation or router that implements IPX with other workstations. Although similar to TCP/IP, it uses different packet formats and terminology. See also *TCP/IP* and *Xerox Network Services (XNS).*

Internet Protocol (IP). (1) A protocol that routes data through a network or interconnected networks. IP acts as an interface between the higher logical layers and the physical network. However, this protocol does not provide error recovery, flow control, or guarantee the reliability of the physical network. IP is a connectionless protocol. (2) A protocol used to route data from its source to its destination in an Internet environment.

inverse ARP. A method for discovering a protocol address through the known hardware address. In frame relay, the data link connection identifier (DLCI) is synonymous with the known hardware address.

IP. Internet Protocol.

IPX. Internet Packet Exchange.

ISDN. Integrated services digital network.

K

Kbps. 1000 bits per second.

L

LAN. Local area network.

LED. Light emitting diode.

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.

lobe. (1) In a star/ring network configuration, two pairs of conductors that provide separate send and receive paths between a wiring concentrator and a network port, such as a wall outlet. (2) In the IBM Token-Ring Network, the section of cable that attaches a device to an access unit. The cable can consist of several segments.

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

maintenance analysis procedure (MAP). A maintenance document that gives a service representative a step-by-step procedure for tracing a symptom to the cause of a failure.

MAN. Metropolitan area network.

management services (MS). Services that assist in the management of networks in areas such as problem management, performance and accounting management, configuration management, and change management.

MAP. Maintenance analysis procedure.

maximum transmission unit (MTU). The largest possible unit of data that can be sent on a given physical medium in a single frame. For example, the MTU for Ethernet is 1500 bytes.

memory. All of the addressable storage space in a processing unit and other internal storages that is used to execute instructions.

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) Management information base. (2) MIB module.

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.

monitor. (1) A device that observes and records selected activities within a data processing system for analysis. Possible uses are to indicate significant departure from the norm, or to determine levels of utilization of particular functional units. (T)   (2) Software or hardware that observes, supervises, controls, or verifies operations of a system. (A) (3) In a token-ring network, the function required to initiate the transmission of a token on the ring and to provide soft-error recovery in case of lost tokens, circulating frames, or other difficulties. The capability is present in all ring stations.

MS. Management services.

MTU. Maximum transmission unit.

N

NetBIOS. Network Basic Input/Output System. An operating system interface for application programs used on IBM personal computers that are attached to the IBM Token-Ring Network. See also *BIOS*.

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 administrator. A person who manages the use and maintenance of a network.

O

Open Systems Interconnection (OSI). (1) The interconnection of open systems in accordance with standards of the International Organization for Standardization (ISO) for the exchange of information. (T) (A) (2) The use of standardized procedures to enable the interconnection of data processing systems.

Note: OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications.

optical wrap. Signal transmission, used primarily for testing, that routes the signal from the optical output of a device directly to the optical input.

OSI. Open Systems Interconnection.

P

Point-to-Point Protocol (PPP). A protocol that provides router-to-router and host-to-host network connections over both synchronous and asynchronous circuits.

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.

POST. Power-on self-test.

PPP. Point-to-Point Protocol.

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.

processor. In a computer, a functional unit that interprets and executes instructions. A processor consists of at least an instruction control unit and an arithmetic and logic unit. (T)

Q

queue. A list constructed and maintained so that the next data element to be retrieved is the one stored first. (T)

R

random access memory (RAM). (1) A storage device in which data can be written and read. (2) A storage device into which data is entered and from which data is retrieved in a nonsequential manner. (3) Deprecated term for *direct access storage device*. (T)

read-only memory (ROM). (1) A storage device in which data, under normal conditions, can only be read. (T) (2) Memory in which stored data cannot be modified by the user except under special conditions.

ring. (1) Two or more stations in which information is passed sequentially between active stations, each station in turn examining or copying the information, finally returning it to the originating station. (2) 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.

ROM. Read-only memory. (A)

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 refer-

ence model network layer. Contrast with *bridge* and *gateway*.

S

SDLC. Synchronous Data Link Control.

Simple Network Management Protocol (SNMP).
(1) An IP network management protocol that is used to monitor routers and attached networks. (2) A TCP/IP-based protocol for exchanging network management information and outlining the structure for communications among network devices. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

SIMM. Single in-line memory module.

SNA. Systems Network Architecture.

SNMP. Simple Network Management Protocol.

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)

system unit. (1) A part of a computer that contains the processing unit and devices, such as disk and diskette drives. (2) In an IBM personal computer, the unit that contains the processor circuitry, read-only memory (ROM), random access memory (RAM), and the I/O channel. It can have one or two diskette drives.

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.

Note: 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.

telephone twisted pair. One or more twisted pairs of copper wire in the unshielded voice-grade cable commonly used to connect a telephone to its wall jack. Also referred to as *unshielded twisted pair* (UTP).

terminal. In data communication, a device, usually equipped with a keyboard and display device, capable of sending and receiving information.

throughput. (1) A measure of the amount of work performed by a computer system over a given period of time, for example, number of jobs per day. (I) (A) (2) A measure of the amount of information transmitted over a network in a given period of time. For example, a network's data transfer rate is usually measured in bits per second.

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)*.

trace. (1) A record of the execution of a computer program. It exhibits the sequences in which the instructions were executed. (A) (2) For data links, a record of the frames and bytes transmitted or received.

Transmission Control Protocol (TCP). (1) A communications protocol used in Internet and in any network that follows the U.S. Department of Defense standards for inter-network 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. (2) A transport protocol in the Internet suite of protocols that provides reliable, connection-oriented, full-duplex data stream service.

Transmission Control Protocol/Internet Protocol (TCP/IP). (1) A set of protocols that allow cooperating computers to share resources across a heterogeneous network. (2) A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks.

twisted pair. A transmission medium that consists of two insulated electrical conductors twisted together to reduce noise. (T)

U

unshielded twisted pair (UTP). See *telephone twisted pair*.

V

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 ITU-TS that defines the automatic answering equipment and parallel automatic calling equipment on the General Switched Telephone Network, including procedures for disabling 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.

vital product data (VPD). Product identification information that describes the hardware and software components in the product. VPD is used to assist in asset and inventory control, performing problem determination, identifying service levels, and ensuring proper hardware and software compatibility levels.

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)*.

workstation. A functional unit at which a user works. A workstation often has some processing capability. (T)

wrap test. A test that checks attachment or control unit circuitry without checking the mechanism itself by returning the output of the mechanism as input; for example, when unrecoverable communication adapter or machine errors occur, a wrap test can transmit a specific character pattern to or through the modem in a loop and then compare the character pattern received with the pattern transmitted. See also *optical wrap*.

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 (ITU-TS) recommendation for the interface between data terminal equipment and packet-switched data networks. See also *packet switching*.

Xerox Network Services (XNS). A Xerox Network Services protocol. This term collectively describes the suite of internet protocols developed by the Xerox Corporation. Although similar to TCP/IP protocols, XNS uses different packet formats and terminology. See also *IPX*.

XNS. Xerox Network Services.

Z

zone. A logical grouping of hosts within the AppleTalk internet. A zone name is a 32 ASCII character string that identifies each node.

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Service and Maintenance Guide**

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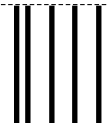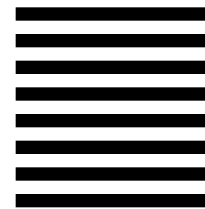
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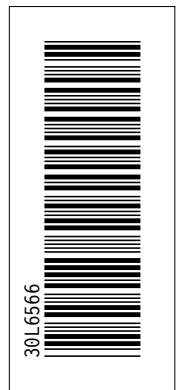NECESSARY
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