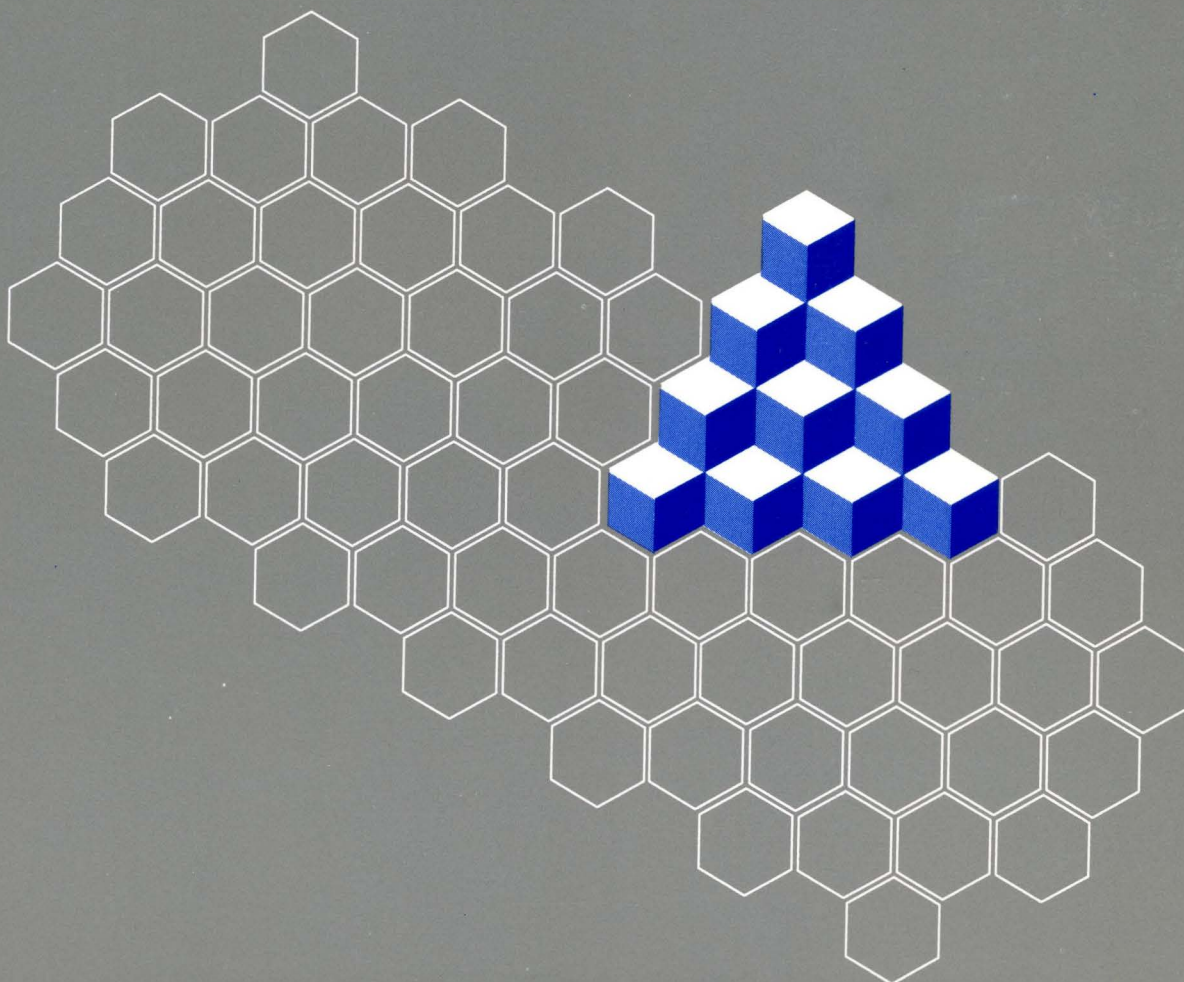




9335 Direct-Access Storage Subsystem

SY33-0113-2

# Service Guide



## **9335 Disk Unit**

### Control Unit A01:

- 6200826 Address switch
- 6243730 A1 board
- 59X6893 A1A1 R/W card
- 75X4472 A1B1 interface card
- 8223625 A1C1 CCP card
- 75X9053 A1C5 SA1 M/P card
- 6200886 Fan
- 6200890 Power supply
- 6200575 Power switch
- 6200884 Service panel/keypad
- 6495246 Terminator
- 59X6803 Thermal

### DRIVE B01:

- 8232314 CB3, 4 amp
- 8232311 CB5, 1 amp
- 8232315 CB6, 5 amp
- 8232220 DE/HDA
- 75X8831 Fan (above S/N 02739)
- 75X8831 Fan (S/N 02739 & below)
- 6200583 Power supply box, AC
- 62X9790 Power supply, DC
- 5146651 Stator B/M
- 75X5987 Switch, airflow
- 59X6789 Thermal, internal
- 6200580 Thermal, left rear

### LOGIC:

- 8223640 A1 board
- 75X4418 A1A5 demodulator card
- 75X4473 A1B1 servo card
- 8223646 A1C1 interface card
- 75X9311 A1C5 power control card
- 59X6908 B1A1 CCP card
- 8232196 C1A1 motor driver card
- 8232235 E1A1 power regulator card
- 6243740 F1A1 read detect card
- 75X4421 G1A1 actuator driver card



9335 Direct-Access Storage Subsystem

SY33-0113-2

**Service Guide**

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### **Third Edition (June 1988)**

IBM has prepared this service manual for the use of IBM service representatives in the maintenance or repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

Information contained in this manual is subject to change from time to time. Any such changes will be reported in subsequent revisions.

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## **Safety**

This section contains the following information for ensuring your safety:

- **Rules for Safety** including **First Aid**.
- **Danger** text given in this manual.

---

## Rules for Safety

*This product meets IBM safety standards.*

The following information has been included in this publication for the use and safety of IBM personnel. For more information, see *Electrical Safety for IBM Service Representatives*, S229-8124, and *Safety/Health Guidelines for IBM Service Representatives*, S241-5493.

### General Safety During Work

Use these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during maintenance and after completing it.
- Use only field-supply items (such as adhesives, cleaning fluids, lubricants, paints, and solvents) that have been approved by IBM, that is, are supplied under an IBM part number.
- When lifting any heavy object:
  1. Ensure that you can stand safely without slipping.
  2. Balance the weight of the object between your two feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer or that makes the equipment unsafe.
- Put removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Always keep your tool case away from walk areas so that other persons will not trip over it; for example, put it under a desk or table.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or are rolled up above the elbows. If your hair is long, fasten it.
- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

**Note:** Remember. A metal object lets more current flow if you touch a live conductor.
- Insert the ends of your necktie or scarf inside other clothing or fasten the necktie with a clip, preferably nonconductive, approximately 8 centimeters (3 inches) from the ends.

- Wear safety glasses when you are:
  - Using a hammer to drive pins or similar parts
  - Drilling with a power hand-drill
  - Using spring hooks or attaching springs
  - Soldering parts
  - Cutting wire or removing steel bands
  - Cleaning parts with solvents, chemicals, or cleaning fluids
  - Working in any other conditions that might be hazardous to your eyes.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- After maintenance, reinstall all safety devices such as shields, guards, labels, and ground wires. Exchange any safety device that is worn or defective for a new one.

**Note:** Remember. Safety devices protect personnel from hazards. You destroy the purpose of the devices if you do not reinstall them before completing your service call.
- Reinstall all covers correctly before returning the machine to the customer.

## Safety with Electricity

Observe these additional rules when working on equipment powered by electricity:

- Find the room emergency power-off (EPO) switch or disconnecting switch. If an electrical accident occurs, you can then operate the switch quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages. Always inform your manager of any possible problem or if you must work alone.
- Disconnect all power:
  - Before removing or installing main units
  - Before working near power supplies
  - Before doing a mechanical inspection of power supplies
  - Before installing changes in machine circuits.
- Before you start to work on the machine, unplug the machine's power cable. If you cannot unplug the cable easily, ask the customer to switch off the wall box switch that supplies power to the machine, and either:
  - Lock the wall box switch in the off position, or
  - Attach a DO NOT OPERATE tag (IBM Order Number Z229-0237) to the wall box switch.

**Note:** A non-IBM attachment to an IBM machine can be powered possibly from another source and controlled by a different disconnecting switch or circuit breaker. If you determine that this condition is present, ensure that you remove (eliminate) this hazard before you start work.

- If you need to work on a machine that has *exposed* electrical circuits, observe the following precautions:
  - Ensure that another person, who is familiar with the power-off controls, is near you.

**Note:** Remember. Another person must be there to switch off the power, if necessary.

- **CAUTION:**

**Some IBM hand tools have handles covered with a soft material that does not insulate you when working with live electrical circuits.**

Use only those tools and testers that are suitable for the job you are doing.

- Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

**Note:** Remember. There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through the vital parts of your body.

- When using testers, set the controls correctly and use the IBM-approved probe leads and accessories intended for that tester.

- **CAUTION:**

**Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to ground electrostatic charges. Do not use this wrong type of mat to protect yourself from electric shock.**

Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

- Observe the special safety precautions when you work with very high voltages; these instructions are given in IBM safety service memorandums (SMs) and the safety sections of maintenance information. Use extreme care when measuring high voltages.
- Do not use tools or testers that have not been approved by IBM. Ensure that electrical hand tools, such as power drills, are inspected regularly.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been switched off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are: moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the glass surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Unless the maintenance information specifically lets you, do not service the following parts *with power on them* when they are removed from their normal operating places in a machine:

Power supply units  
Pumps  
Blowers and fans  
Motor generators

and similar units. (This rule ensures correct grounding of the units.)

- If an electrical accident occurs:
  - **Use caution; do not become a victim yourself.**
  - **Switch off power.**
  - **Send another person to get medical aid.**
  - **If the victim is not breathing, decide whether to give rescue breathing.**

These actions are described below.

---

## Emergency First Aid

When giving rescue breathing after an electrical accident:

- *Use Caution.* If the victim is still in contact with the electrical-current source, remove the power; to do this, you may need to use the room emergency power-off (EPO) switch or disconnecting switch.  
If you cannot find the switch, use a dry wooden rod or some other nonconductive object to pull or push the victim away from contact with the electrical-current source.
- *Work Quickly.* If the victim is unconscious, he or she possibly needs rescue breathing. If the heart has stopped beating, the victim may also need external cardiac compression.  
**Only a trained and certified person<sup>1</sup> should perform external cardiac compressions.**
- *Get Medical Aid.* Call a rescue group, an ambulance, or a hospital immediately.

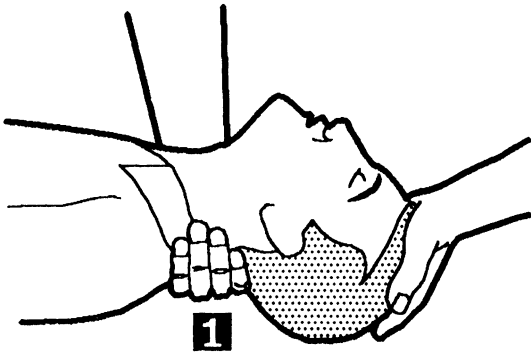
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<sup>1</sup> If you want to be trained in giving this aid, ask a suitable organization (such as the Red Cross) in your area.

## Rescue Breathing Procedures

### Determine if the victim needs rescue breathing:

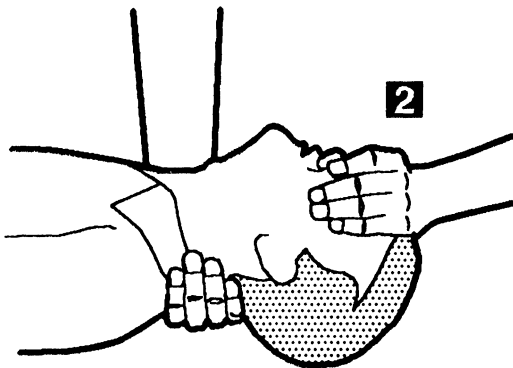
1. Prepare the victim:
  - a. Ensure that the victim's airway is open and not obstructed. Check the mouth for objects (such as chewing gum, food, dentures, or the tongue) that can obstruct the flow of air.
  - b. Place the victim on his or her back, then put one hand under the victim's neck and the other hand on the victim's forehead.
  - c. Lift the neck with one hand **1** and press the forehead backward with the other hand.



2. *Look, listen, and feel* to determine if the victim is breathing freely:
  - a. Put your cheek near the victim's mouth and nose.
  - b. Listen and feel for the breathing-out of air. At the same time, look at the victim's chest and upper abdomen to see if they move up and down.

### If the victim is not breathing correctly and you decide that you want to give rescue breathing:

3. Continue to press on the victim's forehead with your hand and pinch together the victim's nostrils **2** with the thumb and finger.

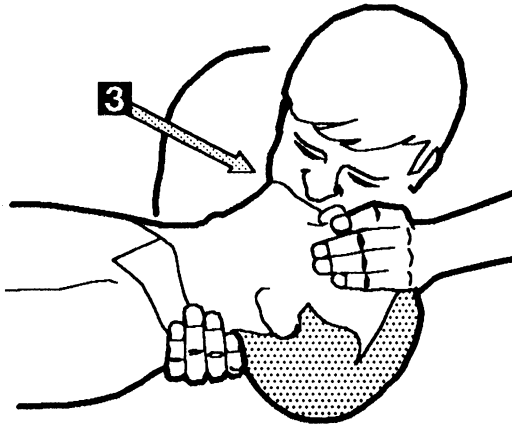




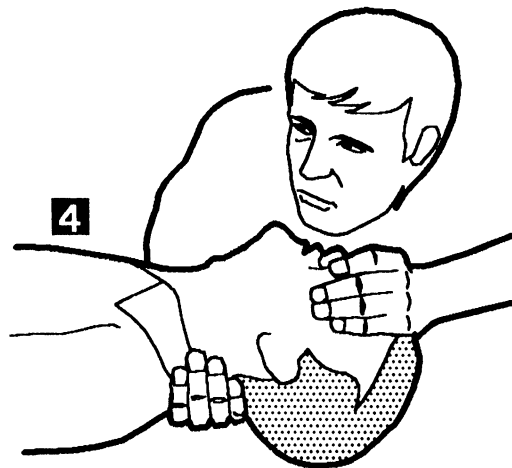
4. **CAUTION:**

Use extreme care when giving rescue breathing to a victim who possibly has breathed-in toxic fumes. *Do not breathe-in air that the victim has breathed-out.*

Open your mouth wide and take a deep breath. Make a tight seal with your mouth<sup>2</sup> around the victim's mouth **3** and blow into it.



5. Remove your mouth and let the victim breathe out while you check that the victim's chest **4** moves down.



6. Repeat steps 4 and 5 once every 5 seconds until the victim breathes normally again or until medical aid comes.

---

<sup>2</sup> A rescue-breathing face covering (mask) or similar unit can be used if you have been taught how to use it.

---

## Reporting Accidents

Report to your manager or to your IBM site all accidents, possible hazards, and accidents that nearly occurred.

**Note:** Remember. An accident that nearly occurred can be caused by a design problem. Quick reporting ensures quick solving of the problem.

Report also each small electric shock, because the conditions that caused it need only differ slightly to cause serious injury.

---

## “Danger” Text in this Book

This section shows the Danger text that is given in the chapters of this book. If desired, translate the text and write your own words in the space under it.

Danger Text	Page Reference
<p><b>DANGER</b></p> <p>Switch power off and remove the mainline power cable before removing or installing a FRU.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	4-3, 7-10
<p><b>DANGER</b></p> <p>Switch power off and remove the mainline power cable before starting servicing procedures.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	7-4
<p><b>DANGER</b></p> <p>Hazardous voltages are present at the power supply unit.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	7-20

Danger Text	Page Reference
<p><b>DANGER</b></p> <p>Connector J21 must not be removed if you are servicing with power on.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>7-28</p>
<p><b>DANGER</b></p> <p>Where a hazardous voltage label is shown, mainline ac voltage is present on the components within covers until the mainline power cable is removed.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>8-26, 8-27, 8-28, 8-29, 8-30, 8-34, 8-35, 8-38, 8-42, 8-44, 8-45, 8-55, 8-56, 8-61, 8-62, 8-64, 8-66, 8-67, 8-80, 8-85, 8-88, 8-96, 8-99, 8-109, 8-111, 8-113 and 8-117</p>
<p><b>DANGER</b></p> <p>Do not attempt to remove the cover from this unit. It contains electrical shock hazards.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>4-12</p>

Danger Text	Page Reference
<p><b>DANGER</b></p> <div style="border: 1px solid black; padding: 10px;"><p><b>Do not attempt to apply power without the fan cover in place. Unshielded rotating fan blades cause danger from both direct contact and from objects dropped on to them.</b></p><hr/><hr/><hr/><hr/><hr/><hr/><hr/></div>	7-71

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## About This Book

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### Who Should Use This Service Guide

This Service Guide is to be used by service representatives during unscheduled maintenance of the IBM 9335 Direct-Access Storage Subsystem.

---

### How This Service Guide Is Arranged

The Service Guide is in four parts:

- **Part 1** describes the IBM 9335 Direct-Access Storage Subsystem, lists the associated publications, and contains the start of the problem determination procedures.
- **Part 2** details the field-replaceable unit (FRU) removal and installation procedures for the IBM 9335 Model A Device Function Controller. It also shows the location of the FRUs and contains problem isolation procedures for the Model A.
- **Part 3** details the field-replaceable unit (FRU) removal and installation procedures for the IBM 9335 Model B Disk-Storage Device. It also shows the location of the FRUs and contains problem isolation procedures for the Model B.
- **Part 4** details the safety inspection procedures for the IBM 9335 Model A and Model B.

Each part of the manual is separated by a tab.

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### Changes Since the Last Edition

This edition includes changes that:

- Describe recent updates to the IBM 9335
- Correct errors in the previous edition.

These changes are indicated by a vertical bar in the left-hand margin.



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---

## Book Layout and Chapter Summaries

This Service Guide is for service representatives to use during maintenance work. The Service Guide is in four parts: the first contains information common to both the IBM 9335 Model A Device Function Controller and the IBM 9335 Model B Direct Access Storage unit; the second part is only for the Model A; the third is for the Model B; the fourth part is for safety information common to both units.

The arrangement of the Service Guide, with a summary of each chapter, is shown below:

### Part 1 – Common Information

- Chapter 1. Start
  - Introduction
  - Subsystem summary
  - Procedures for initial problem analysis.
- Chapter 2. Associated Publications
  - Details of other manuals referred to in this manual.
- Chapter 3. Controls, Indicators, and Diagnostics
  - Model A controls and indicators
  - Model B controls and indicators
  - Diagnostic programs in the Model A
  - Using the service panel
  - Descriptions of the Model B diagnostic tests
  - Machine exception data
  - Other diagnostic aids.

### Part 2 – Information for the IBM 9335 Model A Device Function Controller

- Chapter 4. Model A: FRU Removal and Installation
  - Step-by-step procedures for removing and installing field-replaceable units (FRUs).
- Chapter 5. Model A: Power and Grounding Locations
  - Power supply servicing procedures
  - Power distribution diagrams
  - Electrical grounding safety checks.
- Chapter 6. Model A: Locations
  - Locations of FRUs
  - Fault indicator locations.

**Part 3 – Information for the IBM 9335 Model B Direct-Access Storage**

- Chapter 7. Model B: FRU Removal and Installation
  - Step-by-step procedures for removing and installing FRUs.
- Chapter 8. Model B: Power and Grounding Locations
  - Power supply servicing procedures
  - Power distribution diagrams
  - Electrical grounding safety checks.
- Chapter 9. Model B: Locations
  - Locations of FRUs
  - Fault indicator locations.

**Part 4 – Safety Inspections**

- Chapter 10. Safety Inspections

**Glossary**

**Index.**

---

## Introduction to the IBM 9335 Subsystem

The IBM 9335 Direct-Access Storage Subsystem provides fixed-disk, direct-access storage. A minimum configuration has a capacity of over 850 million bytes of formatted information. The subsystem consists of:

- The IBM 9335 Model A Device Function Controller. This contains:
  - A system adapter
  - A microprocessor
  - A device adapter containing:
    - A device interface adapter
    - A device read/write adapter.
  - A front control panel and its adjacent service panel
  - A back panel with the mainline power cable connector and power supply indicators
  - Power supplies
  - A cooling fan.

One Model A can control up to four units of Model B.

- The IBM 9335 Model B Disk-Storage Device. This contains:
  - A disk enclosure with:
    - Three 356-mm (14-inch) disks
    - Two actuators (logical devices)
      - Each actuator, which carries six read/write heads, is considered to be a separately addressable logical device with a capacity of over 425 million bytes of formatted information.
      - Six read/write heads per actuator
      - Associated electronics.
  - A front control panel and a back panel
  - Power supplies
  - A cooling fan.

The IBM 9335 models are installed in an IBM 9309 rack enclosure.

The Model A connects to a using system by a 24-signal interface. Any module in the rack can be installed, removed, and serviced separately.

A typical subsystem configuration is shown in Figure 1-1.

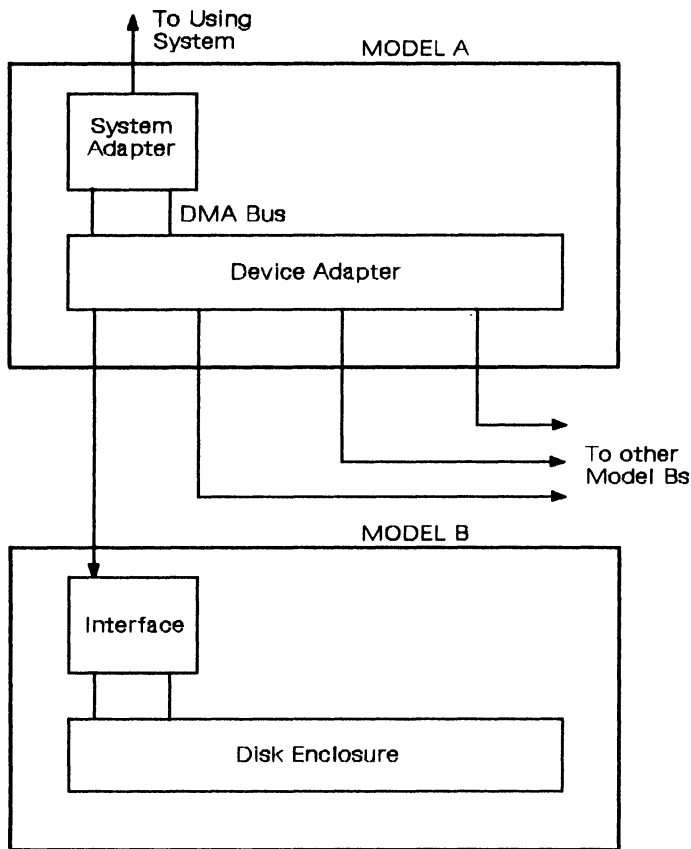


Figure 1-1. IBM 9335 Subsystem: Typical Configuration

## Problem Analysis

The problem analysis procedures for the IBM 9335 Direct-Access Storage Subsystem start at "Problem Determination Procedures" on page 1-6. During problem analysis, one or more unit reference codes (URCs) may be generated. The URC is the primary guide to isolating a failing field-replaceable unit (FRU).

The URC is normally displayed at the using system; see the appropriate using-system publication. The URC can also be displayed at the Model A control panel. The URC is held in bytes 22 and 23 of the machine exception data (MED). A URC is also generated when a diagnostic test program finds a problem. Make a note of the URC after each test procedure. Chapter 3 tells you how to display the MED and the URC, how to run the diagnostic test programs, and describes the separate diagnostic tests in each program.

---

## Problem Determination Procedures

### Problem Determination Entry

You are here because of a failure (or failures) in the IBM 9335 Direct-Access Storage Subsystem. Your first step is to isolate the cause of the failure. Answer the questions in the left-hand column, then follow the instructions in the right-hand column. Continue until you find the cause of the failure.

#### CAUTION:

Make the checks described in the "Safety Inspection Guide" in Chapter 10 before doing any maintenance on the IBM 9335 Direct-Access Storage Subsystem.

**Note:** All actions refer to the failing or suspected failing unit. Device 0 means a device with an even-numbered address and Device 1 means a device with an odd-numbered address.

---

#### SYMPTOM

#### ACTION

---

1

Has the customer completed the problem determination procedures and made a note of the URC displayed on the using-system console or listed in *Using your IBM 9335*?

Ask the customer for the URC or any other message that was displayed.

Go to the *Guide to Unit Reference Codes* and perform the procedures described for the URC displayed.

NO      YES



Follow the instructions on the right.

---

2

Is the IBM 9335 making an unusual noise or giving out smoke, or can you smell burning that may indicate that severe damage is occurring?

1. Remove power from the failing unit.
2. Wait for the unit to cool if overheating is suspected.
3. Go to "Problem Isolation Procedure A1" on page 5-3 if the failure is in the Model A. Go to "Problem Isolation Procedure B1" on page 8-3 (Entry Point A) if the failure is in the Model B.

NO      YES



Follow the instructions on the right.

---

### 3

| **Has the machine has been online to the**  
| **using system since the last power on?**

| **NO      YES**



| Go to step 5

---

### 4

**Do not check the following by**  
**powering off and on again:**

| **Did either the Model A or any device**  
| **of a Model B fail to come ready when**  
| **it was powered on?**

**NO      YES**



Follow the instructions on  
the right.

If the failure is in the Model A, go to "Problem Isolation  
Procedure A1" on page 5-3 (Entry Point A).

If the failure is in the Model B, go to "Problem Isolation  
Procedure B1" on page 8-3 (Entry Point A).

---

### 5

**Is a URC displayed at the using-system**  
**console?**

**NO      YES**



Follow the instructions on  
the right.

Go to the *Guide to Unit Reference Codes* and perform the  
procedures described for the URC displayed.



---

## 6

Is there a message on the using-system console that indicates either that there is a Model A problem, or that more than one Model B has a problem, or that both of these conditions are present?

NO



YES

Follow the instructions on the right.

You have a Model A problem.

Go to the Model A and:

1. Check that the Power switch on the front panel is set to On.
2. Check that the Attachment A Device Enable/Disable switch is set to Enable.
3. Check that the address switch is set to the correct address. If it is incorrect, power off and correct the address.
4. If none of the Model B front Power On lights are on, go to the *IBM 9309 Rack Enclosure: Guide to Analyzing Problems*, SA24-4077.
5. Otherwise, go to "Problem Isolation Entry Point A" on page 5-3.

**Is there a message on the using-system console that indicates that there is a problem at only one Model B?**

**NO**

**YES**



Follow the instructions on the right.

**Go to step 9.**

You have a Model B problem. One logical device or one Model B01 is failing.

1. Check that the Power switch is set to On.
2. Check that the Device Enable/Disable switch is set to Enable.
3. Check that the cables at the back of the failing unit are fully plugged into their sockets at both the Model A and Model B ends of the cable.
4. Check that the voltage selector switch is set correctly (VS1 on the back panel).
5. Check the Power On light of the failing unit. If it is off, go to "Problem Isolation Procedure B1" on page 8-3 (Entry Point A).
6. If the Power On light of the failing unit is on, force the failing device to display sense data on the Model A service panel by performing the procedure "Displaying Diagnostic Sense Data" on page 3-27. If both devices are failing, force the sense data from the device with the lower address.
7. Make a note of the sense data and retain it for future use.
8. Run diagnostic test program 10 to the failing device. If both devices are failing, run the diagnostic test program to the lower address. See "Running a Diagnostic Test Program" on page 3-18.
9. Make a note of the displayed URC and perform the instructions for that code in the *Guide to Unit Reference Codes*.
10. If there is no displayed URC or if the device is no longer failing, there may be an intermittent problem. Go to the next step.

---

## 8

You are here because there is no URC displayed, and you may have an intermittent error.

Follow the instructions on the right.

If you have not noted any sense data, go to step 17.

Look at the sense data you previously noted, and exchange, for new ones, the following FRUs.

If your IBM 9335 serial number is from 57-B0000 onward:

Sense Byte Code	Primary FRU Replacements
D20	Read-detect card, sermod card; and, if the failure persists, exchange the disk enclosure
D10	Sermod card, read-detect card
D08	Motor driver, power control card, sermod card
D04	Sermod card
D02	Actuator driver card, power regulator card
D01	Sermod card, device interface card

If your IBM 9335 serial number is before 57-B0000,

Sense Byte Code	Primary FRU Replacements
D20	Read detect card, demod card, servo card; and, if the failure persists, exchange the disk enclosure
D10	Demod card, servo card, read detect card
D08	Motor driver, power control card, servo card
D04	Servo card, demod card
D02	Actuator driver card, power regulator card
D01	Servo card, device interface card

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 9

On a Model B, have the Power On, and Power Ready lights remained on after local or remote power off?

NO

YES



Follow the instructions on the right.

1. Run diagnostic test program 21 to device 0 of the failing Model B, and make a note of the displayed URC.
2. Go to the *Guide to Unit Reference Codes* and perform the procedures for the code displayed.

If test 21 runs without an error but the Model B still does not switch off, go to the *Guide to Unit Reference Codes* for URC 2218.

---

## 10

**On a Model B, does a Device Attention switch fail to operate?**

**(If it operates correctly, the Device Ready light goes out for 3 seconds, and comes on again.)**

**NO**



**YES**

Go to "Problem Isolation Entry Point W" on page 8-108.

---

## 11

**On a Model A, are all the lights on the front panel off, and is the reference display blank, with the Power Switch set to On?**

**NO**



**YES**

Follow the instructions on the right.

Run diagnostic test program 10 from the system to a device connected to the failing Model A.

If the test fails, go to the *Guide to Unit Reference Codes* and perform the procedure for the code displayed. Otherwise, exchange for new ones, the following FRUs in sequence:

1. Control panel card 01A-C1A1
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 12

**On a Model A, is the Power On light off and the Controller Ready light on?**

**NO**



**YES**

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the procedures for code 2511.

---

## 13

**On a Model A, do you suspect failure in the keypad, the reference display, or the control panel?**

**NO**

**YES**



Follow the instructions on the right.

Go to "Testing the Service Panel" on page 3-28.

If the test fails, exchange for new ones, the following FRUs in sequence:

1. Keypad on the control panel
2. Control panel card 01A-C1A1
3. Device adapter interface card 01A-A1B1
4. System adapter (microprocessor) card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 14

**Does a Model B remain online to the using system when its Enable/Disable switch is set to Disable?**

**NO**

**YES**



Go to "Problem Isolation Entry Point X" on page 8-113.

---

## 15

**Does the Model A fail to power off?**

**NO**

**YES**



Follow the instructions on the right.

Disconnect the mainline power cable at the back of the drawer, then exchange, for a new one, the Power switch on the front panel.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 16

**Run diagnostic test 10 to each device in turn. If a URC is reported, go to the *Guide to Unit Reference Codes* and perform the actions for that code. If no URC is reported, can you see that something is wrong on the Model B?**

**NO**

**YES**



Follow the instructions on the right.

Power off the Model B and check the lights with the primary power switched on. Go to "Problem Isolation Entry Point C" on page 8-20.

---

**17**

| **Call for support and report your**  
| **problem.**

---

## **Chapter 2. Associated Publications**

<b>Using-System Publications</b> .....	<b>2-2</b>
<b>Publication References Made from This Book</b> .....	<b>2-2</b>

---

## Using-System Publications

For information about the maintenance procedures for the using system, see its service guide.

---

## Publication References Made from This Book

- *IBM 9335 Direct-Access Storage Subsystem Guide to Unit Reference Codes*, SY33-0143
- *IBM 9335 Direct-Access Storage Subsystem: Parts Catalog*, S135-0021
- *IBM 9309 Rack Enclosure: Guide to Analyzing Problems*, SA24-4077.



## Chapter 3. Controls, Indicators, and Diagnostics

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---

## Introduction

**Note:** If you have been sent to this chapter to run a diagnostic test program, go to “Running Diagnostics from the Service Panel” on page 3-17.

This chapter has four main sections:

- The first section describes the physical controls and indicators on a Model A and a Model B. It starts with “Model A: Controls and Indicators” on page 3-4.
- The second section describes the diagnostic programs that can be used from the Model A and that are part of the Model A microcode. It starts with “Diagnostic Programs in the Model A” on page 3-15.
- The third section describes the use of the service panel on the Model A to perform the diagnostic programs described in the second section. It starts with “Running Diagnostics from the Service Panel” on page 3-17.
- The fourth section is a summary of some other diagnostic aids that can be used in problem isolation for the IBM 9335 Direct-Access Storage Subsystem. It starts with “Microcode Trace Procedure” on page 3-38.

---

## Model A: Controls and Indicators

### Front Panel

The control panel (Figure 3-1) on the front of the Model A contains the switches and indicators needed for normal operation of the IBM 9335 Direct-Access Storage Subsystem.

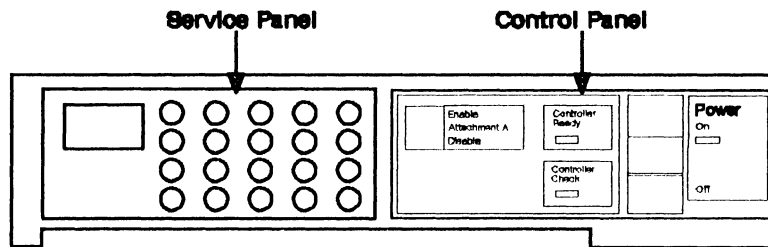


Figure 3-1. Model A Control Panel

### Control Panel Switches and Indicators

The control panel contains the following switches and indicators:

#### Attachment A Enable/Disable

When set to Disable, this switch disconnects the Model A from the using system.

#### Power

This switch powers-on or powers-off the Model A. The power indicator is on when power is on.

#### Controller Check

This indicator is on when a failure stops the Model A microprocessor.

#### Controller Ready

This indicates that the Model A is ready for use. It flickers during normal operation.

## Back Panel Switch and Indicators (Early Version)

The back panel (Figure 3-2) of the early version of the Model A has the following switch and indicators:

### SW1

This switch sets the address of the Model A.

### L1

This light indicates that power is present at the Model A.

### L2

This light indicates a dc power failure.

### L3

This light indicates that the unit has overheated.

### L4

This light indicates that the primary ac power-supply fuse has blown.

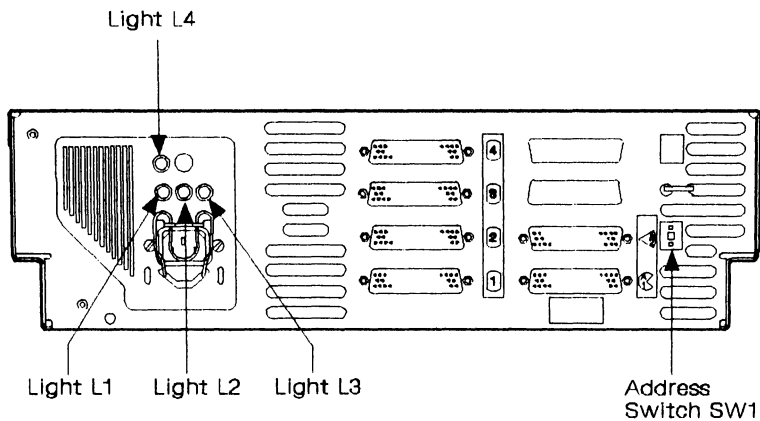


Figure 3-2. Model A Back Panel (Early Version)

## Back Panel Switch and Indicators (Later Version)

The back panel (Figure 3-3) of the later version of the Model A has the following switch and indicators:

### SW1

This switch sets the address of the Model A.

### L1

This indicates that power is present at the Model A.

### L2

This indicates that the primary ac power-supply fuse has blown.

### L3

This indicates that the unit has overheated.

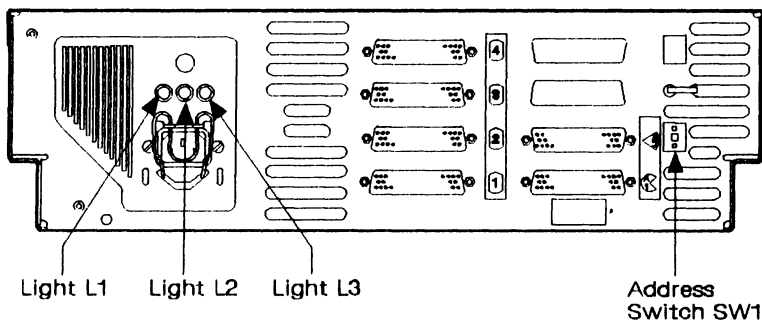


Figure 3-3. Model A Back Panel (Later Version)

---

## Model A: Service Panel Description

The Model A service panel (Figure 3-4) contains a three-digit reference display and a hexadecimal keypad. It is installed beside the control panel and behind the removable front panel.

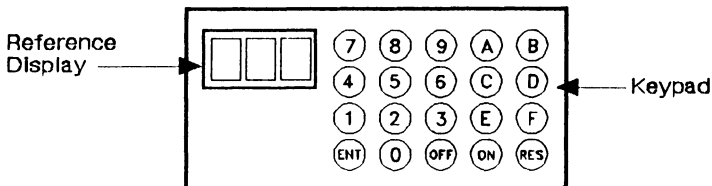


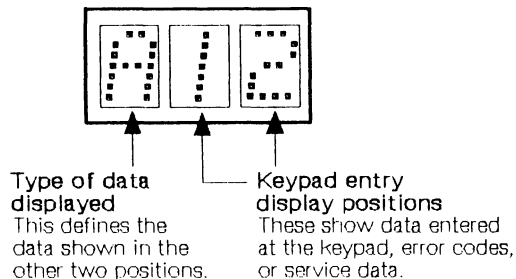
Figure 3-4. Model A Service Panel

The purposes of the reference display and keypad are:

- To display the IML status of the subsystem
- To display codes associated with failures during basic assurance tests (BATs)
- To run the Model A diagnostic programs
- To reset the Model A
- To run the BATs in a loop
- To display the unit history log
- To display machine exception data (MED)
- To display diagnostic sense data
- To display control block data.

## Service Panel Reference Display

The service panel reference display digits have these functions:



The character (number or letter) shown in the left-hand position of the reference display defines the type and meaning of the data shown in the other two positions, thus:

Display	Meaning
0xx	BAT failure codes
1xx	Enter diagnostic program selection
2xx	Enter device address
3xx	Enter diagnostic test number
4xx	Enter diagnostic test option
5xx	BAT failure codes
6xx	Enter log display option
7xx	(Not used)
8xx	Diagnostic test run status
9xx	IML status code
Axx	Device address
Bxx	Byte number or record number
C00	Operation complete
Dxx	Data
Exx	First half of URC
Fxx	Second half of URC



## Service Panel Keypad

You use the keypad (Figure 3-5), together with the reference display, to run the diagnostic programs.

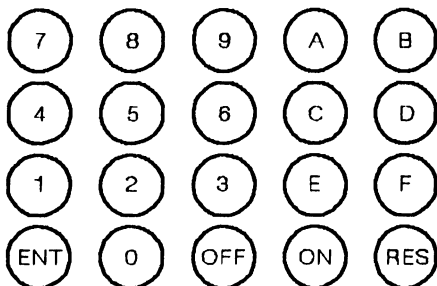


Figure 3-5. Service Panel Keypad

Use the keys as follows:

- **ON:** Press this to start the diagnostic program.
- **0–F:** Press these to enter hexadecimal characters (data) into the Model A. Each character entered from the keypad is displayed in the right-hand position of the reference display, moving the previous entry to the center position.

If you make a mistake during entry, provided you do not press ENT, you can continue to enter characters from the keypad until the correction is made.

- **ENT (Enter):** Press this to enter the data. What you enter is displayed in the center and right-hand positions of the reference display.

An entry error is shown by EE in the center and right-hand display positions. If this happens, reenter the data correctly.

- **RES (Reset):** Press this together with ON, to reset the Model A when the characters AB are displayed in the center and right-hand positions of the reference display.
- **OFF:** Press this to end the diagnostic program. This key can be pressed at any time during a diagnostic program.

---

## Model B Controls and Indicators

### Front Control Panel

The control panel (Figure 3-6) on the front of the Model B contains a reference display and the switches and indicators necessary for normal operation.

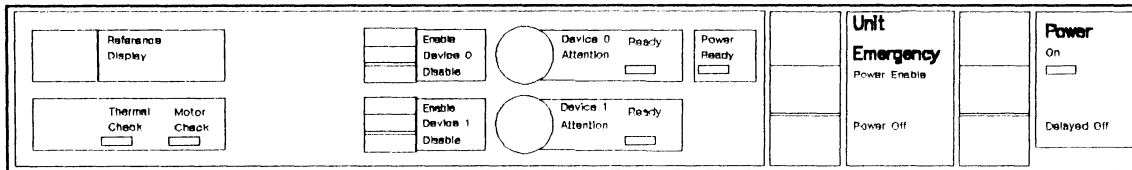


Figure 3-6. Model B Control Panel

### Reference Display

The reference display shows a single hexadecimal character representing a power reference code:

Code	Meaning
0	Control voltage present with the Power switch set to Delayed Off
1	- 5 V over voltage
2	- 12 V over voltage
3	+ 5 V over voltage
4	+ 12 V over voltage
5	+ 66 V over voltage
6	This code is not valid
7	All dc levels over voltage
8	This code is not valid
9	- 5 V under voltage
A	- 12 V under voltage
B	+ 5 V under voltage
C	+ 12 V under voltage
D	+ 66 V under voltage
E	Both - 12 V and + 12 V under voltage
F	All dc levels under voltage

Under normal operation, this display shows a 0 when the Power switch is set to Delayed Off, and is blank when power-on is complete.

## Switches and Indicators

The control panel on the Model B has the following switches and indicators:

### Device 0 Enable/Disable

When this switch is set to Disable, the Model B completes any actuator-0 (logical-device-0) operation in process, and then makes device 0 unavailable to the using system.

### Device 1 Enable/Disable

When this switch is set to Disable, the Model B completes any actuator-1 (logical-device-1) operation in process, and then makes device 0 unavailable to the using system.

### Device 0 Attention

This switch, which has a Ready indicator associated with it, causes the read/write heads of actuator 0 to return to the home position (cylinder 0 with head 0 selected). The Model A sends a signal to the using system reporting that the actuator has changed from “not ready” to “ready.” The Ready indicator, which flickers during normal operation, shows that actuator 0 is ready for use.

### Device 1 Attention

This switch, which has a Ready indicator associated with it, causes the read/write heads of actuator 1 to return to the home position (cylinder 0 with head 0 selected). The Model A sends a signal to the using system reporting that the actuator has changed from “not ready” to “ready.” The Ready indicator, which flickers during normal operation, shows that actuator 1 is ready for use.

### Power

When set to On, this switch starts a power-on sequence. The indicator associated with the switch lights when the switch is set to On and shows that ac power is present at the Model B. If there is a fault, power is removed and the appropriate power reference code is displayed on the front panel.

When set to Delayed Off, it starts a 33-second braking sequence to stop the motor, after which ac and dc supplies are switched off.

**Note:** Power control circuits are not affected by this switch. A voltage is present in the power control circuits whenever ac power is connected to the Model B.

### **Unit Emergency**

This switch is not installed on later Model Bs. If installed, this switch is covered with a blanking plate. This switch instantly removes ac power from the Model B when it is switched from Power Enable to Power Off.

**Note:** Because this switch bypasses the normal controlled braking operation, **it must only be used in emergencies.** Repeated use of this switch may result in reduced reliability, or damage to the heads and disks, or both.

### **Thermal Check**

This indicates that the Model B power supply unit or the disk enclosure has overheated. In this case, the delayed power-off sequence is initiated. The thermal sensors inhibit power on until the unit has cooled down. The thermal sensors reset automatically without manual intervention. (Power is not switched on, however, until the Power switch is set to Delayed Off and then to On.)

### **Motor Check**

If your IBM 9335 serial number is from 57-B0000 onward, this light will show for one second during initial power-on. If it stays on or comes on when the unit is in operation, an unsafe-motor condition has occurred.

If your IBM 9335 serial number is before 57-B0000, this light may flash during power on. If it stays on when the unit is in operation, an unsafe-motor condition has occurred.

This initiates the delayed power-off sequence. DC power remains on to allow sense data to be collected.

### **Power Ready**

This light shows that the power-on sequence has ended and that all dc power is present at the Model B.

## **Back Panel Indicators and Circuit Protectors**

The back panel (Figure 3-7 on page 3-14) of the Model B has the following indicators and circuit protectors:

### **L1**

This light indicates, when lit, that ac power is present at the ac power box in the Model B.

### **VS1**

Voltage selector switch.

### **CB1**

Mainline ac circuit breaker.

### **CB2**

Circuit breaker in ac line to transformer T1.

### **CB3**

Circuit breaker in ac line to transformer T2.

### **CB4**

- | Circuit breaker in ac line to the motor start circuit. This circuit breaker is not installed on later Model Bs.

### **CB5**

Circuit breaker in T1 5 V secondary circuit.

This lever normally remains in the unlocked position (to the right, as shown in Figure 3-5 on page 3-9) so that the disks can rotate. Move it to the locked position (down slightly then left) only before you move the Model B or remove the disk enclosure.

## Internal Indicators and Circuit Protector

These indicators can be seen only when the top cover of the Model B drawer has been removed:

A **green light-emitting diode (LED)** in the power supply unit (Power on indicator).

This indicator is lit when ac supply is present at the power supply unit. It is visible through a hole near the right front of the top cover of the power supply unit 01A-D1A1 viewed from the front of the Model B. (See Figure 9-3 on page 9-4.)

An **LED** in the motor driver box (Motor Driver DC Indicator).

This indicator is lit when a dc supply is present at the motor windings. It is visible through the left side of the motor driver box 01A-C1A1 viewed from the front of the Model B. (See Figure 9-3 on page 9-4.)

**CB6** is a circuit breaker in the 66 V dc line to the actuator drivers.

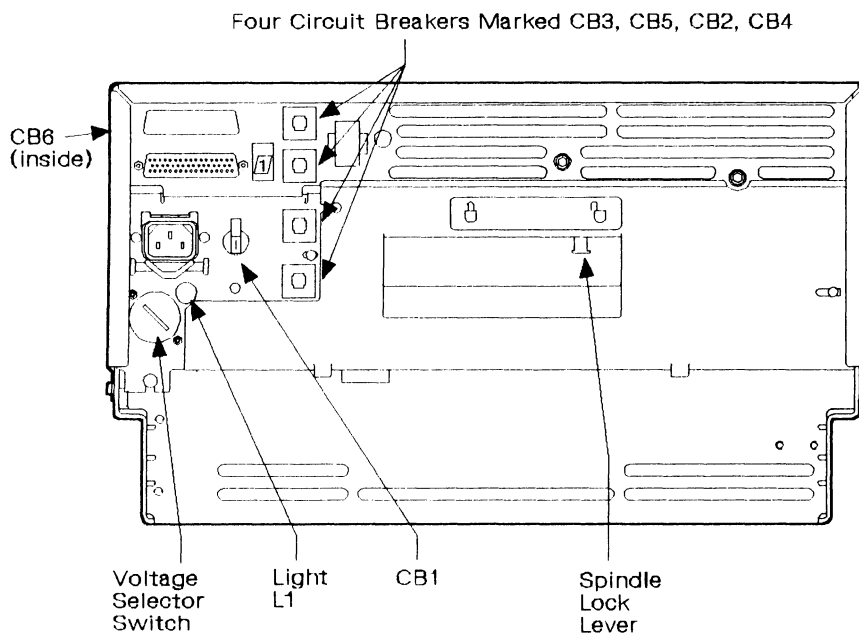


Figure 3-7. Model B Back Panel

---

## Diagnostic Programs in the Model A

The diagnostic programs ensure that the subsystem works correctly. They are also used during service procedures to find failed field-replaceable units (FRUs) and verify the repair.

There are four types of diagnostic program:

- **Basic assurance tests** for the Model A.

These tests run automatically every time that the subsystem is powered on, and when the Model A is reset. They test the Model A hardware.

- **Diagnostic test program** for the Model A.

This program tests the operation of the reference display and keypad on the Model A service panel.

- **Diagnostic data retrieving programs.**

These programs display data, stored in the Model A, that may be used for problem isolation.

**Note:** This data is lost if the Model A is powered off or reset.

- **Diagnostic test programs** for the Model B.

These programs test the Model Bs that are attached to a Model A. They consist of a series of linked tests and two nonlinked tests. The tests run when requested at the using system or when selected at the service panel on the Model A.

### Basic Assurance Tests for the Model A

Basic assurance tests (BATs) check for, and identify, failures in the Model A hardware that can be tested without transferring data. The tests, which are in read-only storage (ROS), run each time the subsystem is powered on or a Model A reset occurs.

The BATs must end an error-free run before an initial microcode load (IML) operation can start.

If the BATs detect a hardware failure in the Model A, the Controller Check light goes on and the microprocessor is stopped. An error code is displayed on the service panel reference display at this time, which is used for FRU isolation. See the *Guide to Unit Reference Codes* for repair actions.

**Note:** The BATs can be run in a continuous loop. See page 3-37 for the procedure.

### Diagnostic Test Program for the Model A

This test program checks for the correct operation of the reference display and keypad on the service panel of the Model A. See page 3-28 to use the program.

## Diagnostic Data Retrieval Programs

Using the Model A service panel, you can run the following diagnostic data retrieval programs:

1. Display the URC history log for the subsystem; see page 3-25 to use the program.
2. Display the last MED record for the Model A and each Model B in the subsystem; see page 3-23 to use the program.
3. Display Model B diagnostic sense data. This data is for use by a support center and is not described here; see page 3-27 to use the program.
4. Display control block data. This data is for use by a support center and is not described here; see page 3-28 to use the program.

**Note:** The data that can be displayed by these programs is lost if the Model A is powered off or reset.

## Diagnostic Test Programs for the Model B

A set of test programs for the Model B is stored in the Model A. These test programs check for correct operation of the logical devices attached to the Model A. You can select the test you want to run and how you want it to run. Table 3-3 on page 3-31 and Table 3-4 on page 3-34 each show a table of test programs, followed by a description of each test. "Selecting Diagnostic Test Run Options" on page 3-35 describes the options for running the tests.

**Warning:** The tests shown in Table 3-3 on page 3-31 (linked tests) should not be run as separate tests unless instructed.

Test 10 (which gives the linked tests as a series) must always be run before the device is returned to the customer.

You can usually run the diagnostic test programs to the Direct-Access Storage Subsystem from the using system. (See the using system manual.) If the using system is not available, you can run the diagnostic test programs from the service panel on the Model A; see page 3-18 to use the programs from the panel.

Each Model B has two logical device addresses, one for each of its actuators. The first Model B attached to the Model A has logical device addresses 0 and 1, the second has addresses 2 and 3, and so on (see "Logical Device Addresses" on page 3-30). The diagnostic test programs check only one logical device at a time. On some systems, the other logical device in the same Model B can continue to be used by the system while a test program is run, unless you want to run diagnostic test program 21. A logical device must be offline from the system before you run test programs to it.



---

## Running Diagnostics from the Service Panel

**Note:** Model B diagnostic tests should be run from the using system where possible. See the system publications for procedures. The service panel can be used by a service representative for the functions shown in Table 3-2. The first column of the table shows the number you enter at the keypad to select that function during the selection sequence.

No.	Function	Example Procedure Reference
1	Run diagnostic tests	“Running a Diagnostic Test Program” on page 3-18
2	Display unit reference code history log	“Displaying the URC History Log” on page 3-25
3	Display machine exception data	“Displaying the MED” on page 3-26
4	Display diagnostic sense data	“Displaying Diagnostic Sense Data” on page 3-27
5	Display control block data	“Displaying Control Block Data” on page 3-28
6	Run the service panel test	“Testing the Service Panel” on page 3-28

For additional functions that the service panel can be used for, see:

- “Resetting the Model A from the Service Panel” on page 3-37
- “Looping the Basic Assurance Tests” on page 3-37.

### Reference Display shows xEE

If you pressed ENT at the service panel keypad and xEE (where x is any hex character) is displayed on the reference display, you have made an Entry Error.

Key again the data you want to enter, ensuring that it is correct for the procedure you are following.

---

## Running a Diagnostic Test Program

**Warning:** Ensure that the direct-access storage being tested is offline (disabled) from the using system before you run a diagnostic test program to it.

This section tells you how to run the diagnostic test program from the Model A service panel and gives an example procedure.

### Example of Procedure

#### ACTION

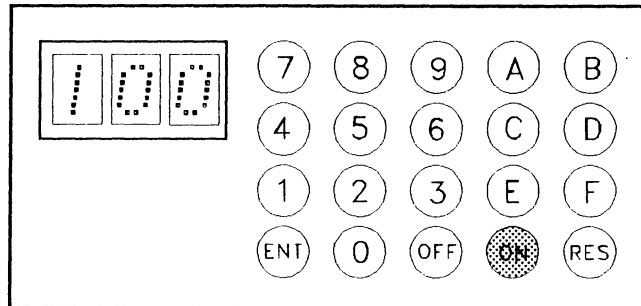
#### RESULT

---

**1**

Press ON.

100 is displayed.

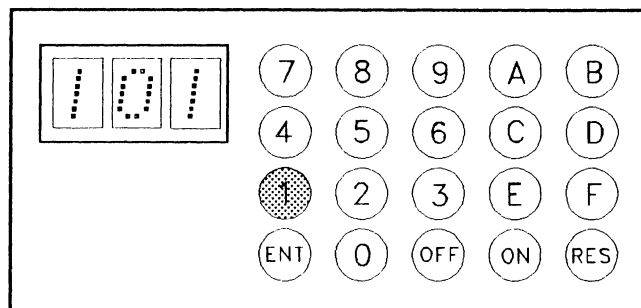


---

**2**

Press key 1.

Selects Model B test program.

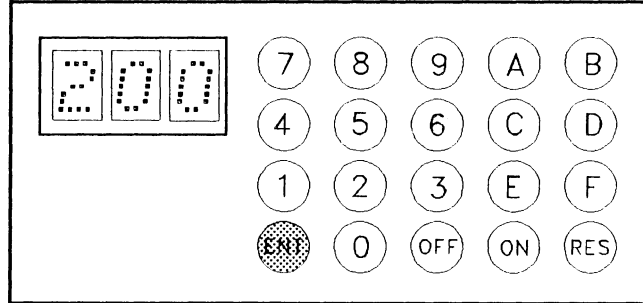


---

**3**

Press ENT (Enter).

200 is displayed.



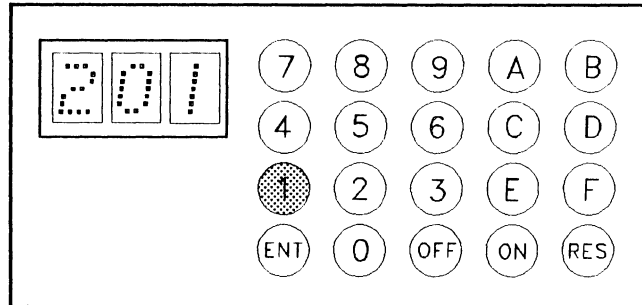
---

**4**

Enter the address (0 through 7) of the logical device that is to be tested.

See "Logical Device Addresses" on page 3-30 for information.

In this example, device 1 has been selected.

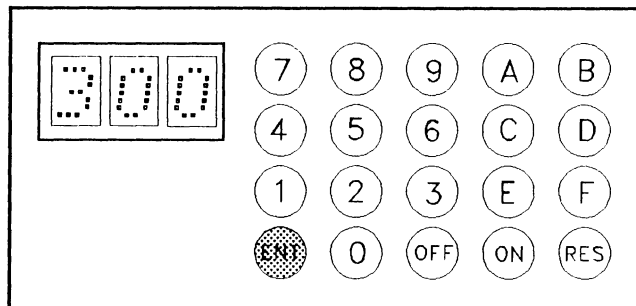


---

**5**

Press ENT.

300 is displayed. If 2DB is displayed, go to "Forcing a Test to Run" on page 3-23.



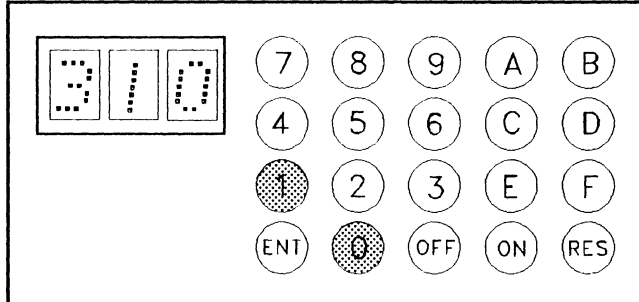
---

## 6

Key in the number of the test you want to run.

See "Model B Diagnostic Test Descriptions" on page 3-31 for reference.

In this example, test 10 has been keyed in.

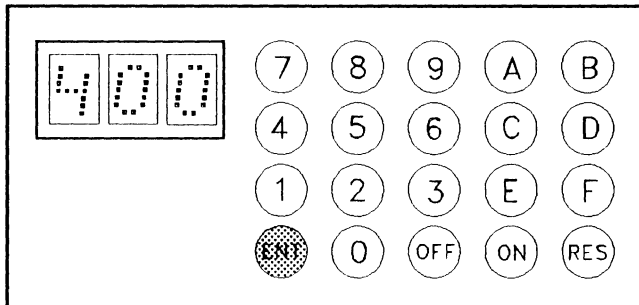


---

## 7

Press ENT.

400 is displayed.



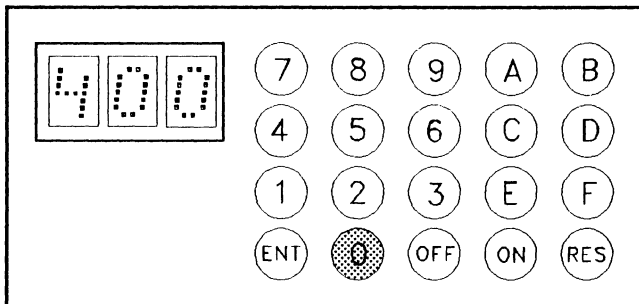
---

## 8

Key in the number of the test run option you want to use.

See "Selecting Diagnostic Test Run Options" on page 3-35 for information.

In this example, option 00 has been keyed in.



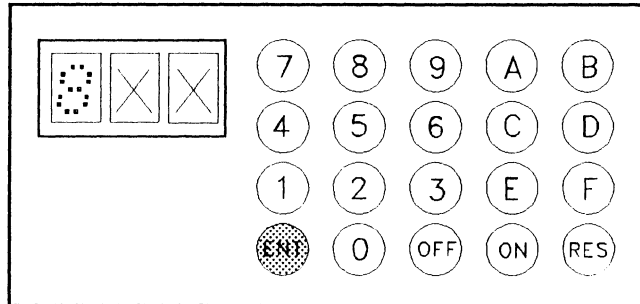
---

## 9

Press ENT.

8xx is displayed.

**Note:** The numbers xx indicate which test is running. If 800 is displayed, the test is waiting to start.



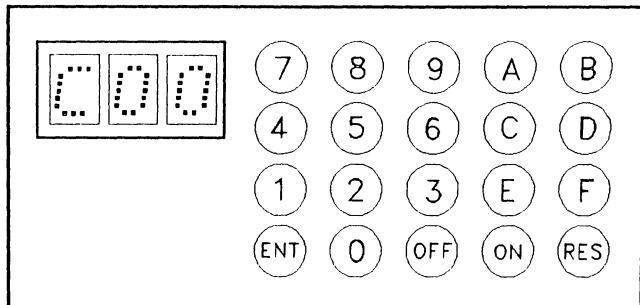
---

## 10

If C00 is displayed, as shown, the test has completed without finding a failure.

If Exx is displayed, go to the next step in this procedure.

C00 is displayed. Go to "Completing a Diagnostic Test Program" on page 3-36 to continue.

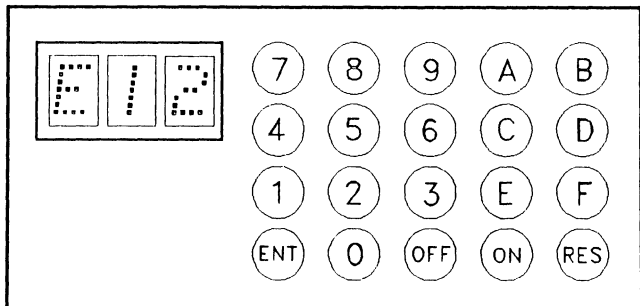


---

## 11

When Exx is displayed, the diagnostic test has found a failure. The numbers xx are the first half of a URC.

E12 is displayed. In this example, the first half of the URC is therefore 12.



---

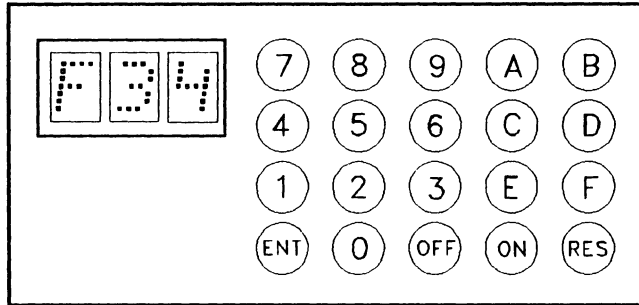
## 12

Press ENT.

Fxx is displayed. The numbers xx are the second half of a URC.

F34 – is displayed. In this example, the second half of the URC is therefore 34.

The complete URC has now been displayed and should be noted. In this example, you would record a URC of 1234.

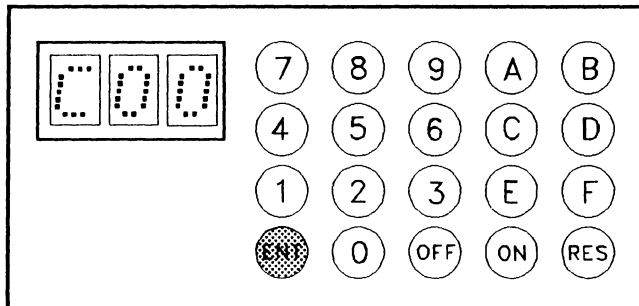


---

## 13

Press ENT.

C00 is displayed. See "Completing a Diagnostic Test Program" on page 3-36 to continue.



## Forcing a Test to Run

You can force the diagnostics to run if the Device Busy, 2DB, message occurs when a device is selected for testing.

**Warning:** 2DB may be displayed if the device selected for test is not offline from its using system. Ensure that an attempt to put the device offline has been made before you use the force diagnostic procedure.

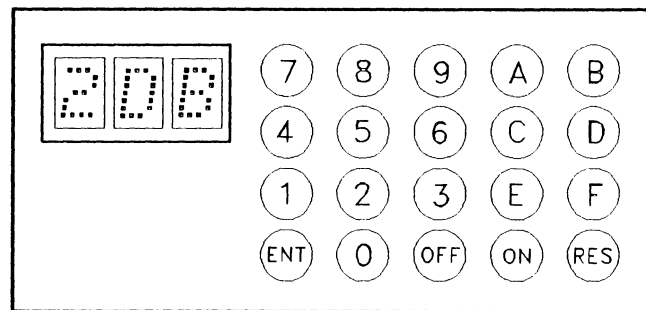
In the example sequence, a Device Busy message has occurred, so the Force Diagnostics (FD) function is used.

### ACTION

### RESULT

1

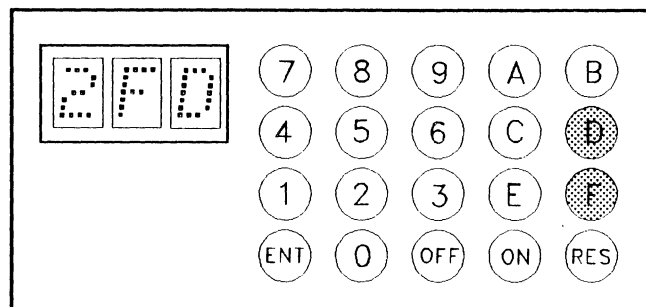
2DB -- is displayed.



2

Press F then D (FD).

Force the test to run. See warning above.

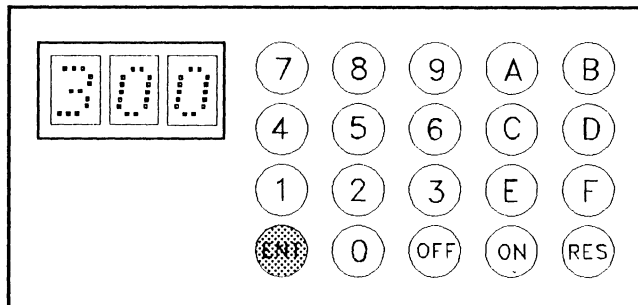


---

3

Press ENT (Enter).

300 is displayed. Now continue from step 6 on page 3-20.





---

## Displaying the URC History Log

This function displays the last 16 unit reference codes (URC) logged by the Model A. The latest entry is displayed first.

**Note:** URCs generated by the Model B diagnostic test programs are not stored in this log.

### Example of Procedure

In the following example, the first record shows that device 2 has logged a URC of 1234. The second record shows that the Model A has logged a URC of 3456. See Table 3-1 on page 3-8.

**Note:** If less than 16 unit reference codes are stored, the Operation Complete code C00 is displayed after the last stored URC. Therefore, if no unit reference codes are stored, C00 is displayed after 102 has been entered (that is, displayed at line 3 in this example).

Key to Press	Display	Description
ON	100	
2	102	URC history log is selected.
ENT	B01	The most recent record (01) will be displayed next.
ENT	A02	Record 01 is associated with device 02. (See "Logical Device Addresses" on page 3-30.)
ENT	E12	The first half of the URC in record 01 is 23.
ENT	F34	The second half of the URC in record 01 is 45.
ENT	B02	Record 02 will be displayed next.
ENT	AFF	The Model A is associated with record 02.
ENT	E34	The first half of the URC is 34.
ENT	F56	The second half of the URC is 56.
ENT	C00	Go to "Completing a Diagnostic Test Program" on page 3-36 to continue.

---

## Displaying the MED

An error in the Model A or one of its attached devices generates machine exception data (MED). To display the MED, you select function 3 from the keypad. This function displays the 32 bytes of MED logged at the most recent failure of the device selected. For details of MED, see the *9335 Functional Characteristics* manual.

In the following example, the contents of the first three bytes of MED logged for device 3 are 12, 34, and 56.

Key to Press	Display	Description
ON	100	
3	103	MED display is selected.
ENT	200	
3	203	Device 3 is selected. (See "Logical Device Addresses" on page 3-30.)
ENT	600	
8 THEN 0 or 0 THEN 0	680	Key in the log display option (80) that displays all bytes sequentially.
ENT	600	Key in number of the byte (from 00 decimal) that you want to display.
ENT	A03	The most recent MED record for device 3 is displayed.
ENT	B00	Byte 00 of the most recent MED for device 3 is displayed.
ENT	D12	The data in byte 00 is 12.
ENT	B01	Byte 01 of the MED is ready to be displayed.
ENT	D34	The data in byte 1 is 34.
ENT	B02	Byte 02 of the MED is ready to be displayed.
ENT	D56	The data in byte 3 is 56.
ENT		Repeat the ENT-byte/ENT-display data sequence until C00 is displayed.
	C00	Go to "Completing a Diagnostic Test Program" on page 3-36 to continue.
OFF		To end the program.

---

## Displaying Diagnostic Sense Data

This function is intended mainly for support center use, although it is used in diagnosing those intermittent faults, where running diagnostics would destroy the sense data. The procedure below is not a general procedure; you should only use it when instructed to in step 7 on page 1-9.

Key to Press	Display	Description
ON	100	
1	101	Select Model B test program
ENT	200	
'x'	20x	'x' is the device address
ENT	300	
1 THEN 1	311	Run diagnostic test 11 to load sense into buffer
ENT	400	
2	402	Force Model B to read sense data
ENT	E11	Sense data has been read into Model A buffer
OFF THEN ON	100	Start read out of buffer
4	104	Display sense data
ENT	600	
4 THEN 9	649	
ENT	B49	Read sense data at offset 49 from start of buffer
ENT	Dxx	The data in offset 49 is 'xx'
OFF		

---

## Displaying Control Block Data

This function is intended for support center use only. No details of the data displayed are contained in this manual.

The following example shows you how to display the data held in the Control Block Data area, 16 bytes at a time, by using function 5. The procedure is similar to those for displaying the machine exception data (function 3) and the sense data (function 4).

**Note:** The address entered in steps 4 through 6 is checked and 6EE is displayed at step 5 or 7 when the address used is not valid.

Key to Press	Display	Description
ON	100	
5	105	Control Block Display is selected.
ENT	600	
9 THEN 6	696	96 is the first byte of the address.
ENT	600	
0 THEN 0	600	00 is the second byte of the address.
ENT	B00	Offset 0 from address 9600 will display next.
ENT	D12	The data in offset 0 from address 9600 is 12.
ENT	B01	Offset 1 from address 9600 will display next.
ENT	D34	The data in offset 1 from address 9600 is 34.
ENT	B02	Offset 2 from address 9600 will display next.
ENT	D56	The data in offset 2 from address 9600 is 56.
ENT		Repeat the ENT-byte/ENT-display data sequence until C00 is displayed.
	C00	Go to "Completing a Diagnostic Test Program" on page 3-36 to continue.
OFF		To end the program.

---

## Testing the Service Panel

You use function 6 to check that the Model A control panel works correctly.

In each step of the test, the characters you enter from the keypad are displayed in the center and right-hand positions. A check is made when you press the ENT key to ensure that they are the same as the character in the left-hand display position.

If the center and right-hand characters are not the same as the left-hand character, the mismatch causes an error that displays EF in the center and right-hand display positions. If the characters are the same, the next character to be checked is displayed in the left-hand position, with its complemented character in the center and right-hand positions.

**Note:** If the service panel test does not give the results described in the procedure described below, change the following FRUs in sequence.

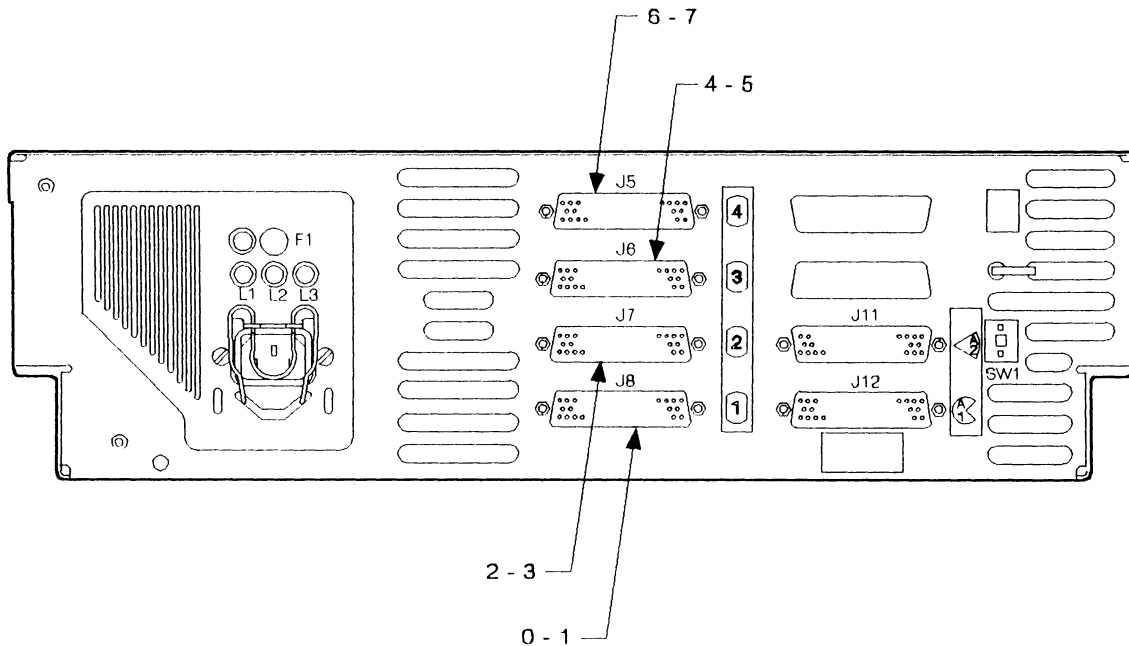
1. Keypad
2. Control panel card 01A-C1A1
3. Device adapter interface card 01A-A1B1
4. System adapter (microprocessor) card 01A-A1C5.

In the example that follows, the test detects an error with key 3.

Key to Press	Display	Description
ON	100	
6	106	The service panel is selected.
		When you press ENT, the left hand digit is the complement of the other two digits. When you enter the left hand digit twice, all three digits display the same.
ENT	0FF	0 and F are complementary.
0 THEN 0	000	
ENT	1EE	1 and E are complementary.
1 THEN 1	111	
ENT	2DD	2 and D are complementary.
2 THEN 2	222	
ENT	3CC	3 and C are complementary.
2 THEN 2	322	As an example, simulate a defective key by pressing 22 instead of 33.
ENT	3EF	EF is the error code. There is a second chance to allow for miskeying.
2 THEN 2	4EF	When EF displays again, it is known that there is an error with key 3.
4 THEN 4	444	
ENT	5AA	5 and A are complementary.
5 THEN 5	555	
ENT	699	6 and 9 are complementary. Repeat until C00 is displayed.
	C00	Go to "Completing a Diagnostic Test Program" on page 3-36 to continue.
OFF		To end the program.

## Logical Device Addresses

When making reference to a Model A and its attached Model Bs, this manual uses the logical device addresses shown below:



Address	Logical Device
0	1st Model B Device 0
1	1st Model B Device 1
2	2nd Model B Device 0
3	2nd Model B Device 1
4	3rd Model B Device 0
5	3rd Model B Device 1
6	4th Model B Device 0
7	4th Model B Device 1

Figure 3-8. Logical-Device Addresses and Their Model A Plugging Positions

---

## Model B Diagnostic Test Descriptions

### Linked Tests for Device Checkout

**Warning:** Ensure that the selected device is offline from the using system before you run diagnostic test programs to it.

You can select and run the tests described in Table 3-3 either separately or as a linked series.

**Warning:** Do not run linked tests separately unless you are directed to do so.

Always run test 10 before you return the subsystem to the customer.

Test	Description
10	Run tests 11 through 18 linked
11	Device interface test
12	Device initial reset test
13	Resynchronization analysis test
14	Head change and rotational-position sensing match test
16	Basic seek test
17	Data transfer test
18	Multifunction test

### Test 10 – Linked Tests 11 – 18

Selecting test 10 causes tests 11 through 18 to run as a linked series.

### Test 11 – Device Interface Test

Test 11 checks for correct operation of the interface. The test:

- Determines that basic communication is possible between the device adapter and the microprocessor of the Model B.
- Checks for cable continuity between the device adapter and the Model B.
- Checks for the correct transfer of commands across the interface.
- Checks for correct loading of the device adapter sense bytes into the diagnostic buffer of the Model A.
- Ensures that the disk enclosure motor is running.

## **Test 12 – Device Initial Reset Test**

Test 12 verifies the initial resetting of the Model B. The test:

- Ensures that the Model B can be reset.
- Ensures that full communication can be obtained between the device adapter and the microprocessor of the Model B.
- Ensures that device sense bytes can be loaded into the diagnostic buffer of the Model B.
- Ensures that the “operation complete” line can be reset.

## **Test 13 – Resynchronization Analysis Test**

Test 13 analyzes failures in the Model B that cause resynchronization problems. It also ensures that the Model B can remain synchronized on all read/write heads. The test:

- Selects each read/write head in sequence.
- Sends a Resynchronization command to each read/write head in sequence.
- Assembles a matrix table from the resynchronization results.
- Analyzes the matrix table to identify any failures.

## **Test 14 – Head Change and Rotational-Position Sensing Match Test**

Test 14 checks the operations of the disk read/write heads. The test:

- Performs head-change operations, using all practical combinations.
- Ensures that the rotational-position sensing (RPS) matching is correct after each head change.
- Measures the timing of each head-change operation.
- Measures the RPS latency.
- Ensures that the sense byte data in the diagnostic buffer area is correct after each command.

**Note:** No data is transferred during this test.

## **Test 15 – not used**

This is now not used.

## **Test 16 – Basic Seek Test**

Test 16 checks for correct seek operations of the Model B by using a specified number of read/write head and cylinder addresses. The test:

- Performs seek operations to cylinder/head addresses as defined in a preset table of addresses.
- Compares the time taken to reach a given address against the expected time.

**Note:** Additional checking for correct cylinder addresses is done by test 17.



## **Test 17 – Data Transfer Test**

Test 17 performs read operations on cylinders 0 and 982 and the diagnostic cylinder. It also performs write operations on the diagnostic cylinder. The test:

- Performs seek operations to cylinders 0 and 982 and to the diagnostic cylinder.
- Selects all read/write heads on each cylinder, as defined in the head selection table.
- Identifies data fields that have no permanent errors in the first 16 sectors of each of the selected cylinders.
- Reads the identity (ID) bytes of the first sector that has no errors, in the first 16 sectors of each of the selected cylinders.
- Verifies the ID field of the first sector that has no errors, in the first 16 sectors of each of the selected cylinders.
- Checks that verify-compare hardware is working by forcing an ID mismatch.
- Writes predetermined data patterns on one sector of all tracks on the diagnostic cylinder.
- Reads back the data patterns and compares them with the expected data pattern.

## **Test 18 – Multifunction Test**

Test 18 checks the integrity of the diagnostic cylinder and ensures that it can be used for running diagnostic test programs. The test does this by identifying any sector IDs that may have become damaged during earlier runs of diagnostic tests when hardware faults existed, or during other engineering actions. The test:

- Checks the ID areas of the diagnostic cylinder to ensure that past engineering action has not damaged the sector IDs to an extent that prevents acceptable running of the diagnostic test programs.
- Checks for the data-field format used on the diagnostic cylinder.
- Checks head-offset operations.
- Operates and tests the Moved ID and Extended Moved ID facility.
- Checks the cyclic redundancy check (CRC) and error checking and correction (ECC) hardware.

## Nonlinked Tests for Device Checkout

The nonlinked tests (Table 3-4) must be run as separate tests. They can be run from the using system or from the Model A service panel.

Table 3-4. Nonlinked Test Routines	
Test	Description
21	Motor-stop operation test
31	Device interface adapter wrap test

### Test 21 – Motor-Stop Operation Test

**Warning:** Both actuators of the Model B must be offline to the using system before test 21 is run to the Model B.

Test 21, which is not linked to any other test, ensures that motor-stop operations can be done successfully. It must be run only with device 0 in the failing Model B.

The test operates in this way:

1. It ensures that the motor is running and at full speed.
2. It then sends a Stop Motor command.
3. After 30 seconds, the “operation complete” line should be active and no errors should appear.
4. If there are no errors, the test sends a Start Motor command.
5. The test ends when the ‘operation complete’ line is active and the motor is running again.
6. At the end of a successful test, only device 0 in the failing Model B is READY. Device 1 in the failing Model B must be made ready by pressing the device 1 attention button.

**Note:** The number of start/stop operations is controlled to prevent overheating of the motor.

### Test 31 – Device Adapter Interface Wrap Test

Test 31, which is not linked to any other test, checks the integrity of the device adapter interface by sending a test signal from the Model A to the interface and back, comparing the signal sent with the signal received.

**Note:** Test 31 must be run with address 0 selected (see Figure 3-8 on page 3-30). It is recommended that the Model A and all attached Model Bs should be powered on, ready, and enabled because Test 31 checks all devices via address 0.

---

## Selecting Diagnostic Test Run Options

Enter one of the test run options during the test-selection sequence to select how you want the test to run. See Table 3-5.

**Note:** If you have not been instructed to use any specific option, use option 00.

Table 3-5. Diagnostic Run Options	
No.	Diagnostic Run Option
00	Normal execution. Runs the test (or linked tests). Reports the first error detected.
01	Loop – stop on error. Loops the test (or linked tests) until the first error is detected.
02	Force – force Model B to read sense. Use only as directed.
03	Loop – bypass errors. The selected test (or linked tests) is looped. If an error is detected, the tests restart at the beginning. No errors are reported.
10	Fast speed, single run – stop on error.
11	Fast speed, loop test – stop on error.
12	As option 02, but fast speed.
13	Fast speed, loop test. Restarts the test(s) from the first test without indicating an error condition.

**Note:** If a loop option is selected, the diagnostic test programs can only be stopped by pressing OFF on the keypad at the Model A service panel. The diagnostic test programs end when the current loop is being run.

Normal-speed operation (the default) has minimum effect on the speed of operation of the using system. Ensure, however, that the device to be tested is offline from the using system before tests are run to it.

Fast-speed operation impacts the speed of operation of the using system to such an extent that the effects are obvious.

---

## Completing a Diagnostic Test Program

When a diagnostic test program has completed its current operation, C00 is displayed on the reference display of the Model A service panel.

**Warning:** If you have been running Model B diagnostic test programs, the device selected is offline. The using system cannot access the device until OFF is pressed.

When you have finished with the diagnostic programs, press OFF on the keypad at the Model A service panel.

## Rerunning Diagnostic Test Programs After Completion

If you want to run a diagnostic program again, the options from Table 3-6 can be used. Press 9 on the keypad, followed by 3, 4, 6, or 8. Then press the ENT key; the diagnostic program starts again at the selected point.

Press	Press	Displays	Diagnostic Restart Entry Point
9 THEN 3	ENT	300	Diagnostic test selection
9 THEN 4	ENT	400	Diagnostic test run option
9 THEN 6	ENT	600	Log display option (MED)
9 THEN 8	ENT	8xx	Restart program without change. This option is valid only for Model B diagnostic test programs.

---

## Resetting the Model A from the Service Panel

**Warning:** Resetting a Model A can cause loss of data for the customer. Therefore, ensure that the Model A and all attached Model Bs are offline from the using system before you reset the Model A.

You can use the service panel to reset the Model A as follows:

1. At the keypad, press ON, then A, then B. The reference display shows AB.
2. Press RES (Reset).

The Model A is reset and the basic assurance tests now can be run.

**Note:** To prevent accidental use of the Reset key, the Model A is reset only when the reference display shows AB.

---

## Looping the Basic Assurance Tests

The service panel can be used for looping the basic assurance tests.

The BATs, when selected from the service panel, run in an endless loop that stops only after a power-on reset or if the BATs detect an error condition.

**Warning:** Ensure that the Model A and all attached Model Bs are offline from the using system before you loop the BATs.

You loop the BATs from the Model A service panel as follows:

1. At the keypad, press ON, then B, and then 1.
2. Press ENT (Enter).
3. Press B, then 2.
4. Press ENT.

The BATs now run in a loop.

**Note:** To leave this procedure, power the Model A off then on again.

---

## Other Diagnostic Aids

### Error Recording by the Using System

Information concerning errors and checks that occur during operation of the Direct-Access Storage Subsystem can be obtained from the using system.

Details of the error recording and retrieval procedures are given in the using system publications.

### Microcode Trace Procedure

If the BATs and the diagnostic test programs (together with the problem isolation procedures) do not find a fault, the problem could be in the microcode. Ask your support center for help.

### Disk-Surface Management

Disk-surface management is needed if the disk surface in a sector becomes damaged. If this occurs, the defective sector can be reassigned to a reserved good sector. The using system reassigns defective sectors. See the using system publications for more information.

Typical disk-surface management operations are:

- **Surface Analysis**

This operation analyzes the selected disk surface and lists failing sectors that cannot be used for data storage.

- **Defective Sector Reassignment**

This operation assigns the defective sectors found in a surface analysis to the reserved good sectors.

## Chapter 4. Model A FRUs

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In this chapter, the field-replaceable units (FRUs) for the IBM 9335 Model A Device Function Controller are grouped into sections by their functional machine areas.

The sections are:

- Powering on and off
- Panels and covers
- Power FRUs
- Logic cards and boards
- Miscellaneous FRUs
- Internal and external cable assemblies.

After installing a new FRU, or reinstalling an old one, go to “Cleanup and Repair Verification” on page 5-23.

**Warning:**

1. Do not apply power to the power FRUs after they have been removed.
2. When removing electrostatic discharge (ESD) sensitive FRUs, use the field ESD kit (IBM part 6428316) in accordance with CEM 270 (305).

---

## Removing and Installing a Drawer

Some of the repair actions described in this chapter may require you to remove a drawer. Removal and installation instructions for the drawer are contained in *Setting Up Your IBM 9335*, GA33-3144.



---

## Powering the Model A Off and On

### DANGER

Switch off power and remove the mainline power cable before removing or installing a FRU.

### Powering Off

---

#### Power off the Model A.

Set the Power switch at the control panel on the front of the drawer to Off.

Disconnect the mainline power cable from the back of the drawer (see Figure 4-2 on page 4-4).

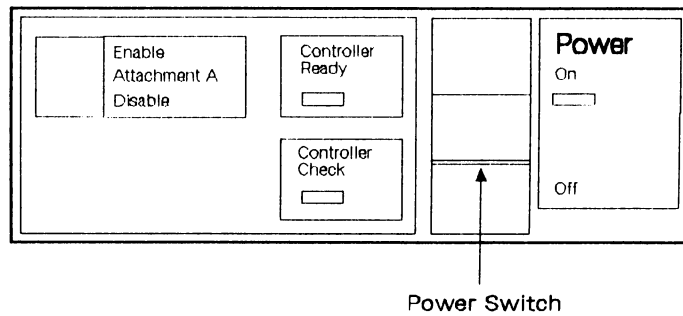


Figure 4-1. Power Switch

## Powering On

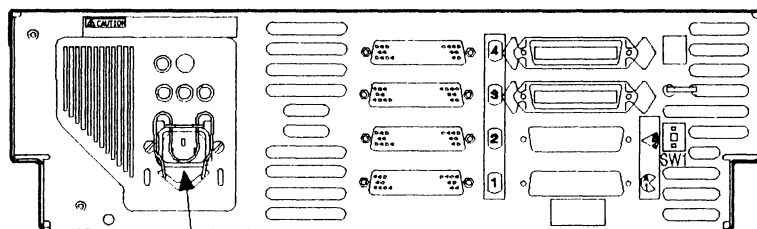
---

### Power on the Model A.

Connect the mainline power cable at the back of the drawer as follows:

1. Open the spring clip on the socket for the mainline power cable by pressing in the sides of the clip and pulling it out.
2. Plug the mainline power cable connector into the socket.
3. Retain the plug by pressing in the sides of the spring clip and lifting it over the plug.

Set the Power switch on the control panel to On.



Connector for  
main power  
supply cable

Figure 4-2. Mainline Power Cable Connector

---

## Panels and Covers

### Removing the Front Panel

---

Remove the front panel.

Hold the front panel **1** by each recess **2** and pull it forward from the drawer. The panel is held to the drawer by spring clips **3**.

### Installing the Front Panel

---

Install the front panel.

Align the studs on the front panel **1** with spring clips **3** in the drawer and press on both ends of the panel until it clicks into position.

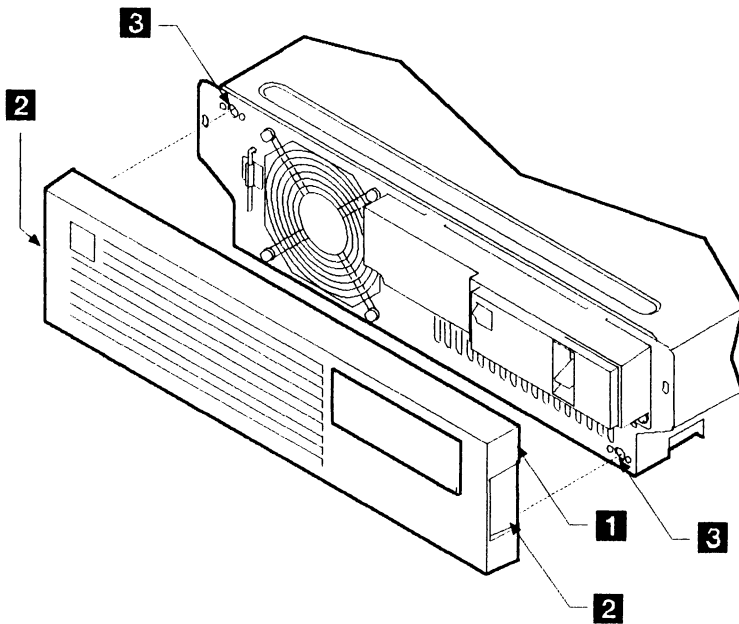


Figure 4-3. Front Panel

## Removing and Installing the Top Cover

---

**1**

Remove power from the drawer.

See page 4-3.

---

**2**

Remove the front panel.

See page 4-5.

---

**3**

Remove the top cover.

Check that the shipping clamp is not holding the cable support carrier to the rack. See page 4-34, and Figure 4-17 on page 4-35.

Turn the thumb levers **1** at each side of the front panel inward, toward the center of the drawer.

Slide the drawer out of the rack until it locks in its extended position.

Loosen the four screws **2** and lift off the top cover **3**.

---

Installation is the reverse of removal.

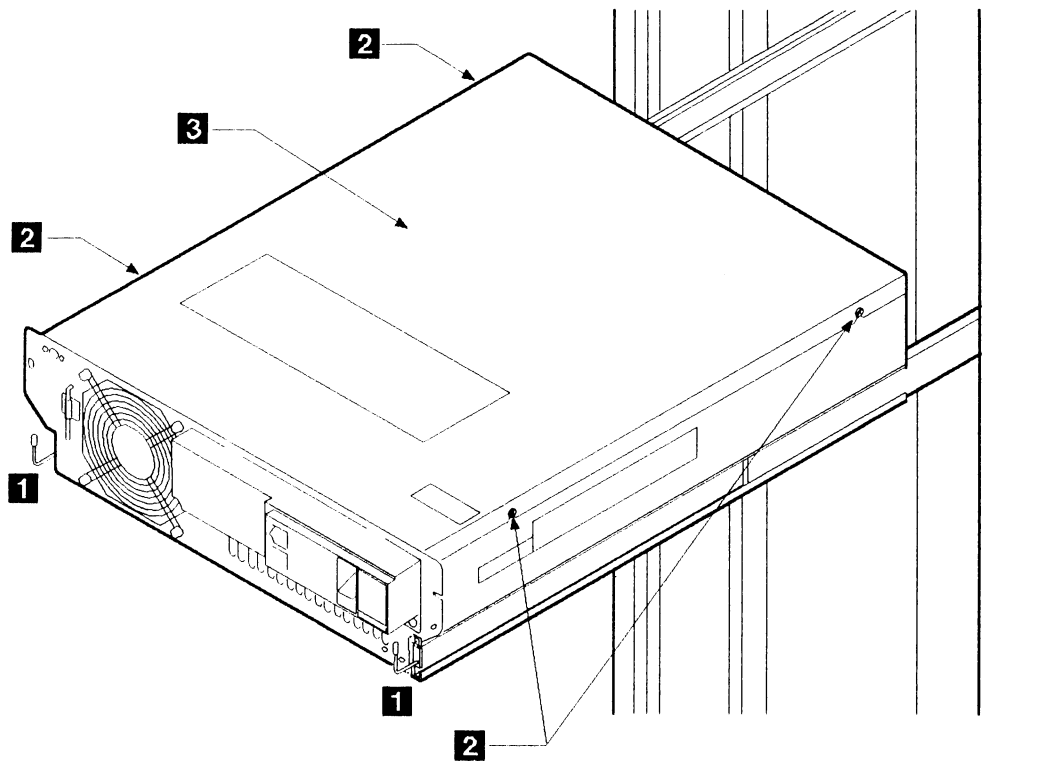


Figure 4-4. Removing and Installing the Top Cover

## Removing the Control Panel, Power Switch, Logic Board, and Keypad

**Note:** These are four FRUs; exchange them in sequence and continue only as far as is necessary.

---

<b>1</b>	
<b>Remove power from the drawer.</b>	See page 4-3.
<hr/>	
<b>2</b>	
<b>Open the drawer and remove the top cover.</b>	See page 4-6.
<hr/>	
<b>3</b>	
<b>Remove the control panel.</b>	<p>Unplug the ribbon cable <b>3</b> from position C2 on the logic board at the back of the card gate <b>2</b>.</p> <p>See the detail on Figure 4-7 on page 4-13 and pull out the plug from position P4 behind the Power switch <b>6</b>.</p> <p>Remove the two screws <b>1</b>, then tilt the panel upward from the bottom and disengage it from the two slots <b>4</b> in the front of the drawer.</p> <p>Withdraw the ribbon cable through the opening in the front of the drawer and remove the control panel <b>5</b>.</p>
<hr/>	
<b>4</b>	
<b>Remove the Power switch.</b>	Remove the two screws <b>8</b> and detach the Power switch <b>6</b> and the ground lead from the panel.
<hr/>	
<b>5</b>	
<b>Remove the control panel logic board.</b>	Remove the three screws <b>9</b> and detach the circuit board <b>10</b> from the panel.

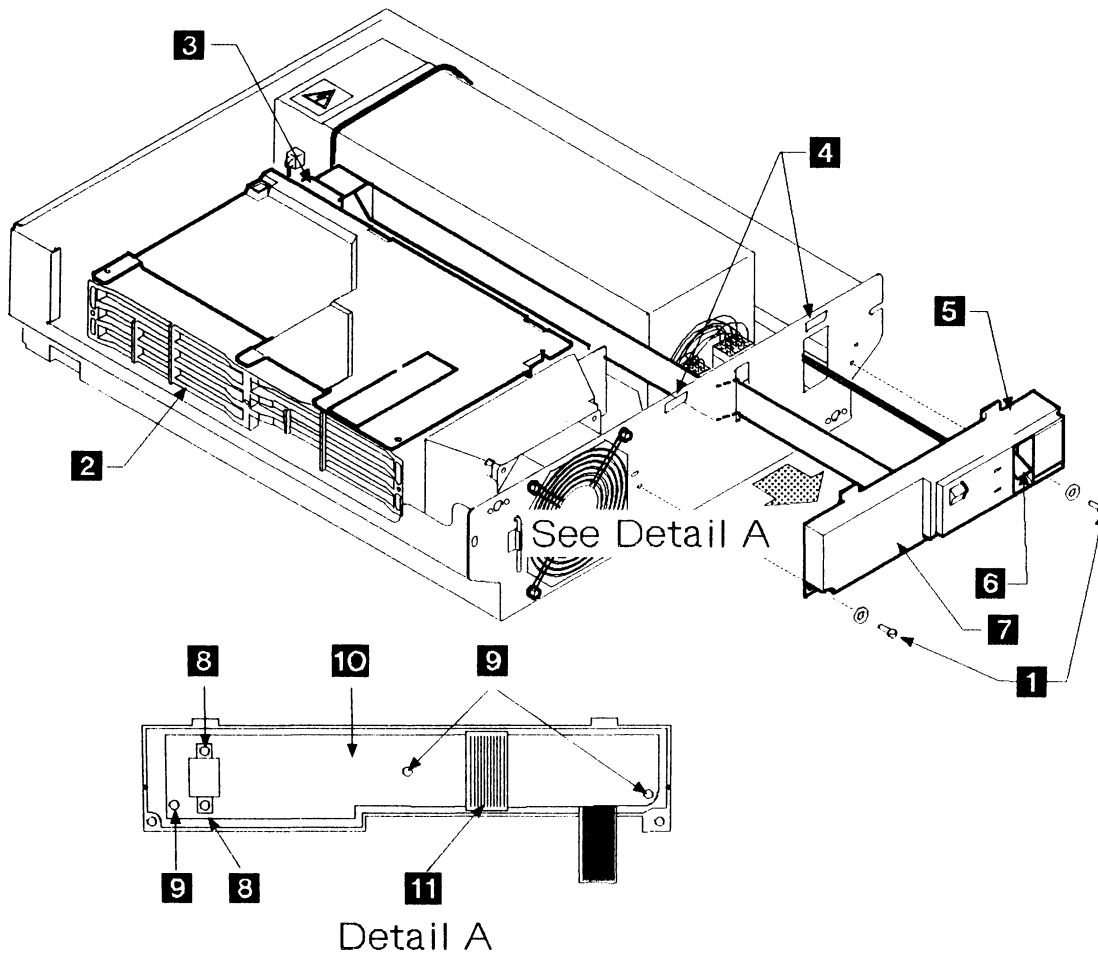


Figure 4-5. Removing the Control Panel, Power Switch, Logic Board, and Keypad

**6**

**Remove the keypad.**

Unplug the ribbon cable **11** from the circuit board.

Carefully peel the touch-sensitive keypad **7** from the recess in the front of the control panel **5**, and remove it together with its ribbon cable **11**.

## Installing the Control Panel, Power Switch, Logic Board, and Keypad

---

### Install the control panel, Power switch, logic board and keypad

Installation of these is the reverse sequence of removal.

Ensure that the Power switch cable is at the top of the control panel.

Ensure that the lugs **12** engage with the holes in the frame **13**.

Restore power to the drawer (see page 4-4).



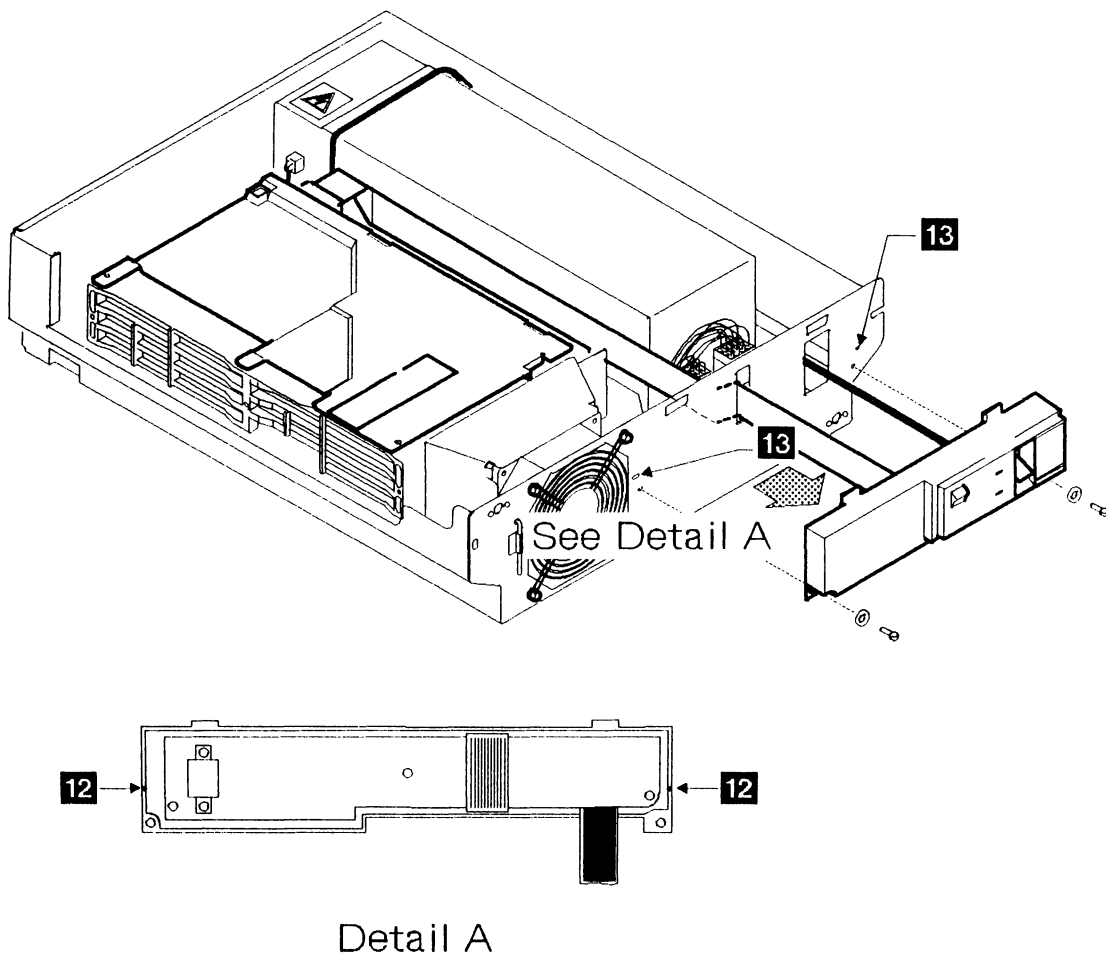


Figure 4-6. Installing the Control Panel, Power Switch, Logic Board, and Keypad

---

## Power FRUs

### Removing the Power Box

---

1

Remove power from the drawer.

See page 4-3.

---

2

Remove the top cover.

See page 4-6.

---

3

Unplug the dc power cable.

Unplug the dc power cable connectors P1 **1** and P2 **6** from the front of the power box **4**.

---

4

Remove the power box.

#### DANGER

**Do not attempt to remove the cover from this unit. It contains electrical shock hazards.**

Unplug the ac power cable connector P3 **3** from the side of the power box. If the ac power cable is as shown in **9**, remove it from the clips **7**. If it is installed as shown in **10**, then continue.

Remove the two screws **5** at the front of the power box **4**.

Remove the ground strap by undoing the screw **8**.

Loosen screw **2** at the back of the power box, then slide the power box forward and lift it out of the drawer.

## Installing the Power Box

Install the power box.

Install the power box in the reverse sequence of removal.

**Note:** Ensure that the following are reinstalled:

- The ground strap. (Ensure that the external lock washer is correctly positioned between the ground strap and the frame.)
- The shake-proof washers under the two front retaining screws **5**.

Restore power to the drawer (see page 4-4).

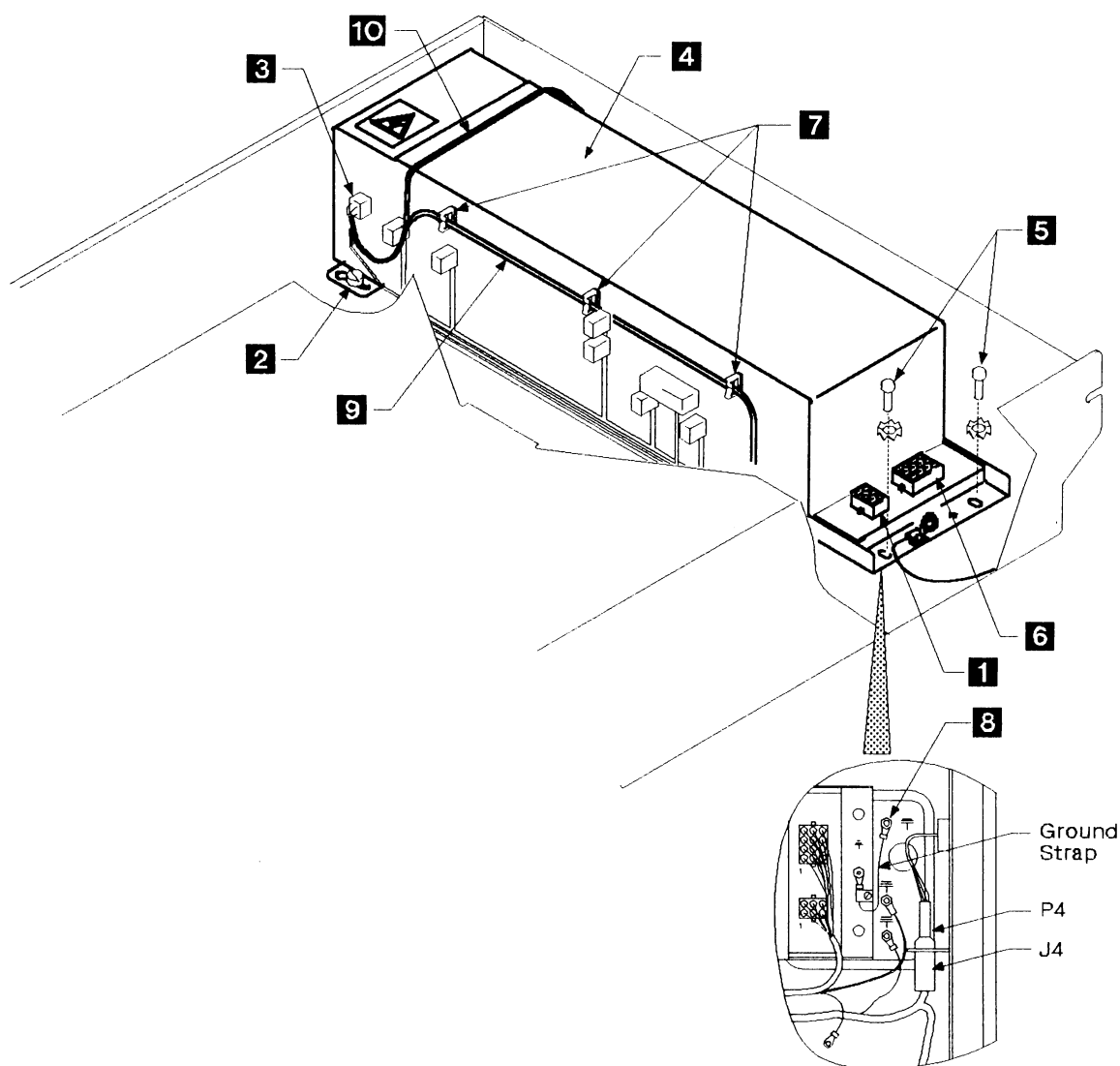


Figure 4-7. Power Box

## Removing the Card Gate Cooling Fan

---

**1**

**Remove power from the drawer.**

See page 4-3.

---

**2**

**Remove the top cover.**

See page 4-6.

---

**3**

**Remove the front panel.**

See page 4-5.

---

**4**

**Remove the card gate cooling fan.**

Remove the four screws **1** and take off the fan guard **2**.

Disconnect the two power cables **3** and the ground cable **4** from the fan **5**. Note where the cables come from so they can be reinstalled in the same place.

Lift the fan up and out of the drawer.

Remove the two screws and washers **7** and detach the fan cowl **8**.

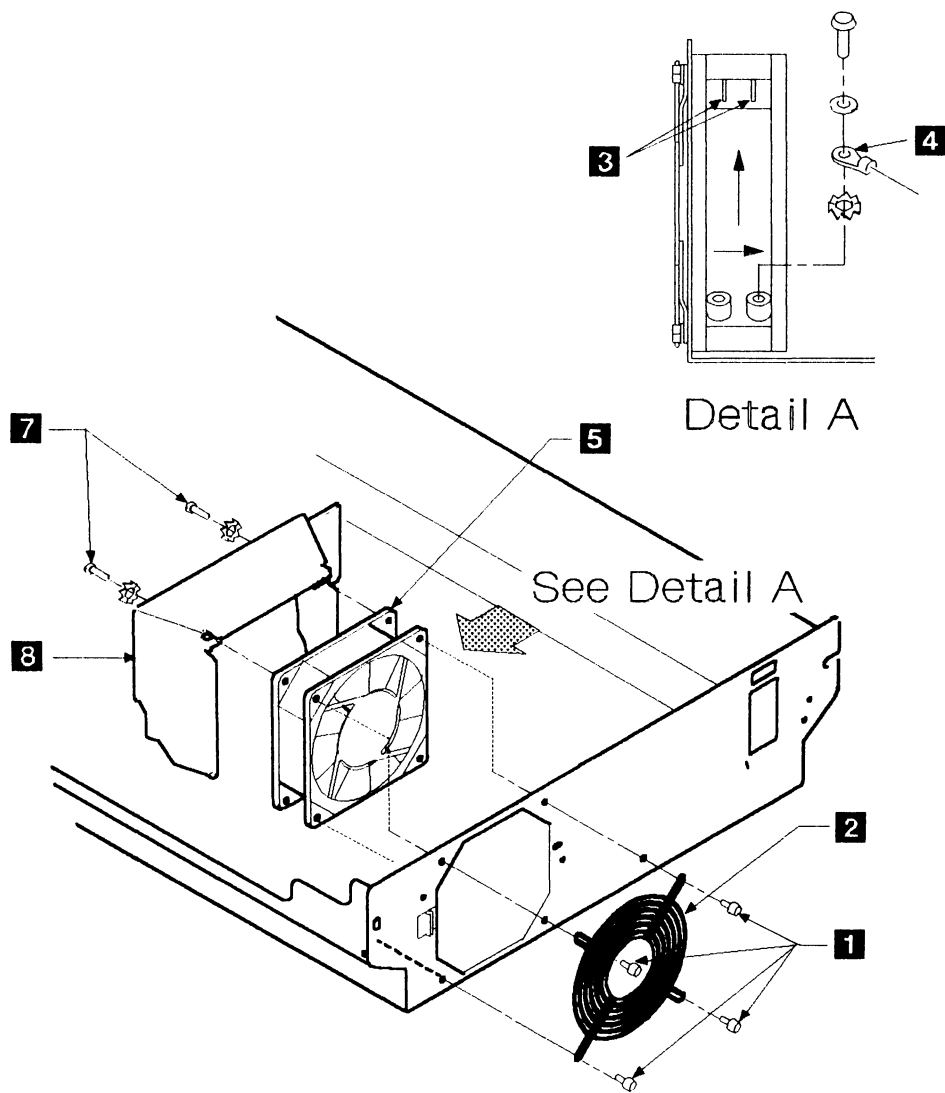


Figure 4-8. Removing the Card Gate Cooling Fan

## Installing the Card Gate Cooling Fan

---

### Install the cooling fan.

Reinstall the ground cable **4** before pushing the fan into its mounting.

Then install the card-gate cooling fan in the reverse sequence of removal.

**Note:** Engage the tab **6** on the back of the fan cowl in the guide on the front of the card gate (if installed), and push the fan down into the drawer.

**Warning:** Be careful not to trap the card-gate signal ground cable between the fan cowl and the card gate.

Restore power to the drawer (see page 4-4).

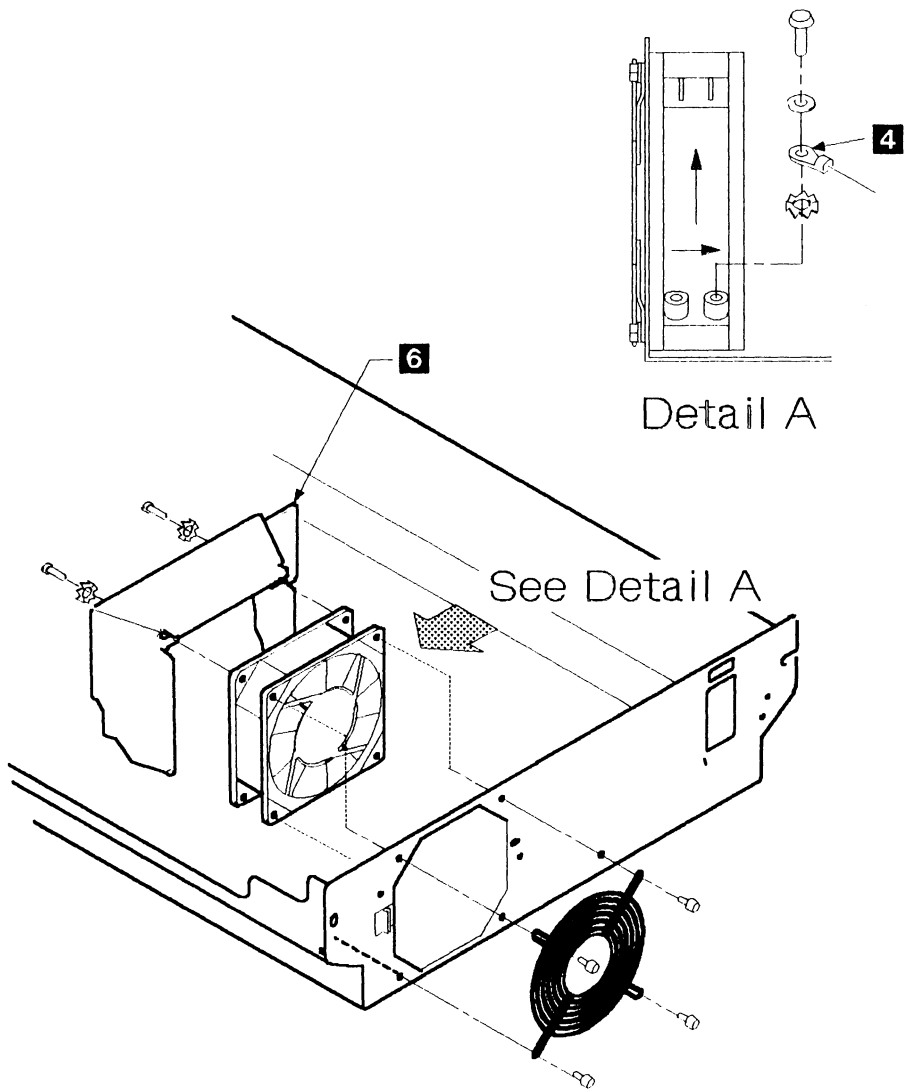


Figure 4-9. Installing the Card Gate Cooling Fan

## Removing and Installing the Thermal Trip Switch

---

<b>1</b>	
<b>Remove power from the drawer.</b>	See page 4-3.
<b>2</b>	
<b>Remove the top cover.</b>	See page 4-6.
<b>3</b>	
<b>Remove the thermal trip switch.</b>	Remove the two push-on connectors from the thermal trip switch <b>1</b> to disconnect the ac power cable <b>2</b> .  Remove the two screws and washers <b>3</b> and lift the switch off its mounting bracket <b>4</b> .

---

**Installation is the reverse of removal.**



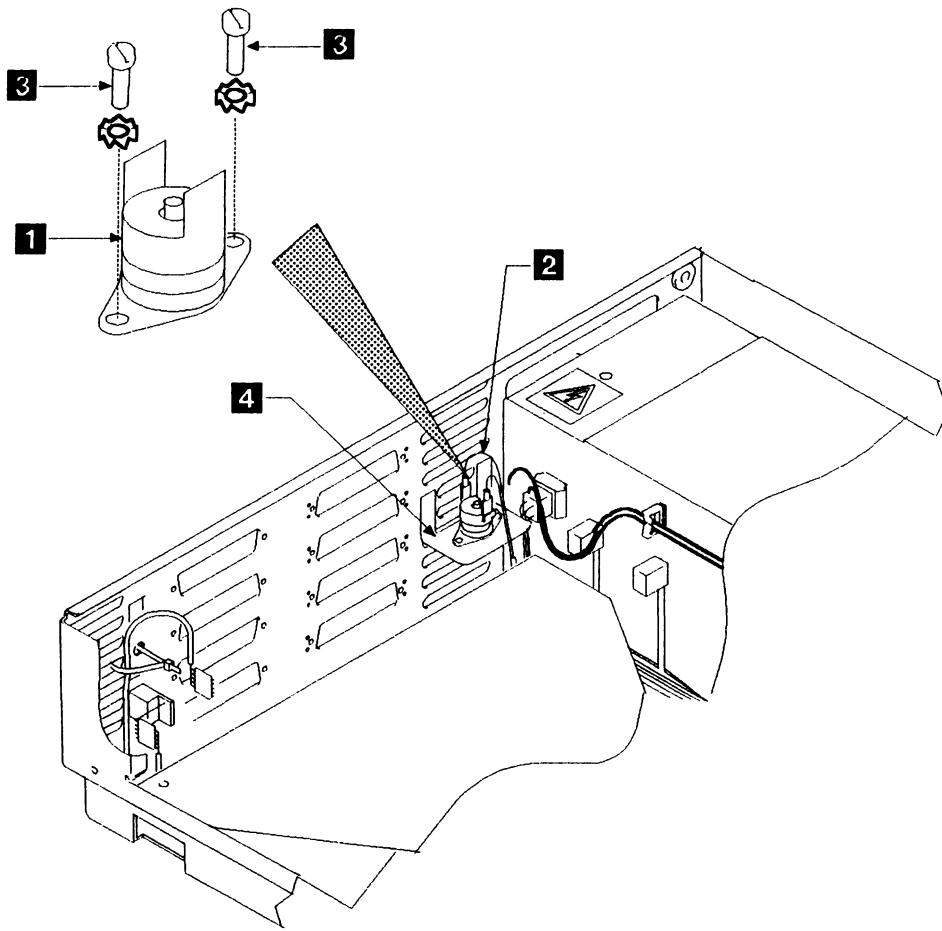


Figure 4-10. Thermal Trip Switch



---

## **Logic Cards, Gate, and Board**

### **Logic Card Positions in the Gate**

The logic cards and their positions in logic board 01A-A1 are:

- Device adapter interface card – position 01A-A1B1
- Device adapter read/write card – position 01A-A1A1
- System adapter (microprocessor) card – position 01A-A1C5.

## Removing the Logic Cards

---

**1**

Remove power from the drawer.

See page 4-3.

---

**2**

Remove the top cover.

See page 4-6.

---

**3**

Disconnect the ribbon cables.

Disconnect the ribbon cables **3** from the front of each logic card as required.

---

**4**

Remove the card retainer and interposers.

Remove the three screws **1** noting that the short screw is from the end nearest the fan. These three screws remove the card retainer bar **6** (if fitted). Remove the interposers **7** from positions 01A-A1A1-W and 01A-A1A1-X.

Remove the plastic card retainer **2**.

---

**5**

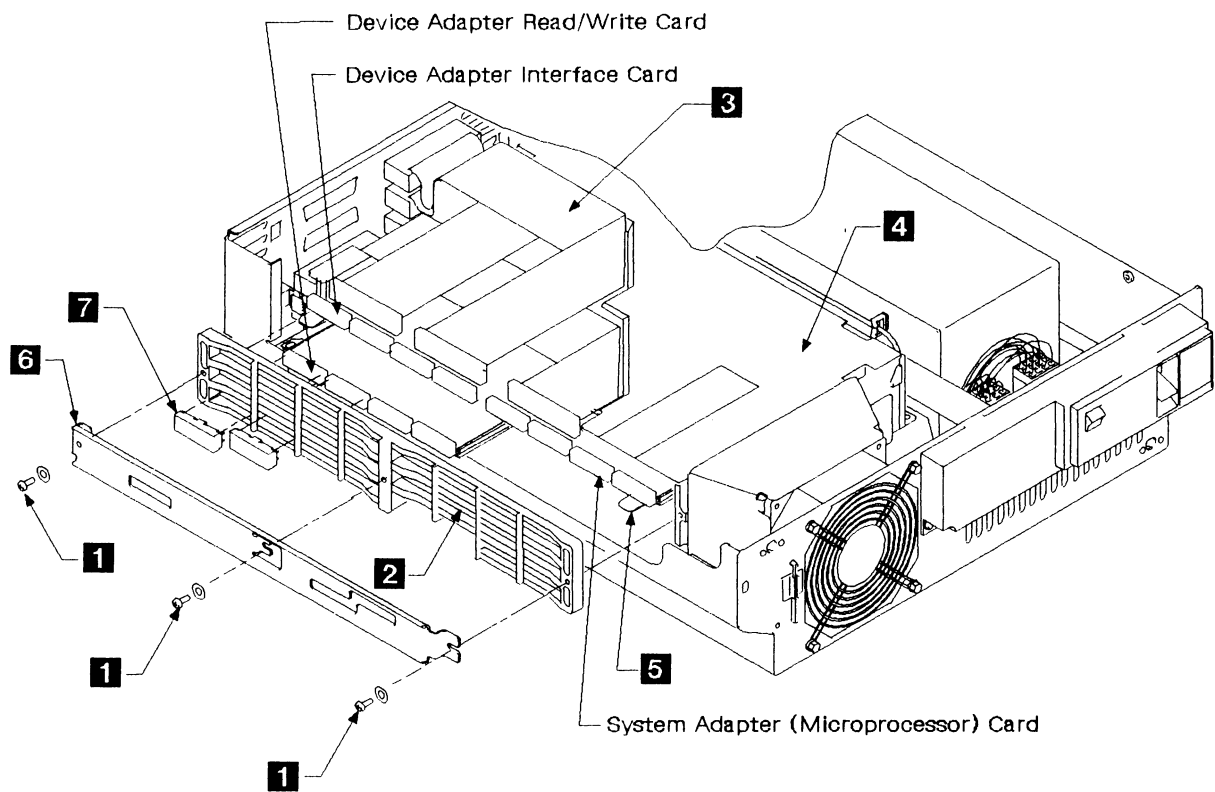
Remove the logic cards.

Pull the cards horizontally from the card gate **4** using the pull tabs **5** at the end of each card.

If a card has to be exchanged for a new one, remove the interposers and the card carrier because they are needed for use on the replacement card.

## Installing the Logic Cards

Installation is the reverse of removal. Be careful to latch the ribbon cable connectors securely.



	System Adapter (Microprocessor) Card
Device Adapter Interface Card	
Device Adapter Read/Write Card	

Card Positions in Gate 01A-A1

Figure 4-11. Removing and Installing the Logic Cards

## Removing the Card Gate

---

### 1

Remove power from the drawer to be serviced.

See page 4-3.

---

### 2

Remove the top cover.

See page 4-6.

---

### 3

Remove the cables.

Slide the card gate to the left by loosening the back two screws **1** and removing the front two screws **8**.

Unplug the four interface ribbon cables 01A-A1B1 from the top card 01A-A1C5.

Remove the two screws **2** from the card gate cover **3** and pull the cover from the card-gate frame.

Remove the signal ground cable **5** from the card-gate frame.

Unplug the control panel ribbon cable **4** from the logic board, together with the six dc power cable connectors **6**.

Unplug the address switch connector **7** at position B7 on the logic board.

---

### 4

Remove the card gate.

Remove the two screws **1** from the corners of the card gate.

Lift the card gate out of the drawer.

---

## Installing the Card Gate

---

Install the card gate.

Install the card gate in the reverse order of the removal instructions.

Restore power to the drawer (see page 4-4).

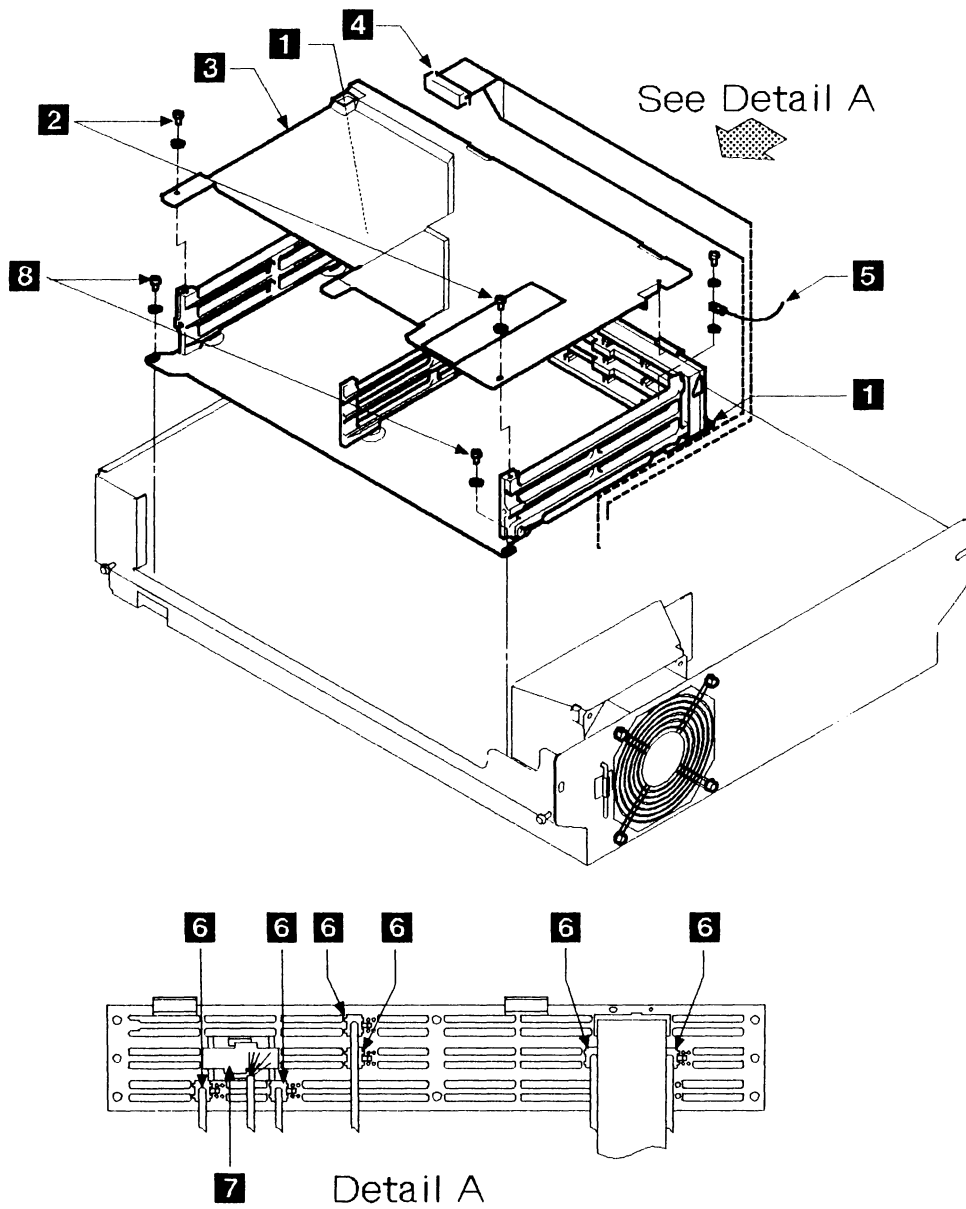


Figure 4-12. Removing and Installing the Card Gate

## Removing the Logic Board

---

**1**

Remove power from the drawer.

See page 4-3.

---

**2**

Remove the top cover.

See page 4-6.

---

**3**

Remove the card gate.

See page 4-24.

---

**4**

Remove the logic cards from the card gate.

See page 4-22.

---

**5**

Remove the logic board.

Remove the six screws **2** and remove the logic board **3** from the card gate **1**.

**Warning:** Do not remove screws **4**.

---

## Installing the Logic Board

---

Install the logic board.

Install the logic board in the reverse sequence of removal.

Restore power to the drawer (see page 4-4).



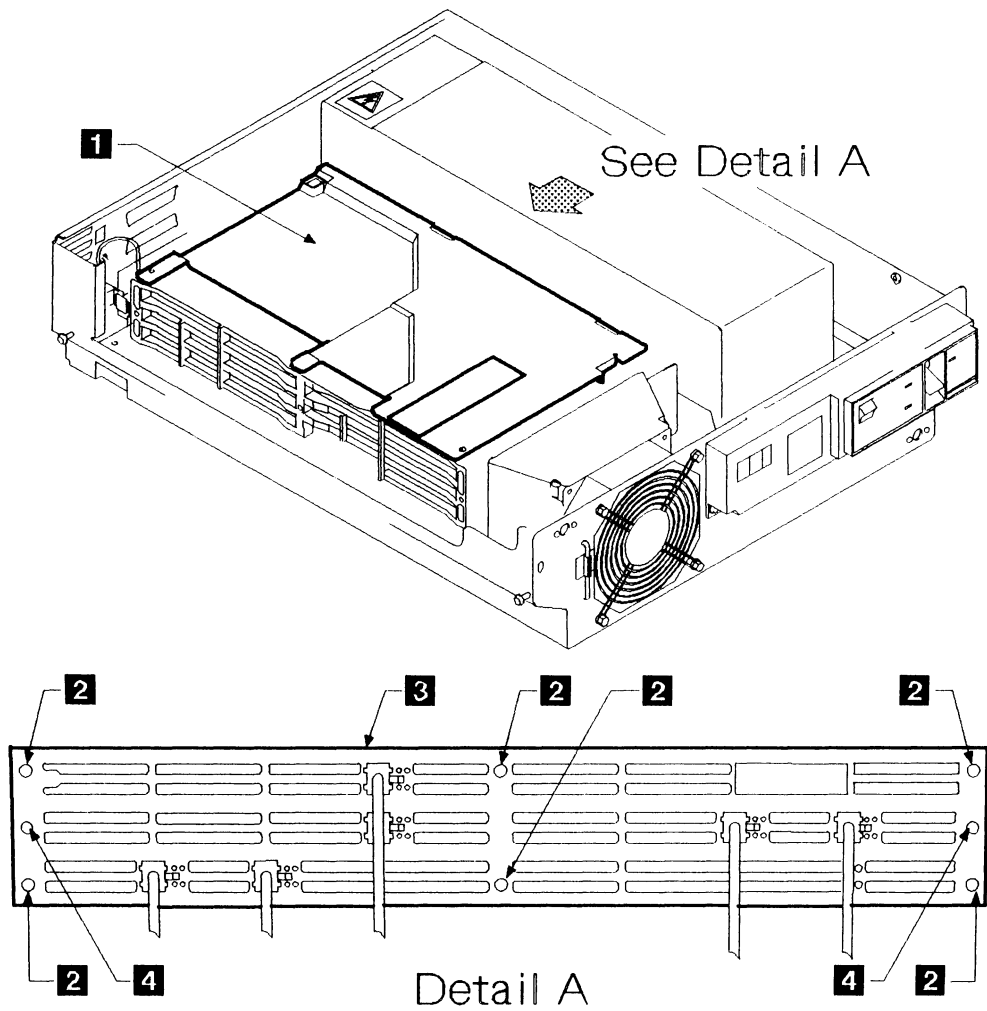


Figure 4-13. Logic Board

---

## Miscellaneous FRUs

### Removing the Address Switch

---

**1**

**Remove power from the drawer.**

See page 4-3.

---

**2**

**Remove the top cover.**

See page 4-6.

---

**3**

**Remove the address switch cable.**

At the back of the drawer, remove the connector from the back of the address switch **1**.

---

**4**

**Remove the address switch.**

At the switch, compress the top and bottom retaining clips **2** into the body of the switch.

Push the switch (from the inside) out through the rear panel of the drawer.

---

### Installing the Address Switch

---

**Install the address switch.**

Connect the address switch in the reverse sequence of removal.

Restore power to the drawer (see page 4-4).

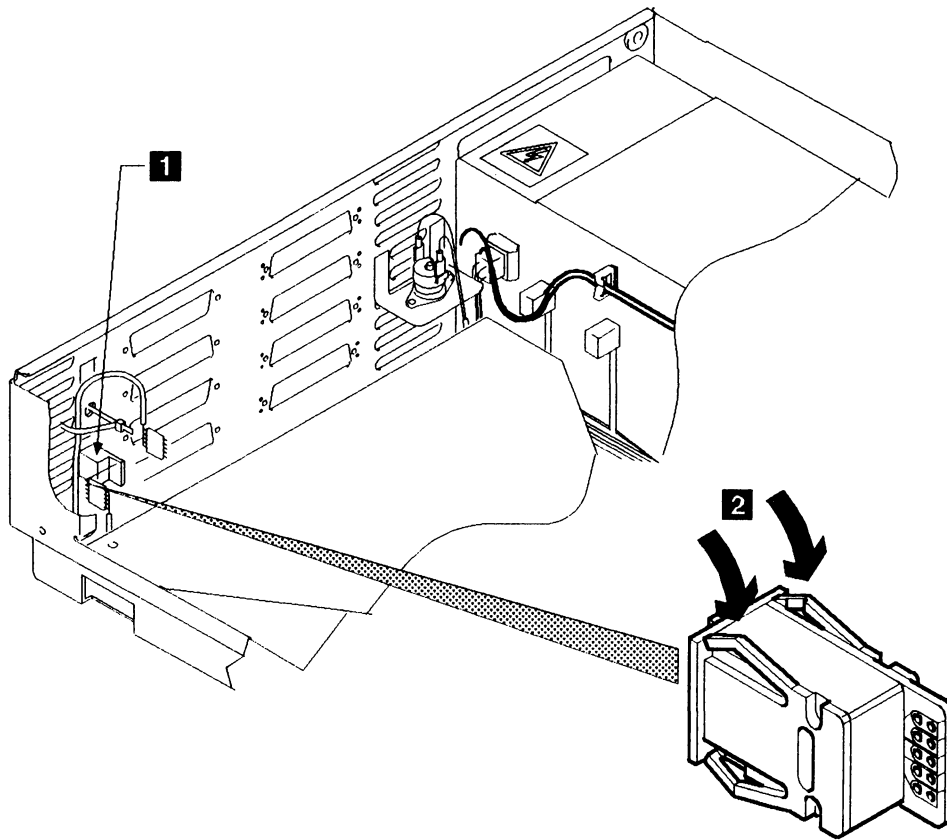


Figure 4-14. Address Switch

## Removing the Slide Assemblies

**Note:** Each drawer in the rack has a right-hand slide and a left-hand slide. To remove a slide, you have to take the drawer out of the rack.

---

### 1

**Remove power from the drawer.**

See page 4-3.

---

### 2

**Remove the drawer.**

Disconnect the ac power cable and the logic cables from the back of the Model A.

Remove the cable-carrier hinge pin (see step 3 on page 4-34).

Remove the front panel (see page 4-5).

Turn the thumb levers **2** at each side of the front of the Model A inward toward the center of the drawer and pull them away from the rack.

Slide the drawer out of the rack until it locks in its extended position.

**CAUTION:**

**The drawer weighs approximately 17.5 kg (38 lb).**

Lift the drawer off its slides **3** and away from the rack.

Turn the thumb levers inward and push the slides back into the rack.

---

### 3

**Remove the slide assemblies.**

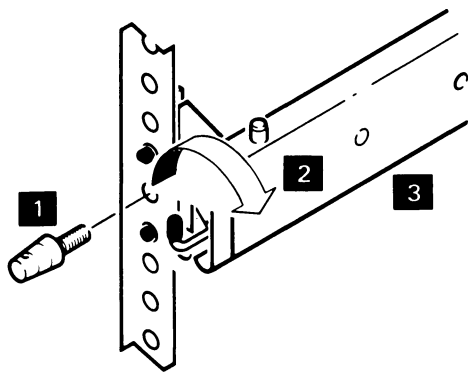
**Note:** Make a note of the position of the slides in the rack before removing the securing screws.

Remove the screws **1** at the front and at the rear of the rack.

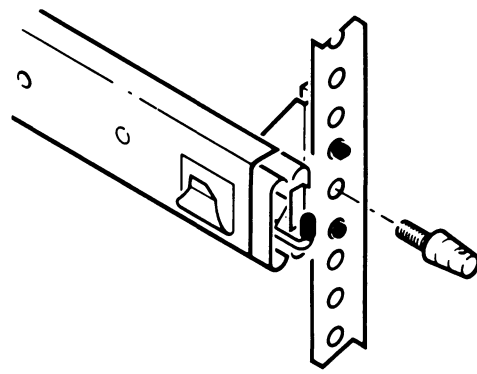
When removing the screws at rear-right, support the cable support carrier.

Save the shipping clamp **4**.

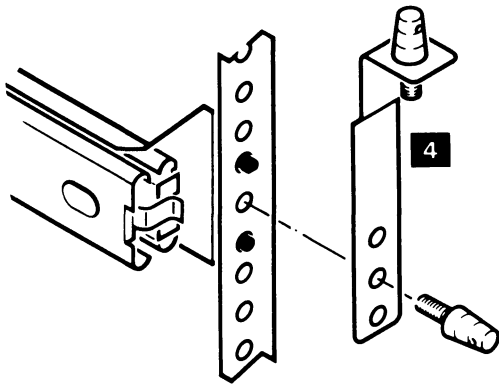
Remove the slide assemblies.



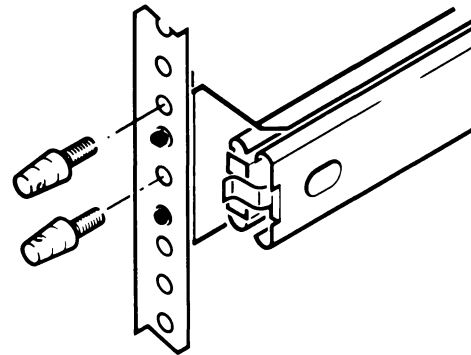
FRONT – LEFT



FRONT – RIGHT



REAR – LEFT



REAR – RIGHT

Figure 4-15. Removing the Slide Assemblies

## Installing the Slide Assemblies

---

### 1

**Install the slide assemblies.**

Place the slide assemblies **2** in the rack, ensuring that the pins are in the correct holes in the rack.

Insert the screws **1** that hold the slides to the rack. Do not fully tighten them. (Include the cable support carrier at right-rear and the shipping clamp **4** at left-rear.)

---

### 2

**Install the drawer.**

**CAUTION:**

**The drawer weighs approximately 17.5 kg (38 lb).**

Fully extend each slide and ensure it is locked in the out position.

Locate the drawer on the slides so that the holes on the drawer are aligned with the spigots on the slides.

Push the drawer in.

Tighten the screws that hold the slides to the rack.

Reinstall the front panel.

Reinstall the cable carrier hinge pin.

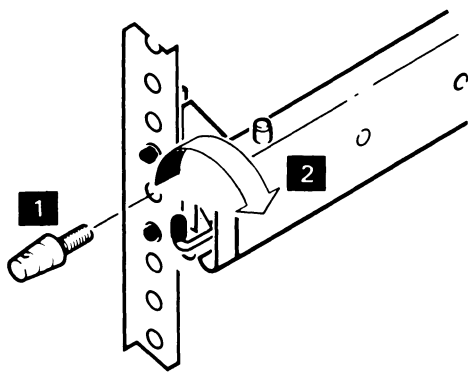
Reconnect the ac power and the logic cables at the back of the drawer.

---

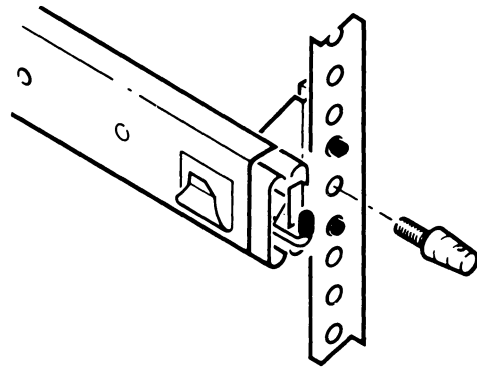
### 3

**Restore power to the drawer.**

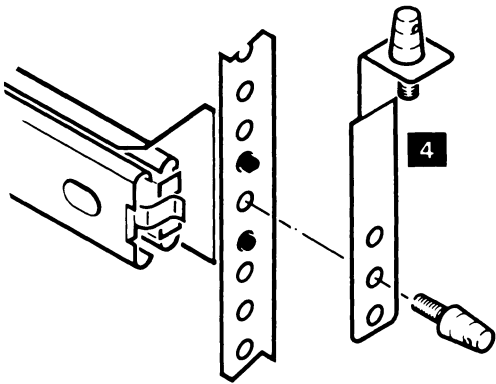
See page 4-4.



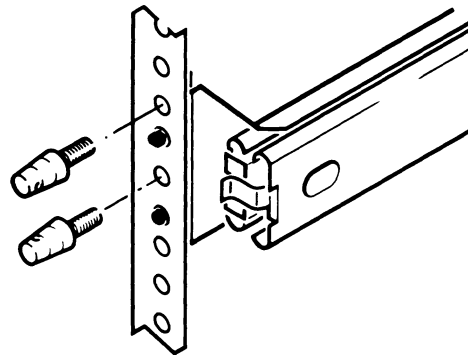
FRONT – LEFT



FRONT – RIGHT



REAR – LEFT



REAR – RIGHT

Figure 4-16. Installing the Slide Assemblies

## Removing the Cable Support Carrier

---

### 1

Remove power from the drawer.

See page 4-3.

---

### 2

Remove the cables from the cable support carrier.

Release the shipping clamp (if not as shown) by loosening screws **5** and sliding the bar to the left.

Note the position of the cables in the cable support carrier **6**.

Loosen the captive screw **4** and fold out the cable support carrier.

Open the cable clips **7** and remove the cables.

Close the cable clips.

---

### 3

Remove the cable support carrier.

Remove the screw **1** that holds the cable support carrier to the rack.

Remove the hinge-pin **2** that holds the cable support carrier to the bracket **3** on the left-hand side of the drawer.

Remove the cable support carrier from the rack.



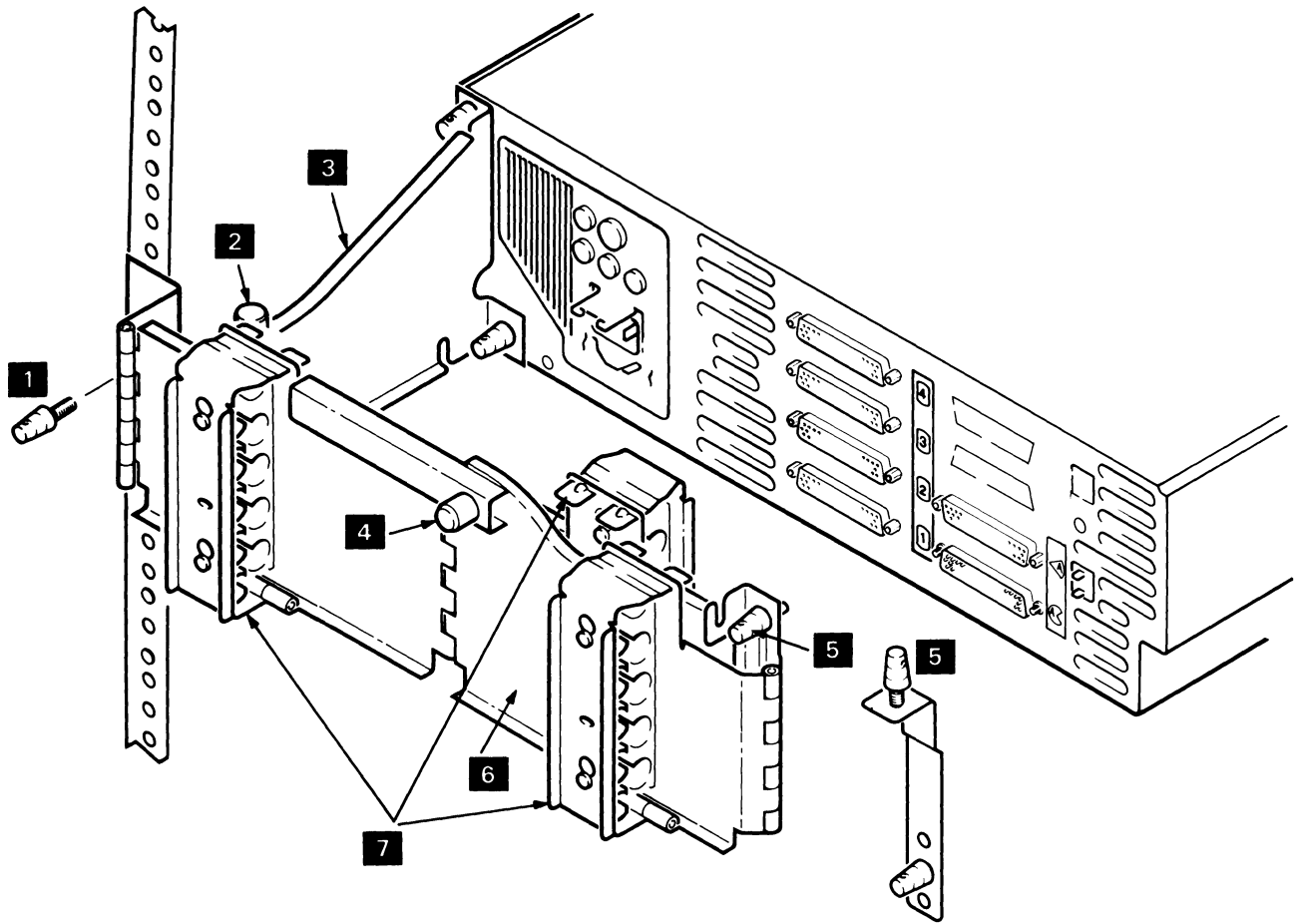


Figure 4-17. Removing the Cable Support Carrier

## Installing the Cable Support Carrier

---

### 1

**Install the cable support carrier.**

Reinstall the hinge-pin **2** that holds the cable support carrier to the bracket **3** on the left-hand side of the drawer.

Attach the cable support carrier **6** to the rack with screw **1**.

---

### 2

**Install the cables in the cable support carrier.**

Ensure that the captive screw **4** is loose and fold out the cable support carrier.

Open the cable clips **7**.

Refer to your note of the cable positions, and place the cables into the cable support carrier in the order in which they were removed, then close the clips **7**.

Fold in the cable support carrier and tighten the captive screw **4**.

Close and open the drawer and check that the cable support carrier moves in and out correctly.

---

### 3

**Restore power to the drawer.**

See page 4-4.



Figure 4-18. Installing the Cable Support Carrier

---

## Internal and External Cables

### Removing the DC Power Cable

---

- |                               |   |
|-------------------------------|---|
| <b>1</b>                      |   |
| Remove power from the drawer. | See page 4-3.   |
| <hr/>                         |   |
| <b>2</b>                      |   |
| Remove the top cover.         | See page 4-6.   |
| <hr/>                         |   |
| <b>3</b>                      |   |
| Remove the dc power cable.    | <p>Slide the card gate to the left after loosening the inner two corner screws and removing the outer two corner screws.</p> <p>Disconnect plugs P1 <b>4</b> and P2 <b>5</b> at the front of the power box <b>6</b>.</p> <p>Disconnect the ground cable <b>3</b> at the front of the power box.</p> <p>Disconnect the signal ground cable from the card gate frame.</p> <p>Unplug the six dc power cable connectors <b>2</b> from the back of the logic board.</p> <p>Lift the dc power cable <b>1</b> from the bottom of the drawer.</p> |

### Installing the DC Power Cable

---

- |                             |  |
|-----------------------------|--|
| Install the dc power cable. | <p>Install the dc power cable in the reverse sequence of removal.</p> <p>Reinstall the grounding connection <b>3</b>.</p> <p>Restore power to the drawer (see page 4-4).</p> |
|-----------------------------|--|

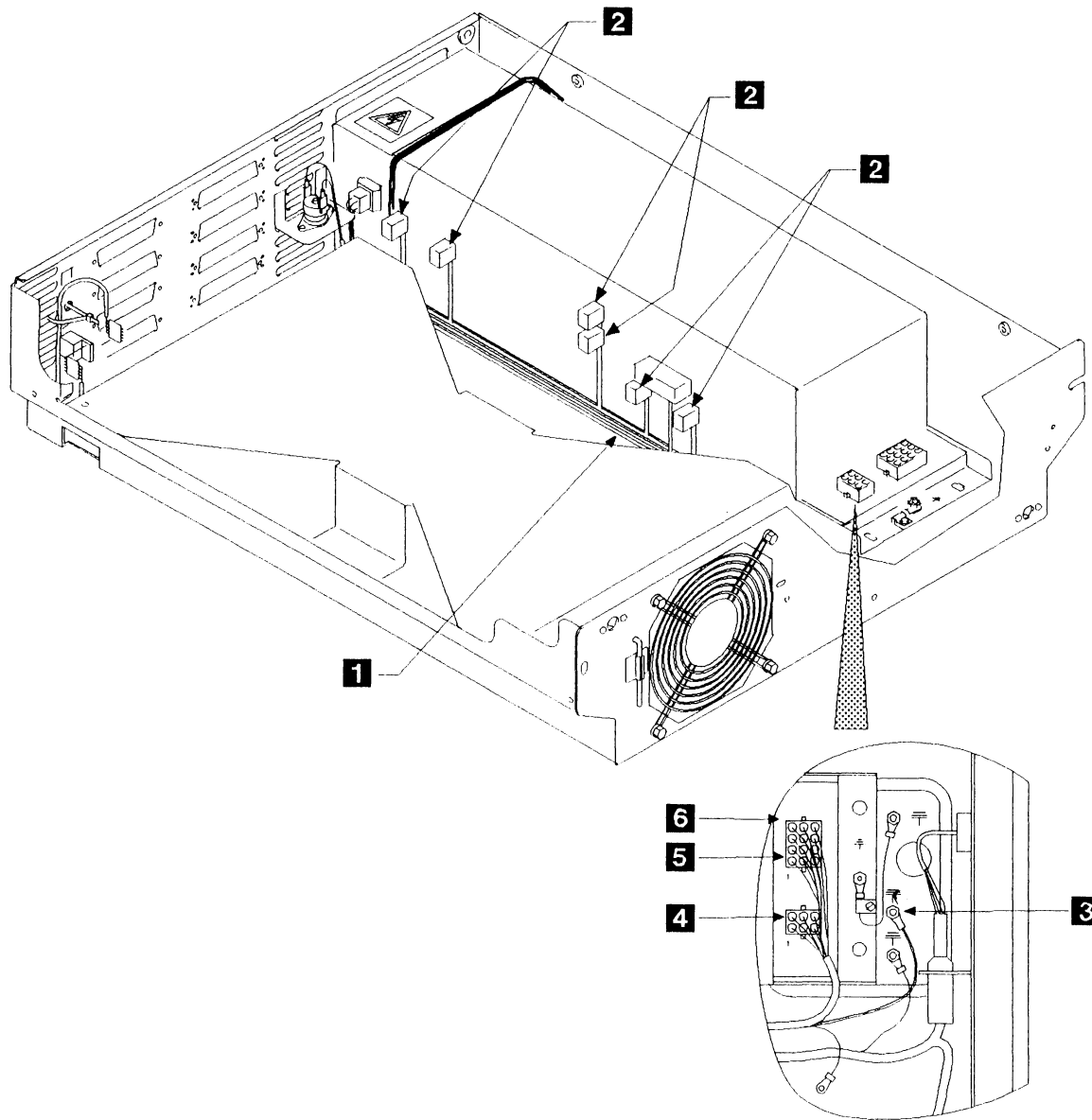


Figure 4-19. DC Power Cable

## Removing the Address Switch Cable

---

- |  |  |
|--|--|
| <b>1</b>                                       |  |
| Remove power from the drawer.                  | See page 4-3.  |
| <hr/>  |  |
| <b>2</b>                                       |  |
| Slide the drawer out and remove the top cover. | See page 4-6.  |
| <hr/>  |  |
| <b>3</b>                                       |  |
| Slide the card gate.                           | Loosen the inner two corner screws at the base of the card gate, remove the outer two screws, and slide the card gate to the left.   |
| <hr/>  |  |
| <b>4</b>                                       |  |
| Remove the address switch cable.               | Unplug the connector <b>3</b> from the address switch <b>4</b> at the back of the drawer.<br><br>Disconnect the address switch cable connector plug <b>1</b> from position B7 on the logic board.<br><br>Lift the address switch cable <b>2</b> from the bottom of the drawer. |

## Installing the Address Switch Cable

---

- |                                   |   |
|-----------------------------------|---|
| Install the address switch cable. | Install the address switch cable in the reverse sequence of removal.<br><br>Restore power to the drawer (see page 4-4). |
|-----------------------------------|---|

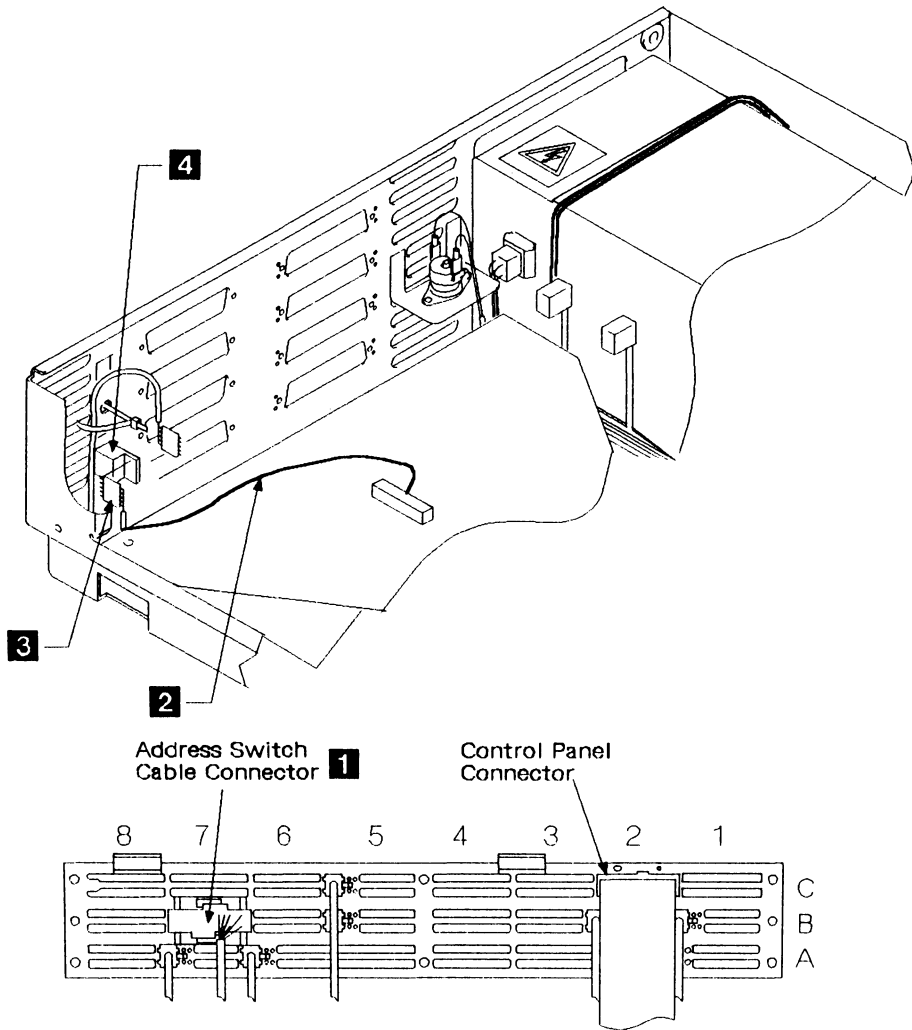


Figure 4-20. Address Switch Cable

## Removing the Internal AC Power Cable

---

<b>1</b>	
<b>Remove power from the drawer.</b>	See page 4-3.
<b>2</b>	
<b>Remove the top cover.</b>	See page 4-6.
<b>3</b>	
<b>Move the card gate.</b>	Loosen the inner two corner screws at the base of the card gate, remove the outer two screws, and slide the card gate to the left.
<b>4</b>	
<b>Remove the internal ac power cables.</b>	<p>At the front of the drawer, remove the ground cable from the ground stud.</p> <p>Remove the two push-on connectors from the thermal trip switch <b>1</b>.</p> <p>Disconnect plug J3 <b>2</b> from the back of the switched-mode power supply unit <b>3</b>.</p> <p>Disconnect plug P4 then remove socket J4 from its mounting (see Figure 4-7 on page 4-13).</p> <p>Disconnect the two power cables and the ground cable from the fan (shown as <b>3</b> and <b>4</b> on Figure 4-8 on page 4-15).</p> <p>If the ac power cable is as shown in <b>6</b>, remove it. If it is as shown in <b>4</b>, lift it from the clips <b>5</b> before removing it.</p>

## Installing the Internal AC Power Cable

---

<b>Install the internal ac power cable.</b>	<p>Install the internal ac power cable in the reverse sequence of removal.</p> <p>Restore power to the drawer (see page 4-4).</p>
---	---



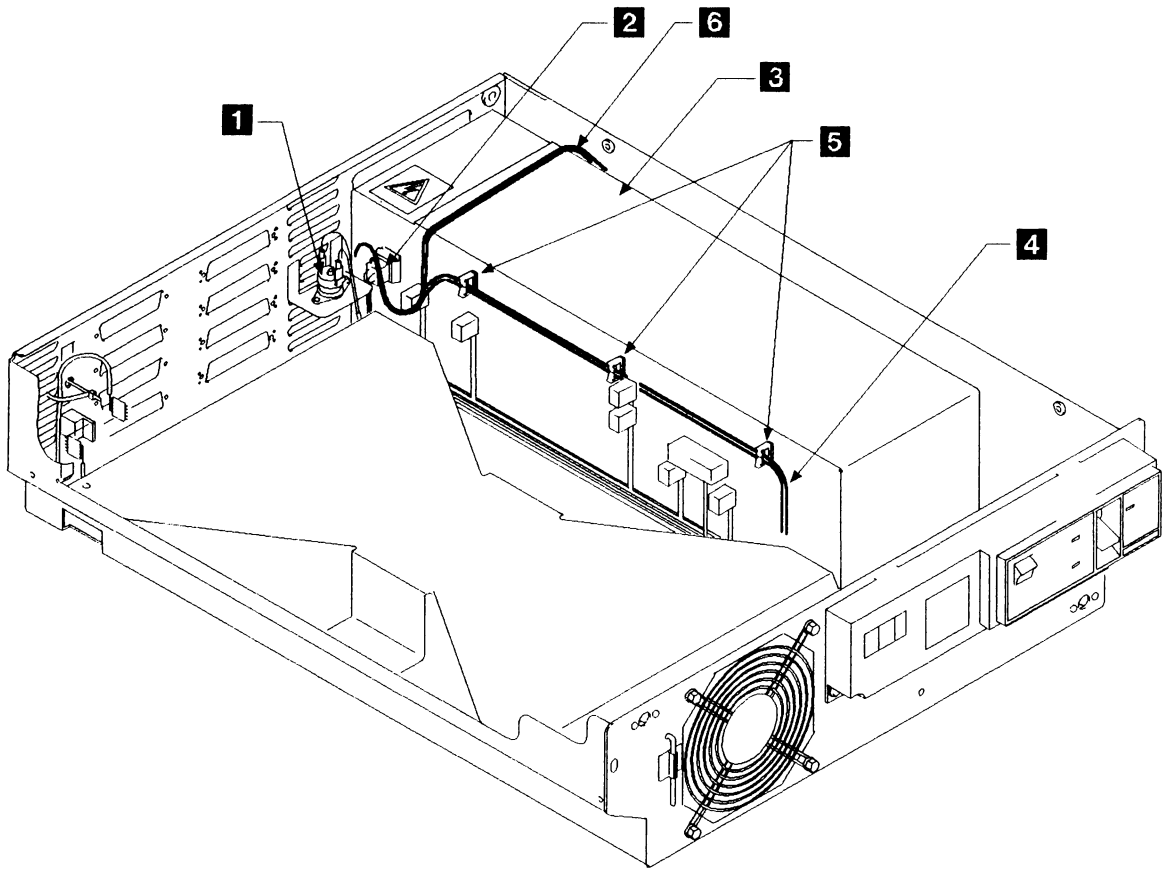


Figure 4-21. Internal AC Power Cable

## Removing the Interface Ribbon Cables

**Note:** The following instructions can be used for all the interface ribbon cables.

---

<b>1</b>	
<b>Remove power from the drawer.</b>	See page 4-3.
<b>2</b>	
<b>Remove the top cover.</b>	See page 4-6.
<b>3</b>	
<b>Remove the interface ribbon cables.</b>	Disconnect the interface ribbon cables <b>1</b> from the card-gate.  At the back of the drawer, remove the two screws <b>2</b> at each ribbon cable connector <b>3</b> .  Push each ribbon cable connector in through the hole in the back of the drawer and remove the interface ribbon cable.

---

## Installing the Interface Ribbon Cables

---

<b>Install the interface ribbon cables.</b>	Install the interface ribbon cables in the reverse sequence of removal.  Restore power to the drawer (see page 4-4).
---	--

---

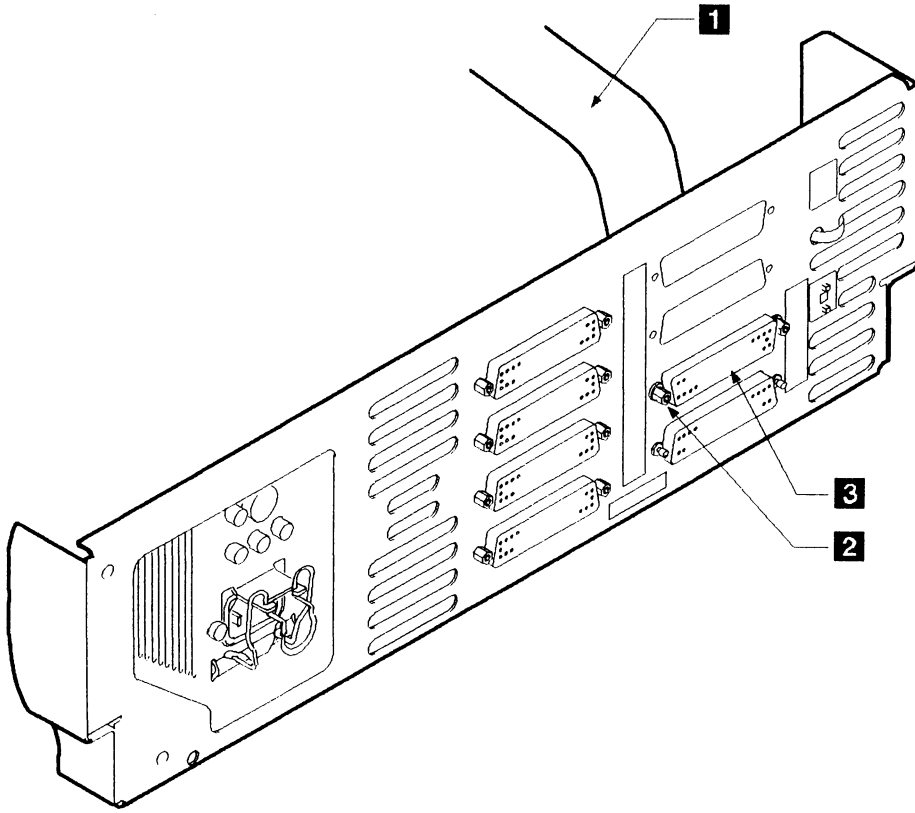


Figure 4-22. Interface Ribbon Cables

## Removing the External Cable Assemblies

The external cable assemblies are: (1) the ac power cable, (2) the signal cables to the Model B, and (3) signal cables to a processor or another device.

---

**1**

**Remove power from the drawer.**

See page 4-3.

---

**2**

**Remove the external cables.**

Disconnect the ac power cable and the disk storage device signal cables from the connector panel on the back of the drawer.

Loosen the clips on the cable support carrier (see step 2 on page 4-34) and remove the cables.

## Installing the External Cable Assemblies

---

**1**

**Install the external cables.**

Place the cable assemblies into the clips on the cable-support carrier (see page 4-36) and fasten the clips.

Plug the external cable assemblies into the connector panel.

Ensure that the connectors are firmly retained by the thumb screws.

---

**2**

**Restore power to the drawer.**

See page 4-4.

---

# Chapter 5. Model A: Power and Grounding

- Problem Isolation Procedure A1 . . . . . 5-3
  - Problem Isolation Entry Point A . . . . . 5-3
- Problem Isolation Procedures A2 . . . . . 5-10
  - Problem Isolation Entry Point B . . . . . 5-10
  - Problem Isolation Entry Point C . . . . . 5-13
  - Problem Isolation Entry Point D . . . . . 5-19
  - Problem Isolation Entry Point E . . . . . 5-21
- Cleanup and Repair Verification . . . . . 5-23
- Grounding . . . . . 5-28
  - Electrical Grounding Checks . . . . . 5-28
- Power Distribution for Model A . . . . . 5-31

This chapter contains power servicing details for the IBM 9335 Model A Device Function Controller. The contents are:

- Problem isolation procedures.
- Power distribution diagrams (to supplement the power problem isolation when fault-finding).
- Lights that help in fault-finding:
  - Power On light (on the control panel).
  - L1** (on the back panel). This lights when power is present.
  - L2** (on the back panel). On early versions this lights when the dc power fails, but on later versions of the power supply L2 lights when the fuse blows.
  - L3** (on the back panel). This lights when the power box overheats.
  - L4** (on the back panel). On early versions this lights when the fuse blows. It is not installed on later versions.
  - Power supply circuit-breaker light (on the power box).
- Electrical grounding safety checks.
- Grounding diagrams.

---

## Problem Isolation Procedure A1

### Problem Isolation Entry Point A

**Warning:** Ensure all affected devices are offline to the using system before you switch the power off.

You are here from the “Problem Determination Entry,” step 2, step 4 on page 1-7, or step 6 on page 1-8.

Set the Power switch on the front panel to On (if it is not already set to On).

---

**1**

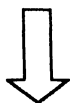
Are any of these front panel lights on after 2 minutes?

Power On.  
Controller Ready.  
Controller Check.

Check the power present light (L1 on the back panel) and then go to step 2.

YES

NO



Follow the instructions on the right.

Go to step 10.

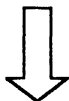
---

**2**

Is the power present light on?

YES

NO



Follow the instructions on the right.

URC 2500. The mainline power supply has failed. Check for an open-circuit power cable from the main line power cable socket to the distribution box.

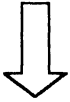
Go to the rack enclosure problem isolation procedures (in the using system service guide).

---

### 3

**Is the fuse blown light (L4 on the back panel) on? (Follow the NO leg if L4 is not installed.)**

**YES      NO**



Follow the instructions on the right.

Check the power failure light (L2 on the back panel) and go to step 4.

**Go to step 8.**

---

### 4

**Is the power failure light on?**

**YES      NO**



Follow the instructions on the right.

Check the thermal fault light (L3 on the back panel) and go to step 5.

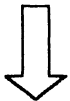
**Go to step 9.**

---

### 5

**Is the thermal fault light on?**

**YES      NO**



Follow the instructions on the right.

Remove the front panel and look at the reference display. Then go to step 6.

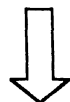
**Go to step 7.**

---

### 6

**Is the reference display blank?**

**YES      NO**



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2503.

**Go to step 14.**

---



---

**7**

**You are here from step 5 because the thermal fault light is on.**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2502.

---

**8**

**You are here from step 3 because the fuse blown light (L4 on the back panel) is on.**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2504.

---

**9**

**You are here from step 4 because the power failure light (L2 on the back panel) is on.**

Go to the *Guide to Unit Reference Codes* and, if the power box does not have an L4 indicator on the back panel, perform the actions for URC 2504; otherwise, perform the actions for URC 2505.

---

**10**

**You are here from step 1.**

**Is the Controller Ready light on?**

**NO      YES**



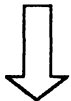
Go to step 15.

---

**11**

**Is the Controller Check light on?**

**YES      NO**



Follow the instructions on the right.

---

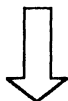
Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2506.

---

## 12

Is the Power On light on?

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2507.

---

## 13

The Power On light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2508.

---

## 14

You are here from step 6 because the reference display is blank.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2509.

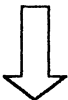
---

## 15

You are here from step 10.

Is the Power On light on?

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2511.

---

## 16

The Power On light is on.

Follow the instructions on the right.

Remove the front panel from the drawer and look at the reference display on the control panel.

Go to step 17.

---

## 17

Does the reference display show 900, 902, 904, 906, 908, 90C, 910, or 914?

NO YES



Follow the instructions on the right.

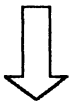
Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2514.

---

## 18

Does the reference display show 9AA?

YES NO



Go to step 22.

---

## 19

Did you enter this Problem Isolation Procedure from System URC FFF0?

NO YES



Follow the instructions on the right.

If the Attachment A Enable/Disable switch is set to Disable, set it to Enable and try the customer's job again.

Otherwise, go to step 26.

---

## 20

Do all the Model Bs connected to this Model A have their device ready lights on, and their Enable/Disable switches set to Enable?

YES NO



Follow the instructions on the right.

1. Switch on all Model B units.
2. Set all Model B Device Enable/Disable switches to Enable.
3. Set the Power switch on the Model A to Off and then to On again.
4. Wait 2 minutes.
5. Check the reference display again.

Go to step 21.

Go to step 25.

---

## 21

You are here from step 25.

Go to "Cleanup and Repair Verification" on page 5-23.

Does the reference display show 900?

NO

YES



Follow the instructions on the right.

---

## 22

You are here from step 18 or from step 21.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2513.

Is the reference display blank?

NO

YES



Follow the instructions on the right.

---

## 23

Is the reference display showing 9AD or 9AE?

There was an equipment check during the subsystem IML. Download the Model A IML data. Refer to the using system manual.

NO

YES



Follow the instructions on the right.

If this fails for the second time, make a note of the URC and go to the *Guide to Unit Reference Codes*, and perform the appropriate actions for that URC.

---

## 24

The reference display is *not* showing 9AD or 9AE.

Go to the *Guide to Unit Reference Codes*. Perform the actions for the code that is shown in the reference display.

Follow the instructions on the right.

---

## 25

You are here from step 20.

Load the Model A IML data from the system. (See the using system manuals for instructions on how to do this.)

Go back to step 21.

---

## 26

You are here from step 19.

Is the address switch on the Model A back panel set to the correct address?

NO

YES



Follow the instructions on the right.

---

---

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2512.

## 27

Follow the instructions on the right.

1. Set the Power switch to Off.
2. Set the address switch to the correct address.
3. Set the Power switch to On.
4. Wait two minutes.
5. Try the customers job again.

---

## Problem Isolation Procedures A2

### Problem Isolation Entry Point B

Other Isolation Entry Points in A2	Page
Problem Isolation Entry Point C	5-13
Problem Isolation Entry Point D	5-19
Problem Isolation Entry Point E	5-21

**Warning:** Ensure all affected devices are offline to the using system before you switch the power off.

---

#### 1

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 2502. Take these actions:

1. Set the Power switch (on the front panel) to Off.
  2. Pull out the drawer and remove the top cover.
  3. Set the Power switch to On.
  4. Observe the fan through the grille at the front of the Model A, then go to step 2.
- 

#### 2

Is the fan working?

NO      YES



Follow the instructions on the right.

Check the connections on plug P3 on the side of the power box. If they are correctly located, install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

---

### 3

**Set the Power switch (on the front panel) to Off.**

**Allow ten minutes for the unit to cool.**

**The card gate thermal trip switch (see Figure 6-3 on page 6-3) may have tripped (check by trying to press down the red button to reset it).**

**Set the Power switch to On.**

**Is the fan now working?**

**NO**

**YES**



**Follow the instructions on the right.**

**Go to step 6.**

Exchange, for new ones, the following FRUs:

1. The thermal trip switch assembly.
2. The fan.

Go to "Cleanup and Repair Verification" on page 5-23.

---

### 4

**You are here from step 7.**

**Is the thermal trip switch open circuit?**

**YES**

**NO**



**Follow the instructions on the right.**

Repair or install a new cable to the switch.

Go to "Cleanup and Repair Verification" on page 5-23.

---

### 5

**The thermal trip switch is open circuit.**

**Follow the instructions on the right.**

Install a new switch.

Go to "Cleanup and Repair Verification" on page 5-23.

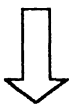
---

## 6

You are here from step 3.

Is the thermal failure light (L3) on?

YES      NO



Follow the instructions on the right.

1. Disconnect the mainline power cable from the power box.
2. Disconnect plug P4 from socket J4 at the front of the unit (see Figure 6-3 on page 6-3).
3. Disconnect the cable from the fan.
4. Check for continuity from the fan cable connectors to socket J4 pins 3 and 4.

Go to step 8.

---

## 7

The light L3 is on.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Check the gate thermal trip switch. Measure the resistance across its terminals.

Go back to step 4.

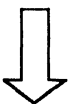
---

## 8

You are here from step 6.

Is the continuity OK (that is, resistance is less than 1 ohm on both leads)?

YES      NO



Follow the instructions on the right.

Repair or install a new ac cable assembly.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 9

The continuity is OK.

Follow the instructions on the right.

Install a new fan.

Go to "Cleanup and Repair Verification" on page 5-23.

---



## Problem Isolation Entry Point C

**Warning:** Ensure all affected devices are offline to the using system before you switch the power off.

---

### 10

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 00F, 1AB, 5AB, 2506, 2508, or 2509. Take these actions:

1. Set the Power switch (on the front panel) to Off.
2. Pull out the drawer and remove the top cover.
3. Set the Power switch to On.
4. Check the fan. (Observe the fan through the grille at the front of the Model A.)

Go to step 11.

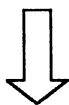
---

### 11

Is the fan working?

YES

NO



Follow the instructions on the right.

Go to step 16.

1. Set the Power switch (on the front panel) to Off.
2. Check that plugs P3 and P4 are securely connected to sockets J3 and J4 (see Figure 6-3 on page 6-3).
3. Switch the rack circuit breaker for the failing Model A to O.
4. Disconnect plug P3 at the side of the power box.
5. Set the Power switch to On.
6. Check for continuity between plug P3 pins 1 and 3.
7. Check for continuity between plug P3 pins 2 and 4.

Go to step 12.

---

### 12

Is the continuity OK. (Less than 1 ohm for both readings)?

YES

NO



Follow the instructions on the right.

Go to step 15.

1. Disconnect plug P4 from the back of the control panel.
2. Check for continuity through the Power switch between plug P4 pins 1 and 3.
3. Check for continuity on plug P4 between pins 2 and 4.

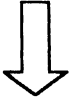
Go to step 13.

---

## 13

Is the continuity OK. (Less than 1 ohm for both readings)?

YES      NO



Follow the instructions on the right.

Install a new Power switch assembly.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 14

The continuity is OK. (The resistance is less than 1 ohm.)

Follow the instructions on the right.

Install a new ac cable assembly.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 15

You are here from step 12 because the continuity is OK. (The resistance is less than 1 ohm.)

Follow the instructions on the right.

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 16

You are here from step 11 because the fan is working.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Check that the plugs and sockets in the following locations are tight: P1, P2, and VC1 through VC6. (See Figure 6-3 on page 6-3.)
3. If all plugs and sockets are tight, set the Power switch to On.
4. Measure the following voltages on logic board 01A-A1:
  - a. - 5 V  
    between pins C5D08 (positive) and C5B06 (negative).  
    between pins C5D08 (positive) and A1B06 (negative).
  - b. + 5 V  
    Between pins C5D03 (positive) and C5D08 (negative).
  - c. + 1.7 V  
    Between pins C5G05 (positive) and C5D08 (negative).

Go to step 17.

---

## 17

Are all the voltages measured inside the range plus or minus 10%?

NO      YES



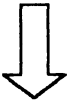
Go to step 28.

---

## 18

Is the +5 V missing or out of range?

YES      NO



Follow the instructions on the right.

Go to step 23.

---

1. Set the Power switch (on the front panel) to Off.
2. Disconnect plug P1 from socket J1 on the power box at the back of the drawer.
3. Set the Power switch to On.
4. Measure the following voltages on socket J1:
  - a. -5 V between pins 3 (negative) and 4 (positive).
  - b. +1.7 V between pins 2 (positive) and 4 (negative).

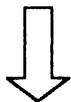
Go to step 19.

---

## 19

Are the voltages in the range plus or minus 10%?

YES      NO



Follow the instructions on the right.

---

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 20

The voltages are in the range plus or minus 10%.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Reconnect plug P1.
3. Remove all logic cards from the card-gate 01A-A1.
4. Set the Power switch to On.
5. Recheck the following voltages at the logic board:
  - a. -5 V
    - Between pins C5B06 (negative) and C5D08 (positive).
    - Between pins A1B06 (negative) and C5D08 (positive).
  - b. +1.7 V
    - Between pins C5G05 (positive) and C5D08 (negative).

Go to step 21.

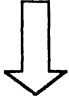
---

---

## 21

Are the voltages within the range plus or minus 10%?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cable assembly, dc supply
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 22

All the voltages are in the range plus or minus 10%.

Follow the instructions on the right.

1. Install all the logic cards into the card gate one at a time, and recheck the voltages after each card has been installed.
2. Exchange, for a new one, the card that alters the voltage.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 23

You are here from step 18 because the +5 V is missing or out of range.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Disconnect plug P2 from socket J2 on the power box.
3. Set the Power On switch to On.
4. Measure +5 V on socket J2 between pins 7 (positive) and 1 (negative).

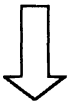
Go to step 24.

---

## 24

Is the voltage in the range plus or minus 10%?

YES      NO



Follow the instructions on the right.

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 25

The voltage is in the range plus or minus 10%.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Reconnect plug P2.
3. Remove all the logic cards from the card gate 01A-A1.
4. Set the Power switch to On.
5. Recheck + 5 V on logic board pins C5 D03 (positive) and C5 D08 (negative).

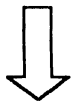
Go to step 26.

---

## 26

Is the voltage in the range plus or minus 10%?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cable assembly, dc supply
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 27

The voltage is in the range plus or minus 10%.

Follow the instructions on the right.

1. Insert the logic cards into the card gate one at a time, and recheck the voltage after each card has been installed.
2. Exchange, for a new one, the card that alters the voltage.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 28

You are here from step 17 because all the voltages measured are in the range plus or minus 10%.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Remove the following logic cards (see Figure 6-4 on page 6-4):
  - a. Device adapter interface card 01A-A1B1.
  - b. System adapter (microprocessor) card 01A-A1C5.
3. Set the Power switch to On.
4. Measure for + 5 V on logic board 01A-A1 between pins C5 B02 (positive) and C5 D08 (negative); C5 G13 (positive) and C5 D08 (negative).

Go to step 29.

---

---

## 29

Is the voltage in the range +4.5 V to +5.5 V?

YES NO



Follow the instructions on the right.

Go to step 32.

1. Set the Power switch (on the front panel) to Off.
2. Disconnect plugs P1 and P2 from sockets J1 and J2 on the power box (see Figure 6-3 on page 6-3).
3. Set the Power switch to On.
4. Measure +5 V on socket J1 pins 6 (positive) and 4 (negative).
5. Measure +5 V on socket J2 pins 11 (positive) and 1 (negative); see Figure 6-3 on page 6-3.

Go to step 30.

---

## 30

Are both voltages in the range plus or minus 10%?

YES NO



Follow the instructions on the right.

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 31

Both voltages are in the range plus or minus 10%.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cable assembly, dc supply
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 32

You are here from step 29 because the voltage measured is in the range +4.5 V to +5.5 V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. System adapter (microprocessor) card 01A-A1C5.
2. Device adapter interface card 01A-A1B1.
3. Device adapter read/write card 01A-A1A1.
4. Control panel card 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 5-23.

## Problem Isolation Entry Point D

**Warning:** Ensure all affected devices are offline to the using system before you switch the power off.

---

### 33

You are here from *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 2511. Take these actions:

1. Set the Power switch (on the front panel) to Off.
2. Pull out the drawer and remove the top cover.
3. Check that the connectors in positions P1, P2, and VC5 are securely plugged. (See Figure 6-3 on page 6-3 and Figure 6-5 on page 6-5.)
4. Disconnect plugs P1 and P2 from sockets J1 and J2 on the power box.
5. Set the Power switch to On.
6. Measure + 5 V on socket J1 between pins 6 (positive) and 4 (negative).
7. Measure + 5 V on socket J2 between pins 11 (positive) and 1 (negative).

Go to step 34.

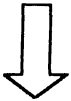
---

### 34

Are both voltages in the range plus or minus 10%?

YES

NO



Follow the instructions on the right.

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

### 35

Both voltages are in the range plus or minus 10%.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Check for continuity from plug P1 pin 6 to logic board 01A-A1 pin C5G13.
3. Check for continuity from plug P2 pin 11 to logic board 01A-A1 pin C5B02.

Go to step 36.

---

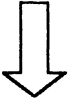
---

## 36

Is the continuity OK (that is, the resistance is less than 1 ohm on both pins)?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cable assembly, dc supply
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 37

Follow the instructions on the right.

1. Reconnect plugs P1 and P2
2. Add a jumper on the card side of logic board 01A-A1 between pins C1G05 and C1J08
3. Set the Power switch to On.

Go to step 38.

---

## 38

Is the Power On light now on?

NO

YES



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power box
2. Cable assembly dc supply.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 39

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. System adapter (microprocessor) card 01A-A1C5
2. Device adapter interface card 01A-A1B1
3. Control panel 01A-C1A.

Go to "Cleanup and Repair Verification" on page 5-23.



## Problem Isolation Entry Point E

**Warning:** Ensure all affected devices are offline to the using system before you switch the power off.

---

### 40

You are here from URC 06A or 09E.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Pull out the drawer and remove the top cover.
3. Check that connectors P1 and VC1 are securely plugged (see Figure 6-3 on page 6-3).
4. Set the Power switch to On.
5. Measure the  $-5$  V supply on the logic board 01A-A1 between pins A1B06 (negative) and A1D08 (positive).

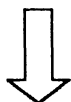
Go to step 41.

---

### 41

Is the voltage in the range  $-4.5$  V to  $-5.5$  V?

YES      NO



Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Off.
2. Disconnect plug P1 from the power supply.
3. Set the Power switch to On.
4. Measure the  $-5$  V between pins 3 (negative) and 4 (positive) of power-supply socket J1. See Figure 6-3 on page 6-3.

Go to step 43.

---

### 42

The voltage is in the range  $-4.5$  V to  $-5.5$  V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Device adapter read/write card 01A-A1A1
2. System adapter (microprocessor) card 01A-A1A5
3. Device adapter interface card 01A-A1B1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

---

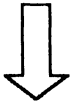
## 43

You are here from step 41.

Is the voltage in the range  $-4.5$  V to  $-5.5$  V?

YES

NO



Follow the instructions on the right.

Install a new power box.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## 44

The voltage is in the range  $-4.5$  V to  $-5.5$  V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cable assembly, dc supply
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 5-23.

---

## Cleanup and Repair Verification

---

### 1

**You are here because you have repaired or installed a new FRU in the Model A.**

**Follow the instructions on the right.**

1. Set the Power switch (on the front panel) to Off.
2. Remove any wire jumpers used during failure isolation.
3. Reinstall any cards, interposers, cross-card connectors, and cables that were removed for failure isolation.
4. Reseat any loose cards or connectors moved or disturbed during failure isolation.
5. Check that all cables are clipped in position.
6. Reinstall the machine covers and return the machine to its operating position.
7. Set the Power switch (on the front panel) to On.
8. Wait for 90 seconds.

Go to step 2.

---

### 2

**Is the IML successful (control panel reference code is 900)?**

**YES**

**NO**



Follow the instructions on the right.

If the symptoms of the failure are the same after the first pass through the procedures, call for aid from your support group.

If the symptoms are not the same, go to the *Guide to Unit Reference Codes* and perform the procedure for the code that is displayed.

---

### 3

**Have you had URC 1BXX?**

**YES**

**NO**



Follow the instructions on the right.

Run diagnostic test program 10 to each device in the failing storage unit.

Go to step 5.

---

## 4

Run diagnostic test program 31 to device 0 first, then run diagnostic test program 10 to each device in the failing storage unit.

Go to step 5.

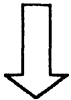
---

## 5

You are here from step 3 or step 4.

Do the tests run without an error?

YES      NO



Follow the instructions on the right.

---

If the symptoms are the same as the first pass, call for aid from your support group. If they are not the same, restart problem determination (see "Problem Determination Entry" on page 1-6).

## 6

Check that the Power On light and the Ready light on the front panel are on. Also check that Power Present light (L1) on the back panel is on.

Are all these lights on?

NO      YES



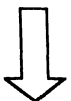
Go to step 9.

---

## 7

Is the Power Present light (L1) on the back panel on?

YES      NO



Follow the instructions on the right.

The lamp has failed.

Install a new power box.

Return to step 1.

---

## 8

**The ready lamp is off.**

**Follow the instructions on the right.**

A lamp has failed in the control panel.

Install a new control panel 01A-C1A1.

Return to step 1.

---

## 9

**You are here from step 6.**

**Follow the instructions on the right.**

Install all machine covers and restore it to its operating position.

Check that the service panel keypad is switched OFF after running any diagnostic test program from the Model A. If it is not switched off, the customer will not be able to use previously selected devices.

Ensure that the Attachment A Enable/Disable switch (on the front panel) is set to Enable.

The repair is now complete.

Go to step 10.

---

## 10

**Have you exchanged the device adapter interface card, 01A-A1B1?**

**NO**



**YES**

Follow the instructions on the right.

Using the following data, update the Model A VPD. The system manual describes how to do this.

**Note:** VPD fields not listed here are filled in automatically or are not required.

<b>VPD Field</b>	<b>What To Put In It</b>
<b>Number of FRUs</b>	00000005
<b>Device type</b>	9335
<b>Maintenance package level</b>	If the machine has a white label on the front panel showing that EC 397013A is installed, put 1 in this field; otherwise, put 0.
<b>Device model</b>	A01
<b>Serial number</b>	Take the number from the serial number plates fixed to machine. Use this number right justified with leading zeros.
<b>Controller/Device ID</b>	00
<b>Manufacturing ID</b>	00000057
<b>Engineering change level</b>	F0F0F0F0F0F0
<b>Installed features</b>	00
<b>Expected microcode level</b>	If you have done no other work, such as microcode updates or ECs, make this field equal to the microcode release level VPD field.
<b>Card part numbers and EC levels</b>	Fill in the card part numbers and EC levels by reference to the installed cards.

Go to step 12.

---

## 11

**Have you changed a FRU for one with a different part number or EC level?**

**NO**

**YES**



Follow the instructions on the right.

Update the appropriate VPD field with the new part number or EC level. The using-system manual describes how to do this.

Go to step 12.

---

## 12

**You are here from step 10 or step 11.**

Follow the instructions on the right.

You have now completed the cleanup and repair verification procedure for the Model A. If you were directed to this manual from another manual, return there now.

---

## Grounding

### Electrical Grounding Checks

See Figure 5-1 on page 5-29 and Figure 5-2 on page 5-30 and perform the following checks on the Model A electrical power grounds:

- At the power box:  
Check that a green and yellow wire connects the power box to the bottom of the drawer.
- At the card-gate fan:  
Check that a green and yellow wire is connected between the cooling fan assembly and the bottom of the drawer.
- Check that star washers are in place under the heads of the two screws securing the front of the power box to the drawer.



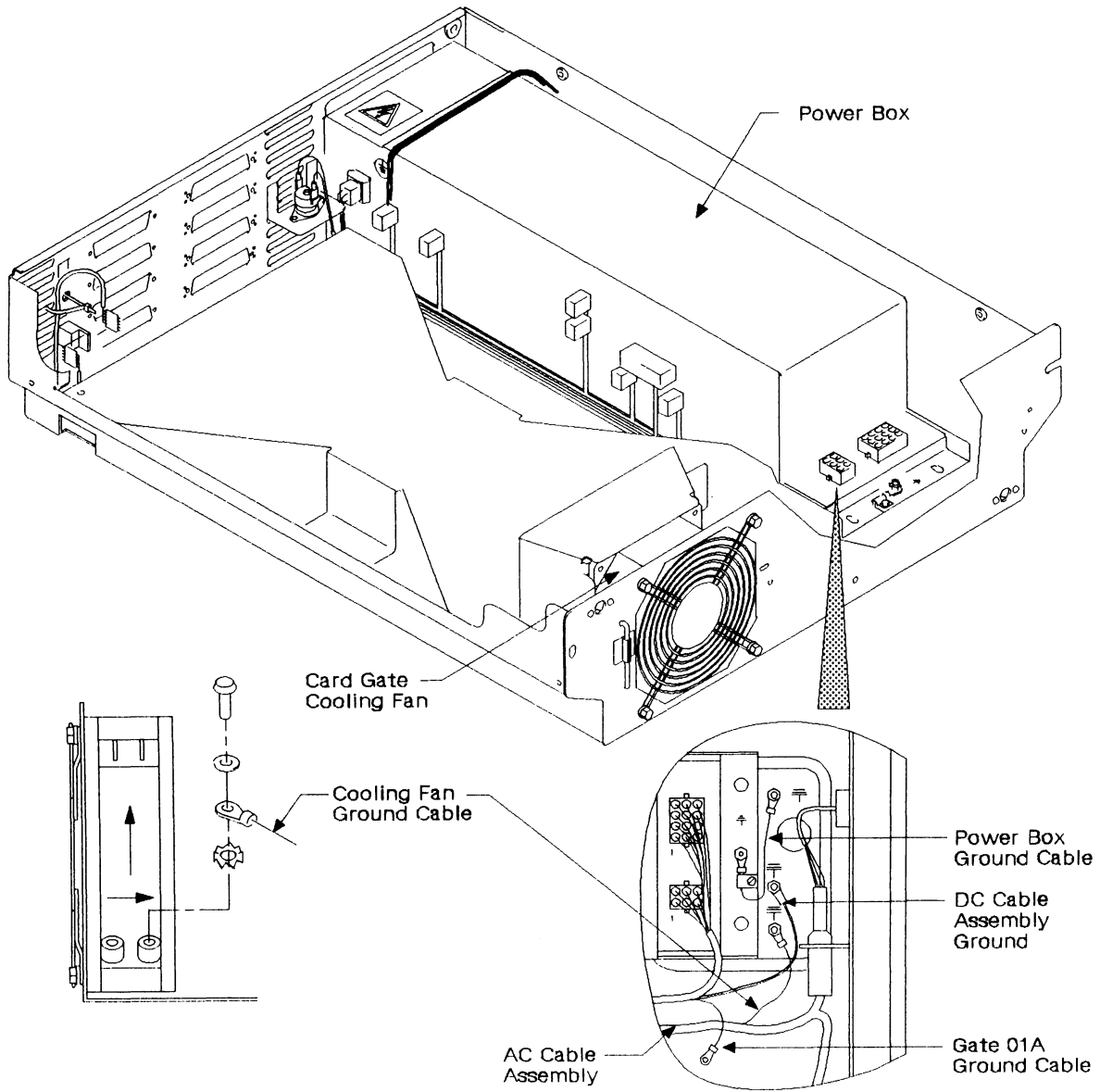


Figure 5-1. Grounding Locations – Model A

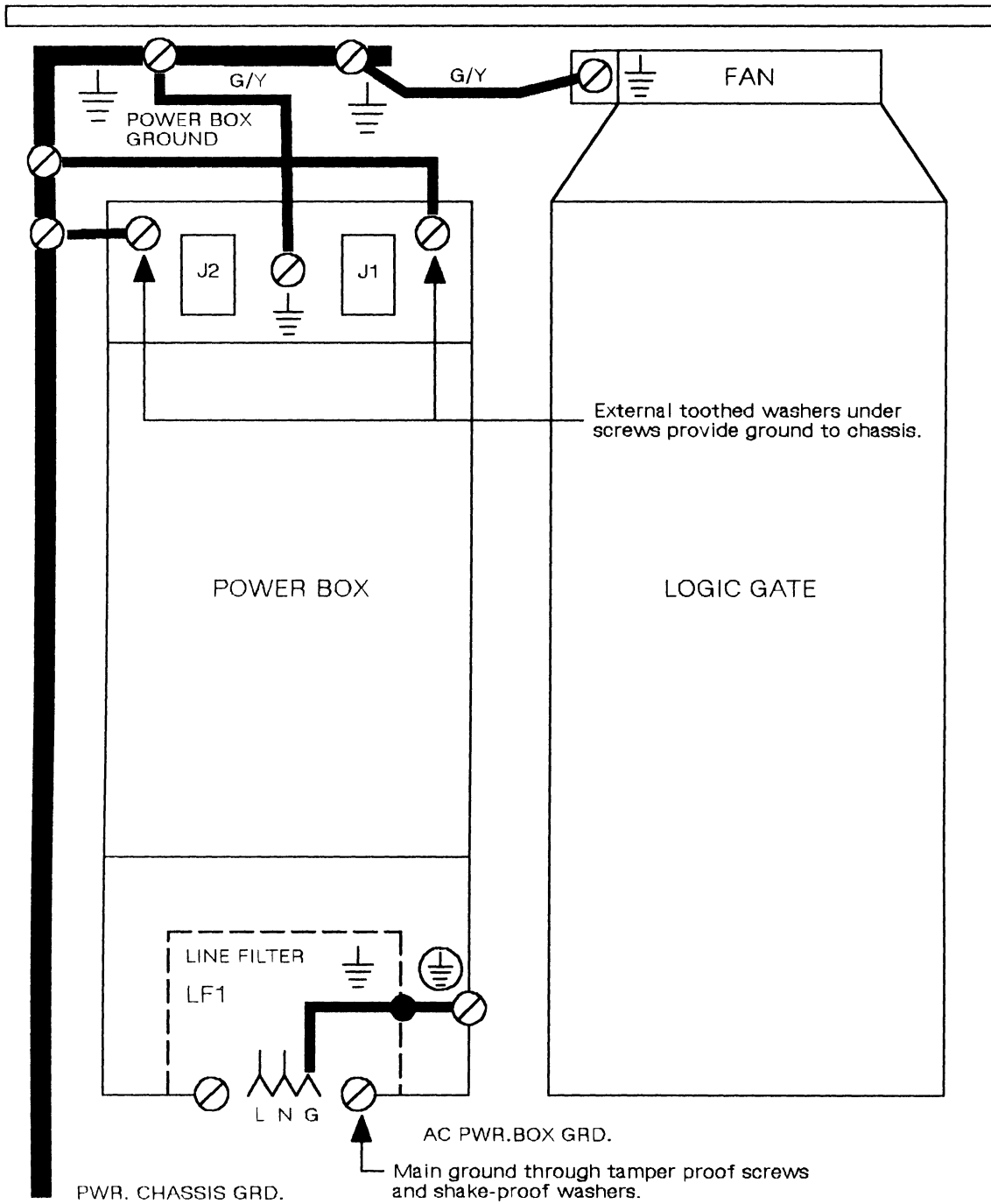


Figure 5-2. Grounding Diagram - Model A



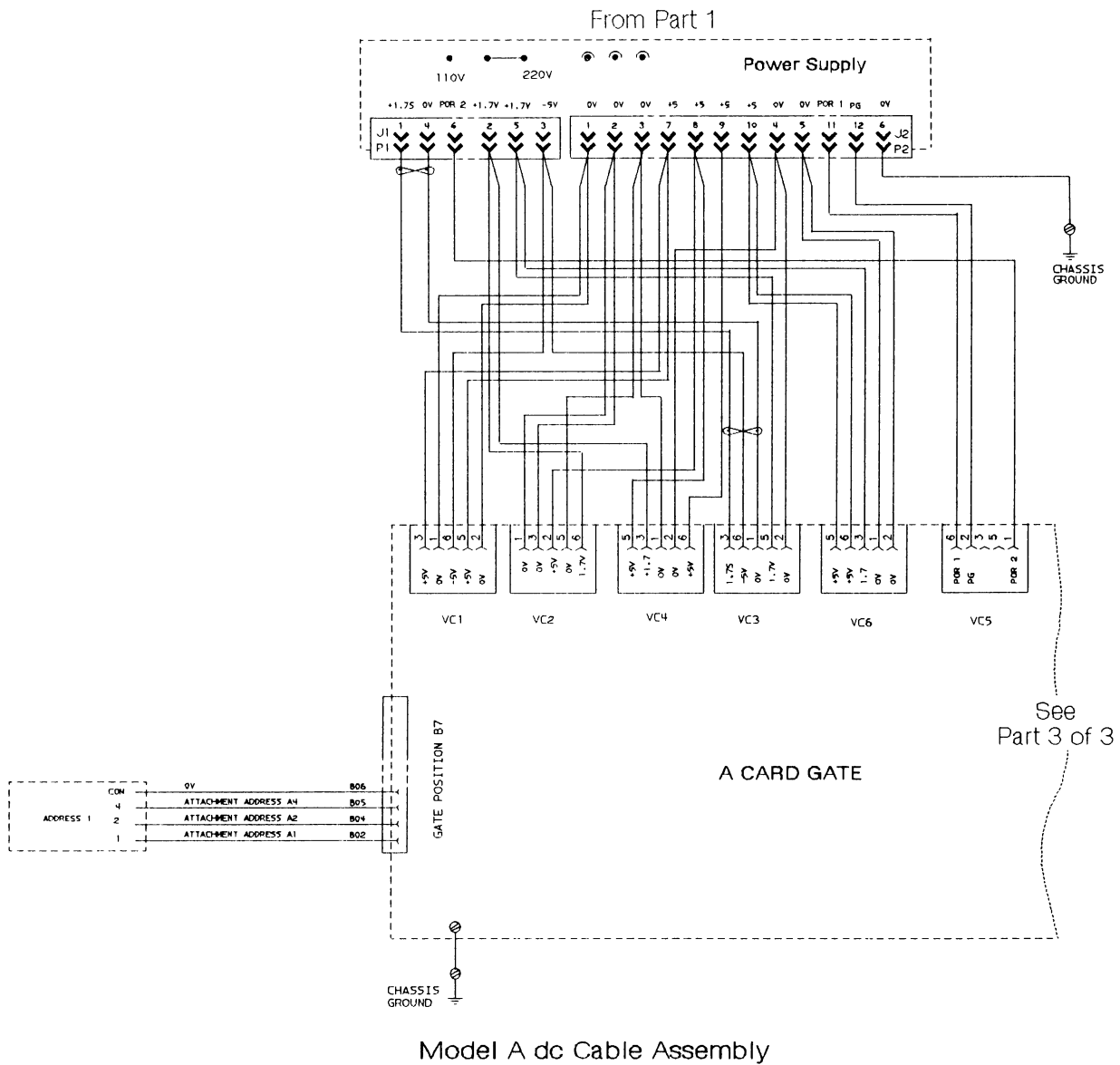
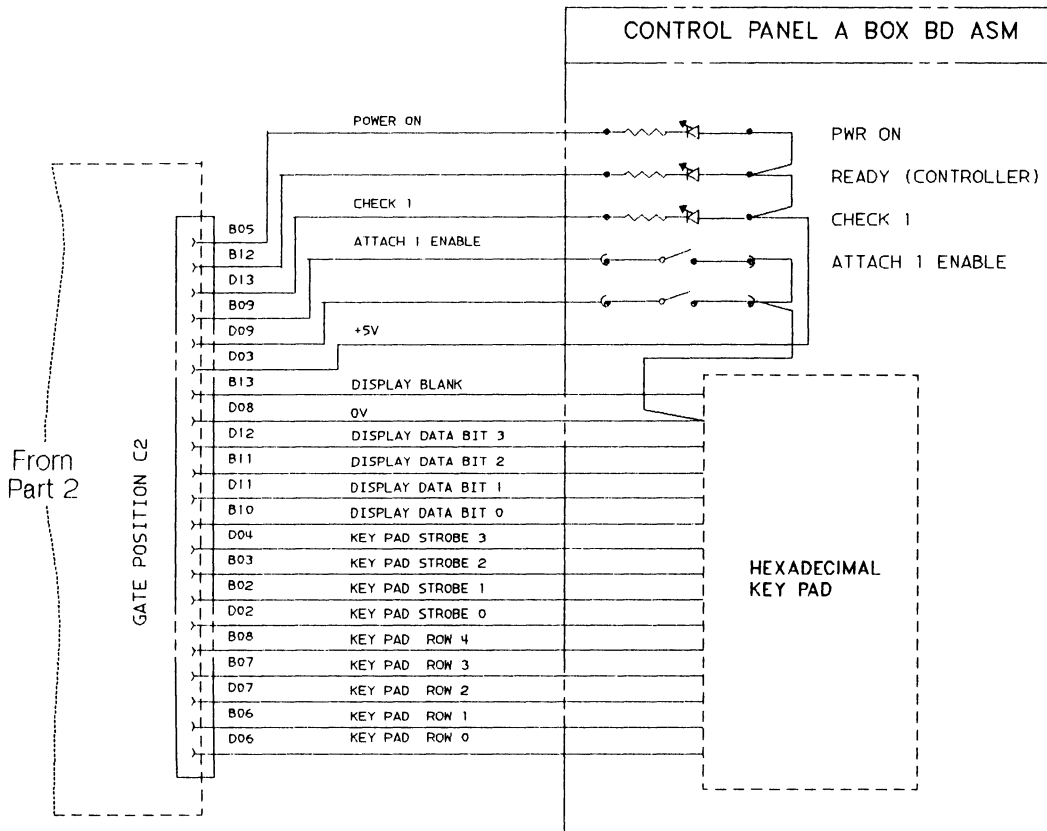


Figure 5-4. Wiring Diagram – Model A (Part 2 of 3)



Model A Signal Cable from 01A-A1C2 to Control Panel

Figure 5-5. Wiring Diagram – Model A (Part 3 of 3)

## Chapter 6. Model A: Locations

This chapter shows the location of the field-replaceable units of the Model A. The FRUs are listed in Figures 6-1 through 6-3.

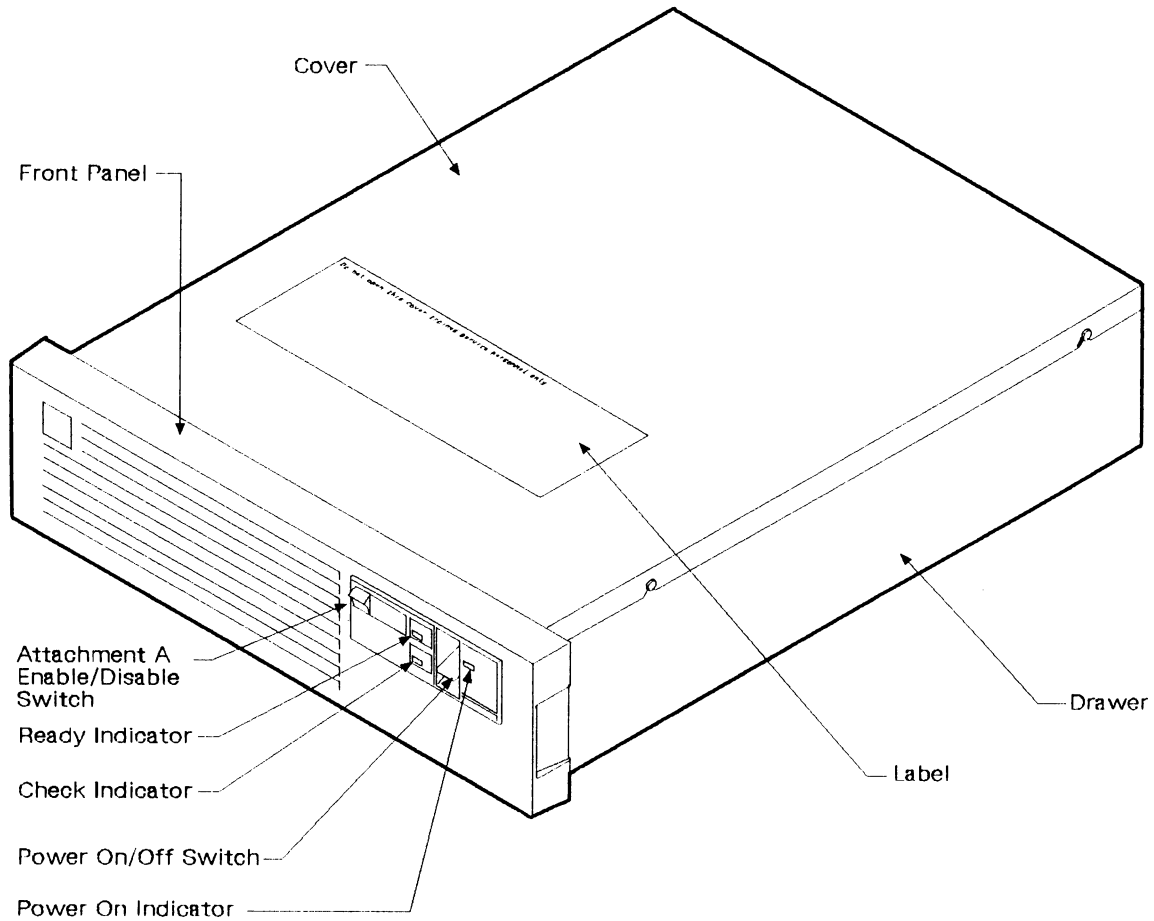


Figure 6-1. Model A Drawer

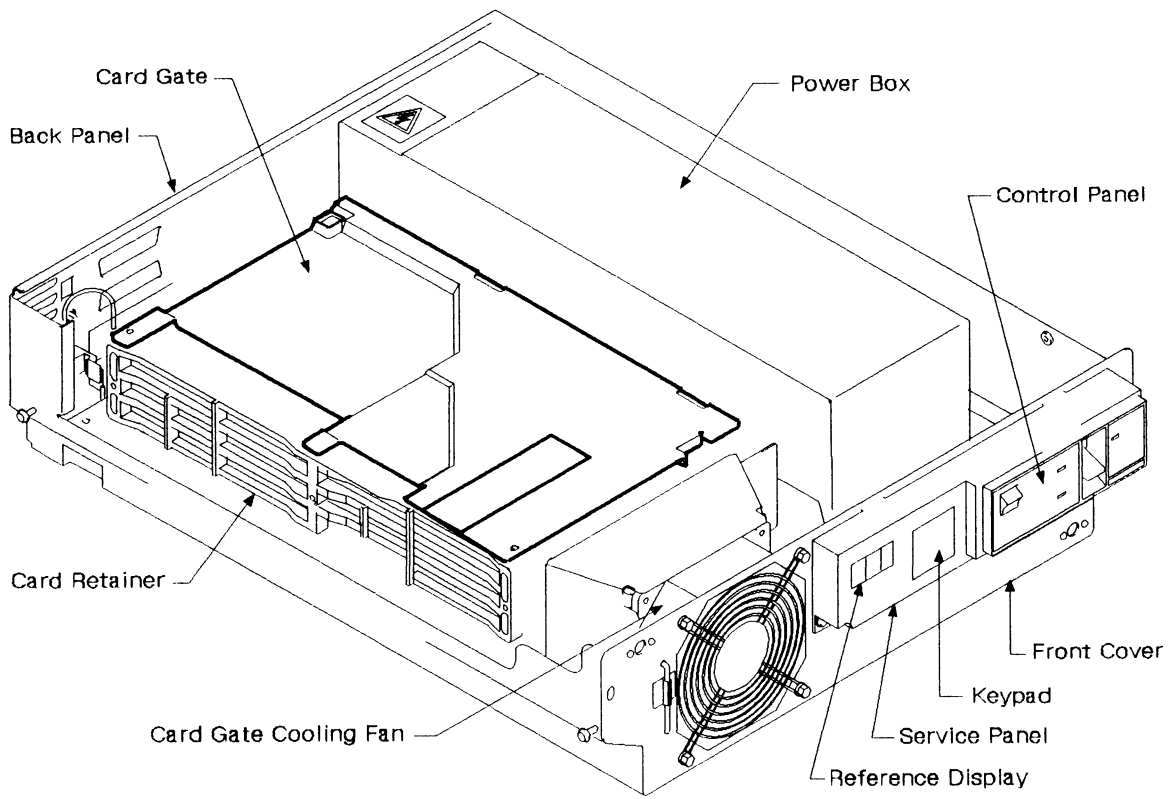


Figure 6-2. Model A Drawer (Front Panel and Top Cover Removed)

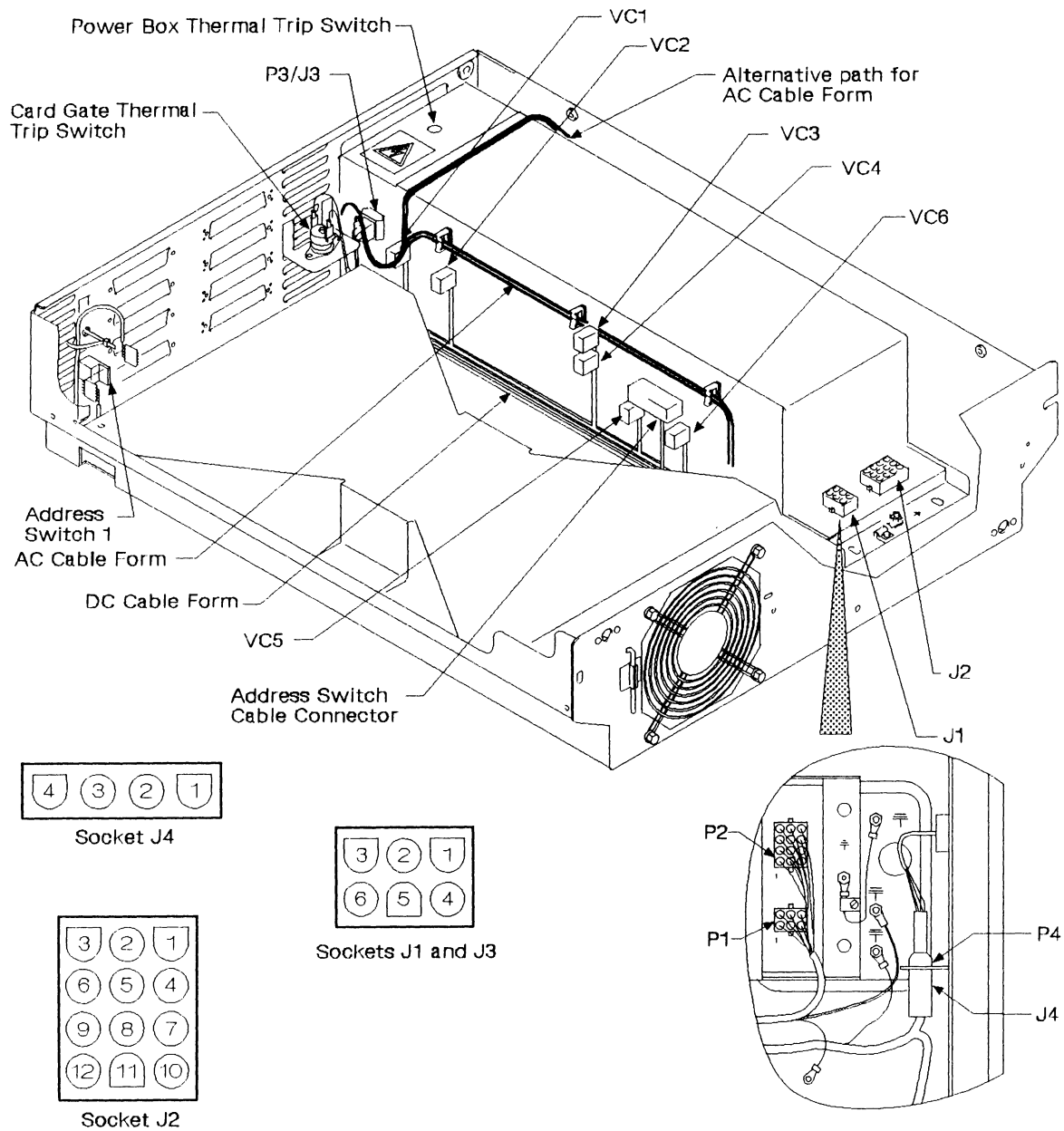
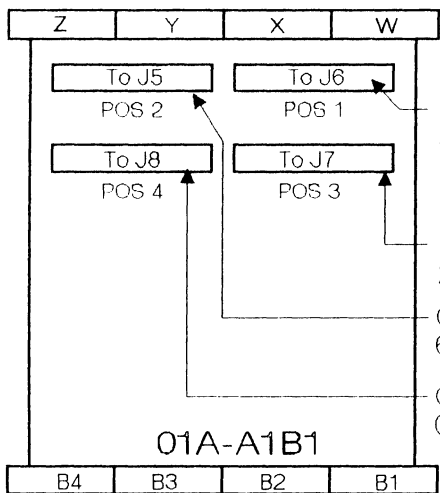
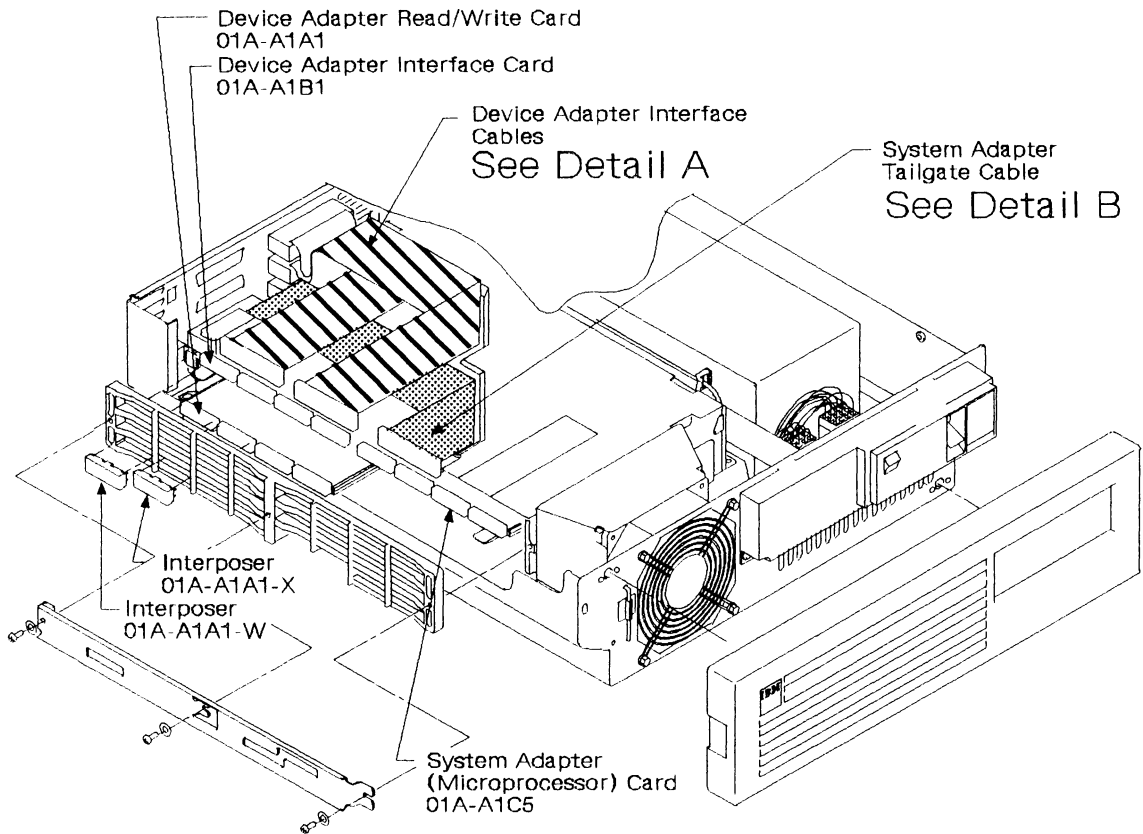


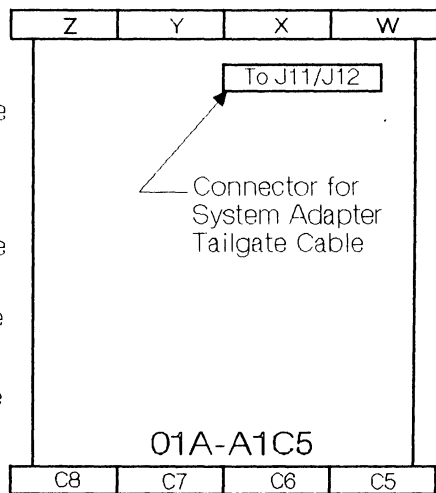
Figure 6-3. Model A Power Cables and Connectors





Detail A

- Connector for Device 4-5 Interface Cable
- Connector for Device 2-3 Interface Cable
- Connector for Device 6-7 Interface Cable
- Connector for Device 0-1 Interface Cable



Detail B

- Connector for System Adapter Tailgate Cable

Figure 6-4. Model A Logic Cards and Cables

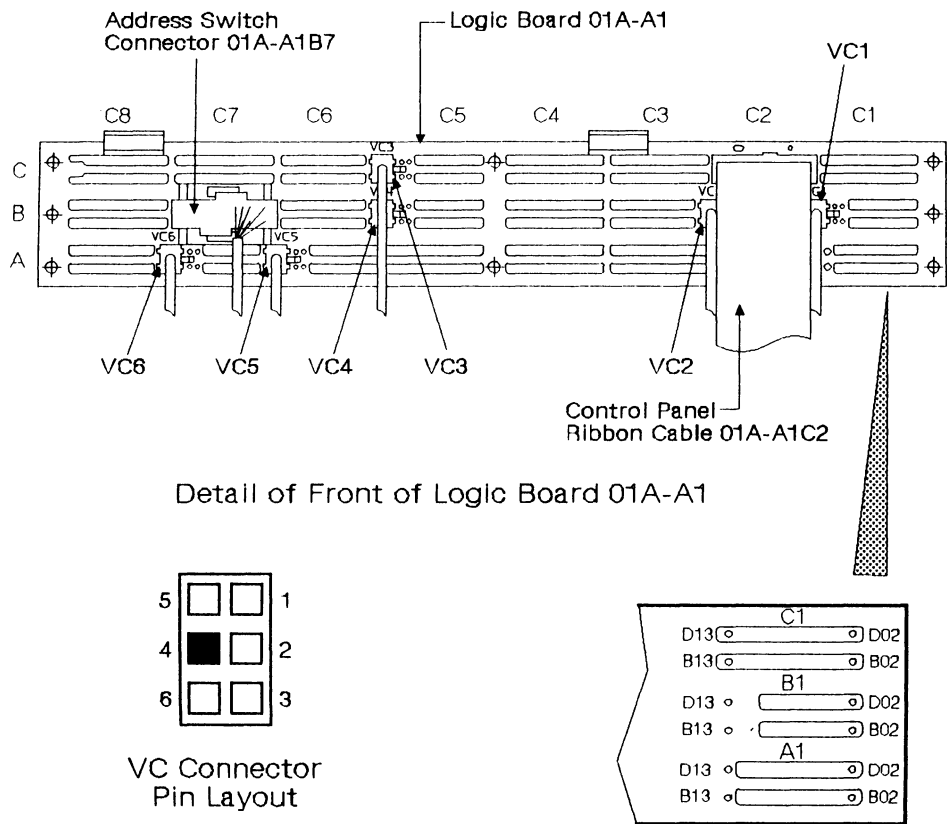


Figure 6-5. Model A Logic Board and Connectors

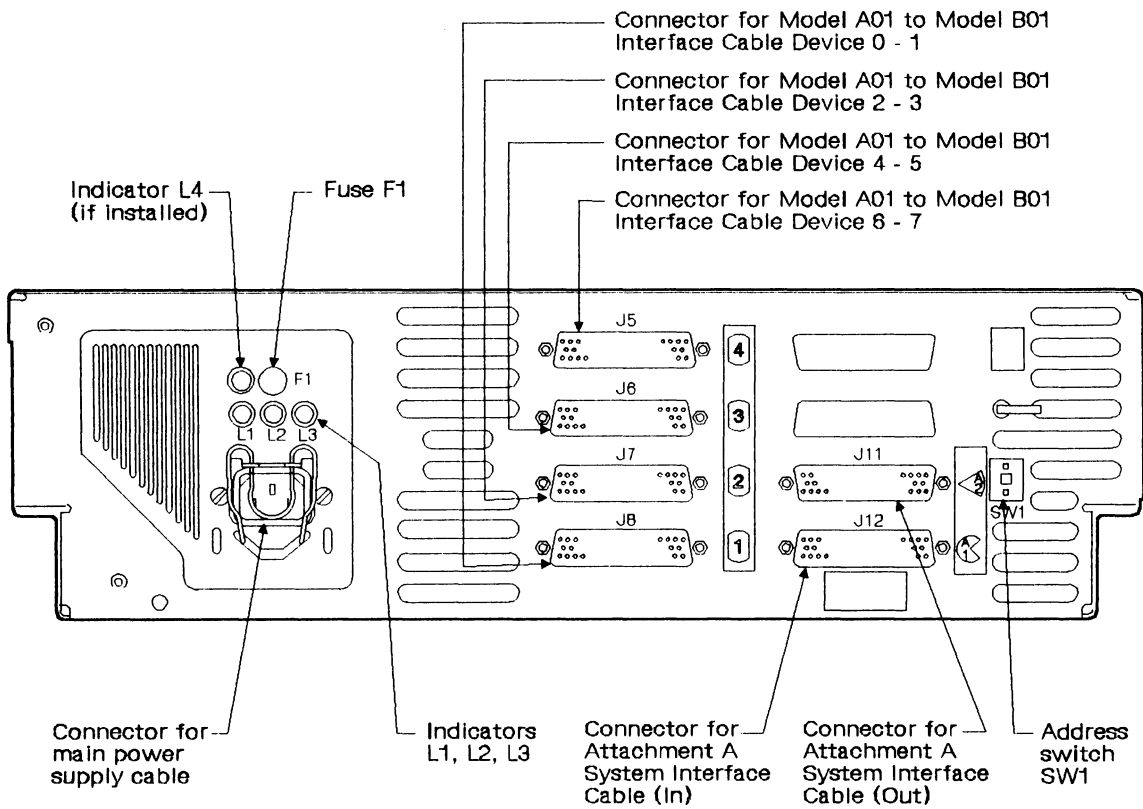


Figure 6-6. Model A Back Panel Connectors and Indicators

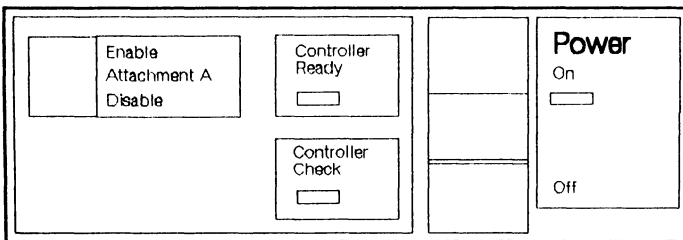


Figure 6-7. Model A Front Panel Switches and Indicators

## Chapter 7. Model B: FRUs

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In this chapter, the field-replaceable units (FRUs) for the Model B are grouped into sections by their functional machine areas.

The sections are:

- Powering off and on
- Panels and covers
- Power and motor FRUs
- Logic cards and board
- Disk enclosure
- Miscellaneous FRUs
- Internal and external cables.

After installing a new FRU, or reinstalling an old one, go to “Cleanup and Repair Verification” on page 8-121.

**Warning:**

1. FRUs should not be connected to primary power after removal.
2. When handling electrostatic discharge (ESD) sensitive FRUs, use the field ESD kit (IBM part 6428316) in accordance with CEM 270 (305).

---

## Removing and Installing a Drawer

Some of the repair actions described in this chapter may require you to remove a drawer. Removal and installation instructions for the drawer are contained in *Setting Up Your IBM 9335, GA33- 3144*.

---

## Powering Off and On the Model B

### Powering Off

**Warning:** Do not power off a disk storage unit from the circuit breaker at the back of the unit if the Power switch is On. If this is done, the disk storage unit does not perform a sequenced power-off.

---

Power off the disk storage device.

#### DANGER

**Switch power off and remove the mainline power cable before starting servicing procedures.**

Ensure that the logical devices in the drawer to be serviced are offline from the using system.

Set the device 0 and device 1 switches **1** on the front of the drawer to disable.

Set the Power switch **2** on the front panel of the drawer to Delayed Off.

Wait 40 seconds for the motor to stop. The reference display on the control panel should now show 0.

Set circuit breaker CB1 **4** on the ac power box to off.

Press in both sides of the spring retainer on the mainline power cable connector **3** and release the cable from its clip. Pull the power cable from its socket.

**Note:** During failure conditions the motor may not stop after setting the Power switch **2** to Delayed Off. In this case, power to the motor is only removed when CB1 is switched off, when the motor will gradually come to a stop after approximately 2.5 minutes.

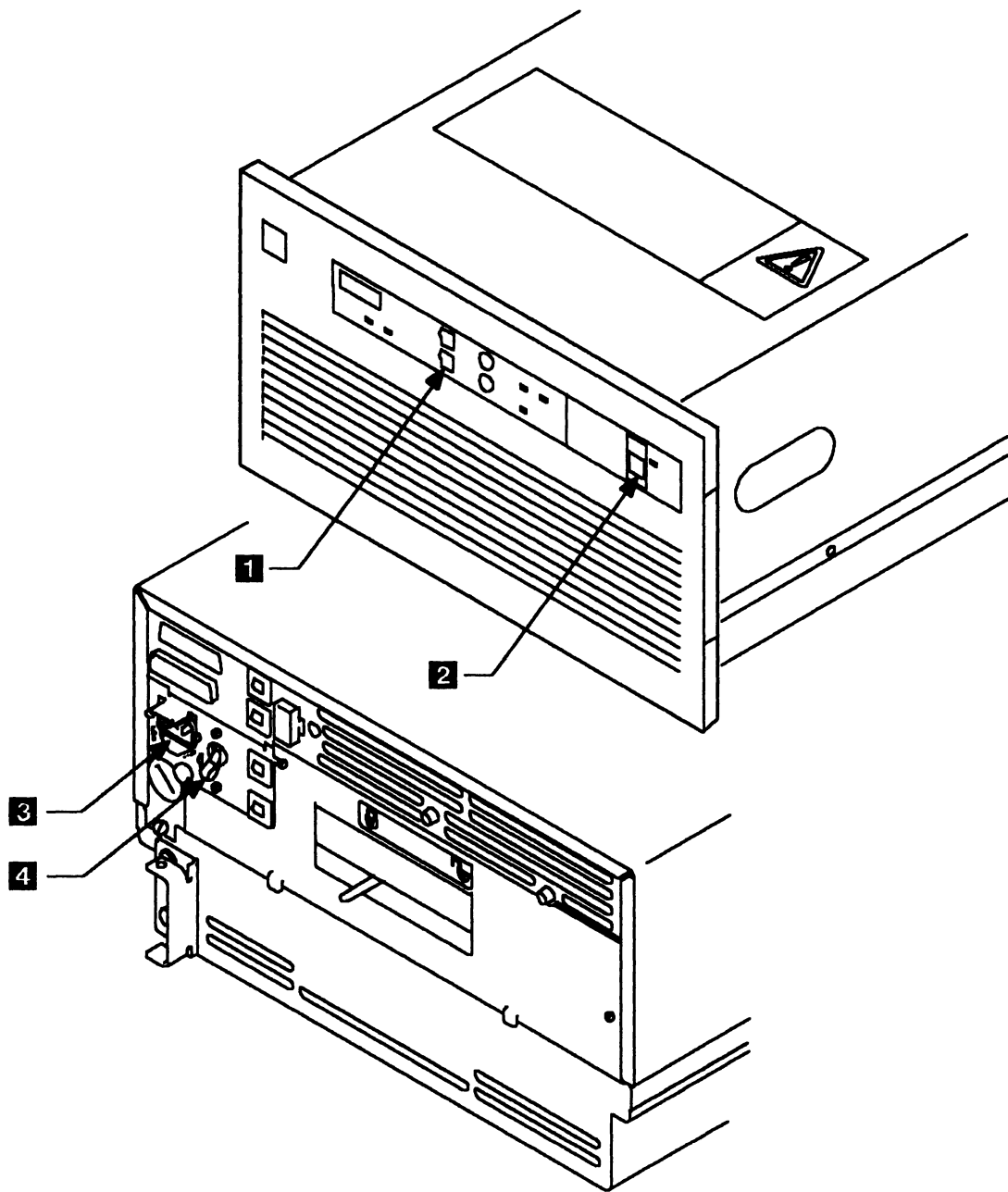


Figure 7-1. Powering Off



## Powering On

**Warning:** Do not power on a Model B from the circuit breaker CB1 (at the back of the unit) if the power switch is On. If this is done, the motor check light comes on and stays on, and the motor does not start. On units fitted with an auto-restart power control card (Part Number 75X9312 or later) no check condition occurs and the motor starts as normal.

If the auto-restart power control card is installed and a power-line disturbance causes the Model B to power off, when the main power supply is restored the Model B powers up and becomes ready without operator intervention.

The auto-restart function is fully operational only if the corresponding change has been installed in the primary control compartment of the rack containing the Model B.

### CAUTION:

Because the auto-restart power control card operates in conjunction with the rack sequencer, a delay of up to 30 seconds can occur before the rack allows the Model B to start.

During the 30-second delay the reference display remains at 0.

After the 30-second delay the motor starts and the devices become “ready” in two minutes.

---

### To power on.

Check that the voltage selector switch on the ac power box is set to the correct supply voltage.

Connect the mainline power cable to its socket **3** at the back of the drawer and put the retainer clip back in position.

Set circuit breaker 1 **4** on the connector panel at the back of the drawer to on.

Ensure that the spindle lock is set to the unlocked position.

Set the Power switch **2** to the **On** position.

Set the Device 0 and 1 switches **1** to Enable.

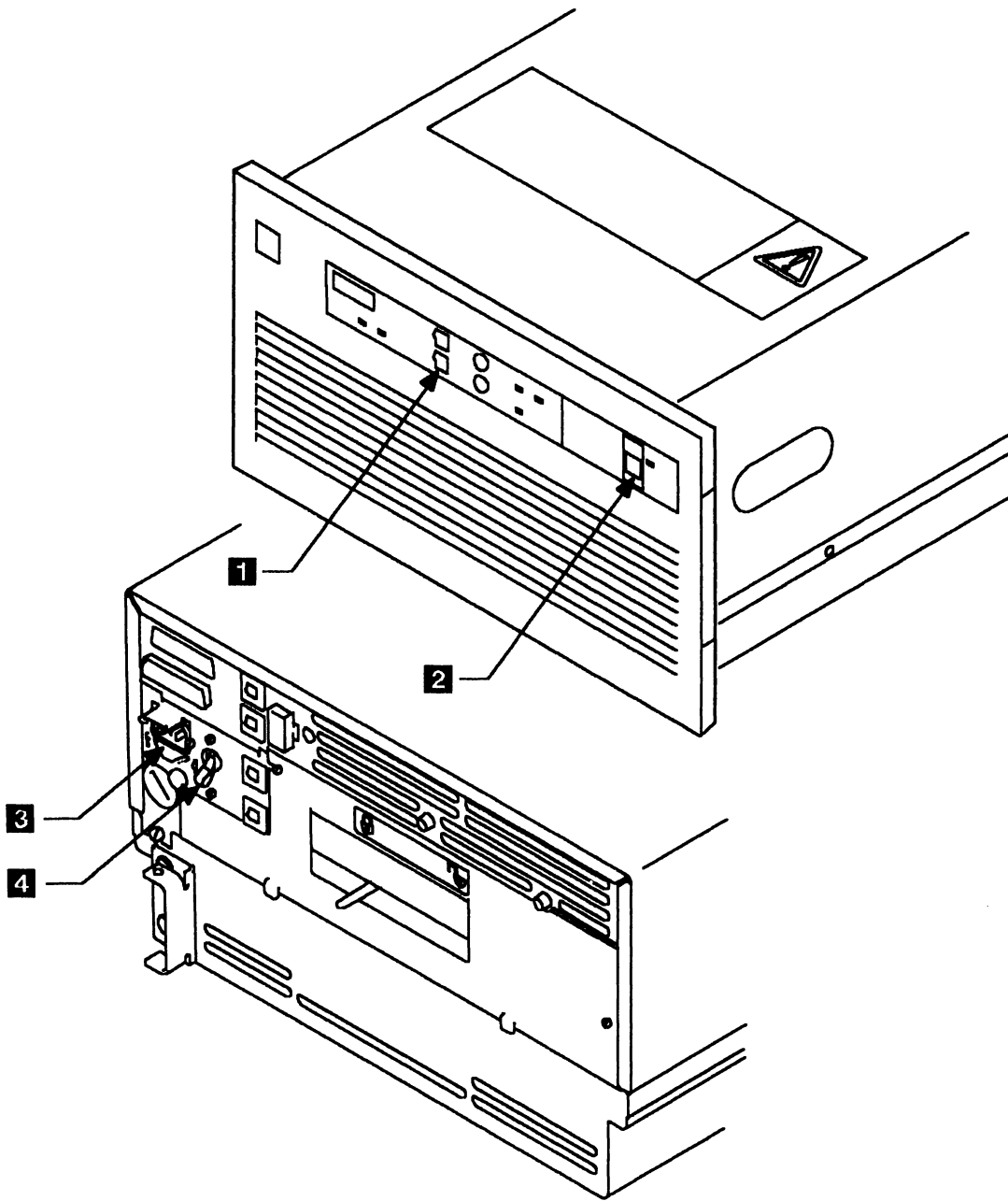


Figure 7-2. Powering On

---

## Panels and Covers

### Removing the Front Panel

---

**Remove the front panel.**

To remove the front panel **1**, hold it by the two recesses **2** and pull it away from the front cover.

### Installing the Front Panel

---

**Install the front panel.**

To install the front panel, align the studs on the front panel **1** with spring clips **3** in the drawer and press on both ends of the panel until it clicks into position.

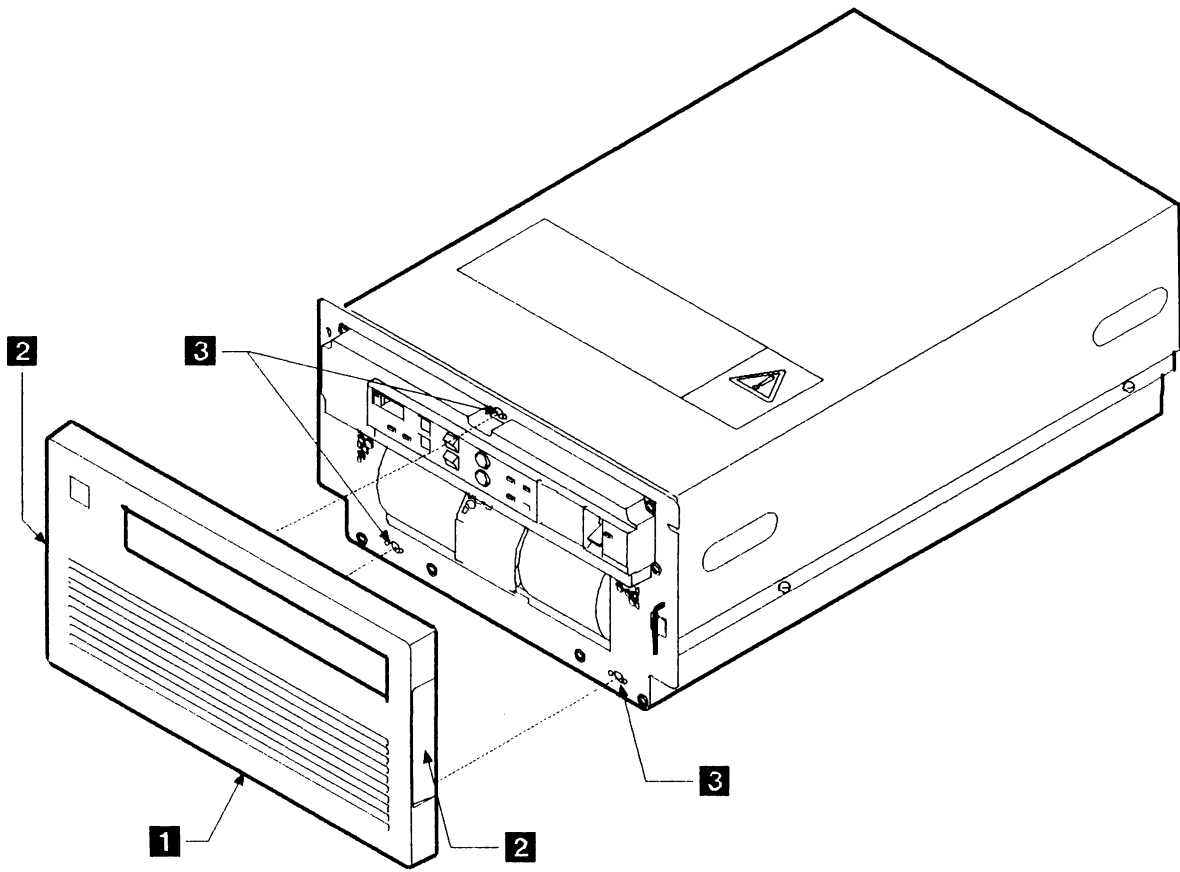


Figure 7-3. Front Panel

## Removing the Top Cover

### DANGER

Switch power off and remove the mainline power cable before removing or installing a FRU.

### CAUTION:

Do not pull more than one drawer out of the rack at any one time.

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the front panel.

See page 7-8.

---

**3**

Pull the drawer out.

Check that the shipping clamp is not holding the cable support carrier to the rack. See page 7-96, and Figure 7-49 on page 7-97.

Turn the thumb levers **1** on each of the slides inward toward the center of the drawer. Pull the drawer out of the rack until it locks in its extended position.

Loosen the four screws **2** that hold the top cover **3** to the frame and pull the top cover up and away from the drawer.

## Installing the Top Cover

---

Installing the top cover.

Place the top cover **3** on the frame of the drawer, sliding the left-hand rear side into the panel at the back. Check that no wires are trapped under the cover.

Tighten the four screws **2** that hold the top cover to the frame of the drawer.

Turn the thumb levers on each of the slides inward and push the drawer fully in until it locks in the rack.

Install the front panel on the front cover.

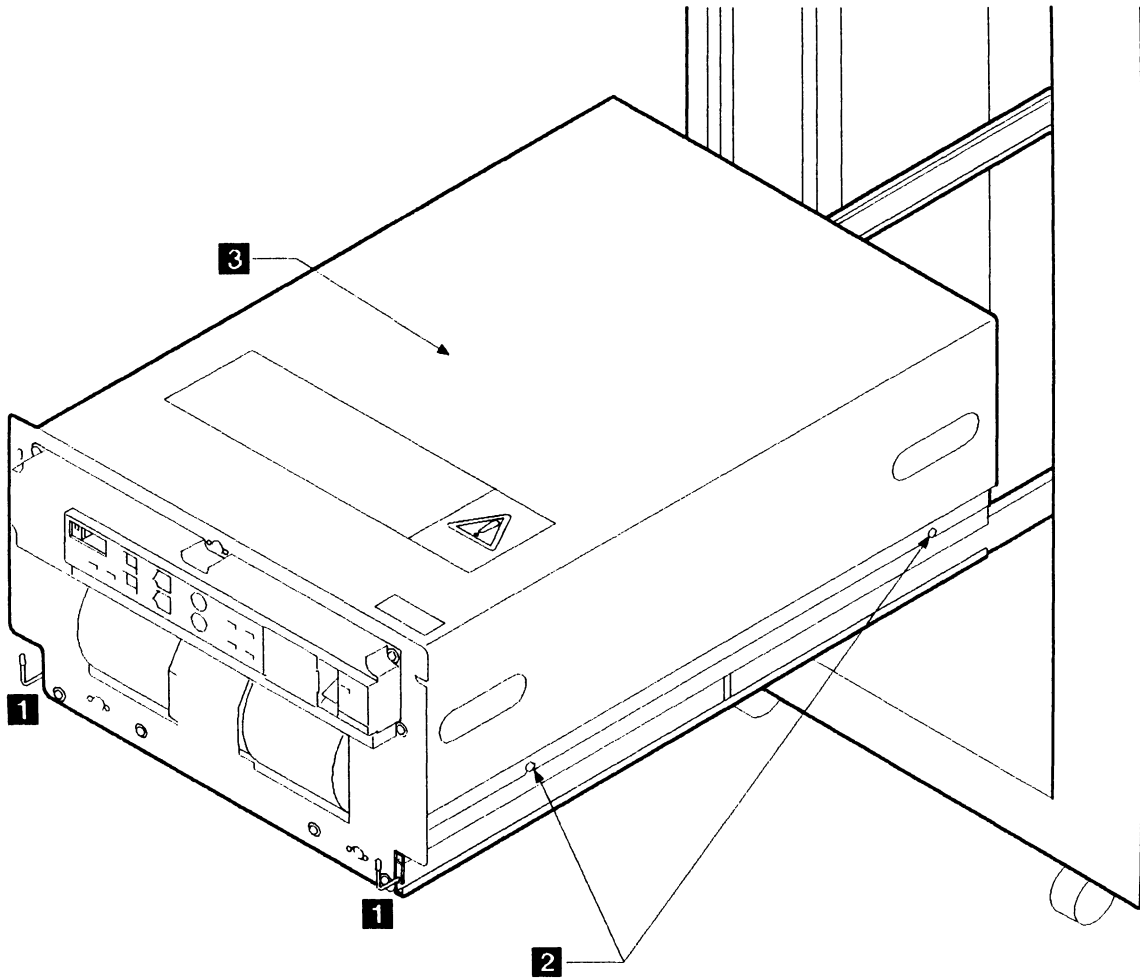


Figure 7-4. Top Cover

## Removing the Front Cover

---

### 1

Remove power from the drawer.

See page 7-4.

---

### 2

Remove the front panel and the top cover.

See pages 7-8 and 7-10.

---

### 3

Remove the front cover.

Disconnect the control panel ribbon cable **1** at position 01A-A1C5 from the logic board and remove the cable ties.

Remove the four screws **4** that hold the front cover **3** to the frame. Use your hand to support the weight of the front cover when the screws are removed. The cover will only fall a short distance. The two wire connectors on the back of the power switch may pull off. This is not a problem.

Lift the front outward and hang it on the two parking clips **8** on the sides of the fan drawer **9**.

Disconnect the two wires **10** at the Power switch **5** on the control panel. They can be disconnected in any order.

Detach the plastic molding from the top of the fan.

Remove plug P30 **2** from the back of the unit if as shown in Figure 7-5, or else from the side of the unit.

Disconnect the cooling fan cable P22 **7** from the fan.

Slacken the nut and disconnect the ground wire **6** from the fan housing. Note that this ground wire has a hooked spade terminal, and that to disconnect the terminal it is necessary only to slacken the nut until the hook can be loosened.

Lift the front cover and fan from the machine.

## Installing the Front Cover

Install the front cover.

Install the front cover in the reverse order of removal. Each wire to the back of the power switch may be installed onto either terminal of the switch.

**Warning:** Ensure that the safety ground strap and the shake-proof washers are correctly reinstalled.

Restore power to the drawer (see page 7-6).

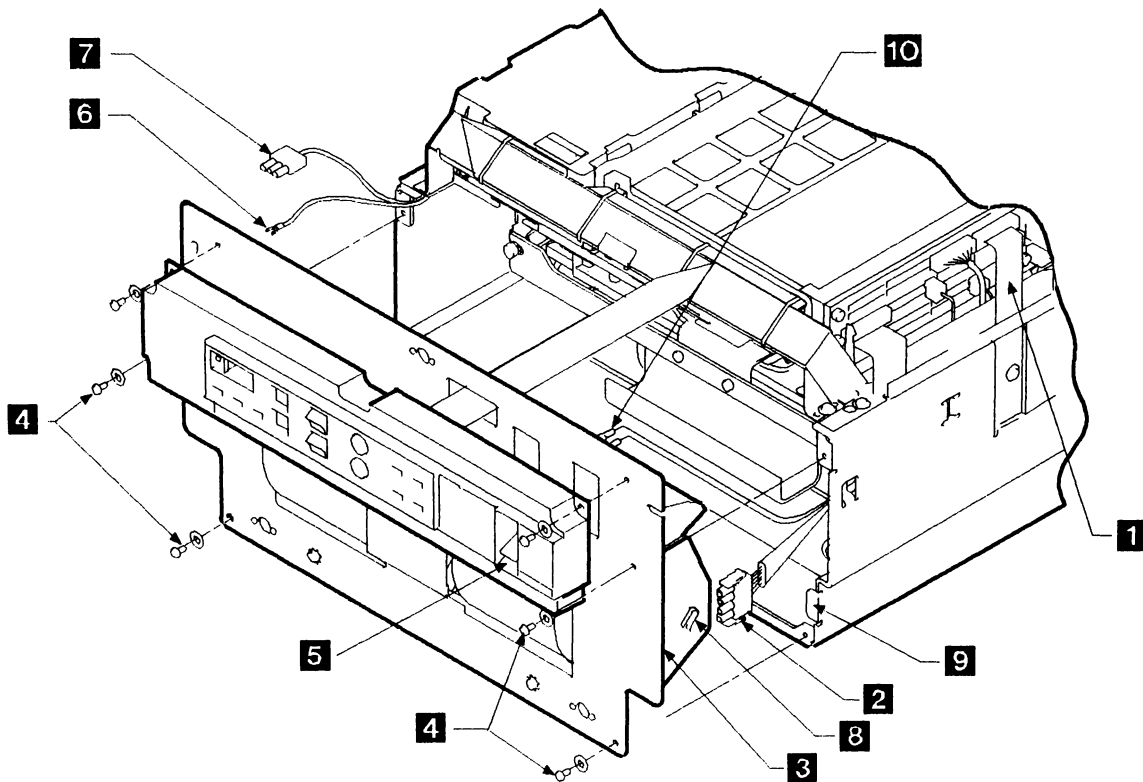


Figure 7-5. Front Cover



## Removing the Air Vent

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the air vent.

Remove the two screws **1** that hold the air vent **2** to the frame at the rear of the drawer.

Remove the air vent from the drawer.

---

## Installing the Air Vent

---

**1**

Install the air vent.

Carefully feed the air vent **2** over the spindle lock lever **3**.

Fasten the air vent to the frame with the two screws **1**.

Check that the spindle lock is released, so that the disk can rotate. (The spindle lock is released when its handle, in the slot on the air vent, is to the right when looking from the rear. To move the spindle lock from left to right, push it slightly downward first.)

---

**2**

Restore power to the drawer.

See page 7-6.

---

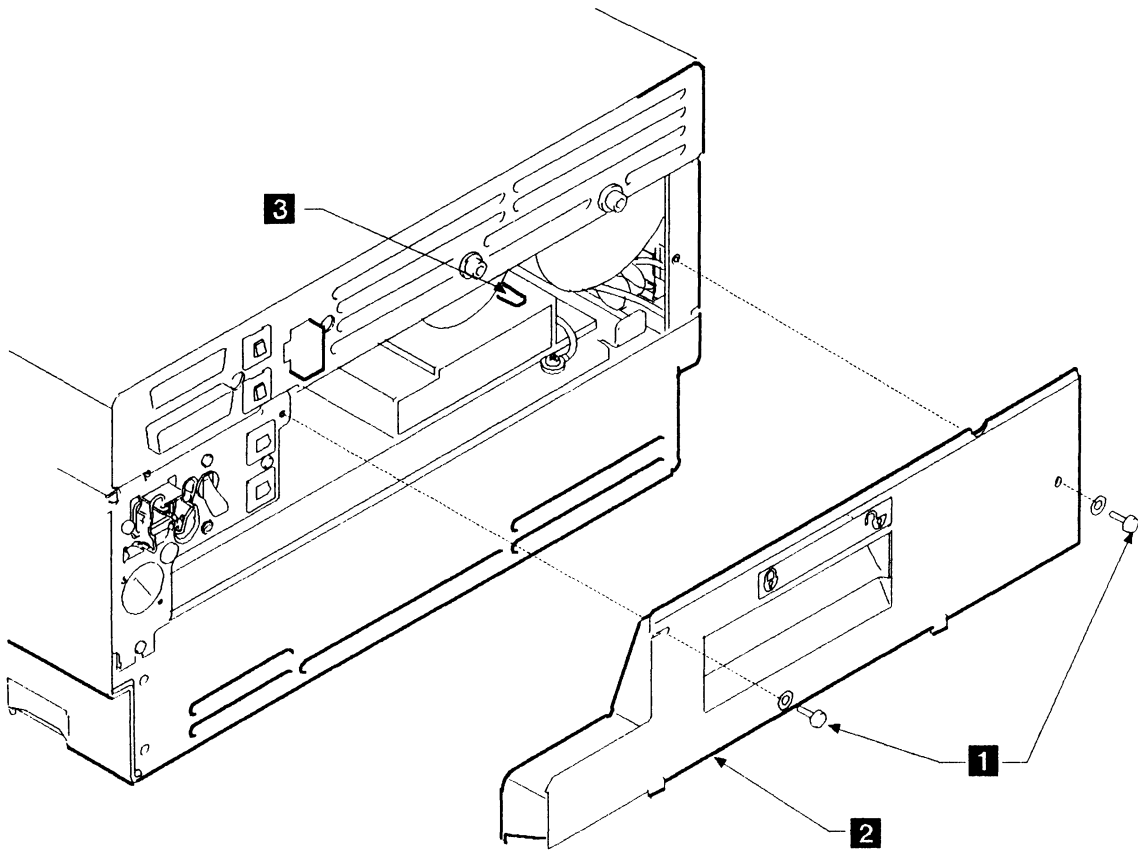


Figure 7-6. Air Vent

---

## Power and Motor FRUs

### Removing the AC Power Box

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the air vent.

See page 7-14.

---

**3**

Remove the top cover.

See page 7-10.

---

**4**

Remove the ac power box.

Slacken the top screws **1**, and remove the bottom screw **5**.  
Pull the ac power box **2** from the back panel **3**.

Feed the ground wire through the power tray.

Disconnect plug P28 (at the back of the ac power box) and  
remove the ac power box.

Note the setting of the voltage selector switch for use when fitting  
a replacement ac power box.

Disconnect the ground wire **4** from the power tray.

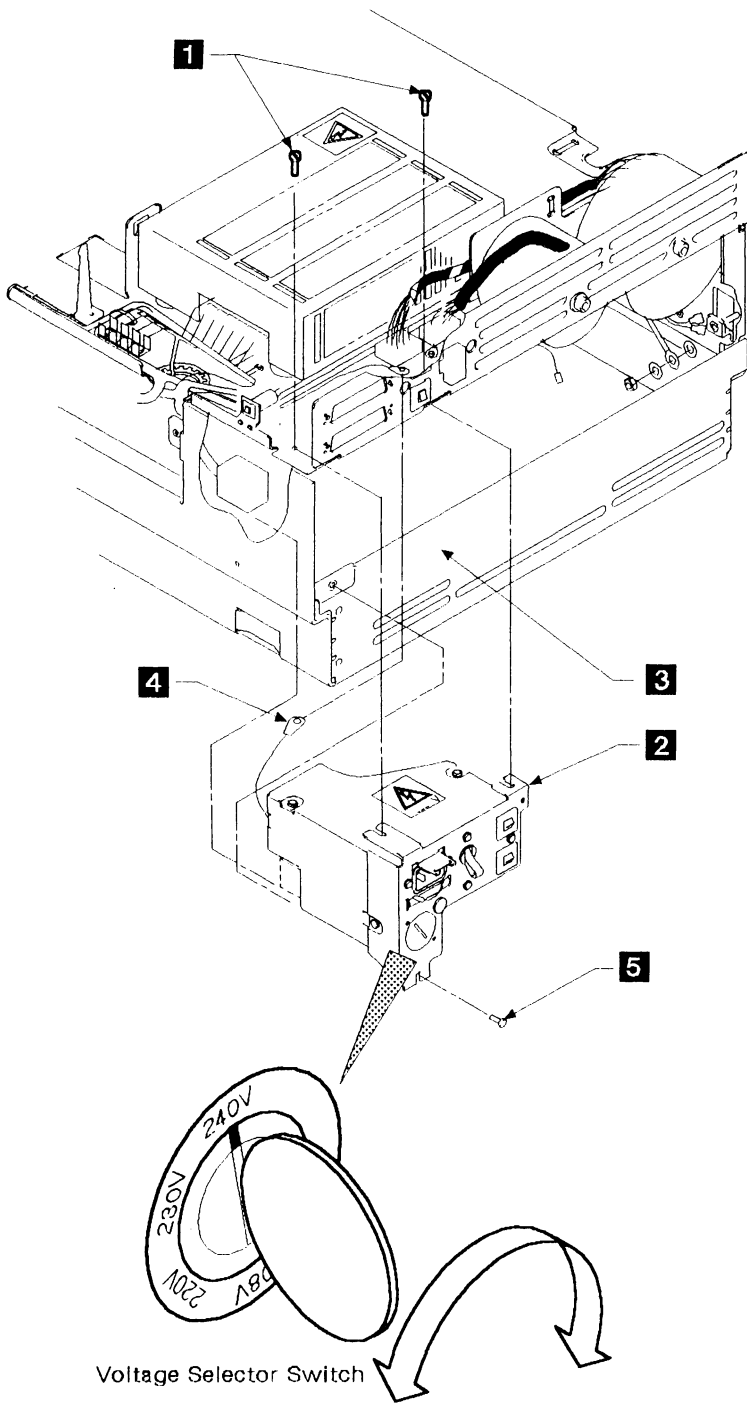


Figure 7-7. AC Power Box

## Installing the AC Power Box

---

**Install the ac power box.**

Install the ac power box in the reverse order of removal.

**Warning:** Ensure that the safety ground strap and the washer are correctly reinstalled.

Check the setting of the voltage selector switch. When installing a new ac power box, ensure that the selector switch has the same setting as the one that has been removed.

Restore power to the drawer (see page 7-6).

<b>Voltage Switch Setting</b>	<b>Supply Voltage Range and Frequency</b>
240	208 through 259 – 50Hz or 60 Hz
230	202 through 249 – 50Hz
220	193 through 238 – 50Hz or 60 Hz
208	180 through 220 – 50Hz or 60 Hz
127	111 through 137 – 60Hz
120	104 through 127 – 60Hz
110	97 through 119 – 50Hz or 60 Hz
100	90 through 110 – 50Hz or 60 Hz

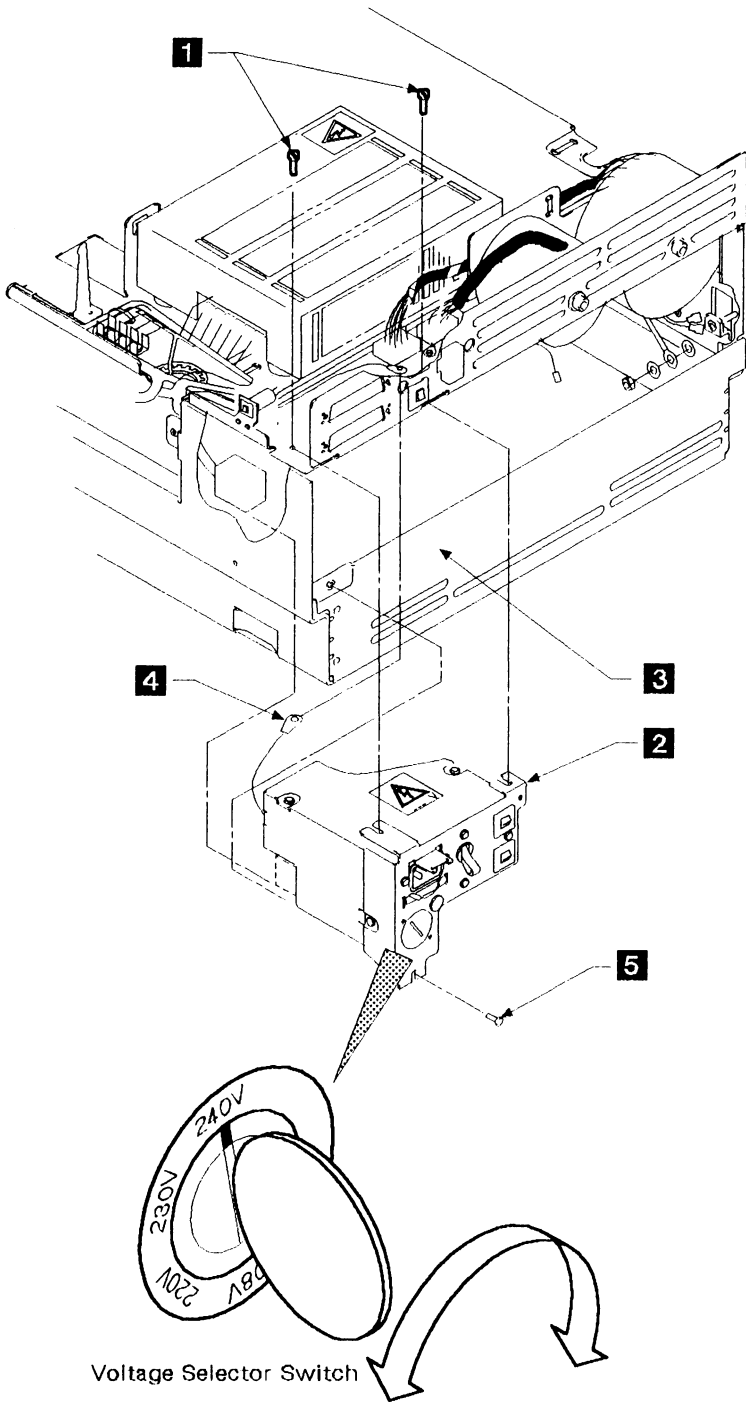


Figure 7-8. AC Power Box

## Removing the Power Supply Unit

---

**1**

Remove power from the drawer.

**DANGER**

**Hazardous voltages are present at the power supply unit.**

See page 7-4.

**2**

Remove the top cover.

See page 7-10.

**3**

Remove the power supply unit.

Remove the four screws **3** from the corners of the power supply unit and remove the cover.

Remove the cables from terminal blocks J1 **1** and J2 **5**. See Figure 8-9 on page 8-135 for the terminal wire connections (connector tags).

Remove the ground strap **6** if installed.

Remove the four screws **2** from the corner recesses of the power supply unit and lift the power supply unit **4** from the drawer.

## Installing the Power Supply Unit

---

Install the power supply unit.

The ground wire **6** is not required on power supply units IBM part 62X9790, but ensure that it is installed on power supply units IBM part 8232239.

Install the power supply in the reverse order of removal.

Ensure that the green and yellow ground wire **6** is correctly installed on IBM part 8232239, if installed.

Restore power to the drawer (see page 7-6).

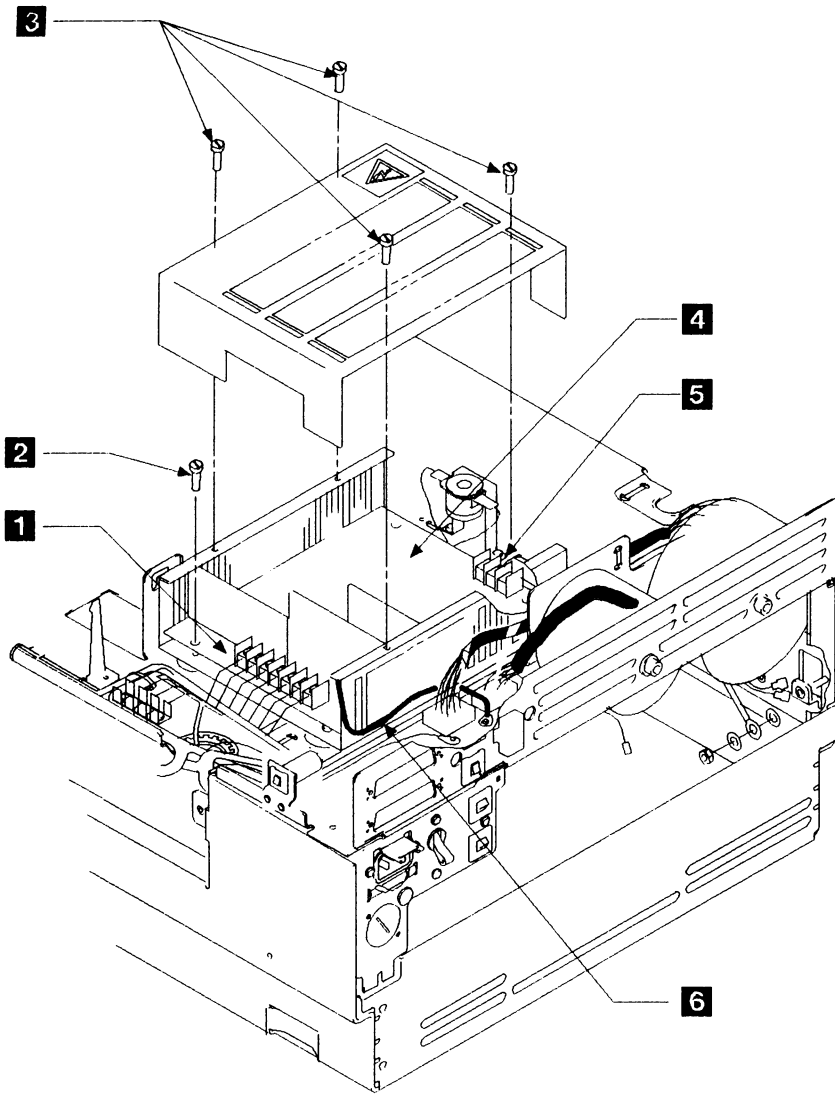


Figure 7-9. Power Supply Unit



## Removing Transformer T1

---

<b>1</b>	
Remove power from the drawer.	See page 7-4.
<b>2</b>	
Remove the top cover.	See page 7-10.
<b>3</b>	
Remove the air vent.	See page 7-14.
<b>4</b>	
Remove transformer T1.	Disconnect the cable from connector J10 <b>1</b> and remove the ground wire <b>6</b> from the frame of the drawer.  Remove bolt <b>4</b> and the insulating bush <b>3</b> and the washer from transformer T1 <b>2</b> .  Pull transformer T1 up and toward the front of the drawer to remove it.

## Installing Transformer T1

---

Install transformer T1.	Install transformer T1 in the reverse order of removal.  <b>Note:</b> Align the bolt <b>4</b> with the keyhole <b>5</b> in the frame.  <b>Ensure that the ground wire is reinstalled in the frame of the drawer.</b>  Restore power to the drawer (see page 7-6).
-------------------------	---

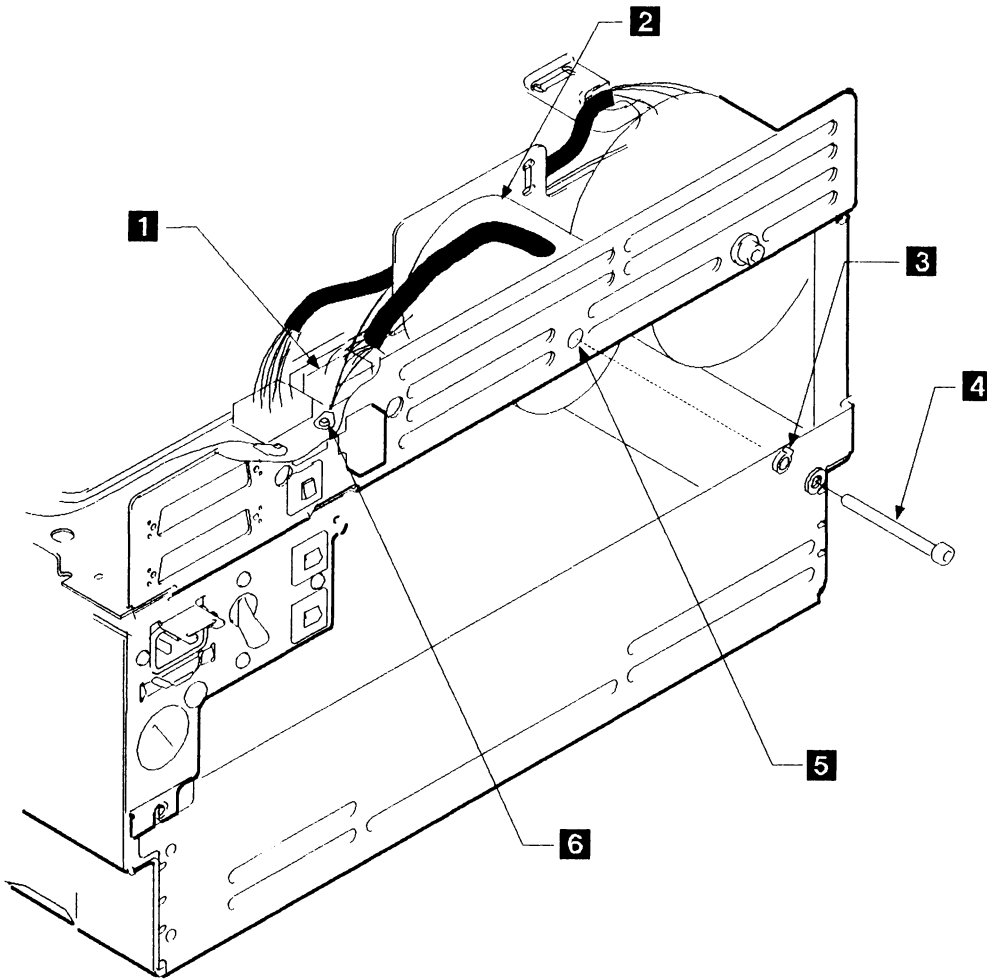


Figure 7-10. Transformer T1

## Removing Transformer T2

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the top cover.

See page 7-10.

---

**3**

Remove the air vent.

See page 7-14.

---

**4**

Remove transformer T2.

Unplug the cable from connector J11 **1** and remove the ground wire from the frame of the drawer.

Cut the cable tie **2**.

Remove bolt **5** and insulating bush **4** from transformer T2 **3**.

Remove transformer T2 by lifting it up and out toward the front of the drawer.

---

## Installing Transformer T2

---

Install transformer T2.

Install transformer T2 in the reverse order of removal and reinstall the cable tie.

**Note:** Align the bolt **5** with the keyhole **6** in the frame.

**Ensure that the ground wire is reinstalled in the frame of the drawer.**

Restore power to the drawer (see page 7-6).

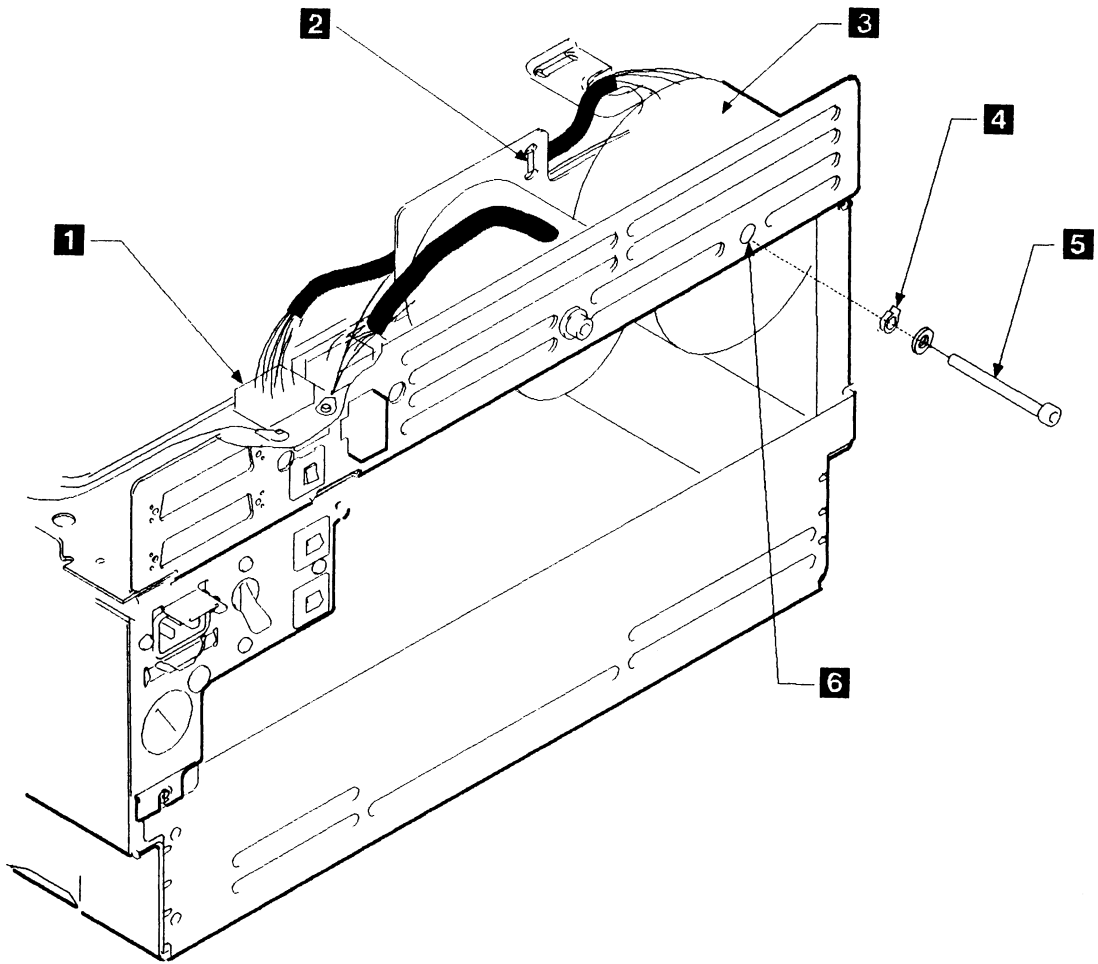


Figure 7-11. Transformer T2

## Removing the Motor Driver Assembly

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Remove the top cover.**

See page 7-10.

---

**3**

**Remove the air vent.**

See page 7-14.

---

**4**

**Remove the motor driver assembly.**

Unplug cable connectors J5 **6**, J6 **7**, and J9 **4** on the tray at the back of the drawer.

Disconnect the motor driver assembly logic cable **5** at logic board position 01A-A1A5 (01A-A1B5 if the Model B has a serial number before 57-B0000). Release the cable from its cable ties on the front frame.

Remove the two screws **1** that hold the motor driver assembly **2** to the frame. Cut the cable tie **8**.

Slide the motor driver assembly toward the edge of the drawer to release the tabs **3** on the cover from the slots in the frame.

Remove the motor driver assembly and its logic cable from the drawer.

## Installing the Motor Driver Assembly

---

**Install the motor driver assembly.**

Install the motor driver assembly in the reverse order of removal and reinstall the cable ties.

Restore power to the drawer (see page 7-6).

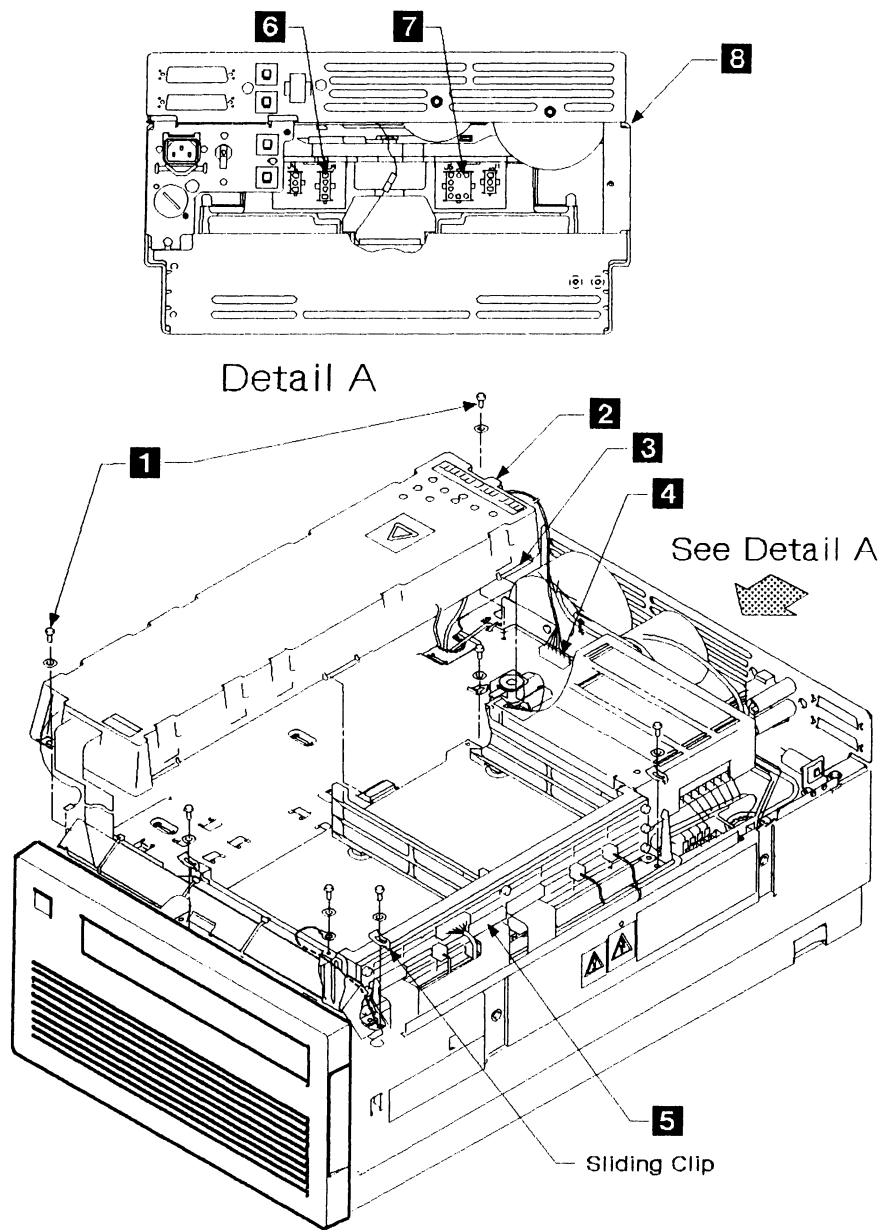


Figure 7-12. Motor Driver Assembly

## Removing the Power Regulator Card

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the top cover.

See page 7-10.

---

**3**

Remove the power regulator card.

**CAUTION:**

Take care when removing the connectors as they may be near hot components.

Remove the two screws **2** that hold the power regulator card **1** to the side of the drawer.

**DANGER**

Connector .J21 **4** must not be removed if you are servicing with the power on.

Disconnect the cable connectors **3** and **4** from the connectors on the power regulator card and take the card out of the drawer.

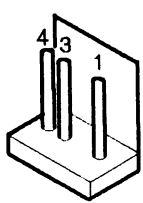
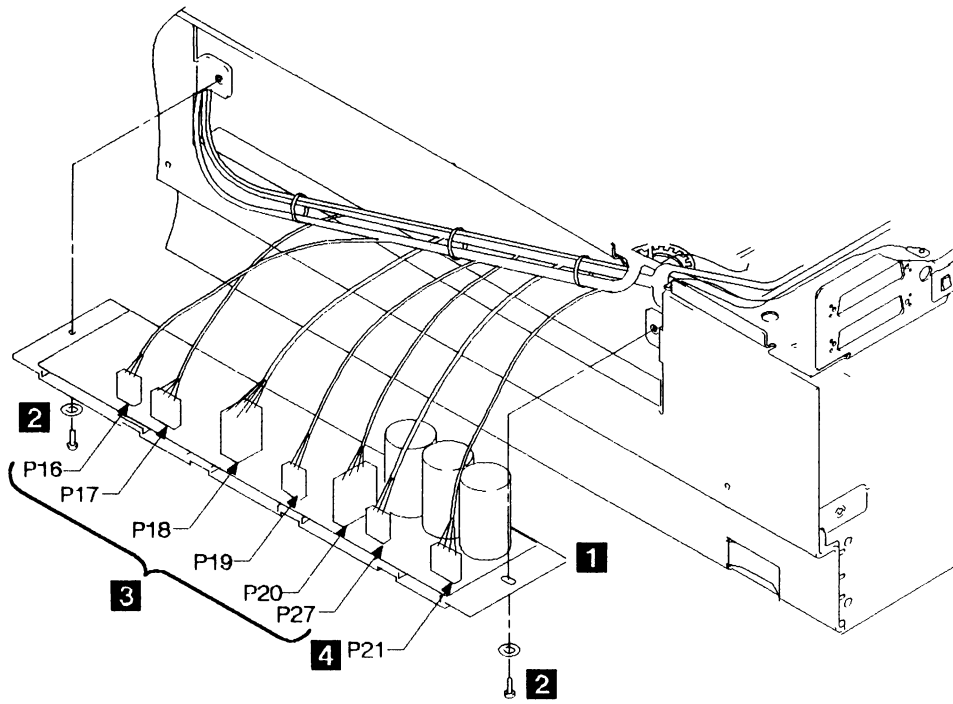
## Installing the Power Regulator Card

---

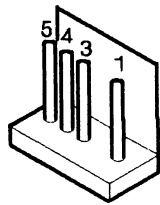
Install the power regulator card.

Install the power regulator card in the reverse order of removal.

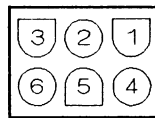
Restore power to the drawer (see page 7-6).



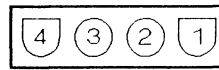
J16, J19 and J27



J21 and J17



Socket J18



Socket J20

Figure 7-13. Power Regulator Card



## Removing the Fan

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the top cover.

See page 7-10.

---

**3**

Remove the front cover.

See page 7-12.

---

**4**

Remove the fan.

**Warning:** The fan must not be run with the front cover in the parked position.

Remove the fan guard cover **1**.

Remove the five screws **2** that hold the fan **3** to the front cover **4**.

Undo the fan connection P22 **5** and ground strap **6**.

---

## Installing the Fan

---

Install the fan.

Install the fan in the reverse order of removal.

**Warning:** Ensure that the safety ground strap is correctly reinstalled.

Restore power to the drawer (see page 7-6).

**Warning:** The fan must not be run with the front cover in the parked position.

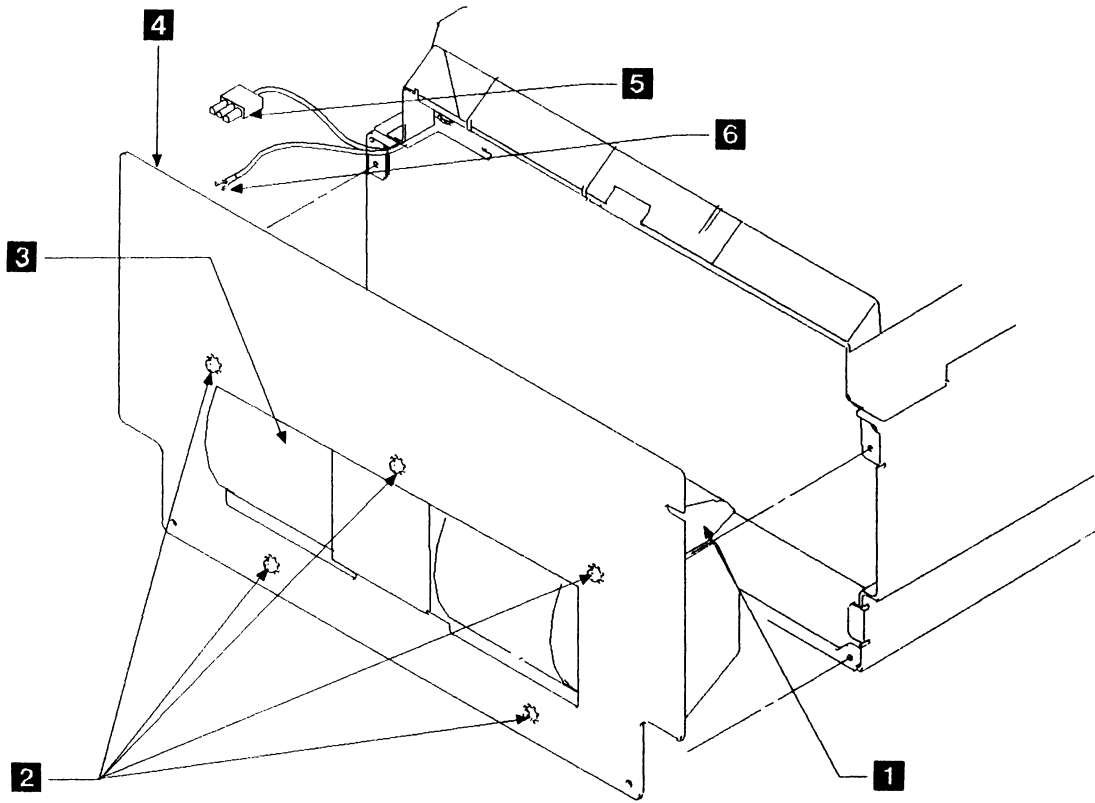


Figure 7-14. Fan

## Removing Circuit Breakers CB3, CB5, and CB6.

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Remove the top cover.**

See page 7-10.

---

**3**

**Remove the circuit breaker(s).**

Make a note of the positions of the wires on the terminals of the failed circuit breaker.

Slide back the sleeving and pull wires off the failed circuit breaker CB3 **1**, CB5 **2**, or CB6 **3**.

Pull the failed circuit breaker out of its mounting hole.

## Installing Circuit Breakers CB3, CB5, and CB6

**Warning:** Each circuit breaker has a different current rating. Ensure that the replacement CB has the same current rating as the one removed.

---

**Install the circuit breakers.**

Install the circuit breakers in the reverse order of removal, and push the sleeving back over the breakers.

Restore power to the drawer (see page 7-6).

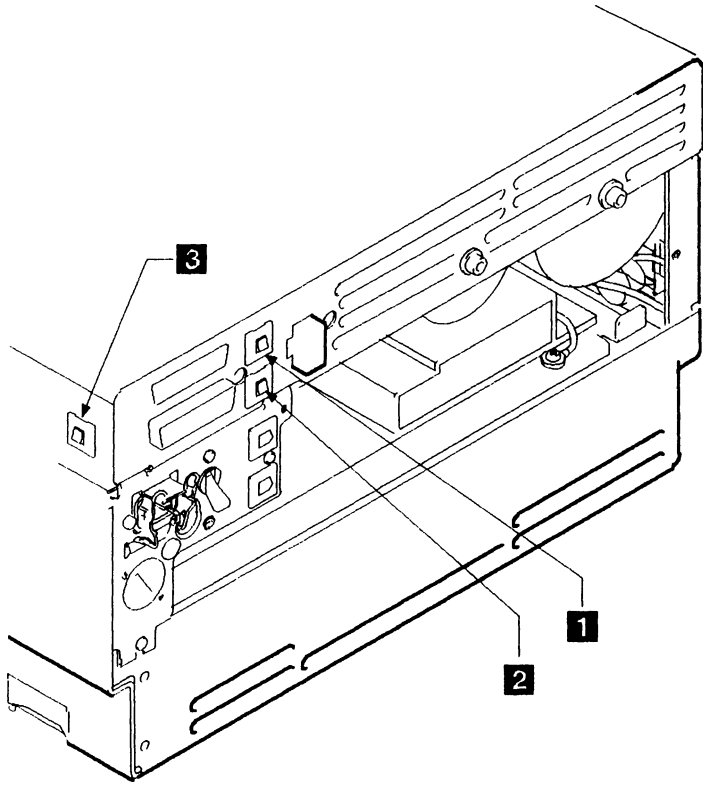


Figure 7-15. Circuit Breakers CB3, CB5 and CB6

## Removing the Disk Enclosure Thermal Switch

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the air vent.

See page 7-14.

---

**3**

Remove the disk enclosure thermal trip switch.

Loosen the screw **2** and lift out the thermal trip switch **3** complete with its mounting bracket.

Remove the two cables **1** from the disk enclosure thermal trip switch.

---

## Installing the Disk Enclosure Thermal Switch

---

Install the disk enclosure thermal trip switch.

Install the trip switch in the reverse order of removal, then restore power to the drawer (see page 7-6).

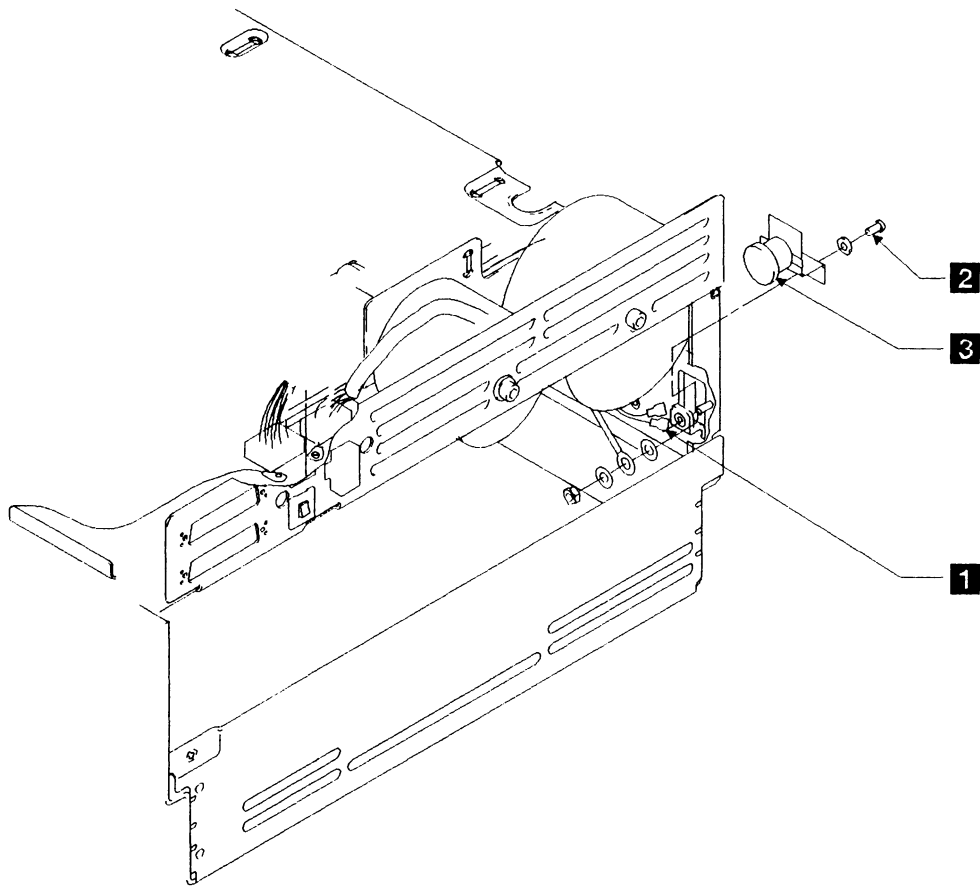


Figure 7-16. Disk Enclosure Thermal Switch

## Removing the Power Thermal Switch

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Remove the top cover.**

See page 7-10.

---

**3**

**Remove the power thermal trip switch.**

Remove the wires **4** from the power thermal trip switch **3**.

Remove the screws **1** and washers **2** that hold the power thermal trip switch.

Remove the power thermal trip-switch from the drawer.

## Installing the Power Thermal Switch

---

**Install the power thermal trip switch.**

Install the thermal trip switch in the reverse order of removal, then restore power to the drawer (see page 7-6).

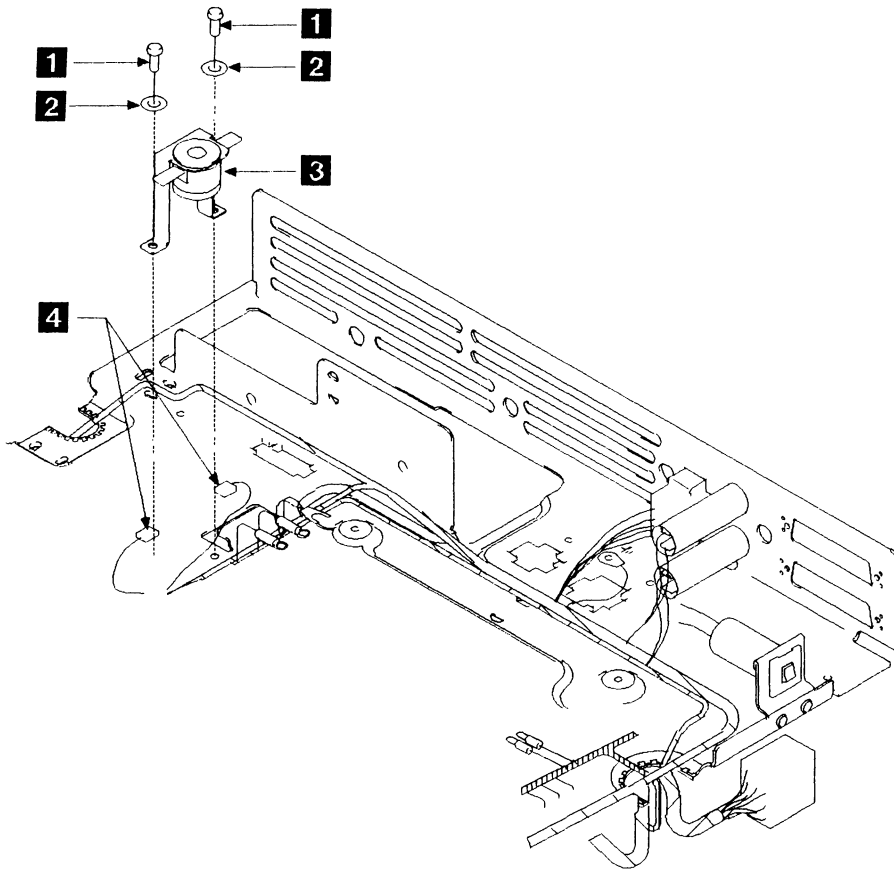


Figure 7-17. Power Thermal Switch



## Removing the Air Flow Switch

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Remove the top cover**

See page 7-8.

---

**3**

**Remove the air flow switch.**

See Figure 7-18 on page 7-39.

Disconnect plug P7 from J7 **1**.

Loosen the cable-ties around the air flow switch **2** and save them for reuse on installation.

Remove the switch and lead.

## Installing the Air Flow Switch

---

**Install the air flow switch.**

Install the air flow switch in the reverse order of removal.

Ensure that the hole in the sensor is mounted pointing downward, that is, in the six o'clock position.

Secure the air flow switch with the cable ties, ensuring that they do not prevent the front cover from seating correctly and also that the cable ties do not obstruct the hole.

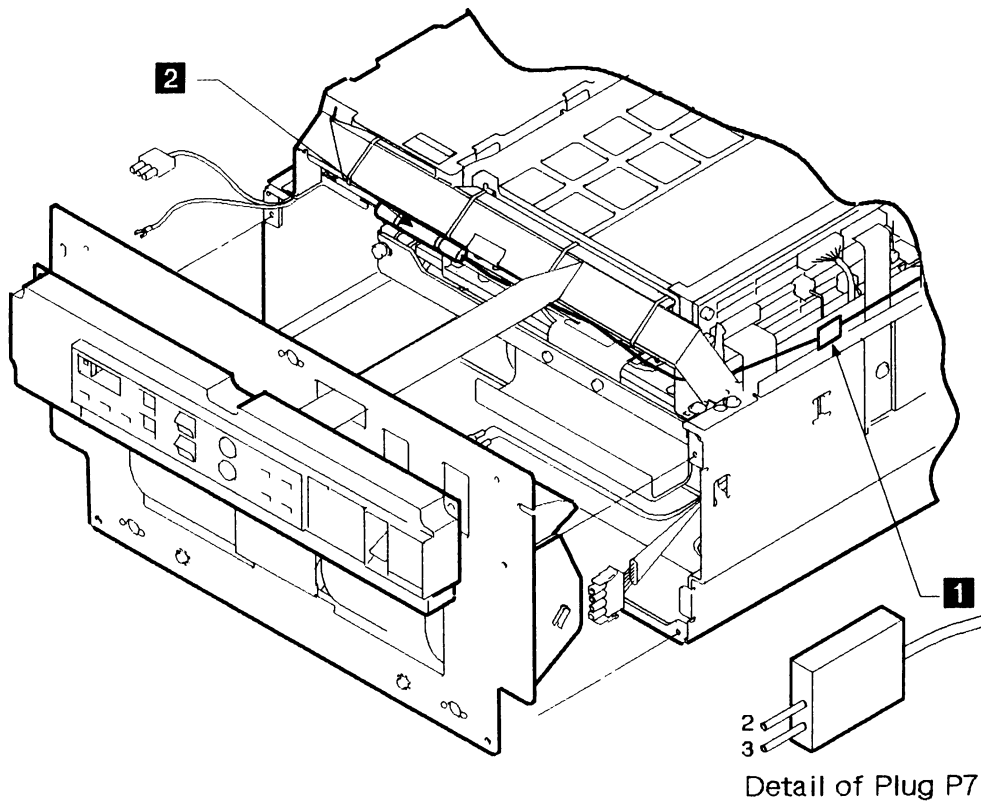


Figure 7-18. Air Flow Switch

## Removing the Motor Stator

### Warning:

- Before you install a stator, ensure that you have a set of shims (IBM part 5146802).
- Do not turn the motor spindle when the motor cover is removed, as disk damage will result.

---

### 1

Remove the disk enclosure.

See page 7-72.

Close the drawer and go to the next step.

---

### 2

Remove the motor stator.

Put the spindle lock to the Off position **2**.

Remove the four screws **1** from the motor cover **3**.

Lift the cover away from the disk enclosure.

Release the two stator connectors **5** from the holes at the back of the disk enclosure.

Remove the three screws and washers **4** that hold the motor stator **6**.

Remove the two grommets from the casting.

Carefully pull the motor stator upward to remove it. Cover the area exposed by the removal of the motor stator to prevent entry of dirt.

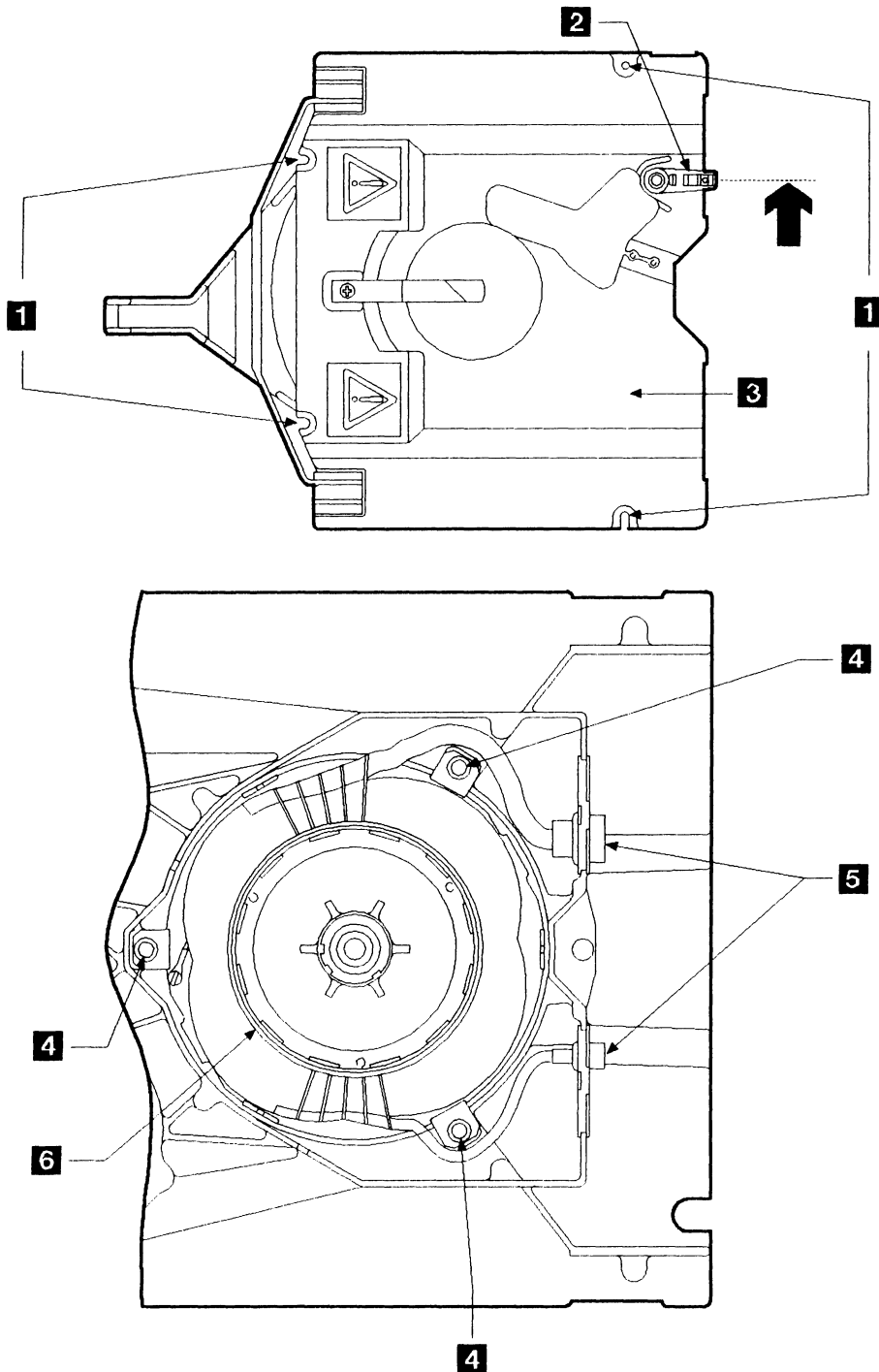


Figure 7-19. Removing the Motor Stator

## Installing the Motor Stator

---

### 1

#### Install the motor stator.

Carefully place the motor stator **5** on the disk enclosure and align the screw holes, then insert the three screws and washers **8** into the motor stator. Do not tighten them yet.

**Warning:** Be careful not to rotate the spindle.

Insert four shims **6** (IBM part 5146802) in the positions shown in Figure 7-20, between the motor spindle **7** and the motor stator **5**.

**Warning:** For the next step, damage will result if the shims are not removed.

Tighten the three screws **8** and then **remove the shims**.

Place the two stator connectors **4** into the holes at the back of the disk enclosure casting and put back the two grommets into the casting.

Put the spindle lock to the off position **2**, by moving it down slightly and to the right. Install the motor cover **3**, and tighten the four screws **1**.

Set the spindle lock **2** to the on position, by moving it down slightly and to the left.

---

### 2

#### Install the disk enclosure.

See page 7-79.

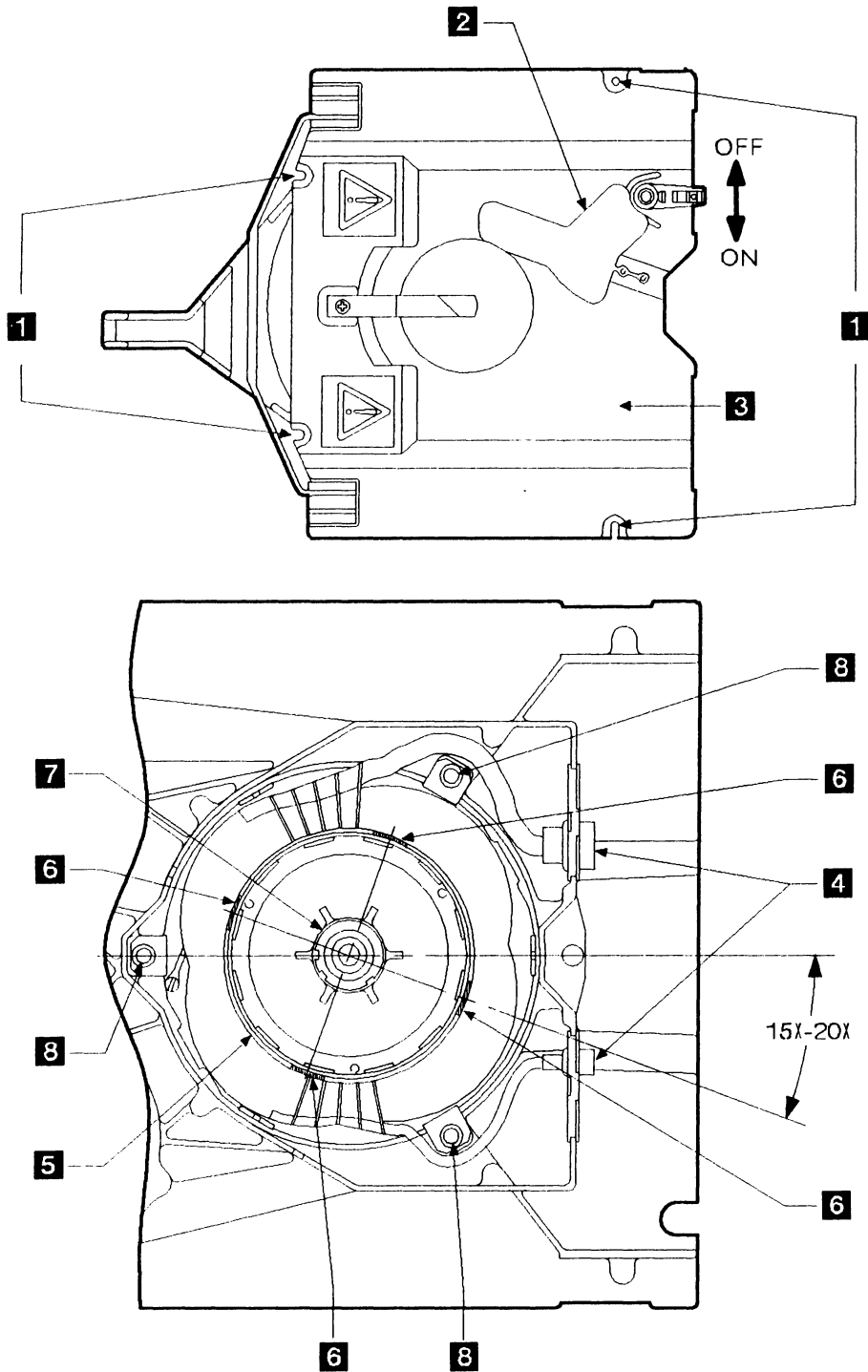


Figure 7-20. Installing the Motor Stator



---

## Logic Cards and Board

### Removing the Logic Cards

Use the same procedure to remove and install the logic cards as those used for the power control card (see page 7-48).

**Note:** The device interface card, 01A-A1C1, has extra steps in its removal and installation procedure (see “Removing the Device Interface Card” on page 7-52).

### Logic Card Positions in the Gate

The logic cards (see Figure 9-5 on page 9-6 or Figure 9-6 on page 9-7 to identify their locations) and their positions in logic board 01A-A1 for Model Bs with serial numbers before 57-B0000 are:

- Power control card – position 01A-A1C5
- Demodulator card 0 – position 01A-A1A5
- Demodulator card 1 – position 01A-A1A1
- Servo card 0 – position 01A-A1B5
- Servo card 1 – position 01A-A1B1
- Device interface card – position 01A-A1C1.

For Model Bs with serial numbers from 57-B0000 onward, the cards and their positions are:

- Power control card – position 01A-A1C5
- Sermod card 0 – position 01A-A1B5
- Sermod card 1 – position 01A-A1B1
- Device interface card – position 01A-A1C1.



## Raising the Card Gate

---

### Raising the card gate.

Slacken the screws holding the four sliding clips (one at each corner of the card gate). (These clips are shown in Figure 7-12 on page 7-27.)

The three positions for the card gate are:

- The home position.
- The service position

To raise the card gate to the service position, lift the gate upward and slide it into the bracket retainers **1**.

- The tilted position

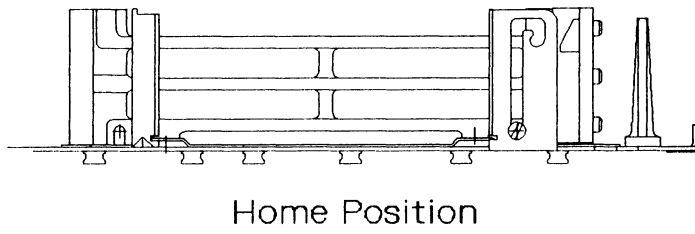
To raise the card gate to the tilted position, lift the card gate upward until it catches in the plastic support brackets **2**.

---

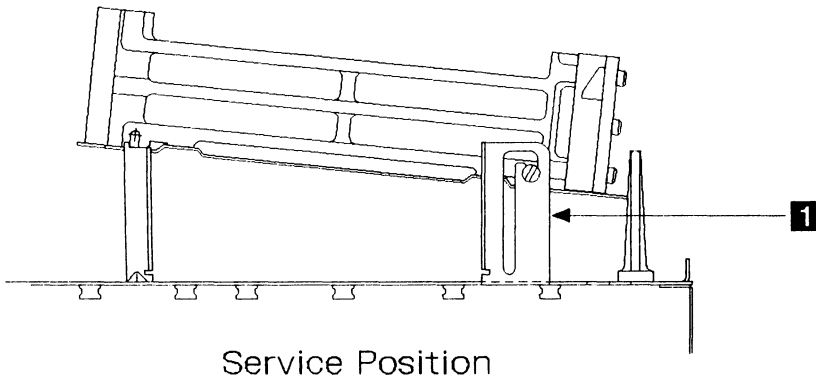
### Lowering the card gate.

To lower the card gate, release the clips on the top of each plastic support bracket **2** and carefully lower the card gate to the home position.

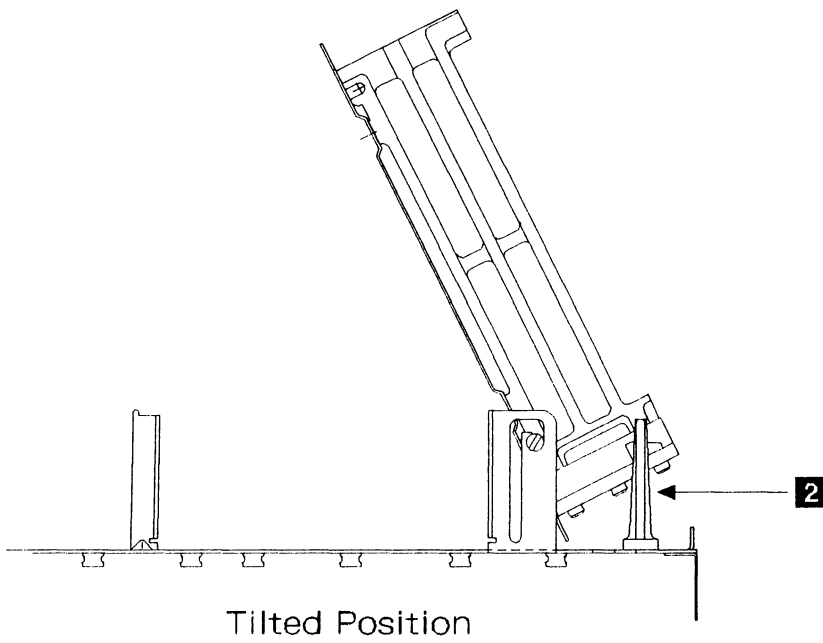
Slide the clips over the corners of the card gate, and tighten the screws.



Home Position



Service Position



Tilted Position

Figure 7-21. Card Gate Positions

## Removing the Power Control, Servo, Demodulator, and Sermod Cards

---

- |   |  |
|---|--|
| <b>1</b>  |  |
| <b>Remove power from the drawer.</b>  | See page 7-4.  |
| <hr/>   |  |
| <b>2</b>  |  |
| <b>Remove the top cover.</b>  | See page 7-10.   |
| <hr/>   |  |
| <b>3</b>  |  |
| <b>Raise the card gate.</b>   | Raise the card gate <b>1</b> to its service position (see page 7-46).                        |
| <hr/>   |  |
| <b>4</b>  |  |
| <b>Remove the cards.</b>  | Take out the three screws <b>2</b> and remove the card retainer bar (if installed).          |
| <b>For Model Bs with serial numbers before 57-B0000, follow the instructions on the right and refer to Figure 7-22.</b> | Remove the two crossover connectors <b>6</b> , and the four interposers <b>5</b> .           |
| <b>For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on page 7-50.</b>                     | Remove the plastic card retainer <b>3</b> .  |
|   | Remove the power control card at position 01A-A1C5 <b>4</b> by pulling on the card guide.    |
|   | Remove the servo card and the demodulator card by pulling on the tabs provided on the cards. |
|   | Remove the card-guide from the card, and keep the guide for use on the new card.             |

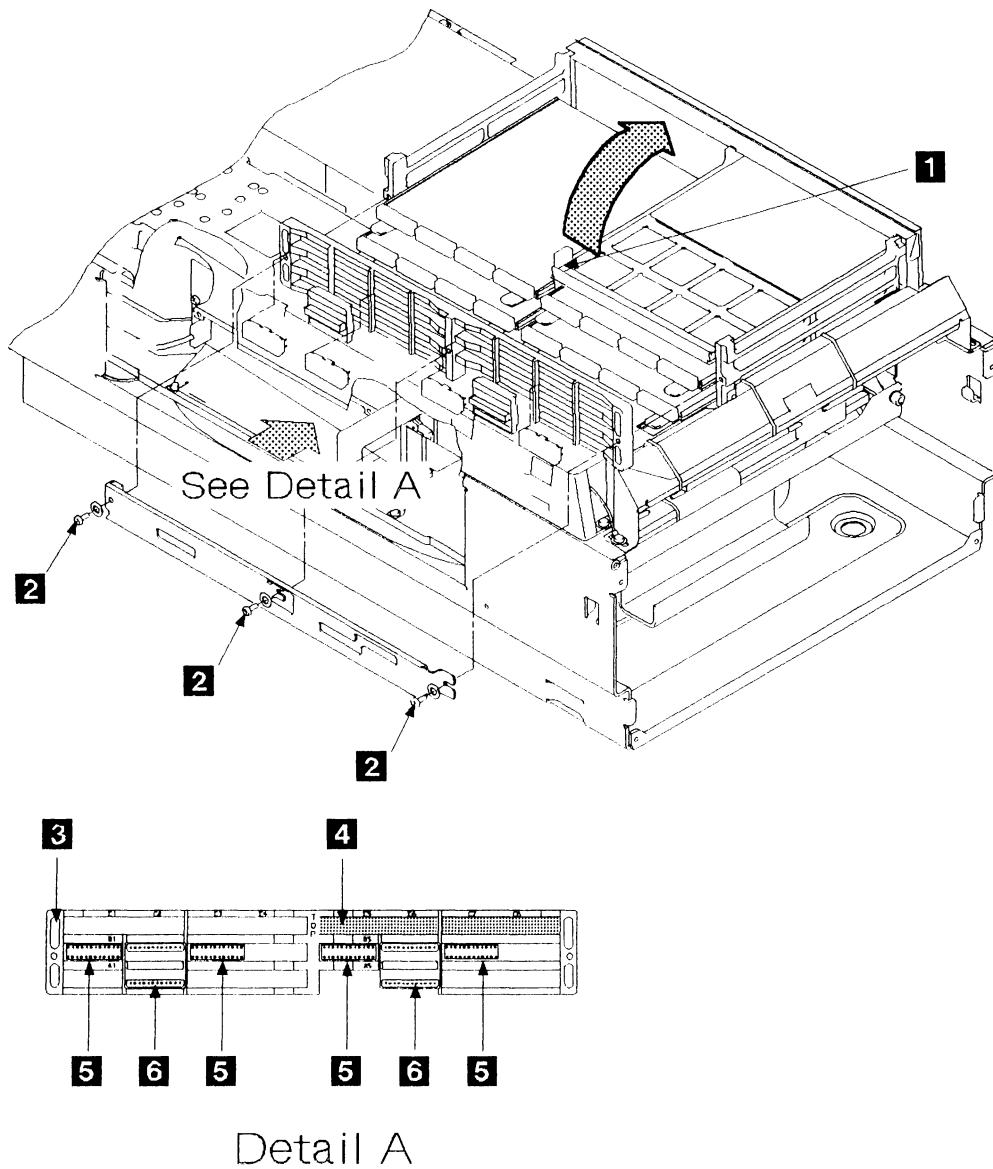


Figure 7-22. Power Control, Servo, and Demodulator Cards (Model Bs with serial numbers before 57-B0000)

---

## 5

### Remove the cards.

For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on the right and refer to Figure 7-23.

For Model Bs with serial numbers before 57-B0000, follow the instructions on page 7-48.

Remove the four interposers **5**.

Take out the three screws **2** and remove the plastic card retainer **3**.

Remove the power control card at position 01A-A1C5 **4** by pulling on the card guide.

Remove the sermod card by pulling on the tabs provided on the cards.

Remove the card-guide from the card, and keep the guide for use on the new card.

---

## Installing the Power Control, Servo, Demodulator, and Sermod Cards

---

### Install the cards.

Install the cards in the reverse order of removal.

#### Warning:

1. Ensure that the cards are not plugged in reversed.
2. Do not drop the card gate.
3. Check that there are no cables trapped under the edges of the card gate when it is seated.

Restore power to the drawer (see page 7-6).

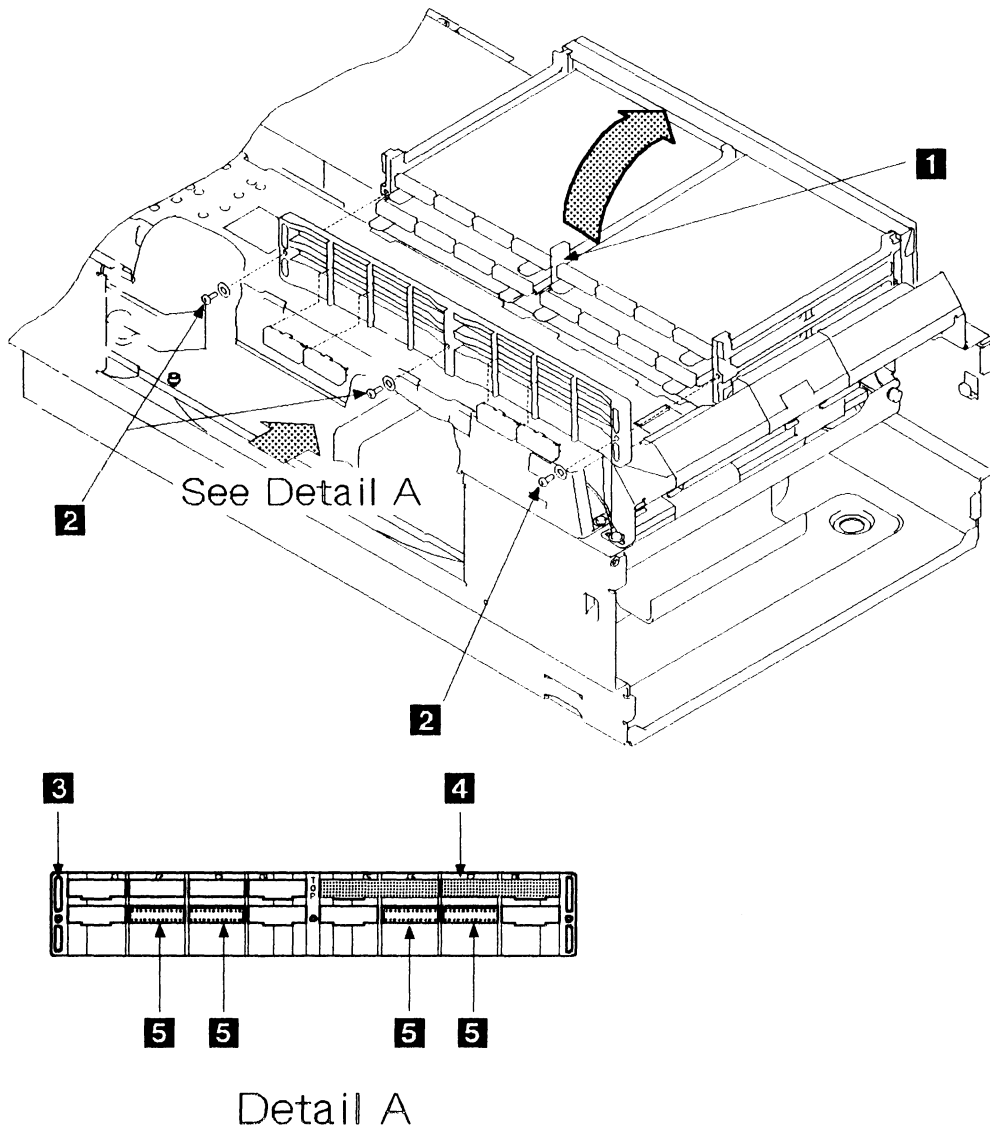


Figure 7-23. Power Control and Sermod Cards (Model Bs with serial numbers from 57-B0000 onward)

## Removing the Device Interface Card

---

<b>1</b>	
Remove power from the drawer.	See page 7-4.
<hr/>	
<b>2</b>	
Remove the top cover.	See page 7-10.
<hr/>	
<b>3</b>	
Raise the card gate.	Raise the card gate to its service position (see page 7-46).
<hr/>	
<b>4</b>	
Remove the device interface card.	Take out the three screws <b>1</b> and remove the card retainer bar.
For Model Bs with serial numbers before 57-B0000, follow the instructions on the right and refer to Figure 7-24.	Disconnect the interface cable <b>4</b> from the device interface card <b>5</b> .
For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on page 7-54.	Remove the two crossover connectors <b>2</b> and the four interposers.
	Remove the plastic card retainer <b>3</b> .
	Remove the device interface card at position 01A-A1C1 <b>5</b> from the gate.
	Remove the card guide from the card, and keep it for use on the new card.

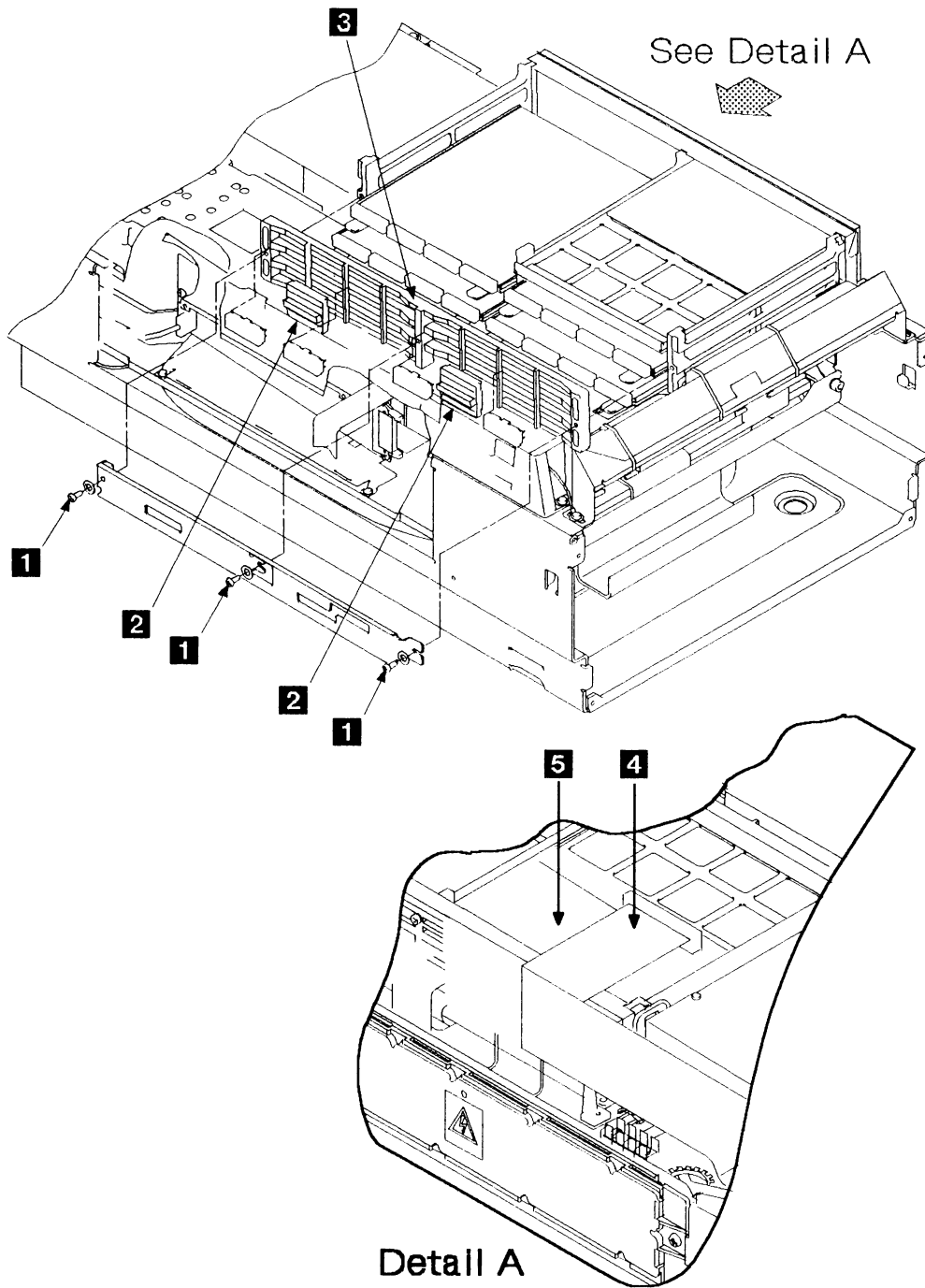


Figure 7-24. Device Interface Card (Model Bs with serial numbers before 57-B0000)



---

## 5

### Remove the device interface card.

For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on the right and refer to Figure 7-25.

For Model Bs with serial numbers before 57-B0000, follow the instructions on page 7-52.

Disconnect interface cable **3** from the device interface card **4**.

Remove the four interposers.

Take out the three screws **1** and remove the plastic card retainer **2**.

Remove the device interface card at position 01A-A1C1 **4** from the gate.

Remove the card guide from the card, and keep it for use on the new card.

## Installing the Device Interface Card

---

### Install the device interface card.

Install the device interface card in the reverse order of removal.

#### Warning:

1. Do not drop the card gate.
2. Check that there are no cables trapped under the edges of the card gate when it is seated.

Restore power to the drawer (see page 7-6).

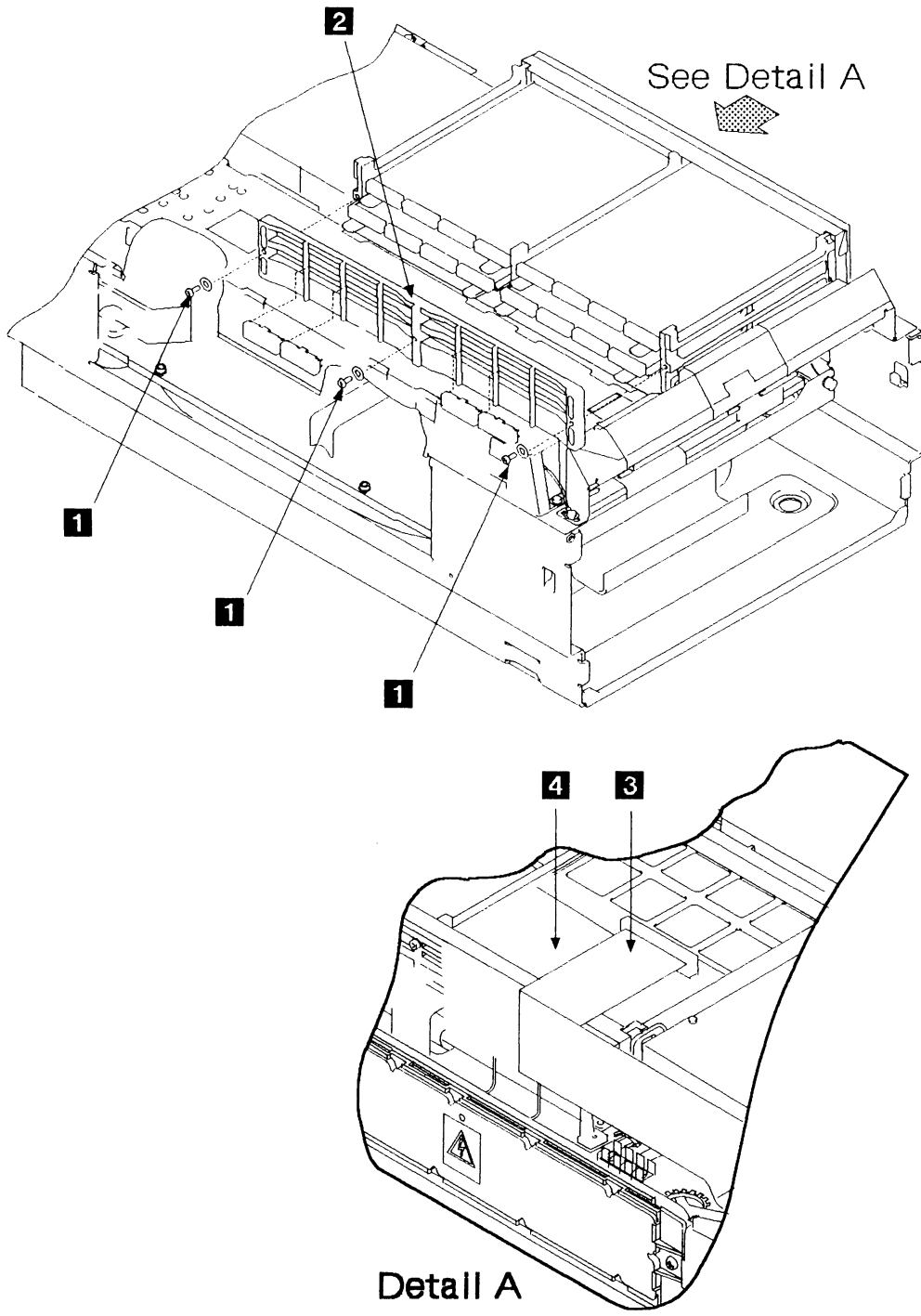


Figure 7-25. Device Interface Card (Model Bs with serial numbers from 57-B0000 onward)

## Removing the Logic Board

---

### 1

Remove power from the drawer.

See page 7-4.

---

### 2

Remove the top cover.

See page 7-10.

---

### 3

Raise the card-gate.

Make a note of the positions of the connectors at the back of the logic board **5**, and then remove them.

Raise the card gate to its service position (see page 7-46).

---

### 4

Remove the logic board.

Take out the three screws **1** and remove the card retainer bar.

For Model Bs with serial numbers before 57-B0000, follow the instructions on the right and refer to Figure 7-26.

Remove the two crossover connectors **2** and the four interposers **7**.

Remove the plastic card retainer **3**.

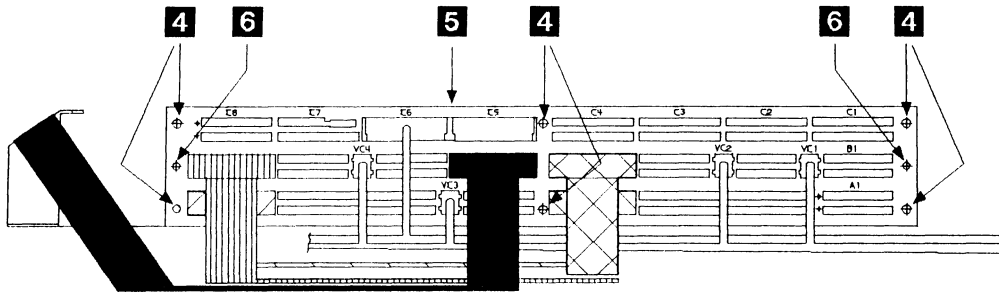
For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on page 7-58.

Remove the interface cable from the device interface card (see page 7-52).

Remove the logic cards from the card-gate and all cables from the board 01A-A1. Make a note of the positions of the cards and cables as you remove them.

Remove the six screws **4** from the back of the card-gate. Remove the logic board.

**Warning:** Do not remove screws **6**.



Detail A

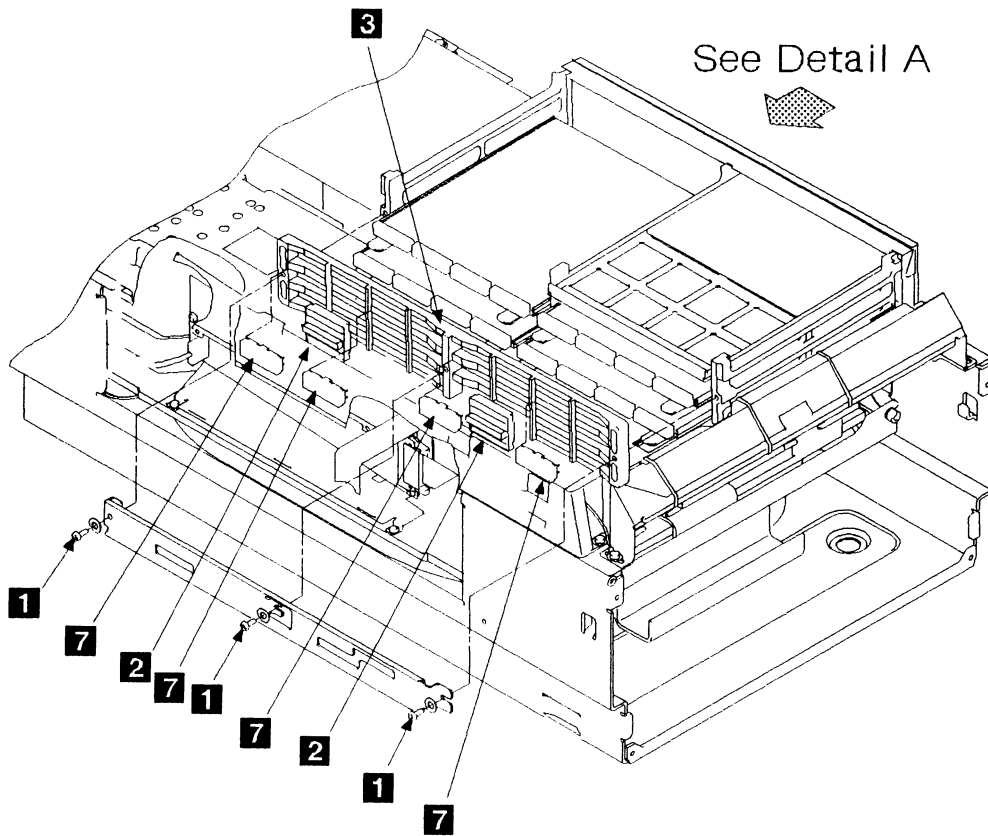


Figure 7-26. The Logic Board (Model Bs with serial numbers before 57-B0000)

---

## 5

Remove the logic board.

For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on the right and refer to Figure 7-27.

For Model Bs with serial numbers before 57-B0000, follow the instructions on page 7-56.

Remove the four interposers **4**.

Take out the three screws **1**.

Remove the plastic card retainer **2**.

Remove the interface cable from the device interface card (see page 7-52).

Remove the logic cards from the card-gate and all cables from the board 01A-A1. Make a note of the positions of the cards and cables as you remove them.

Remove the six screws **3** from the back of the card-gate.  
Remove the logic board.

**Warning:** Do not remove screws **5**.

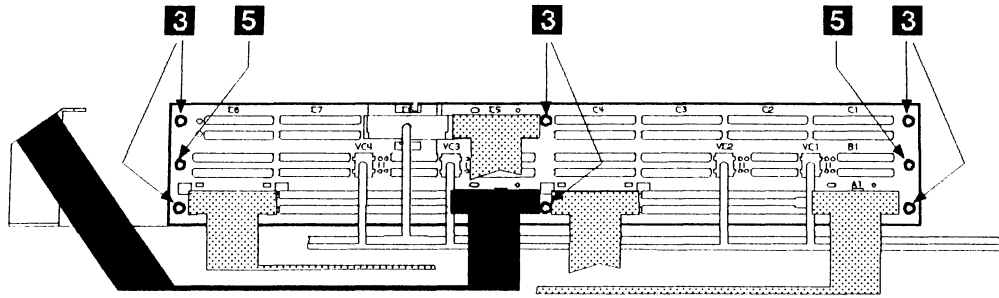
## Installing the Logic Board

---

Install the logic board.

Install the logic board in the reverse order of removal.

Restore power to the drawer (see page 7-6).



Detail A

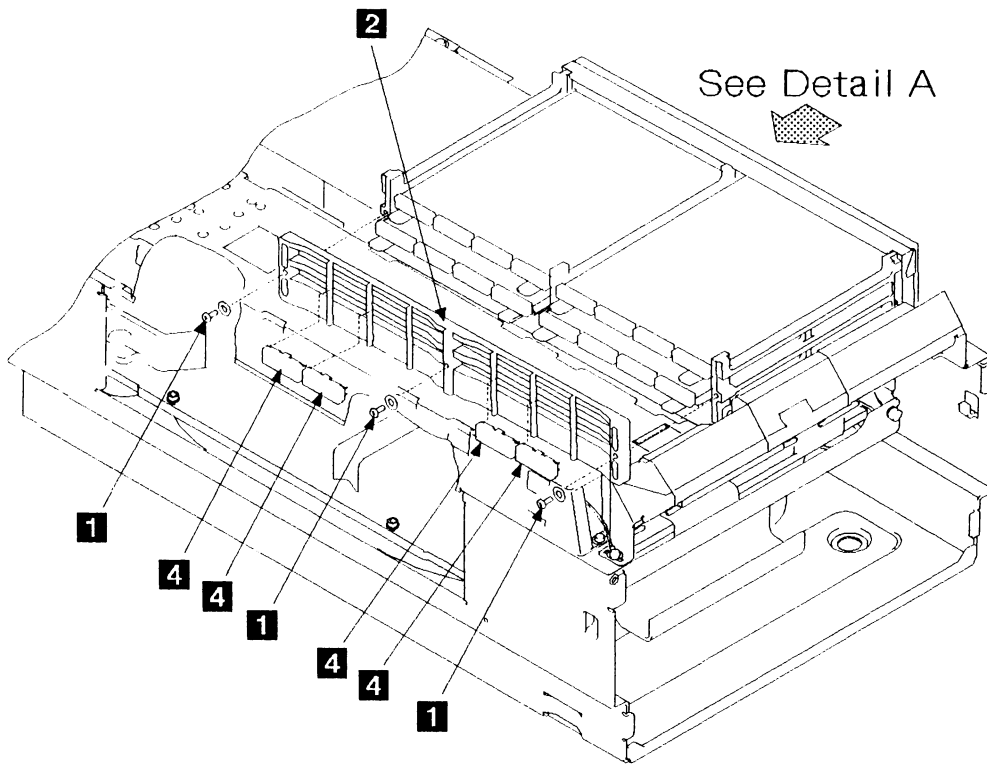


Figure 7-27. The Logic Board (Model Bs with serial numbers from 57-B0000 onward)

## Removing the Read-Detect Cards

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the top cover.

See page 7-10.

---

**3**

Remove the front cover.

See page 7-12.

---

**4**

Remove the read-detect cards.

**Note:** For clarity, the figure shows the disk enclosure pulled forward.

Reach in through the front frame and release the cables from the connectors **3** on the read-detect card to be removed. (Card 0 is the left-hand card **4**, and card 1 is the right-hand card **2**, when looking from the front.)

Remove the two screws **1** from the card to be removed.

Pull the card up and out of the connector on the disk enclosure casting.

## Installing the Read-Detect Cards

---

Install the read-detect cards.

**Warning:** Data on the disk can be destroyed if the read-detect cards are plugged into the wrong connectors.

Install the read-detect cards in the reverse order of removal, ensuring that the connectors are firmly latched.

Restore power to the drawer (see page 7-6).

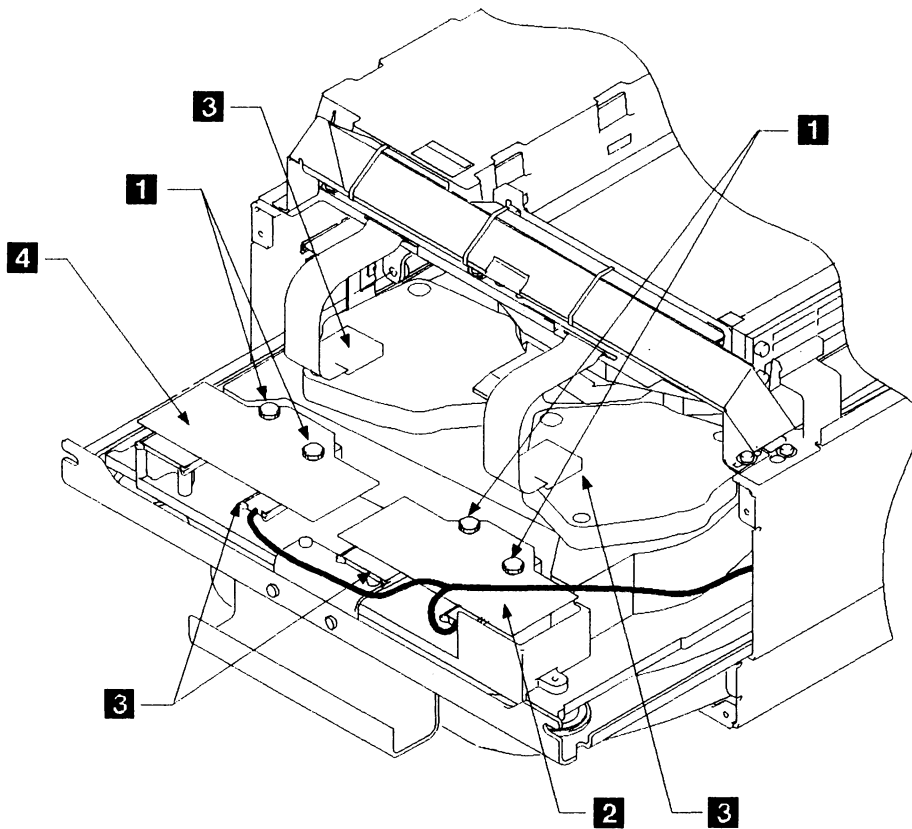


Figure 7-28. Read-Detect Cards



## Removing the Actuator Driver Card or Cards

---

### 1

Remove power from the drawer.

See page 7-4.

---

### 2

Remove the top cover.

See page 7-10.

---

### 3

For Model Bs with serial numbers from 57-B0000 onward, go to step 5 on page 7-64.

For Model Bs with serial numbers before 57-B0000, follow the instructions on the right and in step 4 and refer to Figure 7-29.

Remove the actuator 1 driver card.

1. Remove the two screws **3** on the cover of the actuator driver card enclosure.
  2. Lift the cover up and pull it out to the side.
  3. Carefully open the clips of the logic cable connectors **1** and withdraw the actuator driver card cables.
  4. Disconnect the four-way connectors **5** from the actuator driver cards.
  5. Disconnect the ground strap **6** and remove the actuator 1 driver assembly **4** from the drawer.
  6. Remove the 3 screws **2** from the actuator 1 driver card and remove the card from the cover.
- 

### 4

Remove the actuator 0 driver card.

Remove the 3 screws corresponding to screws **2** from the actuator 0 driver card **7** and remove the card from the cover.

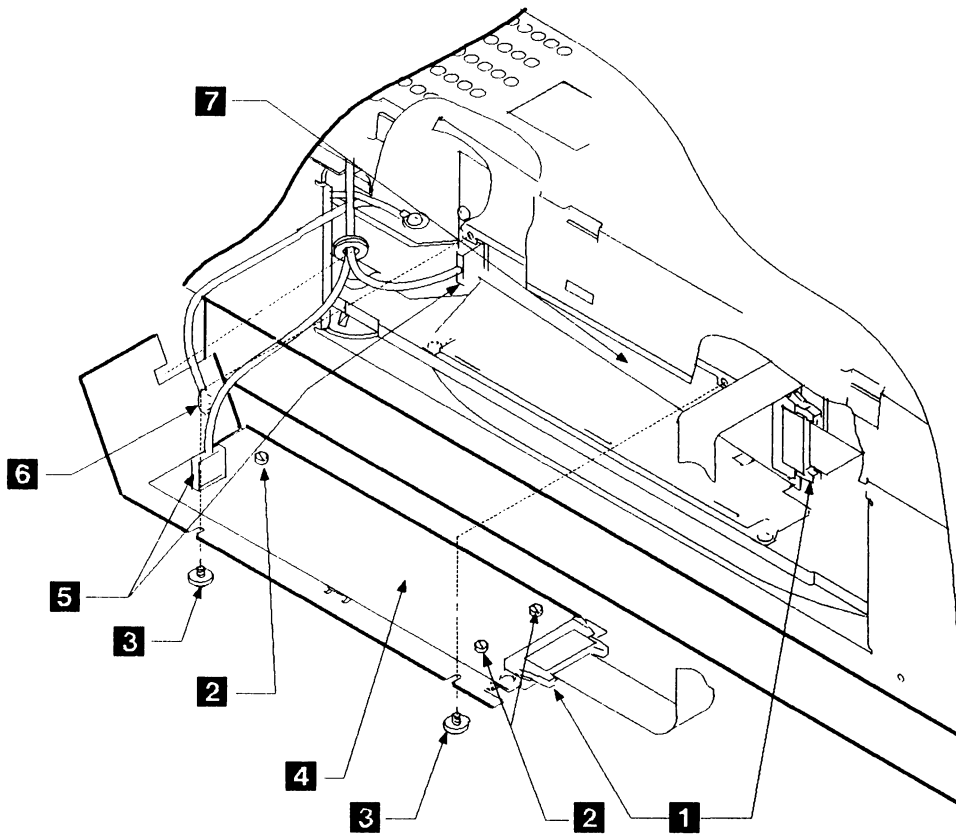


Figure 7-29. Actuator Driver Cards (Model Bs with serial numbers before 57-B0000)

---

## 5

**For Model Bs with serial numbers from 57-B0000 onward, follow the instructions on the right and refer to Figure 7-30.**

**For Model Bs with serial numbers before 57-B0000, follow the instructions on page 7-62.**

**Remove the actuator driver card.**

1. Loosen the two screws **4** and pull the actuator driver assembly **3** straight out from the screws until the logic cable connector **1** can be accessed. There is a resistance because the actuator assembly is held by a clip on the inside.
2. Carefully open the clips of the logic cable connector and withdraw the actuator driver card cable. Park it in the cable park provided.
3. When the logic cable has been disconnected, rotate the assembly to access the seven-way connector (P23) **5**.
4. Disconnect connector (P23) from the actuator driver card.
5. Disconnect the ground strap **6** and remove the actuator driver assembly **3** from the drawer.
6. Remove the 3 screws **2** from the actuator driver card and remove the card from the cover.

## Installing the Actuator Driver Card or Cards

---

**Install the actuator driver card or cards.**

**Warning:** Ensure that wires are not trapped by the cover.

1. Install the actuator driver card or cards in the reverse order of removal.
2. Ensure that the insulating grommet **7** is placed in the left-hand side of the actuator driver cover.
3. **Ensure that the ground strap **6** is correctly reinstalled.**
4. Restore power to the drawer (see page 7-6).

---

## Disk Enclosure

### Disk Enclosure: Removal and Installation

The IBM 9335 Model B contains two devices each with its own actuator driver logic. By swapping the cables connected to these devices, you can check whether a fault is in the actuator driver logic or is in the disk enclosure. If the fault remains with the same device address after the cable swap, the disk enclosure is **not** failing. Use the cable-swapping procedure only when the diagnostic tests give a firm and repeatable error. Use only diagnostic test 10 to identify the failing address and never use customer programs during the cable-swapping procedure.

### Preparatory Work

1. Keep your support center (customer-assist group or similar) informed of your actions according to local procedures.
2. Ensure that a replacement disk enclosure is available of the same type and specification.
3. Ensure that all customer data has been copied from the disk.
4. Ensure that the unit is off-line from the using system.
5. Perform the disk enclosure cable swapping procedure shown below if instructed to do so by the *Guide to Unit Reference Codes*.

### Disk Enclosure Cable-Swapping Procedure

---

#### 1

For Model Bs with serial numbers from 57-B0000 onward, check the drawer.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Set CB1 (on the back panel) off.
3. If the drawer is in its service position with the covers removed, reinstall the top cover and fully insert the unit into the rack to protect the cables.

---

#### 2

For Model Bs from 57-B0000 onward, remove the air vent.

1. Remove the two screws **1** that hold the air vent **2** to the frame at the rear of the drawer.
2. Remove the air vent from the drawer.
3. Ensure that the spindle is not locked.

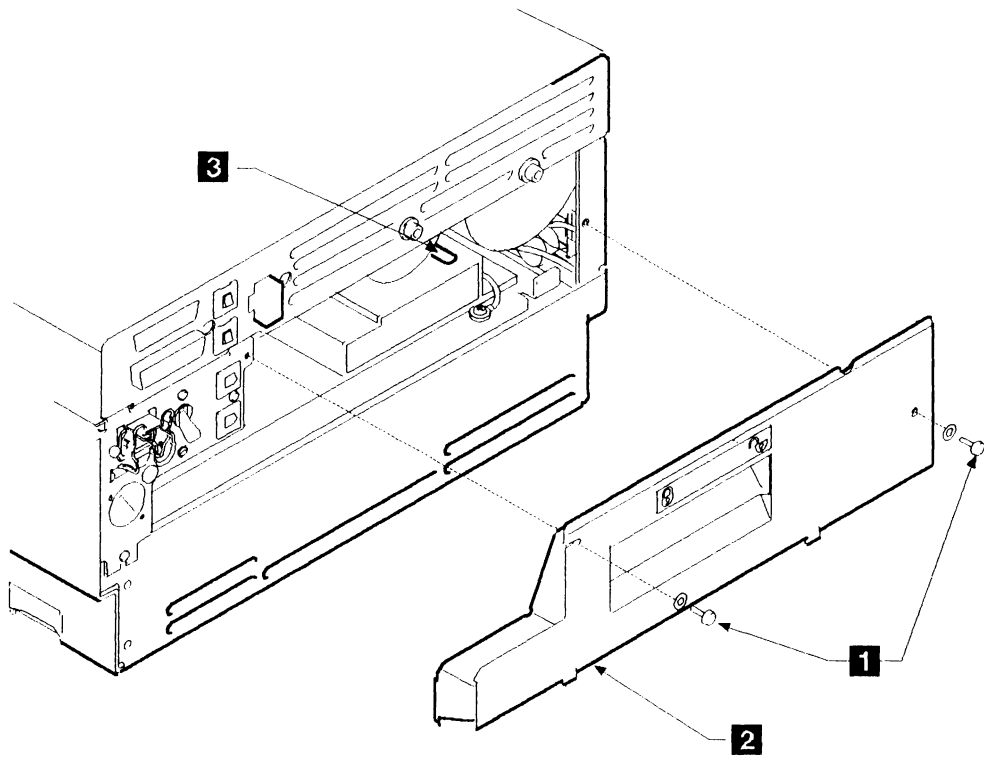


Figure 7-31. Disk Enclosure Cable Swap (Part 1 of 5)

### 3

For Model Bs with serial numbers from 57-B0000 onward, swap the actuator cables by following the instructions on the right.

Swap the actuator cable from actuator 0 by plugging J4 with P1 and from actuator 1 by plugging J1 with P4.

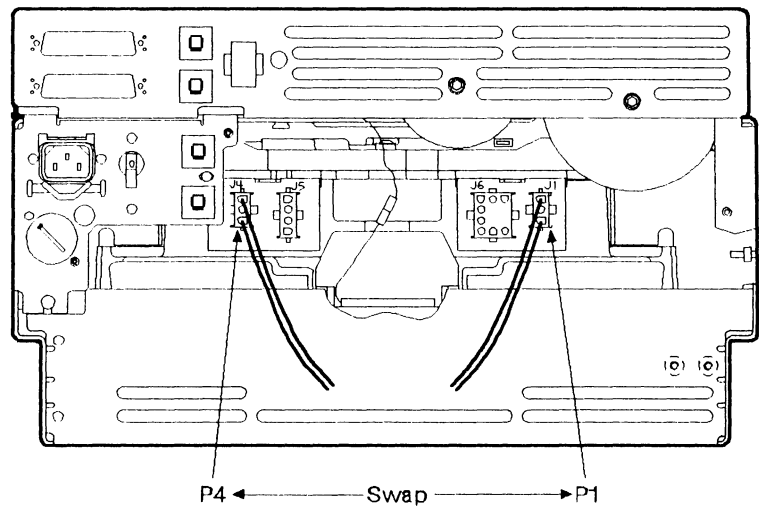


Figure 7-32. Disk Enclosure Cable Swap (2 of 5)

---

## 4

For all Model Bs, pull the drawer out to its service position and remove the front cover.

See page 7-12.

---

## 5

For all Model Bs, swap the read-detect cards.

1. Release the 'X' cable clamps retaining the read-detect signal cables on the underside of the Model B power tray.
2. Unplug the cables on the two read-detect cards and remove the two card retaining screws for each card.
3. Plug read-detect card 0 into read-detect card 1 position, and plug read-detect card 1 into read-detect card 0 position.
4. Swap the signal cable from read-detect 0 card by plugging J13 with P15, (01A-A1A8), and from read-detect 1 card by plugging J15 with P13 (01A-A1A4).
5. Replace the power cable plugs, P12 and P14, on the read-detect cards.

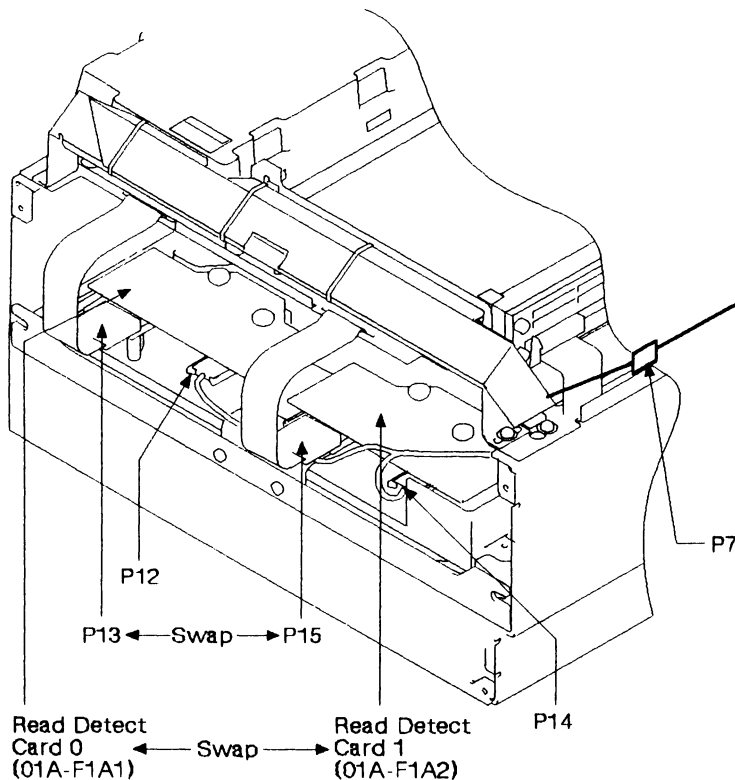


Figure 7-33. Disk Enclosure Cable Swap (3 of 5)

---

## 6

For Model Bs with serial numbers before 57-B0000, swap the actuator cables by following the instructions on the right.

Open the actuator driver cover on the left side of the Model B. Swap the signal cable from actuator driver 1 by plugging J23 with P25, and from actuator driver 0 by plugging J25 with P23.

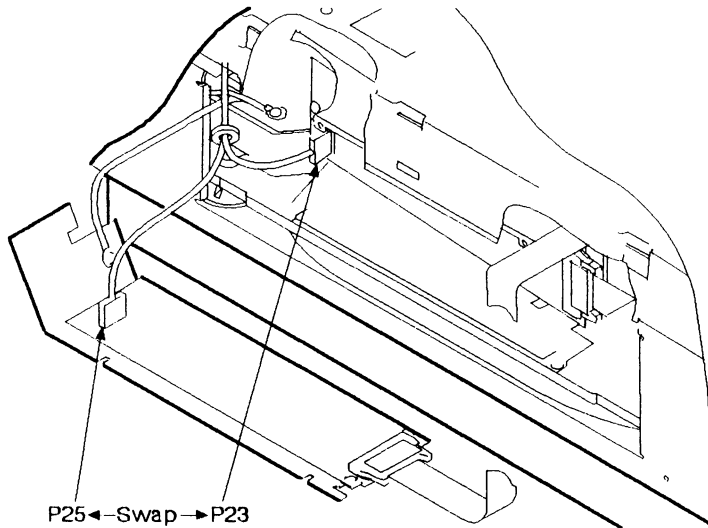


Figure 7-34. Disk Enclosure Cable Swap (4 of 5)

---

7

If an air flow switch is fitted, follow the instructions on the right; if not, carry on with the next step.

Short out pins 2 and 3 of P7 with a jumper, see Figure 7-35.

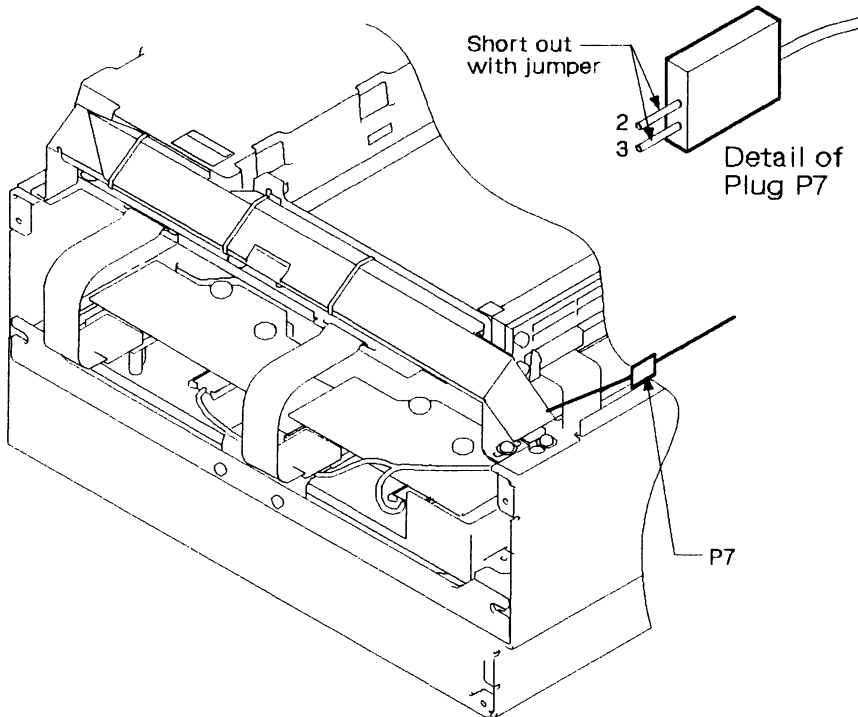


Figure 7-35. Disk Enclosure Cable Swap (5 of 5)



---

## 8

Partially reinstall the machine to run it.

1. Replace the front cover as far as placing it in its parking position.
2. Replace the plastic fan cover.
3. Reconnect all wires and cables to the front cover.

### **DANGER**

**Do not attempt to apply power without the fan cover in place. Unshielded rotating fan blades cause danger from both direct contact and from objects dropped on to them.**

4. Set CB1 (on the back panel) to on.
5. Set the Power switch (on the front panel) to On.

---

## 9

Follow the instructions on the right.

Run the diagnostic program test 10 again to both device 0 and device 1. If the failure still appears on the same device after the cable swap, continue with the next two steps; otherwise, go to the next step and then go to "Removing the Disk Enclosure" on page 7-72.

---

## 10

Restore all the cables and plugs to their original positions.

Follow the instructions given in "Cleanup and Repair Verification" on page 142.

---

## 11

Exchange the other FRUs in the URC list.

## Removing the Disk Enclosure

Do **not** try to remove the disk enclosure unless you have completed the preparatory work.

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Check the drawer.**

If the drawer is in its service position with the covers removed, reinstall the top cover and fully insert the unit into the rack to protect the cables.

---

**3**

**Lock the spindle.**

Set the spindle lock **3** to the locked position, by moving it down and to the left.

---

**4**

**Remove the air vent and spindle-lock lever.**

Remove the two screws **1** that hold the air vent **2** to the frame at the rear of the drawer.

Remove the air vent from the drawer.

Remove the spindle-lock lever by pulling it off with a straight pull. Ensure that you keep the spindle locked.

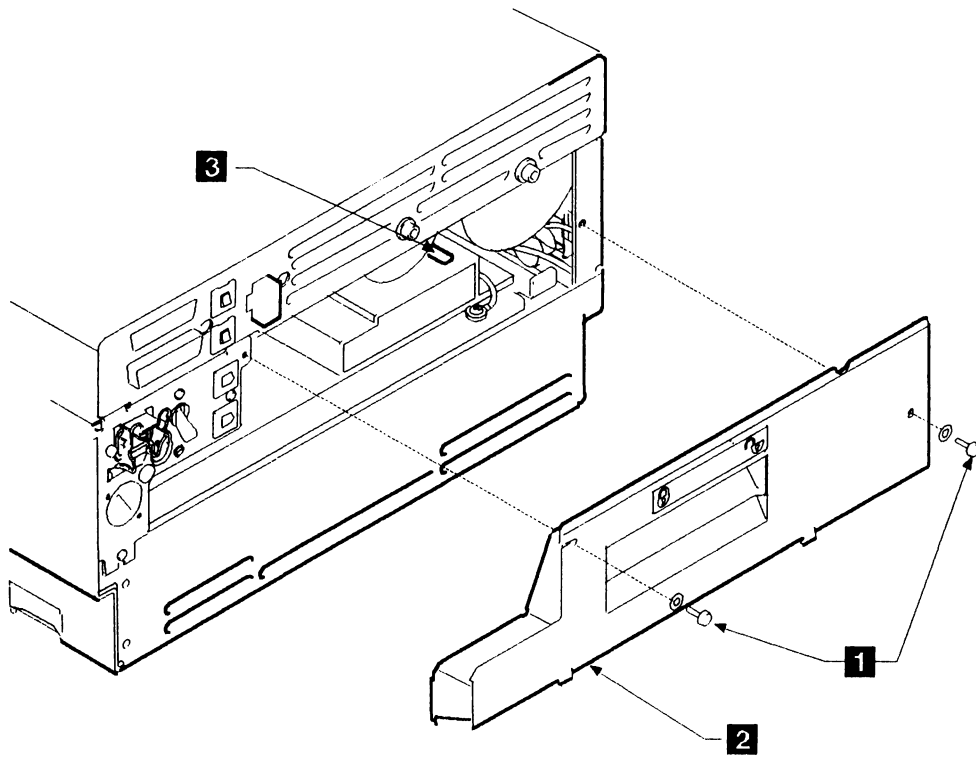


Figure 7-36. Removing the Disk Enclosure (1 of 4)

---

## 5

**Remove the disk enclosure cables.**

1. Remove the ground strap from the disk enclosure cradle to frame (see Figure 8-1 on page 8-127.):
  - a. Find the stud at the frame end of this ground strap **6**.
  - b. Use an M4 nut driver to remove the ground strap and its star washer from the outer end of the stud.
  - c. Do not disturb the other ground strap attached to this stud.
2. Unplug the cables from connectors J1 **1**, J4 **5**, J5 **4**, and J6 **2** from the rear of the disk enclosure.
3. Position the plugs so that they do not obstruct the drawer.
4. Unplug the connector **3** of the power-on-hours meter.

---

## 6

**Go to the front of the rack and fully extend the Model B.**

Pull the drawer forward to its service position.

---

## 7

**Remove the front panel and the top cover.**

See page 7-10

---

## 8

**Remove the front cover.**

See page 7-12.

---

## 9

**Disconnect the ground strap between the power tray and the disk enclosure.**

Find the green-and-yellow ground strap that runs from the rear of the power tray to the disk enclosure. Unscrew this strap at the rear of the power tray and push it through the access hole adjacent to transformer T1.

---

## 10

**Go to the right-hand side (viewed from the front of the unit) and remove the power regulator card.**

1. Remove the two screws retaining the power regulator card.
2. Pull the card and the attached cables clear of the disk enclosure without unplugging any of the cables.

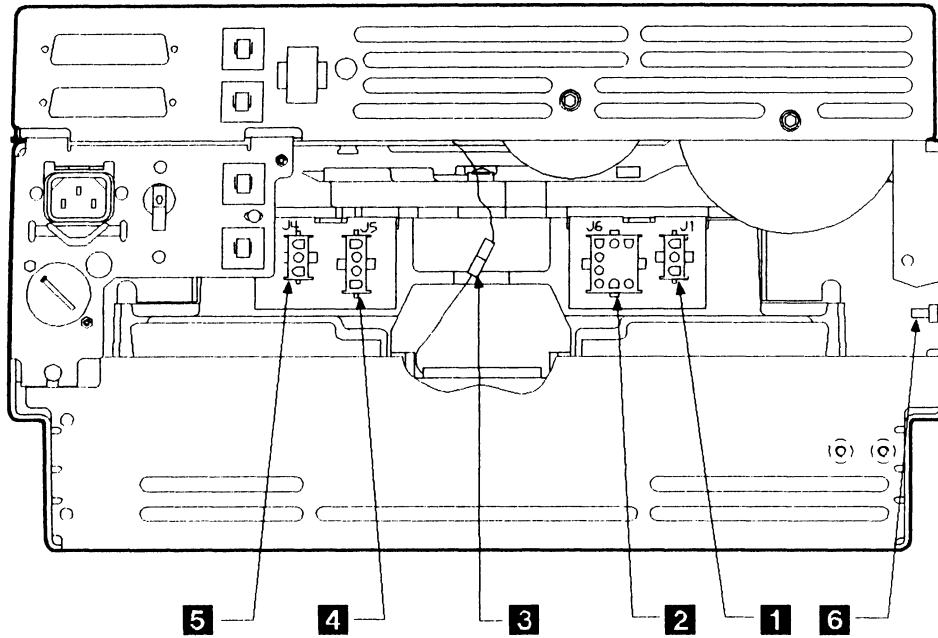


Figure 7-37. Removing the Disk Enclosure (2 of 4)

---

## 11

Go to the left-hand side (viewed from the front of the unit) and remove the actuator driver card assembly.

See "Removing the Actuator Driver Card or Cards" on page 7-62 and perform steps 3 through 5 as appropriate. Do not remove the actuator driver card(s) from their covers.

---

## 12

Go to the front of the unit and prepare to remove the disk enclosure.

1. Unplug the power plugs **3** on the two read-detect cards.
  2. Put the loose cables on each side in cable parks.
  3. Unplug the read-detect signal cables **8**, and place them in cable parks.
  4. Unscrew the two 4-mm socket screws **1** retaining the disk enclosure.
- 

## 13

Remove the disk enclosure.

**CAUTION:**

The disk enclosure weighs approximately 28 kg (62 lb). It may need two people to lift it out; observe the normal safety procedures.

**Note:** There is a handle on the motor cover **7** and another at the front of the disk enclosure **2** for use during maintenance.

Carefully slide the disk enclosure **4** to the front of the drawer. Ensure that cables around the disk enclosure are not trapped.

Remove the disk enclosure from the drawer and put it on a smooth surface.

On Model Bs with serial numbers before 57-B0000, remove the three screws **5** and remove the actuator 0 driver assembly from the disk enclosure casting.

If you have removed it, keep the actuator 0 driver assembly to install it on the replacement disk enclosure.

---

## 14

Remove the read-detect cards.

Remove the screws **6** from the cards.

Pull the cards up and out of the connectors of the disk enclosure.

Keep the read-detect cards to install them on the new disk enclosure.

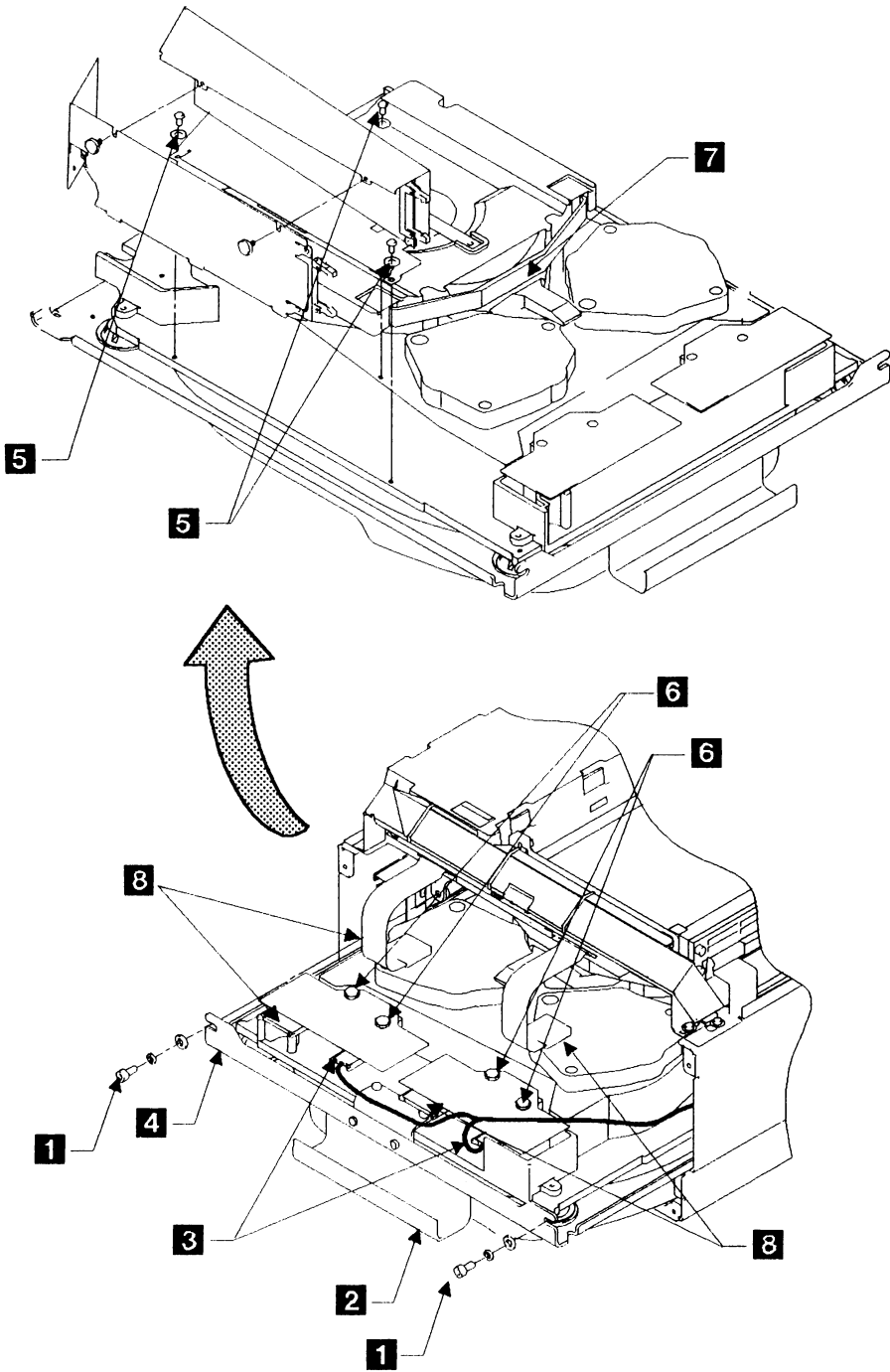


Figure 7-38. Removing the Disk Enclosure (3 of 4) for Model Bs with serial numbers before 57-B0000

---

## 15

### Remove ground strap.

Disconnect the remaining end of the ground strap that runs from the power tray to the disk enclosure, and retain this strap for reinstallation.

---

## 16

For Model Bs with serial numbers from 57-B0000 onward, remove the actuator-driver clip.

Unscrew the clip **1** for the actuator driver support. Retain this part to reinstall it on the new disk enclosure.

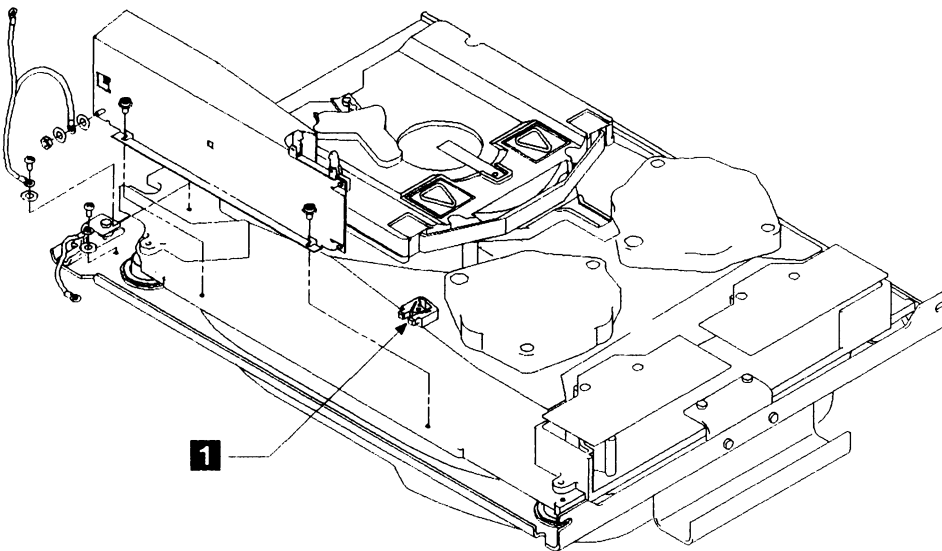


Figure 7-39. Removing the Disk Enclosure (4 of 4) for Model B with serial numbers from 57-B0000



## Installing the Disk Enclosure

---

### 1

Prepare the disk enclosure.

Attach the disk enclosure end of the ground strap from the rear of the power tray to the disk enclosure. Ensure that the star washer is between the ring washer and the disk enclosure.

On Model Bs with serial numbers before 57-B0000, attach the actuator 0 driver assembly **1** to the new disk enclosure with the three screws **2**.

On Model Bs with serial numbers from 57-B0000 onward, attach the actuator driver support clip to the new disk enclosure. (See **1** in Figure 7-39 on page 7-78.)

---

### 2

Install the read-detect cards.

Push the cards into the connectors on the disk enclosure.

Tighten the screws **3** into the cards.

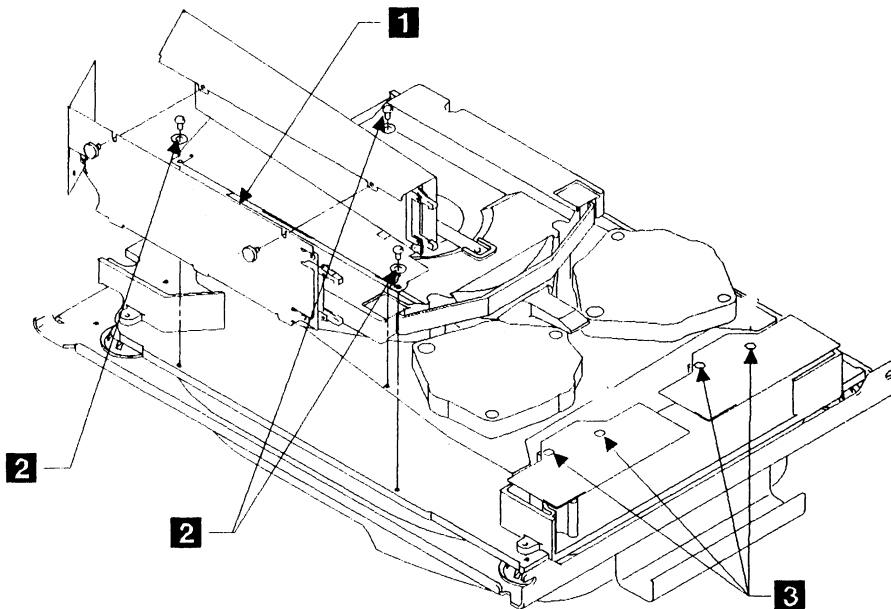


Figure 7-40. Installing the Disk Enclosure (1 of 4)

---

### 3

Go to the front of the unit, and install the disk enclosure.

#### CAUTION:

The disk enclosure weighs approximately 28 kg (62 lb). It may need two people to lift it out; observe the normal safety procedures.

**Warning:** For the next step, ensure that cables are not trapped by the disk enclosure.

Carefully slide the disk enclosure **4** as far as it will go into the drawer, checking at intervals that the cables are not trapped.

**Note:** There is one handle on the motor cover **5** and another at the front of the disk enclosure **2** for use during maintenance.

Insert and tighten the two screws **1** at the front of the disk enclosure mounting cradle.

Reach in through the front frame and connect the read-detect signal cable connectors **6** on the read-detect cards.

Connect the two read-detect power plugs **3** on the read-detect cards.

---

### 4

Install the front cover.

See page 7-12. Install in the reverse order of removal.

---

### 5

Go to the right-hand side of the machine (looking from the front) and reinstall the power regulator card.

Reinstall the power regulator card making sure that all plugs and cables are seated correctly. See "Installing the Power Regulator Card" on page 7-28.

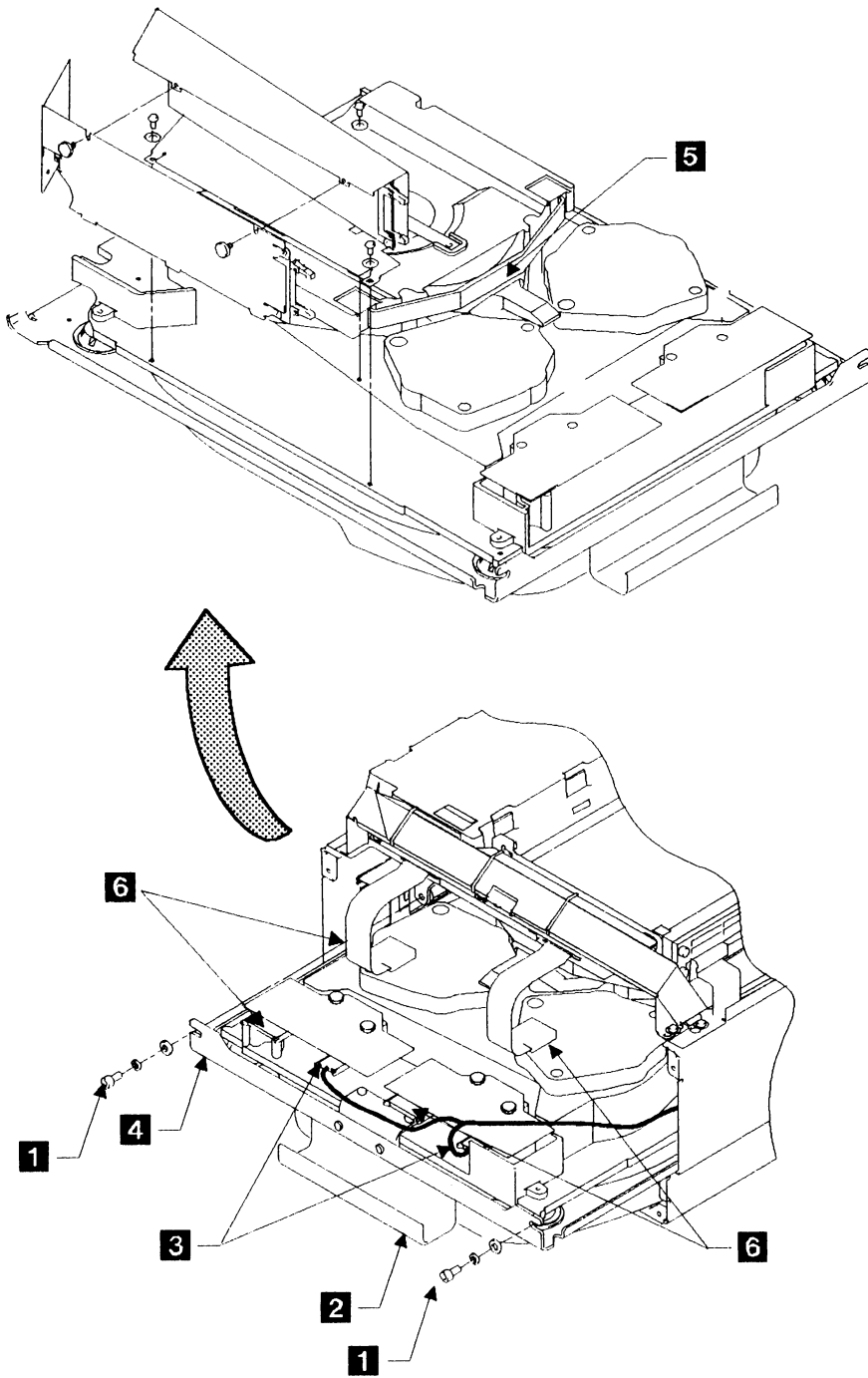


Figure 7-41. Installing the Disk Enclosure (2 of 4)

---

## 6

**Go to the left-hand side of the machine (looking from the front) and reinstall the actuator driver card.**

See pages 7-62 through 7-64.

For Model Bs with serial numbers from 57-B0000 onward:

1. Replug the signal cable on the actuator driver card.
2. Reinstall the ground lead on the actuator driver assembly.
3. Replug P23 and ensure the grommet is in place.
4. Reinstall the ground lead on the actuator driver assembly.
5. Reinstall the actuator driver card ensuring that it clips into the support clip.
6. Reinstall the actuator driver cover and reinstall the screws.

For Model Bs with serial numbers before 57-B0000:

1. Replug the two signal cables on the actuator driver cards.
2. Reinstall the ground lead on the actuator driver 1 assembly.
3. Replug P23 and P25 and ensure the grommet is in place.
4. Reinstall the actuator driver 1 card.
5. Reinstall the actuator driver cover and reinstall the thumb screws.

---

## 7

**Check cards and connectors.**

Pull the drawer out and check that all cards and connectors are seated correctly.

---

## 8

**Reinstall the ground strap between the rear of the power tray and the disk enclosure at the power tray end.**

Partially close the drawer and push the ground strap through the access hole below transformer T1.

---

## 9

**Install the top cover and insert unit fully into the rack.**

See page 7-10.

## 10

### Reconnect the disk enclosure cables.

Plug the cables to connectors J1 **1**, J4 **5**, J5 **4**, and J6 **2** on the back of the disk enclosure, ensuring that they are correctly latched. **Ensure that the star washer is between the cable tag (ring washer) and the frame.**

Replug the Power-on-hours meter connector **3**.

Connect the following ground straps, ensuring that the star washer is fitted:

- Disk enclosure cradle to frame (see Figure 8-1 on page 8-127)
- Green and yellow braid to power tray (see Figure 8-2 on page 8-128).

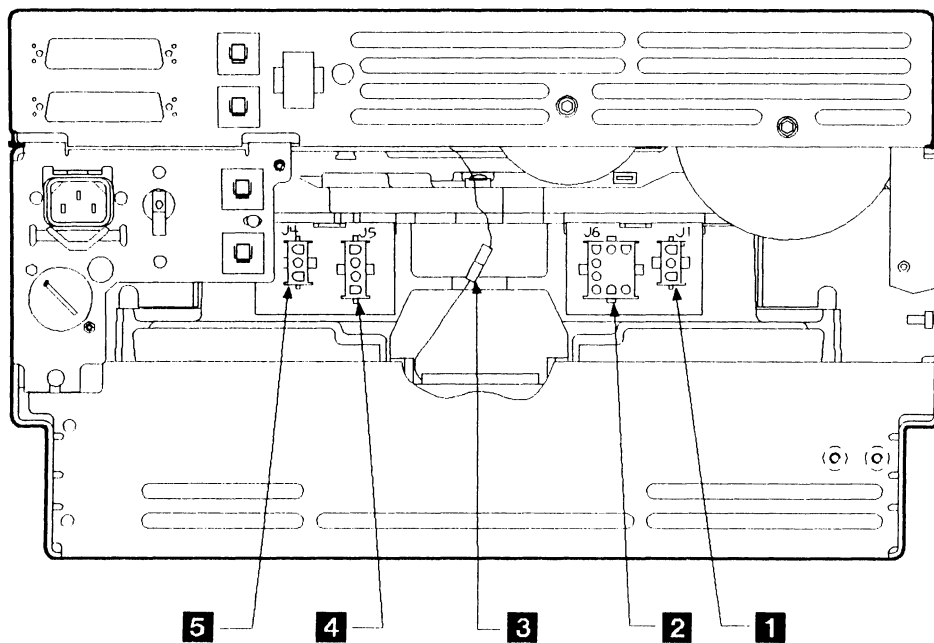


Figure 7-42. Installing the Disk Enclosure (3 of 4)

---

## 11

**Install the air vent.**

See page 7-14.

---

## 12

**Install the spindle lock lever.**

Install the spindle lock lever as a push fit.

---

## 13

**Unlock the disk.**

Move the spindle lock lever to the unlocked position.

---

## 14

**Install the front panel.**

Align the studs on the front panel **1** with spring clips **2** in the drawer and press on both ends of the panel until it clicks into position.

---

## 15

**Restore power to the drawer.**

See page 7-6.

---

## 16

**Test the new disk enclosure.**

Run the diagnostic test programs to test for correct operation.

Inform the support center, according to local procedures, when the replacement is complete and prepare the old disk enclosure for return. Use the packing material that came with the new disk enclosure for this.

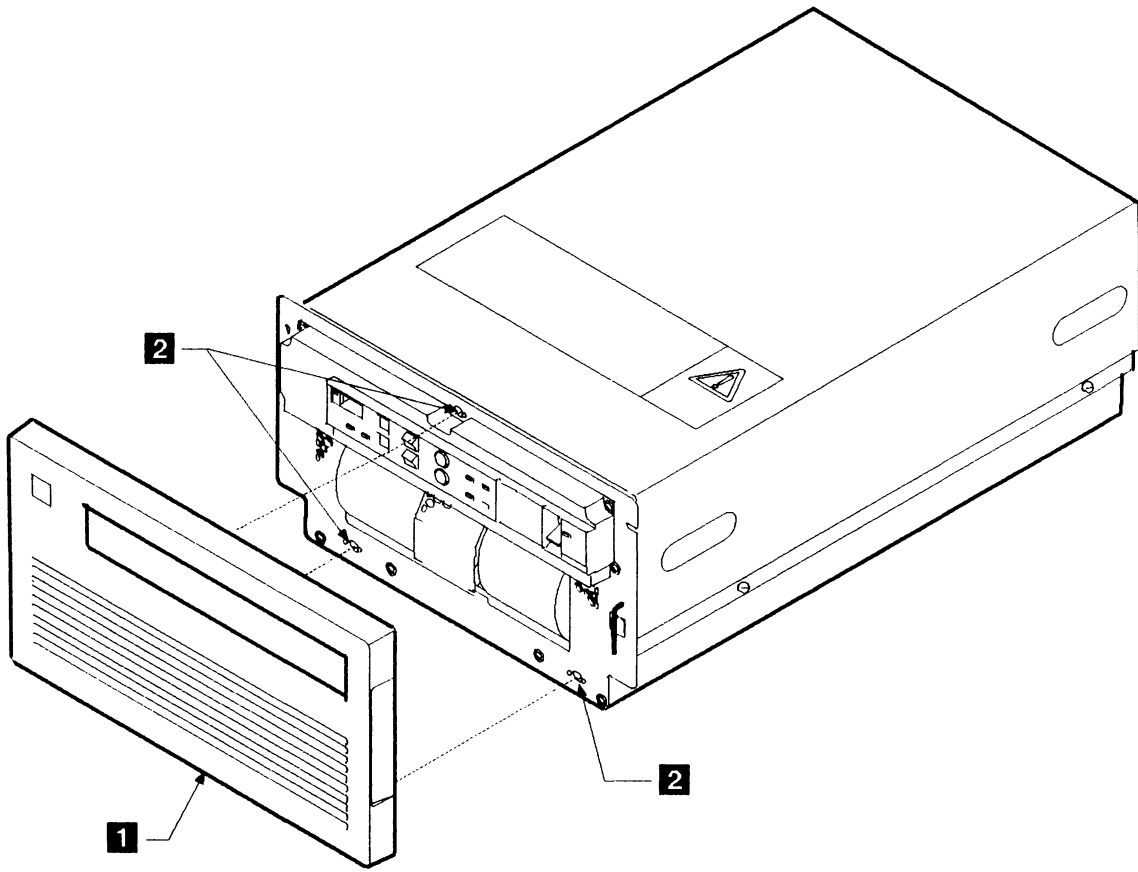


Figure 7-43. Installing the Disk Enclosure (4 of 4)

---

## Miscellaneous FRUs

### Removing the Power Switches and the Control Panel

---

<b>1</b>	
Remove power from the drawer.	See page 7-4.
<b>2</b>	
Remove the top cover.	See page 7-10.
<b>3</b>	
Remove the front cover.	<p>Disconnect the control panel cable <b>2</b> from 01A-A1C5, removing the cable ties and the cable from the cable run.</p> <p>Remove the four screws <b>5</b> from the front cover, and hang the cover on its two parking clips on the front casing.</p> <p>Disconnect P29 (if installed) from the top of the fan housing, or disconnect P30 (see <b>2</b> on Figure 7-5 on page 7-13) from the clip on the back of the fan housing or the side of the frame, and the two wires <b>3</b> from the back of the Power switch <b>6</b>.</p>
<b>4</b>	
Remove the control panel.	Remove the two screws <b>4</b> from the control panel <b>7</b> , and lift it up to release its tabs from the two slots in the front cover.
<b>5</b>	
Remove the switches.	<p>Move the control panel <b>7</b> away from the front cover, withdrawing the flat cable <b>2</b> through the slot <b>1</b> in the front cover.</p> <p>Remove the two screws that secure each power switch to the control panel and remove the switches.</p>
<b>6</b>	
Remove the control panel card.	Remove the two screws and lift out the control panel card <b>7</b> .



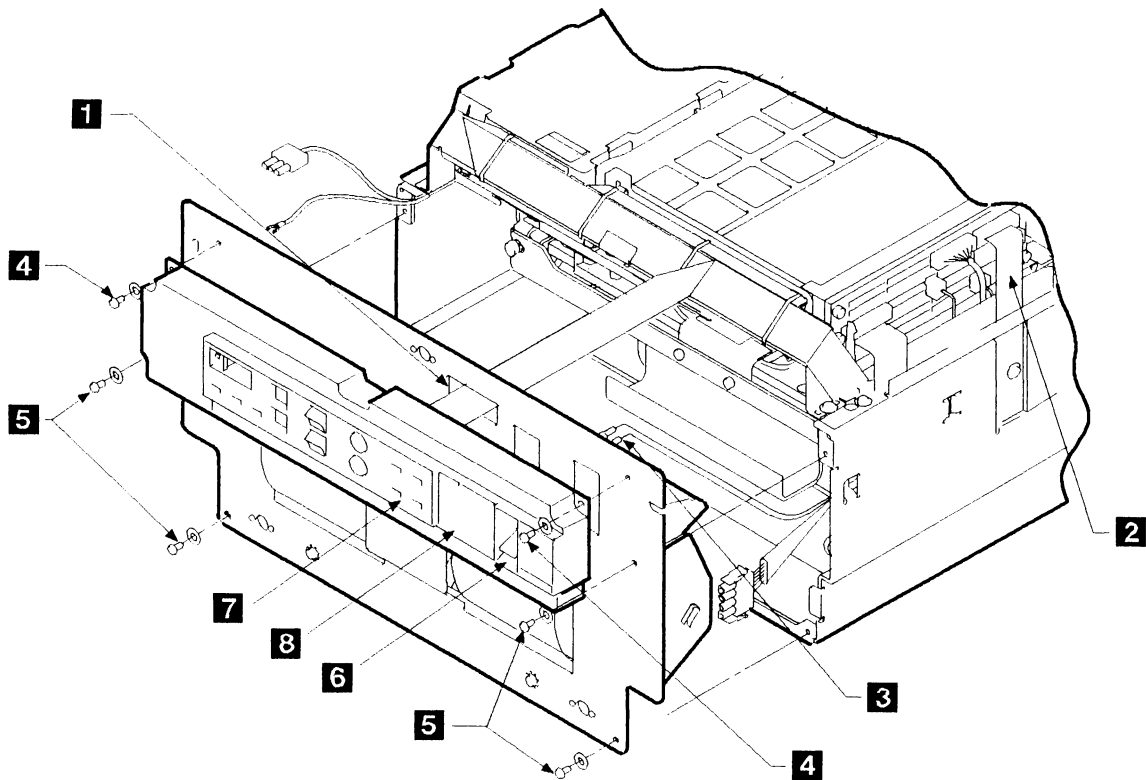


Figure 7-44. Removing and Installing the Power Switches and the Control Panel

## Installing the Power Switches and the Control Panel

### Install the switches.

Install the switches in the reverse order of removal. Note that each wire to the Power switch can be installed on either terminal.

Ensure that the Unit Emergency switch is set to Power Enable.

Reinstall the cover **8** on the Unit Emergency switch (if it was removed). Ensure that the switch is set to Power Enable before you do this.

### Install the control panel.

Installation is the reverse of removal.

When installing the control panel **7**, peel off the box serial number strip from the old panel and apply the strip to the new panel.

Restore power to the drawer (see page 7-6).

## Removing the Antistatic Brush

---

**1**

Remove power from the drawer.

See page 7-4.

---

**2**

Remove the top cover.

See page 7-10.

---

**3**

Raise the card gate.

Raise the card gate to its tilted position (see page 7-46).

---

**4**

Remove the antistatic brush.

There is a hole in the frame, under the gate, for access to the antistatic brush.

Hold back the transparent plastic guard.

The antistatic brush **1** is held by screw **2**. Remove the screw and lock washer, and lift out the antistatic brush.

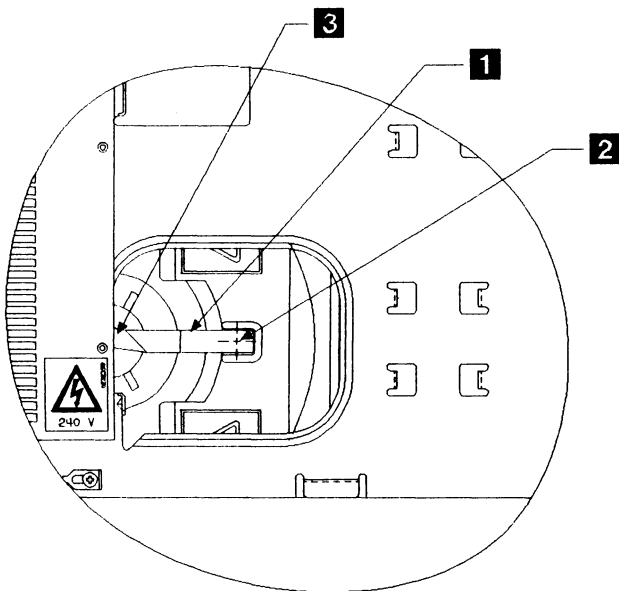


Figure 7-45. The Antistatic Brush

## Installing the Antistatic Brush

---

### 1

**Install the antistatic brush.**

Fasten the antistatic brush **1** to the disk enclosure with screw **2** and its associated lock washer. Ensure that the lock washer is in the correct position (on top of the spring).

Use a dental mirror to check that the brush touches the spindle at **3**.

Reinstall the transparent plastic guard.

**Warning:** Do not power up unless the plastic guard is in place.

---

### 2

**Reinstall the card gate.**

Put back the card gate in its home position (see page 7-46).

**Warning:** Ensure that all cables and connectors are seated before moving the gate.

---

### 3

**Install the top cover.**

See page 7-10.

---

### 4

**Restore power to the drawer.**

See page 7-6.

---

## Spindle Rotation Check

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Remove the top cover.**

See page 7-10.

---

**3**

**Raise the card gate.**

Raise the card gate to its tilted position (see page 7-46).

---

**4**

**Observe the direction of rotation.**

1. Power on the unit (see page 7-6).
2. Observe the direction of rotation through the motor cover.  
The spindle must rotate in the direction of the arrow **1** stamped on the motor cover (clockwise).
3. If the spindle rotates in the opposite direction, power off the unit and perform the actions described under URC 1216 in the *Guide to Unit Reference Codes*.

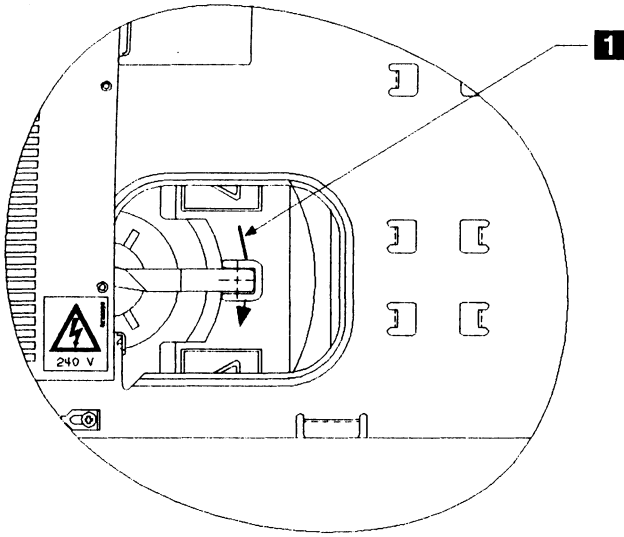


Figure 7-46. Spindle Rotation Check

## Removing the Slide Assemblies

**Note:** Each drawer in the rack has a right-hand and a left-hand slide. To remove them, the drawer has to be taken out of the rack.

---

**1**

**Remove power from the drawer.**

See page 7-4.

---

**2**

**Prepare to remove the slide assemblies.**

See the instructions in the Model B Slide-Replacement Bill of Material.

---

**3**

**Remove the slide assemblies.**

At the front of the rack, turn both thumb levers **2** inward and push the slides back into the rack.

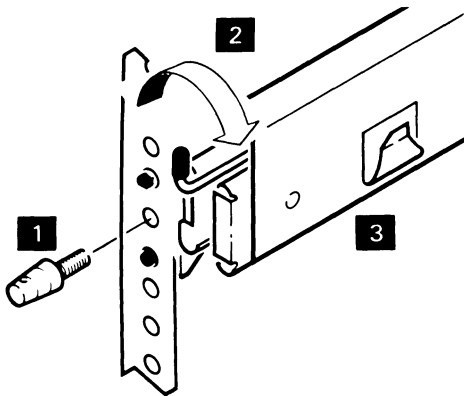
Make a note of the position of the slides **3** in the rack.

Remove the screws **1** at the front and the rear of the rack.

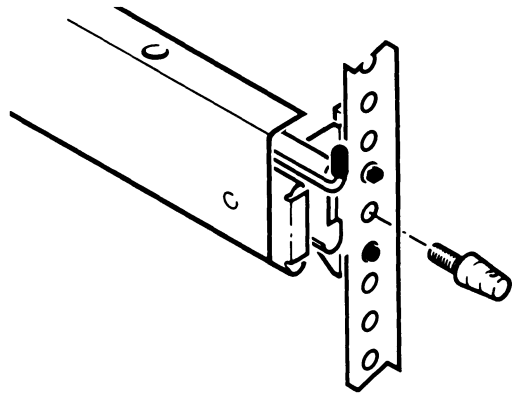
When removing the screws at right-rear, support the cable support carrier.

Save the shipping clamp **4**.

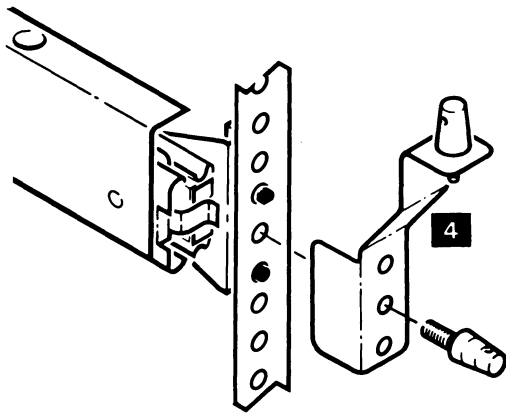
Remove the slide assemblies.



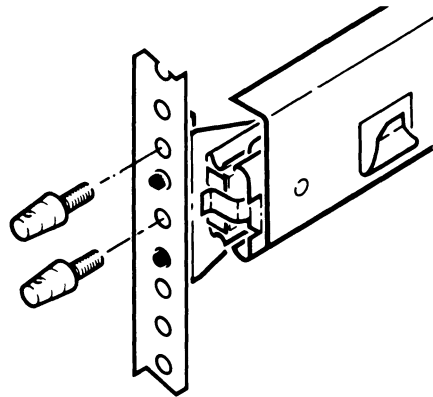
FRONT – LEFT



FRONT – RIGHT



REAR – LEFT



REAR – RIGHT

Figure 7-47. Removing the Slide Assemblies

## Installing the Slide Assemblies

---

### 1

**Install the slide assemblies.**

Place the slide assemblies **3** in the rack, ensuring that the pins are in the correct holes.

Insert the screws **1** that hold the slides to the rack. Do not fully tighten them. (Include the cable support carrier at right-rear and the shipping clamp **4** at left-rear.)

---

### 2

**Install the drawer.**

See the instructions in the Model B Slide-Replacement Bill of Material.

Tighten the screws **1** that hold the slides to the rack.

---

### 3

**Install the front panel.**

See page 7-13.

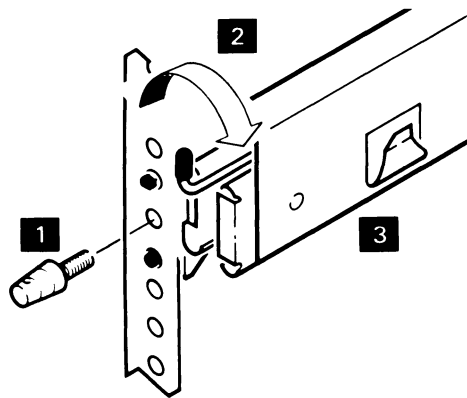
---

### 4

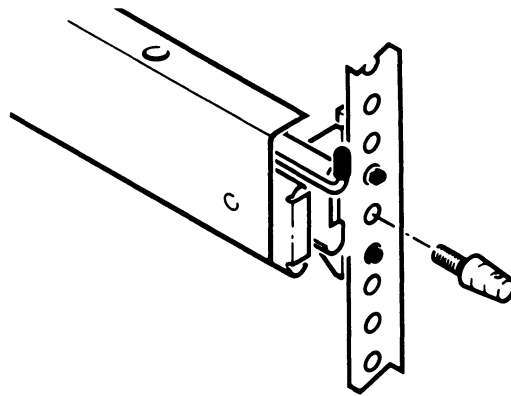
**Restore power to the drawer.**

See page 7-6.

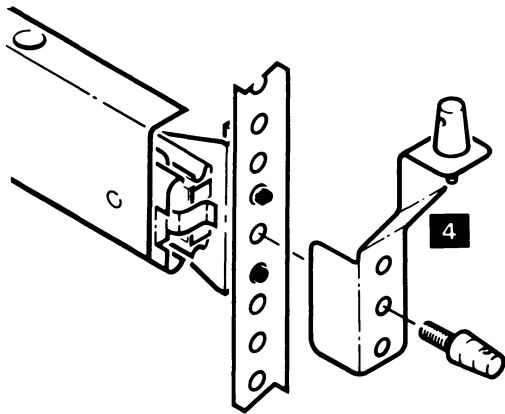




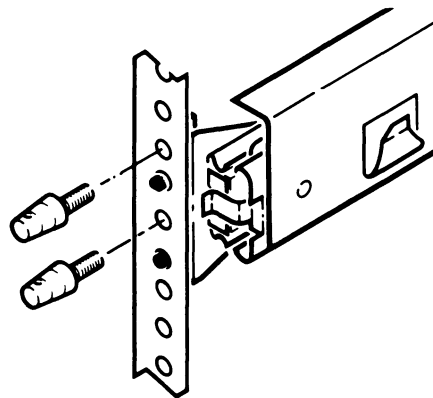
FRONT – LEFT



FRONT – RIGHT



REAR – LEFT



REAR – RIGHT

Figure 7-48. Installing the Slide Assemblies

## Removing the Cable Support Carrier

---

### 1

Remove power from the drawer.

See page 7-4.

---

### 2

Remove the cables from the cable support carrier.

Release the shipping clamp (if not as shown) by loosening the screws **5** and sliding the bar to the left.

Remove the screw **3** that holds the cable support carrier to the rack.

Pull the cable support carrier **2** out to its full extent.

Undo the four cable clips **1** and remove the cables.

Close the clips.

---

### 3

Remove the cable support carrier.

Remove the hinge pin **4** that holds the cable-support carrier to the back of the Model B.

Remove the cable support carrier from the rack.

---

## Installing the Cable Support Carrier

---

Install the cable support carrier.

Install the cable-support carrier and cables in the reverse order of the removal instructions.

Restore power to the drawer (see page 7-6).

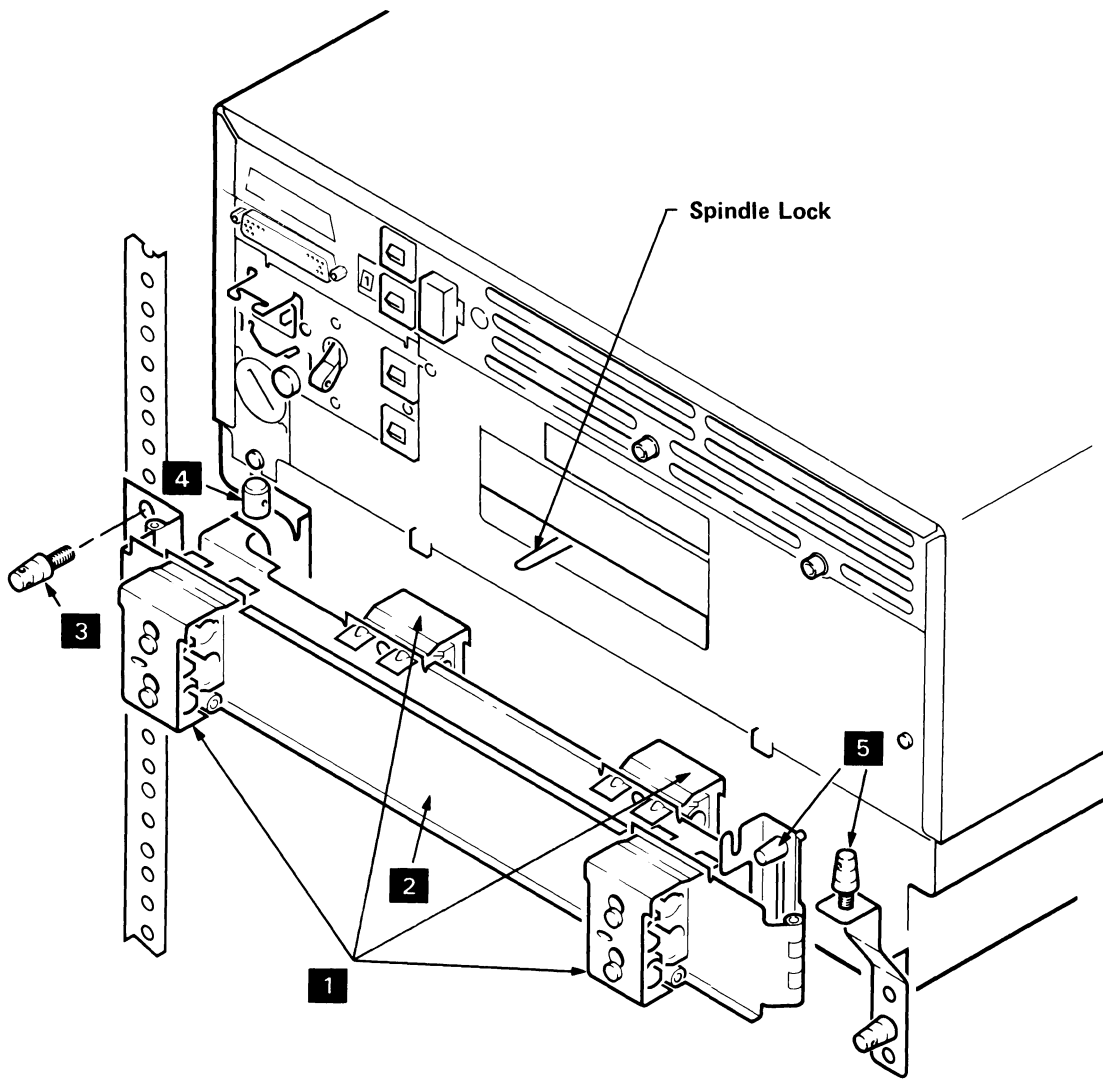


Figure 7-49. Cable Support Carrier

---

## Internal and External Cables

### Removing the Internal and External Cables

---

Remove the internal and external cables.

A list of the internal and external cables is given here for reference. The figure opposite shows their locations. Remove the top cover, front panel, and air vent as required for access to the internal cables.

- The ac internal distribution cable **1**
- The dc internal distribution cable assemblies **2**:
  - Cable to the power regulator
  - Cable to the read-detect cards and the logic board.
- Read detect logic cable 0 to logic board 01A-A1A8 **3**
- Read detect logic cable 1 to logic board 01A-A1A4 **4**
- Actuator driver logic cable 0 to logic board 01A-A1B8 **5**
- Actuator driver logic cable 1 to logic board 01A-A1B4 **6**.  
(This cable is not required on Model Bs with serial numbers from 57-B0000 onward.)

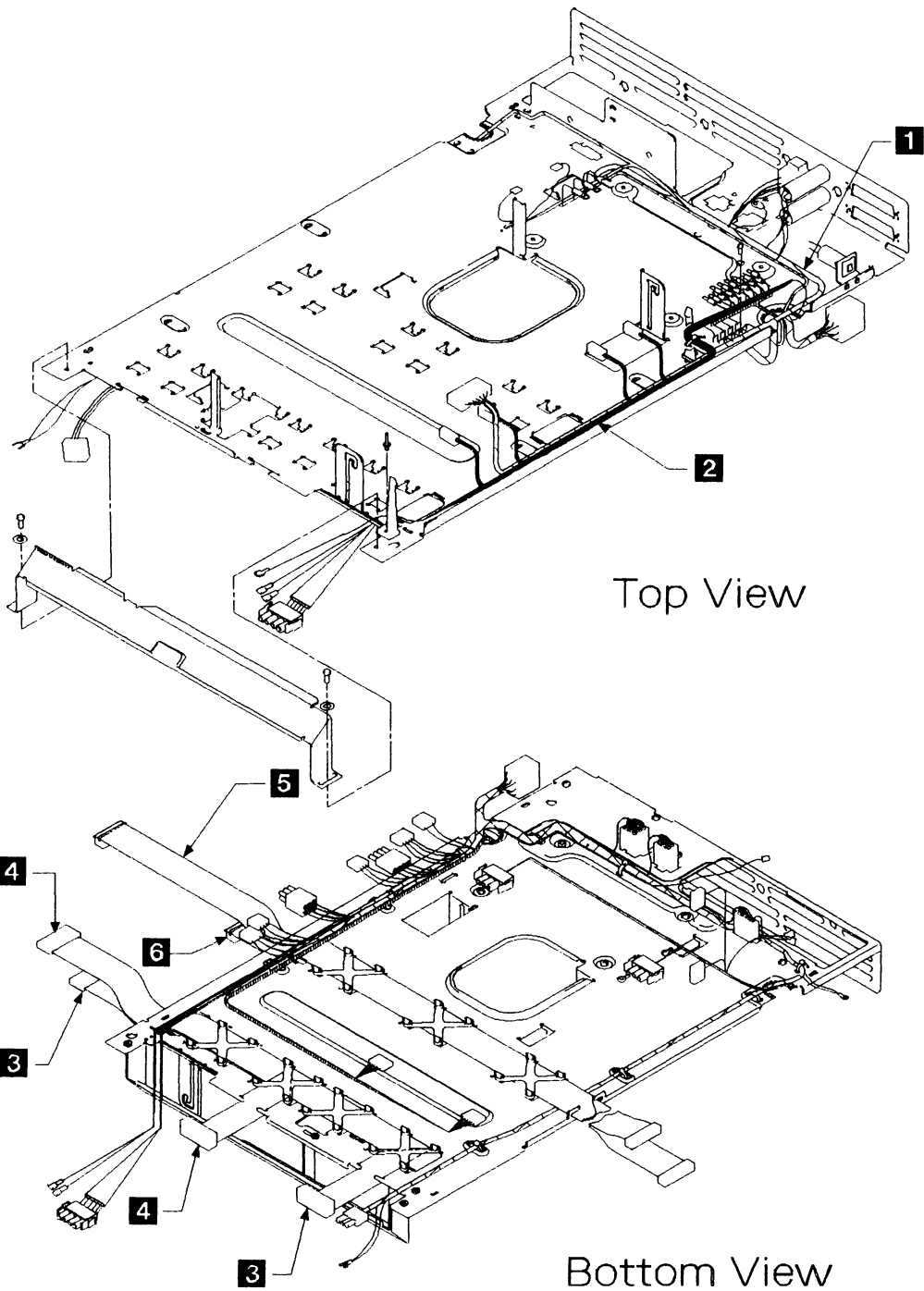


Figure 7-50. Internal Cable Assemblies (Model Bs with serial numbers before 57-B0000)

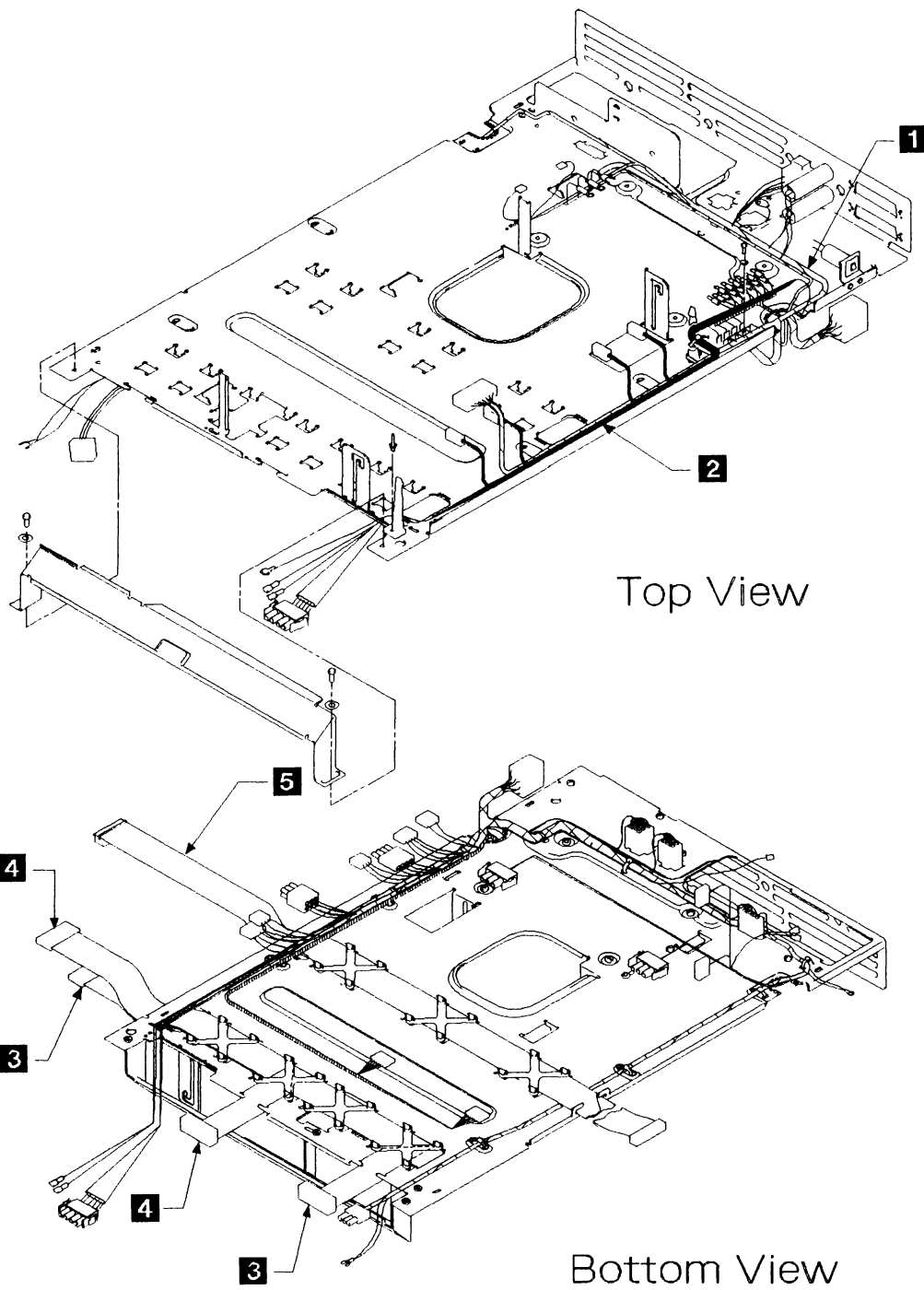


Figure 7-51. Internal Cable Assemblies (Model Bs with serial numbers from 57-B0000 onward)

---

## Chapter 8. Model B Power and Grounding

Problem Isolation Procedure B1	8-3
Problem Isolation Entry Point A	8-3
Problem Isolation Entry Point B	8-7
Problem Isolation Procedure B2	8-20
Problem Isolation Entry Point C	8-20
Problem Isolation Procedure B3	8-26
Problem Isolation Entry Point D	8-26
Problem Isolation Entry Point E	8-27
Problem Isolation Entry Point F	8-34
Problem Isolation Entry Point G	8-38
Problem Isolation Entry Point H	8-40
Problem Isolation Procedure B4	8-42
Problem Isolation Entry Point J	8-42
Problem Isolation Entry Point K	8-44
Problem Isolation Entry Point L	8-55
Problem Isolation Entry Point M	8-61
Problem Isolation Entry Point N	8-62
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Problem Isolation Entry Point T	8-96
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Problem Isolation Entry Point V	8-103
Problem Isolation Entry Point W	8-108
Problem Isolation Entry Point X	8-113
Problem Isolation Entry Point Y	8-115
Problem Isolation Entry Point Z	8-117
Cleanup and Repair Verification	8-121
Model B Grounding	8-126
Electrical Grounding Checks	8-126
Power Distribution	8-132

This chapter contains power servicing details for the IBM 9335 Model B Direct-Access Storage Subsystem.

The contents are:

- Problem isolation procedures for the power supplies

**Problem Isolation Procedure B1**

This is a visual inspection procedure. The device is unavailable with the motor stopped. The procedure examines the LEDs and the status of the CBs.

**Problem Isolation Procedure B2**

This is a visual inspection procedure. It is used when a visual symptom is observed, but a URC is not available and the diagnostics do not fail.

**Problem Isolation Procedure B3**

This is a manual intervention procedure. It presents an analysis of motor failure.

**Problem Isolation Procedure B4**

This is a manual intervention procedure. It presents an analysis of power failure.

- Power distribution diagrams (to supplement the problem isolation procedures when fault-finding).
- Electrical grounding checks, see Chapter 10.
- Grounding diagrams.



---

## Problem Isolation Procedure B1

### Problem Isolation Entry Point A

Other Isolation Entry Points in B1	Page
Problem Isolation Entry Point B	8-7

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

#### 1

Because there is a problem with a Model B, you are here from one of the following:

- Step 2 on page 1-6
- Step 4 on page 1-7
- Step 7 on page 1-9
- URC 1185

1. Set the Power switch (on the front panel) to Delayed Off, and wait 1 minute for the motor to stop.
2. Ensure that the spindle lock on the back panel (see Figure 9-12 on page 9-12) is set to the unlocked position by pushing it down slightly and to the right.

Go to step 2.

Follow the instructions on the right.

---

#### 2

Is the thermal check light on (not flashing)?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2027.

---

#### 3

Have any of the circuit breakers (CB1, CB2, CB3, CB4, or CB5) on the back panel tripped?

NO

YES



Follow the instructions on the right.

If CB1 or CB2 has tripped, go to “Problem Isolation Entry Point B” on page 8-7.

If CB3 has tripped, go to “Problem Isolation Entry Point L” on page 8-55.

If CB4 is installed and has tripped, go to “Problem Isolation Entry Point E” on page 8-27.

If CB5 has tripped, go to “Problem Isolation Entry Point Q” on page 8-77.

---

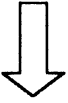
**4**

**Is the reference display showing '0'?**

If the display is blank, go to step 15. Otherwise, go to step 26.

**YES**

**NO**



Follow the instructions on the right.

---

**5**

**Set the Power switch (on the front panel) to On.**

Wait 2 minutes, then go to step 6.

**Are the Power On and Power Ready lights staying on?**

**NO**

**YES**



Follow the instructions on the right.

**Go to "Problem Isolation Entry Point B" on page 8-7.**

---

**6**

**Are both Devices 0 and 1 Ready lights on?**

**NO**

**YES**



Go to step 9.

---

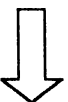
**7**

**Is one Device Ready light on?**

Run diagnostic test program 10 to device 0 on the failing unit. Then go to the *Guide to Unit Reference Codes* and perform the actions necessary for the URC that results from the diagnostic test program.

**YES**

**NO**



Follow the instructions on the right.

---

## 8

**Run diagnostic test program 10 to the device that has the Ready light off.**

**Follow the instructions on the right.**

If the diagnostics run without error, but the device Ready light is not on, go to "Problem Isolation Entry Point C" on page 8-20. Otherwise, go to the *Guide to Unit Reference Codes* and perform the actions necessary for the URC that results from the diagnostic test program.

---

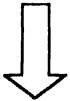
## 9

**You are here from step 6.**

**Run diagnostic test program 10 to devices 0 and 1.**

**Does the diagnostic test program run error-free on both devices?**

YES      NO



Follow the instructions on the right.

---

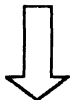
Make a note of the URC, then go to the *Guide to Unit Reference Codes* and perform the actions appropriate to the URC. Use the URC for device 0 if both devices have failed.

---

## 10

**Did the IBM 9335 Model B fail to come ready when it was powered on remotely from a rack, but came ready when powered on locally?**

YES      NO



Follow the instructions on the right.

---

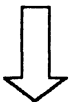
This is probably an intermittent fault. Retry the customer's job.

---

## 11

**Are the Model B power cable and power sequence cable plugged securely into the same numbered "R" and "J" outlet sockets on the rack Power Control Compartment (PCC)?**

YES      NO



Follow the instructions on the right.

---

Reconnect the power and power-sequence cables to their correct positions in the rack PCC.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 12

Go to the rack *Guide to Analyzing Problems* manual, see  
**Chapter 2, “Associated Publications”**  
on page 2-1.

## Problem Isolation Entry Point B

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 13

You are here from one of the following:

- Step 3.
- Step 5.
- Step 62 because the Model B is not available and the motor is not running when power is on.
- A URC action.

Go to step 14.

---

### 14

Are all the lights on the front panel off, and is the reference display blank?



YES

Follow the instructions on the right.

Set the Power switch (on the front panel) to Delayed Off.

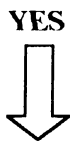
Go to step 15.

---

### 15

You are here from step 4 or step 14.

Is light L1 (on the back panel) on?



NO

Follow the instructions on the right.

URC 2000. Ensure that the mainline power cable is correctly attached to the Model B.

If it is, go to the rack problem isolation procedures (in the using system service guide).

---

Go to step 17.

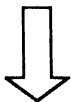
---

## 16

You are here from step 14.

Is the power reference display blank?

YES      NO



Go to step 26.

Go to step 41.

---

## 17

You are here from step 15.

Has circuit breaker CB1 (on the back panel) tripped?

NO      YES



Go to step 58.

---

## 18

You are here from step 17 or step 44.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2003.

Has CB2 tripped?

NO      YES



Follow the instructions on the right.

---

## 19

Has CB5 tripped?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2002.

NO      YES



Follow the instructions on the right.

---

## 20

You are here from step 19 or from step 113 on page 8-80.

Switch CB1 (on the back panel) off and then on again.

Does the reference display show 0?

NO

YES



Go to step 24.

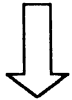
---

## 21

Is the power reference display blank?

YES

NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2001.

---

## 22

| If the Unit Emergency switch (on the front panel) is installed and is uncovered, is the switch set to Power Enable? (If it is covered or is not installed, take the YES leg.)

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2002.

---

## 23

| The Unit Emergency switch is not set to Power Enable.

| Follow the instructions on the right.

Set the Unit Emergency switch to Power Enable.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 24

You are here from step 20.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2006.

Is the Power On light on?

NO

YES



Follow the instructions on the right.

---

## 25

Set the Power switch (on the front panel) to On, if it is not already on.

Is the power reference display blank?

NO

YES



Go to step 41.

---

## 26

You are here from step 4 or step 16.

Does "F" appear on the power reference display?

NO

YES



Go to step 49.

---

## 27

You are here from step 26 or step 48

Does "0" appear on the power reference display?

NO

YES



Go to step 54.



---

## 28

Does “5” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2016.

---

## 29

Does “D” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2015.

---

## 30

Does “4” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2014.

---

## 31

Does “1” appear on the power reference display?

NO

YES



Follow the instructions on the right.

1. Set the Power switch to Delayed Off (if it is not already off).
2. Switch CB1 (on the back panel) to off then on again.
3. Switch the Power switch to On.
4. If both device 0 and device 1 come Ready after two minutes, run diagnostic test 10 to both devices. If test 10 runs without error, the fault may have been caused by an external power line disturbance. Retry the customer's job. If the fault occurs again, call your local support group for help.
5. Otherwise, if both device 0 and device 1 do not come ready, and the reference display again shows a 1 after step 3, go to *Guide to Unit Reference Codes* and perform the actions for URC 2013.

---

## 32

Does “3” appear on the power reference display?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2012.

NO

YES



Follow the instructions on the right.

---

## 33

Does “9” appear on the power reference display?

NO

YES



Go to step 47.

---

## 34

Does “B” appear on the power reference display?

NO

YES



Go to step 45.

---

## 35

Does “C” or “E” appear on the power reference display?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2009.

NO

YES



Follow the instructions on the right.

---

## 36

Does “A” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2008.

---

## 37

Does “2” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2007.

---

## 38

Does “7” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2005.

---

## 39

Does “8” appear on the power reference display?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2020.

---

## 40

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2028.

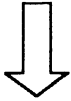
---

## 41

You are here from step 16 or step 25.

Is the Power On light on?

YES      NO



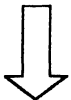
Go to step 43.

---

## 42

Is the Power Ready light on?

YES      NO



Follow the instructions on the right.

Go to step 50.

---

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2021.

---

## 43

You are here from step 41.

Has CB1 tripped?

NO      YES



Follow the instructions on the right.

---

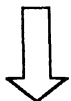
Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2019.

---

## 44

Has CB2 tripped? (The toggle shows a white top if it has tripped.)

YES      NO



Follow the instructions on the right.

Go back to step 18.

---

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2018.

---

## 45

You are here from step 34 because “B” appears on the power reference display.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off and then on again.
3. Set the Power switch to On.

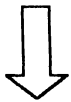
Go to step 46.

---

## 46

Does “F” appear on the power reference display?

YES      NO



Follow the instructions on the right.

Go to step 49.

---

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2010.

---

## 47

You are here from step 33 because “9” appears in the power reference display.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off and then on again.
3. Set the Power switch to On.

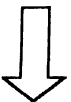
Go to step 48.

---

## 48

Does “F” appear on the power reference display?

YES      NO



Follow the instructions on the right.

If “9” still appears on the reference display, go to the *Guide to Unit Reference Codes* and perform the actions for URC 2011; otherwise, go back to step 27.

---

## 49

You are here from step 26, step 46, or step 48 because “F” appears on the power reference display.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2017.

---

---

## 50

You are here from step 42.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2023.

Is the Motor Check light On?

NO

YES



Follow the instructions on the right.

---

## 51

Wait 2 minutes.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2022.

Are both Device Ready lights on?

NO

YES



Follow the instructions on the right.

---

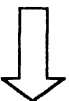
## 52

Is this the first time you have reached this step?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2024.

YES

NO



Follow the instructions on the right.

---

## 53

This is the first time that you have reached this step.

The fault may have corrected itself.

Follow the instructions on the right.

Run diagnostic test program 10 to the faulty device, make a note of the resulting URC, then go to the *Guide to Unit Reference Codes*, and perform the appropriate actions for that URC.

---

## 54

You are here from step 27.

Is the Thermal Check light on?

NO

YES



Go to step 57.

---

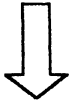
## 55

Is the Power On light on or flashing on and off?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2025.

YES

NO



Follow the instructions on the right.

---

## 56

The Power On light is on, or is flashing on and off.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2026.

Follow the instructions on the right.

---

## 57

You are here from step 54 because the Thermal Check light is on.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2027.

Follow the instructions on the right.

---

## 58

You are here from step 17 because CB1 has tripped.

Reset CB1.

Does it trip immediately?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2004.

---

## 59

Set the Power switch (on the front panel) to On.

Is the Power On light on?

NO

YES



Follow the instructions on the right.

Wait 2 minutes for the motor to start, then run diagnostic test program 10 to device 0.

Go to step 60.

Go to step 62.

---

## 60

Does the diagnostic test program give a URC?

NO

YES



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes*, and perform the actions for the URC that is displayed.

---

## 61

The diagnostic test program does not fail.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2019.



---

## 62

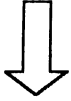
You are here from step 59.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2019.

Is CB1 still set to on?

YES

NO



Follow the instructions on the right.

Go back to step 13.

---

## Problem Isolation Procedure B2

### Problem Isolation Entry Point C

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

**1**

You are here because a symptom is seen but there is no URC and the diagnostics do not fail.

1. Set the Power switch (on the front panel) to Delayed Off. Wait 1 minute for the motor to stop.
2. Switch CB1 (on the back panel) to off, then to on again.

Follow the instructions on the right.

Go to step 2.

---

**2**

Is "0" displayed on the power reference display?

NO

YES



Go to step 6.

---

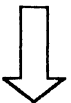
**3**

Is the power reference display blank?

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2201.

YES

NO



Follow the instructions on the right.

---

**4**

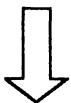
Set the Power switch (on the front panel) to On.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2202.

Is the Power Ready light on?

YES

NO



Follow the instructions on the right.

---

## 5

The Power Ready light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2203.

---

## 6

You are here from step 2.

Is the Device 0 Ready light on or flashing?

NO YES



Go to step 24.

---

## 7

Is the Device 1 Ready light on or flashing?

NO YES



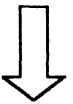
Go to step 23.

---

## 8

Is the Power on, Motor Check, or Thermal Check light on?

YES NO



Follow the instructions on the right.

Go to step 22.

Set the Power switch (on the front panel) to On.

If your IBM 9335 serial number is from 57-B0000 onward, go to step 9. Otherwise, go to step 10.

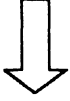
---

## 9

**Does the Motor Check light come on for 1 second, then go off again?**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2204.

YES      NO



Follow the instructions on the right.

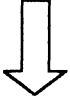
---

## 10

**Is the Power On light on?**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2204.

YES      NO



Follow the instructions on the right.

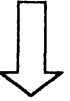
---

## 11

**Is the Power Ready light on?**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2208.

YES      NO



Follow the instructions on the right.

---

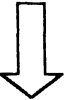
## 12

**Are the Device 0 Ready and Device 1 Ready lights on 2 minutes after the Power switch is operated?**

Run diagnostic test program 10 to devices 0 and 1.

Go to step 13.

YES      NO



Follow the instructions on the right.

**Go to step 16.**

---

## 13

**Does diagnostic test program 10 stop with an error?**

Go to the *Guide to Unit Reference Codes*, and take the appropriate actions for the URC displayed.

**NO**

**YES**



Follow the instructions on the right.

---

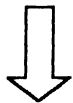
## 14

**Are the Device 0 Ready and the Device 1 Ready lights on?**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2209.

**YES**

**NO**



Follow the instructions on the right.

---

## 15

**Device 0 Ready and Device 1 Ready lights are on.**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2220.

**Follow the instructions on the right.**

---

## 16

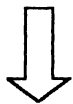
**You are here from step 12.**

Synchronize device 0 again by pressing the yellow device 0 attention switch. Then go to step 17.

**Is the Motor Check light on?**

**YES**

**NO**



Follow the instructions on the right.

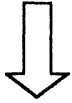
**Go to step 21.**

---

## 17

**Does the Device 0 Ready light go off for 3 seconds, and then come on again?**

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2211.

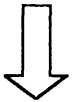
---

## 18

**Synchronize Device 1 again by pressing the yellow Device 1 Attention button.**

**Does the Device 1 Ready light go off for 3 seconds, and then come on again?**

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2212.

---

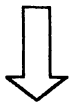
## 19

**Set the Power switch (on the front panel) to Delayed Off.**

**Wait 40 seconds.**

**Does the power reference display show "0" with the power on and power ready lights off?**

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2218.

---

## 20

**The power reference display shows "0." Follow the instructions on the right.**

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2217.

---

## 21

You are here from step 16 because the Motor Check light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2215.

---

## 22

You are here from step 8 because the Power On, Motor Check, or Thermal Check light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2207.

---

## 23

You are here from step 7 because the Device 1 Ready light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2205.

---

## 24

You are here from step 6 because the Device 0 Ready light is on.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and perform the actions for URC 2205.

---

## Problem Isolation Procedure B3

### Problem Isolation Entry Point D

Other Isolation Entry Points in B3	Page
Problem Isolation Entry Point E	8-27
Problem Isolation Entry Point F	8-34
Problem Isolation Entry Point G	8-38
Problem Isolation Entry Point H	8-40

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

#### 1

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 1125. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off, and CB1 (on the back panel) to off.

#### DANGER

**Where a hazardous voltage label is shown, mainline ac voltage is present on the components within covers until the mainline power cable is removed.**

2. Disconnect plug P5 (see Figure 9-4 on page 9-5) and measure the resistance of the sense winding between pins J5-1 and J5-2.

Go to step 2.

---

#### 2

Is the resistance less than 5 ohms?

YES      NO



Follow the instructions on the right.

The sense winding is either open circuit or high resistance.

Exchange, for a new one, the motor stator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

#### 3

There is a motor control fault.

Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.



## Problem Isolation Entry Point E

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 4

You are here from step 3 on page 8-3 or from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 112D and URC 2224.

Set the Power switch (on the front panel) to Delayed Off, and CB1 (on the back panel) to off.

#### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

Go to step 5.

---

### 5

Has CB4 tripped? (See Figure 9-4 on page 9-5; a white top shows if it has tripped.)

If CB4 is not installed, take the NO leg.

NO



YES

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1
2. Motor driver assembly 01A-C1A1
3. The ac power box assembly
4. Cable assembly ac supply.

Go to "Cleanup and Repair Verification" on page 8-121.

---

### 6

CB4 has not tripped or is not installed.

Follow the instructions on the right.

Take these actions:

1. Pull out the drawer and remove the top cover.
2. Switch CB1 (on the back panel) to on.
3. Observe if the motor driver dc indicator inside the motor driver assembly 01A-C1A1 goes on within 8 seconds when the Power switch is set to On. See Figure 9-3 on page 9-4.
4. Set the Power switch (on the front panel) to On.

Go to step 7.

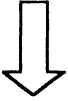
---

## 7

**Does the indicator go on within 8 seconds of switching power on?**

**YES**

**NO**



Follow the instructions on the right.

Go to step 10.

1. Set the Power switch (on the front panel) to Delayed Off, and CB1 (on the back panel) to off.

### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

2. Go to the card-gate 01A-A1, then:
  - a. Remove the power control card 01A-A1C5 and connect jumpers **on the card side** between pins J06 and D08, and pins J07 and J08.
  - b. Switch CB1 to on.
  - c. Observe the indicator inside the motor driver assembly 01A-C1A1. (See Figure 9-3 on page 9-4.)

Go to step 8.

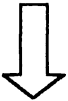
---

## 8

**Is the indicator on?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1.
2. Cable assembly ac supply.
3. The dc cable to the power regulator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 9

**The indicator is on.**

**Follow the instructions on the right.**

1. Switch CB1 (on the back panel) to off.
2. Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 10

You are here from step 7 because the indicator is on within 8 seconds of switching power on.

Follow the instructions on the right.

Take these actions:

1. Measure that the ac voltage between pad 8 (line) and pad 7 (neutral) on the motor driver assembly 01A-C1A1, is within the range 180 V to 260 V within 8 seconds of switching on. (Refer to Figure 9-3 on page 9-4.)
2. Set the Power switch (on the front panel) to Delayed Off and then to On again.

Go to step 11.

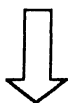
---

## 11

Is the voltage between 180 V and 260 V within 8 seconds of switching on?

YES

NO



Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Disconnect plug P9 (see Figure 9-7 on page 9-8).
3. Set the Power switch to On.
4. Measure the ac voltage between pins 4 and 3 (neutral) on socket J9 (see Figure 9-7 on page 9-8).

Go to step 12.

---

Go to step 16.

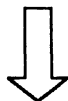
---

## 12

Is the voltage between 180 V and 260 V within 8 seconds of switching on?

YES

NO



Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

3. Disconnect plug P18 from the power regulator (see Figure 9-9 on page 9-10).
4. Switch CB1 to on.
5. Measure the ac voltage between pins 6 and 2 (neutral) of plug P18.

Go to step 13.

---

Go to step 15.

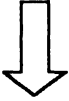
---

---

## 13

Is the voltage between 180 V and 260 V?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The ac power box
2. The ac cable.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 14

The voltage is between 180 V and 260 V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1.
2. The ac cable.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 15

You are here from step 12 because the voltage is between 180 V and 260 V.

Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 16

You are here from step 11 because the voltage is between 180 V and 260 V.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off, and CB1 (on the back panel) to off.

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

2. Remove the main line power cable before continuing. See "Powering Off" on page 7-4.
3. Measure the resistance of the start windings of the motor driver across pads 11 and 12 and across pads 13 and 14.

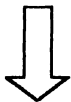
Go to step 17.

---

## 17

**Is the resistance between 8 ohms and 9 ohms for both readings?**

**YES**      **NO**



Follow the instructions on the right.

**Go to step 20.**

1. Remove the air vent and disconnect plug P6. (See Figure 9-4 on page 9-5.)
2. Measure the resistance of the start windings on socket J6 between pins 3 and 6, and 9 and 12. (See Figure 9-4.)

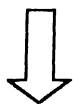
Go to step 18.

---

## 18

**Is the resistance between 8 ohms and 9 ohms for both readings?**

**YES**      **NO**



Follow the instructions on the right.

Exchange, for a new one, the motor stator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 19

**The resistance is between 8 ohms and 9 ohms for both readings.**

**Follow the instructions on the right.**

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 20

**You are here from step 17 because the resistance is between 8 ohms and 9 ohms for both readings.**

**Follow the instructions on the right.**

Measure the resistance of the thermal sensor on the motor driver between pads 9 and 10.

Go to step 21.

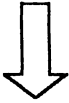
---

## 21

Is the resistance more than 1 ohm?

YES

NO



Follow the instructions on the right.

Go to step 24.

1. Disconnect motor plug P5 (see Figure 9-4 on page 9-5).
2. Install the main line power cable and switch CB1 (on the back panel) to on.
3. Set the Power switch (on the front panel) to On.
4. Wait 2 minutes and then run diagnostic test program 10 to device 0.

Go to step 22.

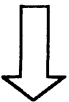
---

## 22

Does diagnostic test program 10 fail with URC 1125?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 23

Diagnostic test program 10 fails with URC 1125.

Follow the instructions on the right.

Exchange, for a new one, the motor stator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 24

You are here from step 21 because the resistance is more than 1 ohm.

Follow the instructions on the right.

Take these actions:

1. Remove the air vent and disconnect motor plug P6 (see Figure 9-4 on page 9-5 and Figure 9-12 on page 9-12).
2. Measure the resistance of the thermal sensor between pins 10 and 11 on J6.

Go to step 25.

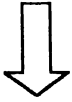
---

## 25

**Is the resistance more than 1 ohm?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 26

**The resistance is more than 1 ohm.**

Exchange, for a new one, the motor stator.

**Follow the instructions on the right.**

Go to “Cleanup and Repair Verification” on page 8-121.

## Problem Isolation Entry Point F

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

**27**

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 112E. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off, and CB1 (on the back panel) to off.

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

2. Pull out the drawer and remove the top cover.
3. Set CB1 to on.
4. Check that the indicator inside the motor driver assembly (01A-C1A1) goes on within 8 seconds of setting the Power switch to On. (See Figure 9-3 on page 9-4).
5. Set the Power switch to On.

Go to step 28.

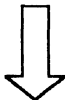
---

**28**

Does the indicator go on within 8 seconds of switching power on?

YES

NO



Follow the instructions on the right.

Go to step 31.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Measure that the mainline voltage between pad 6 (line) and pad 7 (neutral) on the motor driver assembly (01A-C1A1) is within the range 200 V to 270 V within 8 seconds of setting the Power switch to On. (See Figure 9-3 on page 9-4).
3. Set the Power switch to On.

Go to step 29.

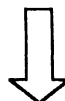
---

**29**

Is the voltage between 200 V and 270 V within 8 seconds of switching power on?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The power regulator card 01A-E1A1
2. The ac cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.



---

## 30

You are here because the voltage is between 200 V and 270 V within 8 seconds of switching power on.

Follow the instructions on the right.

---

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 31

You are here from step 28 because the indicator has gone on within 8 seconds of power being switched on.

Follow the instructions on the right.

Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off and switch CB1 (on the back panel) to off.

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

2. Check that the spindle lock is in the unlocked position (see Figure 9-12 on page 9-12), by pushing the lever down slightly and to the right.

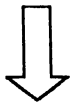
Go to step 32.

---

## 32

Is the spindle lock in the unlocked position?

YES



NO

Follow the instructions on the right.

Move the lever to the unlocked position by pushing it down slightly and to your right.

Go to step 33.

---

---

## 33

**You are here because the spindle lock is unlocked.**

Follow the instructions on the right.

1. Remove the main line power cable before continuing. See "Powering Off" on page 7-4.
2. Raise the card gate to the tilted position.
3. Move the flexible plastic window up out of the way without disconnecting it.
4. Try to turn the motor by hand in the direction of the arrow. This may require some effort.

Go to step 34.

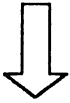
---

## 34

**Did the spindle turn?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Spindle lock assembly
2. Disk enclosure assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 35

**The spindle turns.**

Follow the instructions on the right.

1. Remove the air vent and disconnect plug P6 (see Figure 9-4 on page 9-5).
2. Measure the resistance of the start winding on socket J6 between pins 3 and 6 and between pins 9 and 12.

Go to step 36.

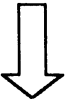
---

## 36

**Is the resistance between 8.0 ohms and 9.0 ohms for both readings?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, the motor stator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 37

**The resistance is between 8 ohms and 9 ohms for both readings.**

Follow the instructions on the right.

Measure the resistance of the Run windings between J6 pins 4 and 7.

Go to step 38.

---

---

**38**

**Is the resistance between 60 ohms and 65 ohms?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, the motor stator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

**39**

**The resistance is between 60 ohms and 65 ohms.**

Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point G

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 40

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 1120. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.

#### DANGER

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the power cable is removed.**

3. Pull out the drawer and remove the top cover.
4. Go to the card gate 01A-A1 and remove the power control card 01A-A1C5.
5. Measure the resistance between J10 (card side) and frame ground.

Go to step 41.

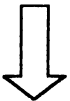
---

### 41

Is the resistance less than 1 ohm (short circuit)?

YES

NO



Follow the instructions on the right.

Go to step 44.

Take these actions:

1. Swap the device 0 card in 01A-A1B5 with the device 1 card in 01A-A1B1.
2. Reinstall the power control card 01A-A1C5.
3. Switch CB1 to on.
4. Set the Power switch to On.
5. Wait 2 minutes for motor starting time.

Go to step 42.

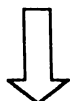
---

### 42

Are the Power On, Power Ready, and Device Ready lights (on the front panel) all on?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 43

**You are here because the Power On, Power Ready, and Device Ready lights are on.**

**Follow the instructions on the right.**

Exchange, for a new one, the card that is now in location 01A-A1B1, then exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 44

**You are here from step 41 because the resistance is less than 1 ohm.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in sequence:

1. Power switch
2. The dc cable to the power regulator
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point H

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 45

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 2217. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Pull out the drawer and remove the top cover.
4. Set CB1 to on.
5. Set the Power switch to On.
6. Check the green indicator through the top cover of the power supply.

Go to step 46.

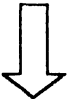
---

### 46

Is the indicator on?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the power supply 01A-D1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

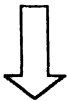
### 47

Check the green indicator through the side cover of the motor driver assembly.

Is the indicator on?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

**48**

**The indicator is on.**

**Follow the instructions on the right.**

1. Set the Power switch (on the front panel) to Delayed Off.
2. Wait 1 minute for motor stop to time out.

Check the green indicator through the side cover of the motor driver assembly 01A-C1A1.

Go to step 49.

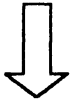
---

**49**

**Is the green indicator off?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. Power regulator card 01A-E1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

**50**

**The green indicator is off.**

**Follow the instructions on the right.**

Go to "Cleanup and Repair Verification" on page 8-121.

---

## Problem Isolation Procedure B4

### Problem Isolation Entry Point J

Other Isolation Entry Points in B4	Page
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Problem Isolation Entry Point M	8-61
Problem Isolation Entry Point N	8-62
Problem Isolation Entry Point P	8-66
Problem Isolation Entry Point Q	8-77
Problem Isolation Entry Point R	8-85
Problem Isolation Entry Point S	8-88
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Problem Isolation Entry Point U	8-99
Problem Isolation Entry Point V	8-103
Problem Isolation Entry Point W	8-108
Problem Isolation Entry Point X	8-113
Problem Isolation Entry Point Y	8-115
Problem Isolation Entry Point Z	8-117

**Warning:** Ensure both devices are offline to the using system before powering off.

---

## 1

**You are here from the *Guide to Unit Reference Codes* because there is a Device-Enable switch failure.**

**Follow the instructions on the right.**

URC 2221. Take these actions:

1. Set the Power switch to Delayed Off.
2. Wait 1 minute for motor stop to time out.
3. Switch CB1 (on the back panel) to off.
4. Pull out the drawer and remove the top cover.

### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

5. Look for a loose cable at logic board 01A at location A1C5. If the logic board cables are secure, remove the interface card 01A-A1C1.
6. Ensure that the Device Enable/Disable switch for both devices are set to Enable.
7. Check the continuity to ground on board 01A-A1C1 between pins U07 and U08, and pins S07 and U08.

Go to step 2.



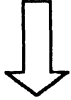
---

## 2

**Is the resistance reading less than  
1 ohm for both readings?**

**YES**

**NO**



Follow the instructions on  
the right.

Exchange, for new ones, the following FRUs in sequence:

1. Control Panel 01A-B1A1
2. Logic board 01A-A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 3

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in sequence:

1. Device interface card 01A-A1C1 (Model B)
2. Device adapter interface card 01A-A1B1 (Model A)
3. Device interface cable 01A-A1C1 (Model B)
4. Device adapter interface cable (Model A)
5. Model A to Model B interface cable.

Go to “Cleanup and Repair Verification” on page 8-121.

## Problem Isolation Entry Point K

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 4

You are here from the *Guide to Unit Reference Codes* because possibly the +66 V supply to an actuator is faulty.

Follow the instructions on the right.

URC 1129, 1219, 123F, 124B.

1. Set the Power switch (on the front panel) to Delayed Off.  
Wait one minute for the motor to stop.
2. Set CB1 (on the back panel) to off.
3. Pull the drawer out and remove the top cover.

**DANGER**

Where a hazardous voltage label is shown, main line ac voltage is present on components within covers until the main line power cable is removed.

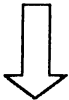
Go to step 5

---

### 5

Has circuit breaker CB6 tripped? (See Figure 9-4 on page 9-5.)

YES      NO



Follow the instructions on the right.

1. Switch CB1 to on.
2. Switch the Power switch to On.
3. Wait 2 minutes for the devices to come ready.

Go to step 6.

Go to step 29.

---

### 6

Is the Motor Check light on? (See Figure 9-3 on page 9-4.)

NO      YES



Follow the instructions on the right.

1. Run diagnostic test 10 to device 0.
2. If the URC is 1129, 1219, 123F, or 124B, go to step 7. Otherwise, take the action for the new URC.

---

7

**Run diagnostic test 12 to both device 0 and device 1 on the failing unit.**

**Are both devices failing?**

**NO**



**YES**

Follow the instructions on the right.

Check the +66 V dc power supply as follows:

If your IBM 9335 serial number is from 57-B0000 onward, proceed as follows:

**DANGER**

**Where a hazardous voltage label is shown, main line ac voltage is present on components within covers until the main line power cable is removed.**

1. Set the Power switch to Delayed Off.
2. Wait 1 minute for the motor to stop, then set CB1 to off.
3. Go to the actuator driver 01A-G1A1. (See Figure 9-6 on page 9-7.)
4. Disconnect plug P23.
5. Switch CB1 (on the back panel) and the Power switch (on the front panel) to On.
6. Measure the dc voltage across pins 5 (positive) and 4 (negative) on plug P23.

Go to step 26.

If your IBM 9335 serial number is before 57-B0000, proceed as follows:

**DANGER**

**Where a hazardous voltage label is shown, main line ac voltage is present on components within covers until the main line power cable is removed.**

1. Set the Power switch to Delayed Off.
2. Wait 1 minute for the motor to stop, then set CB1 to off.
3. Go to the actuator drivers 01A-G1A1 and 01A-G1A2. (See Figure 9-5 on page 9-6.)
4. Disconnect plugs P23 and P25 from the cards.
5. Switch CB1 (on the back panel) to on and the Power switch (on the front panel) to On.
6. Measure the dc voltage across pins 1 (positive) and 3 (negative) on both plugs P23 and P25 (see Figure 9-5).

Go to step 26.

---

## 8

**Only one device is failing.**

**Follow the instructions on the right.**

Note the failing device and take these actions:

1. Set the Power switch to Delayed Off.
2. Wait 1 minute for the motor to stop, then set CB1 to off.
3. Swap the card in 01A-A1B5 with the card in 01A-A1B1.
4. Switch CB1 to on, and the Power switch to On.
5. Wait 2 minutes for the devices to signal "Ready".

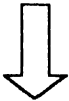
Go to step 9.

---

## 9

**Do any of the Device Ready lights come on?**

YES      NO



Follow the instructions on the right.

Exchange, for a new one, the card that is now in location 01A-A1B5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 10

**Are both Device 0 and Device 1 now ready?**

NO      YES



Follow the instructions on the right.

Exchange, for a new one, the card that is now in location 01A-A1B1.

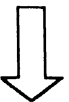
Go to "Cleanup and Repair Verification" on page 8-121.

---

## 11

**Is the device that failed before the card swap in step 8 still failing?**

YES      NO



Follow the instructions on the right.

If device 0 has failed to come ready: exchange, for a new one, the card that is now in 01A-A1B5.

If device 1 has failed to come ready: exchange, for a new one, the card that is now in 01A-A1B1.

Go to "Cleanup and Repair Verification" on page 8-121.

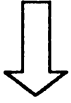
---

## 12

**Is the Device 0 Ready light on?**

**YES**

**NO**



Follow the instructions on the right.

**Go to step 17.**

Device 0 is failing.

Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Set CB1 (on the back panel) to off.
3. Disconnect plug P1 from socket J1 on the back of the disk enclosure. (See Figure 9-4 on page 9-5.)
4. Measure the resistance of the actuator 0, coil between pins J1-1 and J1-2.

Go to step 13.

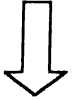
---

## 13

**Is the resistance within the range 4.7 ohms to 5.8 ohms?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, the disk enclosure assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 14

Follow the instructions on the right.

If your IBM 9335 serial number is from 57-B0000 onward:

1. Go to the actuator driver card 01A-G1A1 (see "Installing the Actuator Driver Card or Cards" on page 7-64).
2. Disconnect plug P23 from actuator driver card.
3. Check the continuity:
  - between pins P23-3 and P1-2
  - between pins P23-1 and P1-1
  - between pin P23-4 and frame ground.

Go to step 15.

If your IBM 9335 serial number is before 57-B0000:

1. Go to the actuator driver cards 01A-G1A1/G1A2 (see "Removing the Actuator Driver Card or Cards" on page 7-62).
2. Disconnect plug P23 from actuator driver card 0.
3. Check the continuity:
  - between pins P23-5 and P1-2
  - between pins P23-4 and P1-1
  - between pin P23-3 and frame ground.

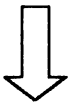
Go to step 15.

---

## 15

Is the continuity OK with the resistance less than 1 ohm for all readings?

YES      NO



Follow the instructions on the right.

Exchange, for a new one, the dc-cable assembly to the power-regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 16

The resistance is less than 1 ohm for all readings.

Follow the instructions on the right.

If your IBM 9335 serial number is from 57-B0000 onward, exchange, for new ones, the following FRUs in order:

1. Actuator driver card 01A-G1A1.
2. Actuator driver cable 01A-A1A1 to 01A-G1A1.
3. Logic board 01A-A1.
4. Disk enclosure (call for support before exchanging this).

Go to "Cleanup and Repair Verification" on page 8-121.

If your IBM 9335 serial number is before 57-B0000, interchange the actuator drivers by swapping the cables as follows:

1. Connect plug P25 to socket J23 on actuator driver 0.
2. Connect plug P23 to socket J25 on actuator driver 1.
3. Swap over the ribbon cable plugs P24 with P26.
4. Reconnect the cable plug P1 to socket J1 at the back of the disk-enclosure.
5. Switch CB1 (on the back panel) to on and the Power switch (on the front panel) to On.
6. Wait 2 minutes.

Go to step 24.

---

## 17

You are here from step 12.

Device 1 is failing.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Disconnect plug P4 from socket J4 at the back of the disk enclosure. (See Figure 9-4 on page 9-5.)
4. Measure the resistance of the actuator 1 coil between pins J4-1 and J4-2.

Go to step 18.

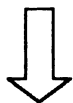
---

## 18

Is the resistance within the range 4.7 ohms to 5.7 ohms?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the disk enclosure assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 19

Follow the instructions on the right.

If your IBM 9335 serial number is from 57-B0000 onward:

1. Go to the actuator driver card 01A-G1A1 (see "Installing the Actuator Driver Card or Cards" on page 7-64).
2. Disconnect plug P23 from actuator driver card.
3. Check the continuity:
  - between pins P23-6 and P4-2
  - between pins P23-7 and P4-1
  - and between pin P23-4 and frame ground.

If your IBM 9335 serial number is before 57-B0000:

1. Go to the actuator driver cards 01A-G1A1/G1A2 (see "Removing the Actuator Driver Card or Cards" on page 7-62).
2. Disconnect plug P25 from actuator driver card 1.
3. Check the continuity:
  - between pins P25-5 and P4-2
  - between pins P25-4 and P4-1
  - between pins P25-3 and frame ground.

Go to step 20.

---

## 20

Is the continuity OK with the resistance less than 1 ohm for all readings?

YES      NO



Follow the instructions on the right.

Exchange, for a new one, the dc-cable assembly to the power-regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.



---

## 21

The resistance is less than 1 ohm for all readings.

Follow the instructions on the right.

If your IBM 9335 serial number is from 57-B0000 onward, exchange, for new ones, the following FRUs in order:

1. Actuator driver card 01A-G1A1.
2. Actuator driver cable 01A-A1A1 to 01A-G1A1.
3. Logic board 01A-A1.
4. Disk enclosure (call for support before exchanging this).

Go to "Cleanup and Repair Verification" on page 8-121.

If your IBM 9335 serial number is before 57-B0000, interchange the actuator drivers by swapping the cables as follows:

1. Connect plug P25 to socket J23 on actuator driver 0.
2. Connect plug P23 to socket J25 on actuator driver 1.
3. Swap over the ribbon cable plugs P24 with P26.
4. Reconnect the cable plug P1 to socket J1 at the back of the disk-enclosure assembly.
5. Switch CB1 (on the back panel) to on and the Power switch (on the front panel) to On.
6. Wait 2 minutes.

Go to step 22.

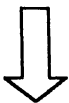
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## 22

Is the Device 1 Ready light on?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Actuator driver 1 cable 01A-A1G2.
2. Logic board 01A-A1.
3. Disk enclosure. (Call for support before exchanging this.)

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 23

Follow the instructions on the right.

If your IBM 9335 serial number is before 57-B0000, exchange, for a new one, the actuator driver 1 card 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

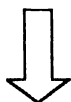
---

## 24

You are here from step 16.

Is the Device 0 Ready light on?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The actuator driver 0 cable 01A-G1A1.
2. Logic board 01A-A1.
3. Disk enclosure. (Call for support before exchanging this.)

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 25

Follow the instructions on the right.

If your IBM 9335 serial number is before 57-B0000, exchange, for a new one, the actuator driver 0 card 01A-G1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

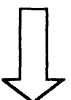
---

## 26

You are here from step 7.

Is the voltage measured on plug P23 pin 5 (+) and pin 4 (-) for Model Bs with serial numbers from 57-B0000 onward, and plugs P23 and P25 pins 1 (+) and 3 (-) for Model Bs with serial numbers before 57-B0000, in the range of 50 V to 80 V?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Power regulator card 01A-E1A1
2. Circuit breaker, CB6
3. The dc cable to the power regulator card. (See Figure 8-7 on page 8-133.)

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 27

The voltage is inside the range 50 V to 80 V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

If your IBM 9335 serial number is from 57-B0000:

1. Actuator driver card 01A-G1A1.
2. Actuator driver cable 01A-A1A1.
3. Logic board 01A-A1.

If your IBM 9335 serial number is before 57-B0000, exchange, for new ones, the following FRUs in order:

1. Actuator driver 0 card 01A-G1A1.
2. Actuator driver 1 card 01A-G1A2.
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 28

You are here from step 5 because circuit breaker, CB6, has tripped.

Follow the instructions on the right.

Reset CB6 (if possible).

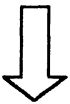
Go to step 29.

---

## 29

Does circuit breaker CB6 reset?

YES



NO

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Circuit breaker CB6.
2. The dc cable to the power regulator card.
3. If your IBM 9335 serial number is from 57-B0000 onward, Actuator driver card 01A-G1A1.  
If your IBM 9335 serial number is before 57-B0000, Actuator 0 card 01A-G1A1.  
Actuator 1 card 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 30

**Circuit breaker CB6 resets.**

**Follow the instructions on the right.**

If your IBM 9335 serial number is from 57-B0000 onward:

1. Go to actuator driver 01A-G1A1 (see Figure 9-6 on page 9-7).
2. Disconnect plug P23.
3. Switch CB1 (on the back panel) to on.
4. Set the Power switch (on the front panel) to On.

If your IBM 9335 serial number is before 57-B0000:

1. Go to actuator drivers 01A-G1A1/G1A2 (see Figure 9-5 on page 9-6).
2. Disconnect plugs P23 and P25.
3. Switch CB1 (on the back panel) to on.
4. Set the power switch (on the front panel) to On.

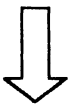
Go to step 31.

---

## 31

**Does CB6 trip again?**

**YES**      **NO**



Follow the instructions on the right.

If your IBM 9335 serial number is from 57-B0000 onward, exchange, for a new one, the Actuator Driver card 01A-G1A1.

If your IBM 9335 serial number is before 57-B0000, exchange, for new ones, the following FRUs in order:

1. Actuator driver 0 card 01A-G1A1.
2. Actuator driver 1 card 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 32

**You are here because CB6 trips again.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in sequence:

1. Circuit breaker CB6.
2. The dc cable assembly to the power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point L

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 33

You are here from step 3 on page 8-3.  
An error has been detected by the +66 V supply being sensed as low.

Follow the instructions on the right.

URC 2015.

Set the Power switch (on the front panel) to Delayed Off and CB1 (on the back panel) to off.

#### DANGER

Where a hazardous voltage label is shown, main line ac voltage is present on components within covers until the main line power cable is removed.

Go to step 34.

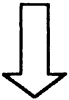
---

### 34

Has CB3 (on the back panel) tripped?

YES

NO



Follow the instructions on the right.

Go to step 47.

1. Pull the drawer out and remove the top cover. (See "Removing the Top Cover" on page 7-10.)
2. Go to the card-gate 01A and remove the card from 01A-A1C5.
3. Add jumpers **on the card side** between pins J06 and D08, and J07 and J08.
4. Switch CB1 (on the back panel) to on.

Go to step 35.

---

### 35

Is the fan working? (A flow of air can be felt around the card-gate if it is.)

YES

NO



Follow the instructions on the right.

Go to step 38.

No ac supply to the fan.

1. Switch CB1 (on the back panel) to off.
2. Check the setting of the voltage selector switch (refer to Figure 9-4 on page 9-5).
3. If the switch is set to the correct line voltage:
  - a. Disconnect plug P11 (refer to Figure 9-4) and check for loose connections in the plug and the socket.
  - b. If the connections are secure, go to transformer T2 and measure the resistance between plug P11 pins 1 (common) and pins 2, 3, 4, and 5.

Go to step 36.

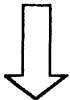
---

## 36

Is the resistance between 4 ohms and 6 ohms for all readings?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, transformer T2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 37

The resistance reading is between 4 ohms and 6 ohms.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. The ac power box.
2. The ac cable.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 38

You are here from step 35 because the fan is working.

Follow the instructions on the right.

Measure the dc voltage on the card side of 01A-A1C5 between pins J05 (positive) and frame ground (negative).

Go to step 39.

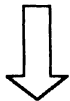
---

## 39

Is the voltage between 1.3 V and 1.75 V?

YES

NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.

### DANGER

Where a hazardous voltage warning label is shown, main line ac voltage is present on components within covers until the main line power cable is removed.

2. Disconnect plug P11 and check for loose connections in the plug and socket.
3. If the connections are secure, check the resistance of transformer T2 between plug P11 pins 6 and 7.

Go to step 40.

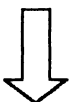
---

## 40

**Is the resistance less than 1 ohm?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, transformer T2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 41

**The resistance is less than 1 ohm.**

**Follow the instructions on the right.**

Measure the resistance of transformer T2 on plug P11 between pins 1 (common) and 2, 3, 4, and 5.

Go to step 42.

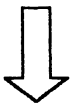
---

## 42

**Is the resistance between 4 ohms and 6 ohms for all readings?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, transformer T2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 43

**The resistance is between 4 ohms and 6 ohms for all readings.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in order:

1. Power regulator card 01A-E1A1.
2. The ac cable.
3. The dc cable to the power regulator card 01A-E1A1.
4. If your IBM 9335 serial number is from 57-B0000 onward, Actuator driver card 01A-G1A1.  
If your IBM 9335 serial number is before 57-B0000, Actuator 0 card 01A-G1A1.  
Actuator 1 card 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 44

You are here from step 39 because the voltage is between 1.28 V and 1.75 V.

Follow the instructions on the right.

Switch CB1 (on the back panel) to off.

Disconnect plug P11 and check for loose connections in the plug and the socket.

If the connections are secure (see Figure 9-3 on page 9-4 and Figure 9-4 on page 9-5) measure the resistance of transformer T2 between plug P11 pin 1 (common) and pins 2, 3, 4, and 5.

Go to step 45.

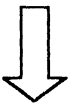
---

## 45

Is the resistance between 4 ohms and 6 ohms for all readings?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, Transformer T2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 46

The resistance is between 4 ohms and 6 ohms.

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 47

You are here from step 34 because circuit breaker CB3 has tripped.

Follow the instructions on the right.

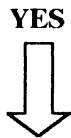
1. Disconnect plug P11 (see Figure 9-4 on page 9-5).
2. Meter for short circuit to frame ground on socket pins J11-2, J11-3, J11-4, and J11-5.
3. Go to step 48.



---

## 48

Is the resistance less than 1 ohm on any pin? (That is, there is a short circuit.)



NO

Follow the instructions on the right.

Go to step 50.

Reset CB3 if possible.

Go to step 49.

---

## 49

Does CB3 reset?



NO

Follow the instructions on the right.

Go to step 51.

Exchange, for new ones, the following FRUs in order:

1. CB3.
2. Transformer T2.
3. Power regulator card 01A-E1A1.
4. The ac cable.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 50

You are here from step 48 because there is a short circuit.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. The ac box assembly.
2. Fan assembly.
3. The ac cable assembly.
4. CB3.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 51

You are here from step 49 because CB3 has reset.

Follow the instructions on the right.

1. Reconnect plug P11 to J11.
2. Disconnect plug P27 from the power regulator card (see Figure 9-9 on page 9-10).
3. Switch CB1 to on.
4. Switch the Power switch to On.

Go to step 52.

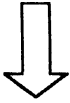
---

## 52

Does CB3 trip again?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the power regulator card 01A-E1A1.

If your IBM 9335 serial number is from 57-B0000 onward, exchange the actuator driver card 01A-G1A1 for a new one.

If your IBM 9335 serial number is before 57-B0000, exchange the actuator driver cards 01A-G1A1 and 01A-G1A2 for new ones.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 53

CB3 trips again.

Follow the instructions on the right.

1. Switch the Power switch to delayed Off.
2. Switch CB1 to off and reset CB3.
3. Disconnect plug 18 (see Figure 9-9 on page 9-10) from the power regulator.
4. Switch CB1 to on.
5. Switch the Power switch to On.

Go to step 54.

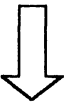
---

## 54

Does CB3 trip again?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following:

1. Motor driver assembly
2. Power regulator card 01A-E1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 55

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Transformer T2.
2. CB3.
3. The ac cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point M

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 56

You are here from the *Guide to Unit Reference Codes* because a +12 V over voltage has been detected on a machine with a serial number from 57-B0000.

Follow the instructions on the right.

URC 2014. Take these actions:

1. Set the Power switch to Delayed Off.
2. Switch CB1 (on the back panel) off.
3. Pull out the drawer and remove the top cover. (See “Removing the Top Cover” on page 7-10.)

#### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

4. Pull out the cable on board 01A-A1 from location A1A1.
5. Switch CB1 to on.
6. Set the Power switch (on the front panel) to On.

Go to step 57.

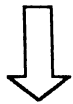
---

### 57

Does a “4” appear on the reference display?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Actuator driver card 01A-A1G1.
2. The dc cable assembly to power regulator. See Figure 8-8 on page 8-134 and **6** on Figure 7-50 on page 7-99.

Go to “Cleanup and Repair Verification” on page 8-121.

---

### 58

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Power control card 01A-A1C5
2. Power supply 01A-D1A1.

Go to “Cleanup and Repair Verification” on page 8-121.

## Problem Isolation Entry Point N

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

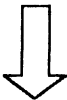
### 59

You are here from the *Guide to Unit Reference Codes* with URC 1170, 1176, 1177, 1178, or 1700 to isolate a faulty sermod card.

Is it device 0 of the failing unit that is failing?

YES

NO



Follow the instructions on the right.

Go to step 64.

1. Set the Power switch (on the front panel) to Delayed Off. Wait 1 minute for the motor to stop.
2. Switch CB1 (on the back panel) off.
3. Pull out the drawer and remove the top cover. (See "Removing the Top Cover" on page 7-10.)

#### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

4. Remove the sermod 0 card in board 01A-A1 from location A1B5 and save it.
5. Pull out the sermod 1 card in board 01A-A1 from location A1B1 and plug this into location A1B5.
6. Switch CB1, on the back panel, to on.
7. Set the Power switch (on the front panel) to On.
8. Wait 2 minutes.
9. Run diagnostic test 10 to device 0 only.

Go to step 60.

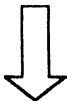
---

### 60

Do the diagnostics run without error on device 0?

YES

NO



Follow the instructions on the right.

Exchange for a new one, the sermod card that is now in location 01A-A1B5 swapping the interposers in 01A-A1B5-X and 01A-A1B5-Y over to the new card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 61

**Follow the instructions on the right.**

1. Set the Power switch (on the front panel) to Delayed Off and wait one minute for the motor to stop.
2. Switch CB1 (on the back panel) off.
3. Plug the sermod card saved from step 59 into location 01A-A1B1.
4. Switch CB1, on the back panel, to on.
5. Set the Power switch (on the front panel) to On.
6. Wait 2 minutes.
7. Run diagnostic test 10 again to device 0 only.

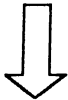
Go to step 62.

---

## 62

**Do the diagnostics run without error on device 0?**

YES



NO

Follow the instructions on the right.

---

Exchange for a new one, the sermod card that is now in location 01A-A1B1 swapping the interposers in 01A-A1B1-X and 01A-A1B1-Y over to the new card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 63

**Follow the instructions on the right.**

Go back to the URC that sent you here and exchange, for new ones, the FRUs in the sequence shown except for the (B) sermod cards in 01A-A1B1 (01A-A1B5).

---

## 64

You are here from step 59.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off. Wait one minute for the motor to stop.
2. Switch CB1 (on the back panel) off.
3. Pull out the drawer and remove the top cover. (See "Removing the Top Cover" on page 7-10.)

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

4. Remove the sermod 1 card in board 01A-A1 from location A1B1 and save it.
5. Switch CB1, on the back panel, to on.
6. Set the Power switch (on the front panel) to On.
7. Wait 2 minutes.
8. Run diagnostic test 10 only to device 0 of the failing unit.

Go to step 65.

---

## 65

Do the diagnostics run without error on that device?

YES      NO



Follow the instructions on the right.

Go to step 68.

1. Set the Power switch (on the front panel) to Delayed Off. Wait one minute for the motor to stop.
2. Switch CB1 (on the back panel) off.
3. Remove the sermod 0 card in board 01A-A1 from location A1B5 and save it.
4. Pull out the sermod 1 card in board 01A-A1 from location A1B1 and plug this into location A1B5.
5. Switch CB1, on the back panel, to on.
6. Set the Power switch at the front panel to On.
7. Wait 2 minutes.
8. Run diagnostic test 10 to device 0 only of the failing unit.

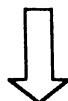
Go to step 66.

---

## 66

Do the diagnostics run without error on that device?

YES      NO



Follow the instructions on the right.

Go back to the URC that sent you here, and exchange, for new ones, the FRUs in the sequence shown except for the (B) sermod cards 01A-A1B5 (01A-A1B1).

---

**67**

**Follow the instructions on the right.**

Exchange for a new one, the sermod card taken from location 01A-A1B5 swapping the interposers in 01A-A1B5-X and 01A-A1B5-Y over to the new card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

**68**

**You are here from step 65.**

**Follow the instructions on the right.**

Exchange for a new one, the sermod card taken from location 01A-A1B1 swapping the interposers in 01A-A1B1-X and 01A-A1B1-Y over to the new card.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point P

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

**69**

You are here from the *Guide to Unit Reference Codes* because an error has been detected: all voltages have been sensed low.

Follow the instructions on the right.

URC 2017. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off.

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

3. Disconnect plug P8 from socket J8 (on the back panel).
4. Switch CB1 to on.
5. Measure 21 V dc between J8 pin 3 (positive) and frame ground (negative).

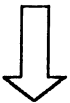
Go to step 70.

---

**70**

Is the voltage between 20 V and 28 V ?

YES      NO



Go to step 71.

Go to step 78.



---

## 71

**You are here because the voltage is not between 20 V and 28 V.**

**Follow the instructions on the right.**

Take these actions:

1. Switch CB1 (on the back panel) to off.
2. Pull out the drawer and remove the top cover.

### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

3. Go to the power regulator card 01A-E1A1 and measure the continuity of the cable between plug P19 pin 1 and plug P16 pin 1 (see Figure 9-9 on page 9-10).

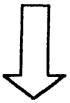
Go to step 72.

---

## 72

**Is the continuity OK with the resistance less than 1 ohm?**

**YES      NO**



Follow the instructions on the right.

The 21 V supply is missing. Exchange, for a new one, the dc cable assembly to the power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 73

**The continuity is OK with the resistance less than 1 ohm.**

**Follow the instructions on the right.**

Measure the resistance of transformer T1 on plug P17 between pins 4 and 5 (see Figure 9-9 on page 9-10).

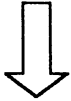
Go to step 74.

---

## 74

Is the resistance inside the range  
1 ohm to 2 ohms between pins 4  
and 5?

YES      NO



Follow the instructions on  
the right.

Go to step 77.

1. Disconnect plug P10 (see Figure 9-4 on page 9-5).
2. Measure the resistance of transformer T1 on plug P10 between pins 5 and 6.

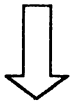
Go to step 75.

---

## 75

Is the resistance in the range 1 ohm to  
2 ohms between pins 5 and 6?

YES      NO



Follow the instructions on  
the right.

The 21 V supply is missing. Exchange transformer T1 (21 and 5 V).

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 76

Follow the instructions on the right.

Exchange, for a new one, the ac supply cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 77

You are here from step 74 because the  
resistance is in the range 1 ohm to  
2 ohms between pins 4 and 5.

Exchange, for a new one, the power regulator card 01A-E1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

Follow the instructions on the right.

---

## 78

You are here from step 70 because the voltage is between 20 V and 28 V.

Follow the instructions on the right.

Take these actions:

1. Switch CB1 (on the back panel) to off.
2. Reconnect plug P8.
3. Pull out the drawer and remove the top cover.

Remove the power control card 01A-A1C5 and add a jumper on the card side of the board between pins J07 and J08.

Switch CB1 to on.

Check the green power on indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 79.

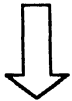
---

## 79

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES      NO



Follow the instructions on the right.

Go to step 104.

---

Check that the fan is working.

(A flow of air can be felt around the card-gate if it is working.)

Go to step 80.

---

## 80

Is the fan working?

YES      NO



Follow the instructions on the right.

Go to step 83.

---

1. Remove the jumper between 01A-A1C5J07 and 01A-A1C5J08.
2. Measure 21 V between pins 01A-A1C5J07 (positive) and 01A-A1C5J08 (negative) on the **card side**.

Go to step 81.

---

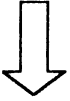
---

## 81

Is the voltage between 20 V and 28 V?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1
2. The dc cable to the power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 82

The voltage is between 20 V and 28 V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1
2. Cable assembly ac supply.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 83

You are here from step 80 because the fan is working.

Follow the instructions on the right.

Take these actions:

1. Switch CB1 (on the back panel) to off.
2. Remove the card from location 01A-A1C1.
3. Switch CB1 to on.
4. Check the power supply power on indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 84.

---

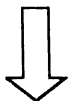
## 84

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES

NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Remove the card from location 01A-A1B1.
3. Switch CB1 (on the back panel) to on.

Check the green power supply power on indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

For Model Bs with serial numbers from 57-B0000 onward, go to step 86. Otherwise, go to step 85.

---

Go to step 103.

---

## 85

**For Model Bs with serial numbers from 57-B0000 onward, skip this step and go to 86.**

**Is the green indicator on?**

**(If it is pulsing on and off, take the NO leg.)**

YES



NO

Follow the instructions on the right.

Go step 99.

1. Switch CB1 (on the back panel) to off.
2. Pull out the card from 01A-A1A1.
3. Switch CB1 to on.
4. Check the green power supply power on indicator in the power supply unit (see Figure 9-3 on page 9-4).

Go to step 86.

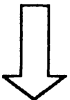
---

## 86

**Is the green indicator on?**

**(If it is pulsing on and off, take the NO leg.)**

YES



NO

Follow the instructions on the right.

**For Model Bs with serial numbers from 57-B0000 onward go to step 99. Otherwise, go to step 101.**

1. Switch CB1 (on the back panel) to off.
2. Remove the card from location 01A-A1B5.
3. Switch CB1 (on the back panel) to on.
4. Check the green power supply power on indicator inside switched-mode power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 87.

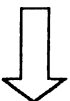
---

## 87

**Is the green indicator on?**

**(If it is pulsing on and off, take the NO leg.)**

YES



NO

Follow the instructions on the right.

Go to step 102.

1. Switch CB1 (on the back panel) to off.
2. For Model Bs with serial numbers from 57-B0000 onward, remove the cable from location 01A-A1A5. Otherwise, remove the card from location 01A-A1A5.
3. Switch CB1 to on.
4. Check the green power supply Power On indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

If your IBM 9335 serial number is from 57-B0000 onward, go to step 89; otherwise, go to step 88.

---

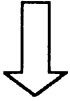
## 88

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES

NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) off.
2. If your IBM 9335 serial number is before 57-B0000, disconnect the cable from the logic board 01A-A1 at location A1B5.
3. Switch CB1 to on.
4. Check the green power supply Power On indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 89.

Go to step 100.

---

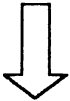
## 89

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES

NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. For Model Bs from 57-B0000 onward, disconnect the cable from board 01A-A1 at location A1A1. Otherwise, disconnect it from location A1B4.
3. Switch CB1 to on.
4. Check the power supply Power on indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

For Model Bs with serial numbers from 57-B0000 onward go to step 91. Otherwise, go to step 90.

Go to step 98.

---

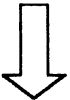
## 90

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES

NO



Follow the instructions on the right.

For Model Bs with serial numbers before 57-B0000, take these actions:

1. Switch CB1 (on the back panel) to off.
2. Disconnect the cable from board 01A-A1 at location A1B8.
3. Switch CB1 to on.
4. Check the green power supply Power On indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 91.

Go to step 97.

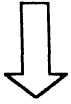
---

## 91

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES      NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Remove the dc supply connectors VC1, VC2, VC3, and VC4 from the logic board 01A-A1. (See Figure 9-10 on page 9-11.)
3. Switch CB1 to on.
4. Check the green power supply power on indicator inside the power supply unit. (See Figure 9-3 on page 9-4.)

Go to step 92.

Go to step 96.

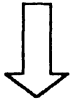
---

## 92

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES      NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Remove the fan to reach the read detect cards.
3. Disconnect power supply connectors P12 and P14. (See Figure 9-3 on page 9-4.)
4. Switch CB1 to on.
5. Check the green power supply power on indicator inside the power supply unit. (See Figure 9-3.)

Go to step 93.

Go to step 95.

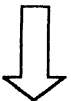
---

## 93

Is the green indicator on?

(If it is pulsing on and off, take the NO leg.)

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power supply unit 01A-D1A1
2. The ac cable assembly
3. The dc cable to the read-detect cards
4. The dc cable to the logic board 01A-A1
5. Power-on-hours meter.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 94

The green indicator is on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Read-detect 0 card 01A-F1A1
2. Read-detect 1 card 01A-F1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 95

You are here from step 92 because the green indicator is on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Read-detect 0 card 01A-F1A1
2. Read-detect 1 card 01A-F1A2
3. Read-detect 0 cable 01A-F1A1
4. Read-detect 1 cable 01A-F1A2
5. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 96

You are here from step 91 because the green indicator is on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The actuator driver card in 01A-G1A1
2. The actuator driver cable in 01A-G1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 97

You are here from step 90 because the green indicator is on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Actuator driver card in 01A-G1A2
2. Actuator driver cable in 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 98

You are here because the green indicator is on. You have come from step 89.

Follow the instructions on the right.

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---



---

## 99

You are here because the green indicator is on.

If your Model B has a serial number from 57-B0000 onward, you came from step 85; otherwise, you came from step 86.

Follow the instructions on the right.

Exchange, for a new one, the card in 01A-A1B1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 100

You are here from step 88 because the green indicator is on.

Follow the instructions on the right.

Exchange, for a new one, the card in 01A-A1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 101

You are here from step 86 because the green indicator is on.

Follow the instructions on the right.

For Model Bs with serial numbers from 57-B0000 onward, exchange, for a new one, the sermod 1 card 01A-A1B1. Otherwise, exchange, for a new one, the demodulator 1 card in 01A-A1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 102

You are here from step 87 because the green indicator is on.

Follow the instructions on the right.

Exchange, for a new one, the card in 01A-A1B5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 103

You are here from step 84 because the green indicator is on.

Follow the instructions on the right.

Exchange, for a new one, the device interface card 01A-A1C1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 104

**You are here from step 79 because the green indicator is on.**

**Follow the instructions on the right.**

Switch CB1 (on the back panel) to off.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point Q

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 105

You are here either from step 3 on page 8-3 because the +5 V control voltage has failed or from the *Guide to Unit Reference Codes*

Follow the instructions on the right.

URC 2002.

Check the Unit Emergency switch on the front panel (see **8** in Figure 7-44 on page 7-87).

Go to step 106.

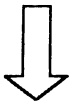
---

### 106

| **If the Unit Emergency switch is installed and is uncovered, is it set to Power Enable?**

| (If it is not installed or is covered, take the YES leg.)

YES      NO



Follow the instructions on the right.

Set the Unit Emergency switch to Power Enable.

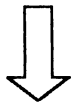
Go to “Cleanup and Repair Verification” on page 8-121.

---

### 107

**Has CB5 (on the back panel) tripped?**

YES      NO



Go to step 112.

---

## 108

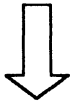
Set the Power switch to Delayed Off.

Switch CB1 (on the back panel) to off.

Reset CB5 (if possible).

Does CB5 reset?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Circuit breaker CB5.
2. Power regulator card.
3. Power control card.
4. Sermod card 01A-A1B5 (01A-A1B1), for Model Bs with serial numbers from 57-B0000 onward.
5. The dc cable to power regulator card.
6. The ac cable assembly.
7. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

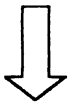
## 109

Disconnect cable connector 01A-A1C6 from board 01A-A1.

Switch CB1 to on.

Does CB5 trip within 30 seconds?

YES      NO



Follow the instructions on the right.

If an external diode is fitted to board 01A-A1 at pin locations C5P03 and C5M11:

1. Check that the diode is fitted with the red lead on pin C5P03 and the black lead on C5M11.
2. Check that the diode has not short circuited by removing the diode and measuring the back resistance — red lead positive and black lead negative .
3. If the resistance is less than 3000 ohms, exchange the diode for a new one.

Otherwise, exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5.
2. Sermod card 01A-A1B5 (01A-A1B1), for Model Bs with serial numbers from 57-B0000 onward.
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 110

Switch CB1 (on the back panel) to off.

Disconnect plug P16 on the power regulator card. (See Figure 9-9 on page 9-10.)

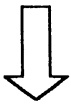
Reset CB5.

Switch CB1 to on.

Does CB5 trip within 30 seconds?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The dc cable to the power regulator card
2. The power control card 01A-A1C5.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 111

CB5 trips within 30 seconds.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The power regulator card 01A-E1A1
2. The power control card 01A-A1C5
3. Circuit breaker CB5
4. The ac cable assembly.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 112

You are here from step 107 because CB5 (on the back panel) has not tripped.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Pull out the drawer and remove the top cover. (See "Removing the Top Cover" on page 7-10.)

### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the power cable is removed.

4. Check that plugs and sockets are securely connected at P10 and the power control card 01A-A1C5 (see Figure 9-4 on page 9-5 and Figure 9-5 on page 9-6).
5. Switch CB1 to on.
6. Check the power reference display on the front panel.

Go to step 113.

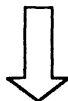
---

## 113

Is the power reference display blank?

YES

NO



Follow the instructions on the right.

Go back to step 20 on page 8-9.

The fault may have been a loose connection.

---

## 114

The power reference display is blank.

Follow the instructions on the right.

Measure +5 V dc between power control card 01A-A1C5 pins U03 (positive) and P08 (negative).

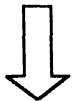
Go to step 115.

---

## 115

Is the voltage between 4.5 V and 5.5 V?

YES      NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Remove the power control card 01A-A1C5.
3. Switch CB1 to on. Measure the + 5 V dc between 01A-A1C5U03 (positive) and 01A-A1C5P08 (negative).

Go to step 117.

Go to step 126.

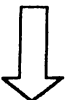
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## 116

You are here from step 117.

Is the voltage in the range 180 V to 260 V?

YES      NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Exchange, for new ones, the following FRUs in sequence:
  - a. The ac power box assembly
  - b. The ac cable assembly
  - c. Unit Emergency switch (if it is installed).

Go to "Cleanup and Repair Verification" on page 8-121.

Go to step 118.

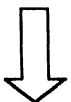
---

## 117

You are here from step 115.

Is the voltage between 4.5 V and 5.5 V?

YES      NO



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off and disconnect plug P10. (See Figure 9-4 on page 9-5.)
2. Switch CB1 to on.
3. Measure the mainline voltage between socket J10 pins 1 and 2.

Go back to step 116.

Go to step 123.

---

## 118

You are here from step 116 because the mainline voltage is between 180 V and 260 V.

Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Measure the resistance of transformer T1 at plug P10 between pins P10-1 and 10-2, and between pins P10-3 and P10-4. (See Figure 9-4 on page 9-5.)

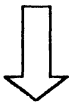
Go to step 119.

---

## 119

Are the resistances between 75 ohms and 100 ohms between pins 1 and 2, and between 0 ohm and 1 ohm between pins 3 and 4?

YES      NO



Follow the instructions on the right.

---

Exchange, for a new one, the transformer T1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 120

The resistances are within range.

Follow the instructions on the right.

Go to the power regulator card 0A1-E1A1 (see Figure 9-9 on page 9-10) and measure the resistance between plug P17 pin 1 and socket J10 pin3, and between plug P17 pin3 and socket J10 pin4. See Figure 8-6 on page 8-132.

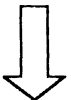
Go to step 121.

---

## 121

Are the resistances less than 1 ohm?

YES      NO



Follow the instructions on the right.

---

Exchange, for new ones, the following FRUs in sequence:

1. The dc cable assembly to the power regulator card.
2. Circuit breaker CB5.

Go to "Cleanup and Repair Verification" on page 8-121.



---

## 122

The resistances are less than 1 ohm.

Follow the instructions on the right.

Disconnect the dc cable plug at location 01A-A1C6. Measure the resistance between (1) position A1C6 D03 at the cable end and E1A1 plug P16 pin 4, and (2) between frame-ground and E1A1 plug P16 pin 3.

Go to step 124.

---

## 123

You are here from step 117 because the voltage is between 4.5 V and 5.5 V.

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

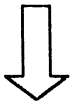
## 124

You are here from step 122.

Are the resistances less than 1 ohm?

YES

NO



Follow the instructions on the right.

Repair or exchange, for a new one, the dc cable assembly to the power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 125

The resistances are less than 1 ohm.

Follow the instructions on the right.

Exchange, for a new one, the power regulator card 01A-E1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 126

You are here from step 115 because the voltage is between 4.5 V and 5.5 V.

Follow the instructions on the right.

For Model Bs with serial numbers from 57-B0000 onward, jumper logic board 01A-A1B1 pins B1G05 and B1D08.

For Model Bs with serial numbers before 57-B0000, jumper logic board 01A-A1 B1 pins B1B05 and B1D08.

Go to step 127.

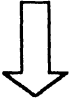
---

## 127

**Has the Device 1 Ready light on the front panel come on?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for a new one, the control panel 01A-B1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 128

**The Device 1 Ready light on the front panel has come on.**

**Follow the instructions on the right.**

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point R

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 129

**You are here because circuit breaker CB2 has tripped.**

**Follow the instructions on the right.**

URC 2003. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off and CB1 (on the back panel) to off.
2. Reset CB2 if possible. (If not, go to step 136.)
3. Pull out the drawer and remove the top cover.

#### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

4. Disconnect plug P10 (see Figure 9-4 on page 9-5) and switch CB1 to on.

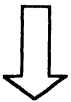
Go to step 130.

---

### 130

**Does CB2 trip within 30 seconds?**

**YES      NO**



Follow the instructions on the right.

**Go to step 135.**

1. Switch CB1 (on the back panel) to off.
2. Reconnect plug P10.
3. Go to the power regulator card.
4. Disconnect plug P17 (see Figure 9-9 on page 9-10).
5. Switch CB1 to on.

Go to step 131.

---

### 131

**Does circuit breaker CB2 trip within 30 seconds?**

**NO      YES**



Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Disconnect plug P10.
3. Check for a ground short circuit on socket pins J10-3, 4, 5, and 6 (positive) and frame ground (negative).

Go to step 133.

---

## 132

**CB2 has not tripped again.**

**Follow the instructions on the right.**

Switch CB1 (on the back panel) to off.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card
2. The dc cable assembly to the power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 133

**You are here from step 131.**

**Is the resistance to ground less than 1 ohm for all readings?**

**NO**

**YES**



Follow the instructions on the right.

---

Exchange, for a new one, the ac cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 134

**The resistance to ground is not less than 1 ohm for all readings.**

**Follow the instructions on the right.**

---

Exchange, for a new one, transformer T1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 135

**You are here from step 130 because circuit breaker CB2 has tripped within 30 seconds.**

**Follow the instructions on the right.**

Switch CB1 (on the back panel) to off.

Exchange, for new ones, the following FRUs in sequence:

1. The ac power box
2. The ac cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

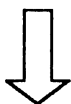
## 136

You are here from step 129.

Has circuit breaker CB5 tripped?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The ac power box
2. Power regulator card
3. Transformer T1
4. The dc cable to the power regulator card
5. The ac cable assembly.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 137

CB5 has tripped.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The ac power box
2. Circuit breaker CB5
3. Power regulator card
4. Transformer T1
5. The dc cable to the power regulator card
6. The ac cable assembly.

Go to “Cleanup and Repair Verification” on page 8-121.

## Problem Isolation Entry Point S

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 138

You are here because there is a thermal problem. The Thermal Check light is on.

Follow the instructions on the right.

URC 2027. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off and CB1 (on the back panel) to off.
2. Pull out the drawer and remove the top cover.

#### **DANGER**

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

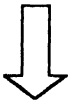
Go to step 139.

---

### 139

Is there a power thermal switch in the position shown in Figure 9-7 on page 9-8?

YES      NO



Go to step 151.

---

## 140

Allow ten minutes for the device to cool.

Switch CB1 on the back panel to on.

Set the Power switch on the front panel to On.

Is the Thermal Check light on within 3 seconds?

NO YES



Follow the instructions on the right.

Go to step 142.

1. Set the power switch to Off.
2. Switch CB1 to off.
3. Disconnect plug P7 (see the figure on page 7-68 and Figure 8-8 on page 8-134).
4. Short out pins 2 and 3 of P7 with a jumper.
5. Switch CB1 to on.
6. Set the power switch to On.

Go to step 141.

---

## 141

Is the Thermal Check light on within three seconds?

NO YES



Follow the instructions on the right.

Go to step 146.

1. Set the Power switch at the front panel to Delayed Off.
2. Switch CB1 on the back panel to off.
3. Pull out the power control card 01A-A1C5.
4. Meter for continuity to frame ground on pin 01A-A1C5J12 on the card side of the board.

Go to step 148.

---

## 142

You are here from step 140

Does "E" appear on the power reference display?

NO YES



Follow the instructions on the right.

Go to "Problem Isolation Entry Point U" on page 8-99.

---

## 143

The air flow can be felt around the card gate if the fan is working.

Is the fan operating?

NO

YES



Follow the instructions on the right.

1. Wait 2 minutes. If the Device Ready lights come on, the failure is intermittent.
2. Exchange, for new ones, the following FRUs in order:
  - a. The air flow switch.
  - b. The disk enclosure thermal switch.
  - c. Power control card 01A-A1C5.
  - d. The dc cable assembly to the power regulator.
  - e. Logic board 01A-A1.
3. If the failure occurs again, go to *Guide to Unit Reference Codes* and perform the instructions for URC 1127.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 144

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Fan assembly
2. The ac cable assembly.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 145

Set the Power switch at the front panel to On.

Exchange, for new ones, the following FRUs in order:

Is the Thermal Check light on within one second?

1. Power control card 01A-A1C5
2. The dc cable assembly to the power regulator
3. Logic board 01A-A1.

NO

YES



Follow the instructions on the right.

Go to "Cleanup and Repair Verification" on page 8-121.



---

## 146

You are here from step 141.

Measure for +12 V between plug P7 hole-pin 1 and frame ground.

Is the voltage between 11 V and 13 V?

YES

NO



Follow the instructions on the right.

Exchange, for a new one, the dc cable assembly to the power regulator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 147

Follow the instructions on the right.

Exchange, for new ones, the following FRUs:

1. Air flow switch
2. Power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 148

You are here from step 141 because the Thermal Check light is on.

Is the continuity less than 1.5 ohms?

NO

YES



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The power control card 01A-A1C5
2. The dc cable to the power regulator card
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 149

Meter across the disk enclosure thermal switch (Figure 9-4 on page 9-5) for an open circuit. Is the thermal switch open circuit?

Exchange, for a new one, the faulty thermal switch.

Go to "Cleanup and Repair Verification" on page 8-121.

NO

YES



Follow the instructions on the right.

---

## 150

Follow the instructions on the right.

Exchange, for new ones, the following FRUs:

1. The dc cable assembly to power regulator
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 151

You are here from step 139.

Examine the two thermal trip assemblies. See Figure 9-4 on page 9-5 and Figure 9-7 on page 9-8.

Remove the power control card A1C5 and check the continuity between frame ground and pins A1C5 J12 and J13 (on the card side).

Go to step 152.

Are either or both red thermal trip buttons out?

YES      NO



Follow the instructions on the right.

Go to step 156.

---

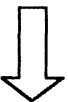
## 152

Is the continuity OK with the resistance less than 1 ohm on both pins?

Check for an open circuit across the terminals of both thermal trip switches.

Go to step 153.

YES      NO



Follow the instructions on the right.

Go to step 155.

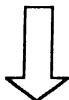
---

## 153

Is either switch open circuit?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The dc cable to the power regulator card
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 154

Either or both thermal trip-switches are open circuit.

Follow the instructions on the right.

Exchange, for new, the thermal trip switch(es).

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 155

You are here from step 152 because the continuity is OK with the resistance on both pins less than 1 ohm.

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 156

You are here from step 151 because either or both thermal trip switches has tripped (the reset button is out).

Follow the instructions on the right.

Allow ten minutes for the device to cool.

Reset the thermal trip switch(es) and set circuit breaker CB1 (on the back panel) to on.

Go to step 157.

---

## 157

Is the Thermal Check light on?

YES

NO



Follow the instructions on the right.

Set the Power switch (on the front panel) to On.

Check for a flow of air around the card-gate. (Airflow means that the cooling fan is working.)

Go to step 158.

---

Go to step 160.

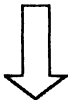
---

## 158

Is the fan working?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Cooling fan assembly
2. Cable assembly ac supply.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 159

The fan is working.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power thermal trip switch
2. Disk enclosure thermal trip switch
3. Power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 160

You are here from step 157 because the Thermal Check light is on.

Follow the instructions on the right.

1. Switch CB1 (on the back panel) to off.
2. Pull out the power control card 01A-A1C5.
3. Meter for continuity to frame ground on pins A1C5 J12 and J13 (card side).

Go to step 161.

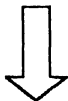
---

## 161

Is the continuity OK with the resistance less than 1 ohm on both pins?

YES

NO



Follow the instructions on the right.

Measure across each thermal trip switch and check for an open circuit.

Go to step 162.

---

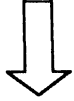
Go to step 164.

---

## 162

Is either thermal trip switch open circuit?

YES



NO

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The dc cable assembly to the power regulator card
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 163

Either or both thermal trip switches is open circuit.

Follow the instructions on the right.

Exchange, for new, the thermal trip switch(es).

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 164

You are here from step 161 because the continuity is OK with the resistance on both pins less than 1 ohm.

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## Problem Isolation Entry Point T

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 165

You are here from the *Guide to Unit Reference Codes* because an error has been detected by the - 12 V supply failing.

Follow the instructions on the right.

URC 2008. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off and CB1 (on the back panel) to off.
2. Pull out the drawer and remove the top cover.

#### DANGER

Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.

3. Check that the - 12 V supply-connector VC2 (see Figure 9-10 on page 9-11) is located correctly in board 01A-A1.
4. If connector VC2 is located correctly do the following:  
If your IBM 9335 serial number is before 57-B0000, disconnect the cable from the logic board 01A-A1 at locations A1B4 and A1B8.
5. Switch CB1 to on.
6. Set the Power switch to On.

If your IBM 9335 serial number is from 57-B0000 onward, go to step 169; otherwise, go to step 166.

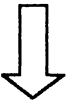
---

### 166

Is the power reference display showing "F" or "A"?

YES

NO



Follow the instructions on the right.

Go to step 169.

There is an actuator driver or cable fault.

1. Set the Power switch to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Reconnect cable in location A1B4.
4. Switch CB1 to on.
5. Set the Power switch to On.
6. Check the power reference display.

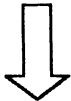
Go to step 167.

---

## 167

Is the power reference display showing “F” or “A”?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Actuator driver 0 card 01A-G1A1
2. Actuator driver 0 cable 01A-G1A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 168

The power reference display is showing “F” or “A”.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Actuator driver 1 card 01A-G1A2
2. Actuator driver 1 cable 01A-G1A2.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 169

You are here because the power reference display is showing “F” or “A.”

If your IBM 9335 serial number is from 57-B0000 onward, you are here from step 165.

If your IBM 9335 serial number is before 57-B0000, you are here from step 166.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Pull out the cards on board 01A-A1, one at a time, with the exception of the power control card in 01A-A1C5.
4. Switch CB1 (on the back panel) to on.
5. Set the Power switch (on the front panel) to On in between removing the cards.

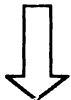
Go to step 170.

---

## 170

Is the reference display showing “F” or “A”?

YES      NO



Follow the instructions on the right.

Exchange, for a new one, the last card that was removed.

Go to “Cleanup and Repair Verification” on page 8-121.

---

---

## 171

The power reference display is showing “F” or “A.”

Follow the instructions on the right.

1. Set the Power switch to Off.
2. Set CB-1 to off.
3. Pull out the Power Control card 01A-A1C5.
4. Add a jumper on the card side of Board 01A-A1 from pin C5D08 to C5J07.
5. Switch CB-1 to on.
6. Measure  $-12$  V dc between pin 01A-A1B5S13 and 01A-A1B5D08.

Go to step 172.

---

## 172

Is the voltage within the range  $-10.8$  V to  $-13.2$  V?

NO

YES



Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 173

The voltage is out of range.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power supply unit 01A-D1A1.
2. The dc cable to the logic board 01A-A1. See **2** in Figure 7-50 on page 7-99.
3. Logic board 01A-A1.

Go to “Cleanup and Repair Verification” on page 8-121.



---

## 176

Does the Power On light come on and stay on?

YES NO



Follow the instructions on the right.

Go to step 184.

You should only be here if your IBM 9335 serial number is from 57-B0000 onward. Take these actions:

1. Set the Power switch to Off
2. Disconnect the cable from logic board location 01A-A1A1
3. Set the Power switch to On.

Go to step 177.

---

## 177

Does the Power On light come on and stay on?

NO YES



Follow the instructions on the right.

Exchange, for new ones, the following FRUs:

1. Actuator driver card 01A-G1A1
2. Actuator driver cable assembly 01A-A1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 178

Follow the instructions on the right.

1. Set the Power switch to Off.
2. Pull out sermod cards from 01A-A1B5 and 01A-A1B1 one at a time.
3. Power on between removing cards.

Go to step 179.

---

## 179

Does the Power On light come on and stay on when a sermod card has been removed?

NO YES



Follow the instructions on the right.

Go to step 181.

Exchange, for a new one, the sermod card that caused the failure — 01A-A1B5 or 01A-A1B1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 180

**Does the Power On light come on when powering on after a servo or a demodulator card has been removed?**

**NO**



**YES**

Follow the instructions on the right.

Exchange, for a new one, the last card that was removed.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 181

**Follow the instructions on the right.**

1. Set the Power switch to Off
2. Set CB-1 to Off
3. Pull out the power control card 01A-A1C5
4. Add a jumper on the card side of board 01A-A1 from pin C5D08 to C5J07
5. Switch CB-1 to On
6. Measure + 12 V dc between pin 01A-A1B5M13 and 01A-A1B5P08.

Go to step 182.

---

## 182

**Is the voltage within the range + 10.8 V to + 13.2 V?**

**NO**



**YES**

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 183

**The voltage is out of range.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs:

1. Power supply unit 01A-D1A1
2. The dc cable assembly to the logic board 01A-A1A1
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 184

**You are here from step 175 or  
step 176**

**The Power On light is on.**

**Follow the instructions on the right.**

Exchange, for a new one, the motor driver assembly 01A-C1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point V

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 185

You are here because an error has been detected by “power good” failing.

Follow the instructions on the right.

URC 2026. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Pull out the drawer and remove the top cover.
4. Switch CB1 to on.
5. Set the Power switch to On.

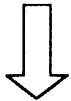
Go to step 186.

---

### 186

Does the Power On light come on and stay on?

YES      NO



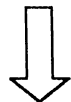
Go to step 191.

---

### 187

Does your IBM 9335 have a serial number from 57-B0000 onward?

YES      NO



Follow the instructions on the right.

---

Check the  $-9$  V dc supply at the power control card 01A-A1C5 between pin M07 (–) and pin P08 (+). (Refer to Figure 9-10 on page 9-11.)

Go to step 192.

---

### 188

Follow the instructions on the right.

1. Switch the Power switch to Off.
2. Remove the Actuator Driver logic cable from board 01A-A1 at location A1A1 (see Figure 9-11 on page 9-11).
3. Set the Power switch to On.

Go to step 189.

---

---

## 189

**Does the Power Ready light come on and stay on?**

**NO**

**YES**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Actuator Driver card 01A-G1A1
2. Actuator Driver logic cable 01A-G1A to 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 190

**Follow the instructions on the right.**

Check the  $-9$  V dc supply at the power control card 01A-A1C5 between pin M07 (-) and pin P08 (+). (Refer to Figure 9-10 on page 9-11.)

Go to step 192.

---

## 191

**You are here from step 186 because the Power On light does not stay on.**

**Follow the instructions on the right.**

Exchange, for a new one, the power regulator card 01A-E1A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 192

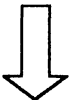
**You are here from one of the following:**

**Step 187  
Step 190.**

**Is the voltage between 8.5 V and 9.5 V ?**

**YES**

**NO**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. If your IBM 9335 serial number is from 57-B0000 onward:  
Sermod 0 card 01A-A1B5
2. If your IBM 9335 serial number is before 57-B0000:  
Demodulator 0 card 01A-A1A5
3. Power control card 01A-A1C5
4. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 193

The voltage is between 8.5 V and 9.5 V.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Unscrew and lift out the power regulator card 01A-E1A1.
4. Switch CB1 to on.
5. Set the Power switch to On.
6. Without disconnecting plug P21 (see Figure 9-9 on page 9-10), measure dc voltage on P21 pin 5 (positive) and frame ground (negative).

Go to step 194.

---

## 194

Is the voltage between 5 V and 7 V?

NO YES



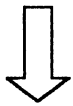
Go to step 197.

---

## 195

Is the voltage between 36 V and 45 V?

YES NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power regulator card 01A-E1A1
2. Power control card 01A-A1C5
3. The dc power cable to power regulator.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 196

The voltage is between 36 V and 45 V.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. The dc power cable to power regulator
3. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 197

You are here from step 194 because the voltage is between 5 V and 7 V.

Follow the instructions on the right.

For Model Bs with serial numbers from 57-B0000 onward, take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Remove the Sermod card from position 01A-A1B1.
4. Remove the device interface card from position 01A-A1C1.
5. Switch CB1 to on.
6. Set the Power switch to On.

Go to step 200.

For Model Bs with serial numbers before 57-B0000, take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. From the logic board 01A-A1 remove:
  - Device interface card 01A-A1C1
  - Servo 1 card 01A-A1B1
  - Servo 0 card 01A-A1B5.
4. Switch CB1 to on.
5. Set the Power switch to On.

Go to step 198.

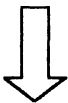
---

## 198

Is the Power Ready light on?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 199

The Power Ready light is on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Servo 0 card 01A-A1B5
2. Servo 1 card 01A-A1B1
3. Device interface card 01A-A1C1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 200

You are here from step 197.

Is the Power Ready light on?

NO

YES



Follow the instructions on the right.

Exchange, for new ones, the following FRUs:

1. Sermod 1 card 01A-A1B1
2. Device interface card 01A-A1C1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 201

You are here because the Power Ready light is off.

Follow the instructions on the right.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Remove the sermod card from 01A-A1B5.
4. Plug sermod card from 01A-A1B1 into position 01A-A1B5.
5. Switch CB1 to on.
6. Set the Power switch to On.

Go to step 202.

---

## 202

Is the Power Ready light on?

NO

YES



Follow the instructions on the right.

Exchange, for a new one, the sermod card removed from position 01A-A1B5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 203

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5.
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.



## Problem Isolation Entry Point W

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 204

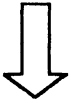
You are here because a device has failed to come ready.

Run diagnostic test program 12 to device 1.

Go to step 205.

Does the Device 0 Ready light fail to come on?

YES      NO



Follow the instructions on the right.

Go to step 211.

---

### 205

Is the Device 1 Ready light on after running diagnostic test program 12?

NO      YES



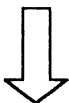
Go to step 209.

---

## 206

**Did diagnostic test program 12 stop with a URC?**

**YES      NO**



Follow the instructions on the right.

**Go to step 210.**

1. Set the Power switch (on the front panel) to Delayed Off.
2. Wait one minute for motor stop to time out.
3. Switch CB1 to off.
4. Pull the drawer out and remove the top cover.

### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

5. Switch CB1 to on.
6. For Model Bs with serial numbers from 57-B0000 onward:  
Jumper logic board 01A-A1 pins A1B1G05 and A1B1D08.
7. For Model Bs with serial numbers before 57-B0000:  
Jumper logic board 01A-A1 pins A1B1B05 and A1B1D08.

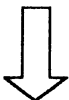
Go to step 207.

---

## 207

**Does the Device 1 Ready light come on?**

**YES      NO**



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Control panel 01A-B1A1
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 208

**The Device 1 Ready light is on.**

**Follow the instructions on the right.**

Exchange, for a new one, the card in 01A-A1B1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 209

**You are here from step 205 because the Device 1 Ready light is on after running diagnostic test program 12.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in sequence:

1. The sermod 1 or servo 1 card in 01A-A1B1
2. Power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 210

You are here from step 206 because diagnostic-test program 12 gave a URC.

Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes*, and perform the appropriate actions for the URC displayed.

---

---

## 211

You are here from step 204 because the Device 0 Ready light fails to come on.

Follow the instructions on the right.

Run diagnostic test program 12 to device 0.

Go to step 212.

---

---

## 212

Is the Device 0 Ready light on after running diagnostic test program 12?

NO

YES



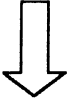
Go to step 216.

---

## 213

Did test 12 stop with a URC displayed?

YES      NO



Follow the instructions on the right.

Go to the *Guide to Unit Reference Codes* and follow the procedures for the code that is displayed.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Wait one minute for motor stop to time out.
3. Switch CB1 (on the back panel) to off.
4. Pull the drawer out and remove the top cover.

### DANGER

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

5. At the logic board 01A-A1 disconnect the cable from the Sermod 0 card 01A-A1B5.
6. Switch CB1 to on.
7. For Model Bs with serial numbers from 57-B0000 onward:  
Jumper logic board 01A-A1 pins A1B1G05 and A1B1D08.
8. For Model Bs with serial numbers before 57-B0000:  
Jumper logic board 01A-A1 pins A1B1B05 and A1B1D08.

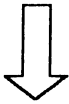
Go to step 214.

---

## 214

Does the Device 0 Ready light come on?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Control Panel 01A-B1A1
2. Logic board 01A-A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 215

The Device 0 Ready light comes on.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The card in 01A-A1B5.
2. Motor driver FRU, 01A-C1A1.

Go to “Cleanup and Repair Verification” on page 8-121.

---

## 216

**You are here from step 212 because the Device 0 Ready light is on after running diagnostic test program 12.**

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in sequence:

1. The card in 01A-A1B5.
2. Power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point X

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 217

**The Device Enable/Disable switch(es) has failed.**

**Follow the instructions on the right.**

URC 2223. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Wait 1 minute for the motor to stop.
3. Switch CB1 (on the back panel) to off.
4. Pull out the drawer and remove the top cover.

#### DANGER

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

5. Remove the device adapter interface card 01A-A1C1.
6. Set both Device Enable/Disable switches to disable.
7. Check for a short circuit to ground on 01A-A1C1 pins S07 and U07.

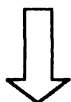
Go to step 218.

---

### 218

**Is the resistance less than 1 ohm?**

**YES**



**NO**

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Device interface card 01A-A1C1 (Model B)
2. Device adapter interface card 01A-A1B1 (Model A)
3. Device interface cable 01A-A1C1 position 1 to J3 (Model B)
4. Model A to Model B interface cable (see Figure 6-6 on page 6-6).

Go to "Cleanup and Repair Verification" on page 8-121.

---

### 219

**The resistance reading is less than 1 ohm.**

**Follow the instructions on the right.**

1. Remove the power control card 01A-A1C5.
2. Set the Device Enable/Disable switch to Disable.
3. Check for a short circuit to ground on logic board A1C1 pins S07 and U07.

Go to step 220.

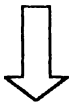
---

## 220

Is the resistance less than 1 ohm?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Power control card 01A-A1C5
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 221

The resistance is less than 1 ohm.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. Control panel 01A-B1A1
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point Y

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 222

You are here from the *Guide to Unit Reference Codes*.

Follow the instructions on the right.

URC 2025.

There may be a fault in the power sequence cable or the rack power control compartment.

1. Set the Power switch (on the front panel) to Off.
2. Check that the power sequence cable is plugged securely into socket J8. (See Figure 9-4 on page 9-5.)
3. Check that the IBM 9335 Model B powers up locally as follows:
  - a. Switch CB1 (on the back panel) to off. Leave the rack power on.
  - b. Remove the power sequence cable plug P8 from socket J8.
  - c. Connect socket J8 pins 4 and 5 (see Figure 9-4 on page 9-5) with a 150 ohm ¼ watt resistor (IBM part 216429 or equivalent).
  - d. Switch CB1 to on.
  - e. Set the Power switch to On.
  - f. Wait for 2 minutes.

Go to step 223.

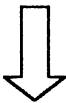
---

### 223

Does the unit power and come ready after 2 minutes?

YES

NO



Follow the instructions on the right.

1. Set the Power switch to Delayed Off.
2. Switch CB1 to off.
3. Pull out the drawer and remove the top cover.
4. Pull out the power control card 01A-A1C5.
5. Switch CB1 to on.
6. Measure + 5 volts dc between pins A1C5J11 (positive) and A1C5J08 (negative) on the **card** side of the board.

Go to step 225.

---

### 224

Follow the instructions on the right.

There is a fault in the power sequence cable, or the rack power control compartment.

Go to the system maintenance documentation.



---

## 225

Is the voltage within the range +4.5 V to +5.5 V?

YES

NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in sequence:

1. The dc cable to power regulator card
2. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 226

Follow the instructions on the right.

1. Set CB1 (on the back panel) to off.
2. Measure the resistance between A1C5J10 and A1C5J08 on the card side of the board.
3. Set the Power switch to On.

Go to step 227.

---

## 227

Does the meter show a short circuit when the Power switch is On?

YES

NO



Follow the instructions on the right.

Exchange the following FRUs in sequence:

1. Power switch assembly
2. The dc cable to power regulator card.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 228

Follow the instructions on the right.

Exchange, for a new one, the power control card 01A-A1C5.

Go to "Cleanup and Repair Verification" on page 8-121.

## Problem Isolation Entry Point Z

**Warning:** Ensure both devices are offline to the using system before you switch the power off.

---

### 229

**You are here from the *Guide to Unit Reference Codes* because a **-5 V** under voltage has been detected.**

**Follow the instructions on the right.**

URC 2011. Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off.
3. Pull out the drawer and remove the top cover. (See “Removing the Top Cover” on page 7-10.)

#### **DANGER**

**Where a hazardous voltage label is shown, mainline ac voltage is present on components within covers until the mainline power cable is removed.**

4. If your IBM 9335 serial number is from 57-B0000 onward, pull out the cable on board 01A-A1 from location A1A5; otherwise, pull out the cable on board 01A-A1 from location A1B5.
5. Switch CB1 to on.
6. Set the Power switch at the front panel to On.

Go to step 230.

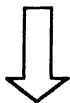
---

### 230

**Does the Power On light come on and stay on?**

**YES**

**NO**



Follow the instructions on the right.

**Go to step 239.**

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off.
3. If your IBM 9335 serial number is from 57-B0000 onward, pull out the cable on board 01A-A1 from location A1A1; otherwise, pull out the cables on board 01A-A1 from location A1B4 and location A1B8.
4. Switch CB1 to on.
5. Set the Power switch at the front panel to On.

Go to step 231.

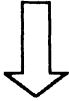
---

## 231

**Does the Power On light come on and stay on?**

**YES**

**NO**



Follow the instructions on the right.

Go to step 234.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) to off.
3. Pull out the cards in the board 01A-A1, one at a time, with the exception of the power control card in 01A-A1C5.
4. Switch CB1 to on.
5. Set the Power switch at the front panel to On in between removing the cards.

Go to step 232.

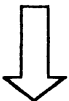
---

## 232

**Does the Power On light come on and stay on when powering on after a card has been removed?**

**YES**

**NO**



Follow the instructions on the right.

---

## 233

**Follow the instructions on the right.**

Exchange, for a new one, the last card that was removed.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 234

You are here from step 231.

Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

If your IBM 9335 serial number is from 57-B0000 onward:

1. Actuator Driver card 01A-G1A1
2. Actuator Driver cable 01A-A1A1.

If your IBM 9335 serial number is before 57-B0000:

1. Actuator Driver card 0 01A-G1A1
2. Actuator Driver card 1 01A-G1A2
3. Actuator Driver 0 cable 01A-G1A1
4. Actuator Driver 1 cable 01A-G1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

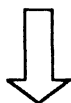
---

## 235

You are here from step 232.

Is the voltage within the range  $-4.5$  V to  $-5.5$  V ?

YES      NO



Follow the instructions on the right.

Go to step 238.

1. Set the Power switch (on the front panel) to Delayed Off.
2. Switch CB1 (on the back panel) off.
3. Remove the front cover. (See "Removing the Front Cover" on page 7-12.)
4. Reach through the front frame and disconnect power plugs P12 and P14 from the read-detect cards. (See Figure 9-3 on page 9-4.)
5. Partially install the front cover, (see "Removing the Front Cover" on page 7-12) leaving the front cover on its two parking clips, but do not reinstall the fan plastic molding. Reconnect plug 30, the cooling fan cable, the ground wire from the fan housing, and the two wires at the power switch.
6. Switch CB1 to on.
7. Set the Power switch at the front panel to On.

Measure  $-5$  V dc between pin 01A-A1B5B06 and frame ground.

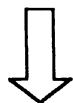
Go to step 236.

---

## 236

Is the voltage within the range  $-4.5$  V to  $-5.5$  V ?

YES      NO



Follow the instructions on the right.

Exchange, for new ones, the following FRUs in order:

1. Power supply 01A-D1A1
2. The dc cable assembly to board 01A-A1
3. The dc cable assembly to read-detect
4. Logic board 01A-A1.

Go to "Cleanup and Repair Verification" on page 8-121.

---

---

## 237

**Follow the instructions on the right.**

Exchange, for new ones, the following FRUs in order:

1. Read Detect card 0 01A-F1A1
2. Read Detect card 1 01A-F1A2.

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 238

**You are here from step 235.**

Exchange, for a new one, the power control card 01A-A1C5.

**Follow the instructions on the right.**

Go to "Cleanup and Repair Verification" on page 8-121.

---

## 239

**You are here from step 230.**

Exchange, for a new one, the Motor Driver Box 01A-C1A1.

**Follow the instructions on the right.**

Go to "Cleanup and Repair Verification" on page 8-121.

---

## Cleanup and Repair Verification

---

### 1

You are here because you have just exchanged or repaired a FRU in a Model B.

Follow the instructions on the right.

Take these actions:

1. Set the Power switch (on the front panel) to Delayed Off and circuit breaker CB1 (on the back panel) to off.
2. Remove any wire jumpers used during fault isolation.
3. Reinstall any loose cards, interposers, cross-card connectors, and cables that were removed during fault isolation.
4. Reseat any loose cards or plugs that may have been dislodged during fault isolation.
5. Check that all cards, cables, and plugs are located correctly.
6. Reinstall card clamps and check that all cable retention clips are in place.
7. If any diagnostic test programs have been run from the Model A control panel, check that the keypad is Off. If it is not switched off, the customer will not be able use previously selected devices.
8. Switch CB1 to on.
9. Set the Power switch to On.
10. **Wait 2 minutes for "start" to time out.**

Go to step 2.

---

### 2

Are the Device 0 Ready and the Device 1 Ready lights in the failing storage unit on?

NO      YES



Go to step 5.

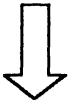
---

### 3

Is one device ready?

YES

NO



Follow the instructions on the right.

If the Power On indicator is not lit, go to “Problem Isolation Procedure B1” on page 8-3 (Entry Point A); otherwise, run diagnostic test program 10 to device 0 in the failing storage unit.

If the fault symptoms remain the same after a first pass through the procedures, ask your support group for help.

If they are not the same, return to “Problem Determination Entry” on page 1-6.

---

### 4

One device is ready.

Follow the instructions on the right.

Run diagnostic test program 10 to the failing storage unit.

If the fault symptoms remain the same after a first pass through the procedures, ask your support group for help.

If they are not the same, return to “Problem Determination Entry” on page 1-6.

---

### 5

You are here from step 2 because both devices are ready.

Follow the instructions on the right.

If you have a URC of 1AXX, run diagnostic test program 21 to device 0 first, then run test 10 to each device in the failing storage unit.

If you have had a URC of 1BXX, run diagnostic test program 31 to device 0 first, then run test 10 to each device in the failing storage unit.

Otherwise, run diagnostic test program test 10 to each device in the storage unit on which you were working.

Go to step 6.

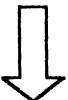
---

### 6

Does the diagnostic test program run without an error?

YES

NO



Follow the instructions on the right.

If the fault symptoms remain the same after a first pass through the procedures, ask your support group for help.

If they are not the same, return to “Problem Determination Entry” on page 1-6.

---

## 7

Check that all the green lights on the front panel, the lights on the ac power box, and the switched-mode power supply, are on.

Are *all* these lights on with the Motor Check and the Thermal Check lights off?

NO      YES



Follow the instructions on the right.

Go to "Problem Isolation Entry Point C" on page 8-20.

1. Set the Power switch on the front panel to Delayed Off.
2. Install the card clamps and all machine covers.
3. If the diagnostic test program has been run from the service panel on the Model A, ensure that the device is returned to system control by pressing the OFF key of the service keypad.
4. Restore the device to its operating position.
5. Check that the device 0 and device 1 Enable/Disable switches are set to Enable.

Go to step 8.



---

## 8

**Have you exchanged the disk enclosure?**

**NO**



**YES**

Follow the instructions on the right.

If you have exchanged the disk enclosure, update the complete VPD for each device address in the Model B. The using system manual describes how to do this.

**Note:** Listed below are the fields for which input is required. Fields not listed below are automatically filled in or are not required.

<b>VPD Field</b>	<b>What To Put In It</b>
<b>Number of FRUs</b>	00000009
<b>Device type</b>	9335
<b>Maintenance package level</b>	1, if the machine serial number is from 57-B0000 onward; otherwise, 0.
<b>Model number</b>	B01
<b>Serial Number</b>	Take the number from the serial number plates fixed to machine. Use this number right justified with leading zeros.
<b>Microcode load ID</b>	00000000
<b>Controller/Device ID</b>	If this is an even numbered device, it is 02. If an odd numbered device, 03.
<b>Manufacturing Identification</b>	00000057
<b>Engineering change level</b>	000000000000
<b>Installed features</b>	00
<b>Card part numbers and EC levels</b>	Fill in the card part numbers and EC levels by reference to the installed cards.

Go to step 10.

---

## 9

**Have you changed a FRU for one with a different part number or EC level?**

**NO**



**YES**

Follow the instructions on the right.

Update the appropriate VPD field with the new part number or EC level. The using-system manual describes how to do this.

Go to step 10.

---

## **10**

**You are here from step 8 or step 9**

**Follow the instructions on the right.**

You have now completed the IBM 9335 Model B cleanup and repair verification procedures. If you were directed to this manual from another manual return there now.

---

## Model B Grounding

### Electrical Grounding Checks

Refer to Figure 8-1 on page 8-127, Figure 8-4 on page 8-130, and Figure 8-6 on page 8-132 and perform the following checks on the Model B electrical power grounds:

- **At the ac power box:**

Check that a green and yellow wire connects the ac power box assembly to the power tray.

- **At transformers T1 and T2:**

Check that a green and yellow wire from each transformer is connected to its respective screw on the power tray.

- **At the switched-mode power supply unit:**

- Check that a green and yellow wire is connected between the switched-mode power supply unit and the power tray.

- **At the disk enclosure assembly:**

1. Check that a green and yellow wire connects the actuator driver 1 mounting plate to the disk enclosure frame.
2. Check that a green and yellow covered braid connects the disk enclosure frame to a screw on the power tray.
3. Check that a green and yellow covered braid connects the disk enclosure mounting cradle to the side of the drawer.

- **At the cooling fan assembly:**

1. Check that a green and yellow wire connects the fan motor to the fan housing.
2. Check that the following two green and yellow wires are attached to the fan-housing ground screw:
  - a. One runs back through the ac cable form to the ground stud at the left rear of the frame.
  - b. One goes back to the fan motor via pin 3 of P22/J22.

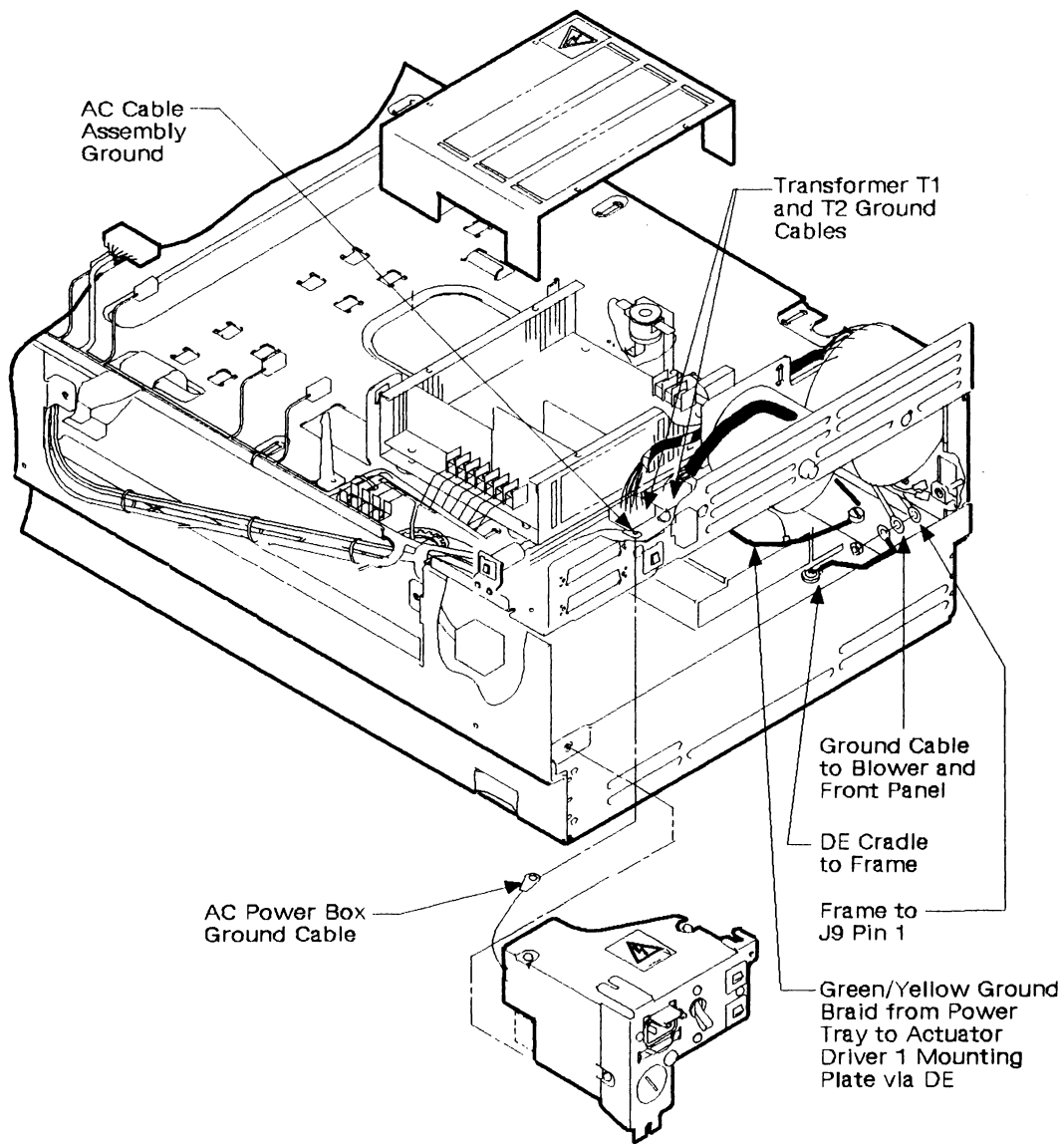


Figure 8-1. Grounding Locations – Model B (1 of 3)

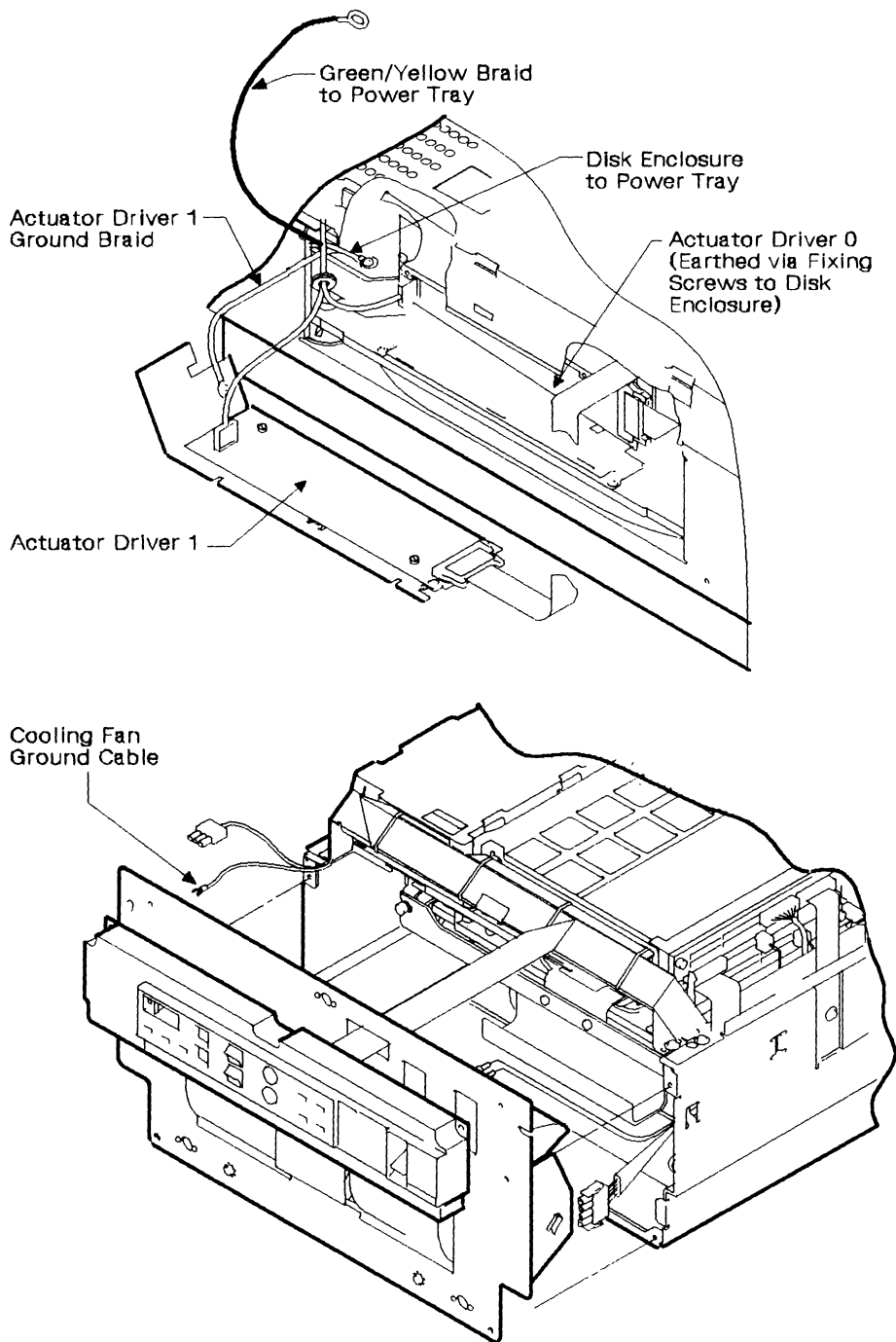


Figure 8-2. Grounding Locations – Model Bs with serial numbers below 57-B0000 (2 of 3)

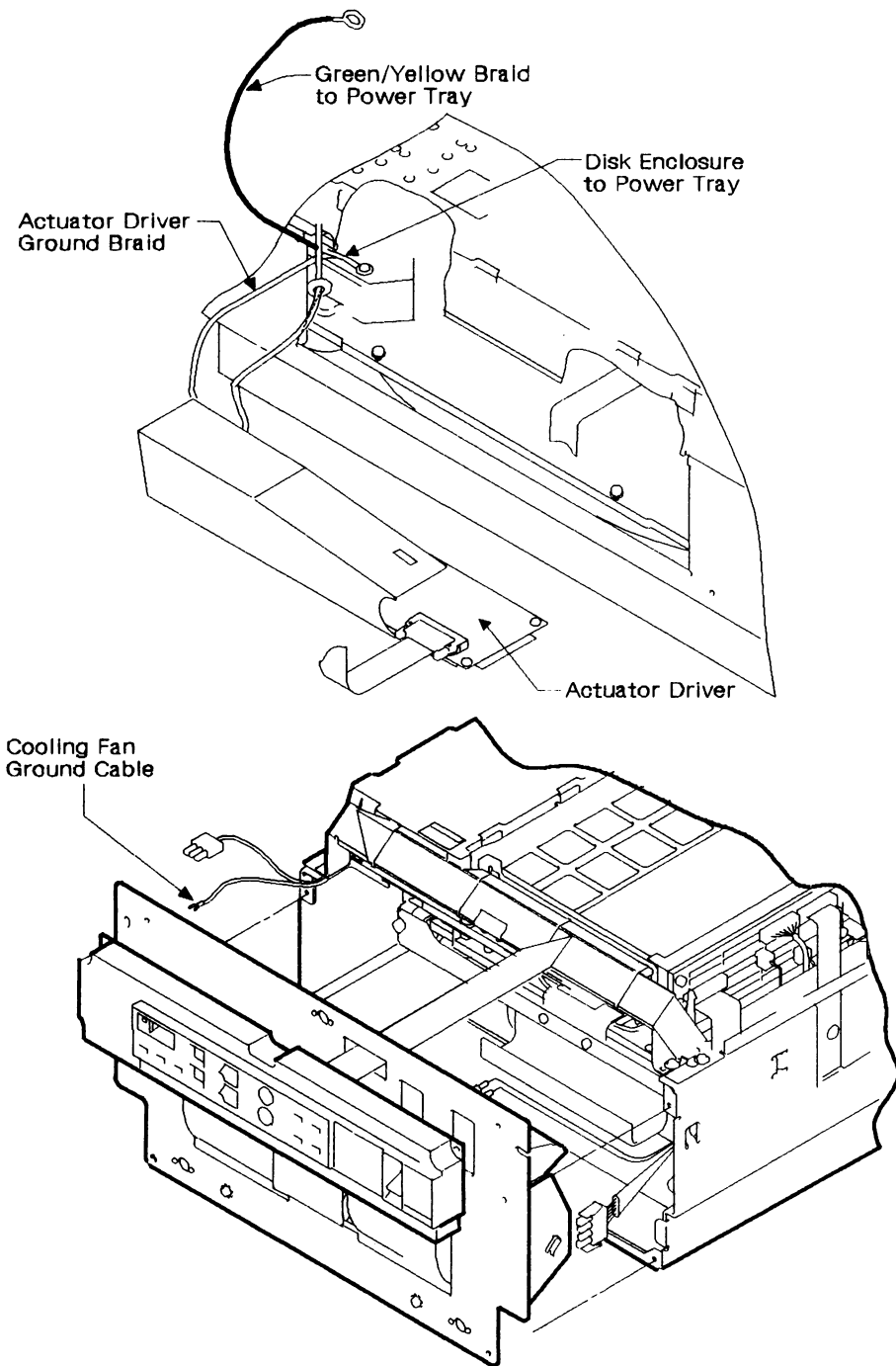


Figure 8-3. Grounding Locations – Model Bs with serial numbers from 57-B0000 onward (3 of 3)

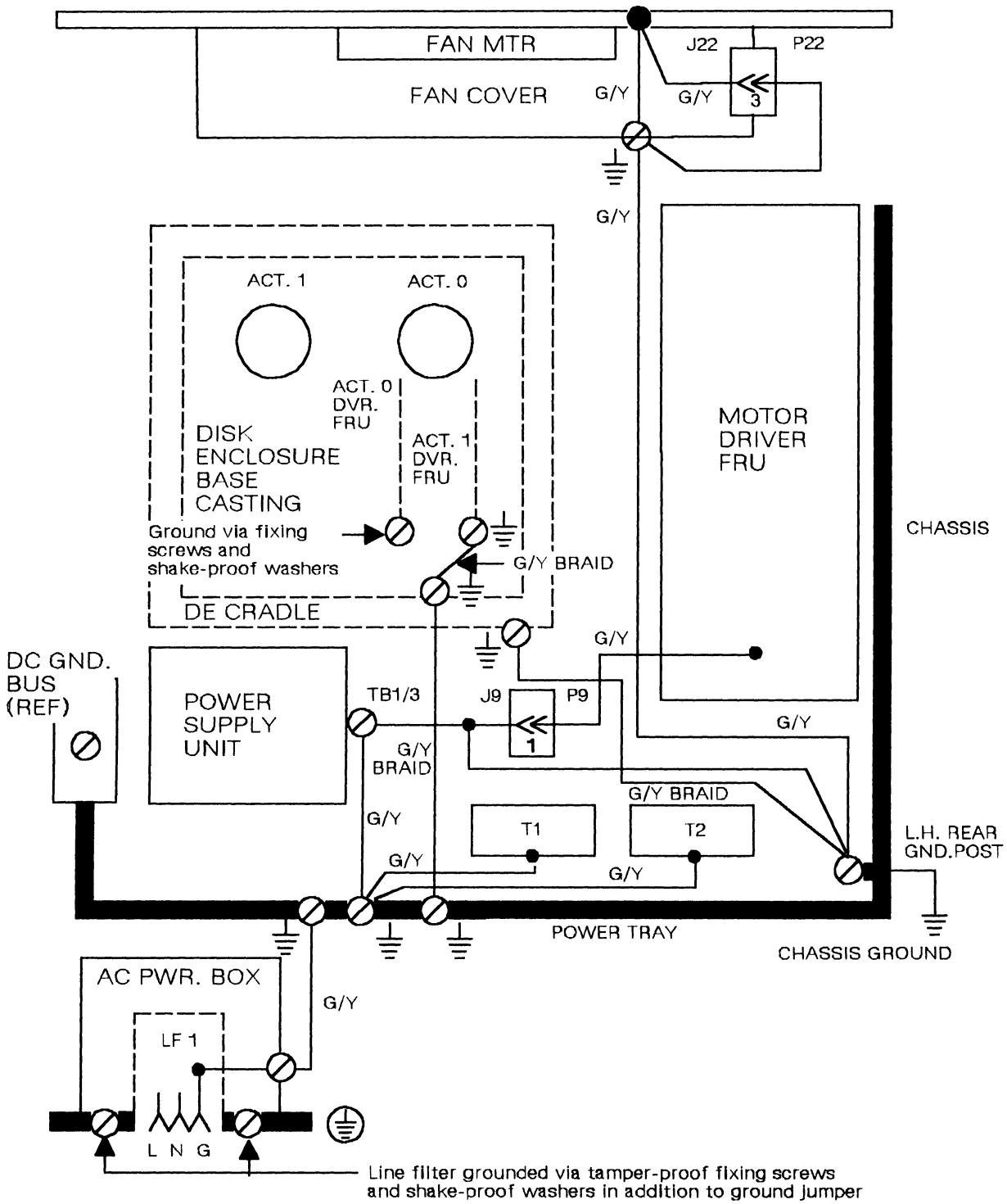


Figure 8-4. Grounding Diagram – Model Bs with serial numbers below 57-B0000

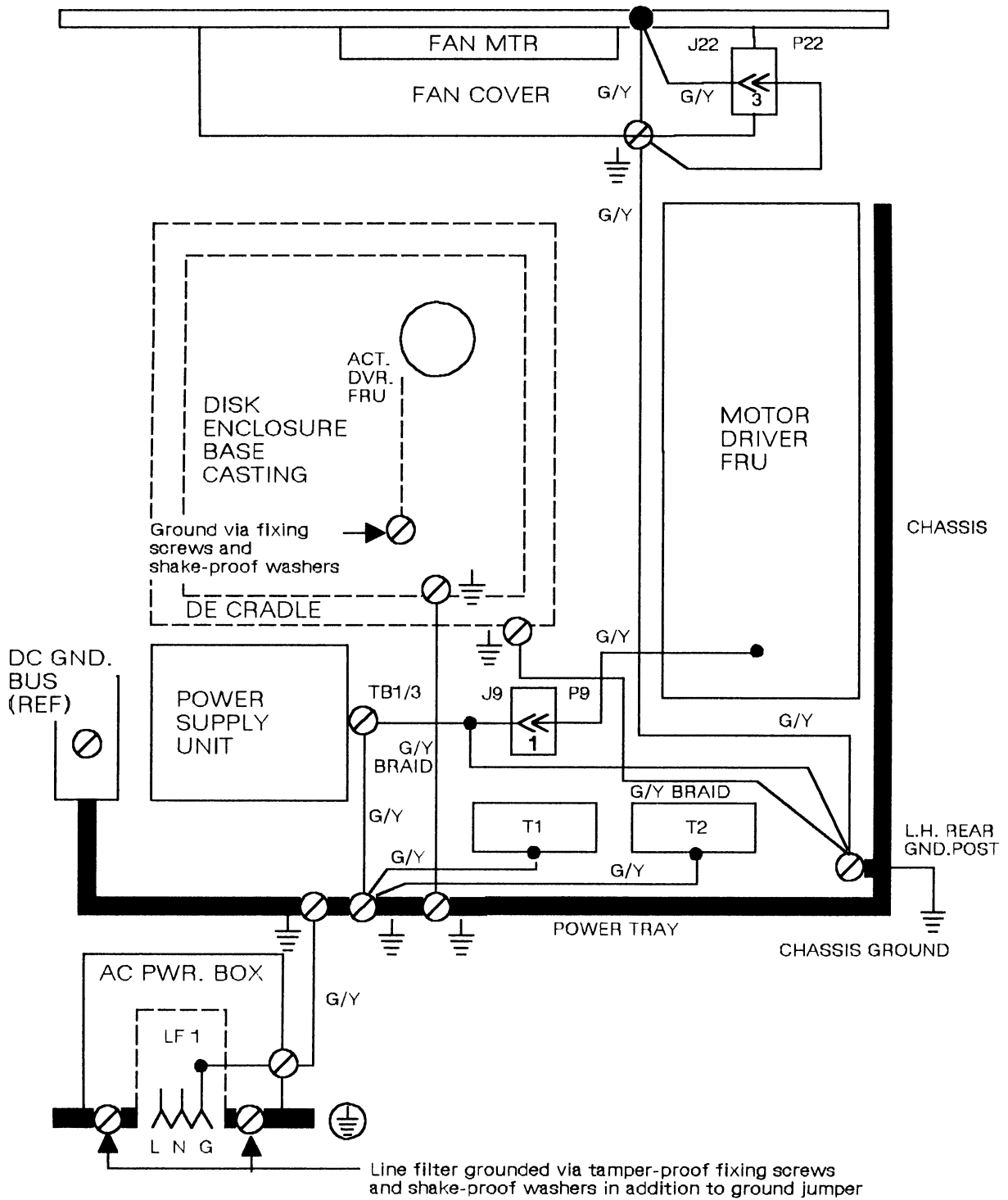


Figure 8-5. Grounding Diagram – Model Bs with serial numbers from 57-B0000 onward



# Power Distribution

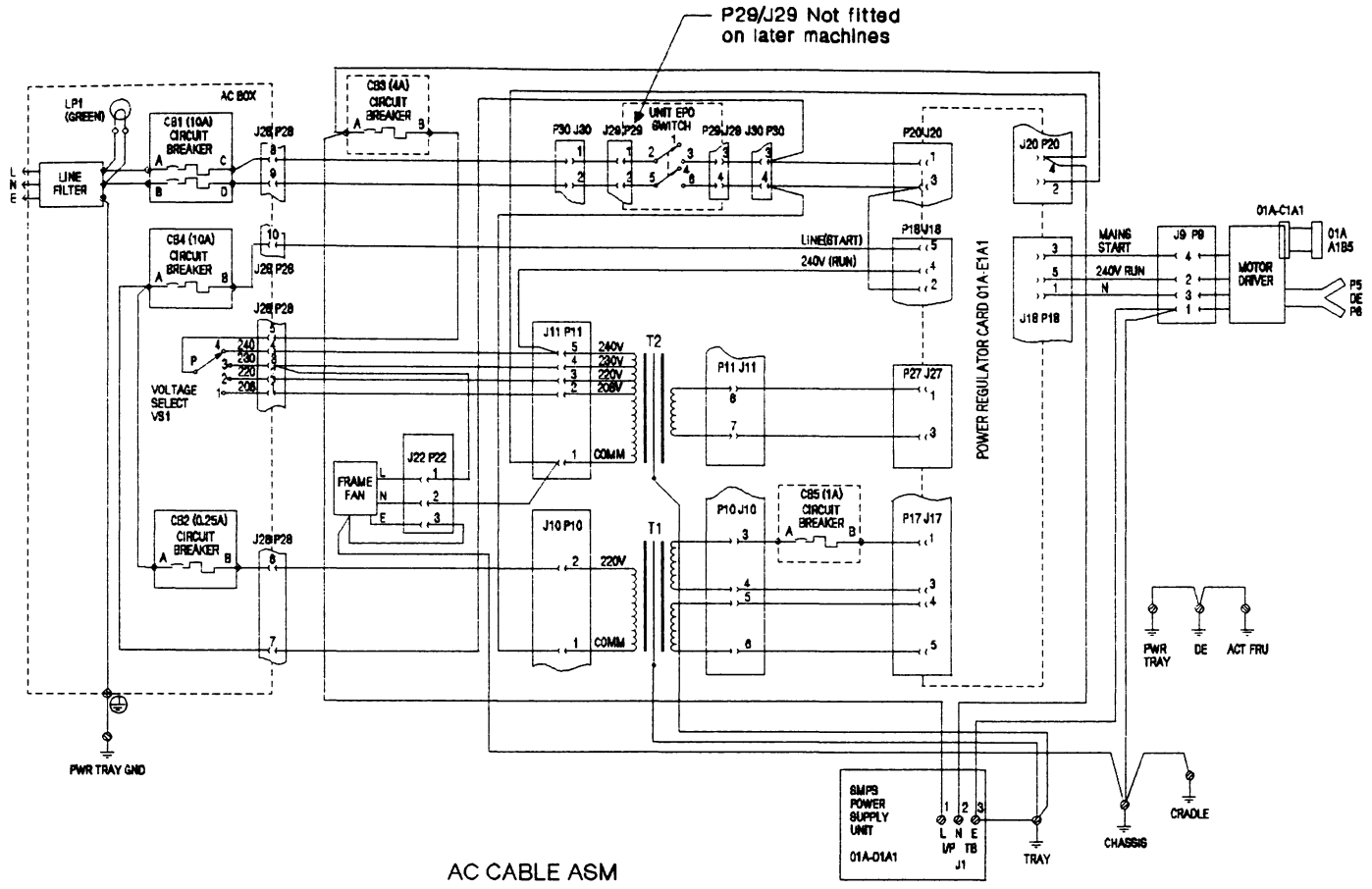
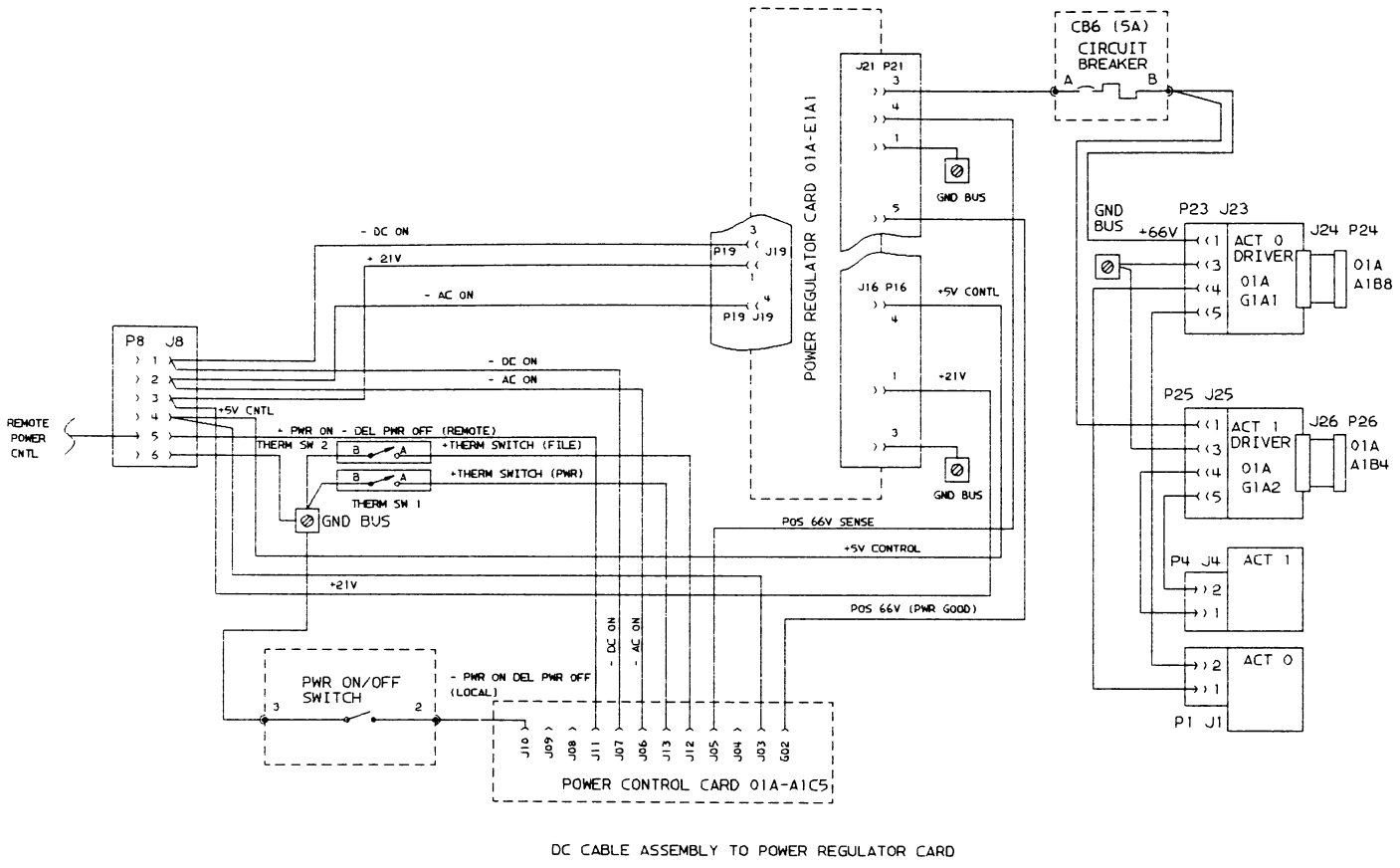


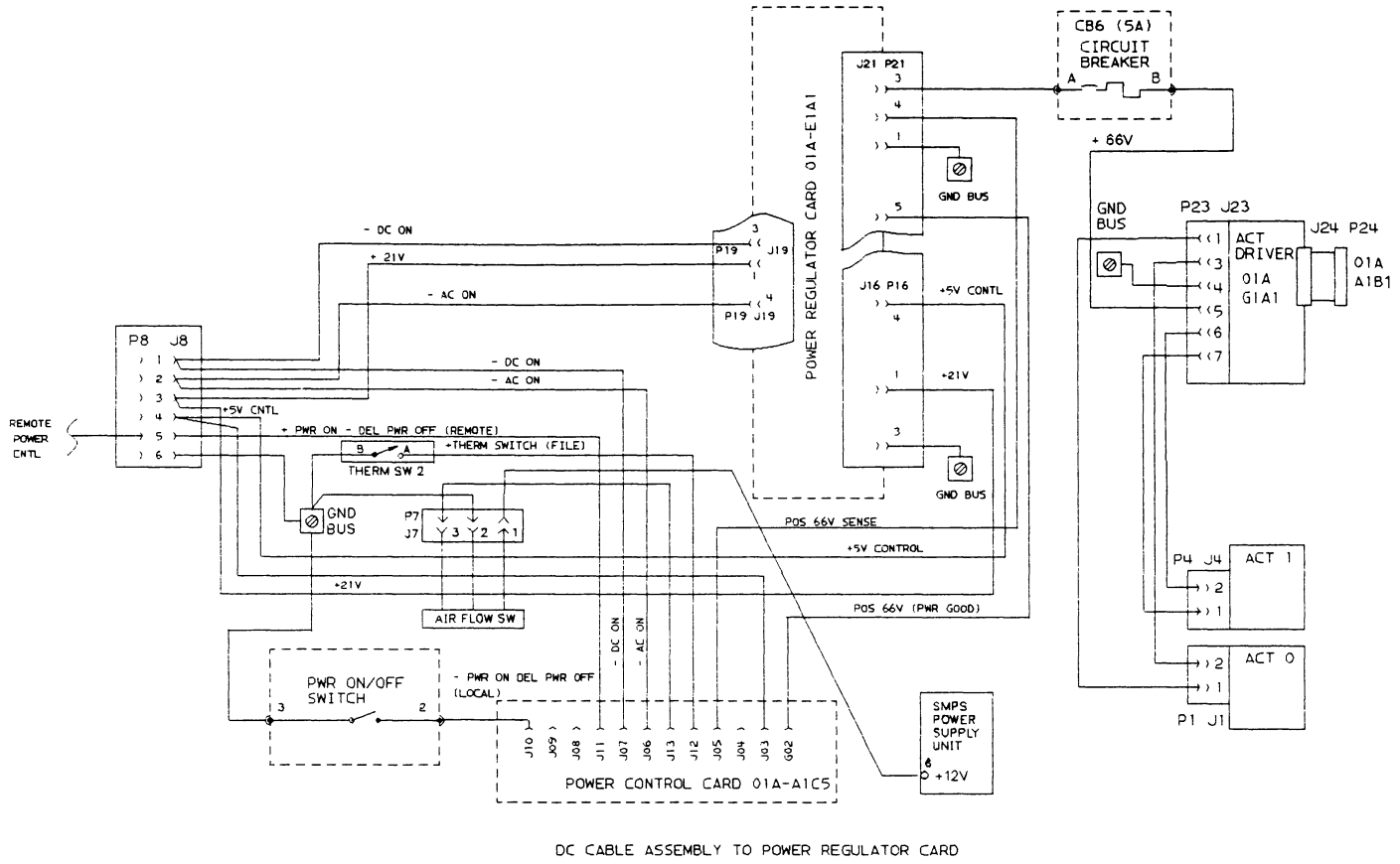
Figure 8-6. Model B AC Cable Assembly



DC CABLE ASSEMBLY TO POWER REGULATOR CARD

Figure 8-7. Model B DC Cable Assembly to Power Regulator (before serial number 57-B0000)

Figure 8-8. Model B dc Cable Assembly to Power Regulator (from serial number 57-B0000)



DC CABLE ASSEMBLY TO POWER REGULATOR CARD

CABLE TAGS	+5V	+5V	0V	0V	-5V	+12V	-12V
Power Supply Output TB	1	2	3	4	5	6	7
Cable from Logic Board	1,2,3	12,13	4,5, 8	14,15, 9	10,11	7	6
Cable from P12		1,14			5,6,7		
Cable from P14		2,13			8		
Cable from CE hours meter			18		19		
Ground Bus				17			
Air-Flow Switch						9	

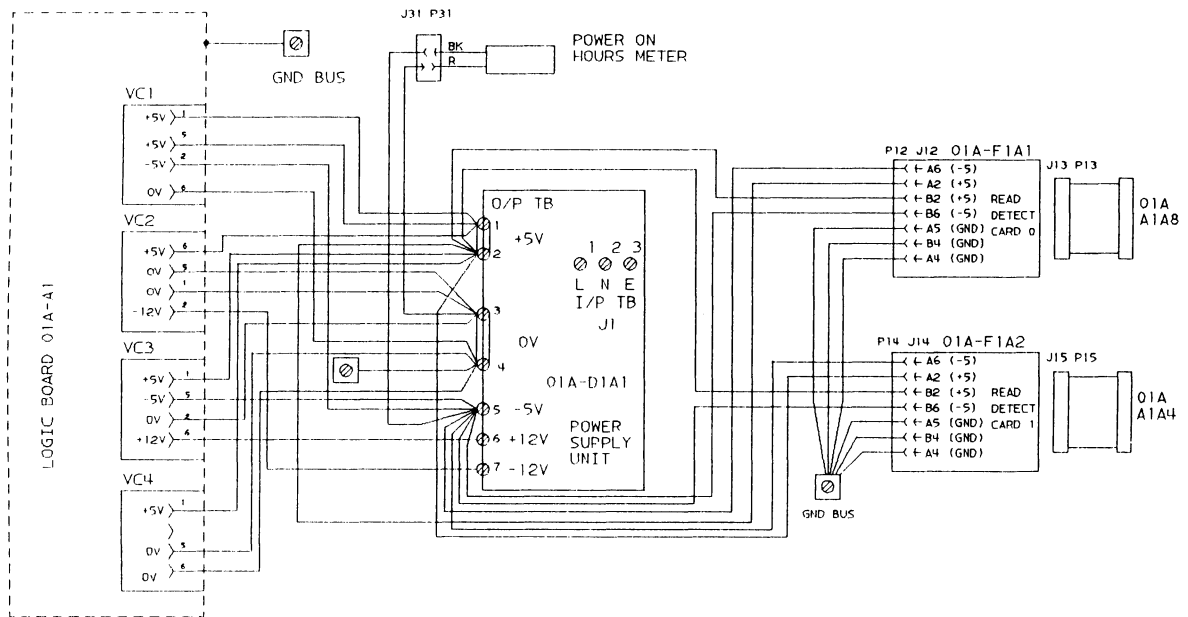


Figure 8-9. Model B dc Cable Assembly to Read-Detect Cards and Logic Board



---

## Chapter 9. Model B: Locations

This chapter shows the locations of the field-replaceable units and fault indicators in the Model B. The FRUs are shown in Figures 9-3 through 9-14.

Logic-card positions are shown below.

For Model Bs with serial numbers before 57-B0000:

Table 9-1. Logic Card Positions	
Logic card	Position in the gate
Demodulator card 0	01A-A1A5
Demodulator card 1	01A-A1A1
Servo card 0	01A-A1B5
Servo card 1	01A-A1B1
Device interface card	01A-A1C1
Power control card	01A-A1C5

For Model Bs with serial numbers from 57-B0000 onwards:

Table 9-2. Logic Card Positions	
Logic card	Position in the gate
Sermod card 0	01A-A1B5
Sermod card 1	01A-A1B1
Device interface card	01A-A1C1
Power control card	01A-A1C5

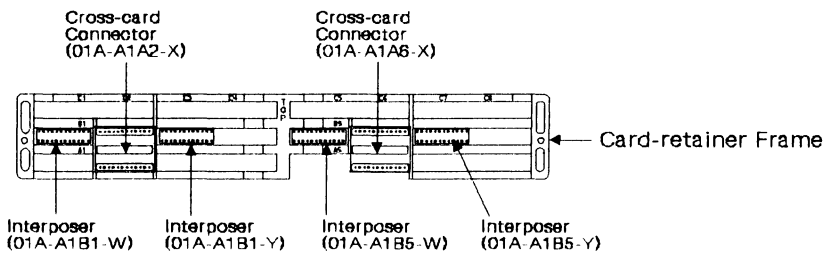
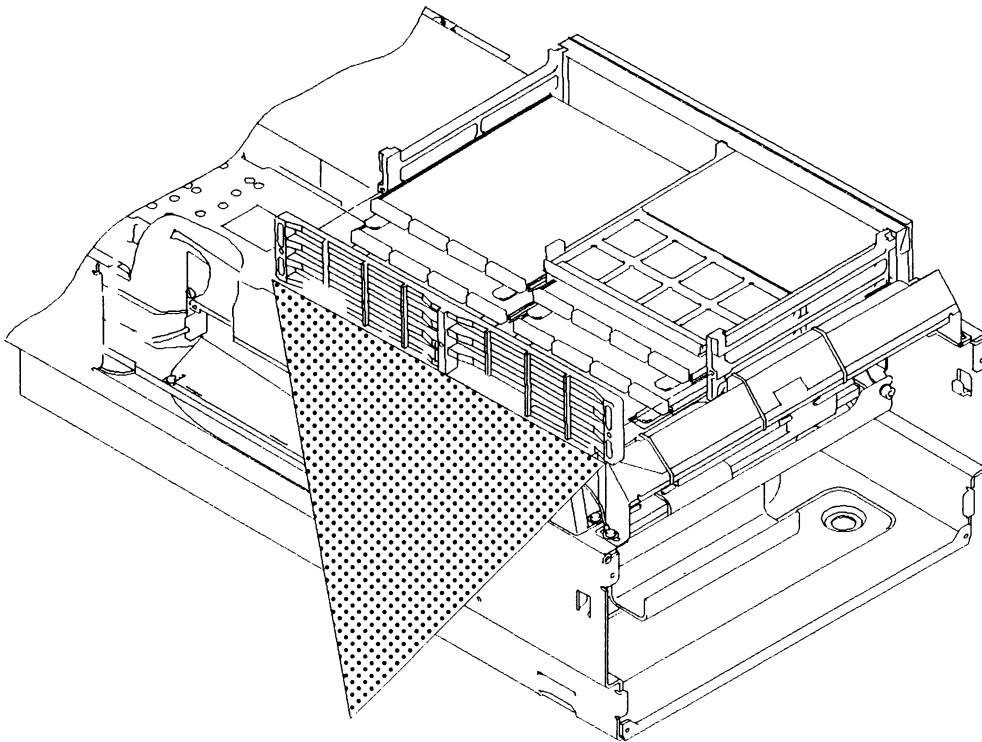


Figure 9-1. Model B Interposer and Crossover Locations (Model Bs before 57-B0000)

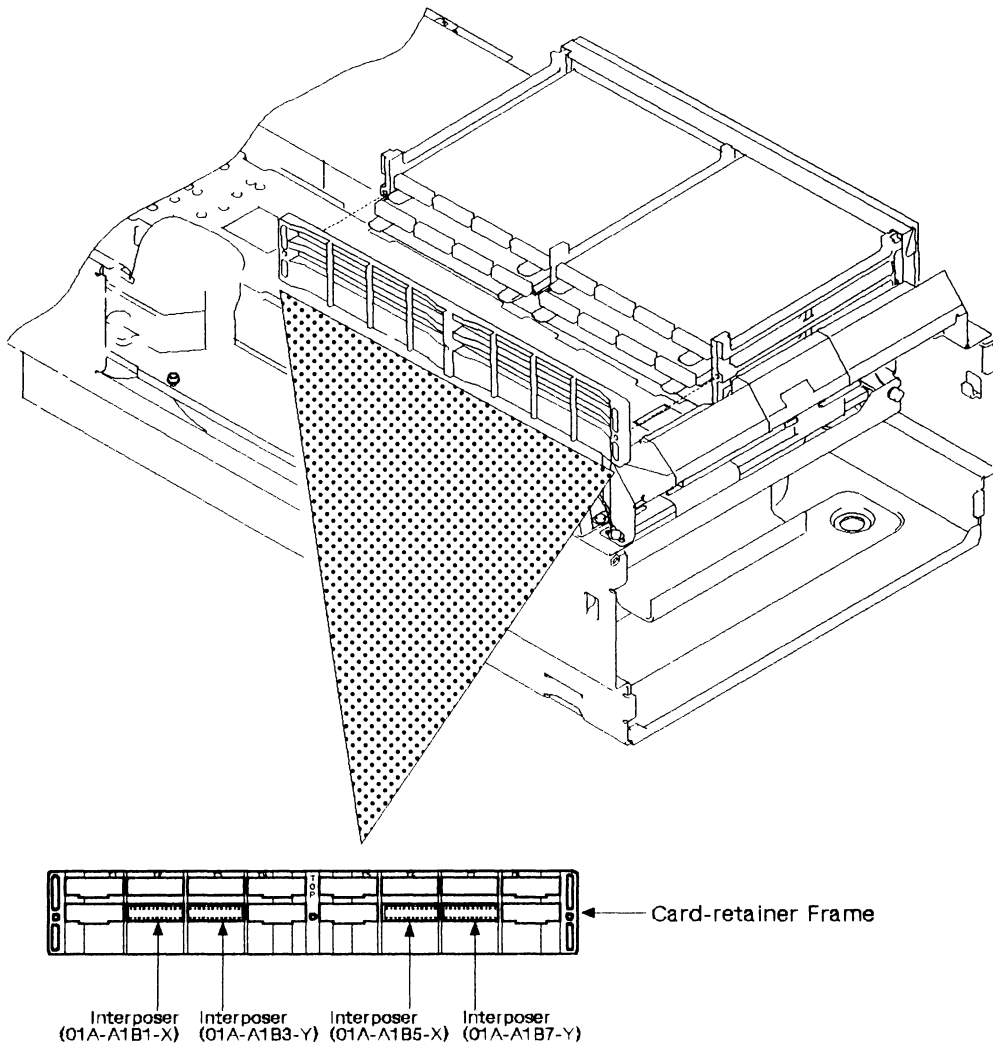


Figure 9-2. Model B Interposer and Crossover Locations (Model Bs from 57-B0000 onward)



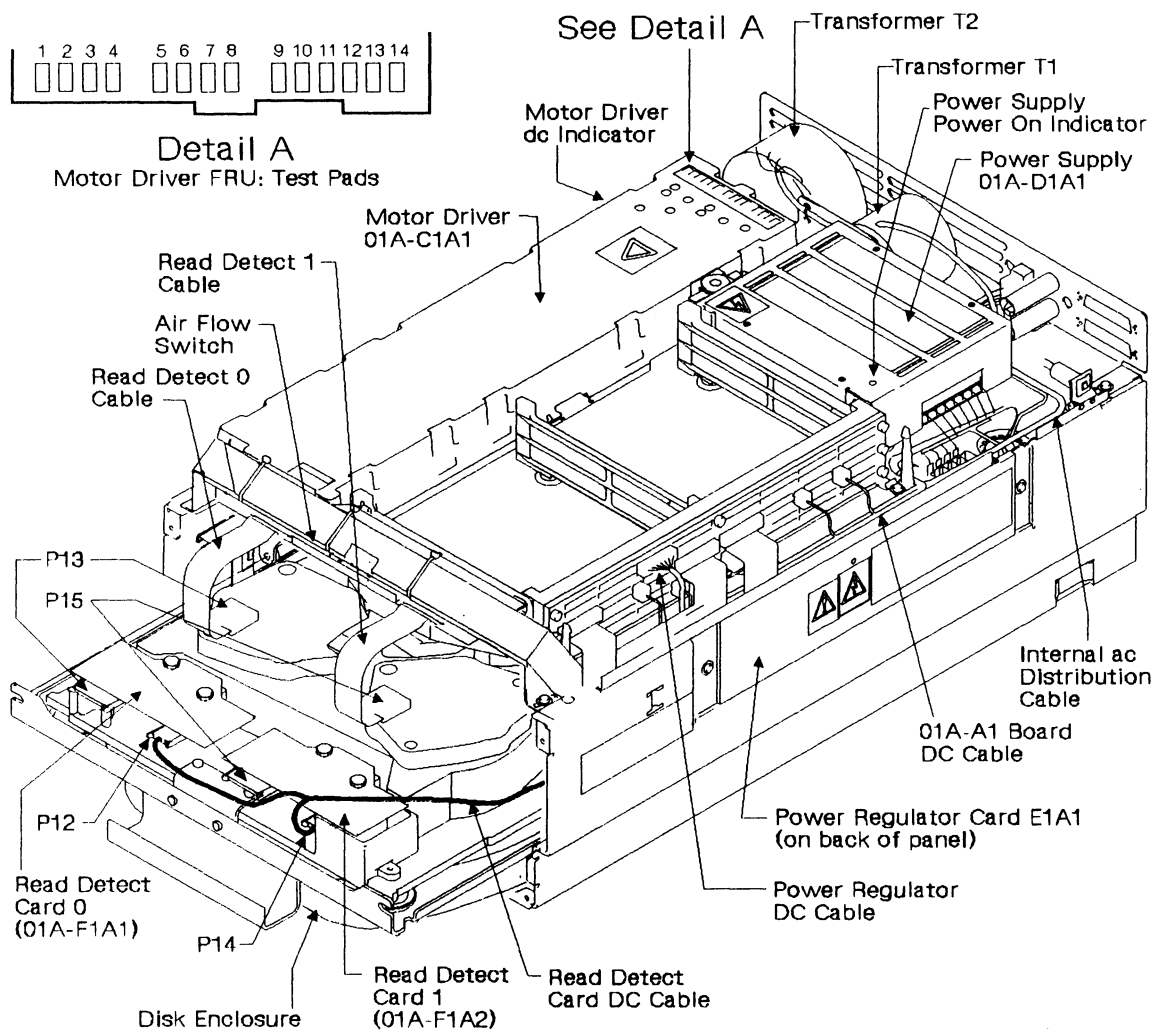


Figure 9-3. Front View of the Model B

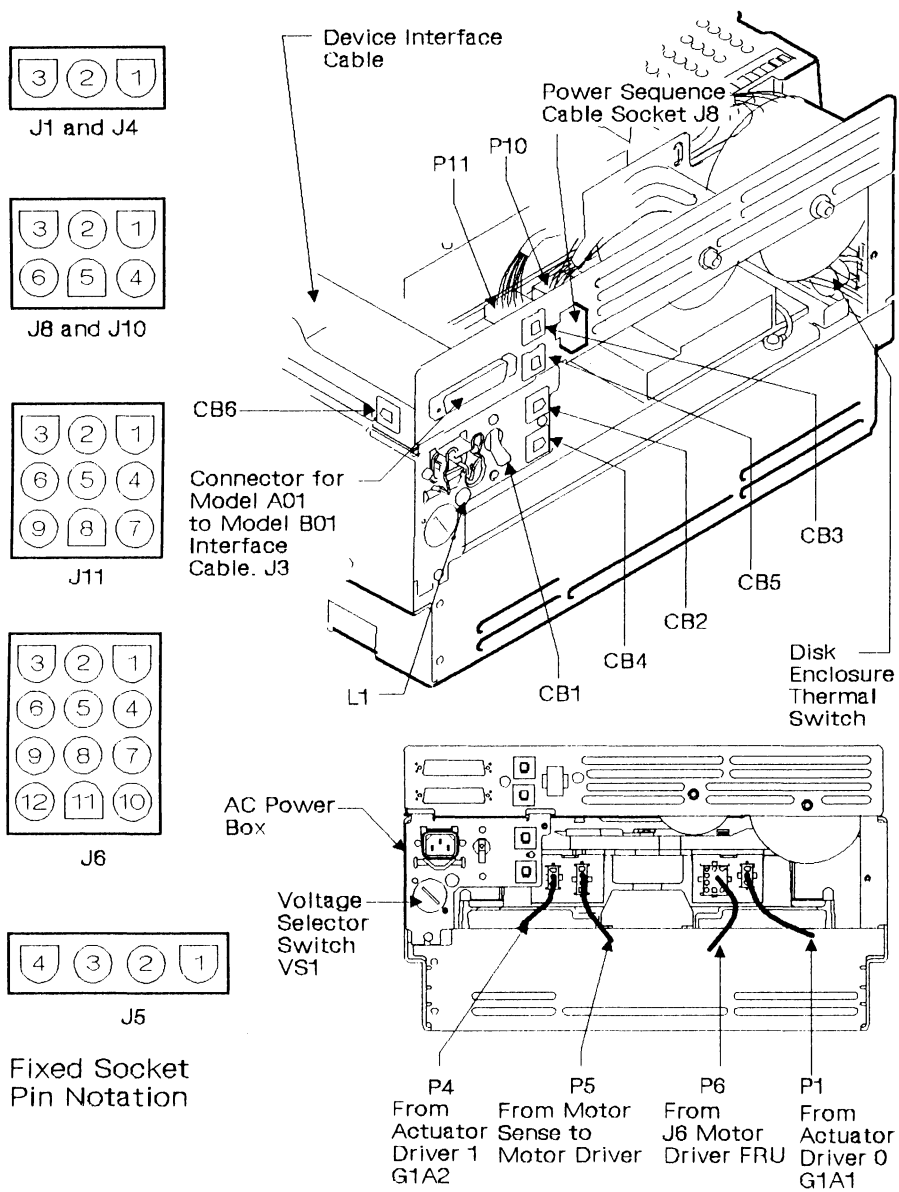


Figure 9-4. Model B: Back Panel and Connectors

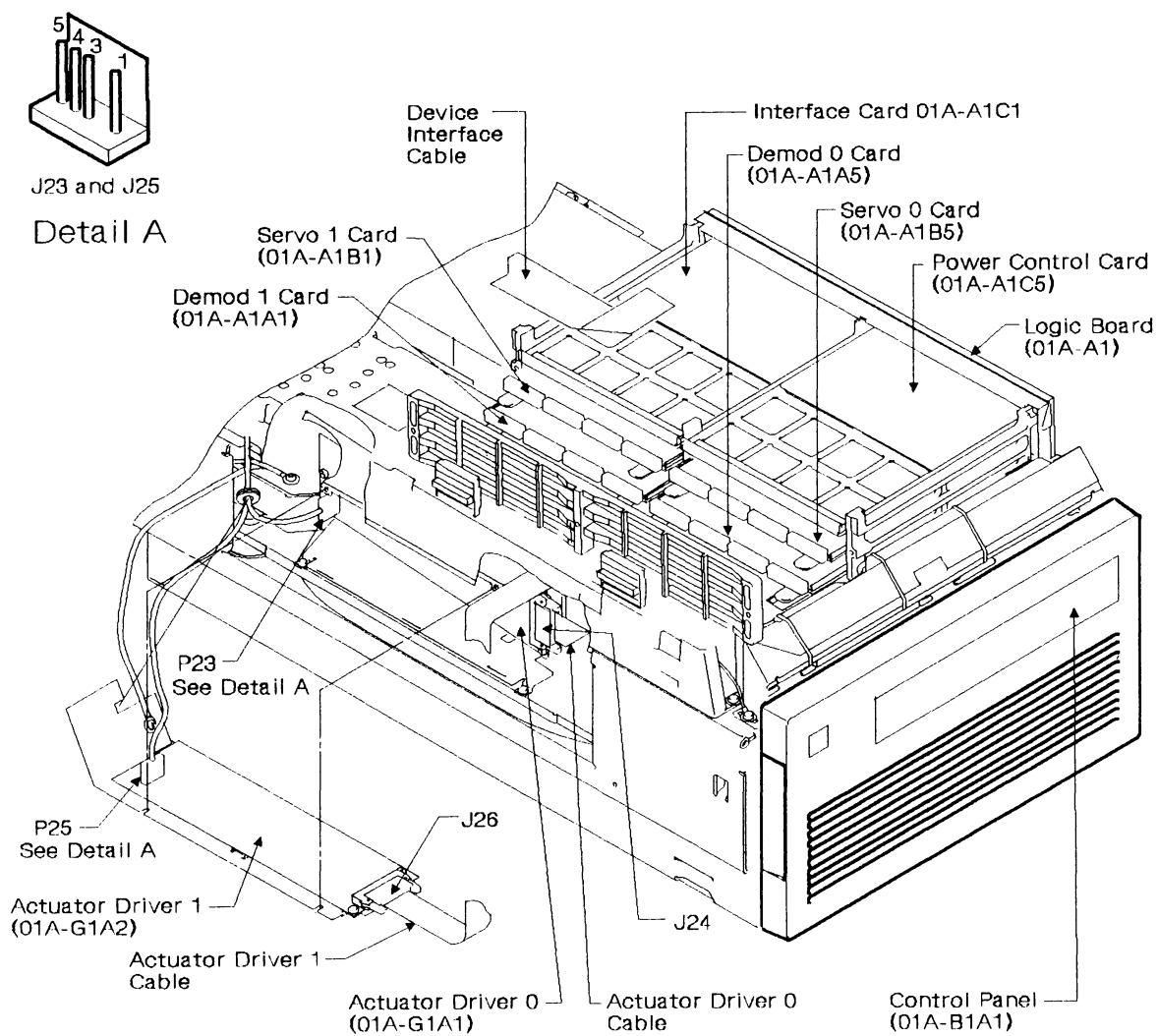


Figure 9-5. Top View of the Model B (before 57-B0000)

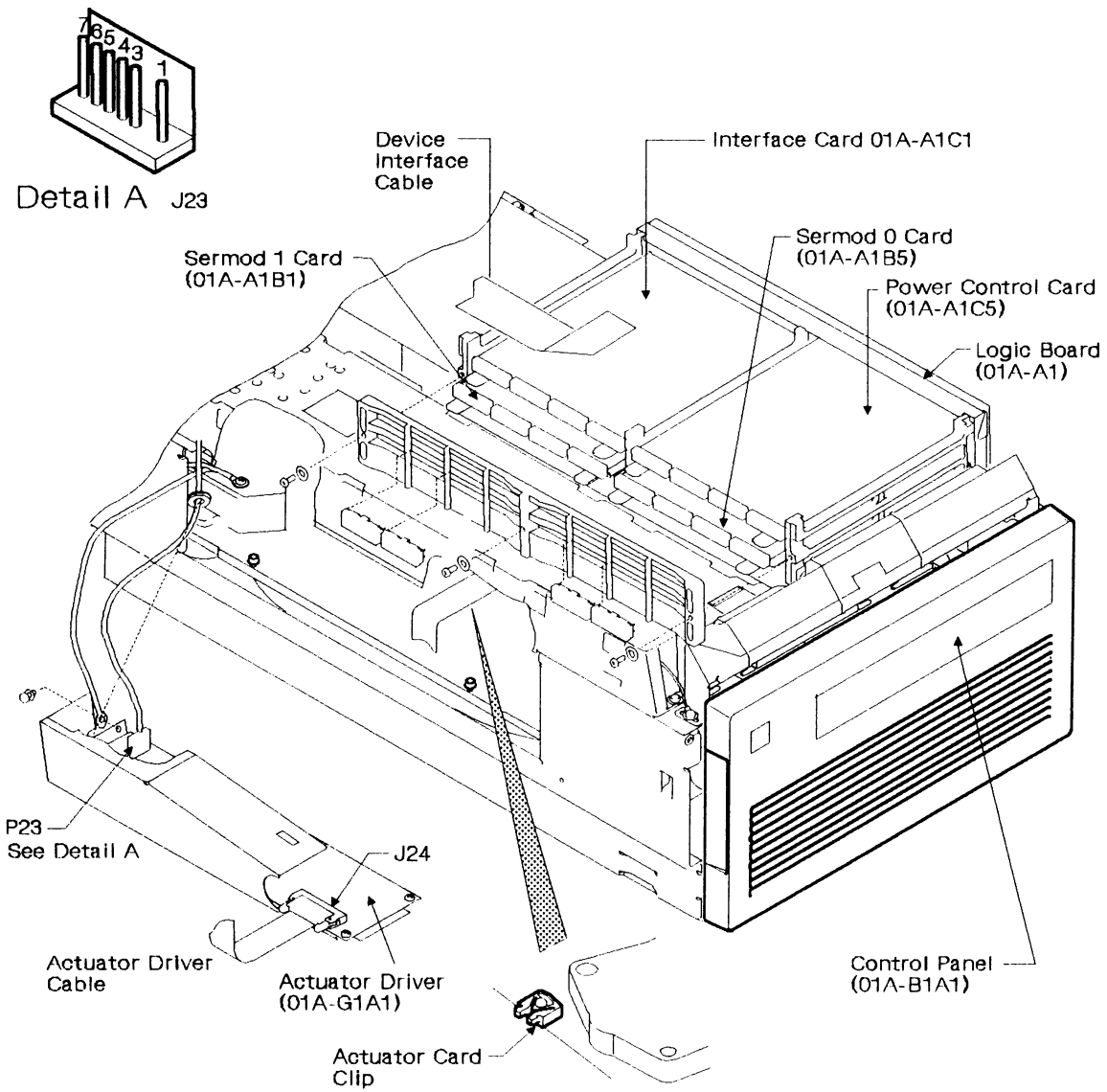


Figure 9-6. Top View of the Model B (from 57-B0000 onward)

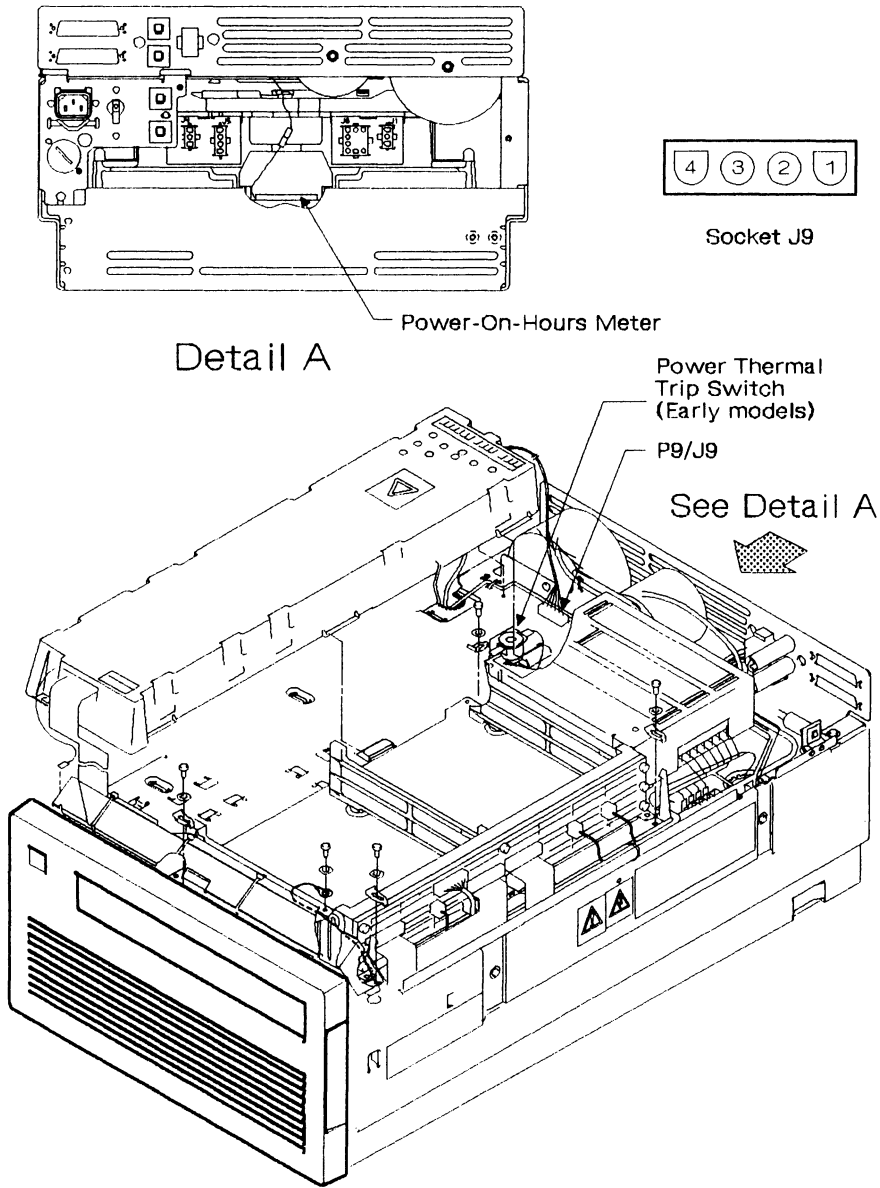


Figure 9-7. Front View of the Model B

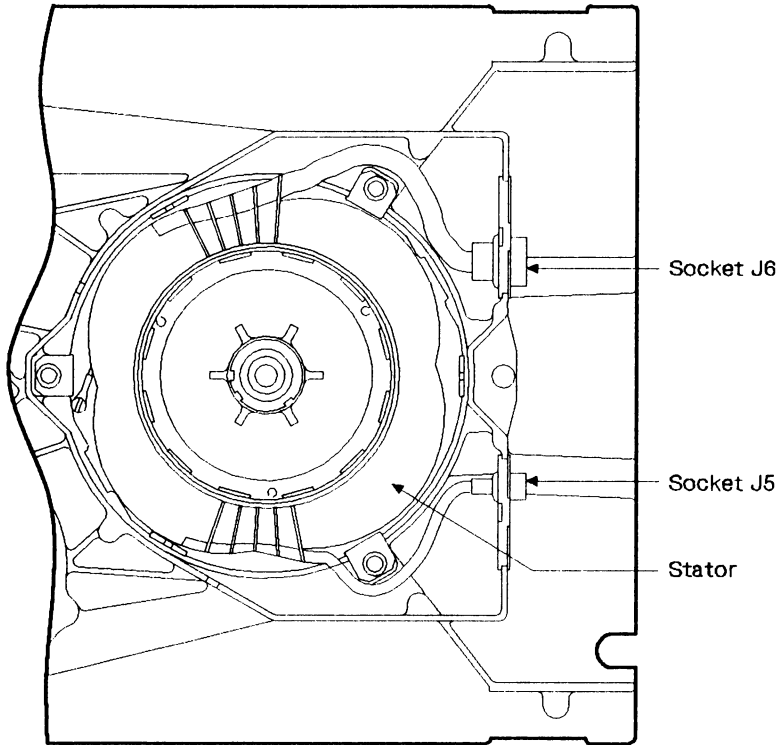
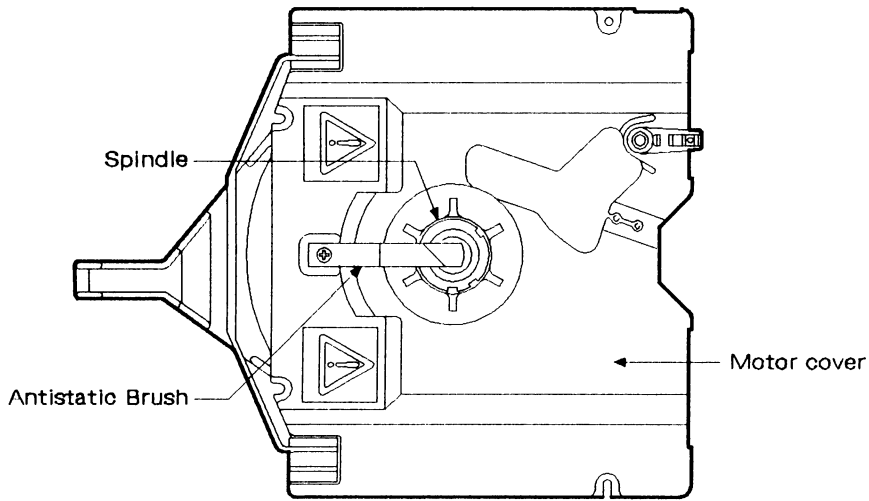
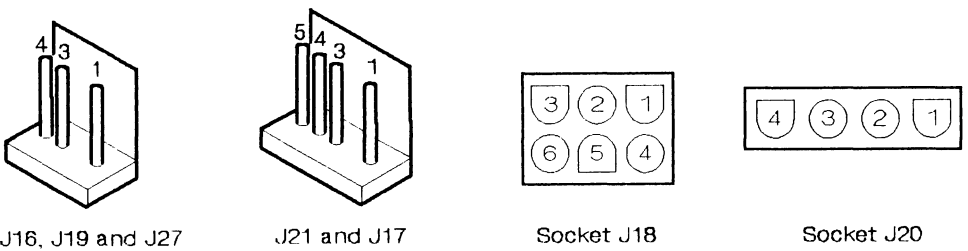
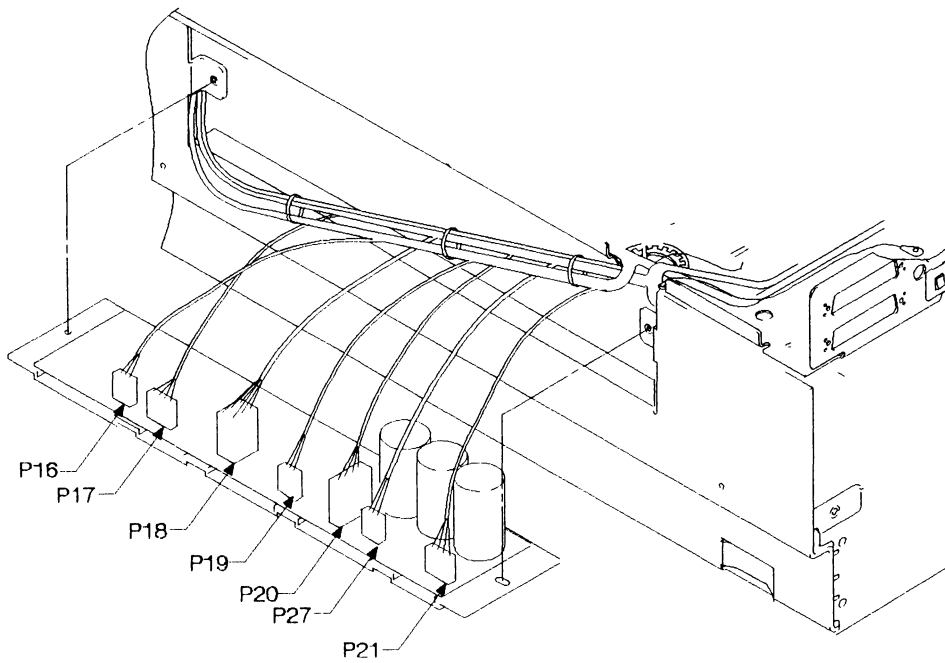


Figure 9-8. Disk Enclosure Motor Locations



J16, J19 and J27

J21 and J17

Socket J18

Socket J20

Figure 9-9. Power Regulator Card Connectors

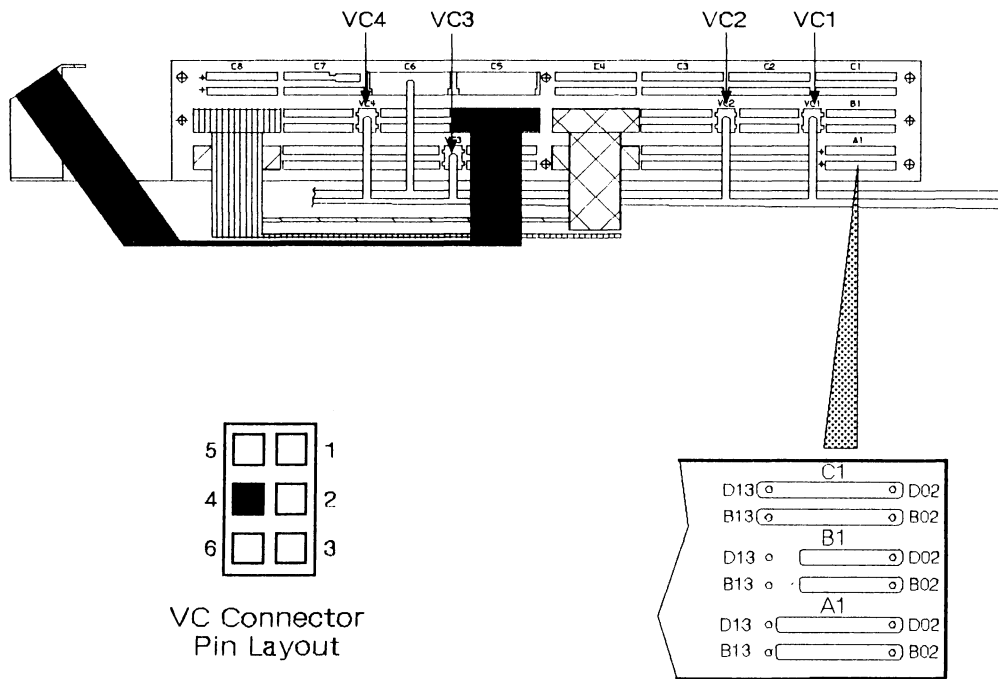


Figure 9-10. Model B 01A-A1 Board Locations (before 57-B0000)

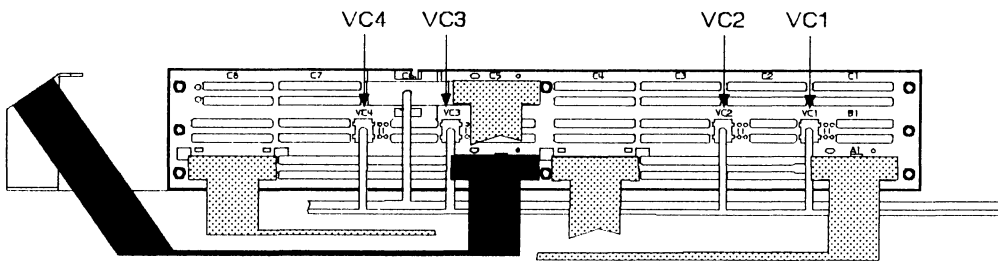


Figure 9-11. Model B 01A-A1 Board Locations (from 57-B0000 onward)



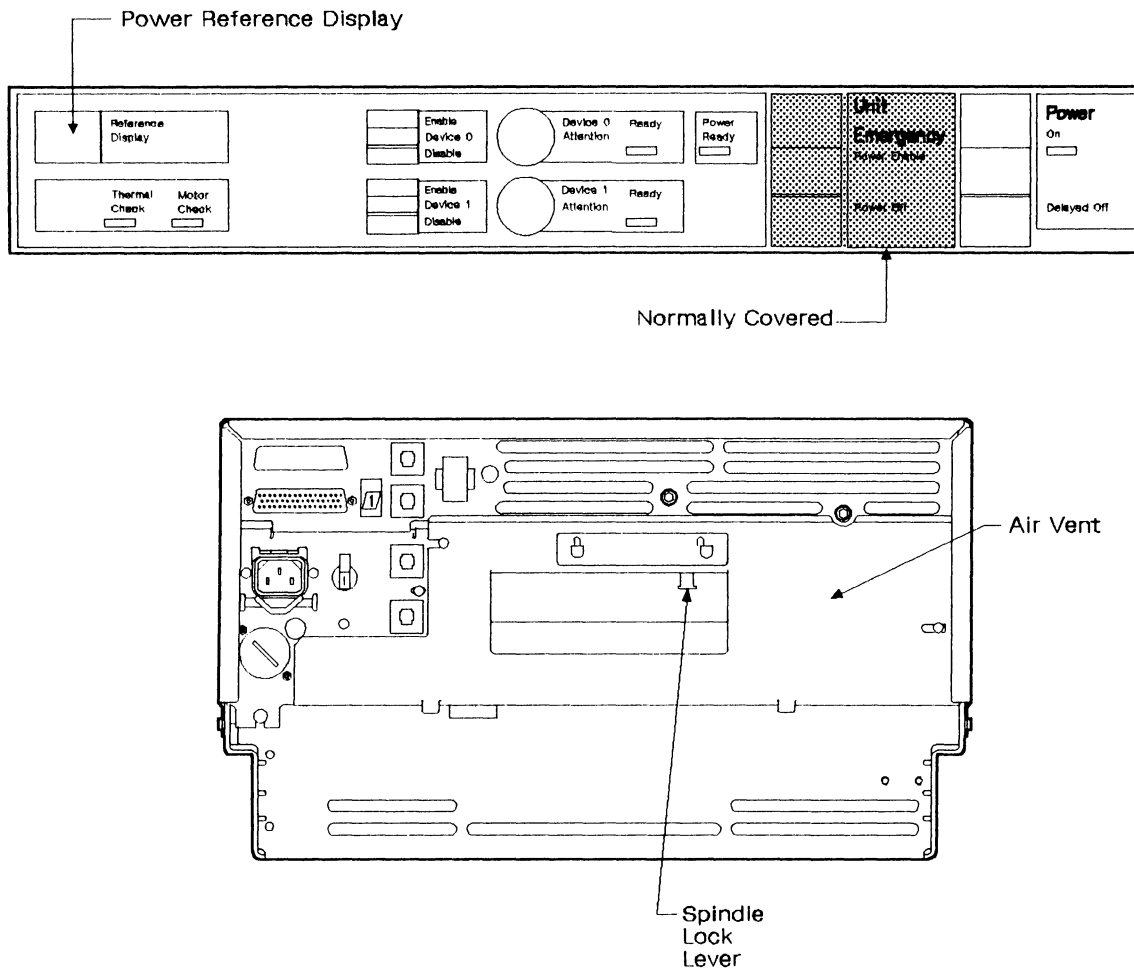


Figure 9-12. Model B: Control Panel and Back Panel

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## Chapter 10. Safety Inspections

Safety Inspection Guide . . . . .	10-2
Requirements Before Starting . . . . .	10-2
Guidelines . . . . .	10-2
Electrical Components . . . . .	10-4
Mechanical Components . . . . .	10-4
Safety Warning Labels for Model A . . . . .	10-5
Safety Warning Labels for Model B . . . . .	10-7

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## Safety Inspection Guide

### Requirements Before Starting

It is important that IBM product-trained service representatives have completed the *Electrical Safety Training Course for IBM Service Representatives* (self-study course 77170 or current level) before following any of the work procedures detailed in this service guide. Reference items:

- Current service memorandums (SMs) and engineering change announcements (ECAs).
- Minimum space requirements. You can get this information from the *IBM Input/Output Equipment Installation Manual – Physical Planning*, GC22-7084.
- *Safety/Health Guidelines for IBM Service Representatives*, S241-5493.
- *Electrical Safety for IBM Service Representatives*, S229-8124.

Use these documents as necessary to make certain that **all** safety requirements are met.

**Before starting this safety inspection, ensure that the mainline power cable is disconnected at the consumer power outlet, and that the IBM 9335 Direct-Access Storage Subsystem is powered off.**

### Guidelines

The purpose of the safety inspection procedure is to verify the safe condition of the IBM 9335 Direct-Access Storage Subsystem. If the inspection indicates that the safety of the machine is not acceptable, it must be made acceptable before IBM service can be performed.

A safety inspection is needed:

- When an IBM machine is considered for an IBM service agreement.
- When IBM per-call service is requested and the machine is not being serviced by IBM.
- As part of an alteration and attachments review on any IBM machine on lease, rental, service agreement, or per-call service.
- On any machines that are relocated.

If any of the above four cases apply, perform the safety inspection procedure.

The following are examples of conditions and the hazards they present:

- Electrical: A frame that is not grounded can cause a serious or a fatal electrical shock.
- Explosive: Bulging capacitors are likely to explode, and can cause severe injury.
- Mechanical: Missing belt covers can cause injuries.

Remember, **prevention** is the main aid to electrical safety. Always think about electrical safety and use **good practice**, for example:

- Ensure that the customer's power outlet matches the equipment specifications.
- Inspect power cables and plugs; check for loose, damaged, or worn parts.
- Review the procedure in the maintenance documents before you remove a part that can hold an electrical charge from the machine. **Carefully** discharge the necessary parts exactly as instructed in the procedure.
- Do not use a normal light (for example, a table lamp) as an extension light at a machine.

Never **assume** that a machine or a circuit is safe. No machine is **always** completely safe. You may not know the exact condition of a machine because, for example:

- The power outlets could be wrongly wired.
- Safety devices or features could be missing or defective.
- The maintenance and/or changes history could be wrong or not complete.
- The design could have a problem.
- The machine could have been damaged when it was shipped.
- The machine could have an unsafe change or attachment.
- An engineering change or a sales change could be wrongly installed.
- The machine could have deteriorated (1) because it is old or (2) because it operates in an extreme environment.
- A part could be defective.
- A part could be wrongly assembled.

These are some of the ways that the condition of the machine could affect safety. **Before you start a service procedure, exercise good judgment and use caution.**

## Electrical Components

Perform the following checks on the electrical components of the IBM 9335:

1. Ensure that all power grounds are in place, undamaged, and correctly connected with star washers between the ground points and the terminals (see “Grounding” on page 5-28 for Model A, and “Model B Grounding” on page 8-126 for Model B).
2. Check the condition of all power cables for:
  - a. Chafing or any damage to insulation.
  - b. Connector retainers in place and secure.
  - c. Strain reliefs and cable ties in place and secure.
  - d. Through-frame insulation (rubber grommets) in place and not damaged.

## Mechanical Components

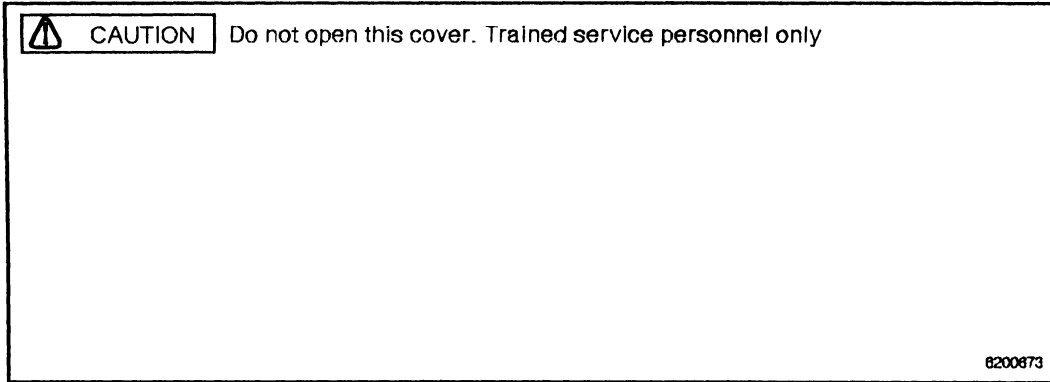
Ensure that:

1. All the covers are undamaged, in place, and secure.
2. The spindle lock on the Model B works correctly, that is, when moved down slightly and to the right, it springs into its detent.
3. With the power off, ensure that all the safety and warning labels are in place (see the figures on the following pages).
4. All the external hardware associated with the rack (slide assemblies, casters, fasteners) are in place, correctly secured, and operate correctly:
  - Sliders operate with no binds and the detents operate in the closed and open positions.
  - Cables in the cable carriers are correctly routed, and the clamps and hinges operate correctly.
5. All cooling ducts and protective grilles are in place and undamaged.
6. The cooling fans operate with no binds. That is, the fans are quiet and there is a steady airflow.

In addition, for the Model B, check the following:

- That card-gate parking brackets are not damaged and the sliding clips are in place when the card-gate is in the home position.
- That the toroidal transformer (T1 and T2) chassis insulating bushes are not damaged (see Figure 7-10 on page 7-23 and Figure 7-11 on page 7-25).
- That the power sequencing and the rack emergency power off (UEPO) function correctly.

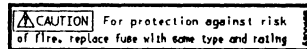
## Safety Warning Labels for Model A



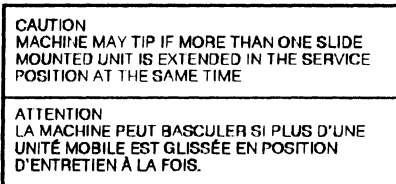
1 Part 6200673



2 Part 8232359



3 Part 6200459



4 Part 69X6183

Figure 10-1. Model A Safety Warning Labels

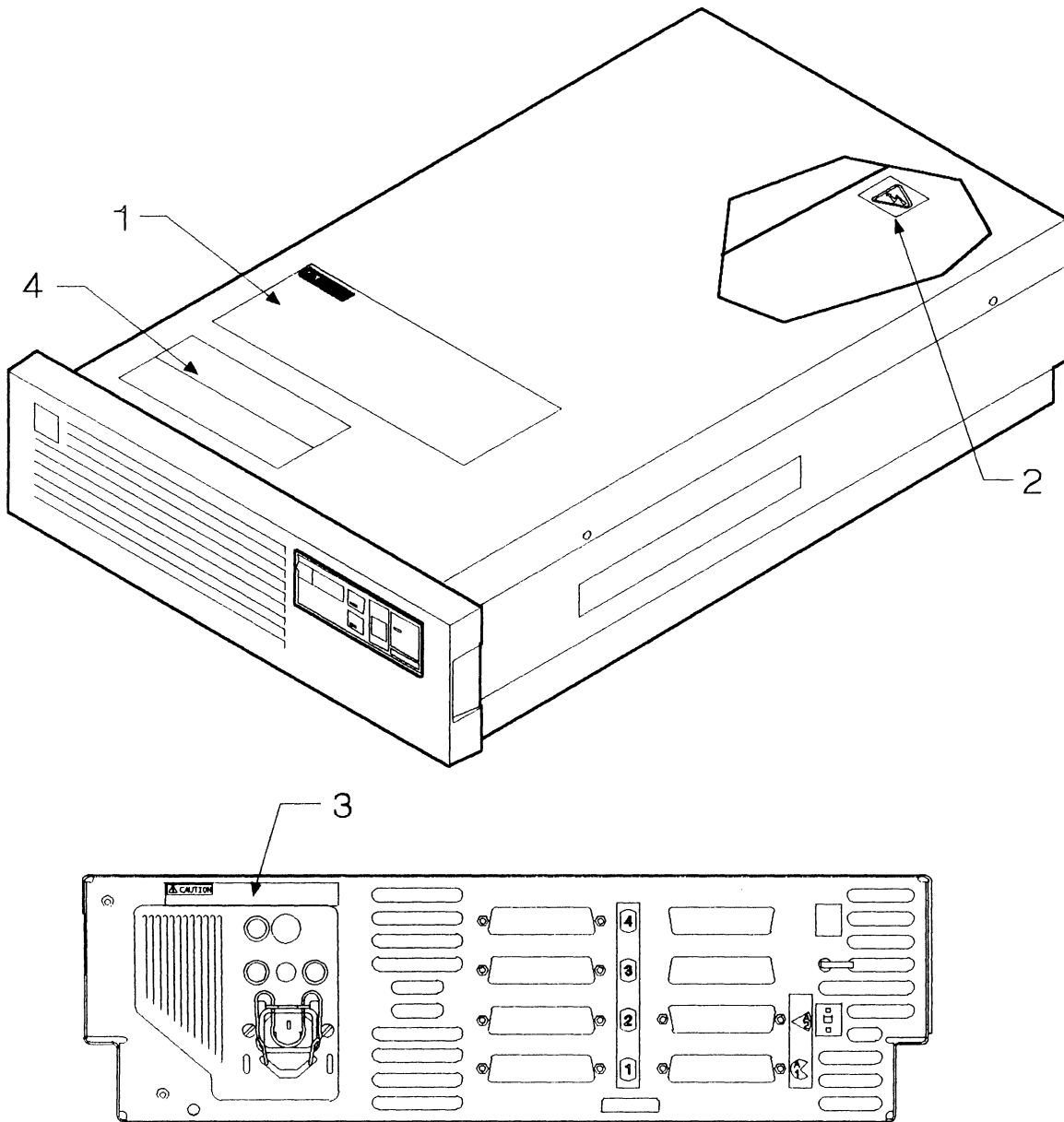
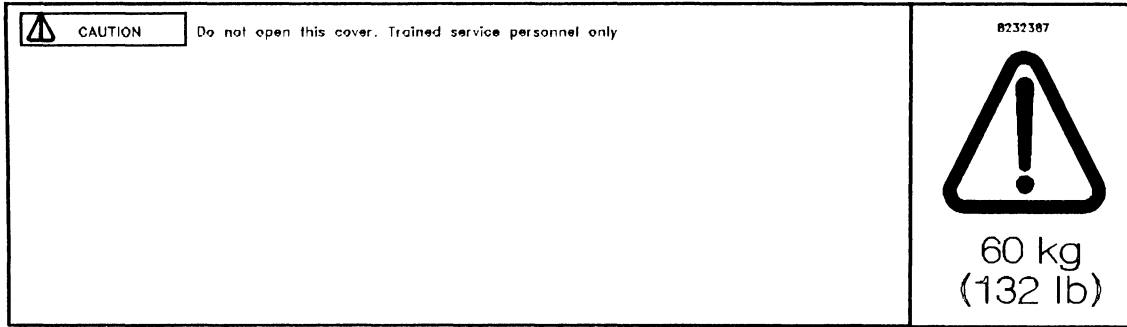
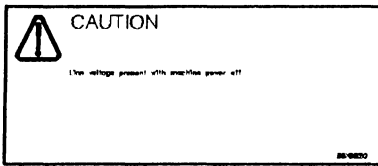


Figure 10-2. Locations of Model A Safety Warning Labels

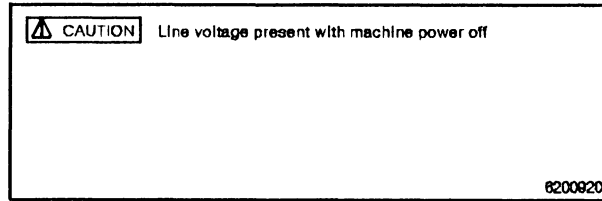
## Safety Warning Labels for Model B



1 Part 8232387



2 Part 59X6820



3 Part 6200920



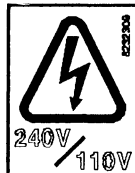
4 Part 5146841



5 Part 59X6831



6 Part 8222220



7 Part 8232309



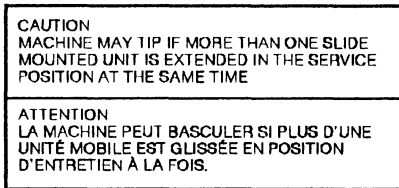
8 Part 8232359



9 Part 8232357



10 Part 8222195



11 Part 69X6183

Figure 10-3. Model B Safety Warning Labels



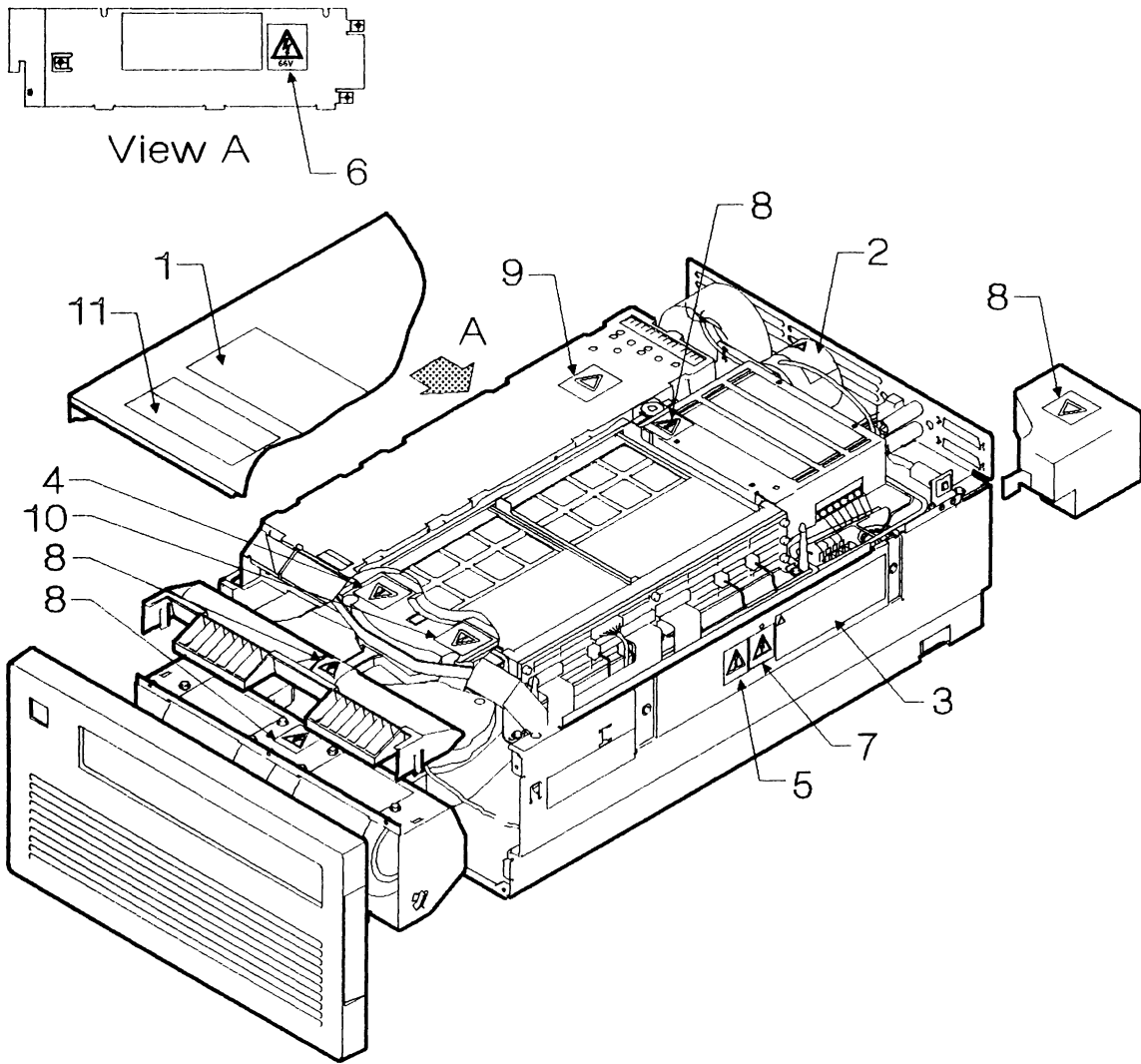


Figure 10-4. Locations of Model B Safety Warning Labels

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## Glossary

This glossary contains terms and abbreviations used in this manual.

The glossary contains terms and definitions from the *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699; that book includes entries, marked here by an asterisk (\*), from the *American National Dictionary for Information Processing*. Some definitions are marked by either (ISO) or (TC97), indicating that they originate from the work of the International Standards Organization, Technical Committee 97.

If you do not find the term that you are looking for, try the index or refer to the *IBM Vocabulary*.

### A

\* **access arm.** A part of a magnetic disk storage unit that is used to hold one or more reading and writing heads.

**access mechanism.** Same as **actuator**.

**access time.** (1) The time from when the IBM 9335 Model B Direct-Access Storage unit receives a request for data to the moment when data transfer is completed. Access time equals the seek time plus the latency plus the transfer time. (2) See also **latency**, **seek time**, and **transfer time**.

**actuator.** (1) In the IBM 9335 Model B Direct-Access Storage unit, an assembly including a group of access arms, read/write heads that are mounted on the arms, and the motor that moves the arms. Each IBM 9335 Model B has two actuators; they have different addresses, one even and one odd. Each actuator reads and writes information on areas of the disks that only that actuator can reach. (2) Also known as **access mechanism**. (3) See also **device**.

**address.** (1) A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination. (2) In the IBM 9335 Direct-Access Storage Subsystem, the means of identifying which device function controller or direct-access storage unit is the destination of a command from an input/output processor or the source of a response to a processor.

**air vent.** A panel that restricts and directs the flow of cooling air out of the back of an IBM 9335 Model B.

**alternate sector.** A disk sector that is assigned in place of a sector that is defective.

**American National Standards Institute (ANSI).** An organization consisting of producers, consumers, and general interest groups that establishes voluntary industry standards.

**ANSI.** American National Standards Institute.

**antistatic brush.** A part of the disk enclosure that conducts static electricity to ground.

**asynchronous.** Without regular time relationship; unexpected or unpredictable with respect to the execution of a program's instructions.

**asynchronous packet.** (1) A packet in which the data identifies a device function controller or a device (actuator) in a direct-access storage unit and holds information about an event that needs to be reported to the using system. (2) A packet indicating to an input/output processor that an event, unrelated to a previous command packet, has occurred at an IBM 9335 Model A Device Function Controller or at a device attached to an IBM 9335 Model A.

### B

**basic assurance tests (BATs).** Automatic tests of the IBM 9335 Model A Device Function Controller that are made when power is switched on and before initial microcode loading can be done. The BATs can also be looped from the service panel.

**BATs.** Basic assurance tests.

**byte.** (1) Eight adjacent bits plus a parity bit. (2) A sequence of eight adjacent binary digits that are operated on as a unit.

### C

**CE cylinder.** *See* diagnostic cylinder

**command packet.** (1) A packet in which the data identifies a device function controller or a device (actuator) in a direct-access storage unit, describes the operation (such as read or write) to be done, and includes all the parameters needed for doing it. (2) A packet that carries command information from the input/output processor to an IBM 9335 Model A Device Function Controller. The command is

addressed to the IBM 9335 Model A or to a device (actuator) in a direct-access storage unit attached to the IBM 9335 Model A.

**CRC.** Cyclic redundancy check.

**control panel.** A panel that contains switches and indicators for the day-to-day operation of a device function controller or of a direct-access storage unit.

**cyclic redundancy check (CRC).** (TC97) A redundancy check in which the check key is generated by a cyclic algorithm.

\* **cyclic redundancy check character.** A character used in a modified cyclic code for error detection and correction.

**cylinder.** The tracks that can be accessed (read from or written to) for a given position of a particular actuator.

## D

**data field.** A 2 x 256-byte or 1 x 520-byte area of a sector for customer's data.

**defective sector reassignment.** (1) A method of using an alternate sector instead of a defective sector. (2) A method of reassigning the address of a defective sector to a reserved alternate sector. The alternate sector assumes the logical address and other characteristics of the defective sector.

**delayed power off.** Normal removal of power from a direct-access storage unit by using a power-off sequence that automatically includes a delay after the Power switch is operated.

**device.** In an IBM 9335 Model B Direct-Access Storage unit, one of the two actuators.

**device adapter.** A part of the IBM 9335 Model A Device Function Controller that consists of an interface adapter and a read/write adapter. Its purpose is to control the operations of up to four IBM 9335 Model B Direct-Access Storage Subsystem Direct-Access Storage units.

**device checkout procedure.** The steps made in running a device checkout program.

**device checkout program.** One of a series of tests that ensure correct operation of a direct-access storage unit.

**device function controller.** The IBM 9335 Model A. A part of the IBM 9335 Direct-Access Storage Subsystem

that controls the operations of up to four IBM 9335 Model B Direct-Access Storage Subsystem Direct-Access Storage units.

**diagnostic checkout procedure.** The steps made in running a device checkout program.

**device checkout program.** One of a series of tests that ensure correct operation of a direct-access storage unit.

**diagnostic cylinder.** The tracks used for write and read diagnostic purposes.

**diagnostics.** (1) The process of studying or investigating the reason for, or the nature of, a particular condition or problem in a product or system. (2) (Loosely) The programs used in the diagnostic process. (3) See also **device checkout program**.

**direct-access storage subsystem.** The collective name for an IBM 9335 Model A Device Function Controller and up to four IBM 9335 Model B Direct-Access Storage Subsystem Direct-Access Storage units.

**direct-access storage unit.** (1) The IBM 9335 Model B Direct-Access Storage Subsystem. A part of the IBM 9335 Direct-Access Storage Subsystem that stores data by means of magnetic recording on the flat surfaces of three rotating disks. (2) See also **magnetic disk storage**.

**disk enclosure.** A field-replaceable unit that consists of disks, actuators (access mechanisms and read/write heads), and electronics.

## E

**ECC.** Error-checking and correction.

**emergency power-off (EPO).** Removal of power from a machine without using a normal power-off sequence.

**error-checking and correction (ECC).** The detection, in the IBM 9335 Model A Device Function Controller, and correction of all single-bit errors and some multiple-bit errors.

## F

**FBA.** Fixed-block architecture.

**field replaceable unit (FRU).** An assembly that is replaced (exchanged) in its entirety when any one of its parts fails. In some cases, a field replaceable unit may contain other field replaceable units; for example, the card gate and its logic board can be exchanged individually or as a unit.

**filler panel.** A panel for covering unused space in a rack.

**fixed-block architecture (FBA).** A method of storing data in blocks of fixed size; these blocks are addressed by block number relative to the beginning of the particular file.

**fixed storage.** (TC97) Synonym for **read-only storage**.

**flag byte.** A byte, in the ID zone of a disk sector, that indicates any special conditions (such as defective, reassigned, or alternate) that apply to that sector.

**FRU.** Field replaceable unit.

## H

**hexadecimal keypad.** A panel on the device function controller that allows service representatives to run device checkout procedures to a direct-access storage unit independently of the using system.

**home position.** The starting position of the read/write heads after power on or a resynchronization operation. That is, the read/write heads are at cylinder 0 with head 0 selected.

**host computer.** (TC97) In a computer network, a computer that provides end users with services such as computation and data bases and that usually performs network control functions.

## I

**ID bytes.** A group of characters used to identify an item of data or a specific sector.

**IML.** (1) Initial microprogram load. (2) Initial machine load.

**initial microcode load (IML).** Same as **initial microprogram load**.

**initial microprogram load (IML).** (1) The action of loading microprograms into computer storage. (2) The process of loading the system microcode and preparing the system for initial program load.

**initial program load (IPL).** The process of loading the system control programs and preparing the system to run jobs.

**input/output processor (IOP).** That part of a processor in the using system that controls an interface and the units attached to the interface.

**interface.** (1) \* A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs. (2) The link between the input/output processor and a device function controller.

**IOP.** Input/output processor.

**IPL.** Initial program load.

## K

**K.** When referring to storage capacity, the exact quantity 1024.

## L

**landing zone.** An area of a disk surface on which the read/write heads rest when the disk is not rotating.

**latency.** The delay from the moment that a read/write head is selected for operation to the moment that the required sector is under the read/write head. See also **access time**, **seek time**, and **transfer time**.

## M

**M.** When referring to storage capacity, the exact quantity 1 048 576.

**machine exception data (MED).** Information reported by the IBM 9335 Model A Device Function Controller to the using system about a failure or an error condition in the IBM 9335 Direct-Access Storage Subsystem. The information is sent in one of several formats, depending on the type of problem being reported, and generates a unit reference code for corrective actions.

**magnetic disk storage.** (1) \* (ISO) A magnetic storage in which data are stored by magnetic recording on the flat surfaces of one or more disks that rotate in use. (2) See also **direct-access storage unit**.

**magnetic head.** (1) \* (ISO) An electromagnet that can perform one or more functions of reading, writing, and erasing data on a magnetic data medium. (2) See also **read/write head**.

\* **magnetic recording.** (ISO) A technique of storing data by selectively magnetizing portions of a magnetizable material.

**maintenance.** Those activities intended to keep a machine in, or restore a machine to, good working order.

**maintenance mode 1.** A condition initiated when a problem occurs that prevents communication between the input/output processor and the IBM 9335 Model A Device Function Controller. The maintenance mode resets all units connected to the input/output processor and selectively tries to reestablish communication. The condition can be initiated either by the failing unit or by the using system.

**MED.** Machine exception data.

**message.** Information sent to a user from a program or another user.

**microcode.** (1) One or more microinstructions. (2) A code, representing the instructions of an instruction set, implemented in a part of storage that is not program-addressable. (3) Hardware instructions that control the processor. (4) See also **microprogram**.

**microprogram.** (1) (TC97) A sequence of microinstructions. (2) A group of microinstructions that, when executed, performs a preplanned function. (3) See also **microcode**.

## N

\* **non-return-to-reference recording.** (1) (ISO) The magnetic recording of binary characters such that the patterns of magnetization used to represent zeros and ones occupy the whole storage cell, with no part of the cell magnetized to a reference condition. (2) (ISO) Synonymous with **non-return-to-zero recording**.

**non-return-to-zero recording (NRZ).** (1) \* Non-return-to-reference recording in which the reference condition is zero magnetization. (2) (TC97) Synonym for **non-return-to-reference recording**.

\* **NRZ.** (ISO) Non-return-to-zero recording.

## O

**offtrack.** A condition where the read/write heads are not following a track.

## P

**packet.** (1) (ISO) In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. (2) On the interface to the input/output processor, the basic unit of control information for communicating between the processor and the IBM 9335 Direct-Access Storage Subsystem. A packet consists of a length field

and a prefix, and may include parameters. (3) See **asynchronous packet**, **command packet**, and **response packet**.

**parameter.** (1) \* (ISO) A variable that is given a constant value for a specified application and that may denote the application. (2) In a packet to or from an IBM 9335 Direct-Access Storage Subsystem, a variable containing command or status information more detailed than that in the prefix of the packet.

**permanent storage.** Synonym for **read-only storage**.

**prefix.** (1) A code at the beginning of a message or record. (2) In a packet to or from an IBM 9335 Direct-Access Storage Subsystem, the code that describes the purpose of the packet. The prefix includes the addresses of the IBM 9335 Model A Device Function Controller and the device to which the packet refers.

## R

**rack.** The frame that holds the direct-access storage units and controllers. It includes logic circuits and controls.

**RBN.** Relative block number.

\* **read-only storage (ROS).** (ISO) A storage device whose contents cannot be modified, except by a particular user, or when operating under particular conditions; for example, a storage device in which writing is prevented by a lock out. Synonymous with **fixed storage**, **read-only memory**.

\* **read/write head.** (ISO) A magnetic head capable of reading and writing.

**reference display.** (1) On the IBM 9335 Model A Device Function Controller, a three-digit display showing part of the unit reference code that is sent to the using system when an error occurs. The display is also used, with the hexadecimal keypad, to run device checkout procedures to a direct-access storage unit. (2) On an IBM 9335 Model B Direct-Access Storage Subsystem Direct-Access Storage unit, a one-digit display that indicates the condition of the power supplies for the unit.

**relative block number (RBN).** (1) In the IBM 9335 Direct-Access Storage Subsystem, the address of a data block as perceived by the using system. (2) A number that identifies the location of a block expressed as a difference with respect to a base address. The relative block number is used to retrieve that block from the data set.

**response packet.** (1) A packet in which the data identifies a device function controller or a device (actuator) of a direct-access storage unit and shows that the actions requested by a command packet have ended. (2) A packet indicating to an input/output processor that a command previously sent to an IBM 9335 Model A Device Function Controller or to a device (actuator) of a direct-access storage unit has ended. A response packet also indicates the success of the command operation and the status of the IBM 9335 Model A or device at the end of the operation.

**resynchronization operation.** (1) An operation, either performed manually or from the using system, that causes the access mechanism to return to the home position and send an interrupt to the using system. (2) An operation, performed either from the using system or by pressing a Device Attention switch on a direct-access storage unit, that causes the actuator to return to the home position and send a message to the using system.

**ROS.** Read-only storage.

**rotational delay.** The time taken for the read/write heads to switch from one sector to another.

**rotational position sensing (RPS).** A means of permitting a direct-access storage unit to disconnect from the interface to an input/output processor, thereby allowing the input/output processor to service other units on the interface during latency.

**RPS.** Rotational position sensing.

## S

**scatter algorithm.** (1) A procedure by which an alternate sector is searched for. (2) A set of instructions or steps that permits a track, other than the track containing the originally-addressed sector, to be examined for an unassigned alternate sector. This action occurs when a defective sector is found and the alternate sector for that track is already assigned.

**sector.** (1) The smallest part of a track that can be accessed. (2) (ISO) That part of a track or band on a magnetic drum, a magnetic disk, or a disk pack that can be accessed by the magnetic heads in the course of a predetermined angular displacement of the data medium.

\* **seek.** To selectively position the access mechanism of a direct access device.

**seek time.** The time that is needed to position the access mechanism of a direct-access storage unit at a

specified position. See also **access time, latency, and transfer time.**

**service representative.** An individual who performs maintenance services for products or systems.

\* **servomechanism.** An automatic device that uses feedback to govern the physical position of an element.

**settle.** To put the read/write heads precisely over a track after a seek operation.

**signal realignment.** The simultaneous gating of all signals on a parallel interface into a receiving device. Realignment is needed because some of the signals may have been delayed by variations in the characteristics of the interface cables. Also known as **deskewing.**

**slides.** The mounting hardware for controllers and direct-access storage units that move in and out of the rack in a drawer-like action.

**spindle.** The revolving part of the disk enclosure to which the disks are attached.

**system adapter.** A part of the IBM 9335 Model A Device Function Controller that deals with command and response packets to and from the using system.

## T

**track.** The portion of the disk that is usable by one read/write head at a specific position.

**transfer time.** (1) \* (ISO) The time interval between the instant at which a transfer of data starts and the instant at which the transfer is completed. (2) Contrast with **access time, latency, and seek time.**

**type 1 check.** A stop that occurs as a result of a severe failure in the IBM 9335 Model A Device Function Controller. The check puts the IBM 9335 Model A into an unknown condition and the microprocessor is stopped, thereby preventing any subsequent operations. See also **maintenance mode 1.**

## U

**unit reference code (URC).** (1) A four-character code that directs the user or a service representative to a procedure for solving a problem. (2) A 2-byte code that directs a service representative either to one or more failing field replaceable units or to an action for resolving a problem.

**URC.** Unit reference code.

**using system.** The system that the IBM 9335 Direct-Access Storage Subsystem is attached to.

## **V**

**vital product data (VPD).** Essential information supplied by the IBM 9335 Direct-Access Storage Subsystem about the field replaceable units within it. The data is used for problem determination, identification of maintenance entitlements, and other functions within the system.

**VPD.** Vital Product Data

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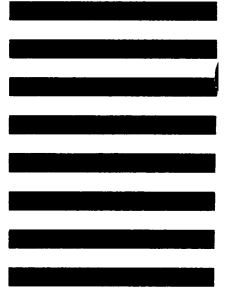
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