

Repair Information

Place the hard-tab page labeled "Repair Information" in place of this page, then discard this page.



SECTION 3. REPAIR INFORMATION

How to Use the Repair Information	3-3
Safety Ground Locations	3-4
Power Supply	3-4
Expansion Unit Power Supply	3-5
Internal Display	3-6
IBM Color Display	3-7
IBM Professional Graphics Display	3-8
Locations	3-9
System Unit	3-9
Front View	3-9
Rear View	3-10
Interior View	3-11
Bottom View	3-12
System Board	3-13
Input Voltage Selector Switch	3-14
5-1/4" Slimline Diskette Drive (Top View)	3-15
5-1/4" Slimline Diskette Drive (Bottom View)	3-16
10 MB Fixed Disk Drive	3-17
83-Key Keyboard	3-18
National Language Keyboard Types (83-Key)	3-19
Expansion Unit (Rear View)	3-20
Expansion Unit (Top View)	3-21
Expansion Board	3-22
Adjustments	3-23
Diskette Drives	3-23
Drive-Motor Preliminary Speed	3-23
Drive-Motor Speed	3-27
IBM Color Display	3-30
Color Trimmer Capacitor	3-30
Vertical-Hold	3-31
Vertical-Size	3-32
Removals and Replacements	3-33
Cover 1005	3-33
Front Panel 1010	3-35
Power Supply 1015	3-37
Power Supply Fan 1020	3-40

System Board 1025	3-41
Memory Module 1030	3-43
Math Coprocessor 1035	3-44
8088 Processor 1040	3-46
Speaker 1045	3-48
Internal Display 1065	3-49
Diskette Drive 1075	3-54
Drive Belt 1080	3-59
Option Adapter 1085	3-60
Color/Graphics Monitor Adapter 1090	3-61
Expansion Unit Option	3-63
Expansion Unit Cover 2000	3-63
Expansion Unit Power Supply 2005	3-64
Expansion Board 2010	3-70
Option Adapter 2015	3-72
Fixed Disk Adapter 2020	3-73
Fixed Disk Drive	3-75
Disassembly and Assembly	3-82
Keyboard	3-82
Removal 3000	3-82
Cover 3005	3-83
Internal Assembly 3010	3-84
Internal Keyboard Cable 3015	3-85

How to Use the Repair Information

This section contains safety grounds, locations, adjustments, and removals for the IBM Portable Personal Computer. Look in the section Table of Contents to find the assembly you are servicing.

Each removal procedure for a field replaceable unit (FRU) has a reference number next to the title of the procedure. When a step is explained fully by another procedure, you can refer back to that procedure by using the reference number in parentheses. For example:

1. Power off the system.
2. Remove the system unit cover (**1005**).
3. Remove the screw holding the speaker.

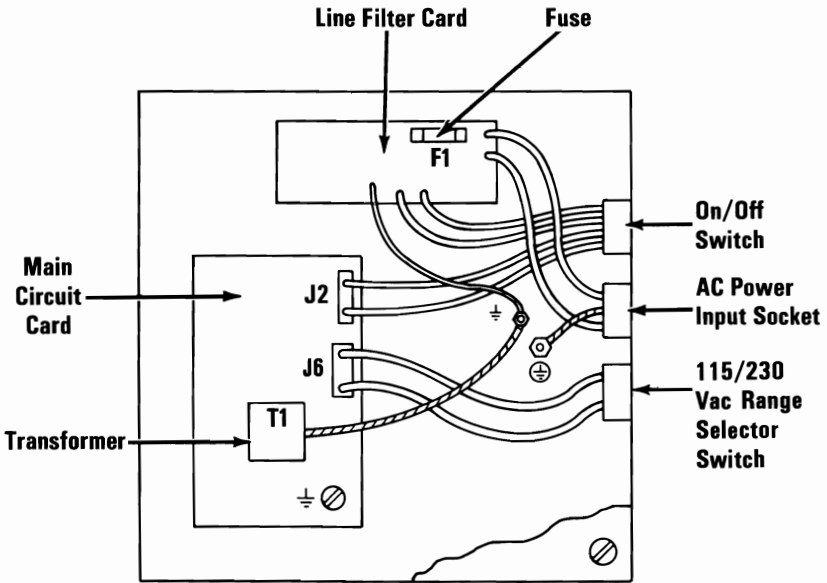
In the example, Step 2 refers you to procedure **1005** for complete instructions on removing the system unit cover.

Note: Procedures are listed in numeric order in the section Table of Contents under "Removals and Replacements."

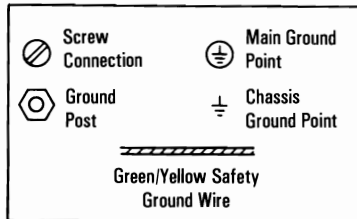
To replace a FRU, reverse the removal procedure and follow any notes that pertain to replacement.

Safety Ground Locations

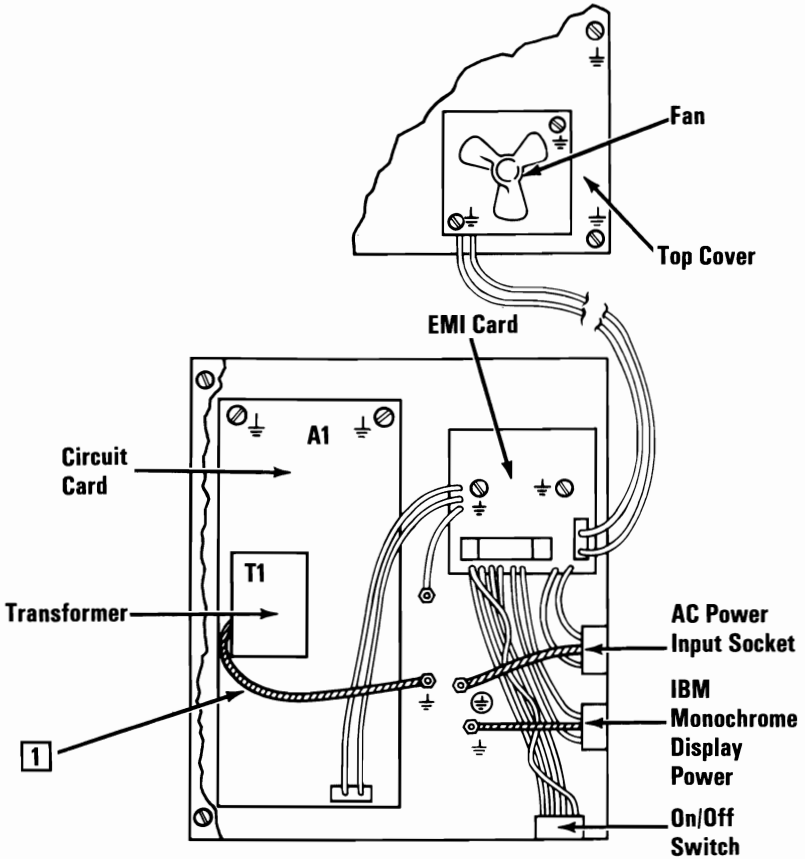
Power Supply









Legend



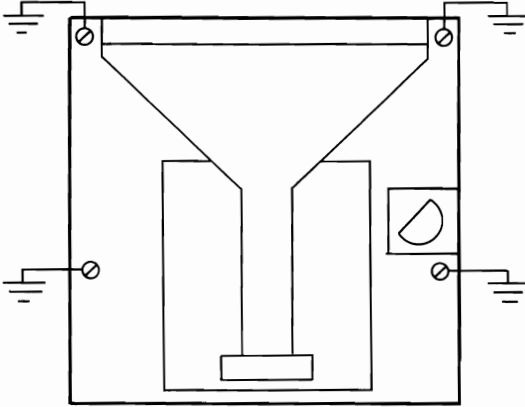
Expansion Unit Power Supply







Legend

 Screw Connection	 Primary Ground	 Ground Wire
 Ground Post	 Chassis Ground	 Note: This lead present on 220/240 Vac machines only.

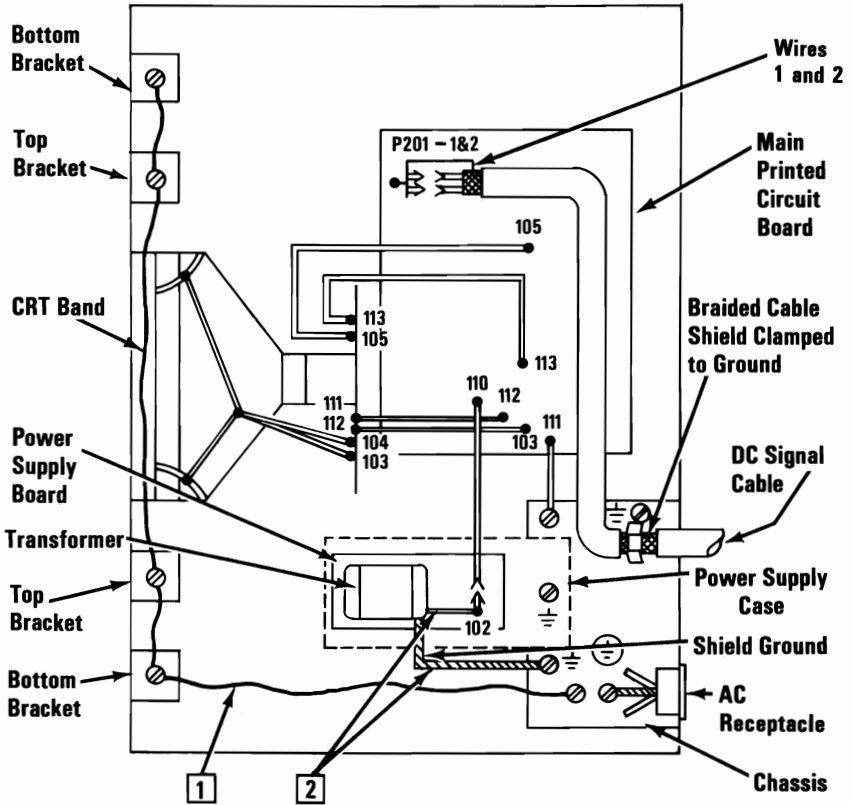
Internal Display









Legend

 Screw Connection	 Primary Ground
 Ground Lead	 Chassis Ground

IBM Color Display



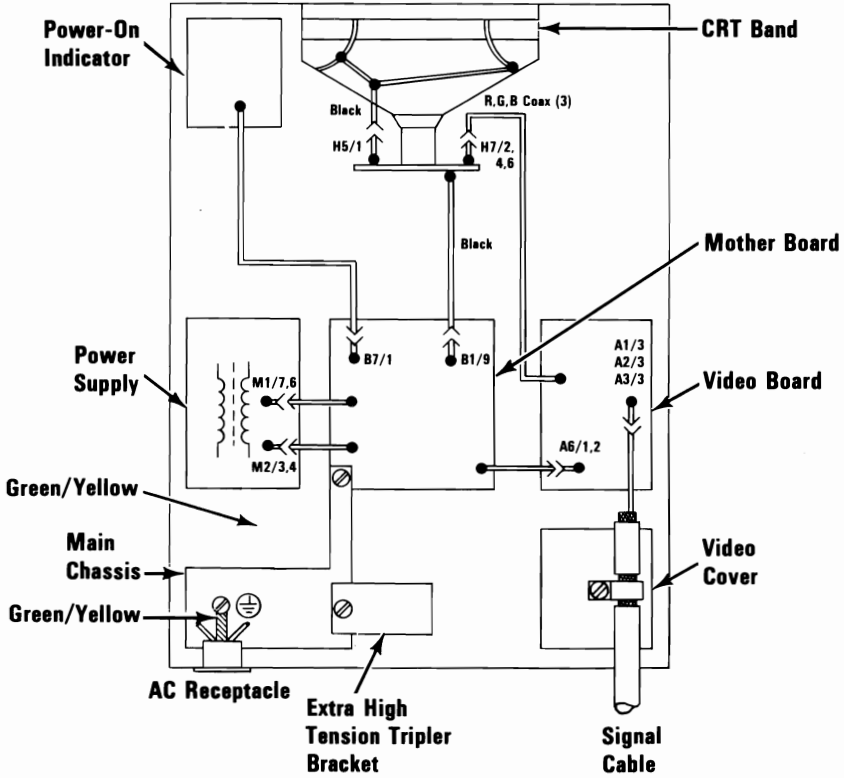
Legend

	Screw Connection		Ground Lead
	Soldered Connection		Primary Ground
	Plugged Connection		Chassis Ground







Note: Points 103, 105, 110, 111, 112, 113, and P201-1&2 on main board are joined by printed circuit lands.

- 1** Not present on U.S. displays
- 2** Present only on Model-2 displays

IBM Professional Graphics Display



Legend

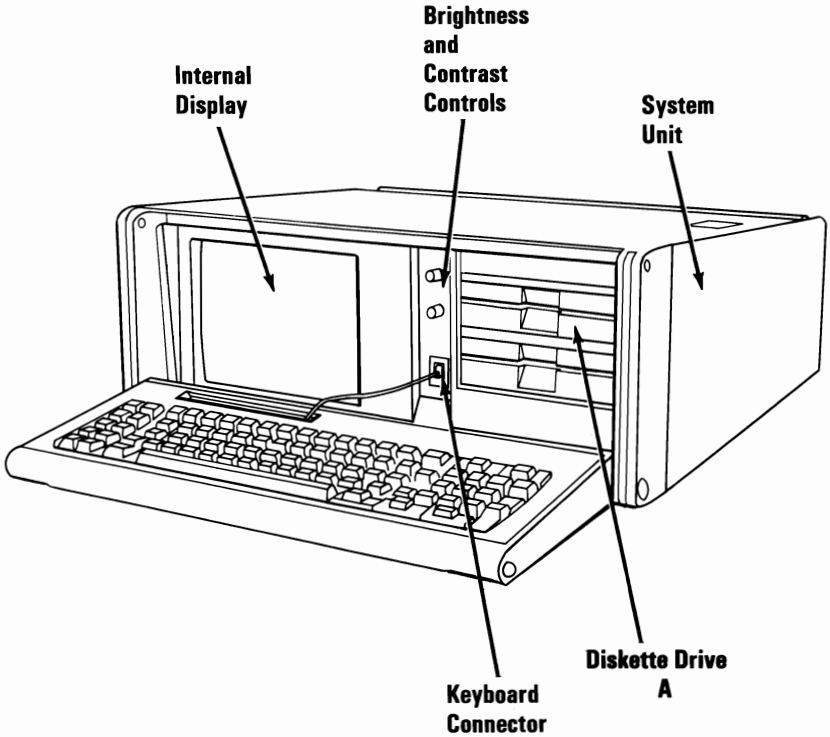
	Screw Connection		Ground Lead
	Soldered Connection		Primary Ground
	Plugged Connection		Chassis Ground

Locations

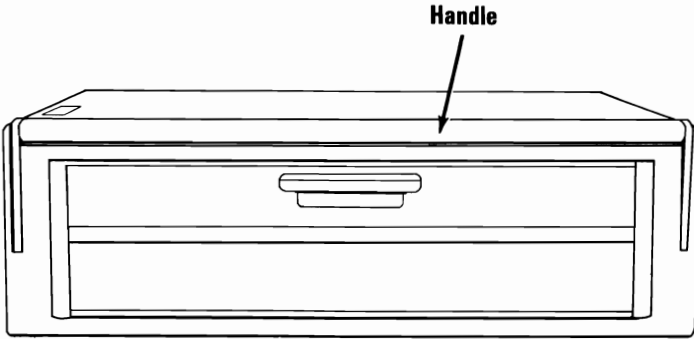
Switch settings and jumper locations are in the *Hardware Maintenance Service* manual.

System Unit

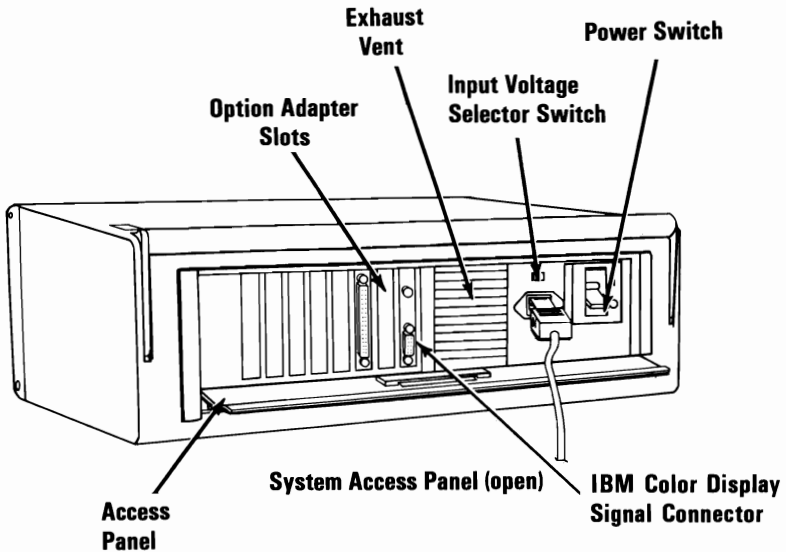
Front View



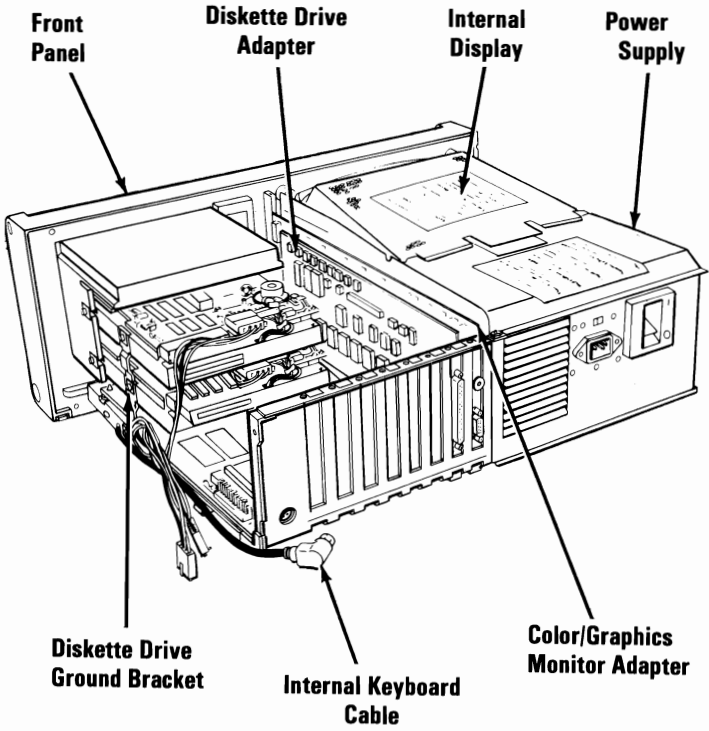
Rear View



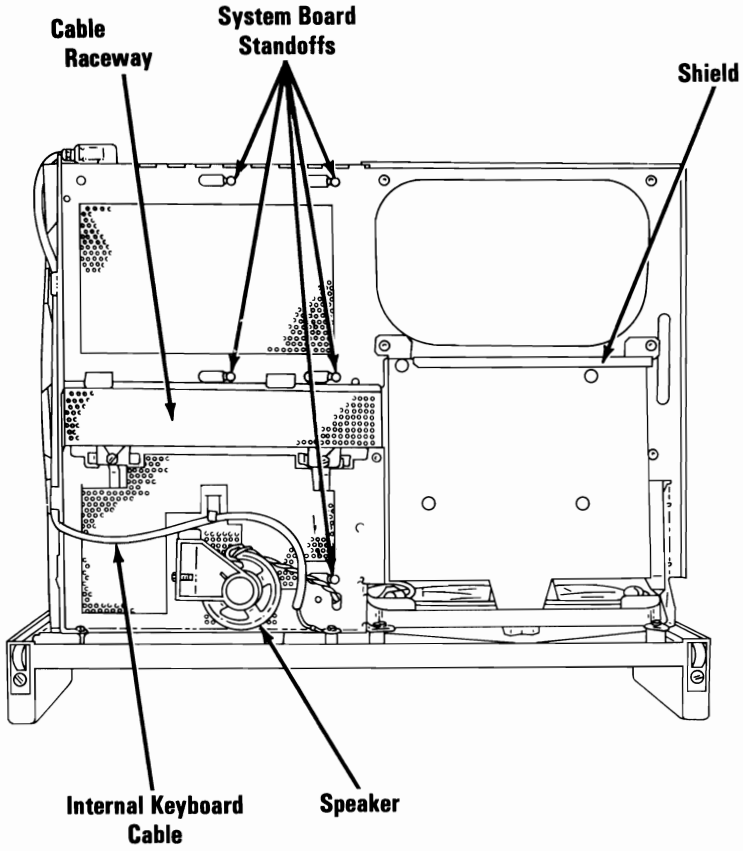
System Access Panel (closed)



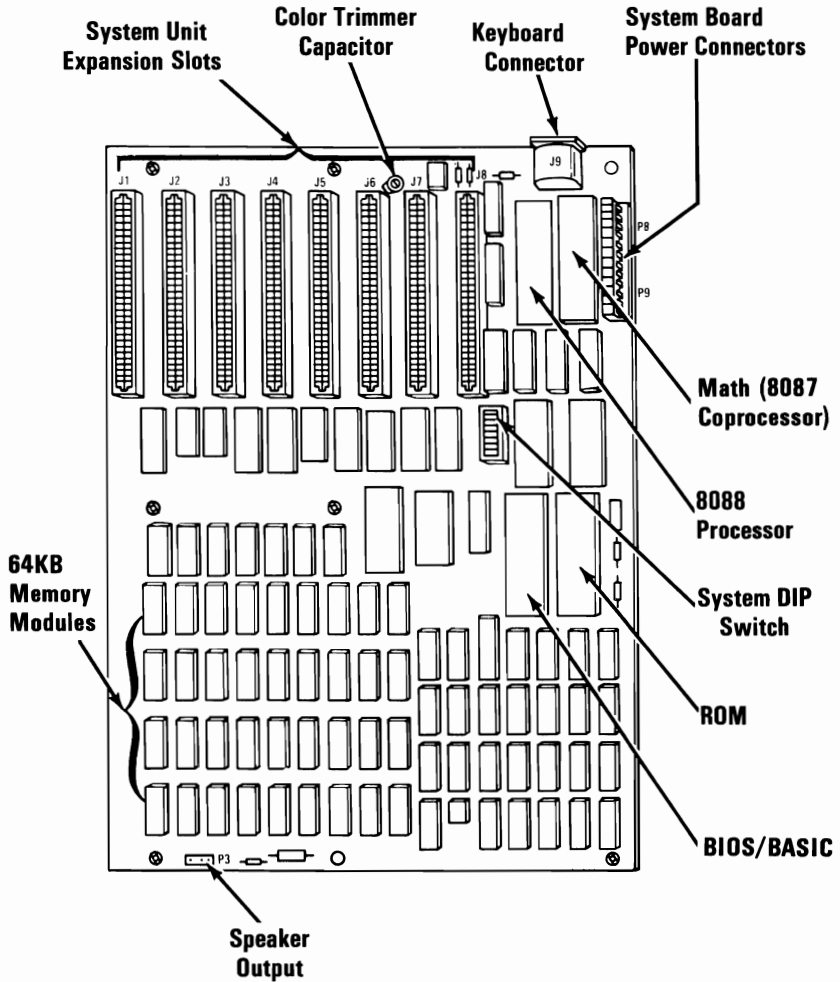
Interior View



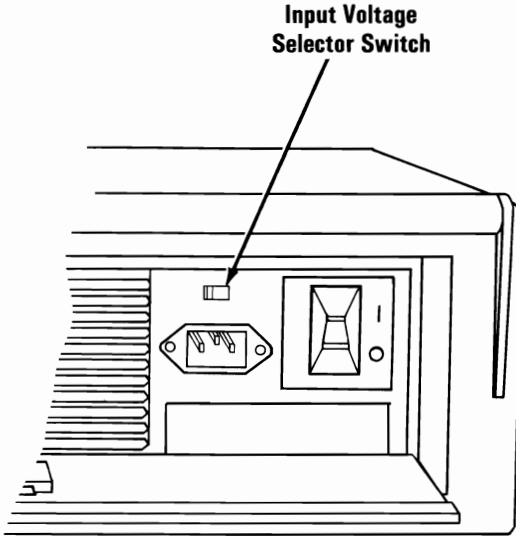
Bottom View



System Board

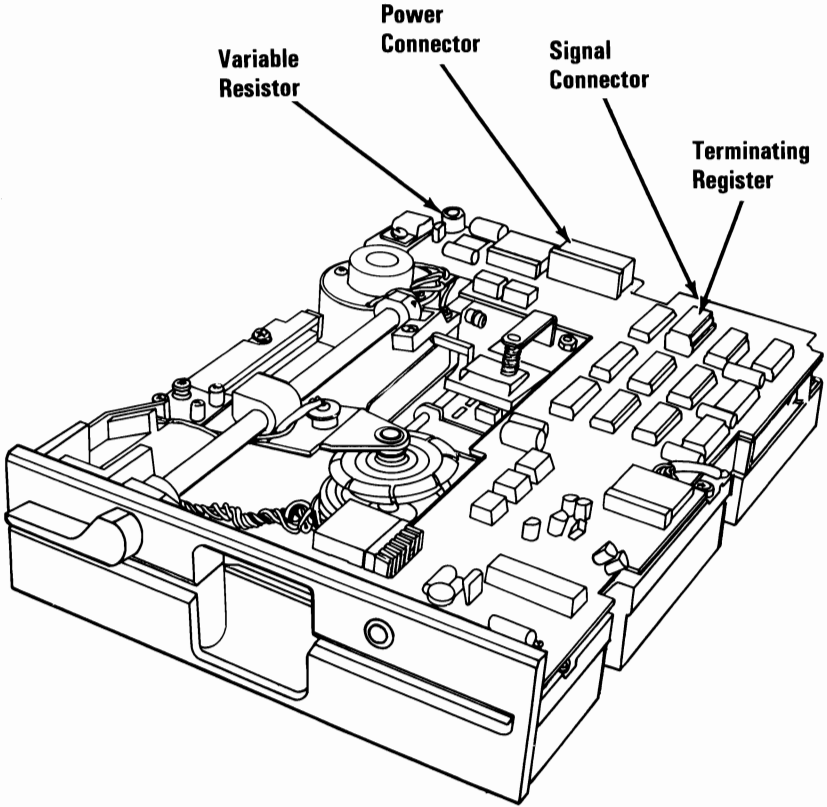


Input Voltage Selector Switch

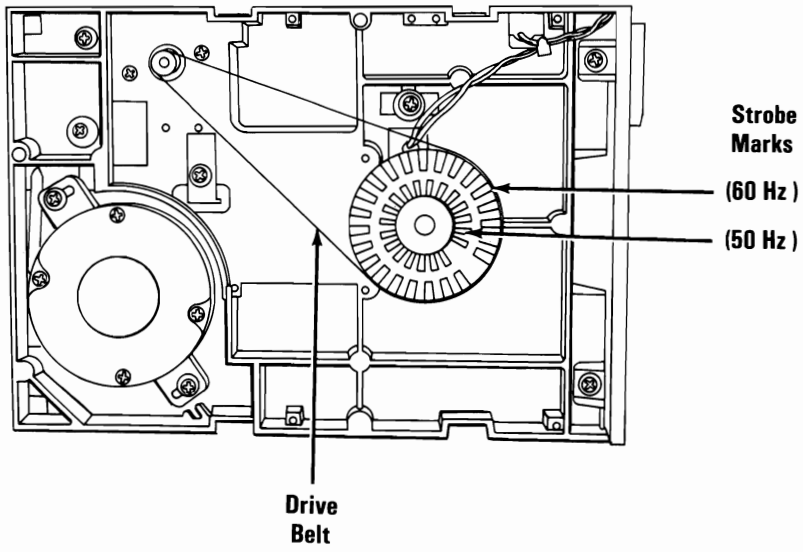


Switch Position	Vac Voltage Range
115	100 to 125
230	200 to 240

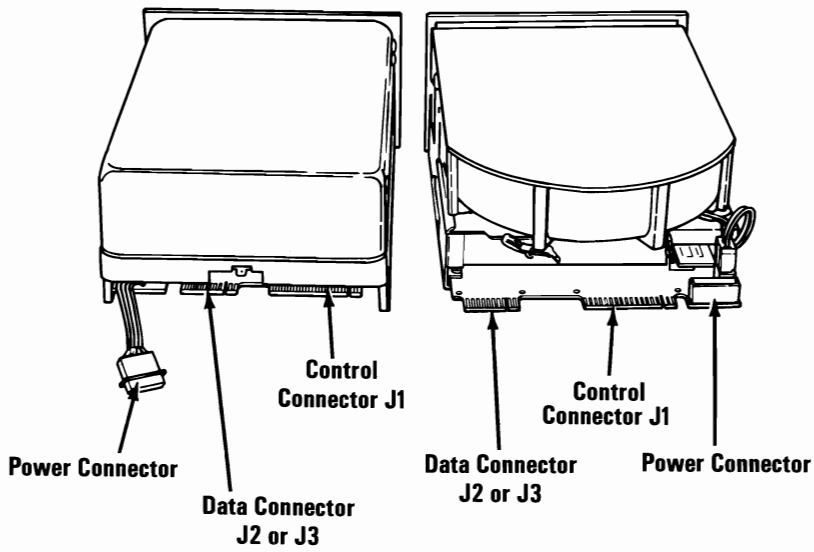
5-1/4" Slimline Diskette Drive (Top View)



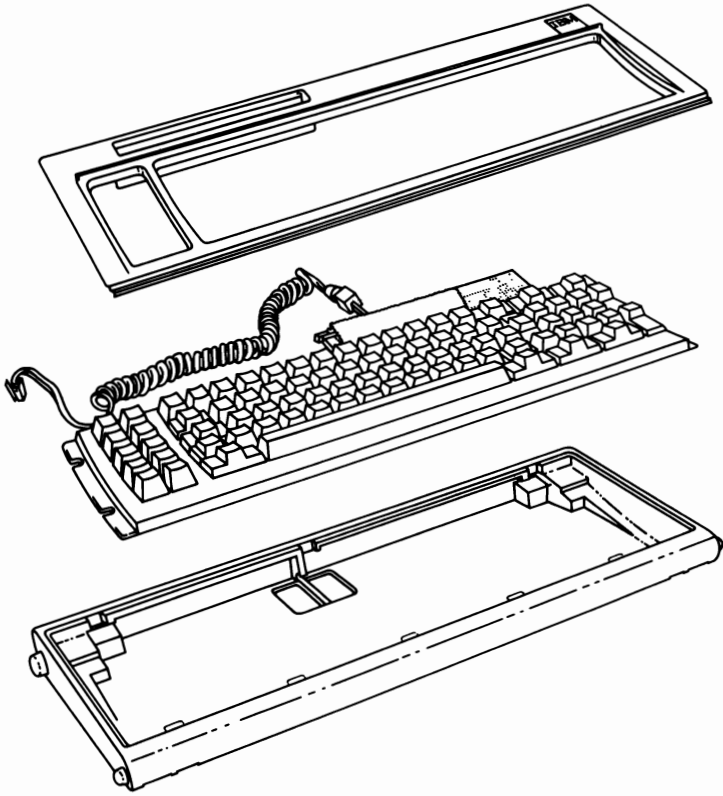
5-1/4" Slimline Diskette Drive (Bottom View)



10 MB Fixed Disk Drive

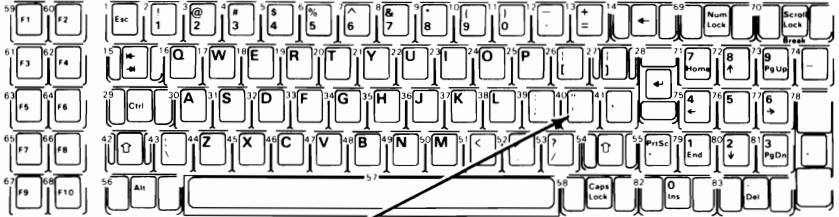


83-Key Keyboard

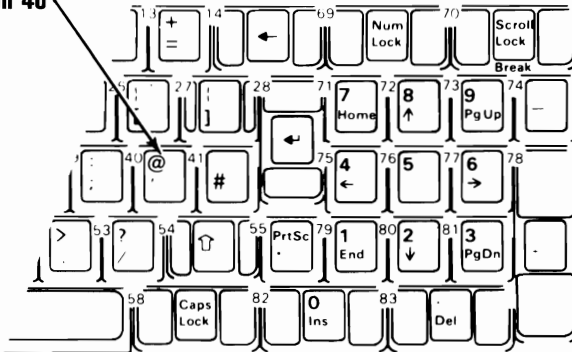


National Language Keyboard Types (83-Key)

Look at the characters in position 40 on the keyboard and compare them with those in the chart to determine which language keyboard you have.

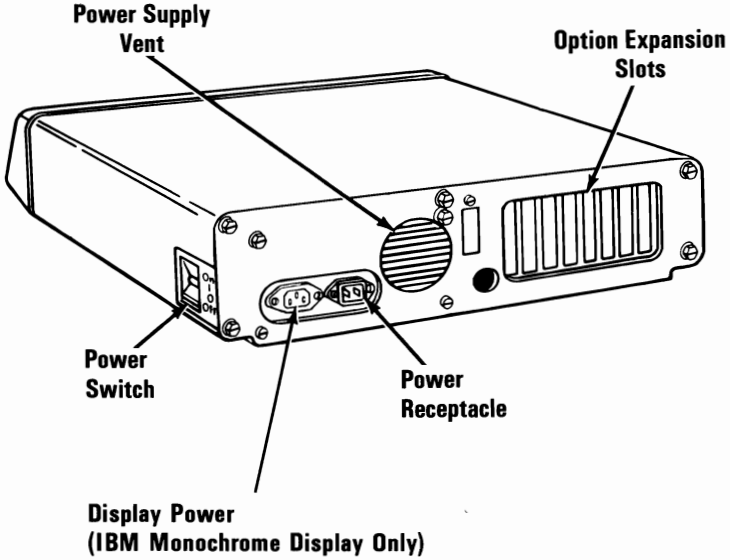


Position 40

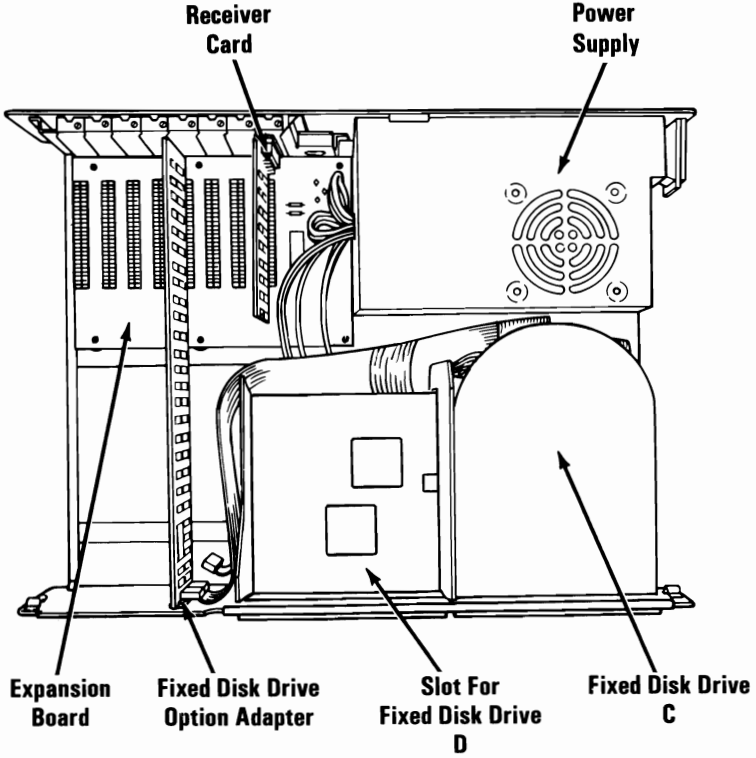


If Position 40 is:	The Keyboard is:
' / "	U.S. (English)
' / @	UK (English)
`u / %	French
¨A	German
`a / #	Italian
; / :	Spanish

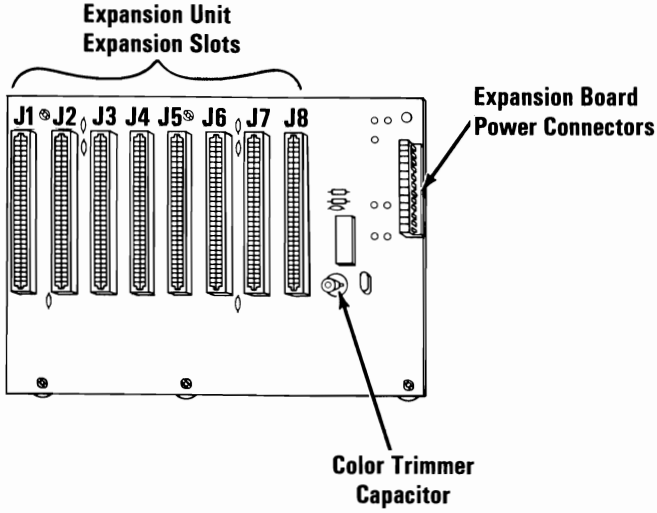
Expansion Unit (Rear View)



Expansion Unit (Top View)



Expansion Board



Adjustments

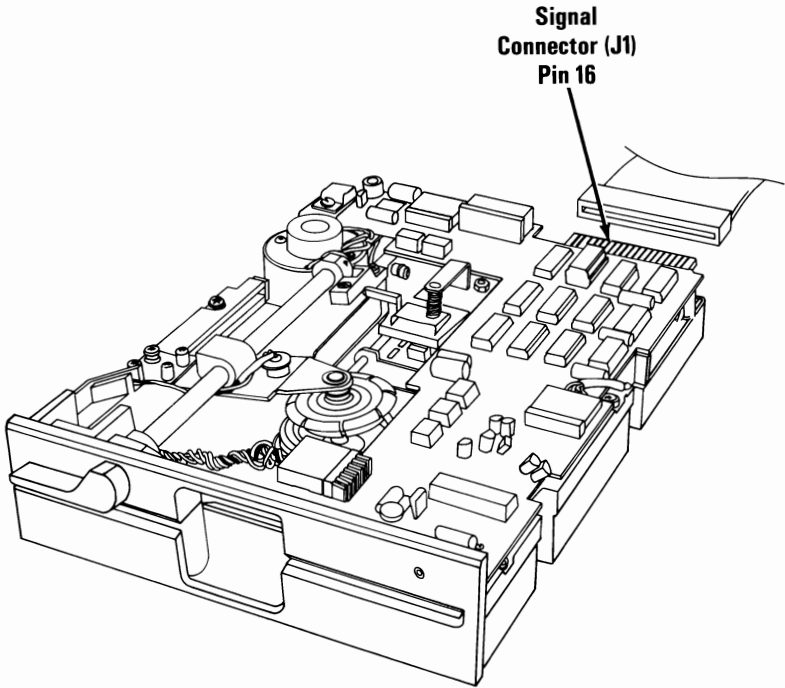
Diskette Drives

Use this procedure for diskette drive A or B, when the Advanced Diagnostics program or the Speed Test does not load. You need fluorescent lighting for this adjustment.

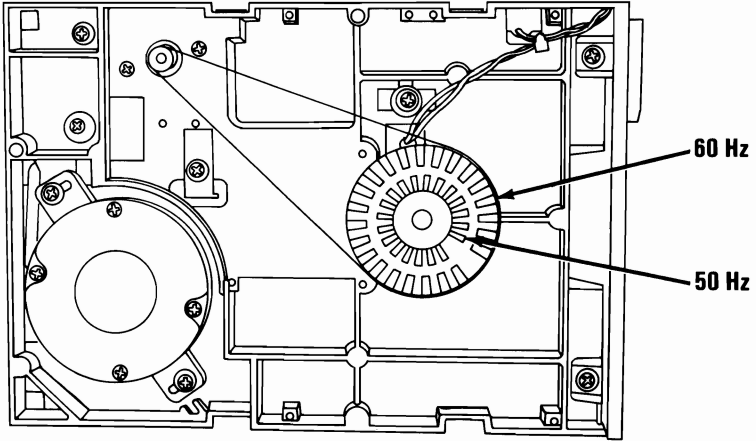
Drive-Motor Preliminary Speed

1. Remove the diskette drive (1075).
2. Insert a scratch diskette into the diskette drive.
3. Place the diskette drive on the right side of the system unit so the bottom of the diskette drive can be seen.
4. Plug the power connector and the signal connector into the diskette drive printed circuit board, and leave the signal cable unplugged.
5. Connect the power cord to the system unit, then plug it into a wall outlet.
6. Power on the system.

7. Install a jumper between J1 pin 16 and ground to start the drive motor spinning.



8. Under fluorescent lighting, observe the strobe marks on the drive pulley. One of the two rings of marks should appear to stand still. (The outer ring of strobe marks is for 60 hertz, and the inner ring is for 50 hertz.) If a ring of marks does not appear to stand still, the diskette drive is not operating at the correct speed.



9. Power off the system.
10. Disconnect the system unit power cord from the wall outlet.
11. Install the diskette drive.
12. Do the "Drive-Motor Speed" procedure to ensure that the speed is within specification. Adjust if necessary.
13. Install the system unit cover.
14. Connect all cables.

Drive-Motor Speed

1. Insert the Advanced Diagnostics diskette into drive A.
2. Power on the system.
3. Advance to the diskette drive diagnostic menu.
4. Select 4 (**SPEED TEST**) for the diskette drive you are testing. The drive-motor speed and the adjustment specification appear on the screen.
5. The indicated speed should be within the range displayed on the screen. If it is not, continue on the next page.

Note: If you are unable to load the Advanced Diagnostics program, or if the Speed Test will not run, go to the "Drive-Motor Preliminary Speed."

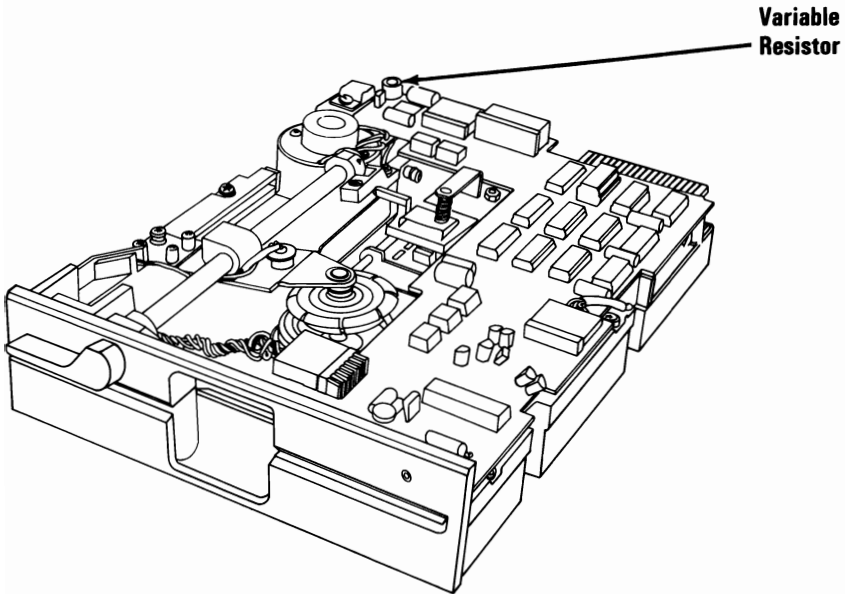
SPEED IS 2000

**ADJUST FOR 1970 TO 2030
PRESS ANY KEY TO EXIT**

SPEED IS 1999

ADJUST FOR 1970 TO 2030

6. Power off the system.
7. Remove the system unit cover (1005).
8. Reconnect all cables.
9. Remove the diskette drive mounting screws and clips (1075).
10. Slide the diskette drive approximately 78 mm (3 inches) toward the front.
11. Power on the system.
12. The adjustment for the drive-motor speed is a variable resistor on the diskette drive circuit board. To adjust the speed, carefully insert an insulated screwdriver into the resistor slot.



13. Turn the screw until the speed shown on the screen is within the required specifications.
14. Power off the system.
15. Unplug the power cord from the outlet.
16. Disconnect all cables from the system unit.
17. Install the diskette drive.
18. Install the system unit cover.

SPEED IS 2000

**ADJUST FOR 1970 TO 2030
PRESS ANY KEY TO EXIT**

SPEED IS 1999

ADJUST FOR 1970 TO 2030

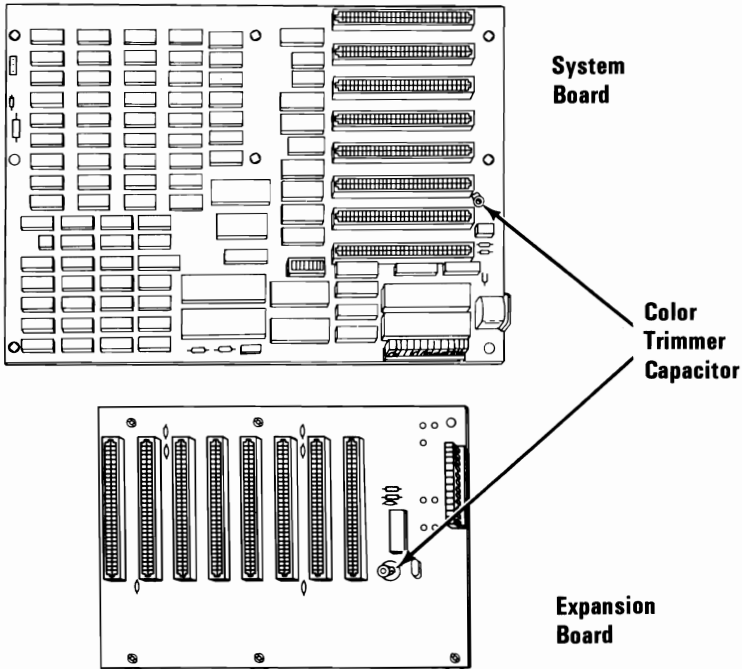
IBM Color Display

Color Trimmer Capacitor

Note: This adjustment is effective for composite displays only.

If the color is incorrect or absent, adjust the color trimmer capacitor on the system board as follows:

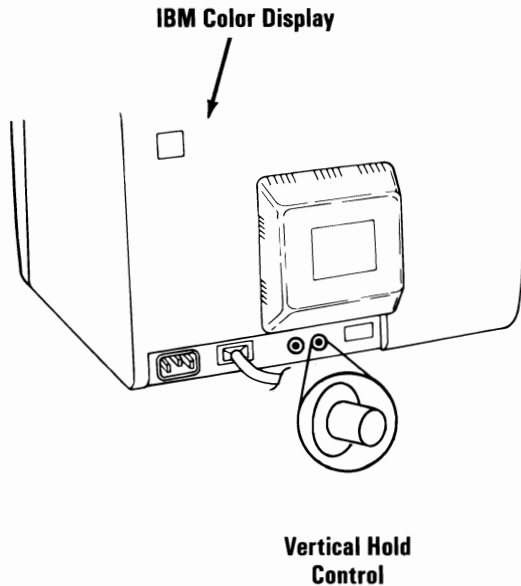
1. Remove the system unit cover (**1005**).
2. Find the color trimmer capacitor adjustment control.
3. Using a small, nonmetallic screwdriver, adjust the capacitor in small increments until the correct color returns.
4. Adjust the Tint and Color controls on the display.



Vertical-Hold

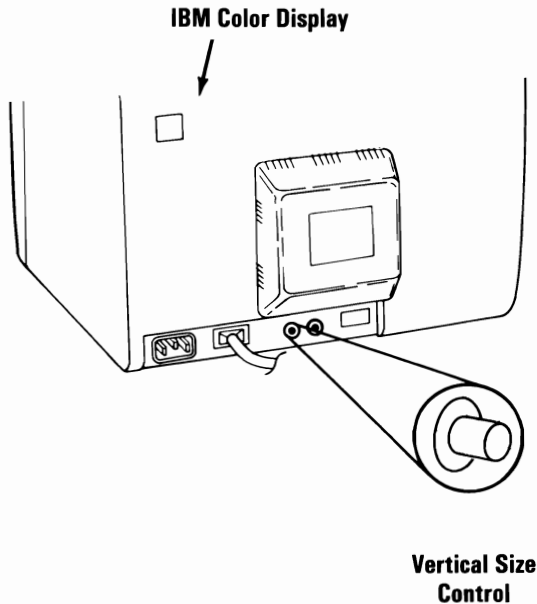
If the IBM Color Display has a vertical hold problem (image rolling), adjust the Vertical Hold control as follows:

1. Power on the system.
2. Wait for the POST to finish.
3. Turn the Vertical Hold control fully clockwise.
4. Turn the Vertical Hold control counterclockwise until the screen stops rolling and is steady.



Vertical-Size

1. Power off the system.
2. Power on the Color Display.
3. Turn the Brightness and Contrast controls fully clockwise.
4. Turn the Vertical Size control fully counterclockwise. A black area appears across the top and bottom of the screen.
5. Turn the Vertical Size control clockwise until both black areas disappear.
6. Adjust the Brightness and Contrast controls for eye comfort.

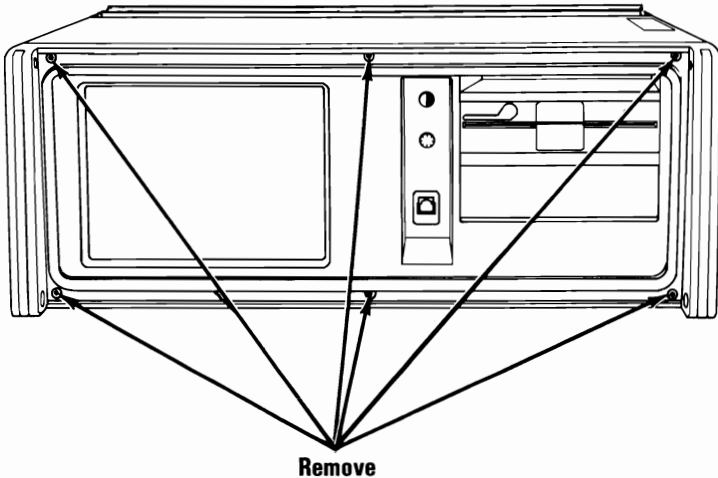


Removals and Replacements

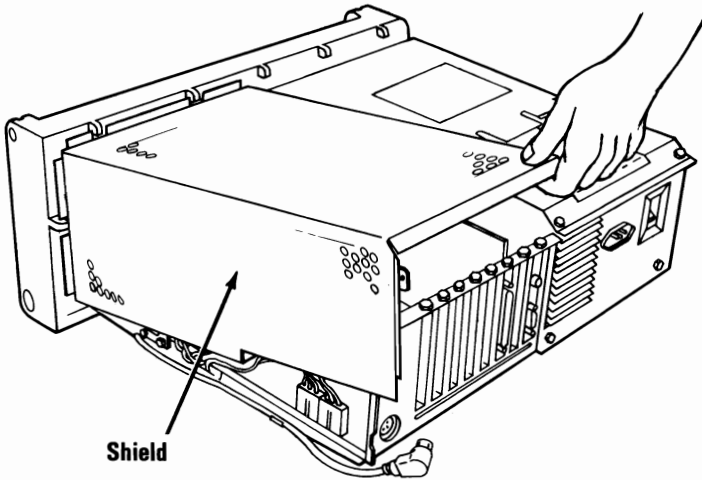
Cover 1005

1. Power off the system.
2. Unplug the system unit (and expansion unit) power cords from the wall outlet.
3. Disconnect all cables from the rear of the system unit.
4. Move the keyboard and all external options away from the system unit.
5. Place the system unit in its operating position so the front panel faces you.
6. Remove the six cover mounting screws from the front panel.

Warning: The system unit cover is now loose. Be careful when picking up the system unit by its cover.

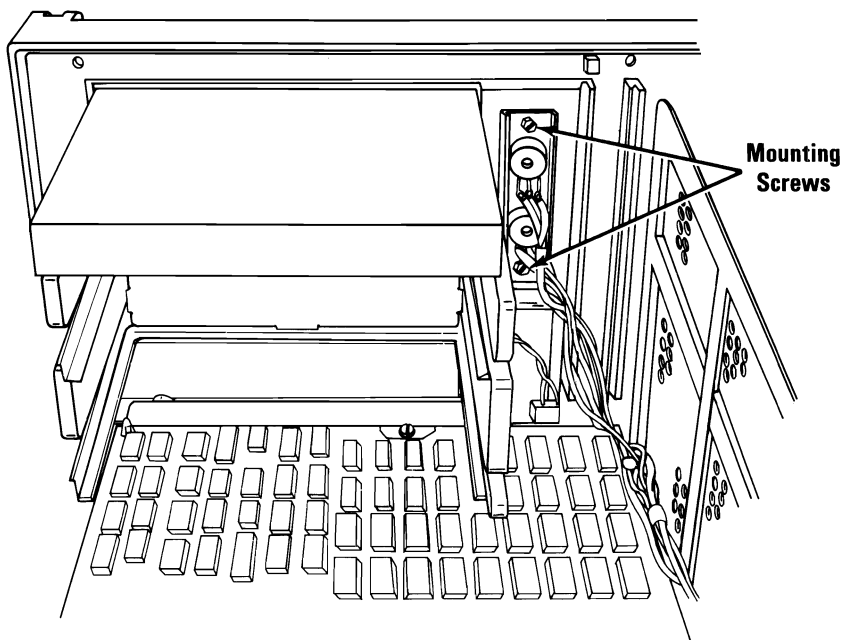


7. Place the system unit on its front panel, in an upright position, and slide the cover off.
8. Return the system unit to its operating position.
9. Find the system-unit shield and remove the screw on the right side of the frame, the one on the back, and the one on top.
10. Remove the shield.

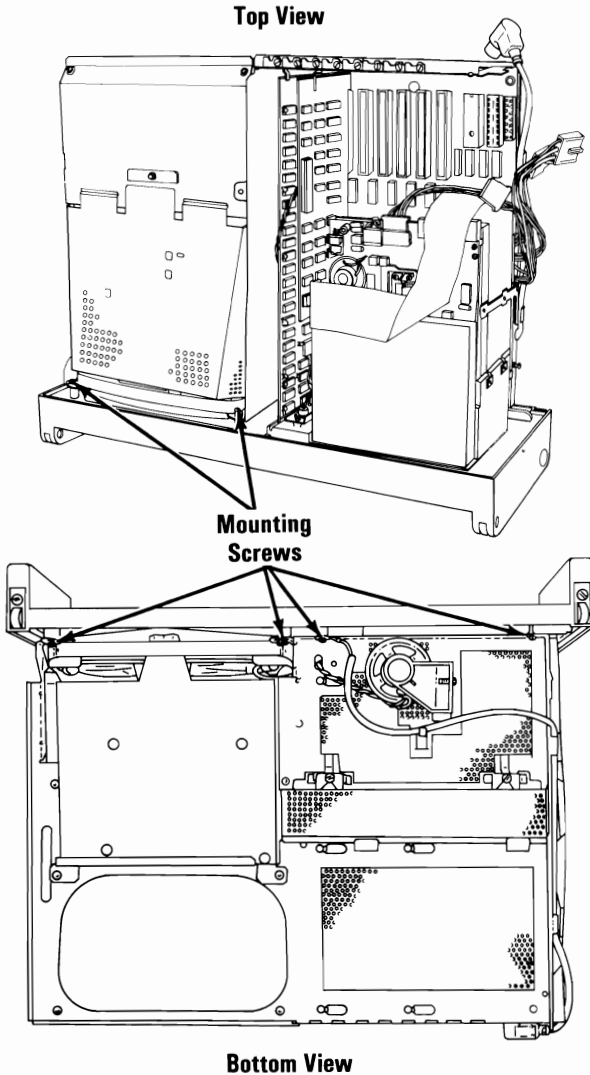


Front Panel 1010

1. Remove the system unit cover (1005).
2. Remove the diskette drives (1075).
3. Remove any option adapters (1085).
4. Remove the Brightness and Contrast control knobs from the front panel by pulling them off.
5. Remove the Brightness and Contrast controls by removing the two screws holding the controls and pulling the controls out.



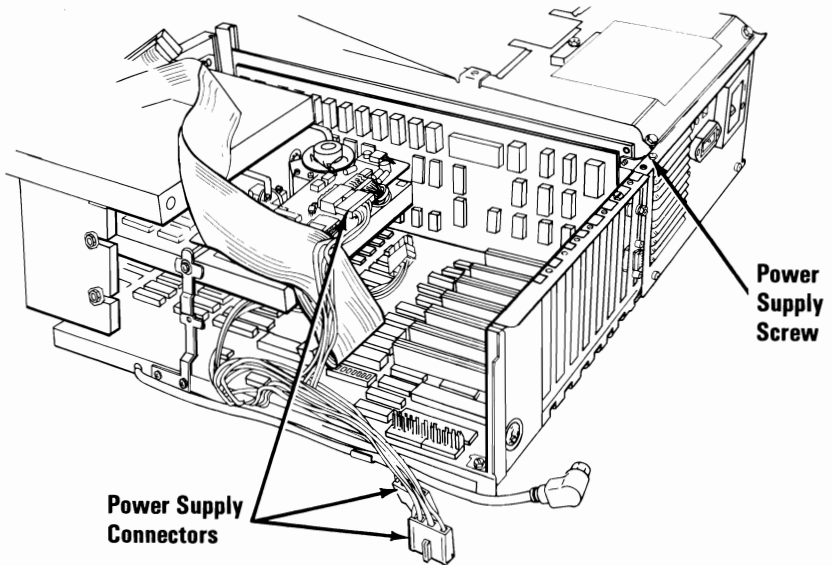
6. Remove the internal keyboard-cable shield by removing its mounting screw and lifting the shield out.
7. Remove the internal keyboard-cable connector from the retainer.
8. Remove the six screws holding the front panel to the frame.
9. Remove the front panel.



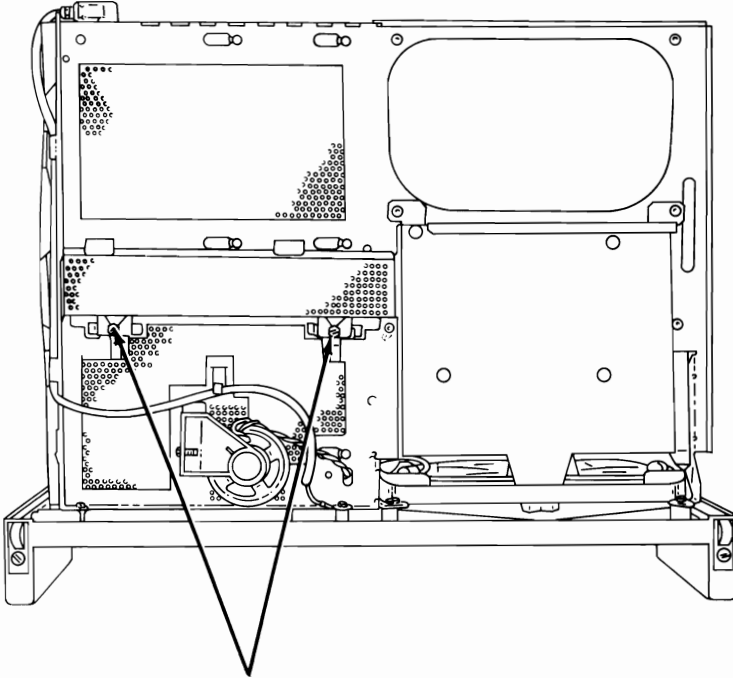
Power Supply 1015

1. Power off the system.
2. Remove the system unit cover (1005).
3. Remove the screw holding the power supply to the frame.
4. Disconnect the system-board power connectors by pulling the connectors straight up.

Warning: Do not pull on the wires when unplugging the connectors.

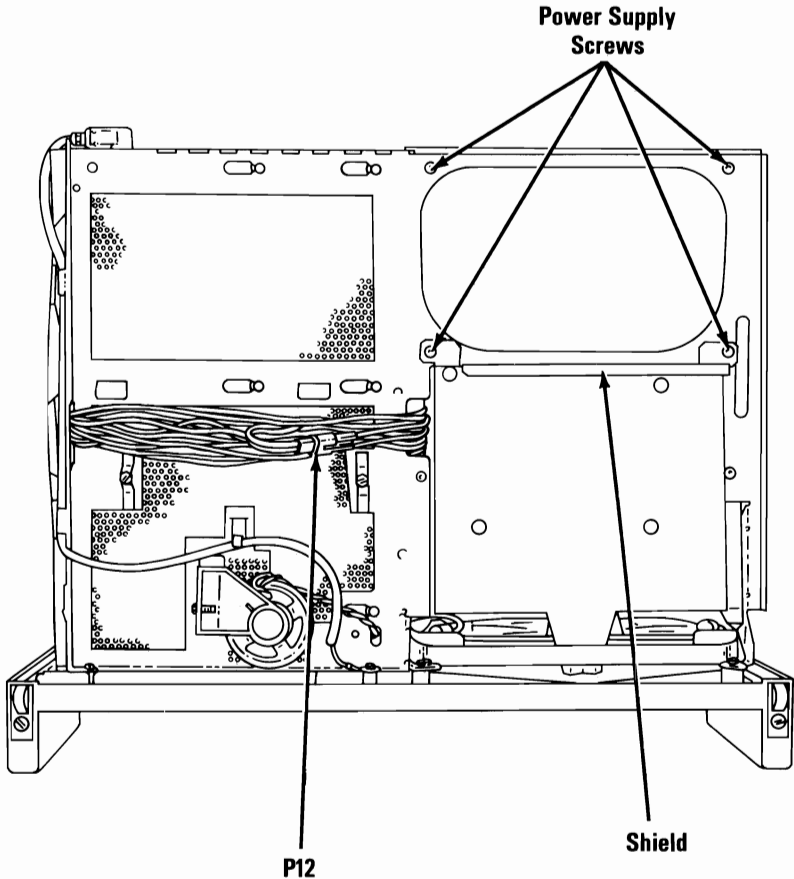


5. Disconnect the diskette-drive power connectors.
6. Set the system unit on its front panel with the bottom side facing you.
7. Remove the cable raceway cover by loosening the screws and sliding the cover off.



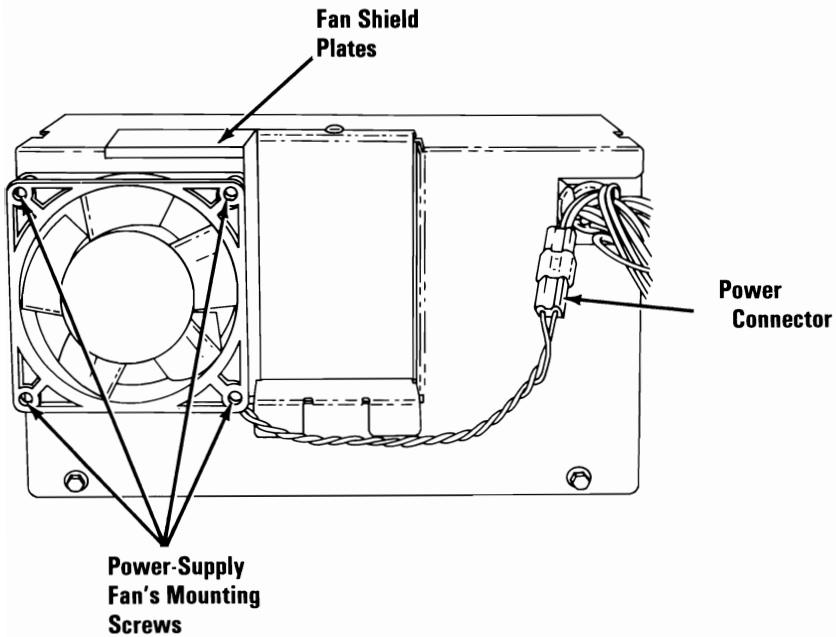
**Cable Raceway
Screws**

8. Disconnect the internal display power connector P12, which is in the cable raceway.
9. Remove the four power supply screws and set the metal shield aside.
10. Notice the routing of the power supply cables, then carefully remove the power supply by sliding it back and pulling it and the cables up and out.



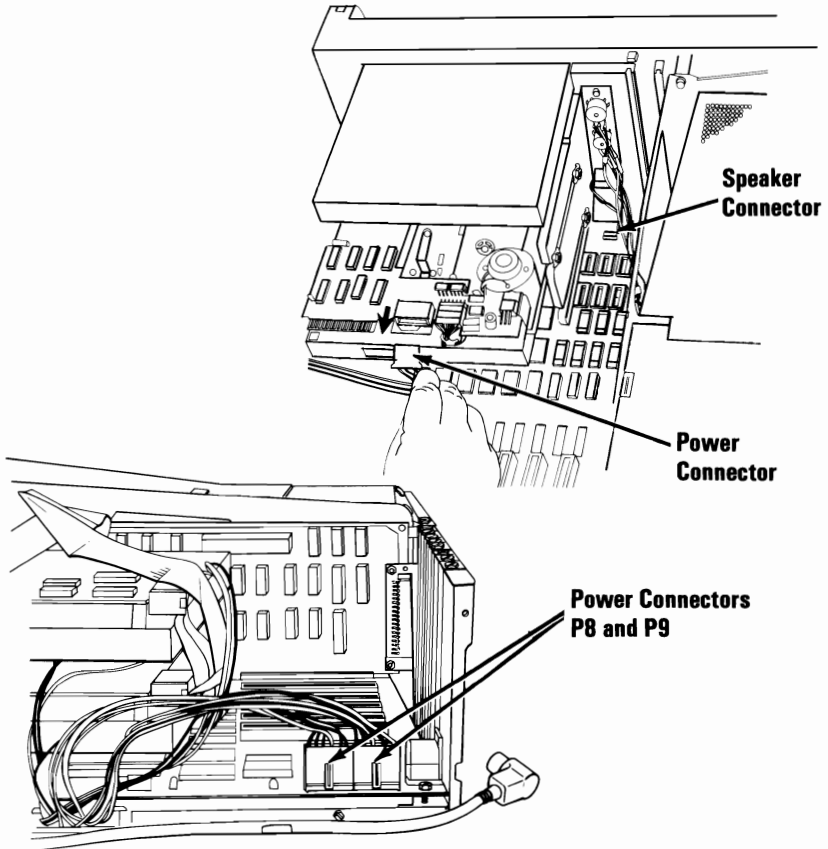
Power Supply Fan 1020

1. Unplug the system unit power cord from the wall outlet.
2. Remove the system unit cover (1005).
3. Remove the power supply (1015).
4. Disconnect the power-supply fan's power connector.
5. Remove the four power-supply fan mounting screws.
6. Set the fan shield plates aside.



System Board 1025

1. Power off the system.
2. Remove the system unit cover (**1005**).
3. Remove any option adapters (**1085**).
4. Remove the diskette drives (**1075**).
5. Disconnect the system board power connectors P8 and P9.
6. Disconnect the speaker connector by pulling straight up on the connector, not on the wires.

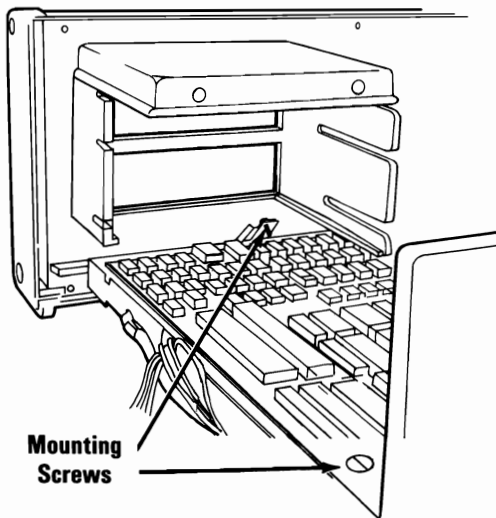


7. Disconnect the internal keyboard cable connector located at the rear of the system board.
8. Remove the two system-board mounting screws.

Note: The front mounting screw is accessible only through the front panel. If your system has only one diskette drive, you must remove the bottom blank to gain access to the front mounting screw.

9. Slide the system board out the right side of the system unit.

Note: If you are going to install a new system board, remove the front system board mounting assembly, the plastic standoffs, all the memory modules, and the Math Coprocessor (if installed). A new system board will not have these items.

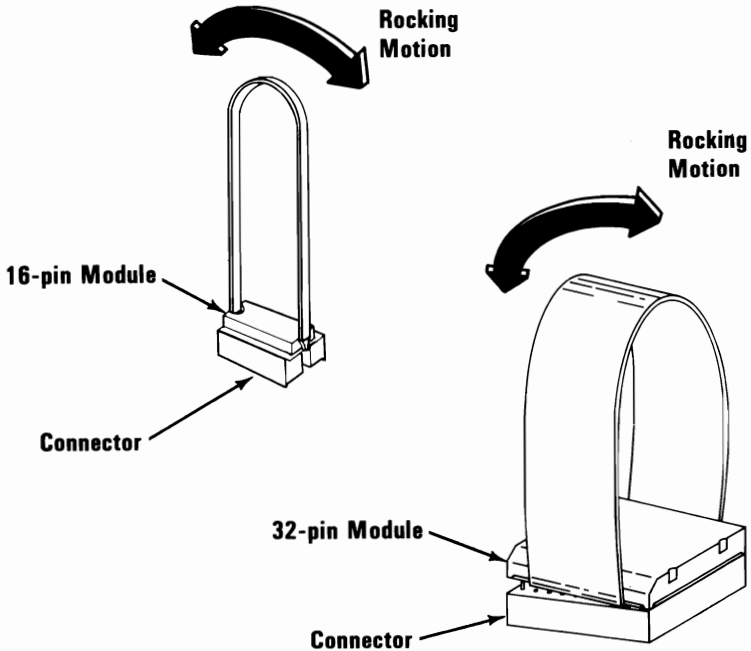


Memory Module 1030

1. Power off the system.
2. Remove the system unit cover (1005).
3. Find the failing memory module, on the system board or memory expansion adapter (see "MAP 0200: Memory" in the *Hardware Maintenance Service* manual).
4. Grasp the module with the module puller and lift in a two-step rocking motion, to avoid bending the pins.

Notes:

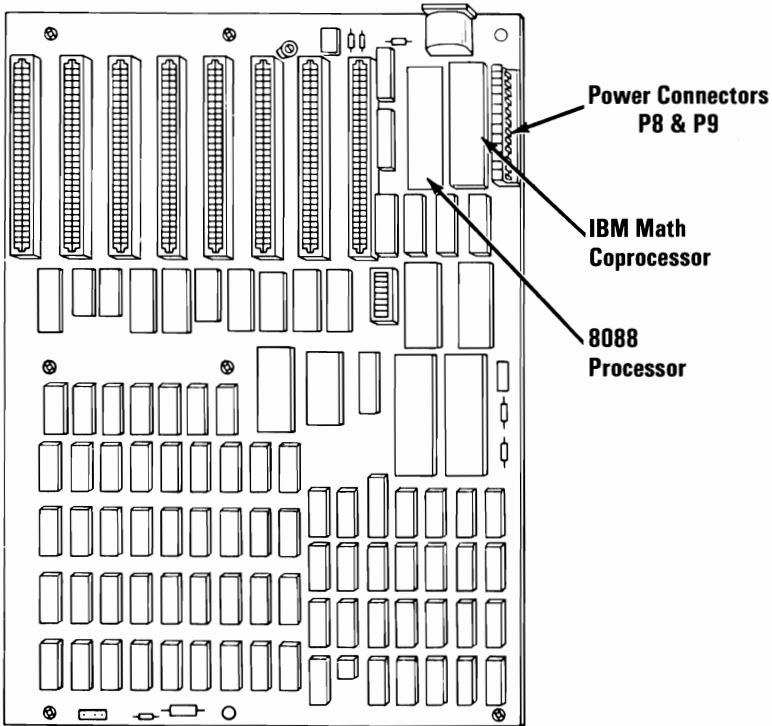
1. When replacing the 16-pin module, ensure the notch on the module aligns with the notch on the connector.
2. When replacing the 32-pin module, ensure the beveled edge on the module aligns with the top of the adapter.



Math Coprocessor 1035

1. Remove the system unit cover (1005).
2. Remove the system-board power connectors P8 and P9.
3. Find the Math Coprocessor on the system board.

Warning: The coprocessor is sensitive to static. Maintain personal grounding by touching the system frame with one hand.



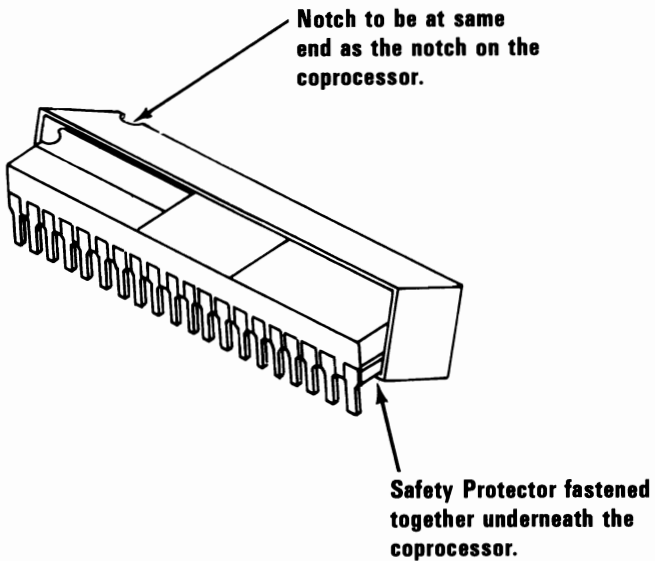
Front

4. Grasp the Math Coprocessor with a module puller and lift it carefully from its socket.

Warning: The pins on the Math Coprocessor are bent easily.

Note: When installing:

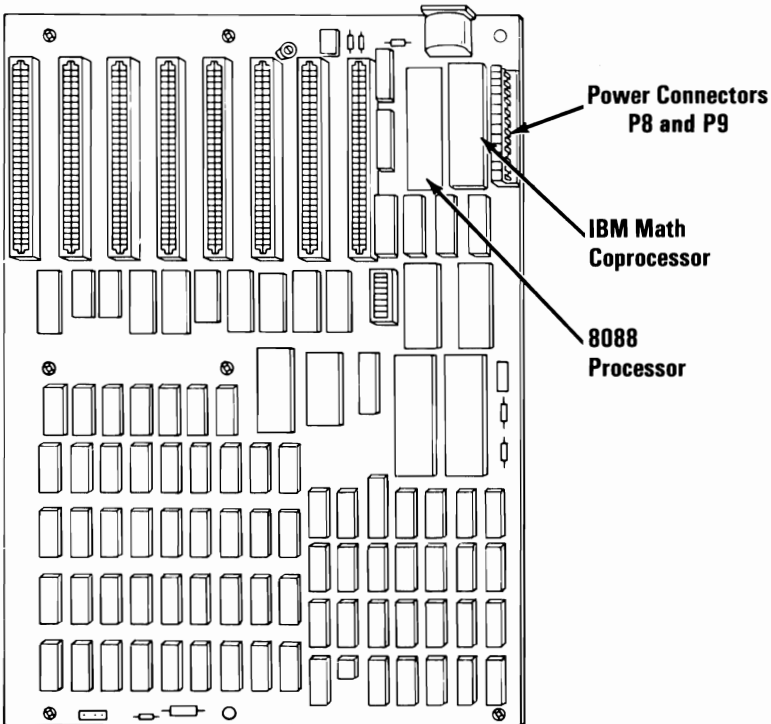
1. Make sure the notch in the safety protector is on the same end as the notch in the coprocessor.
2. The notch must be toward the rear of the system board.



8088 Processor 1040

Warning:

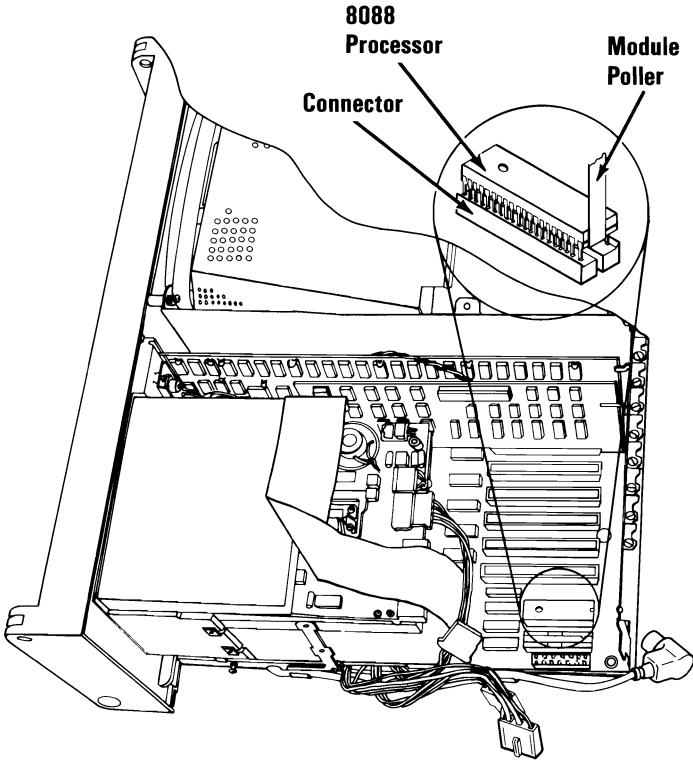
- The pins on the processor module are easily bent. Be careful not to bend them when removing the processor.
 - The processor is sensitive to static. Maintain personal grounding by touching the system frame with one hand.
1. Power off the system.
 2. Unplug the system unit (and expansion unit) power cord from the wall outlet.
 3. Remove the system unit cover (1005).



Front

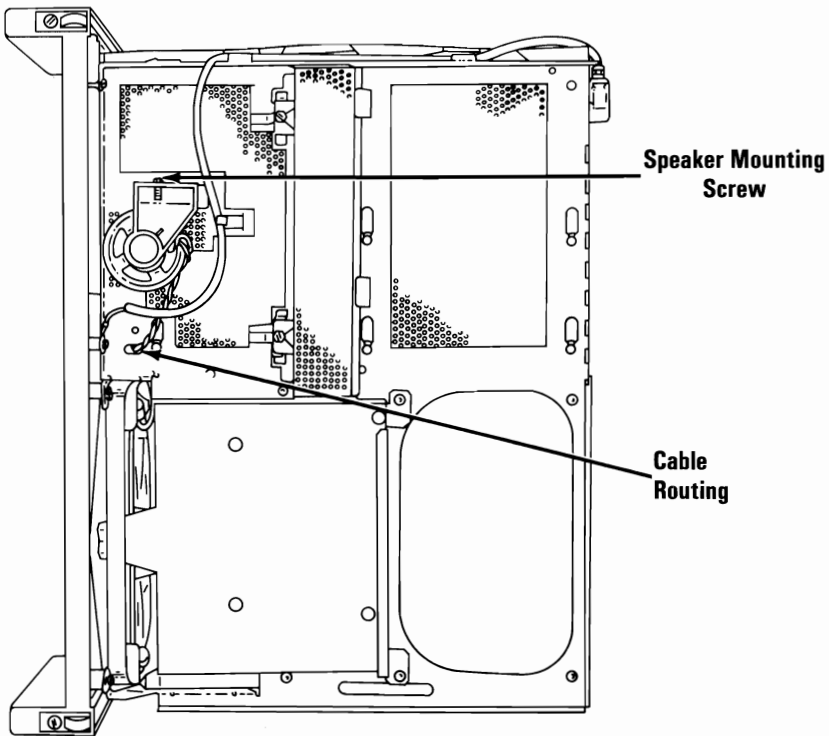
4. Find the 8088 Processor on the system board shown below.
5. Using a module puller, carefully remove the processor.

Note: When replacing the processor, the notch must face the rear of the system unit.



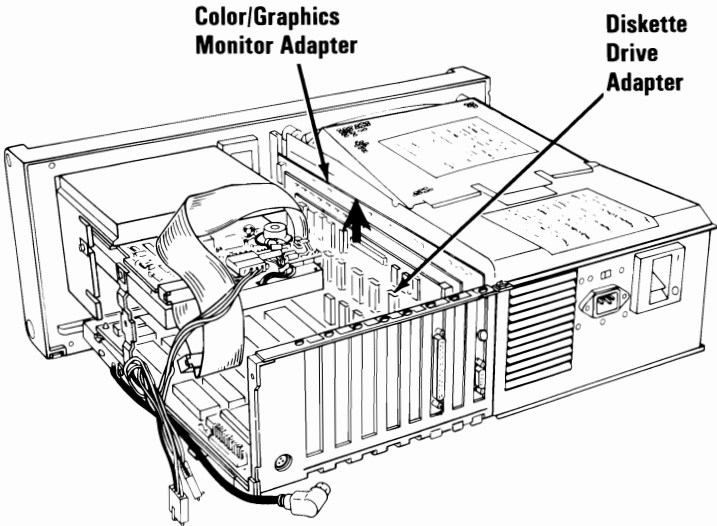
Speaker 1045

1. Remove the system unit cover (1005).
2. Place the system unit on its left side.
3. Notice the speaker cable routing for reinstallation purposes, then disconnect the speaker connector from the system board.
4. Remove the speaker mounting screw.
5. Remove the speaker.

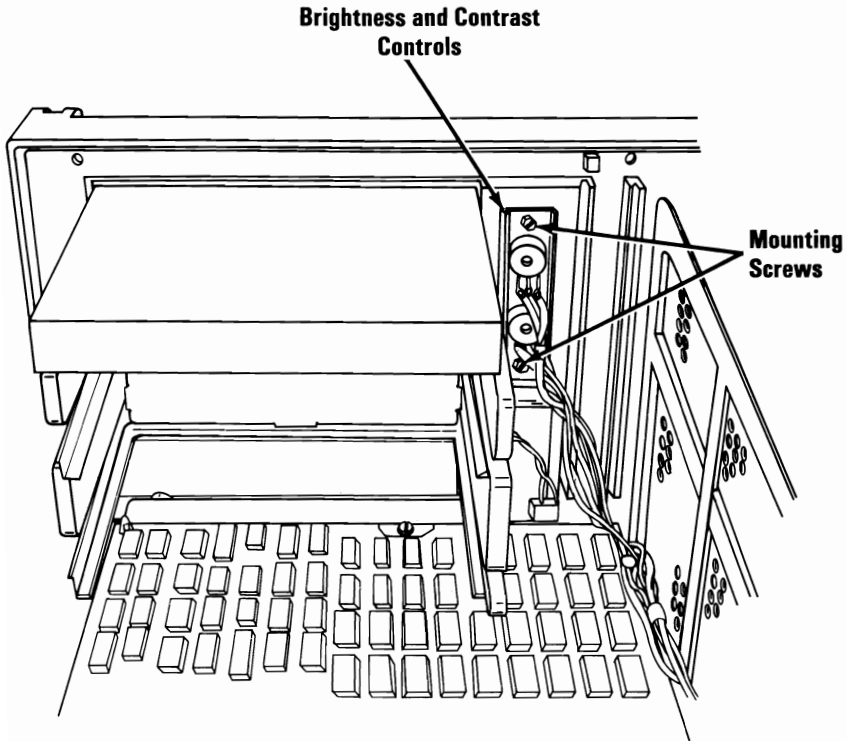


Internal Display 1065

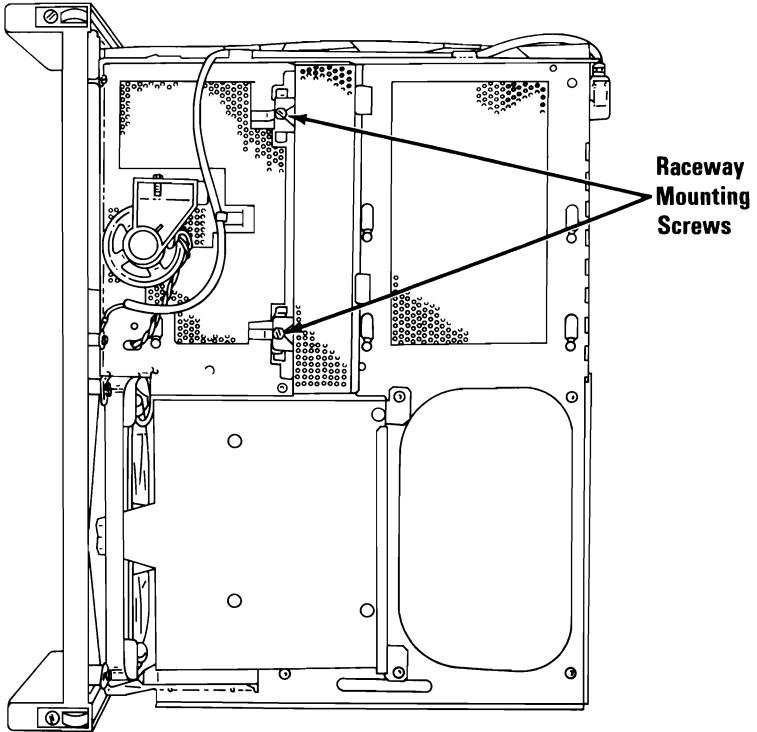
1. Remove the system unit cover (1005).
2. Set the system unit in its operating position.
3. Remove any option adapters (1085).



4. Remove the Brightness and Contrast knobs from the front of the system unit by pulling them off.
5. Remove the two screws holding the Brightness and Contrast controls to the system unit and pull the controls out.

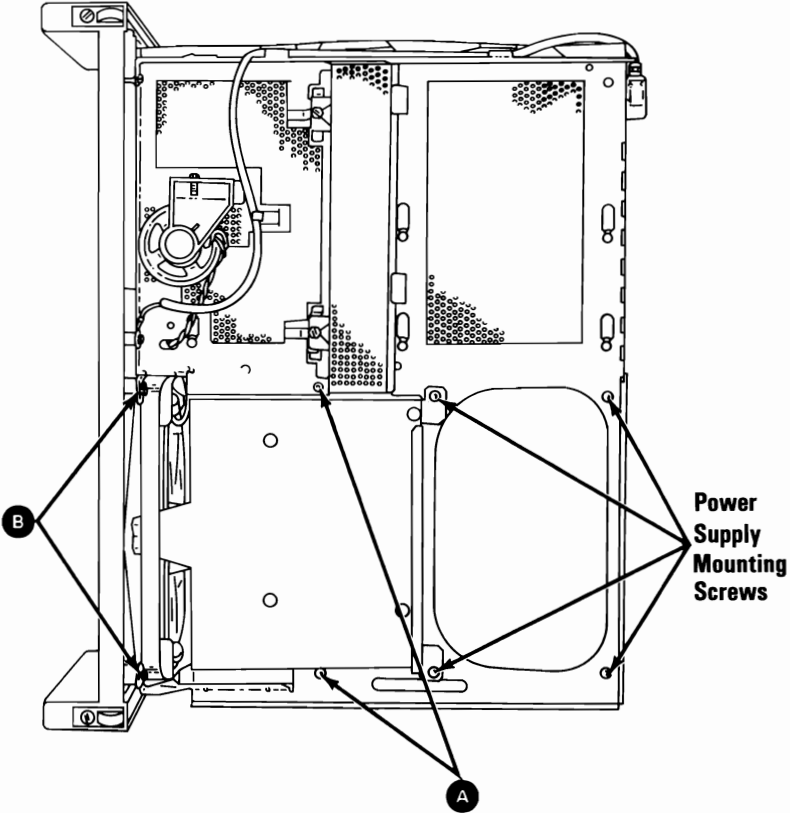


6. Place the system unit with the bottom side facing you.
7. Remove the cable raceway by removing the screws and sliding the cover off.
8. Disconnect the display power connector (P12), which is in the cable raceway.

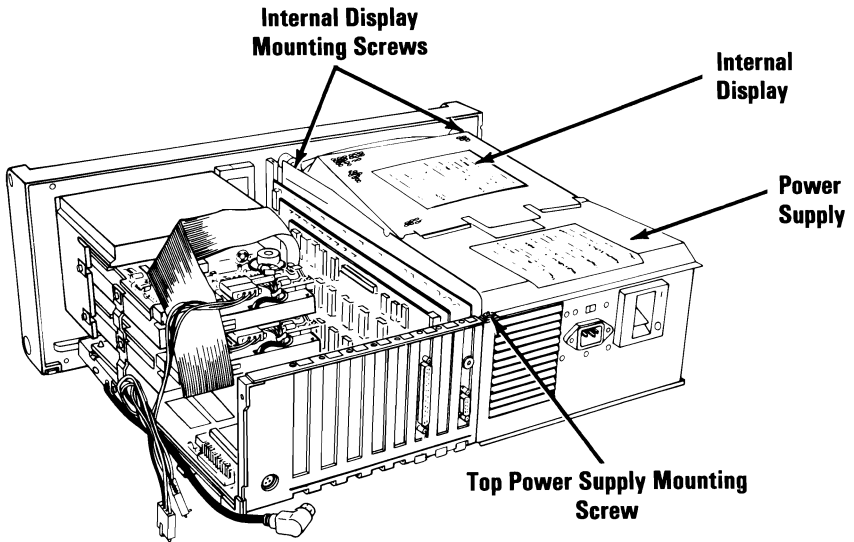


- 9. Remove the two screws **A** from the bottom of the internal display unit.
- 10. Remove the internal-display mounting screws **B**.
- 11. Remove the four power-supply screws.

Warning: The power supply is now loose in the system unit. Handle with care when moving the system unit.



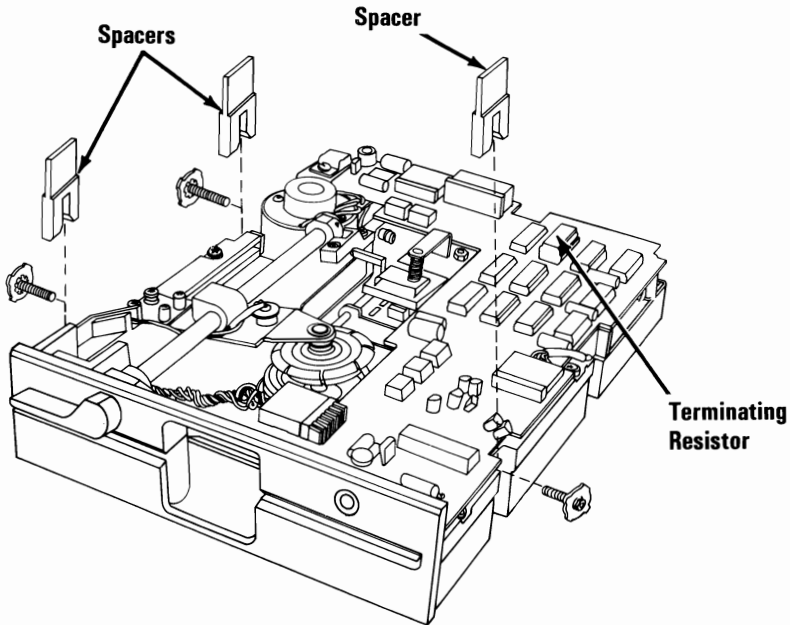
12. Set the system unit in its operating position.
13. Remove the two internal-display mounting screws.
14. Remove the top power-supply mounting screw.
15. Pull the power supply out of the way and lift the display from the system unit.



Diskette Drive 1075

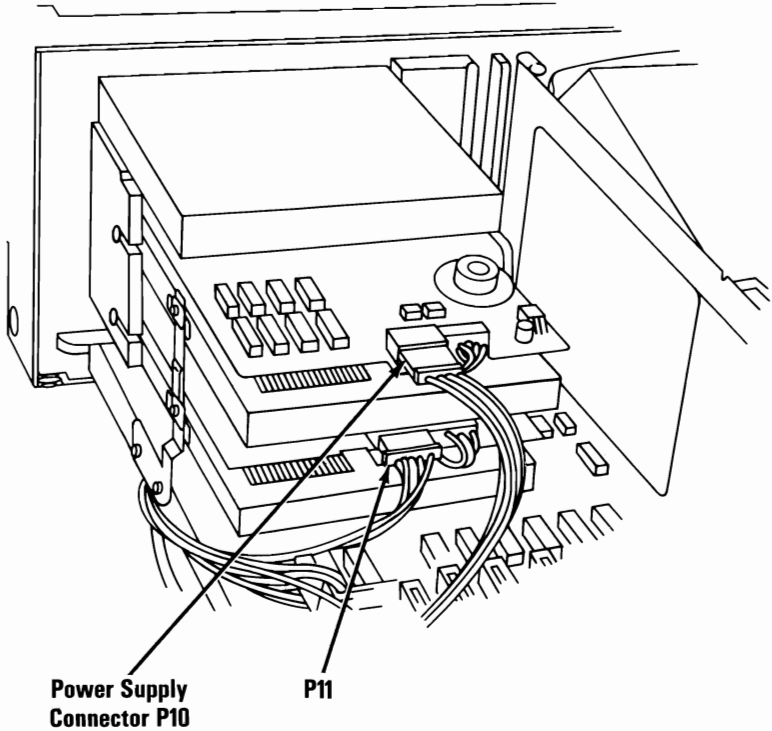
Notes:

1. If your system has only one diskette drive, a blank insert will appear in the position of diskette drive B.
2. This procedure may be used to remove either diskette drive A or diskette drive B. If removing diskette drive B, diskette drive A must always be removed first.
3. Drive A should always have a terminating resistor installed; drive B should not. If installing a new drive A, be sure the drive has a terminating resistor installed.
4. The three diskette-drive mounting spacers must always be installed as shown in the figure below.



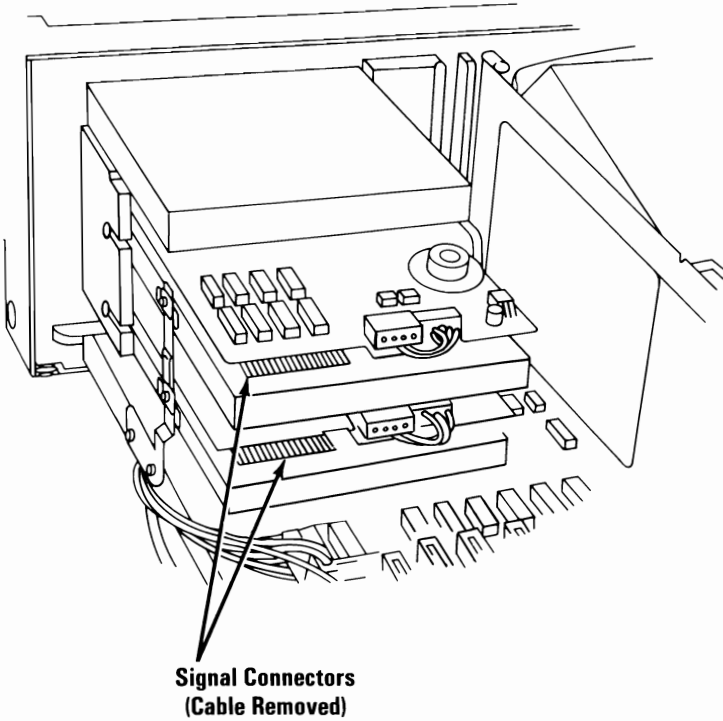
1. Remove the system unit cover (1005).
2. Remove any option adapters (1085).
3. Find the position of power supply connector P10 and P11, if drive B is installed, and disconnect it.

Warning: Do not pull on the wires when disconnecting connectors.

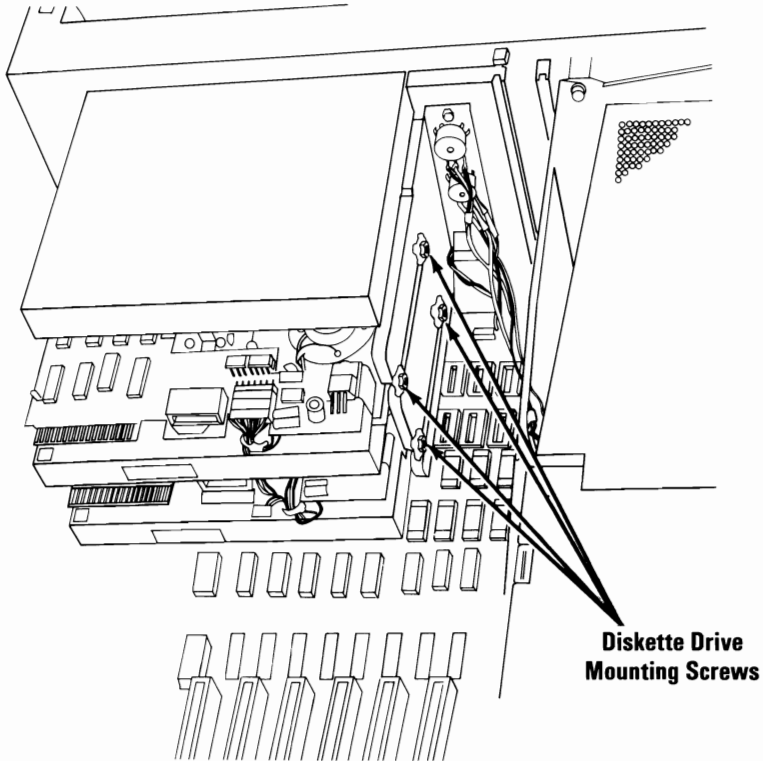


4. Remove the signal connectors from the back of the diskette drives.

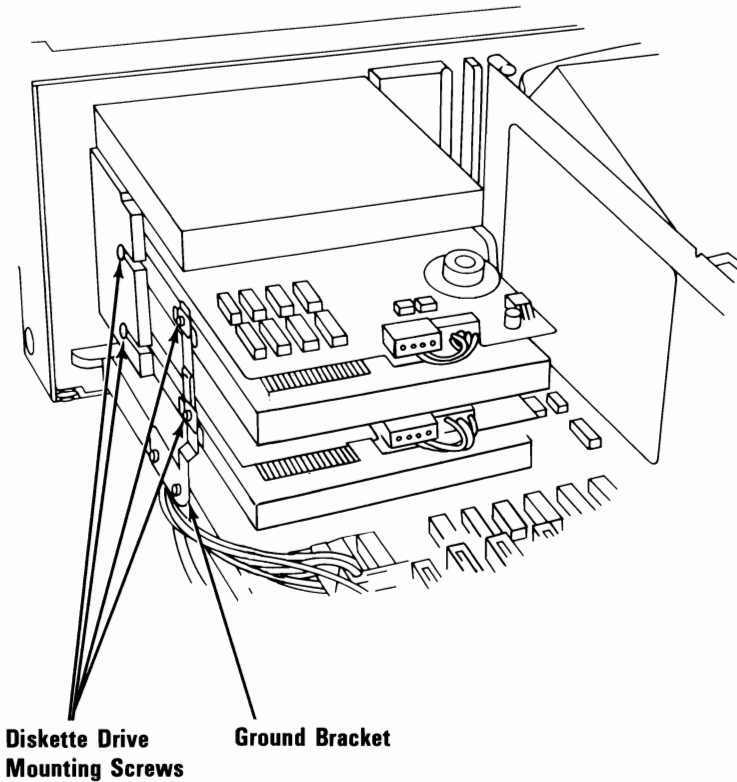
Note: When installing the signal cable, install the end connector on diskette drive A.



5. Loosen, but do not remove, the two mounting screws on the left side of the diskette drive.



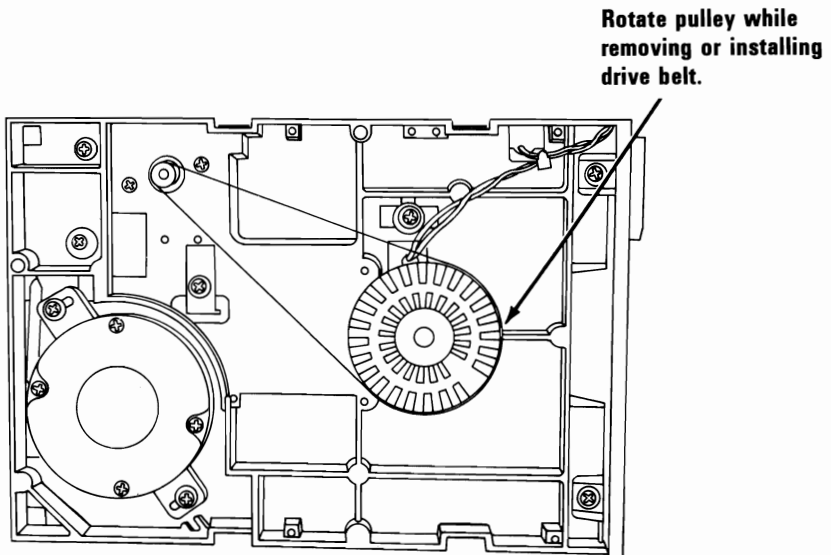
6. Remove the two mounting screws on the right side of the diskette drive.
7. Remove the two screws holding the diskette-drive ground bracket and remove the bracket.
8. Remove the diskette drive by sliding it to the rear.



Drive Belt 1080

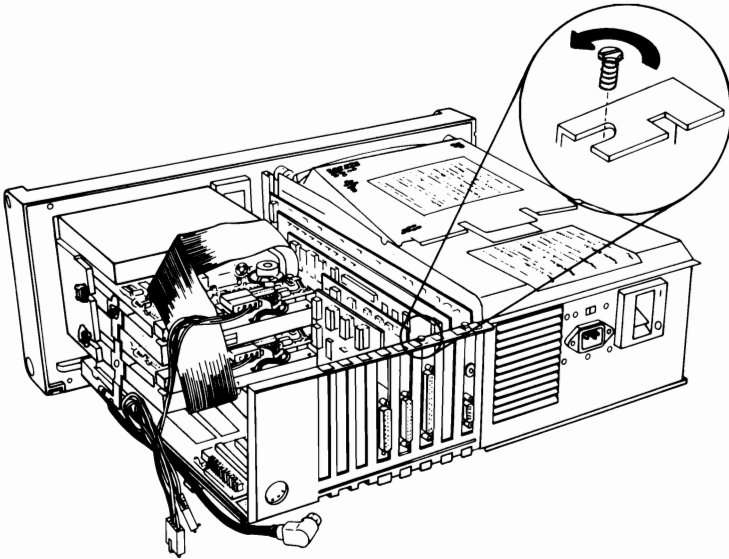
1. Remove the system unit cover (1005).
2. Remove the diskette drive to be worked on (1075).
3. Carefully place the diskette drive on the work surface with the drive belt and pulleys facing up.
4. Lift the belt from the large pulley, then lift it from the small pulley.

Note: When installing the belt, ensure the dark shiny side is facing the pulleys.



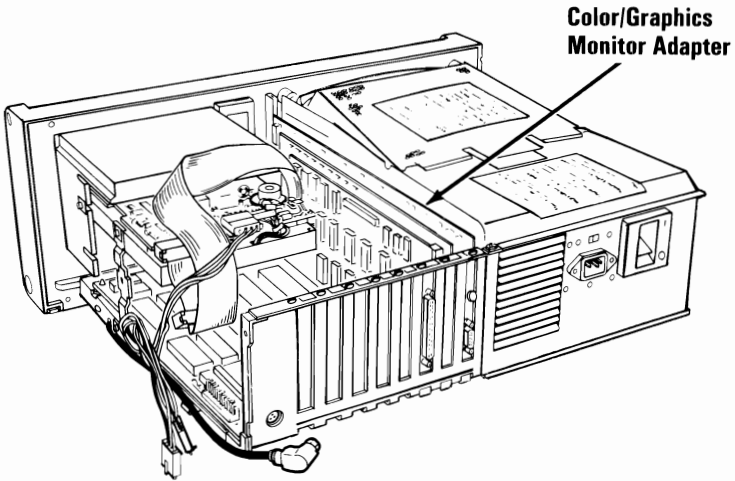
Option Adapter 1085

1. Power off the system.
2. Remove the system unit cover (1005).
3. Remove the option adapter mounting screw.
4. If the option adapter has cables connected to it, make a note of their location and remove the cables.
5. Grasp the option adapter by the top edge and lift straight up.

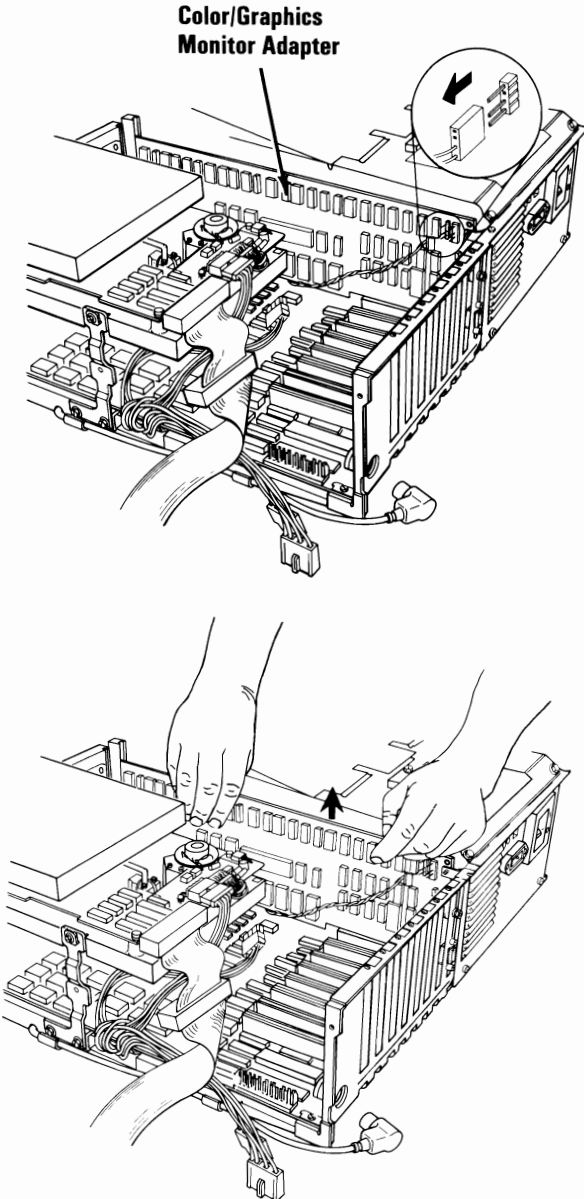


Color/Graphics Monitor Adapter 1090

1. Power off the system.
2. Unplug the system unit power cord from the wall outlet and disconnect all cables from the rear of the system unit.
3. Remove the system unit cover (1005).
4. Remove the Color/Graphics Monitor Adapter mounting screw.



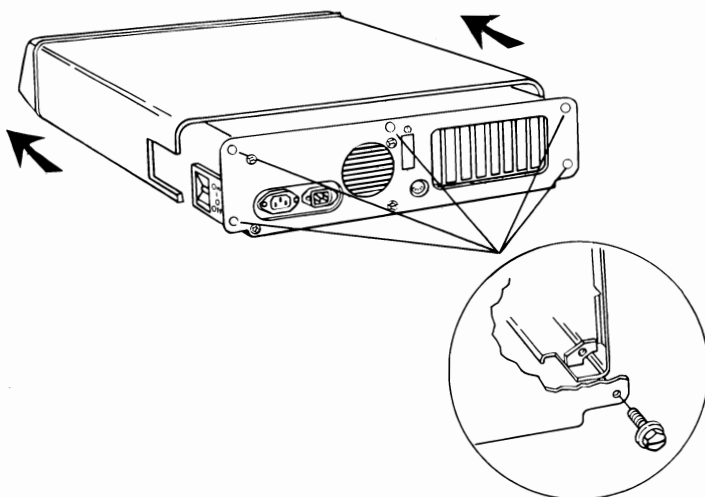
5. Remove the internal display signal connector from the Color/Graphics Monitor Adapter.
6. Grasp the Color/Graphics Monitor Adapter by the top edge and lift straight up.



Expansion Unit Option

Expansion Unit Cover 2000

1. Power off the system.
2. Move all external options away from the work surface.
3. Remove the cover mounting screws and slide the cover to the front until it clears the expansion unit.

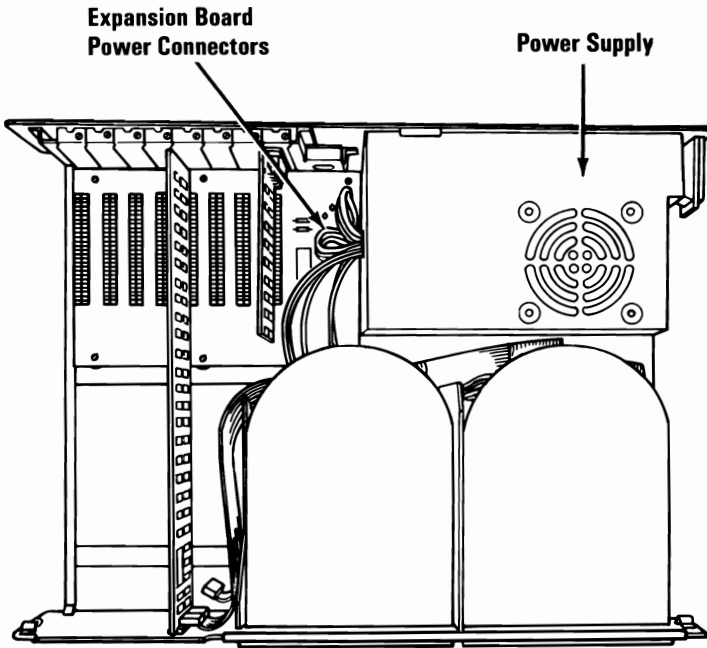


Expansion Unit Power Supply 2005

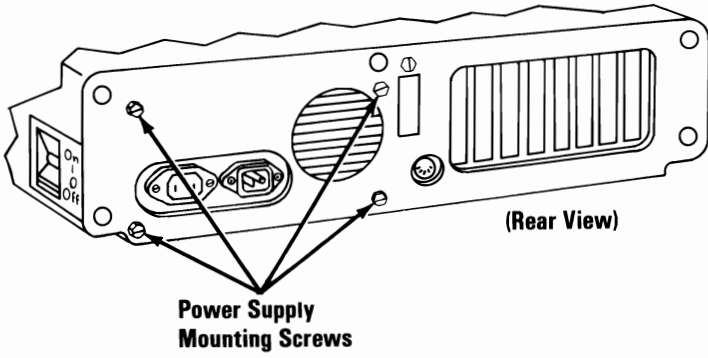
1. Remove the expansion unit cover (2000).
2. Disconnect the expansion board power connectors by grasping the connector and pulling straight up.

Warning: Do not pull on the wires when disconnecting the connectors.

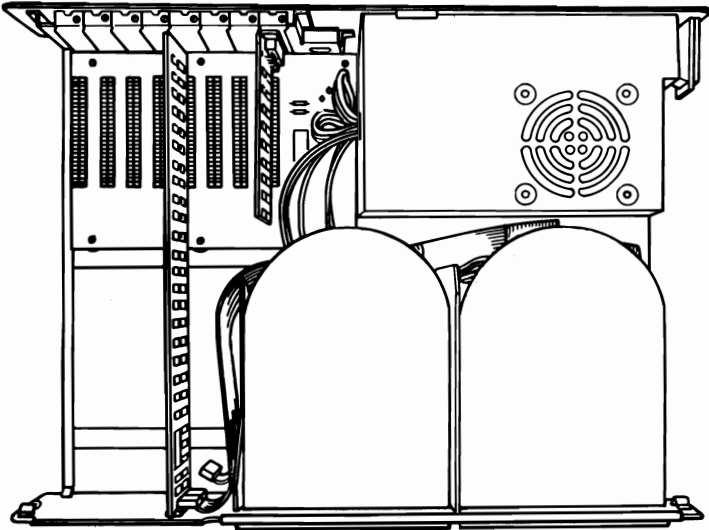
Note: The figure shows the top view of the expansion unit.



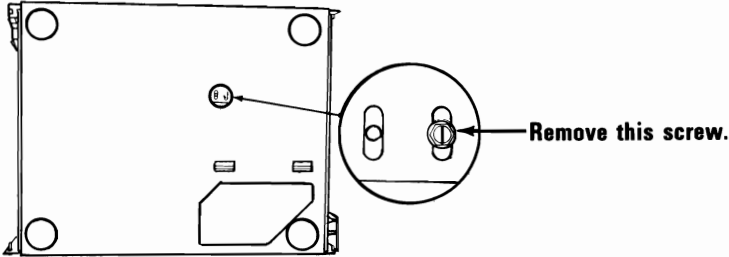
3. Disconnect the fixed-disk-drive and diskette-drive power connectors.
4. Remove the four power supply mounting screws.



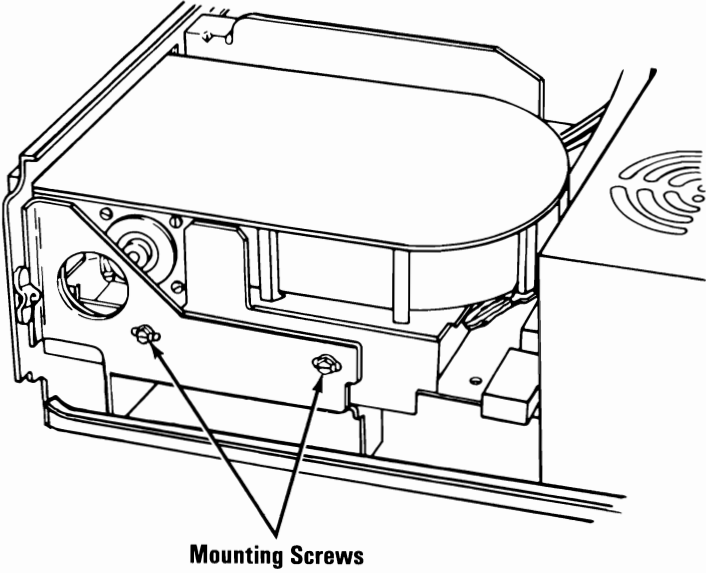
5. Hold the expansion unit by the front panel and tilt it up until it rests on the rear panel.



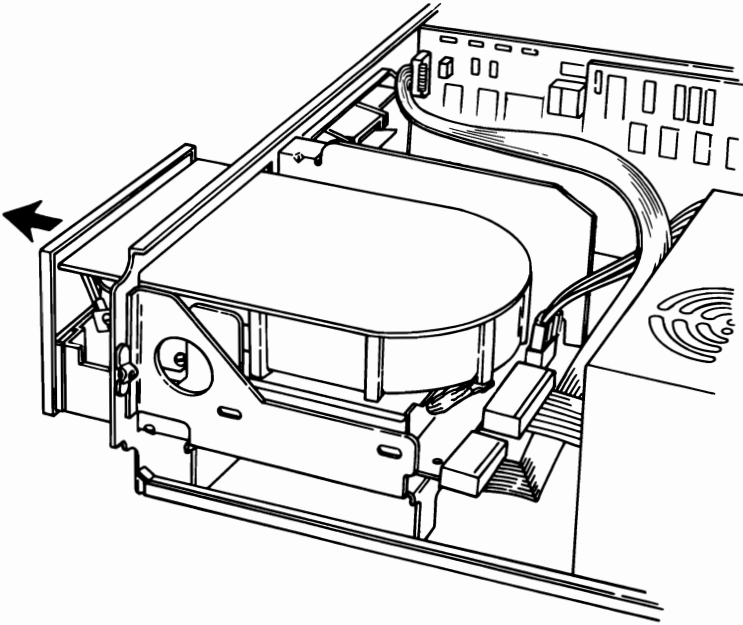
6. Remove the fixed disk drive mounting screw.



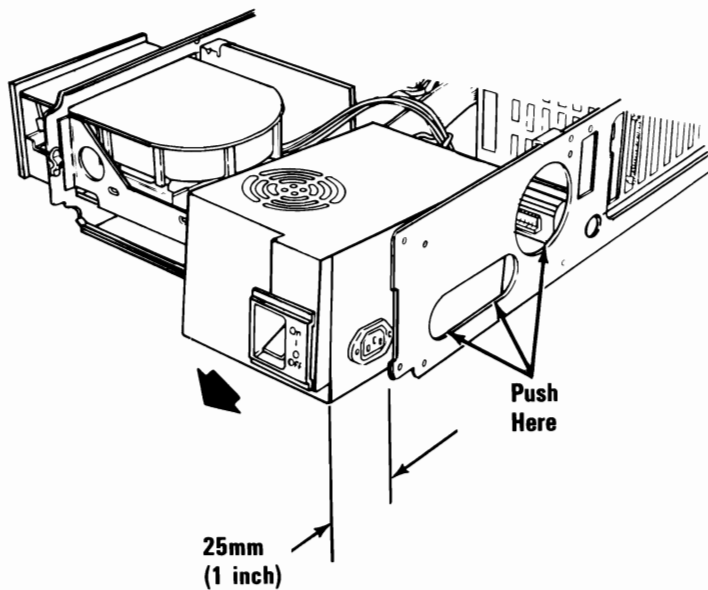
7. Remove the two fixed disk drive mounting screws.



8. Slide the fixed disk drive assembly toward the front of the machine approximately 25 mm (1 inch).

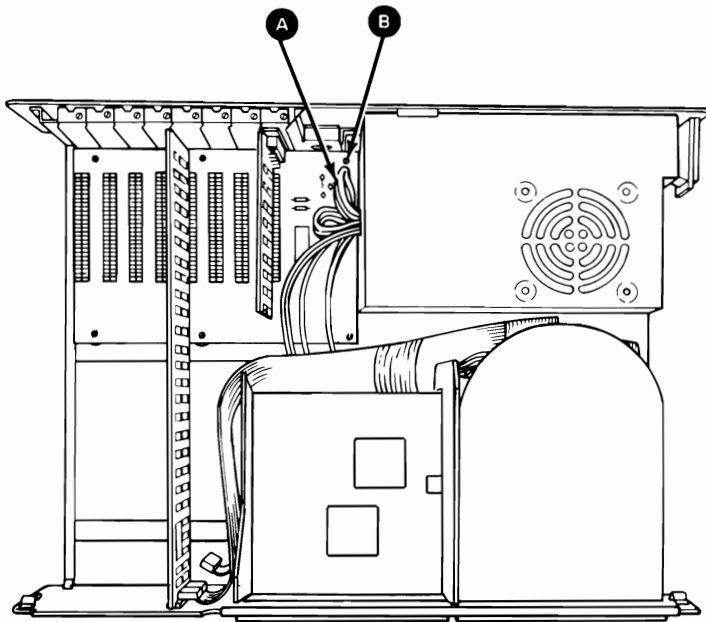


9. Push the power supply forward about 25 mm (1 inch), then lift up and remove.

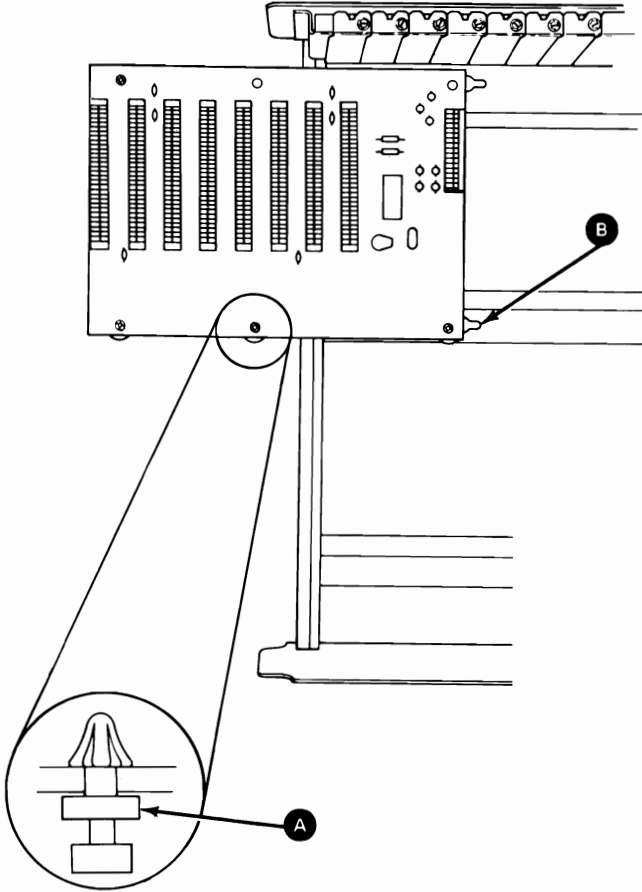


Expansion Board 2010

1. Power off the system.
2. Remove the expansion unit cover (2000).
3. Remove all option adapters, including the receiver card (2015).
4. Remove the expansion board power connectors **A**.
5. Remove the expansion board mounting screw **B**.

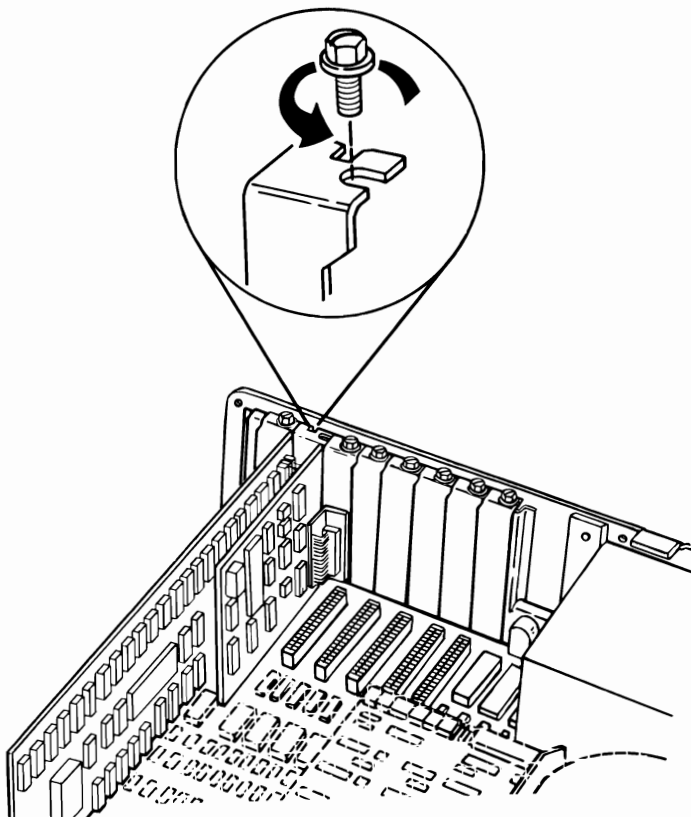


- Slide the expansion board away from the power supply, approximately 25 mm (1 inch) until the standoffs **A** can be lifted from the mounting slots **B**.
- Lift the expansion board up and out of the expansion unit.



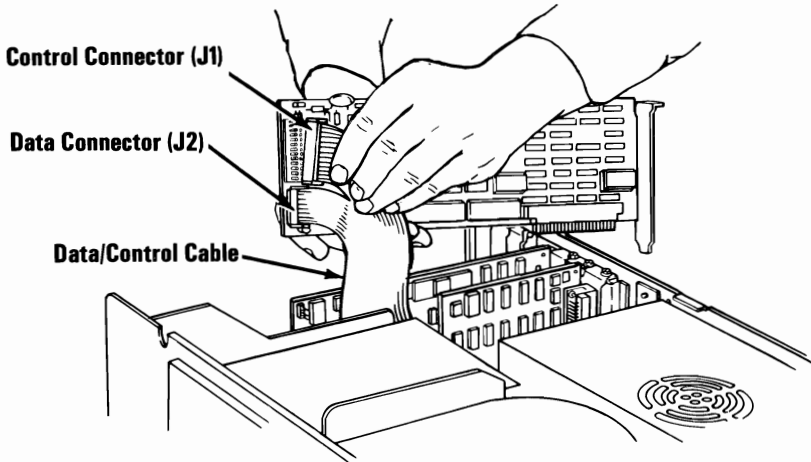
Option Adapter 2015

1. Power off the system.
2. Unplug the expansion unit power cord from the wall outlet and disconnect all cables from the rear of the unit.
3. Remove the expansion unit cover (2000).
4. Remove the option adapter mounting screw.
5. Make a note of the slot in which the adapter is located.
6. Grasp the adapter by the top edge and lift straight up.

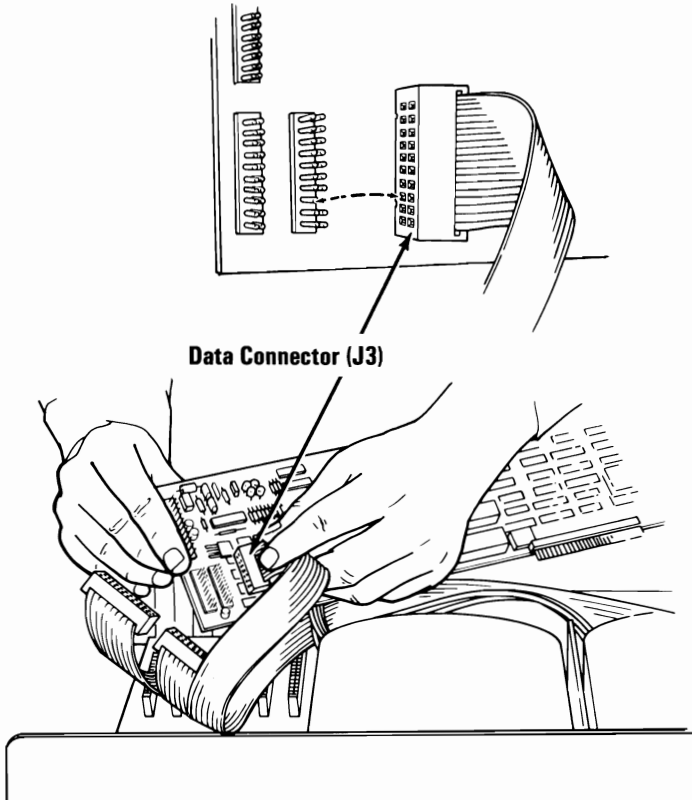


Fixed Disk Adapter 2020

1. Power off the system.
2. Remove the expansion unit cover (2000).
3. Remove the Fixed Disk Adapter mounting screw.
4. Make a note of the slot in which the Fixed Disk Adapter is installed.
5. Grasp the Fixed Disk Adapter by the top edge and lift straight up.
6. Remove the data connector (J2) and control connector (J1).



7. If two fixed disk drives are installed, remove the data connector (J3).



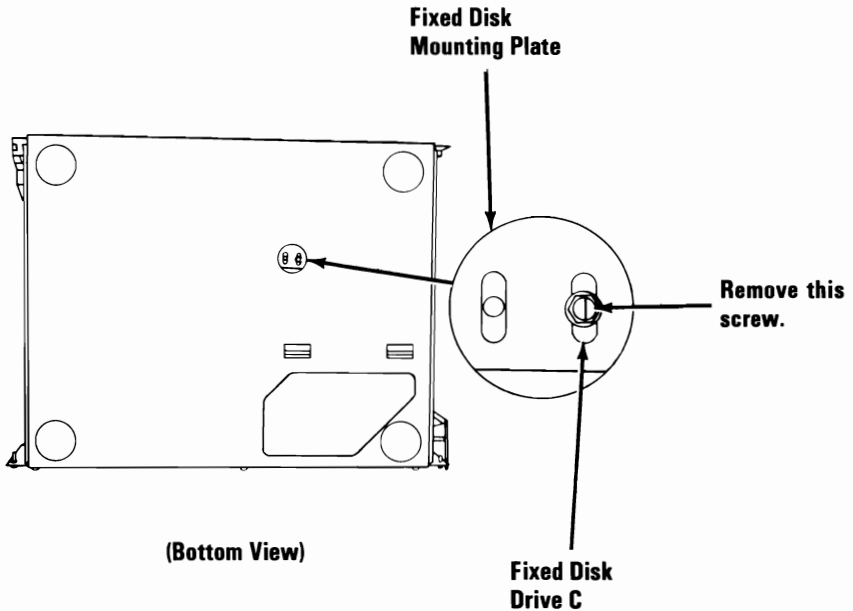
Fixed Disk Drive

Drive C 2025

Warning: Normal shipping and handling can result in permanent loss of all data and formatting on the fixed disk drives. We recommend that you back up all disk files on diskettes.

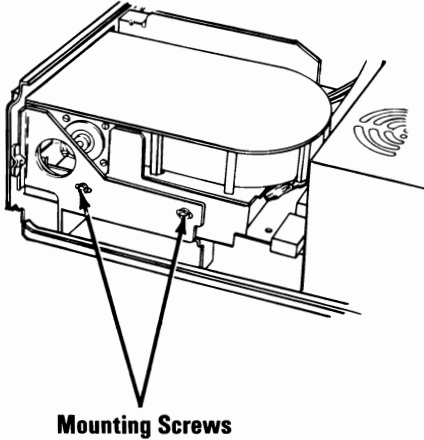
1. Power off the system.
2. Remove all cables from the rear of the expansion unit.
3. Remove the expansion unit cover (2000).
4. Tilt the unit up and remove the screw from the fixed disk drive mounting plate.

Warning: Be sure to use the same screw (short screw) you removed from the mounting plate, or damage to the drive will result.



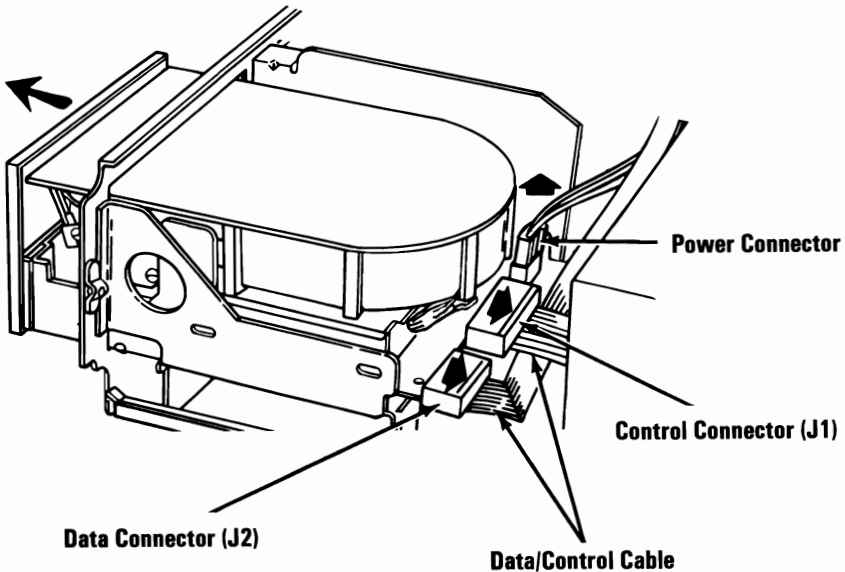
5. Remove the two mounting screws on the right side of the disk drive.

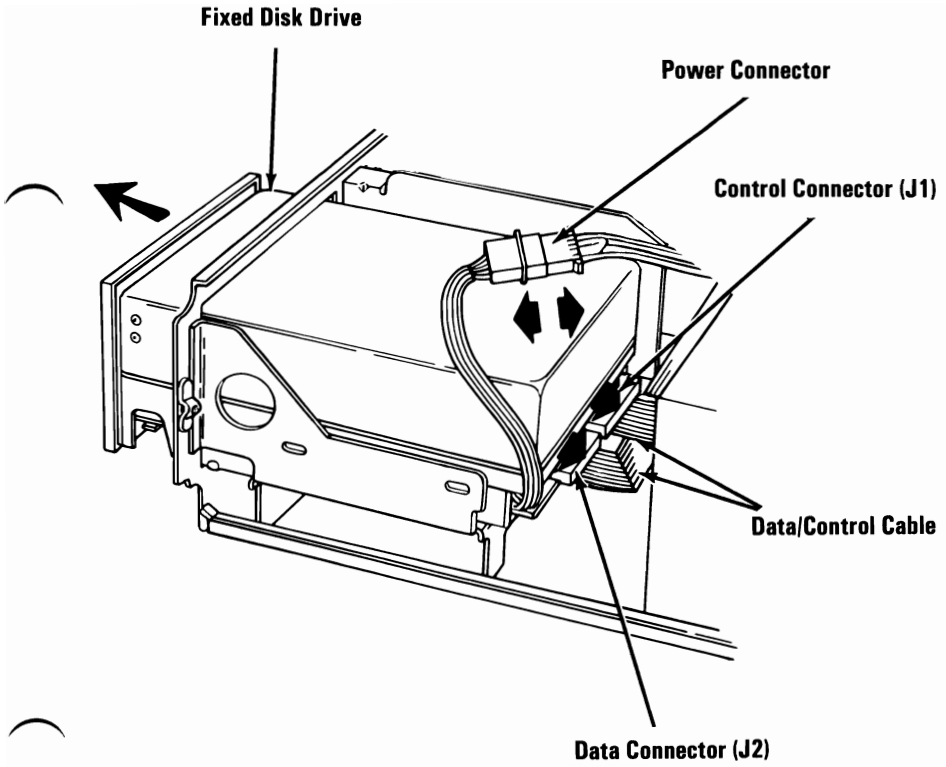
Warning: Be sure to use the same two mounting screws (long screws) you removed from the side of the drive, or damage to the drive will result.



6. Disconnect the power connector, control connector (J1), and data connector (J2). Then slide the drive completely out of the unit.

Fixed Disk Drive



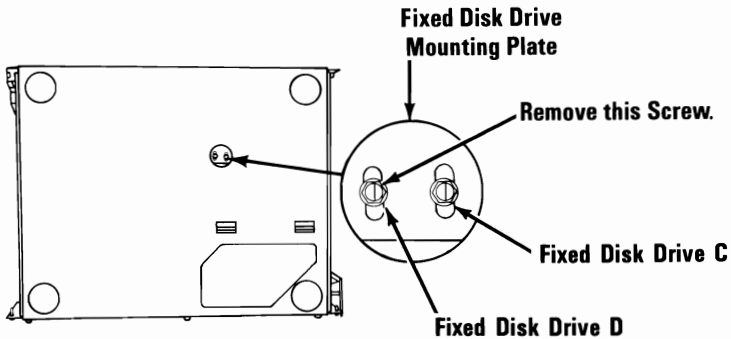


Drive D 2030

Warning: Normal shipping and handling can result in permanent loss of all data and formatting on the fixed disk drives. We recommend that you back up all disk files on diskettes.

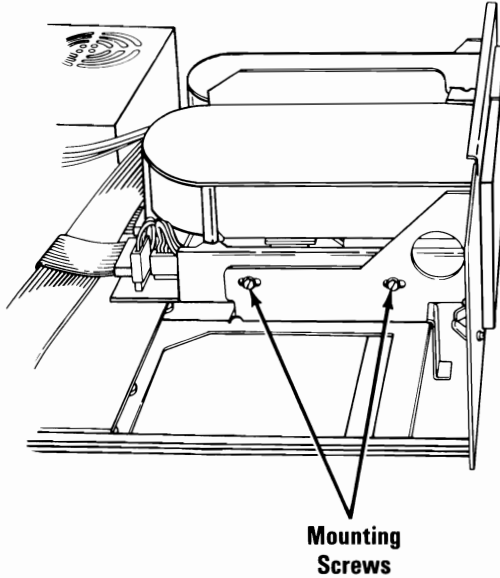
1. Remove the expansion unit cover (2000).
2. Tilt the unit up and remove the screw from the mounting plate for disk drive D.

Warning: Be sure to use the same screw (short screw) you removed from the mounting plate, or damage to the drive will result.

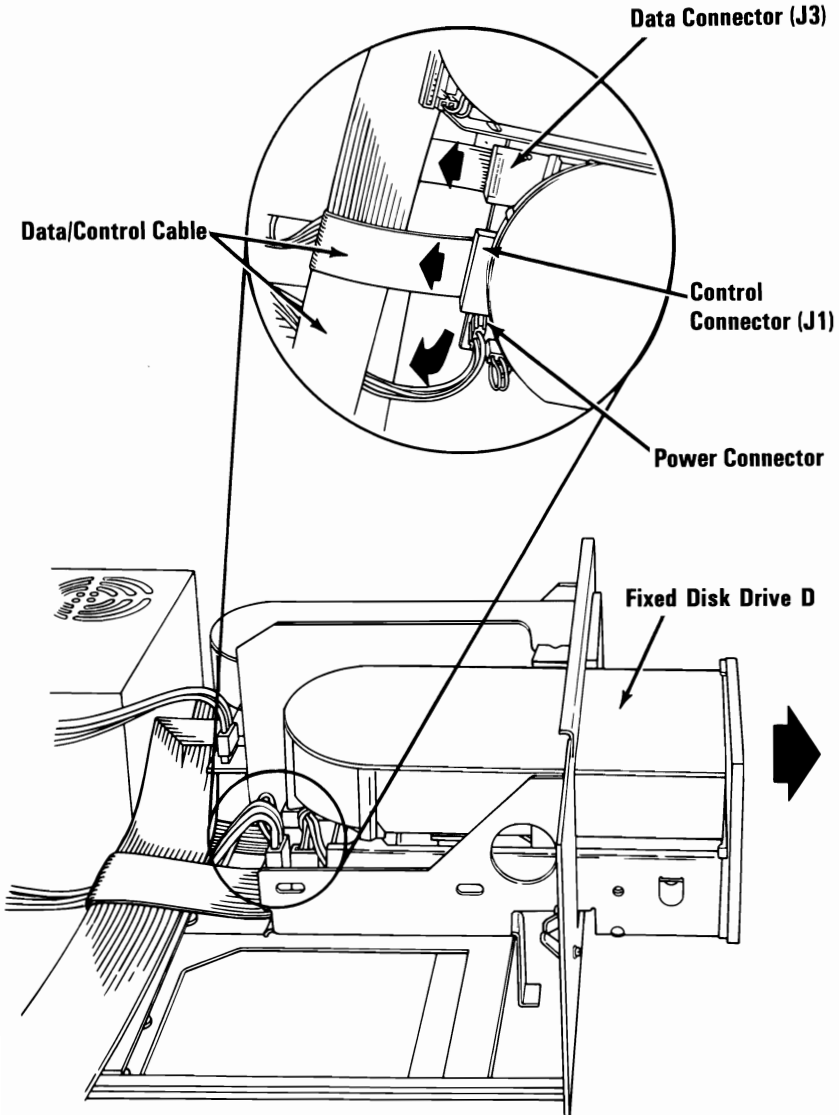


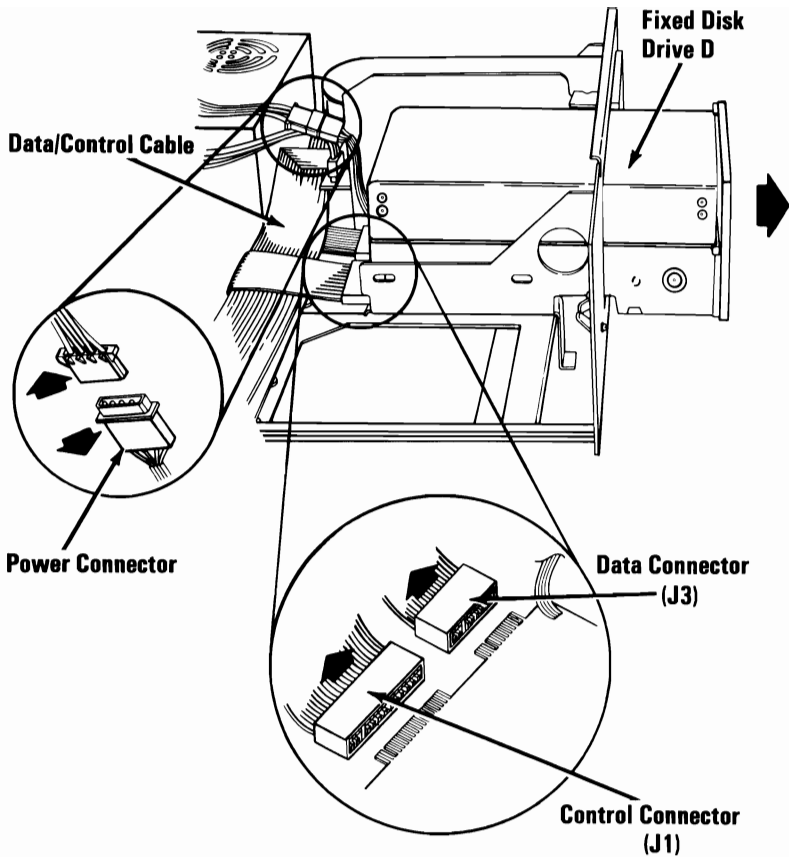
3. Remove all option adapters (**2015**).
4. Remove the mounting screws on the left side of disk drive D.

Warning: Be sure to use the same two mounting screws (long screws) you removed from the side of the drive, or damage to the drive will result.



- Slide the drive 50 mm (2 inches) forward and unplug the control connector (J1), data connector (J3), and power connector.
- Remove the disk drive from the expansion unit.



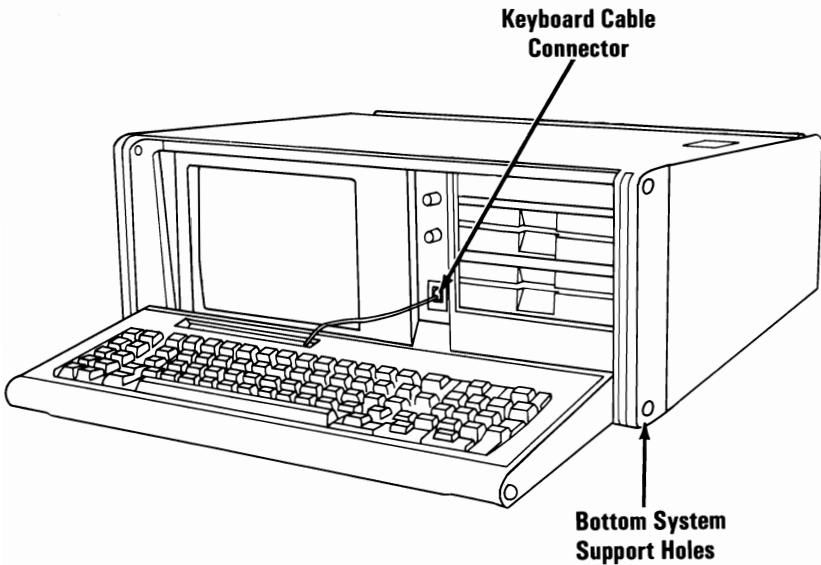


Disassembly and Assembly

Keyboard

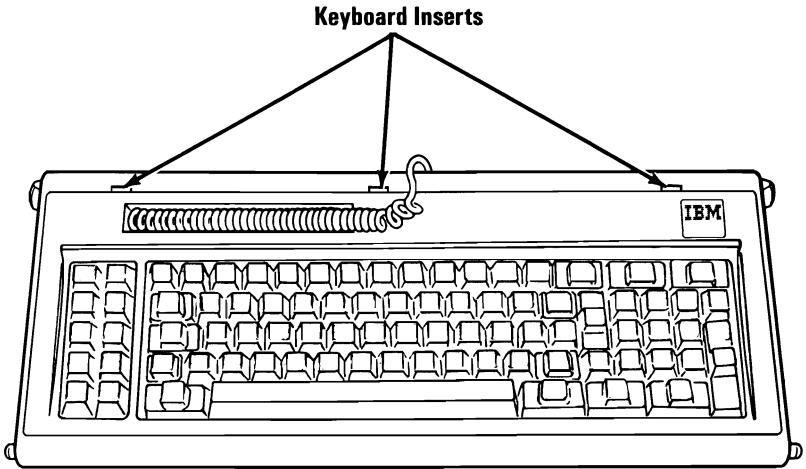
Removal 3000

1. Place the system unit in its operating position and release the keyboard by pushing the keyboard release latches.
2. Disconnect the keyboard cable.
3. Remove the keyboard from the system unit by pushing in the bottom holes on the system supports. This separates the keyboard from the system unit.



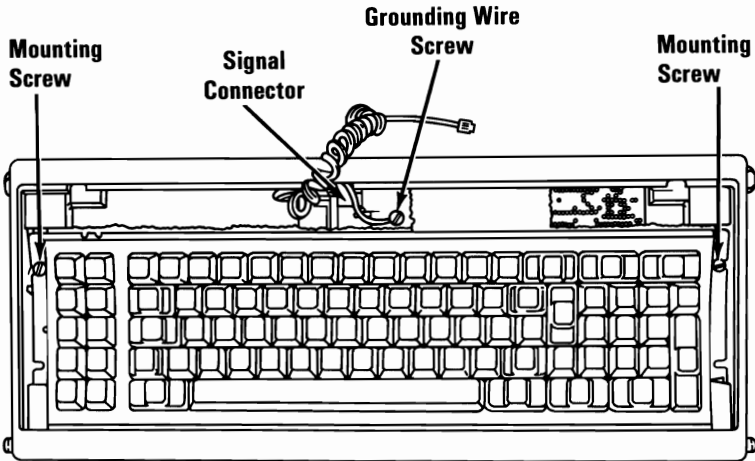
Cover 3005

1. Power off the system.
2. Remove the keyboard (3000).
3. Separate the keyboard cover from its base by inserting a flat-blade screwdriver into the inserts on the top of the keyboard.
4. Lift the keyboard top cover at the front edge and remove.



Internal Assembly 3010

1. Power off the system.
2. Remove the keyboard (3000).
3. Remove the keyboard top cover (3005).
4. Remove the two keyboard assembly mounting screws.
5. Disconnect the keyboard signal cable from the keyboard assembly.
6. Remove the ground wire from the screw shown.
7. Lift the keyboard assembly out of the cover.



Internal Keyboard Cable 3015

1. Remove the system unit cover (**1005**).
2. Remove any option adapters (**1085**).
3. Disconnect the internal keyboard cable at the rear of the system board.
4. Remove the internal keyboard-cable shield mounting screw and remove the shield.

5. Remove the internal keyboard-cable connector by spreading the tabs on the retainer and push the connector towards the rear of the system unit.
6. Remove the internal keyboard-cable grounding wire.
7. Remove the internal keyboard cable from the mounting clips.

