Personal Computer Hardware Reference Library

Guide to Operations

1502332

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Personal Computer
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Guide to Operations

First Edition (January 1984)

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- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
- If peripherals not offered by IBM are used with this equipment, it is suggested that you use shielded, grounded cables with in-line filters, if necessary.

If necessary consult your dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

CAUTION
This product is equipped with a line cord and plug designed for the user's safety. It is to be used with a properly grounded receptacle to avoid possible electrical shock.

Preface

The *Guide to Operations* manual provides you with the necessary information to install and operate your IBM Portable Personal Computer, and describes how to diagnose and correct any problems that may occur.

This manual is divided into six sections. External tabs help you find the section you want. A description of each section follows.

Section 1, "Introduction / Installation," provides a brief description of the system unit, keyboard, and display. System setup, cabling, and the power-on self test are explained in detail.

Section 2, "Problem Determination Procedures," provides step-by-step instructions to assist you in isolating problems that may occur.

Section 3, "Operating Your IBM Portable Personal Computer," describes the location and operation of the power switches, diskette drive, and display adjustments.

Section 4, "Option Installation," contains a cover removal and replacement procedure that is used with the option instructions that come with options you purchase for your IBM Portable Personal Computer. This section has an area for keeping these installation instructions. It also has the switch setting charts for the system board, extender card, and memory options.

Section 5, "Moving Your IBM Portable Personal Computer," contains all the information required to move your system unit and options safely.

Section 6, "Keyboard Templates," contains graphic layouts for all the keyboards available to you when using DOS. The templates will allow you to convert your keyboard to match various languages. This section also contains charts of three-digit ASCII codes for each language.

Contents

Section 1. Introduction/Installation 1-1
Introduction 1-3
IBM Portable Personal Computer Features . 1-5
External Options 1-6
Additional Options 1-7
Installation 1-9
System Setup 1-9
Power-On Self Test 1-16
Keyboard Adjustment 1-19
Display Controls 1-24
Handling Diskettes 1-25
System Cabling 1-26
Summary 1-28

Section 2. Problem Determination Procedures 2-1

Section 3. Operating Your IBM Portable Personal Computer 3-1
Introduction 3-3
System Unit 3-5
Keyboard 3-7
The Typewriter Area 3-8
The Typewriter Area on International Keyboards 3-13
Special Keys when Using DOS with an International Keyboard 3-14
Changing back to the U.S. English Format 3-17
The Numeric Keypad 3-18
Cursor Controls 3-20
Function Keys 3-23
Diskette Drive 3-25
IBM Portable Personal Computer Display . 3-29
Expansion Unit 3-31

IBM Color Display 3-33
Controls 3-33
Vertical Hold Adjustment 3-34
Vertical Size Adjustment 3-35
Other Monitors 3-37
Interface Information 3-39
Auxiliary Connectors 3-40

Section 4. Option Installation 4-1
Introduction 4-3
Requirements 4-5
Installation Requirements 4-5
Tools Required 4-6
Installation Procedures 4-7
Switch Settings 4-77
Introduction 4-77
System Board Switch Settings 4-78
64/256KB Memory Expansion Option Switch Setting 4-84
Extender Card Switch Setting 4-85

Section 5. Moving Your IBM Portable Personal Computer 5-1
Moving Your System Unit 5-3
System Setup 5-9
Moving Your Options 5-15
Preparation of Your Expansion Unit . 5-15
Short Distance Move 5-18
Long Distance Move 5-19
System Unit 5-20
IBM Portable Personal Computer Keyboard 5-21
Expansion Unit 5-22
IBM Color Display 5-23
IBM Personal Computer Graphics Printer 5-24
Installation At Your New Location 5-25

Section 6. Keyboard Templates **6-1**
Introduction 6-3
French 6-5
Italian 6-7
Spanish 6-9
German 6-11
U.S. English 6-13
U.K. English 6-15

Glossary **Glossary-1**

Index **Index-1**

Notes:

Section 1. Introduction/Installation

Contents

Introduction **1-3**

IBM Portable Personal Computer Features **1-5**
External Options 1-6
Additional Options 1-7

Installation **1-9**
System Setup 1-9
Power-On Self Test (POST) 1-16
Keyboard Adjustment 1-19
Display Controls 1-24
Handling Diskettes 1-25
System Cabling 1-26
Summary 1-28

Notes:

Introduction

The IBM Portable Personal Computer is a portable member of the IBM Personal Computer family. It consists of a case that has a built-in, 9-inch display, one IBM Personal Computer Slimline Diskette Drive, a system board, and a keyboard. The case has a handle for carrying. The unit can be placed in its own protective carrying case. The base IBM Portable Personal Computer also has a power supply and two IBM Portable Personal Computer option adapters (with space available for five additional options). You can add a color display, a printer, an expansion unit, additional memory, a second slimline diskette drive, or other options to expand your system to meet your particular needs.

The system board has an Intel 8088 Processor and 256K of available memory. The IBM Color/Graphics Monitor Adapter and the IBM Diskette Drive Adapter are installed in two of the seven expansion slots.

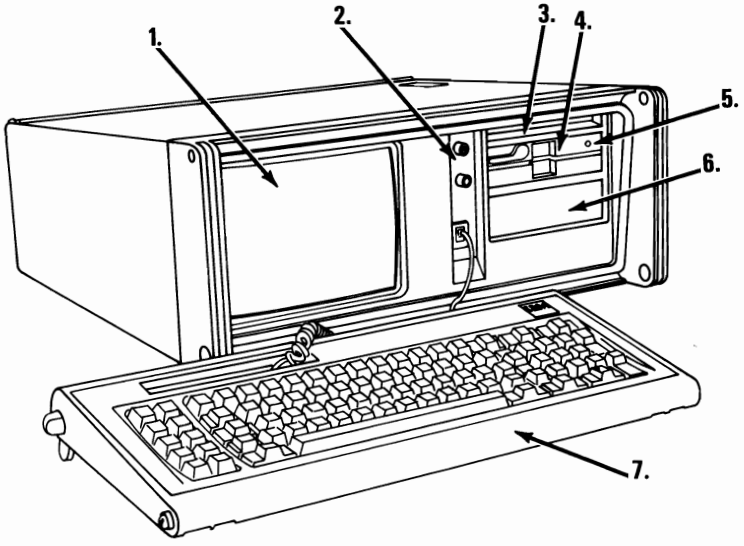
The keyboard, which is the primary means of entering data into the system, connects to the IBM Portable Personal Computer with a 76-centimeter (30-inch) coiled cable. The cable is stored in a compartment on the keyboard while the IBM Portable Personal Computer is being carried. The keyboard attaches to the front of the system unit to form part of the enclosure/carrying case. The keyboard keys are divided into three major sections: the typewriter area, the numeric keypad, and the function keys.

The power supply allows the IBM Portable Personal Computer to operate at either 115 Vac (volts ac) or 230 Vac. Six different line cords are available for various power sources.

Notes:

IBM Portable Personal Computer Features

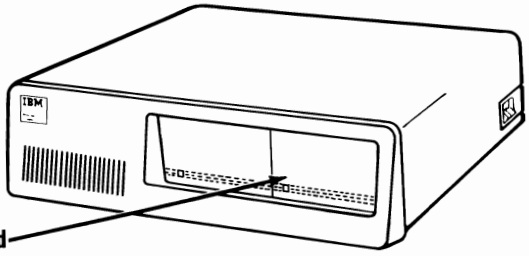
The following figures show some of the features on your IBM Portable Personal Computer.



1. Display
2. Display controls
3. Diskette storage compartment
4. Diskette drive (drive A)
5. Diskette drive in use light
6. Space available for an additional diskette drive (drive B)
7. Keyboard

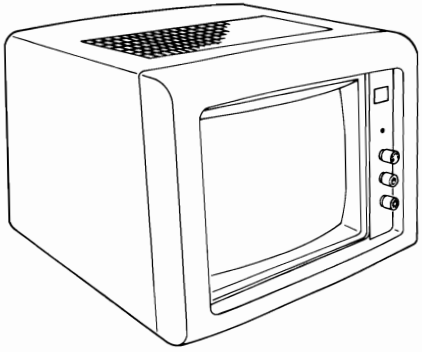
External Options

The following are some of the external options that you can attach to your system unit to expand its capabilities.

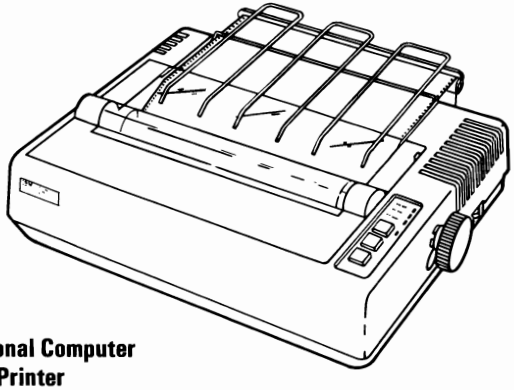


10M-Byte Fixed Disk Drive

Expansion Unit



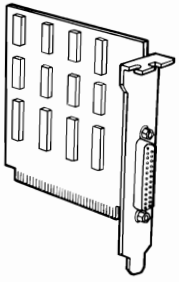
IBM Color Display



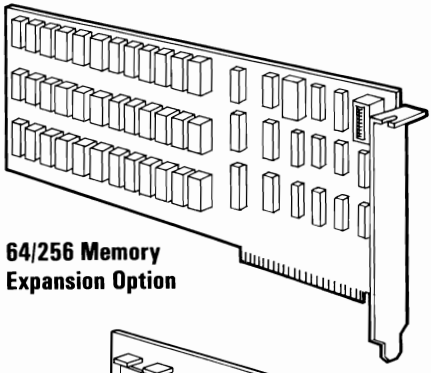
IBM Personal Computer Graphics Printer

Additional Options

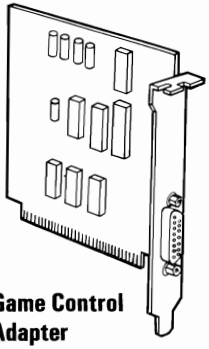
The following are some of the options that can be installed in the expansion slots of your system unit or expansion unit.



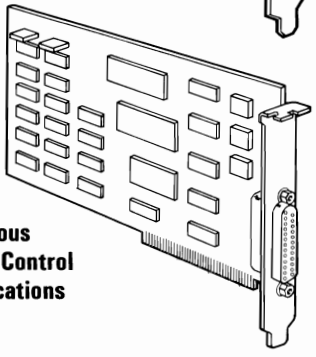
Printer Adapter



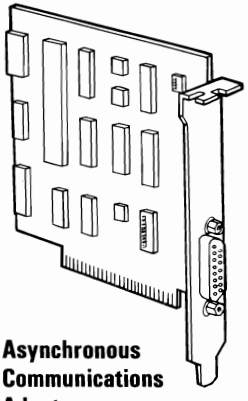
64/256 Memory Expansion Option



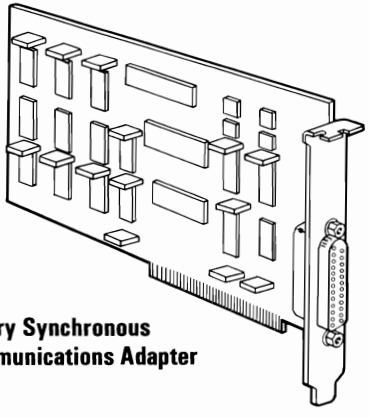
Game Control Adapter



Synchronous Data Line Control Communications Adapter



Asynchronous Communications Adapter



Binary Synchronous Communications Adapter

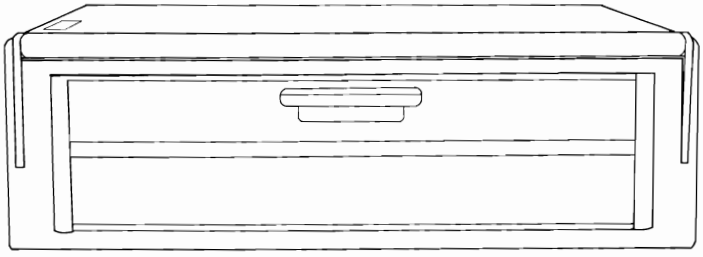
Notes:

Installation

System Setup

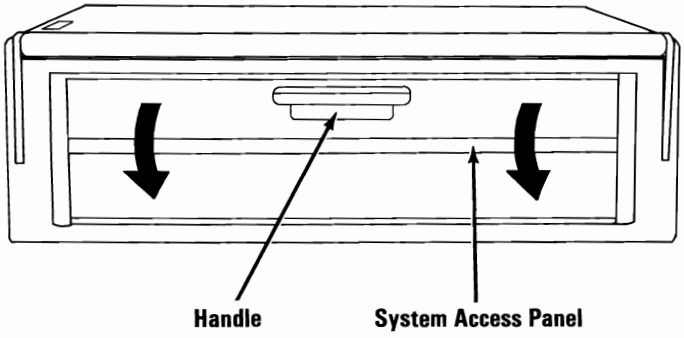
1 Remove the keyboard, system unit, and power cord from the shipping cartons.

2 Place your system unit in the position shown.

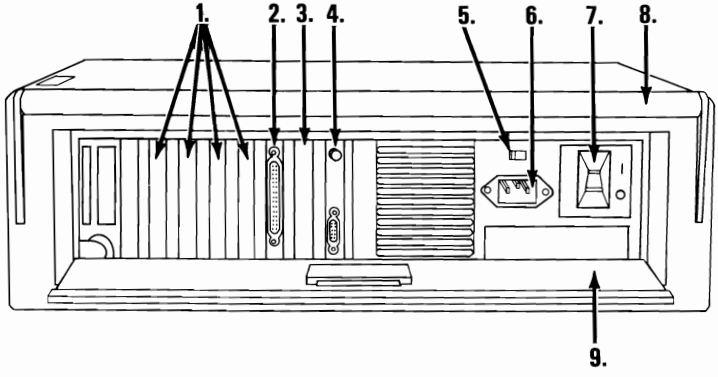


Rear View

3 Open the system access panels by pulling the handle in the center of the top panel as shown below. Lower the hinged panels.



4 Look at the figure below and become familiar with the features at the rear of the system unit.

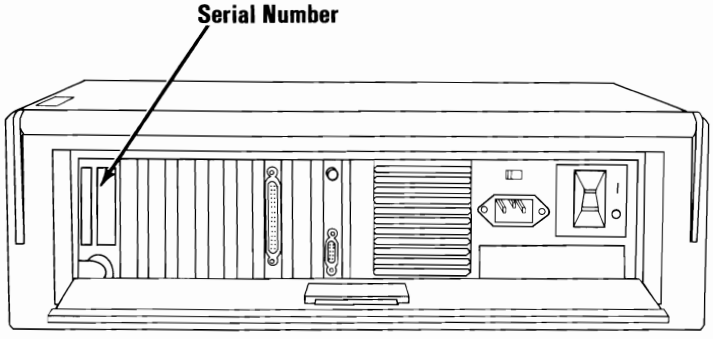


1. Expansion slots 4, 5, 6 and 7; space for additional options
2. Diskette Drive Adapter
3. Expansion slot 2, space for an additional option
4. Color/Graphics Monitor Adapter
5. Input-voltage selector switch
6. Power cord connector
7. Power switch
8. Carrying handle
9. System access panels

5 In the space below record the serial number that is on the serial number plate on your IBM Portable Personal Computer.

Serial Number

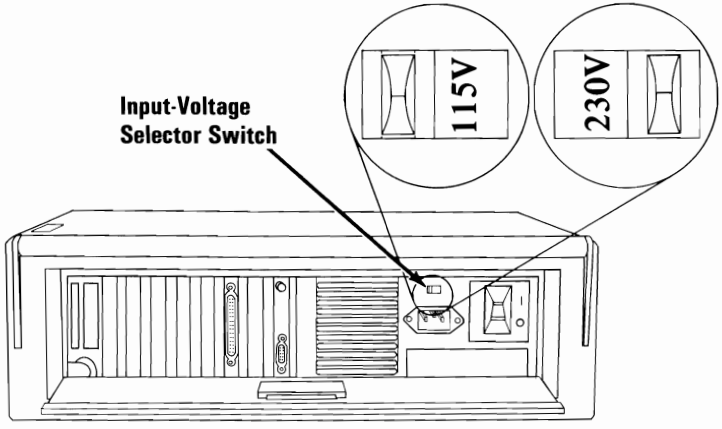
_____



6 Set the input-voltage selector switch to match your power source (115 or 230 Vac).

Warning: Damage to your system unit can result if this switch is set incorrectly.

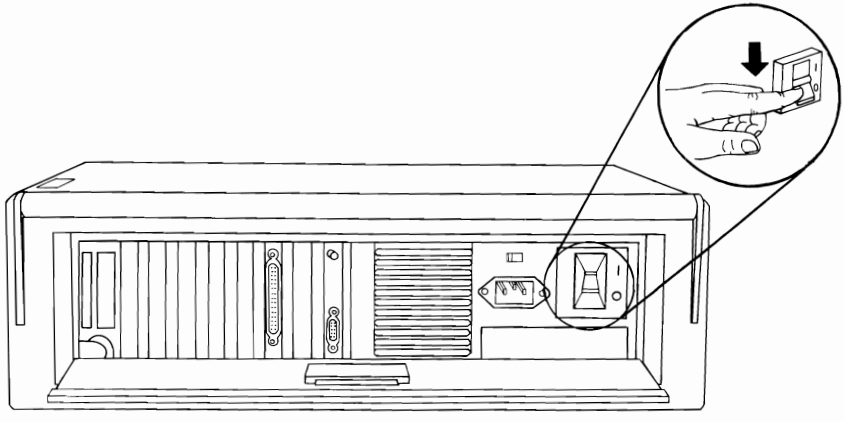
Note: The proper setting for the United States and Canada is 115 Vac.



7 Set the Power switch on the system unit to Off.

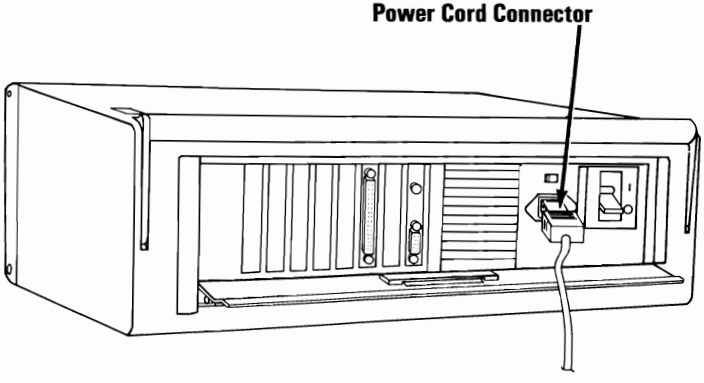
| This is the International symbol for On.

O This is the International symbol for Off.

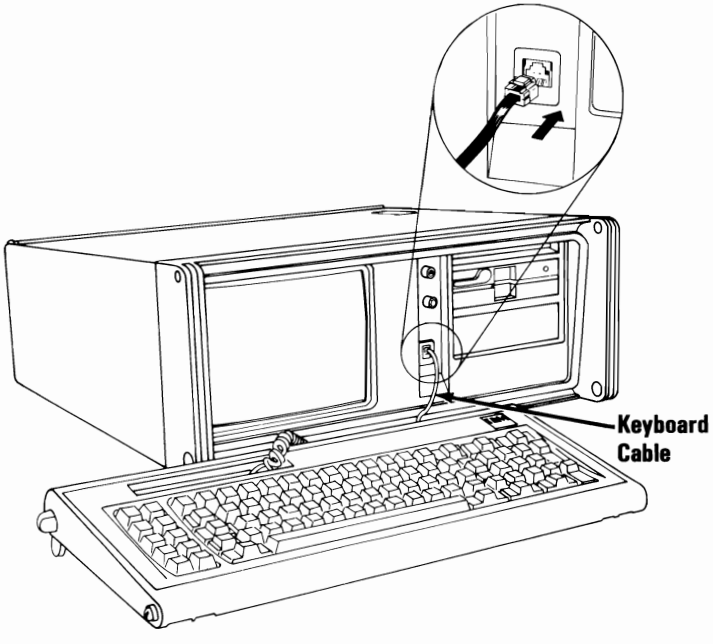


8 Connect the power cord to the system unit.

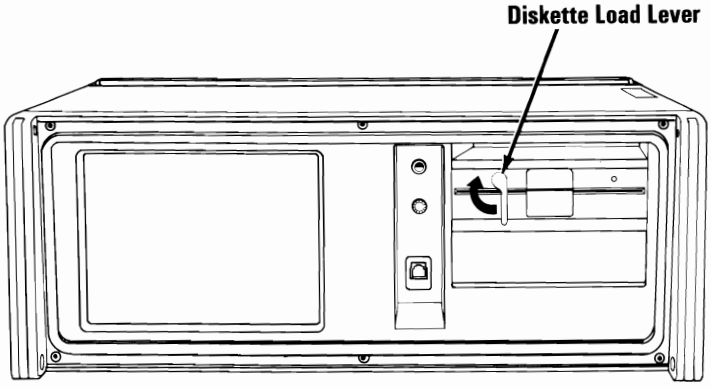
Note: Make sure your cover handle is in the closed position as shown below.



9 Place your system unit so the front faces you. Connect the keyboard cable to its connector, as shown.

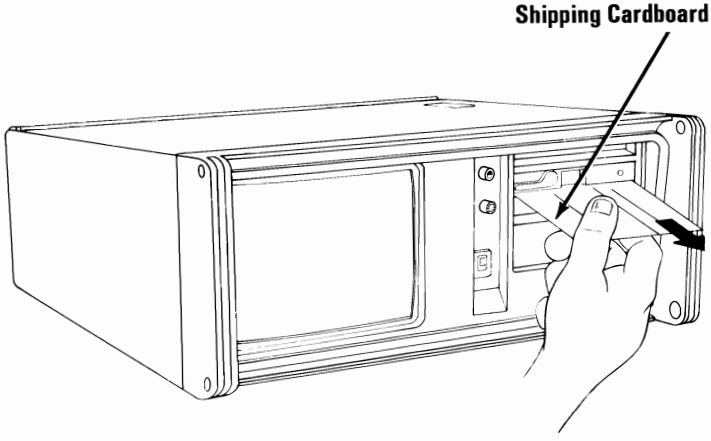


10 Rotate the diskette load lever clockwise.



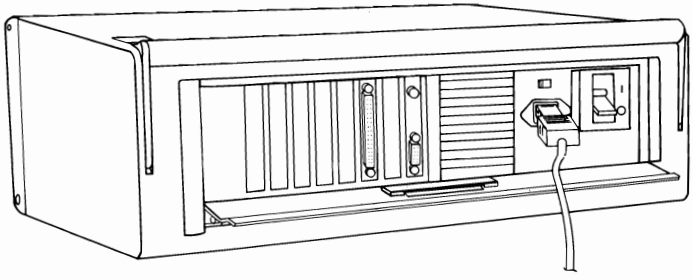
11 Remove the shipping cardboard. If you have two diskette drives installed in your system unit remove the shipping cardboard from both drives.

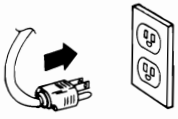
Warning: The diskette load lever should not be rotated counterclockwise unless a diskette or the shipping cardboard is inserted into the drive.



12 Plug the power cord into the wall outlet.

CAUTION
This product is equipped with a line cord and plug designed for the user's safety. It is to be used with a properly grounded receptacle to avoid possible electrical shock.



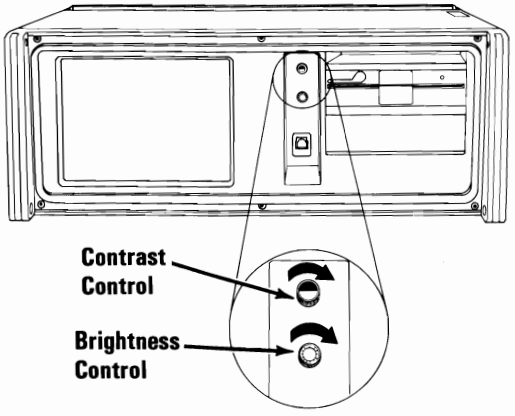


Continue with "Power-On Self Test" on the next page.

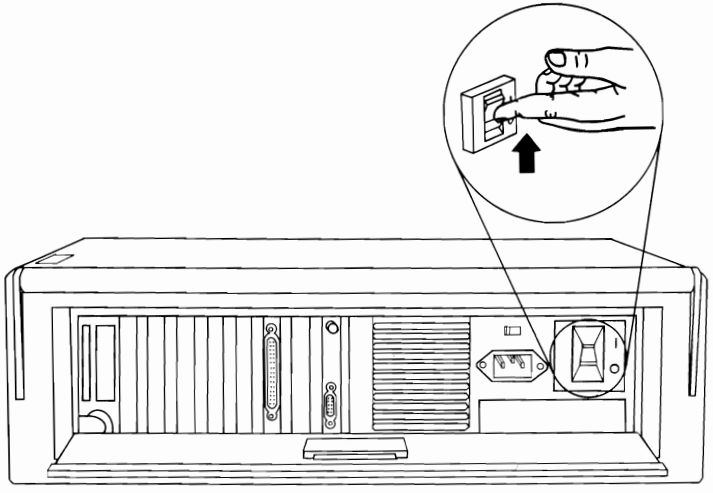
Power-On Self Test (POST)

The power-on self test (POST) will run after you set the Power switch on the system unit to On. The POST will take 23 to 90 seconds, depending on the amount of memory installed in your system.

1 Turn the display's Contrast and Brightness controls fully clockwise. After the first screen is displayed adjust the controls for eye comfort.



2 Set the Power switch on the system unit to On.



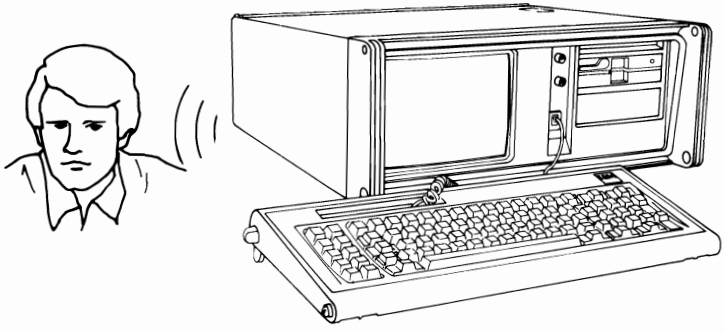
There are normally three responses:

A An indication of the memory test will appear in the upper-left corner of your screen. The number should continue to increase until it equals the amount of memory installed in your system.

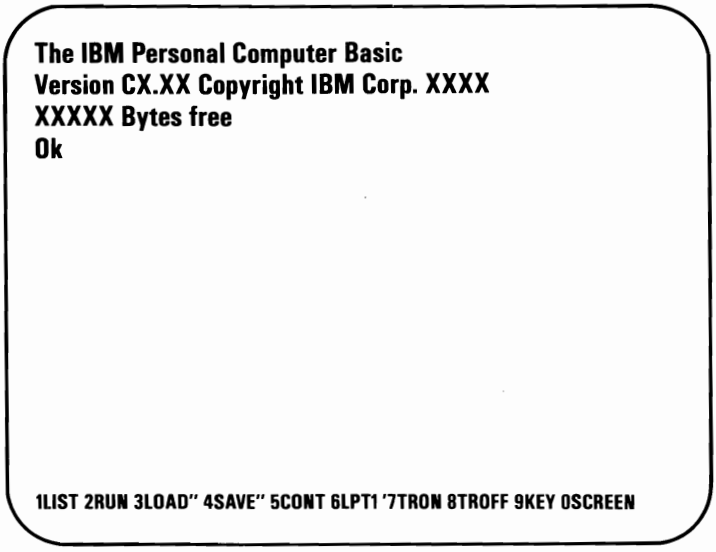
Note: The Xs will equal the amount of memory installed.

```
XXX  KB  OK
```

B One short beep should be heard.



C The IBM Personal Computer BASIC message will appear with a blinking cursor (if a diskette is not loaded).



If you received responses **A**, **B**, and **C** correctly your IBM Portable Personal Computer has successfully completed a POST.

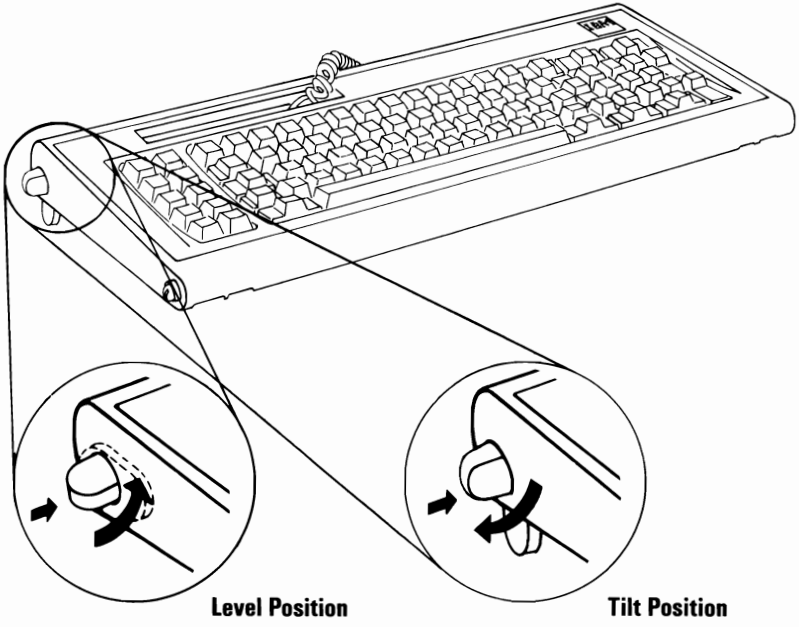
If the responses are not correct, go to Section 2, "Problem Determination Procedures."

Keyboard Adjustment

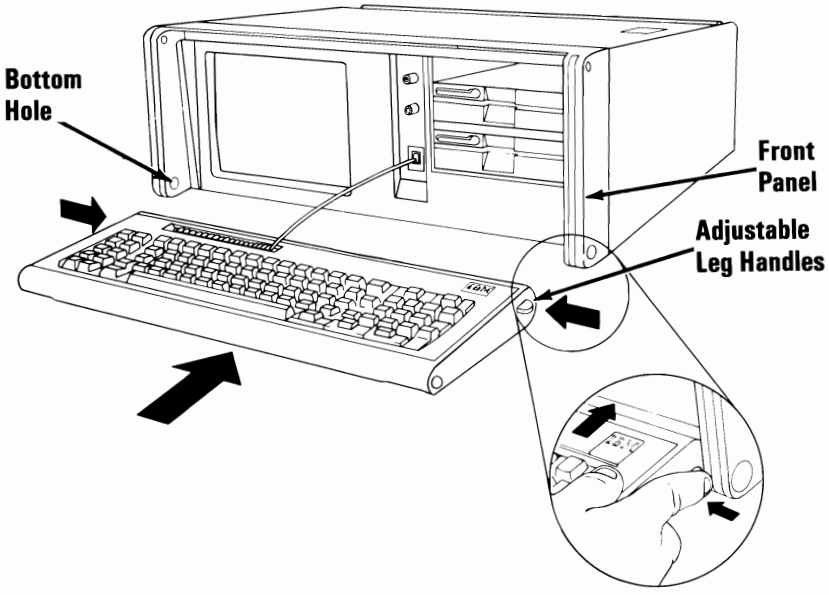
The keyboard can be used either attached to or separated from the front panel.

The keyboard has a tilt position for typing comfort when it is detached from the front panel. Hold the keyboard while changing positions.

Firmly push in the adjustable leg handles and turn them to the desired position.



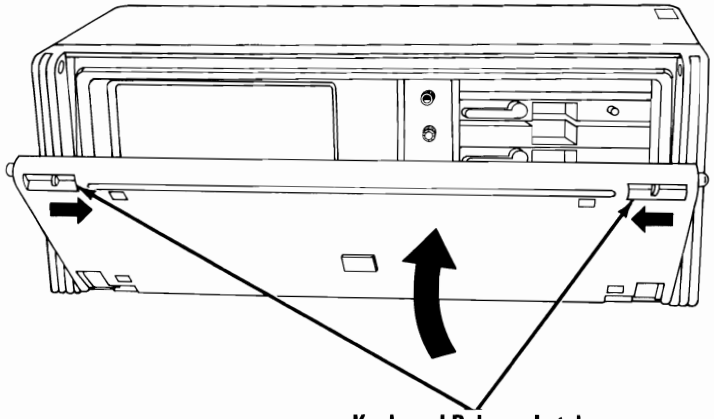
To attach the keyboard to the front panel press the adjustable leg handles in and slide them into the bottom holes on the system unit's front panel.



When the keyboard is attached to the front panel it may be placed in the stored position.

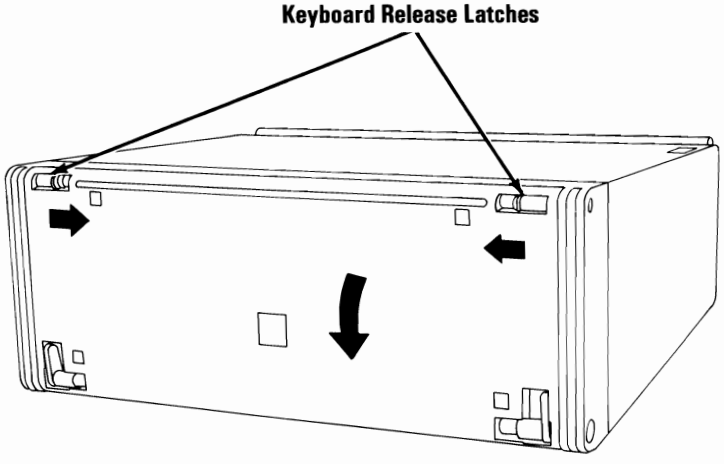
Pivot the keyboard up. Press the two keyboard release latches toward the center of the system unit while pushing the keyboard against the front panel. Release the latches.

When carrying the IBM Portable Personal Computer the keyboard should be in this position. For more information on carrying your system unit go to Section 5, "Moving Your IBM Portable Personal Computer."

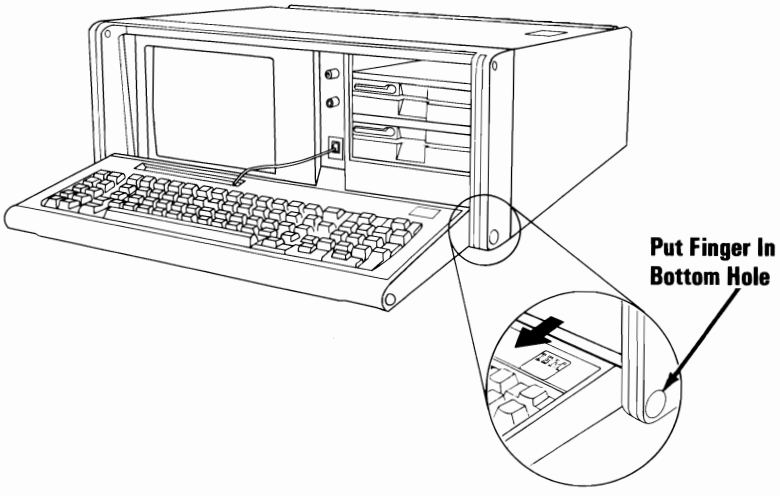


Keyboard Release Latches

To lower the keyboard down to the operating position, press the two keyboard release latches toward the center of the system and lower the keyboard. Release the latches.

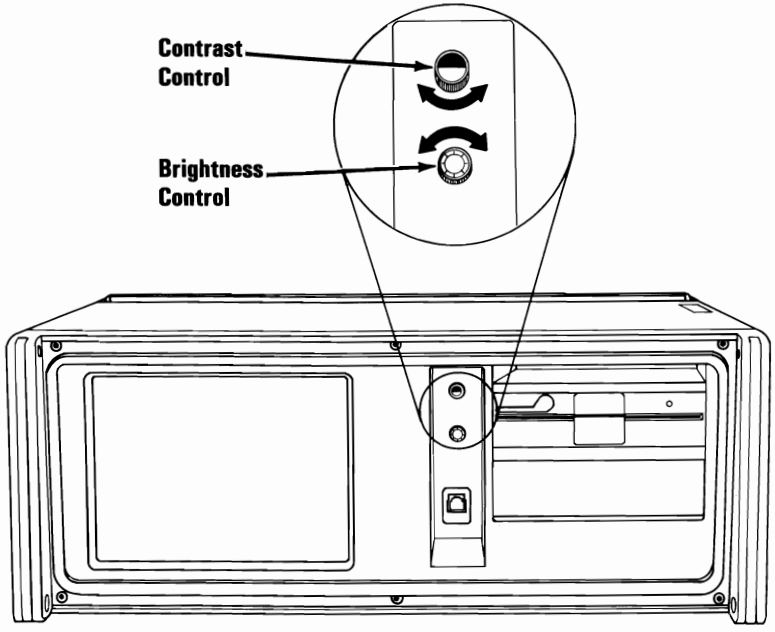


To separate the keyboard from the front panel, push in on the adjustable leg handles by putting a finger in each of the front panel's bottom holes. Pull the keyboard away from the front panel.



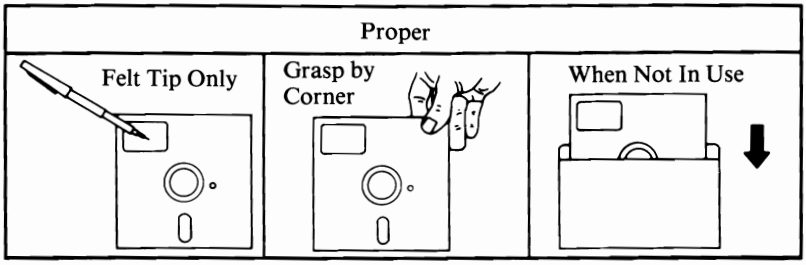
Display Controls

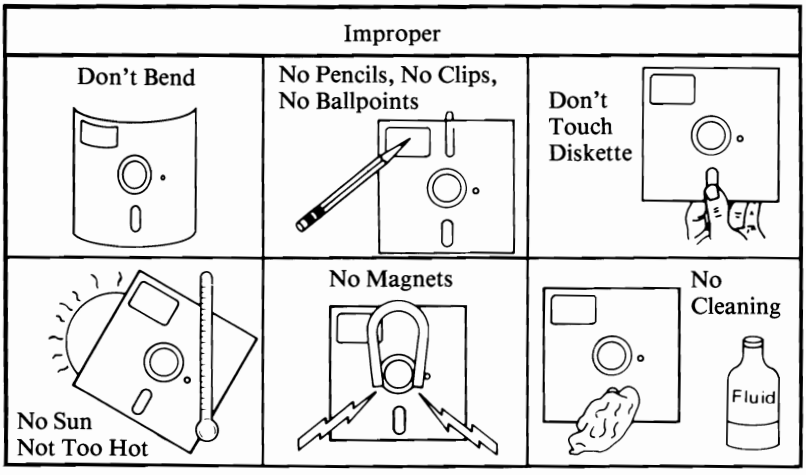
Adjust the Contrast and Brightness controls for eye comfort.



Handling Diskettes

The figures below show proper and improper ways of handling your diskettes. Proper handling will greatly reduce the possibility of damaging them.

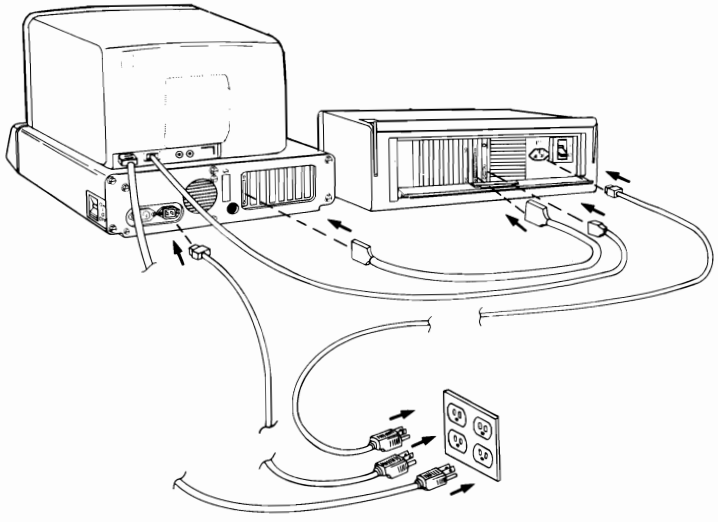




If you have any options to install, install them at this time. Remove and read the Option Instructions that came in the carton with your option. If your options have already been installed and require any cabling continue with "System Cabling."

System Cabling

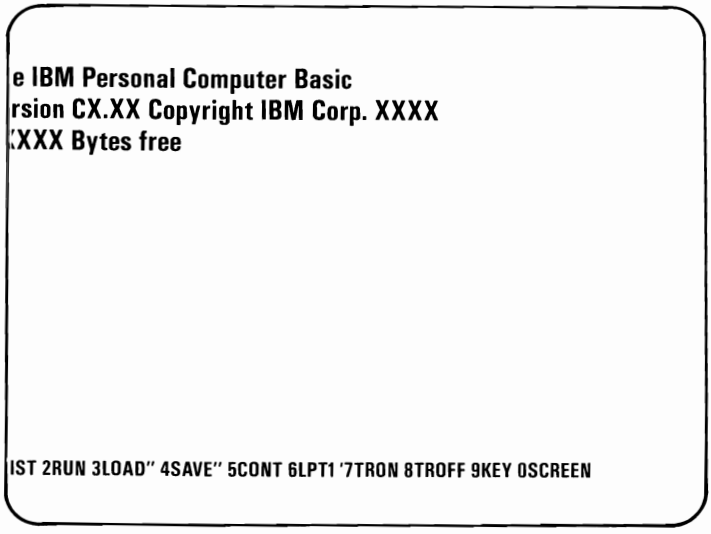
When you have installed your options, connect your cables and power cords to the system unit as shown in the following figure.



CAUTION
Connect power cords to properly grounded receptacles.

Note: If you are using your television or a non-IBM display, you could experience data errors when you operate your diskette drive. This interference can easily be corrected by moving your television or display a minimum of 30-cm (12-in.) away from your IBM Portable Personal Computer.

If you are using a television or color display with your IBM Portable Personal Computer, and its screen is similar to the one below, screen alignment is required. The procedures are explained in Section 2, "Problem Determination Procedures." For now, continue with "Summary".



Summary

You have now installed your IBM Portable Personal Computer, and learned how to perform the POST and recognize the responses that occur during a successful POST. You learned the proper way of handling diskettes to protect them from damage. Now you are ready to run your system through a complete diagnostic test procedure. You should perform a complete system checkout whenever you cable your system or install an option. Go to Section 2, "Problem Determination Procedures," and continue with its "Introduction."

For further information on how to operate your IBM Portable Personal Computer go to Section 3, "Operating Your IBM Portable Personal Computer."

Section 2. Problem Determination Procedures

Introduction

The Problem Determination Procedures help you solve operational or system failures. These procedures will also perform a complete system checkout. By following the step-by-step instructions and answering yes or no to the questions asked, you will be able to determine which unit of your system has a problem.

As part of your problem determination, you may have to load the Diagnostics diskette (the diskette is at the back of this manual). The Diagnostics diskette has a series of tests to help you find your problem in any of the five units of your system. These five units are the system unit, expansion unit, keyboard, display, and printer.

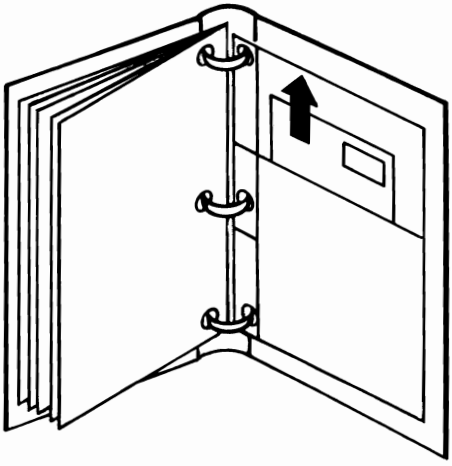
The Diagnostic diskette is programmed to test only the system and its installed options. These tests are performed in sequential order. As each test is successfully completed, the next test will be performed.

If you use the diskette in the back of this manual with a non-U.S. English keyboard, use a U.S. English keyboard template.

For a screen alignment problem, start on the following page. To perform a complete system checkout for any other problem, start with "Checking Electrical Connections" on page Start 20-1.

Screen Alignment Procedure

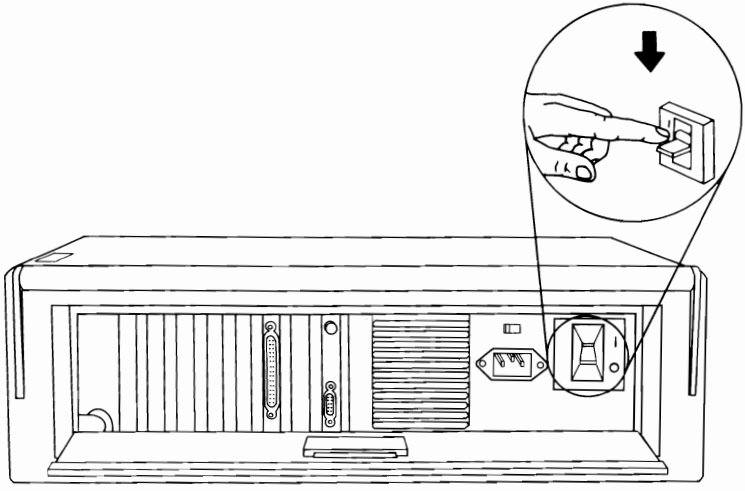
1 Remove the Diagnostics diskette from the back of this manual.



2 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

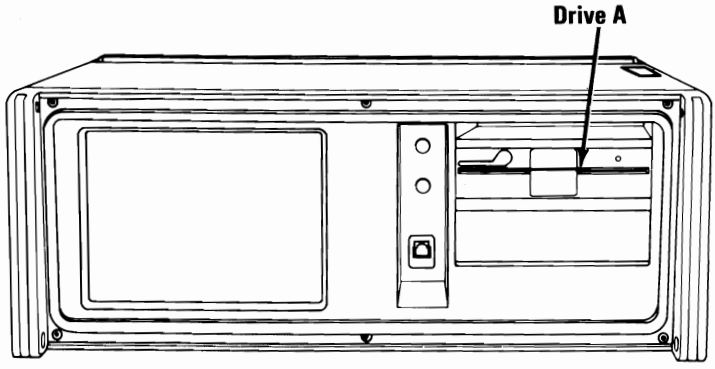
| This is the international symbol for On.

O This is the international symbol for Off.

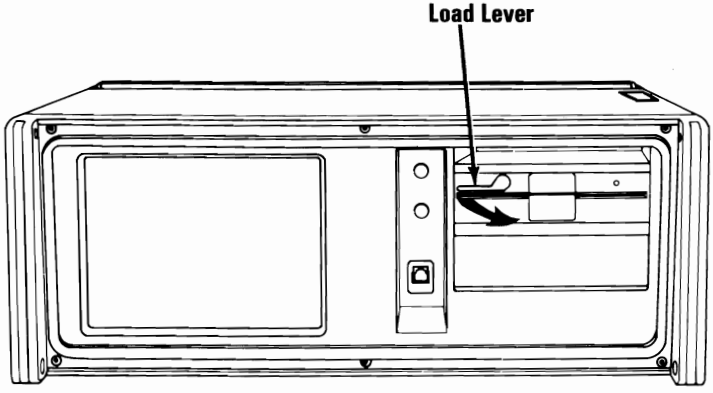


3 Set the Power switches on all external devices to Off.

4 Insert the Diagnostics diskette into drive A.



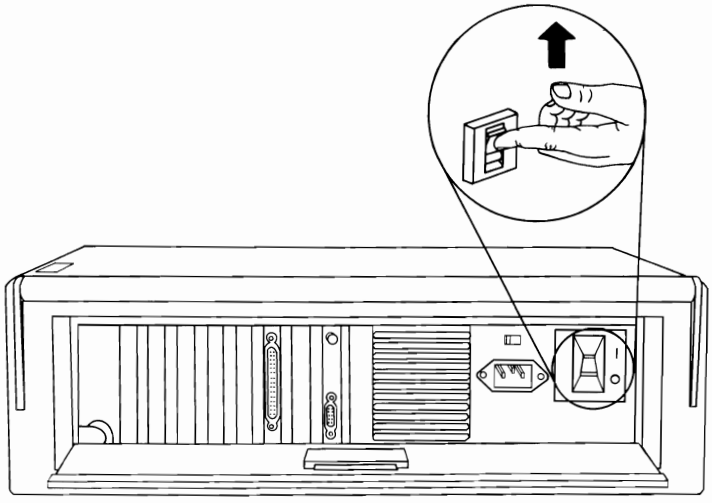
5 Rotate the load lever counterclockwise.



6 Set the Power switches on all external devices to On.

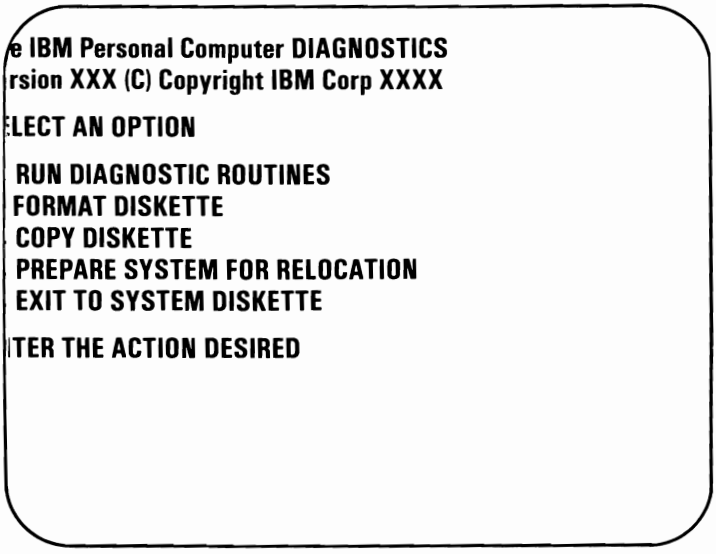
7 If an expansion unit is attached, set its Power switch to On.

8 Set the system unit's Power switch to On.



If you are using a television or a non-IBM display with your system unit, and its screen is similar to the one below, use the procedures following the figure to correct the problem.

Note: If the alignment on any IBM Display is incorrect, have it serviced.



9 Press function key F8 to move the presentation to the right or F7 to move the presentation to the left, as appropriate.

Your screen should match the one shown in the figure below. If so, remove the Diagnostics diskette and return it to the back of this manual. If not, have your television or non-IBM display serviced.

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
?
```

Go to the next page.

Notes:

Checking Electrical Connections

1 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

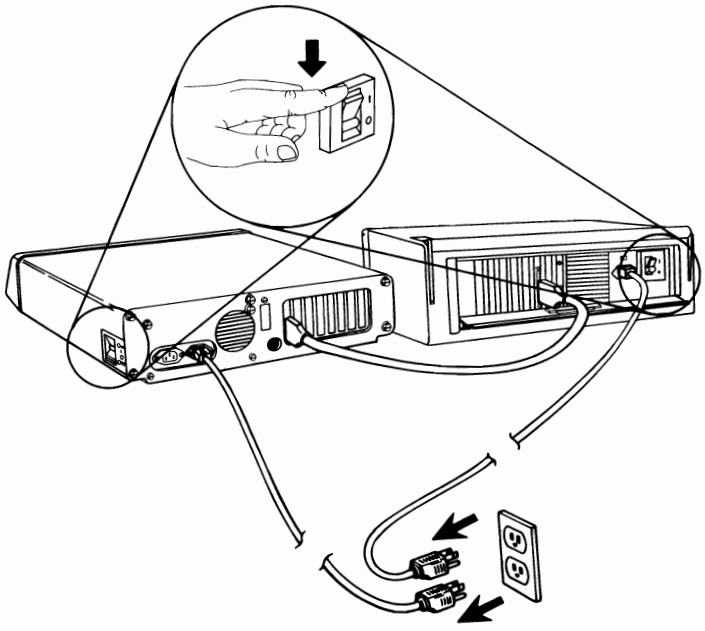
| This is the international symbol for On.

O This is the international symbol for Off.

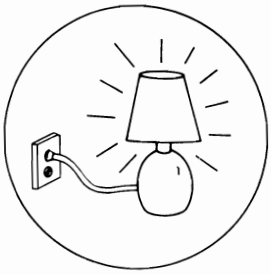
2 Set the Power switches on all external devices to Off.

3 Disconnect all non-IBM devices.

4 Unplug the system unit's (and expansion unit's) power cord from the wall outlet.



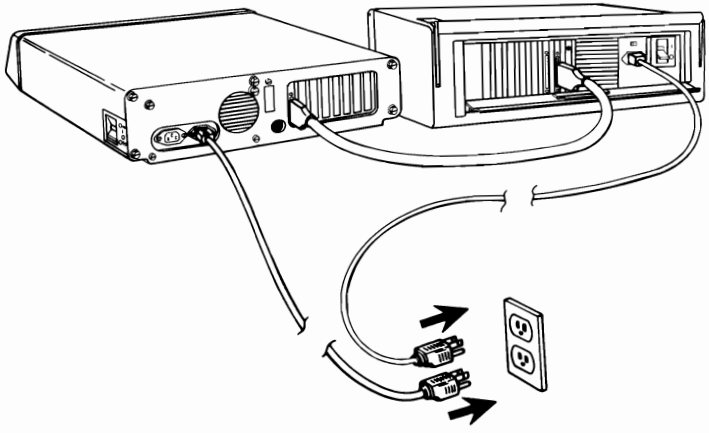
5 Check the wall outlet by plugging in a working lamp.



Outlet O.K.

6 Disconnect and connect each cable on the system unit (and expansion unit, if attached) to ensure correct electrical connection.

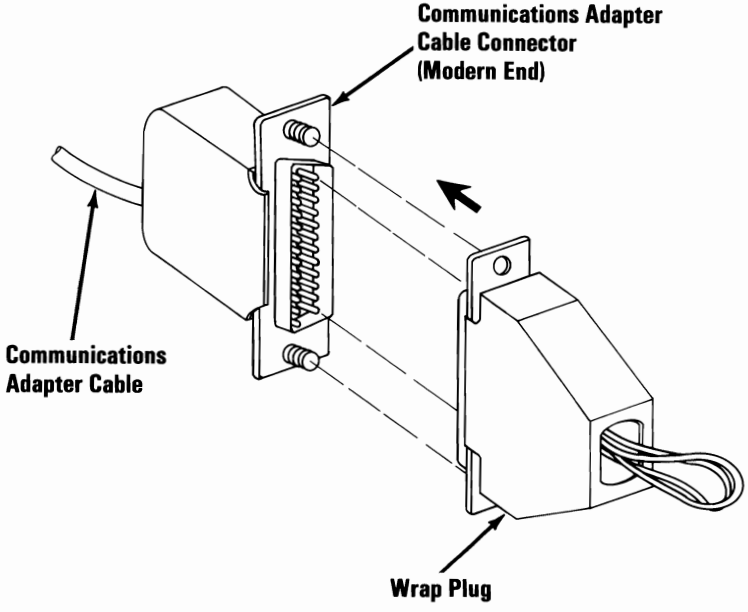
7 Plug the system unit's (and expansion unit's) power cord into the wall outlet.



Note: If you do not have an IBM Communications Adapter Cable attached to your system unit, go to the next page.

8 If you have an IBM Communications Adapter Cable, it came with a wrap plug. Disconnect the Communications Adapter Cable at the modem end (refer to the Communications Adapter Cable's "Option Installation Instructions" for the cable-removal procedure).

9 Refer to the figure below and install the wrap plug (IBM part number 8529280) on the modem end of the cable (end furthest from the system unit). Then go to the next page.

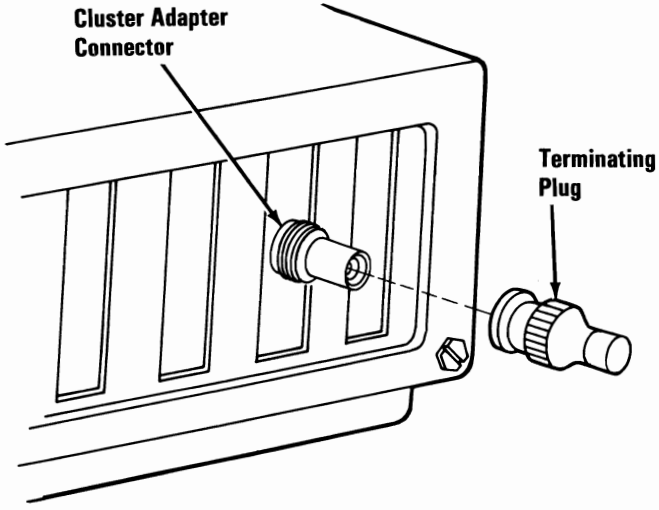


10 If you do not have a IBM Cluster Adapter, continue with "Power-On Self Test" (POST) on the following page.

11 If you have an IBM Cluster Adapter, it came with a terminating plug. Disconnect the coaxial cable at the Cluster Adapter's connector.

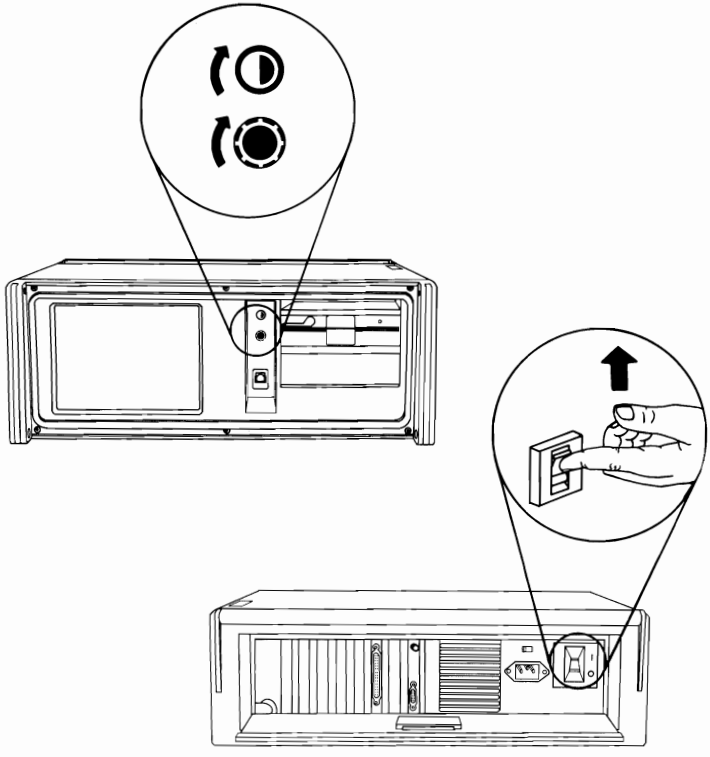
12 Refer to the figure below and install the terminating plug (IBM part number 6320352) on the Cluster Adapter's connector.

Continue with "Power-On Self Test" (POST) on the following page.



Power-On Self Test (POST)

1 Turn the Brightness and Contrast controls fully clockwise. After the first screen is displayed adjust the controls for eye comfort.



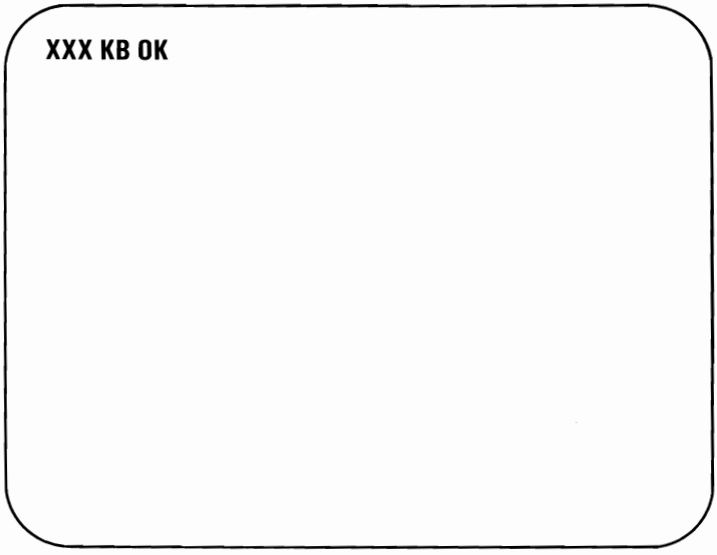
2 Set the Power switches on all external devices to On.

3 If the expansion unit is attached, set its Power switch to On.

4 Set the system unit's Power switch to On.

POST will finish in 23 to 90 seconds, depending on the amount of memory installed in your system. Normally, you will receive the following responses:

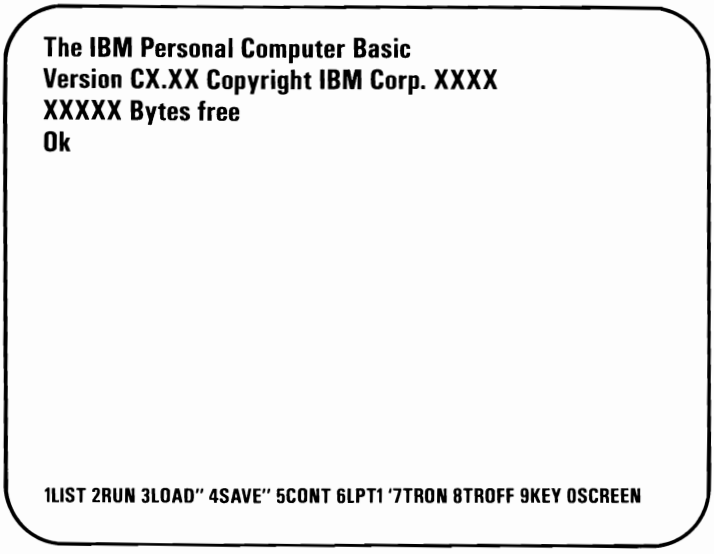
A Look in the upper left-hand corner of the screen during POST.



A number appears in the upper-left corner of your screen. The number should continue to increase until it equals the amount of memory installed in your system.

B One short beep will be heard when the test finishes successfully.

C The "IBM Personal Computer BASIC" message will appear. (If, at the end of POST, a program or an operating system from a fixed disk drive or diskette is automatically loaded, the first screen presentation from the program or operating system will appear).



Did **A**, **B**, and **C** occur?

YES - Go to "Diskette Format Procedure" on page Start 40-1.

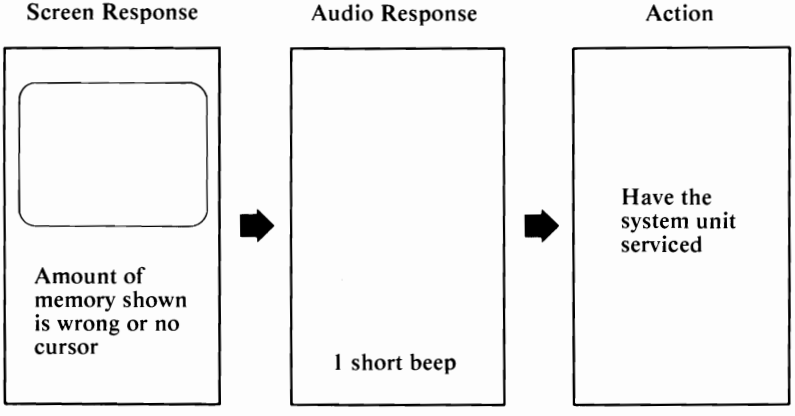
NO - Go to "POST Errors" on the next page.

POST Errors

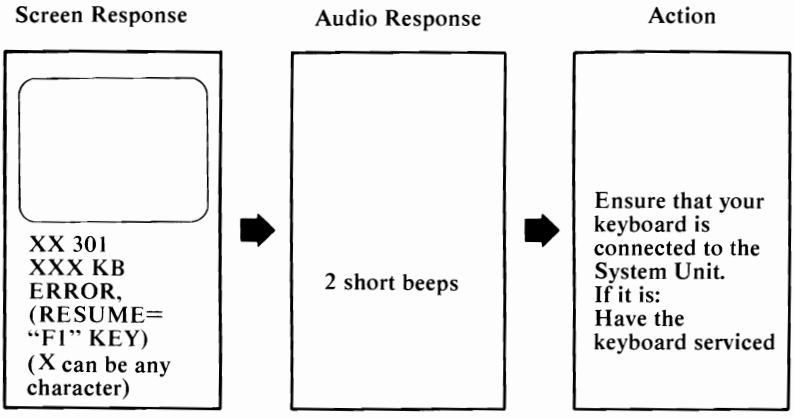
Find your screen and audio responses in the following examples, then follow the instructions in the box marked "Action."

> **Warning:** If the instructions are to have a unit serviced, and that unit has a fixed disk drive, we recommend that you back up all disk files onto diskettes. Normal shipping and handling can result in permanent loss of data on your fixed disk drives. Refer to the IBM *DOS* manual for a description of the Backup command.

Example 1

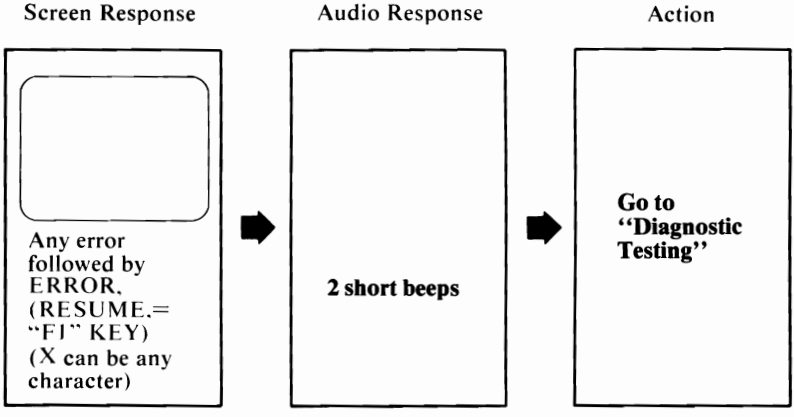


Example 2

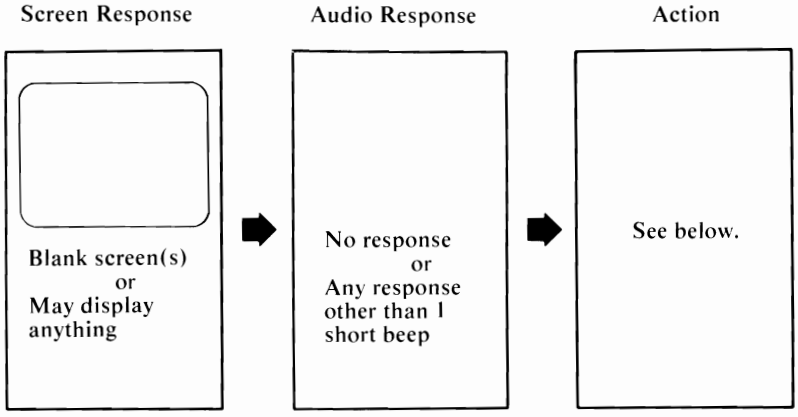


Note: Ensure the keyboard is connected correctly and check for any objects or foreign material on the keyboard. If after having the keyboard serviced, error 301 still appears, have the system unit serviced.

Example 3



Example 4



Note: Ensure that your input-voltage selector switch on your system unit is set correctly.

Do you have an expansion unit attached?

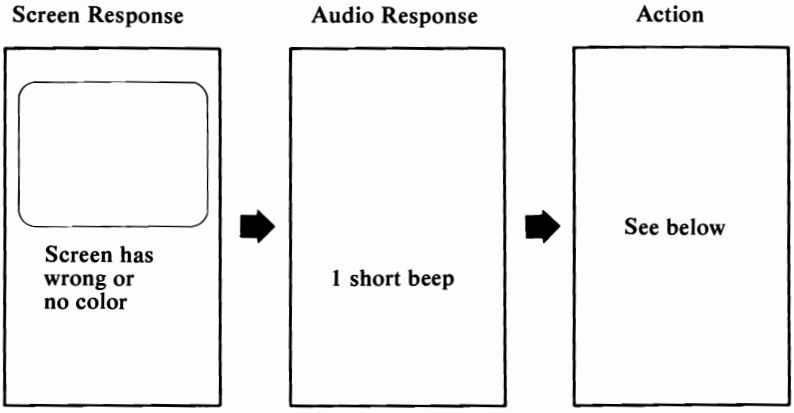
NO - Have the system unit serviced.

YES - Perform the following:

1. Set the Power switches on the system unit and expansion unit to Off.
2. Set the Power switches on all external devices to Off.
3. Disconnect the expansion-unit cable from the system unit.
4. Set the Power switch on the system unit to On.

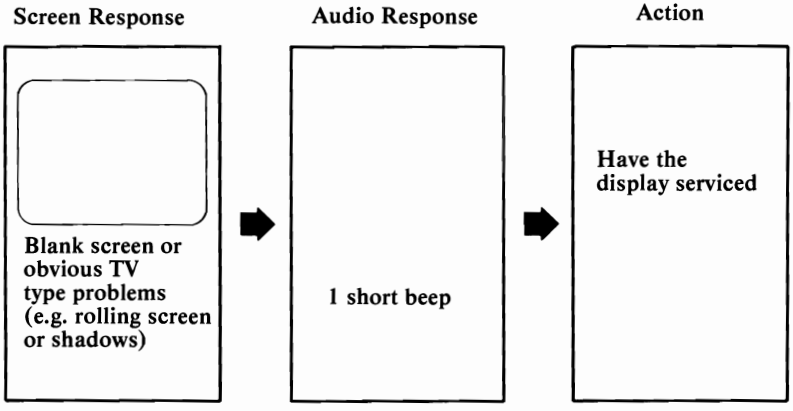
If the error is the same, have the system unit serviced. If the error changes, have the expansion unit and its cable serviced.

Example 5 (Color Display Only)



If you are using a TV as your display, verify that the color is correct by disconnecting your TV from the unit. Operate your TV normally to verify color quality. Also ensure your TV is compatible with U.S. Television Broadcast Standard. If you have an IBM Color Display, go to Test 9000.

Example 6

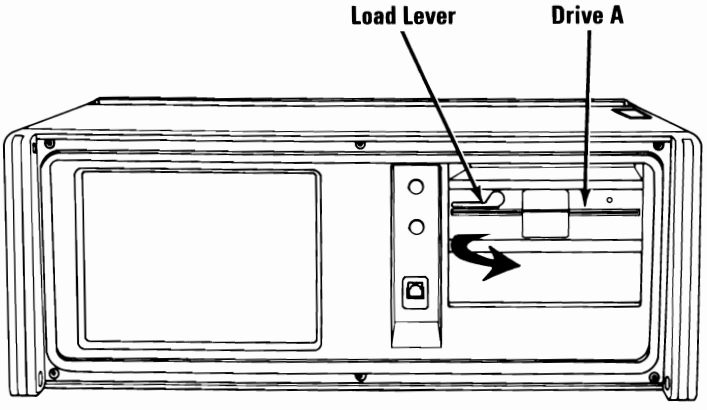


If you have an IBM Color Display, go to Test 9000.

3 Set the Power switches on all external devices to Off.

4 Insert the Diagnostics diskette into drive A.

5 Rotate the load lever counterclockwise.

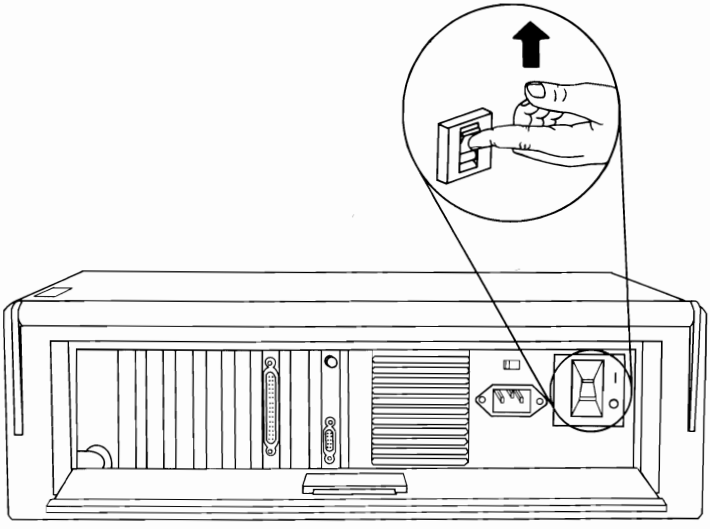


If you are having any problem inserting your diskette into the diskette drive, refer to Section 3, "Operating your IBM Portable Personal Computer" in this manual for more information.

6 Set the Power switches on all external devices to On.

7 If an expansion unit is attached, set its Power switch to On.

8 Set the Power switch on the system unit to On.



9 Did the following appear on your screen? (X can be any character)

```
XXX  KB  OK
XXXX
ERROR. (RESUME = "F1" KEY)
```

YES - Press [F1], then go to the next step.

NO - Go to the next step.

10 Did the following appear on your screen?

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
?
```

YES - Go to the next step.

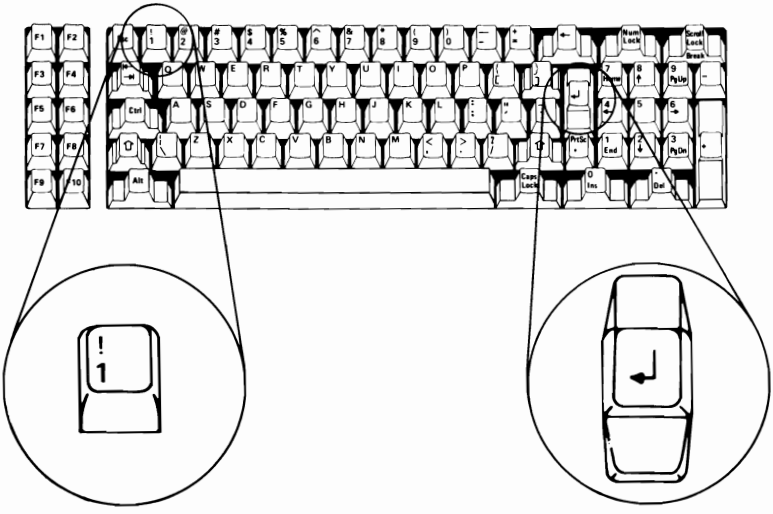
NO - Remove the diskette and verify that it:

- Is the Diagnostics diskette.
- Was inserted correctly.

If the Diagnostics diskette was inserted correctly, have the system unit serviced.

11 Press to select **FORMAT DISKETTE,**

then .



Go to the next step.

12 Did the following appear on your screen?

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? 1

WHICH DRIVE CONTAINS DISKETTE
TO BE FORMATTED?
```

YES - Press then and go to the next step.

NO - Have your system unit serviced.

13 Did the following appear on your screen?

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? 1
WHICH DRIVE CONTAINS DISKETTE
TO BE FORMATTED? A
INSERT DISKETTE TO BE FORMATTED
IN DRIVE A:
PRESS ENTER WHEN READY
```

YES - Remove the Diagnostics diskette from drive A, insert a blank diskette, and go to the next step.

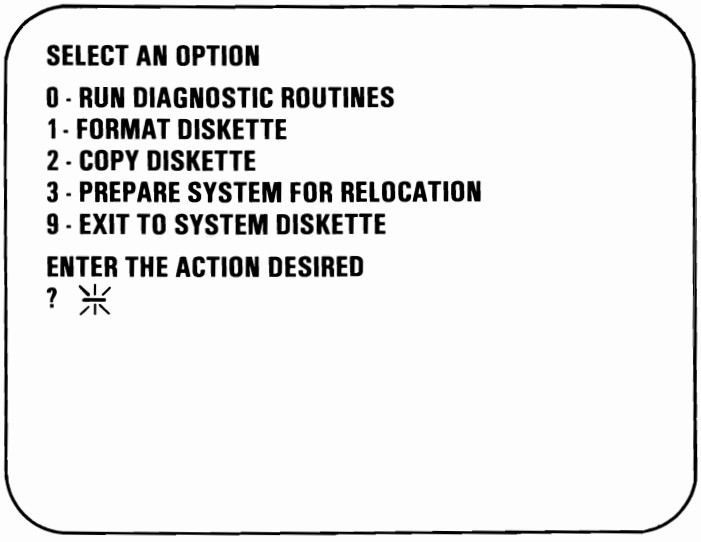
NO - Have your system unit serviced.

14 Rotate the load lever counterclockwise and press .

The blank diskette will be formatted. When the In-Use light goes out, remove the formatted (scratch) diskette.

Go to the next step.

15 Did the following appear on your screen after the diskette was formatted?



YES - Continue with "Diagnostic Testing" on page Test 000-1.

NO - Return to Step 10. Try another blank diskette. Be sure the diskette is inserted correctly. If the problem still exists, have the system unit serviced.

Notes:

Diagnostic Testing

During the diagnostic tests that follow, you will need a scratch diskette. If you do not have a scratch diskette, go to "Diskette Format Procedure" on page Start 40-1.

During the diagnostic tests that follow, you may be asked to record an error message. This information is needed when you have your system serviced.

The following are examples of the error messages you may receive. **A message ending in 00 means the test finished successfully.**

In the following examples X can be any character.

Example 1

```
XX:XX:XX
ERROR – SYSTEM UNIT XXXX
```

Example 2

```
XX:XX:XX
ERROR – EXPANSION UNIT XXXX
```

Depending on which unit your options or devices are installed in, the error messages may read **SYSTEM UNIT** or **EXPANSION UNIT**.

Example 3

```
XXX  KB  OK
XX:XX:XX
ERROR. (RESUME = "F1" KEY)
```

Warning: If the above message is displayed on your screen, it is an indication that POST has detected an error.

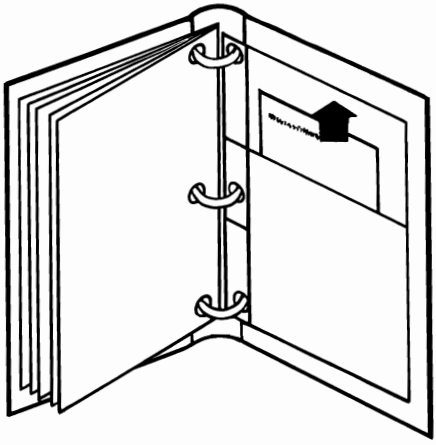
If you have an expansion unit and it is not connected to your system or the Power switch is not set to On, you will receive the above message.

Pressing the F1 key allows the system to bypass the error condition for diagnostic purposes. Your system may not function correctly unless it is serviced.

Continue with "Loading Diagnostics" on the next page.

Loading Diagnostics

1 Remove the Diagnostics diskette from the back of this manual.

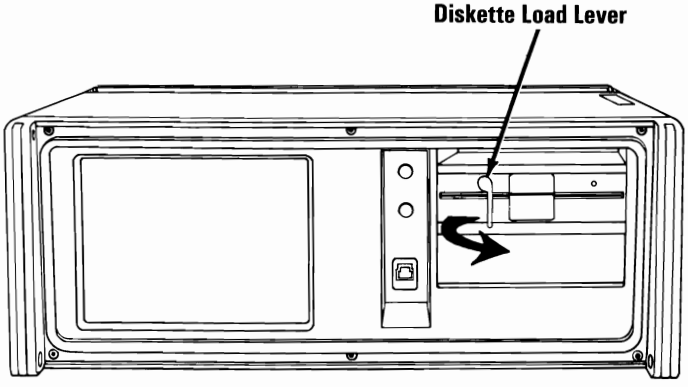


2 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

3 Set the Power switches on all external devices to Off.

4 Insert the Diagnostics diskette into drive A.

5 Rotate the load lever counterclockwise.

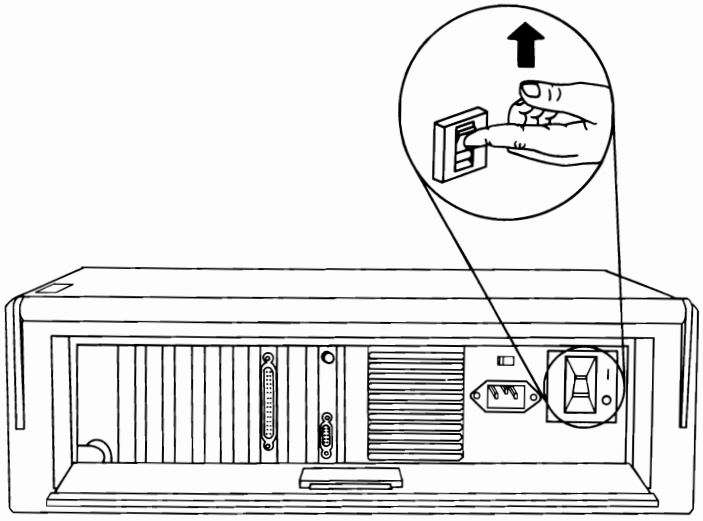


If you are having any problem inserting your diskette into the diskette drive, refer to Section 3, "Operating your IBM Portable Personal Computer" of this manual for more information.

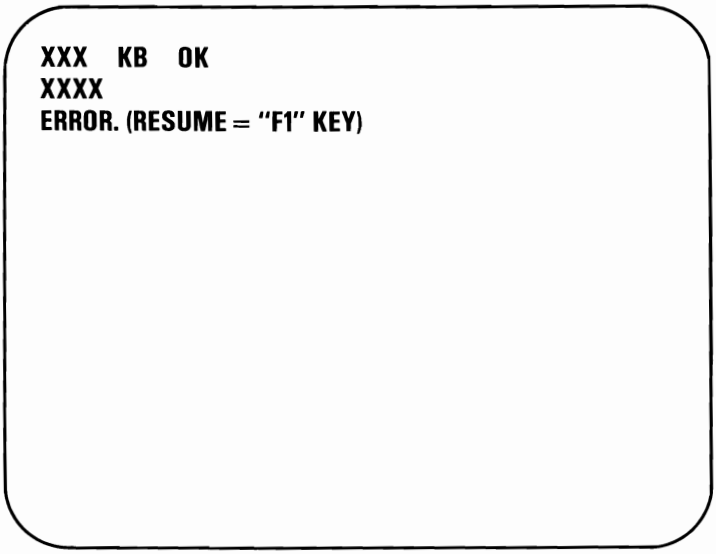
6 Set the Power switches on all external devices to On.

7 If an expansion unit is attached, set its Power switch to On.

8 Set the Power switch on the system unit to On.



9 Did the following appear on your screen?



YES - Press F1, then go to the next step.

NO - Go to the next step.

10 Did the following appear on your screen?

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
?
```

YES - Go to the next step.

NO - Remove the diskette and verify that it:

- Is the Diagnostics diskette.
- Was inserted correctly.

If the Diagnostics diskette was inserted correctly, have the system unit serviced.

> **Note:** If you are using your TV or a non-IBM display, you could experience data errors when you operate your diskette drive. This interference is easily corrected by moving your TV or display a minimum of 30 cm. (12 in.) away from your system unit.

11 Press , then to select **RUN DIAGNOSTIC ROUTINES.**

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
?
```

Note: Depending on the configuration of your system, the screen may ask questions about attached devices. Press Y or N as required, then press .

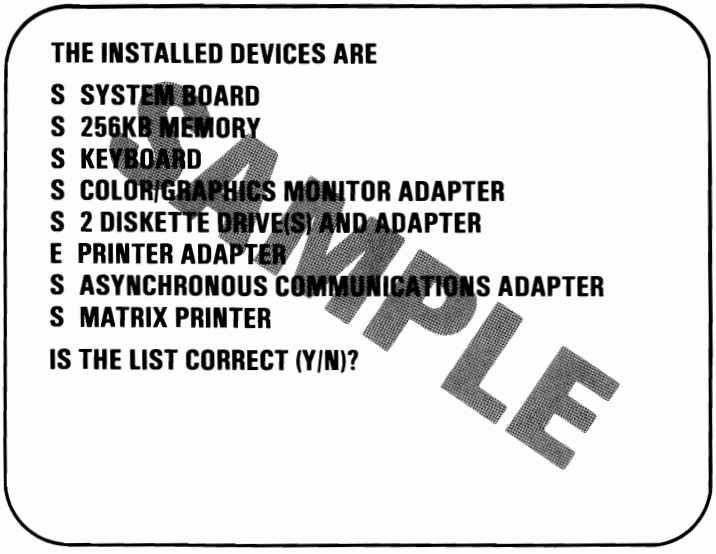
Go to the next step.

12 Complete the list of installed devices and options and show their locations with check marks. Also enter the amount of memory installed in your system. Then go to the next step.

System Unit	Expansion Unit	Installed Device/Option
		System Board
		Expansion Option
		XXX K of Memory
		Keyboard
		Color/Graphics Monitor Adapter
		X Diskette Drive(s) and Adapter

In the following sample, **S** means the device is installed in the system unit, and **E** means the expansion unit.

13 Does the screen on your display correctly list all the installed devices and options?



Note: The IBM Communications Cable and the Printer Cable will not appear in the list. The Graphics Printer will be listed as "Matrix Printer." The Game Control Adapter may not be listed if the joysticks or paddles are not connected when Power is set to On.

YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵, and record the error message. If your printer was missing, press ↵ and go to the next step. If any other devices or options were missing have the unit that contains that option serviced.

14 Press to select **RUN TESTS ONE TIME,** then .

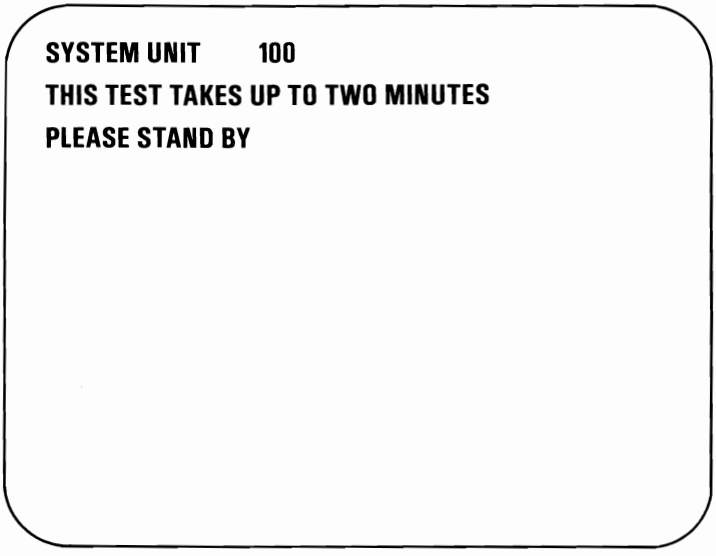
```
SYSTEM CHECKOUT
0 - RUN TESTS ONE TIME
1 - RUN TESTS MULTIPLE TIMES
2 - LOG UTILITIES
9 - EXIT DIAGNOSTIC ROUTINES
ENTER THE ACTION DESIRED
?
```

Diagnostics have successfully loaded. Continue with the tests on the following pages to perform a complete system checkout.

Notes:

Test 100

Did you receive a **SYSTEM UNIT 100** message, as shown below?



YES - Your system has completed this test successfully. Continue with the next Test.

NO - Have the system unit serviced.

Notes:

Test 200

1 Do you have an IBM Expansion Unit attached to your system?

NO - Continue with the next test, Test 300.

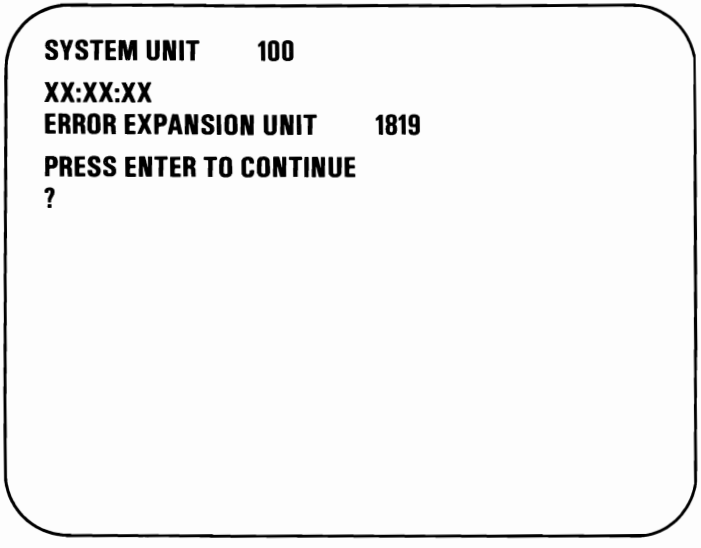
YES - Did you receive a **SYSTEM UNIT 1800** message, as shown below?

```
SYSTEM UNIT        100
EXPANSION UNIT     1800

THIS TEST TAKES UP TO TWO MINUTES
PLEASE STAND BY
```

YES - Your system has completed this test successfully. Continue with the next test, Test 300.

NO - Go to the next step.

2 Did you receive an **1819** error message, as shown below?



YES - Have the expansion unit and its cable serviced.

NO - Go to the next step.

3 Did you receive an **1820** or **1821** error message?

```
SYSTEM UNIT      100

XX:XX:XX
ERROR EXPANSION UNIT      182X

PRESS ENTER TO CONTINUE
?
```

YES - Have the expansion unit and its cable serviced.

NO - Perform the following :

1. Set the Power switches on the system unit and expansion unit to Off.
2. Set the Power switches on all external devices to Off.
3. Disconnect the expansion-unit cable from the system unit.
4. Set the Power switch on the system unit to On.
5. Go to the next step.

4 When the POST finished, did the following appear on your screen?

```
1801
XX  KB  OK
ERROR. (RESUME = "F1" KEY)
```

YES - Press and go to the next step.

NO - Go to the next step.

5 Press 0, then ↵ to select **RUN DIAGNOSTIC ROUTINES.**

```
The IBM Personal Computer DIAGNOSTICS
Version XXX (C) Copyright IBM Corp XXXX

SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? -
```

Note: Depending on the configuration of your system, the screen may ask questions about attached devices. Press Y or N as required, then press ↵.

6 Are any of the options or devices installed in your expansion unit missing from the list?

```
THE INSTALLED DEVICES ARE
S SYSTEM BOARD
S 256KB MEMORY
S KEYBOARD
S COLOR/GRAPHICS MONITOR ADAPTER
S 2 DISKETTE DRIVE(S) AND ADAPTER
E PRINTER ADAPTER
S ASYNCHRONOUS COMMUNICATIONS ADAPTER
S MATRIX PRINTER
IS THE LIST CORRECT (Y/N)?
```

SAMPLE

Note: The IBM Communications Cable and the Printer Cable will not appear in the list. The Graphics Printer will be listed as "Matrix Printer." The Game Control Adapter may not be listed if the joysticks or paddles are not connected when Power is set to On.

YES - Press then and go to the next step.

NO - Have the system unit serviced.

7 Press to select

RUN TESTS ONE TIME, then .

```
SYSTEM CHECKOUT
0 - RUN TESTS ONE TIME
1 - RUN TESTS MULTIPLE TIMES
2 - LOG UTILITIES
9 - EXIT DIAGNOSTIC ROUTINES
ENTER THE ACTION DESIRED
?
```

Did you get an **1820** error message?

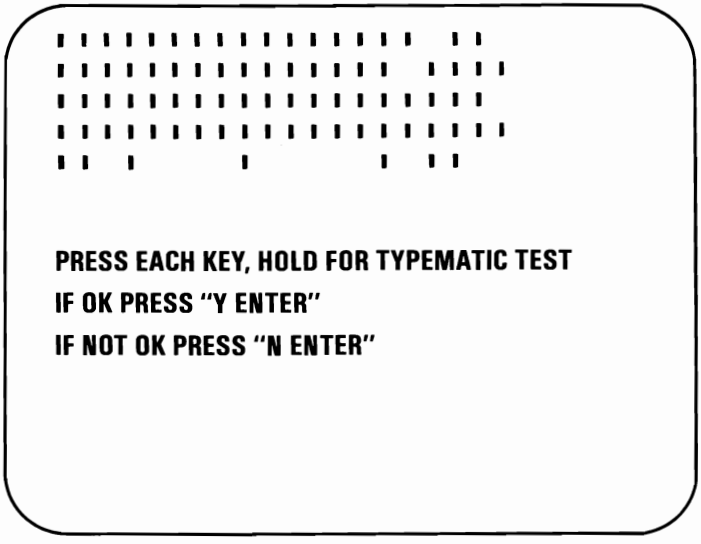
YES - Have the expansion unit and its cable serviced.

NO - Have the system unit serviced.

Notes:

Test 300

1 After approximately two minutes, did the following appear on your screen?



YES - Press each key once, then go to the next step.

NO - Press then . Record the error message. Have the system unit serviced.

2 Did the blocks change to characters as shown below?

```
1 2 ←1 2 3 4 5 6 7 8 9 0 - = ↔  N S
3 4 ↳Q W E R T Y U I O P [ ]  7 8 9 -
5 6 C A S D F G H J K L ; ' ' R 4 5 6
7 8 S \ Z X C V B N M , . / S * 1 2 3 +
9 0   A       S         C   0 .

PRESS EACH KEY HOLD FOR TYPEMATIC TEST
IF OK PRESS "Y ENTER"
IF NOT OK PRESS "N ENTER"
```

YES - Press and hold any key. The corresponding character on the screen will flash. This is the typematic test.

If the typematic test works correctly, press then and go to the next Test. If the typematic test fails, press then . Record the error message. Have the keyboard serviced.

NO - If any block did not change to a character, have the keyboard serviced.

Test 490

If you have an external display connected to your IBM Portable Personal Computer, the sample screens shown in test 500 apply to both displays. If your external display is an IBM Color Display, and if the sample screens are not the same, go to Test 9000.

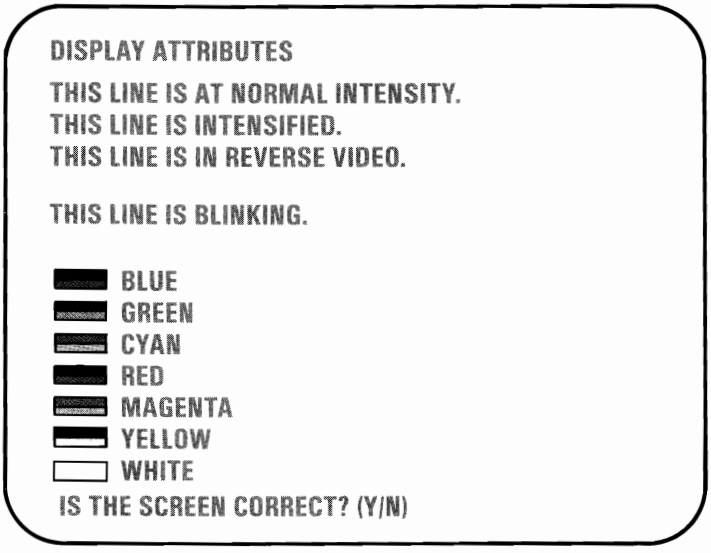
The internal display in the IBM Portable Personal Computer will not give a true representation of the colors shown in Test 500. The colors will be displayed as different shades of amber and black.

Continue with the next Test.

Notes:

Test 500

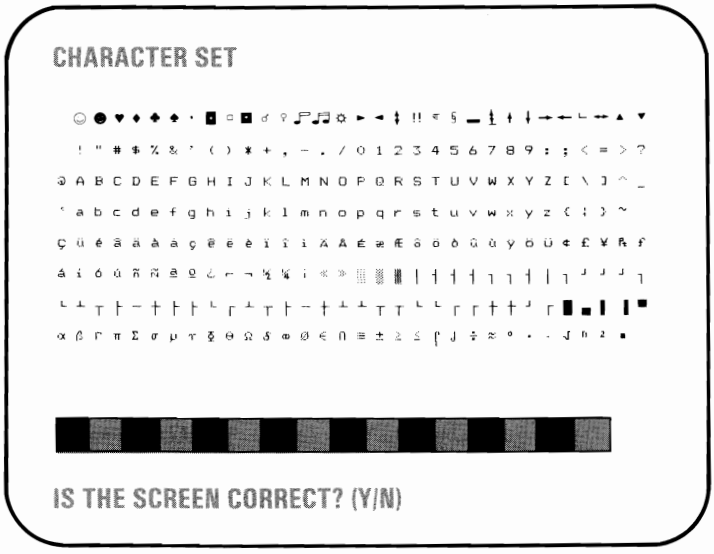
1 Did the following appear on your screen?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

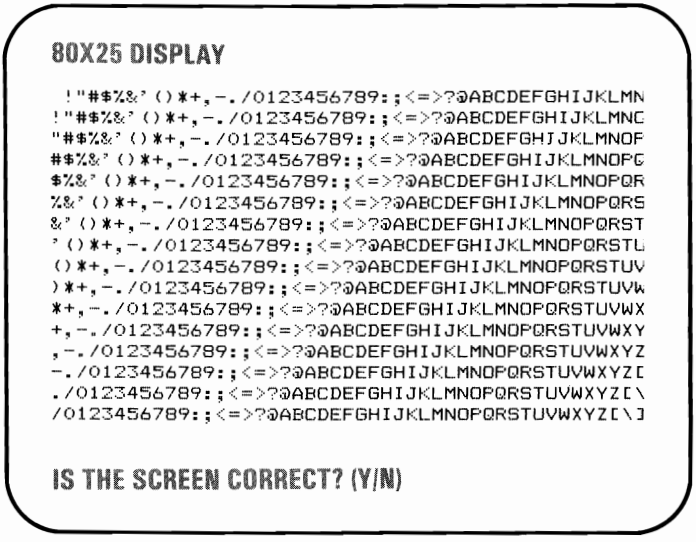
2 Did the following appear on your screen?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

3 Did the following appear on your screen?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

4 Did the following appear on your screen?

40X25 DISPLAY

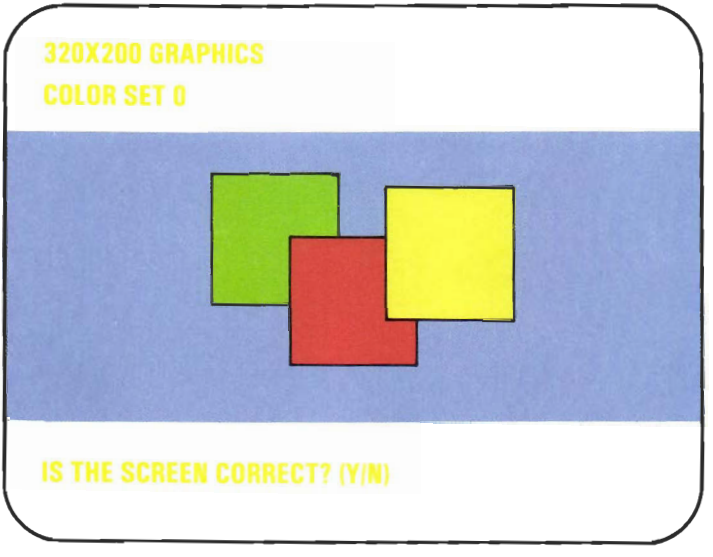
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEF
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGH
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHI
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJ
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJK
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLM
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOP
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQ
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQR
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRS
```

IS THE SCREEN CORRECT? (Y/N)

YES - Press then and go to the next step.

NO - Press then . Record the error message and have the system unit serviced.

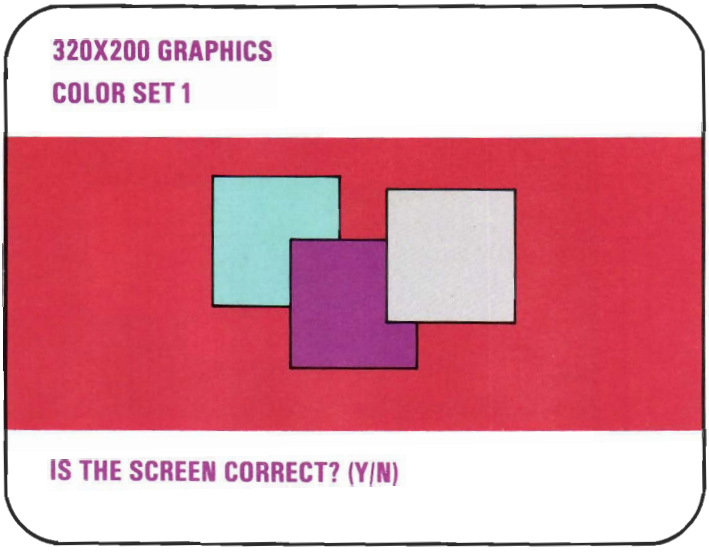
5 Did the following appear on your screen, and if you have an IBM Color Display attached are the colors correct on that display?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

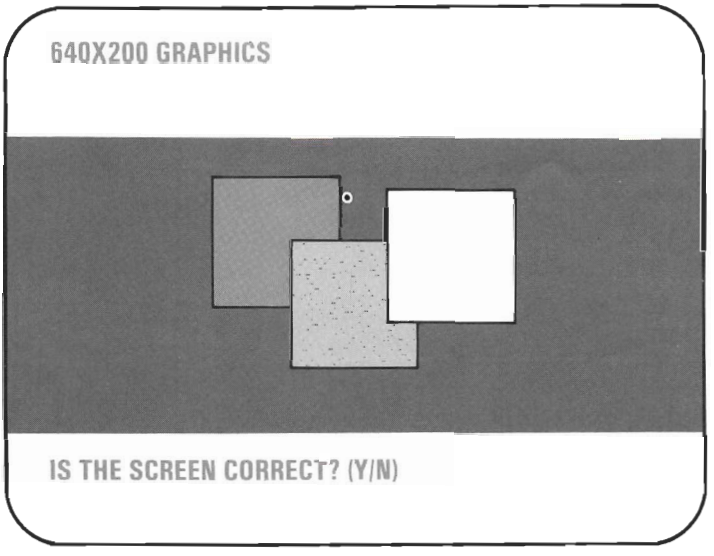
6 Did the following appear on your screen, and if you have an IBM Color Display attached are the colors correct on that display?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

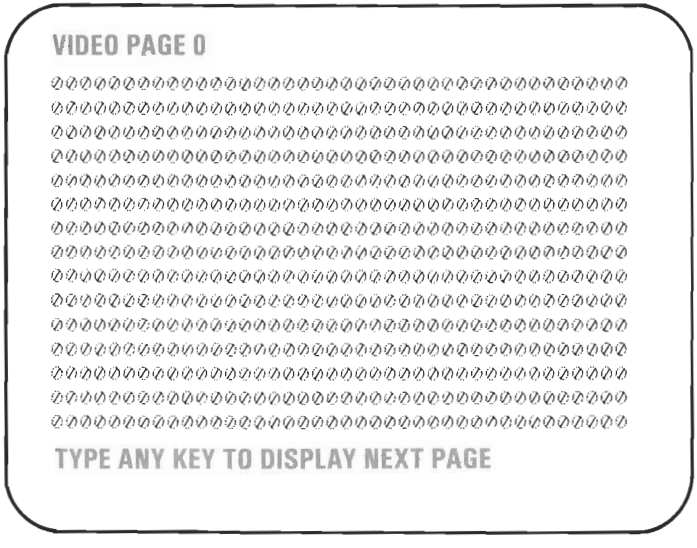
7 Did the following appear on your screen?



YES - Press Y then ↵ and go to the next step.

NO - Press N then ↵. Record the error message and have the system unit serviced.

8 Did the following appear on your screen?



YES - Go to the next step.

NO - Press then . Record the error message and have the system unit serviced.

9 There are eight video pages. Press any key; "VIDEO PAGE 1" appears. Continue to press any key until "VIDEO PAGE 0" appears.

10 Did all 8 pages appear?

VIDEO PAGE 0

WERE ALL 8 PAGES DISPLAYED? (Y/N)

YES - Press then . Your system has completed this test successfully. Continue with the next Test.

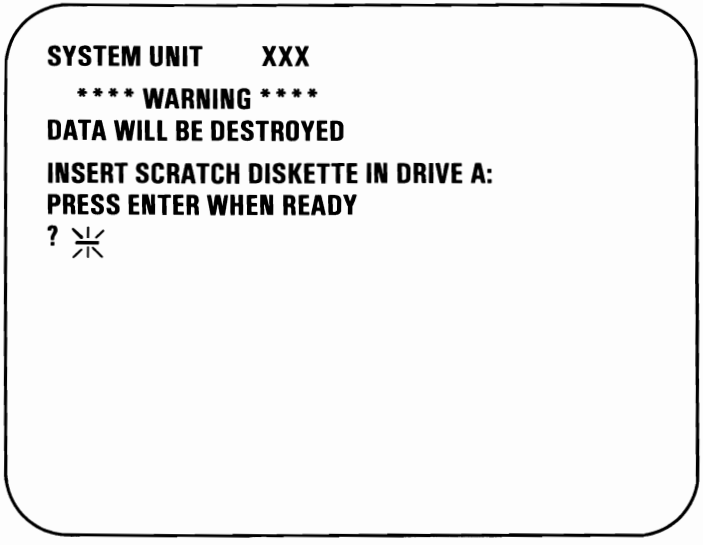
NO - Press then . Record the error message and have the system unit serviced.

Notes:

Test 600

1 Remove the Diagnostics diskette.

2 Does your screen match the one shown in the figure below?



YES - Go to the next step.

NO - Record the error message and have the system unit serviced.

3 Insert a scratch diskette in drive A and press .

4 Did the following appear on your screen and is the drive type correct?

```
DISKETTE A: IS DOUBLE SIDED
IS THE DISKETTE DRIVE TYPE
CORRECT – (Y/N)?
```

YES - Press then . If you have two diskette drives installed in your system, go to the next step. If you have only one diskette drive, your system has completed this test successfully. Continue with the next Test.

NO - Have the system unit serviced.

5 Did the following appear on your screen?

```
*** WARNING ***
DATA WILL BE DESTROYED
INSERT SCRATCH DISKETTE IN DRIVE B:
PRESS ENTER WHEN READY
?
```

YES - Remove the scratch diskette from drive A, place it in drive B, and press .

Go to the next step.

NO - Have the system unit serviced.

6 Did the following appear on your screen, and is the drive type correct?

```
DISKETTE DRIVE B: IS DOUBLE SIDED
IS THE DISKETTE DRIVE TYPE
CORRECT – (Y/N)?
```

YES - Press then . Your system has completed this test successfully. Continue with the next Test.

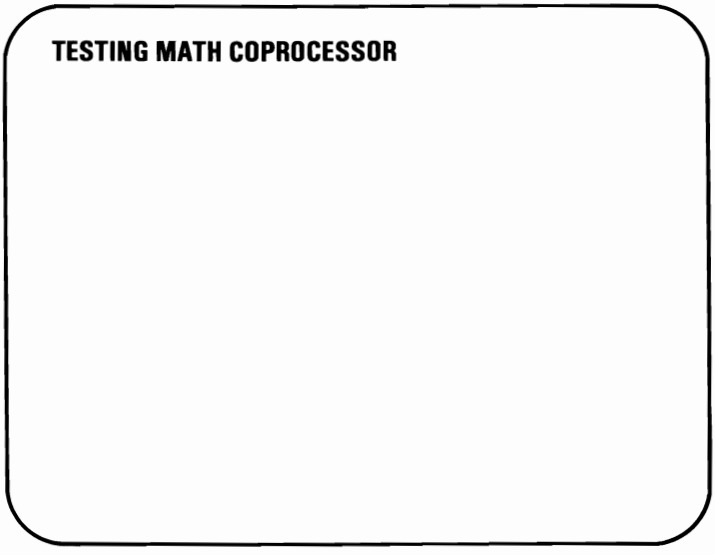
NO - Have the system unit serviced.

Test 700

1 Do you have an IBM Math Coprocessor installed in your system?

NO - Continue with the next Test.

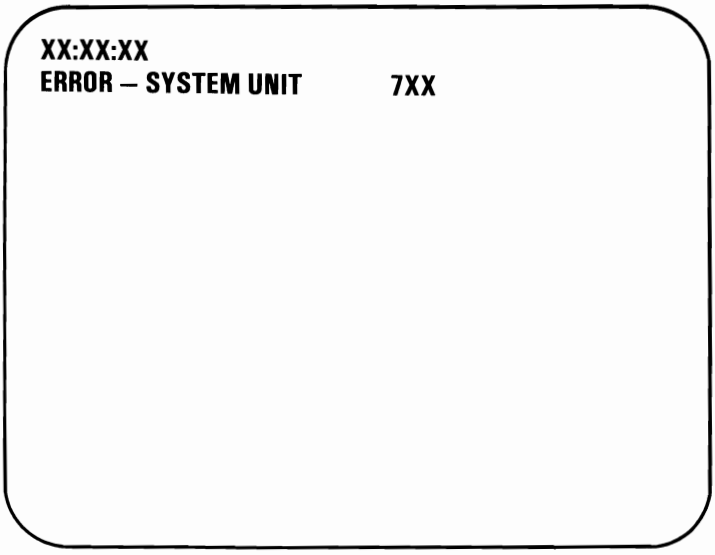
YES - Did the following appear on your screen for more than 10 seconds?



YES - Have the system unit serviced.

NO - Go to the next step.

2 Did the following appear on your screen?



YES - Have the system unit serviced.

NO - Your system has completed this test successfully. Continue with the next Test.

Test 900

Do you have an IBM Printer Adapter installed in your system?

NO - Continue with the next Test.

YES - Did either of the following error messages appear on your screen?

```
XX:XX:XX
ERROR – SYSTEM UNIT          9XX
XX:XX:XX
ERROR EXPANSION UNIT         9XX
```

YES - Have the unit that contains the adapter serviced.

NO - Your system has completed this test successfully. Continue with the next Test.

Notes:

Test 1100

Do you have an IBM Asynchronous Communications Adapter installed in your system?

NO - Continue with the next Test.

YES - Did any of the following error messages appear on your screen?

```
XX:XX:XX
ERROR – SYSTEM UNIT          11XX

XX:XX:XX
ERROR – SYSTEM UNIT          12XX

XX:XX:XX
ERROR EXPANSION UNIT         11XX

XX:XX:XX
ERROR EXPANSION UNIT         12XX
```

YES - Have the unit that contains the adapter serviced.

NO - Your system has completed this test successfully. Continue with the next Test.

Notes:

Test 1300

1 Do you have an IBM Game Control Adapter installed in your system?

NO - Continue with the next Test.

YES - Did the following appear on your screen?

```
DO YOU HAVE JOY STICKS, PADDLES,
OR NOTHING ATTACHED (J P N)?
```

YES - For joysticks press then and go to Step 2.

For paddles press then and go to Step 5.

For nothing press then and go to the next Test.

NO - Continue with the next Test.

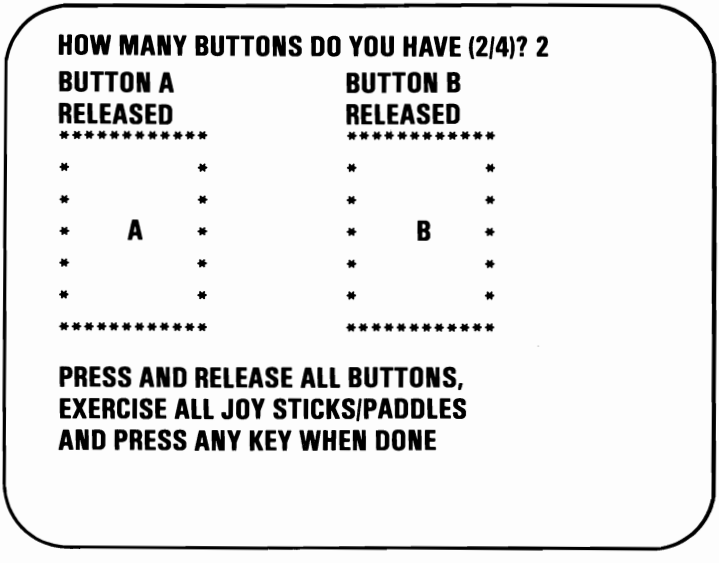
2 Press then .

3 Check for correct operation of your joysticks as follows:

1. Press each button and watch the word **RELEASED** change to **PRESSED**.

2. Move each joystick and watch the character **A** or **B** move inside the box.

4 Did all buttons and joysticks operate correctly?



YES - Your system has completed this test successfully. Press any key and continue with the next Test.

NO - Have the joysticks and the unit the Game Control Adapter is installed in serviced.

5 Enter the number of paddles (2 or 4) attached to your Game Control Adapter and press .

6 Enter the same number for the number of buttons and press .

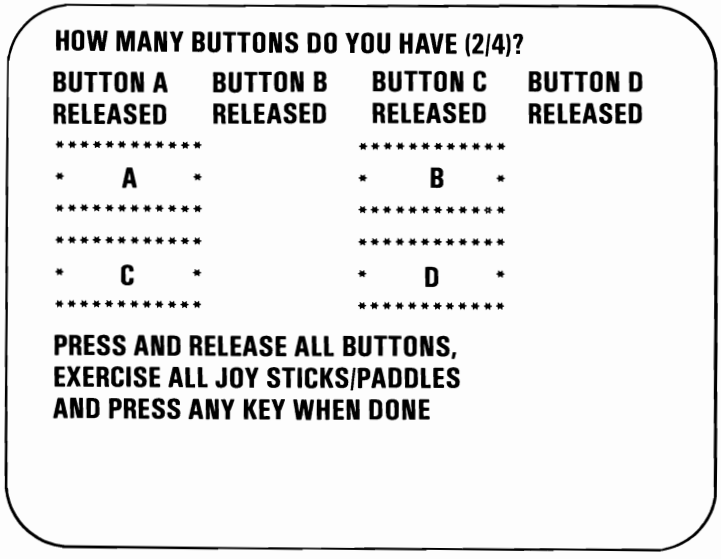
7 Check for correct operation of your paddles as follows:

1. Press each button and watch the word **RELEASED** change to **PRESSED**.

2. Turn each paddle control and watch the characters **A, B, C,** or **D** move inside the box.

Go to the next step.

8 Did all buttons and paddle controls operate correctly?



YES - Your system has completed this test successfully. Press any key and continue with the next Test.

NO - Have the paddles and the unit the Game Control Adapter is installed in serviced.

Notes:

Test 1500

Do you have an IBM Synchronous Data Link Control Adapter installed in your system?

NO - Continue with the next Test.

YES - Did either of the following error messages appear on your screen?

```
XX:XX:XX
ERROR – SYSTEM UNIT          15XX

XX:XX:XX
ERROR EXPANSION UNIT         15XX
```

YES - Have the unit that contains the adapter serviced.

NO - Your system has completed this test successfully. Continue with the next Test.

Notes:

Test 1700

1 Do you have a fixed disk drive installed in one of your units?

NO - Continue with the next Test.

YES - The following will appear on your screen.

```
*** WARNING ***
DATA ON CYLINDER 305 WILL BE
OVERWRITTEN BY FIXED DISK WRITE TESTS
DO YOU WANT TO INCLUDE FIXED DISK
WRITE TESTS ON DRIVE C: (Y/N)?
```

Press and then if you want to include Fixed disk write tests or press and then if you do not want to include Fixed disk write tests.

Go to the next step.

2 Did the following appear on your screen?

Note: This test can take up to 5 minutes.

```
*** WARNING ***
DATA ON CYLINDER 305 WILL BE
OVERWRITTEN BY FIXED DISK WRITE TESTS

DO YOU WANT TO INCLUDE FIXED DISK
WRITE TESTS ON DRIVE C: (Y/N)? y
PERFORMING SEEK TEST
PERFORMING WRITE TEST
PERFORMING TRACK ZERO TEST
PERFORMING SURFACE SCAN
PLEASE STAND BY
```

YES - If you have one fixed disk drive installed, your system has successfully completed this test. Continue with the next Test. If you have two fixed disk drives installed, go to the next step.

NO - Record the error message and have the unit that contains the fixed disk drive serviced.

Note: If you did not select the **Write Test** the PERFORMING WRITE TEST message will not be displayed.

3 Did the following appear on your screen?

```
*** WARNING ***
DATA ON CYLINDER 305 WILL BE
OVERWRITTEN BY FIXED DISK WRITE TESTS
DO YOU WANT TO INCLUDE FIXED DISK
WRITE TESTS ON DRIVE D: (Y/N)?
```

YES - Press

and then

if you want to include Fixed disk write tests or press

and then

if you do not want to include Fixed disk write tests.

Go to the next step.

NO - Record the error message and have the expansion unit serviced.

4 Did the following appear on your screen?

```
DO YOU WANT TO INCLUDE FIXED DISK
WRITE TESTS ON DRIVE D: (Y/N)? y
PERFORMING SEEK TEST
PERFORMING WRITE TEST
PERFORMING TRACK ZERO TEST
PERFORMING SURFACE SCAN
PLEASE STAND BY
```

YES - Your system has successfully completed this test. Continue with the next Test.

NO - Record the error message and have the expansion unit serviced.

Test 2000

Do you have an IBM Binary Synchronous Communications Adapter installed in your system?

NO - Continue with the next Test.

YES - Did any of the following error messages appear on your screen?

```
XX:XX:XX
ERROR – SYSTEM UNIT          20XX

XX:XX:XX
ERROR – SYSTEM UNIT          21XX

XX:XX:XX
ERROR EXPANSION UNIT         20XX

XX:XX:XX
ERROR EXPANSION UNIT         21XX
```

YES - Have the unit that contains the adapter serviced.

NO - Your system has completed this test successfully. Continue with the next Test.

Notes:

Test 2200

1 Do you have an IBM Personal Computer Cluster Adapter installed in your system?

NO - Continue with the next Test.

YES - Did either of the following error messages appear on your screen?

```
XX:XX:XX
ERROR-SYSTEM UNIT          22XX X

XX:XX:XX
ERROR-EXPANSION UNIT       22XX X
```

YES - Have the unit that contains the adapter and the terminating plug serviced.

NO - Go to the next step.

2 Did either of the following error messages appear on your screen?

```
TESTING – CLUSTER ADAPTER X
THE STATION ADDRESS IS  XX
REMOTE IPL IS NOT SELECTED
  XX:XX:XX
ERROR – SYSTEM UNIT  22XX
ERROR – EXPANSION UNIT  22XX
PRESS ENTER TO CONTINUE
?
```

YES - Have the unit that contains the adapter and the terminating plug serviced.

NO - Go to the next step.

3 The following will appear on your screen.

Note: When more than one Cluster Adapter is installed in a Personal Computer, each of the adapters will be tested.

```
TESTING – CLUSTER ADAPTER X
THE STATION ADDRESS IS  XX
REMOTE IPL IS NOT SELECTED

DO YOU WANT TO DISPLAY THE
CLUSTER STATUS (Y/N) ?
```

Go to the next step.

4 Does the adapter number, station address, and remote IPL information shown on your screen match your switch setting information entered below?

CLUSTER ADAPTER NUMBER _____

STATION ADDRESS _____

REMOTE IPL (IS/IS NOT) SELECTED _____

```
TESTING – CLUSTER ADAPTER X
THE STATION ADDRESS IS  XX
REMOTE IPL IS NOT SELECTED

DO YOU WANT TO DISPLAY THE
CLUSTER STATUS (Y/N) ?
```

YES - Go to the next step.

NO - If the adapter number, station address, or remote IPL information is not correct, have the unit that contains the adapter serviced.

5 Do you want to display the Cluster status?

Note: The Cluster status screen presentation will show 64 boxes that represent the stations in the Cluster that have the Power switch set to On and are connected to the Cluster bus.

```
TESTING – CLUSTER ADAPTER X
THE STATION ADDRESS IS  XX
REMOTE IPL IS NOT SELECTED

DO YOU WANT TO DISPLAY THE
CLUSTER STATUS (Y/N) ?
```

YES - Set the Power switch on all Cluster system units (and expansion units, if installed) to On,

press then , then go to the next step.

NO - Your system has successfully completed this test. Remove the terminating plug and attach the coaxial cable to the Cluster Adapter connector.

Press , then

and continue with the next Test.

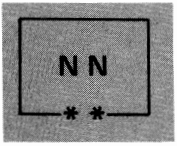
6 The following will appear on your screen.

```
TESTING – CLUSTER ADAPTER  X
THE STATION ADDRESS IS  X
REMOTE IPL IS NOT SELECTED

DO YOU WANT TO DISPLAY THE
CLUSTER STATUS (Y/N)  ? y

CONNECT THE CABLE TO THE
CLUSTER ADAPTER

PRESS ENTER WHEN READY
?
```

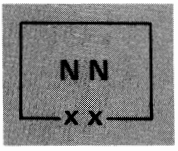
Disconnect the terminating plug and attach the coaxial cable to the Cluster Adapter's connector, then press any key and go to the next page.

This is an information page that explains the Cluster status that may appear on your screen.

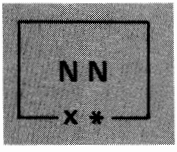
NN is any station address from 0 to 63.



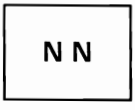
The system you are using is indicated on the screen in blinking reverse video, and the box is marked by two asterisks.



Stations that have the Power switch set to On are displayed in reverse video, and their boxes are marked by two X's.



If another Personal Computer has the same station address as your Personal Computer, a long beep will sound every 3 seconds, the box will be displayed in blinking reverse video and marked by an X and an asterisk.

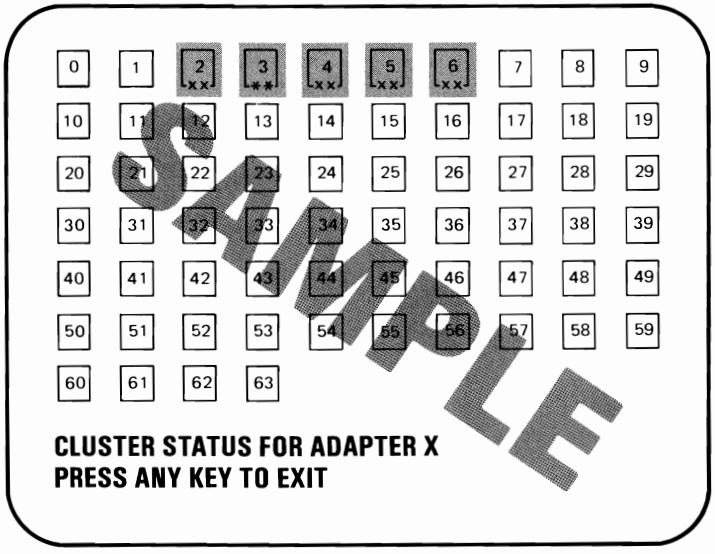


A station address not in the Cluster is indicated by a box displayed in normal video and not marked with X's or asterisks.

A Cluster Access Error message may be displayed in reverse video.

Go to next step.

7 Wait 15 seconds. Do all stations installed in the Cluster appear and remain on the screen presentation?



Notes:

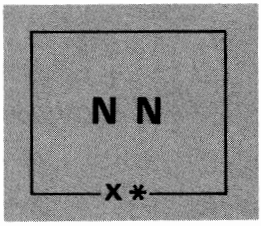
1. Your Installation Manager has a Cluster map that lists the station addresses and the order in which the stations are connected. Compare the map and the status screen presentation to determine that all of the stations on the Cluster are operating properly.

2. The status screen shows all stations installed on your Cluster, and is updated every 3 seconds to show stations that are added to or removed from the Cluster.

YES - Your system has successfully completed this test. Press any key and continue with the next Test.

NO - Go to the next step.

8 Did a box marked in blinking reverse video with an X and an asterisk appear, and did a beep sound every 3 seconds?



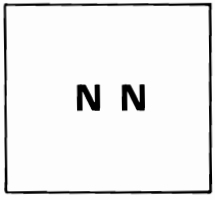
YES - Another Personal Computer has the same station address as your Personal Computer. Use your Cluster map and compare it with the status screen presentation. Run the system diagnostic tests on the Personal Computer that is missing from the Cluster Status screen.

Have the unit that contains the failing adapter serviced.

NO - Go to the next step.

9 On your Cluster Status screen, did a box appear in normal video, not marked with X's or asterisks, for a station address that is on the Cluster?

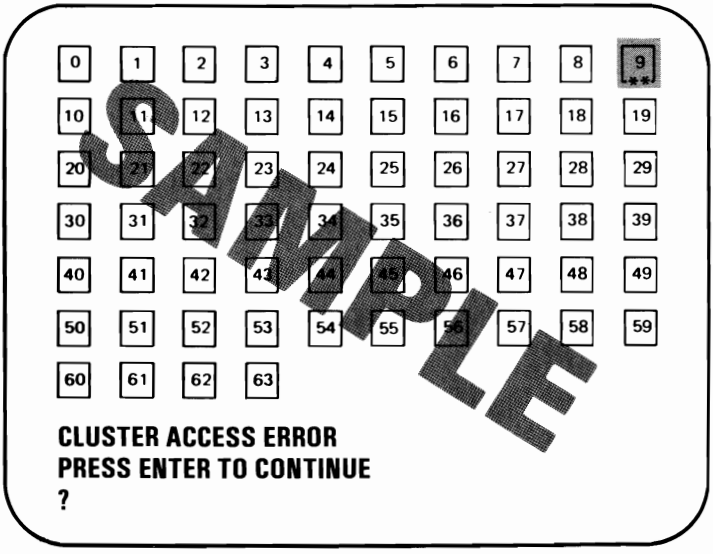
Note: Multiple grounds on the Cluster cables may cause stations to appear on the status screen presentation intermittenly. Contact your Installation Manager.



YES - Go to Step 11.

NO - Go to the next step.

10 Do you have a Cluster Access Error?



YES - Go to Step 11.

NO - Your system has successfully completed this test. Continue with the next Test.

11 You have stations that are not indicated on any status screen, or a Cluster Access Error.

1. Run the system diagnostic tests on a station that is not indicated on any status screen, or that has a Cluster Access Error.

2. If the diagnostic test fails, have the unit that contains the adapter serviced.

3. If the diagnostic test passes, continue doing the diagnostic tests until all of the stations that did not appear on any status screen presentation or had a Cluster Access Error are tested.

4. If the Cluster Adapters check good and the stations did not appear on the Cluster status screen presentations, contact your Installation Manager as the coaxial cable or a terminating plug is suspect.

   Note: If you have more than one Cluster Adapter installed in your system go back to 2200-1, and continue until all of the Cluster Adapters are tested.

Test 7000

Do you have an IBM Printer attached to your system?

YES - Continue with the next Test.

NO - You have completed the Problem Determination Procedures with no failures. Remove the scratch diskette from your drive. Return the Diagnostics diskette to the back of this manual. Your system unit is ready to load your operating system.

If you should have any other problems, contact your place of purchase for additional help.

Notes:

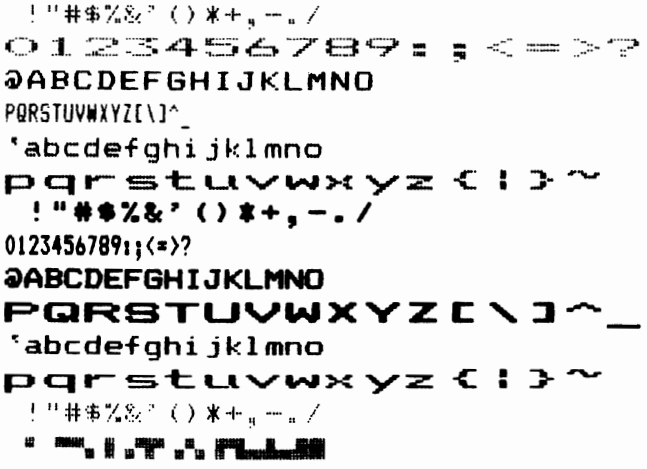
Test 7010

1 Do you have an IBM Graphics/Matrix Printer attached to your system?

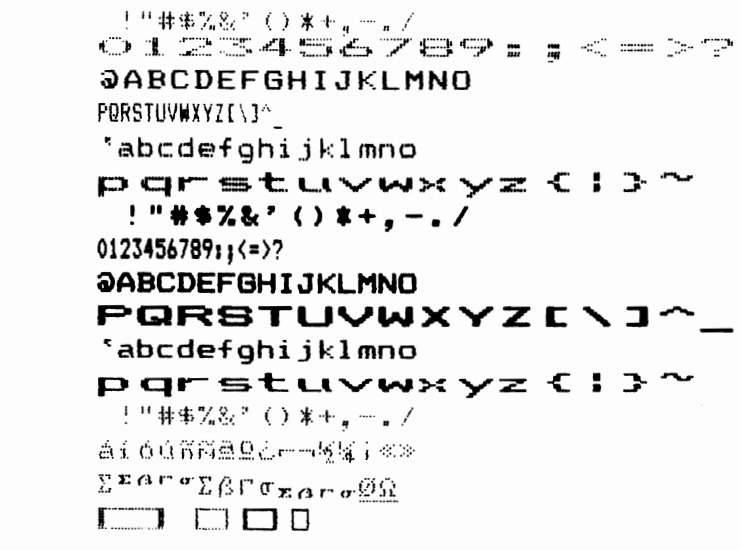
NO - Continue with the next Test.

YES - One of the following printer test patterns should print.

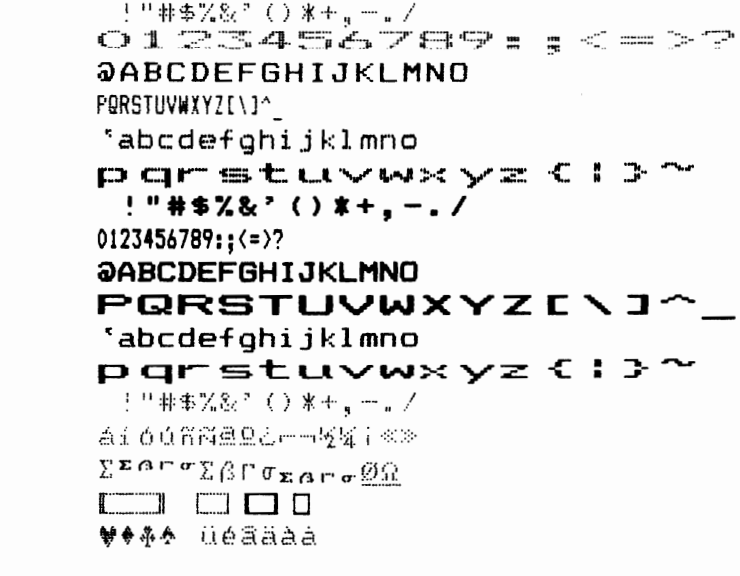
Matrix Printer Example



U.S. Graphics Printer Example



International Graphics Printer Example



2 Did the printer test finish without any errors and the printer test pattern print correctly?

NO - Record the error message, and go to Test 8000.

YES - Continue with the next Test.

Notes:

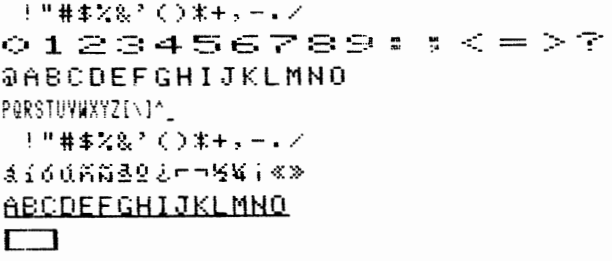
Test 7020

1 Do you have an IBM PC Compact Printer attached to your system?

NO - Continue with the next Test.

YES - The following printer test pattern should print.

Compact Printer Example



2 Did the printer test finish without any errors and the printer test pattern print correctly?

NO - Go to Test 8010.

YES - Continue with the next Test.

Test 7030

1 Do you have an IBM Personal Computer Color Printer attached to your system?

NO - Continue with the next Test.

YES - Does your screen match the screen shown below?

```
SELECT PAPER WIDTH

1 - 8 1/2 INCH PAPER WIDTH
2 - 14 1/2 INCH PAPER WIDTH

ENTER THE OPTION DESIRED
?
```

NO - Go to Test 8020.

YES - Go to the next step.

2 Select the width of paper you are using.

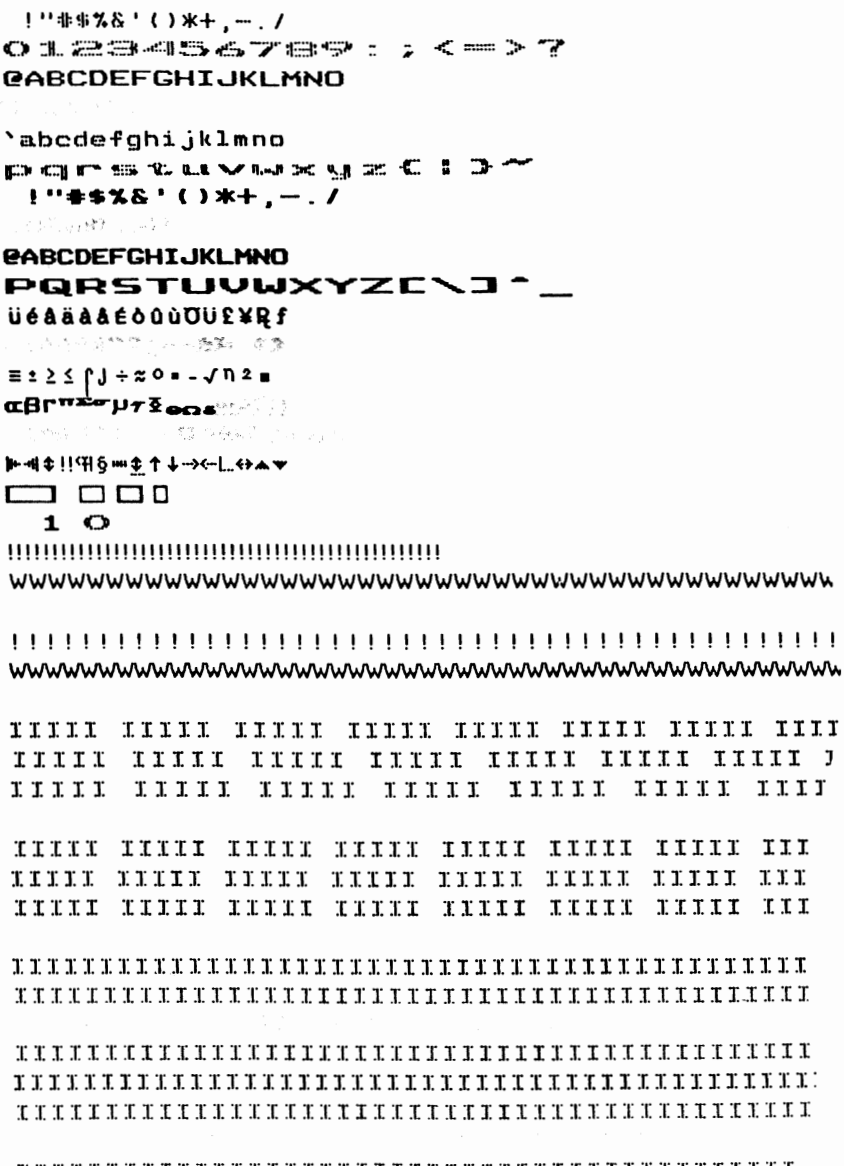
```
SELECT PAPER WIDTH

1 - 8 1/2 INCH PAPER WIDTH
2 - 14 1/2 INCH PAPER WIDTH

ENTER THE OPTION DESIRED
?
```

Press then for paper 8-1/2 inches wide.

Press then for paper 14-1/2 inches wide.

3 The following printer test pattern should print.

Color Printer Example



Note: If the print example shows the incorrect character set, check the DIP switches. If the DIP switches are set correctly, have your printer serviced.

4 Did the printer test pattern finish without any errors and the printer test pattern print correctly?

YES - Go to the next step.

NO - If the test pattern is correct but the colors are wrong, go to the next step. If the test pattern is not correct or you received an error message, record the error message and go to Test 8020.

5 Are the characters in your test pattern correct and is each character only one color?

Are the characters on the printed test pattern correct, and each character a single color (Y/N) ?

YES - Press then and go to Step 8.

NO - Press then and continue on the next step.

Note: Refer to the "Ribbon-Color Knob Adjustment" procedure in the "IBM Personal Computer Color Printer Installation and Operating Instructions" in your *Guide to Operations* manual.

6 Perform the ribbon adjustment procedure. Then press to print the test pattern and verify the adjustment.

Warning: Wait until the printer stops before making any adjustments.

7 Return to Step 4.

Note: If you are unable to adjust the ribbon, have the printer serviced.

8 Continue with the next Test.

Test 7900

You have completed the Problem Determination Procedures with no failures. Remove the scratch diskette from your drive. Return the Diagnostic diskette to the back of this manual. Your system unit is ready to load your operating system.

If you should have any other problems, contact your place of purchase for additional help.

Notes:

Test 8000

1 Check your wall outlet for proper operation (use a working lamp).

2 Verify that your printer cable is properly connected to the printer and the system unit.

Did you find any problem while doing the above step?

NO - Go to the next step.

YES - Correct the problem and perform the system diagnostic tests again.

3 Set the Power switches on the printer and system unit to Off. (If an expansion unit is attached, also set its Power switch to Off.)

4 Disconnect the printer cable.

5 Perform the printer self-test:

1. Press and hold the Line Feed button while you set the printer's Power switch to On.

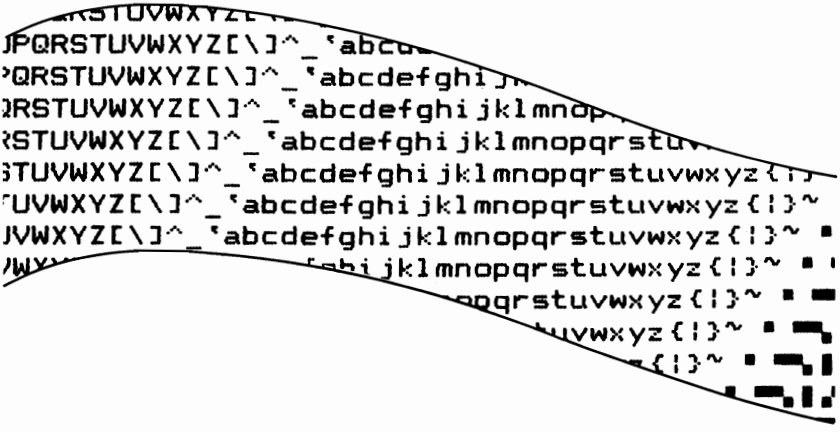
2. When the test starts, release the Line Feed button.

   Note: The printer self-test will take approximately 10 minutes.

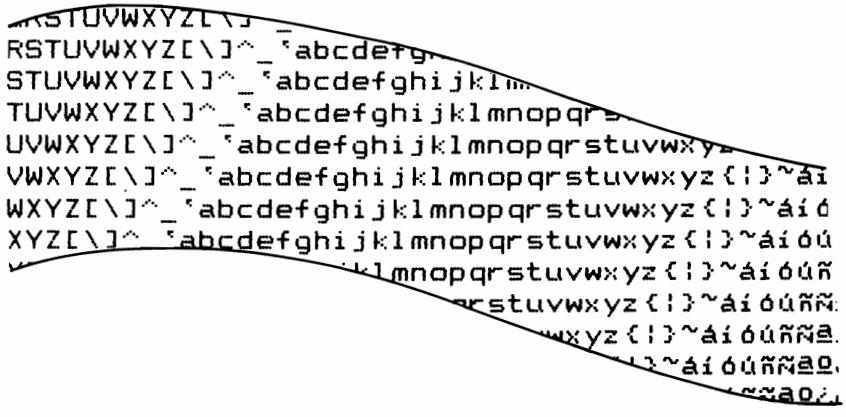
3. To stop the printer self-test before it finishes, set the printer's Power switch to Off.

6 Below are partial examples of the printout for each of the IBM Graphics/Matrix Printers. Compare your printout with the appropriate example.

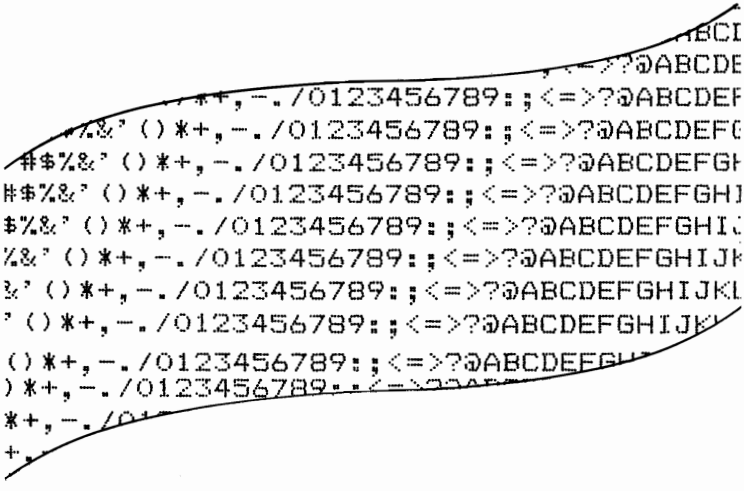
Matrix Printer Example



Graphics Printer U.S. Example



Graphics Printer International Example



Did the self-test finish without failures?

YES - Go to Step 13.

NO - Go to the next step.

7 Ensure the ribbon is installed properly.

8 Ensure the forms or paper is inserted properly.

9 Ensure the forms or paper path has no obstructions.

10 Ensure the tractors are adjusted properly.

If you need help with any of the above, refer to the operating instructions that came with your printer.

11 Did you find any problem while doing the above steps?

NO - Go to the next step.

YES - Correct the problem and restart the printer self-test.

Note: If you are using a non-U.S. English keyboard and your printout does not match the desired character set, have your printer serviced.

12 Does your printer have any of the following problems?

- Your printer beeps even though the paper is installed properly.
- Your printer does not beep even when it is out of paper.
- Some of the lights on the control panel do not work.
- Some of the buttons on the control panel do not work.
- Your printer continues to print when it is out of paper.
- Your printer fails to print or prints incorrectly.

NO - Go to Step 14.

YES - Have your IBM Graphics/Matrix Printer serviced.

13 Did you receive any of the following error messages during diagnostic testing?

199

432

901

1401

YES - Go to the next step.

NO - If you are still having a problem go to Step 16.

14 Leave the printer cable disconnected from the printer and run the system diagnostic tests again. Verify that the list of installed devices and options is correct. (your printer will be missing from the list).

15 Did you receive the same error message when you ran the system diagnostic tests this time?

YES - If your printer is attached to an adapter in your system unit, have the system unit serviced. If your printer is attached to an adapter in the expansion unit, have the expansion unit serviced.

NO - Have the printer and cable serviced.

16 Your printer also is controlled by program commands from the system unit. If you are still having a printer problem, or if you have a printer problem only during a particular program, examine the program thoroughly for commands that might cause the printer to produce undesired results. If you have completed the printer self-test and have no apparent program problems, have the unit that the printer is attached to serviced.

Test 8010

1 Check your wall outlet for proper operation (use a working lamp).

2 Verify that your printer cable is properly connected to the printer and system unit.

Did you find any problem while doing the above step?

NO - Go to the next step.

YES - Correct the problem and perform the system diagnostic tests again.

3 Set the Power switches on the printer and system unit to Off. (If an expansion unit is attached, also set its Power switch to Off.)

4 Disconnect the printer cable.

5 Perform the printer self-test:

1. Be sure there is nothing preventing the paper from moving.

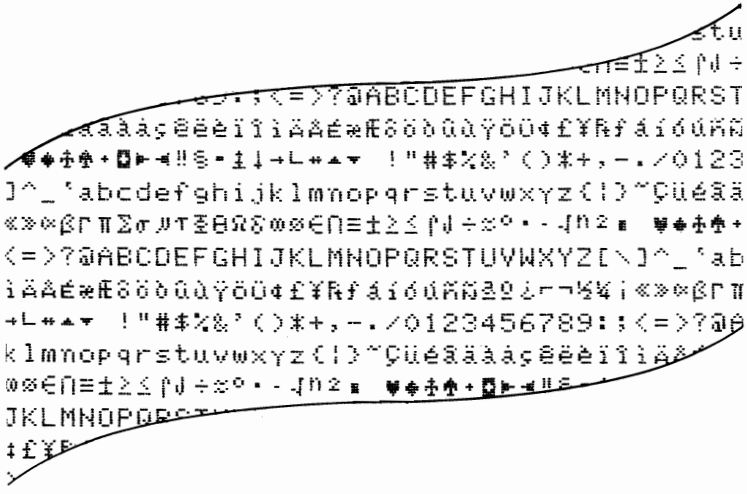
2. Be sure the top cover is closed properly.

3. Press and hold down the Paper Feed button while you set the printer's Power switch to On.

4. After the test starts, release the Paper Feed button.

5. The self-test runs continuously until you set the printer's Power switch to Off.

6 Below is a partial example of the printout for the IBM PC Compact printer. Compare your printout with the example.



Did the self-test finish without failures?

YES - Go to Step 8.

NO - Go to the next step.

7 Does your printer have any of the following problems?

- The printer Ready Light blinks continuously.
- The printer prints backwards question marks continuously.
- The printer has extra or missing dots in the printed characters.
- The printer sounds like it is operating, but does not print anything on the paper. (Be sure the paper is installed properly).
- The printer does not do anything.

YES - Have your IBM PC Compact Printer serviced.

NO - Go to the next step.

8 Your printer also is controlled by program commands from the system unit. If you are still having a printer problem, or if you have a printer problem only during a particular program, examine the program thoroughly for commands that might cause the printer to produce undesired results.

9 If you have completed the printer self-test and have no apparent program problems, have the unit that the printer is attached to serviced.

Test 8020

1 Check your wall outlet for proper operation (use a working lamp).

2 Verify that your printer cable is properly connected to the printer and the system unit.

Did you find any problem while doing the above step?

NO - Go to the next step.

YES - Correct the problem and perform the system diagnostic tests again.

3 Set the Power switches on the printer and system unit to Off. (If an expansion unit is attached, also set its Power switch to Off.)

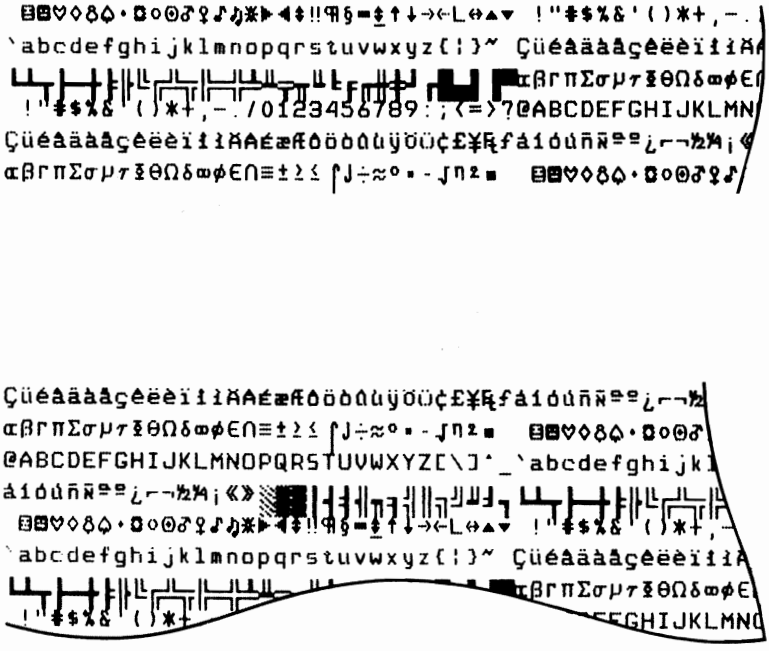
4 Disconnect the printer cable.

5 Perform the printer self-test:

1. Open the access cover, and set all DIP switches to Off.
2. Close the access cover.
3. Set the printer's Power switch to On.
4. Press the Ready button to set the printer to Not Ready (Ready indicator is off).
5. Press the Test Mode button.
6. To stop the test, press the Test Mode button again.

6 Below is a partial example of the printout for the IBM Personal Computer Color Printer. Compare your printout with the example.

IBM Personal Computer Color Printer Example



Did the self-test finish without failures?

YES - Go to Step 15.

NO - Go to the next step.

7 Ensure the ribbon is installed properly.

8 Ensure your forms or paper is inserted properly.

9 Ensure the forms or paper path has no obstructions.

10 Ensure the tractors are adjusted properly.

If you need help with any of the above, refer to the operating instructions that came with your printer.

Did you find any problem while doing the above steps?

NO - Go to the next step.

YES - Correct the problem and restart the printer self-test.

Note: If you are using a non-U.S. English keyboard and your printout does not match the desired character set, verify that the switch settings are correct for the desired character set. If the switch settings are correct have your printer serviced.

11 Does your printer have any of the following problems?

- Your printer beeps even though the paper is installed properly.
- Your printer does not beep even when it is out of paper.
- Some of the lights on the control panel do not work.
- Some of the buttons on the control panel do not work.
- Your printer continues to print when it is out of paper.
- Your printer fails to print or prints incorrectly.

NO - Go to Step 18.

YES - Go to the next step.

12 Ensure that the DIP switches are all set to Off.

13 Ensure the Forms Thickness Control lever is properly adjusted.

14 Ensure the Feed Mode lever is in the correct position.

Did you find any problem while doing the above steps?

NO - Have your printer serviced.

YES - Correct the problem and restart the printer self-test.

15 Did you receive any of the following error messages during diagnostic testing?

199

432

901

1401

2901

2902

YES - Go to the next step.

NO - If you are still having a problem go to Step 18.

16 Leave the printer cable disconnected from the printer and run the system diagnostic tests again. Verify that the list of installed devices and options is correct. (your printer will be missing from the list).

17 Did you receive the same error message when you ran the system diagnostic tests this time?

YES - If your printer is attached to an adapter in your system unit, have the system unit serviced. If your printer is attached to an adapter in the expansion unit, have the expansion unit serviced.

NO - Have the printer and its cable serviced.

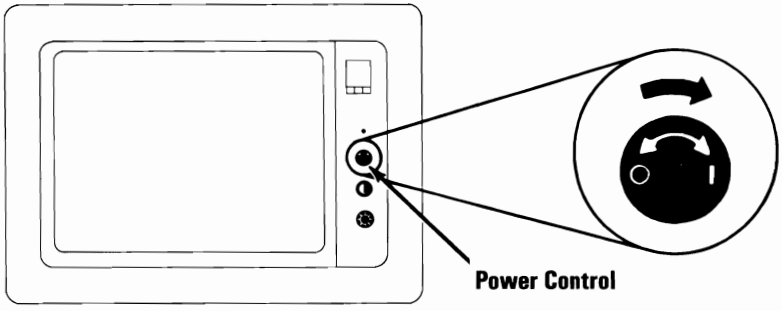
18 Your printer also is controlled by program commands from the system unit. If you are still having a printer problem, or if you have a printer problem only during a particular program, examine the program thoroughly for commands that might cause the printer to produce undesired results. If you have completed the printer self-test and have no apparent program problems, have the unit that the printer is attached to serviced.

Notes:

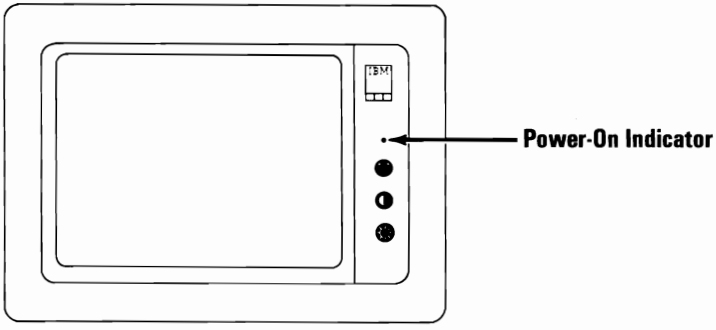
Test 9000

If your IBM Color Display requires service, it must be returned with the power cord.

1 Set the Power control to On.



2 Is the Power-On indicator lit?

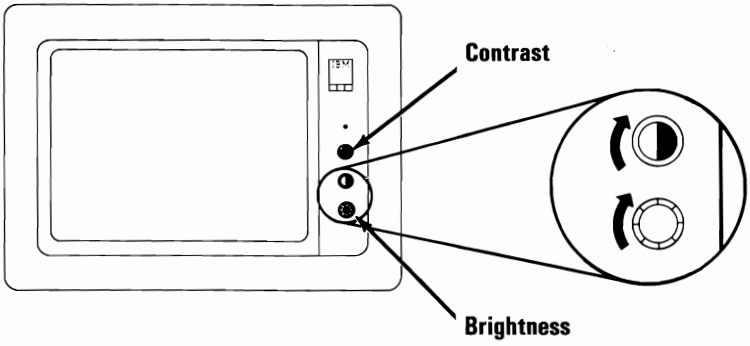


YES - Go to the next step.

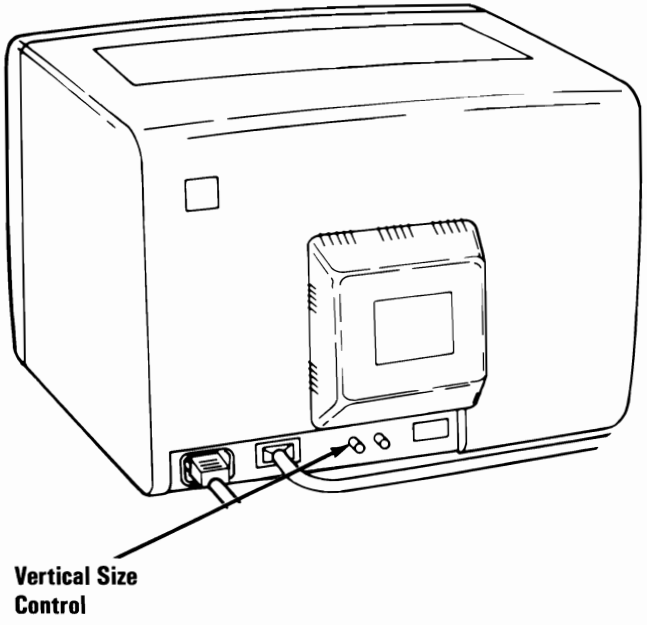
NO - Check that the power cord is plugged into a functioning wall outlet and into the rear of the display. If so, have the display serviced.

3 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

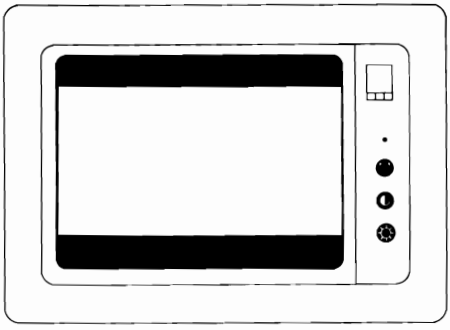
4 Set the Brightness and Contrast controls fully clockwise.



5 Turn the Vertical Size control fully counterclockwise. A black area should appear across the top and bottom of the screen.



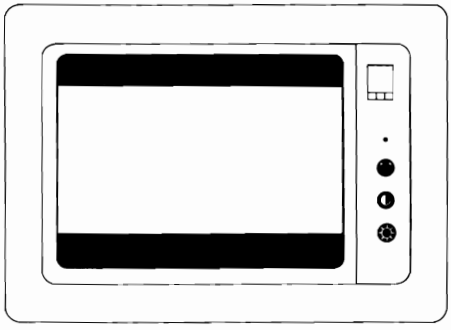
6 Does the black area appear across the top and bottom of the screen?



YES - Go to the next step.

NO - Have the display serviced.

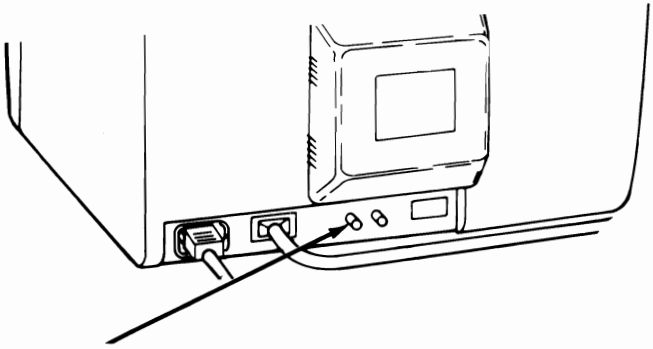
7 Are the black areas at the top and bottom of the screen approximately equal in size?



YES - Go to the next step.

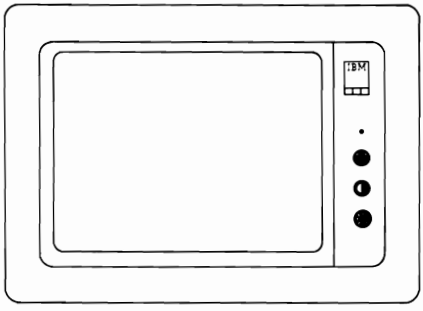
NO - Have the display serviced.

8 Turn the Vertical Size control clockwise until the black areas at the top and bottom of the screen just disappear. If one of the black areas disappears before the other, continue to turn the control until the second black area is gone.



Vertical Size Control

9 Is the entire screen white?

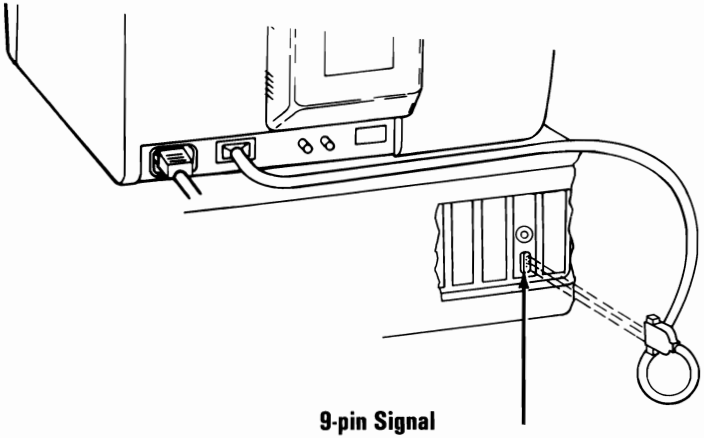


YES - Go to Step 14.

NO - Go to the next step.

10 Set the display's Power control to Off.

11 Disconnect the display's signal cable from the system unit or expansion unit.



12 Set the Power control on the display to On.

13 Is the screen white?

YES - Have the unit that the display was attached to serviced.

NO - Have the display serviced.

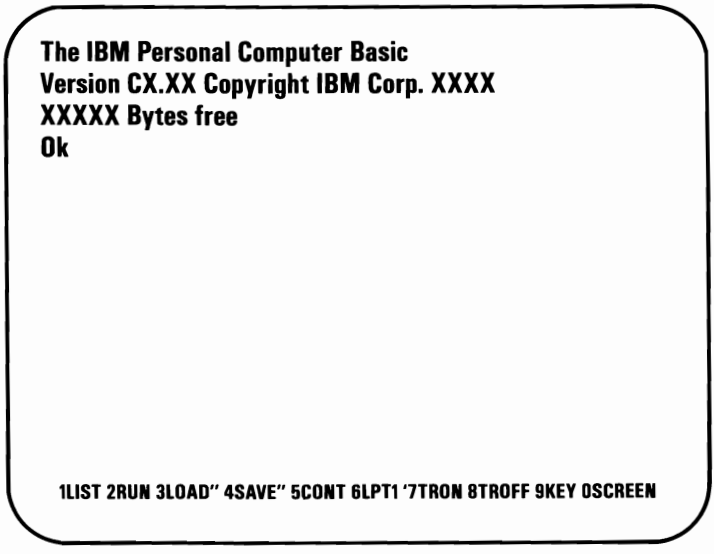
14 While watching the screen, set the Power switch on the expansion unit (if attached) to On. Then set the system unit's Power switch to On.

15 Did the screen change from white to black when the Power switch was set to On? (The totally black screen may last only 13 seconds before the display changes again.)

YES - Go to the next step.

NO - Have the display serviced.

16 Wait for the Power-On Self Test (POST) to complete. The IBM Personal Computer BASIC message, with a blinking cursor, will appear (if a diskette is not inserted, or an operating system is not automatically loaded from a fixed disk drive).



17 Is your screen blank?

NO - Go to the next step.

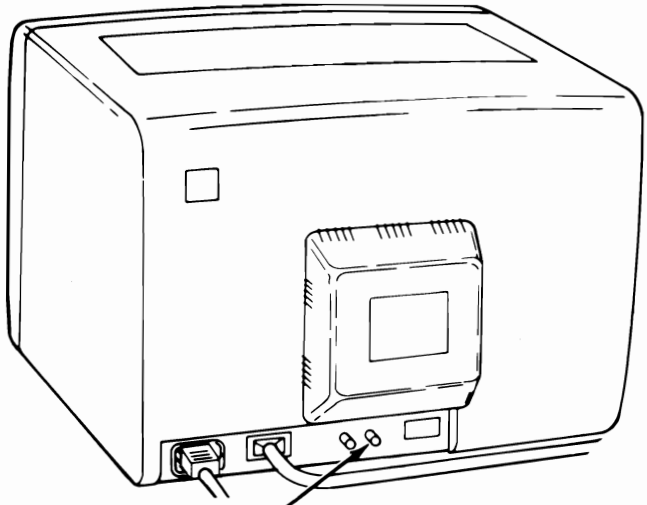
YES - Have the unit that the display was attached to serviced.

18 Is your screen steady?

YES - Go to Step 21.

NO - Go to the next step.

19 Turn the Vertical Hold control clockwise as far as it will go, then turn it counterclockwise until the screen stops rolling and is steady.



20 Were you able to make the screen steady?

YES - Go to the next step.

NO - Have the display serviced.

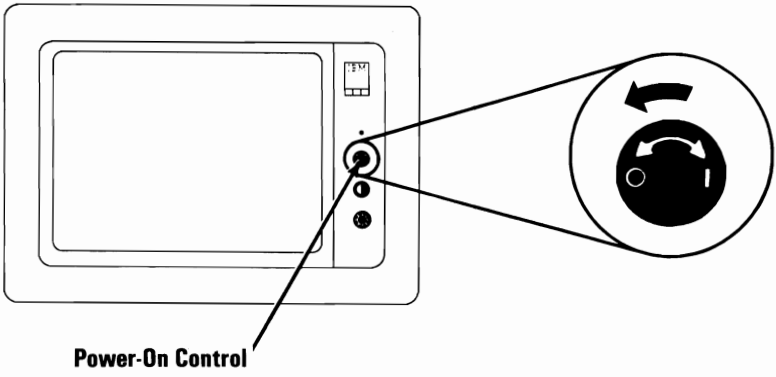
21 Look at the screen. Does it have white characters on a dark background?

YES - Go to Step 27.

NO - Go to the next step.

22 Set the Power switch on the system unit (and expansion unit, if attached) to Off.

23 Set the display's Power control to Off.



24 Disconnect the display's signal cable from the system unit or expansion unit.

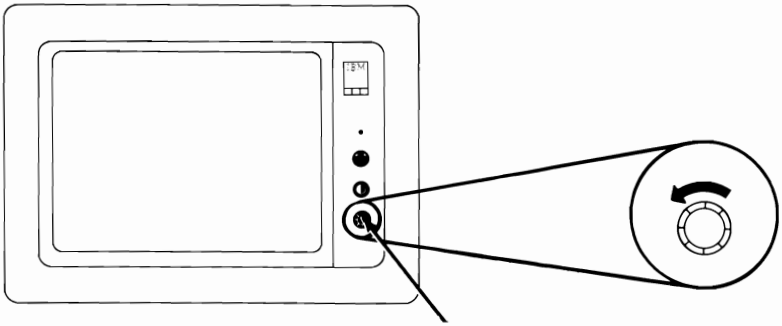
25 Set the display's Power control to On.

26 Is the screen white?

YES - Have the unit that the display was attached to serviced.

NO - Have the display serviced.

27 Turn the Brightness control fully counterclockwise.

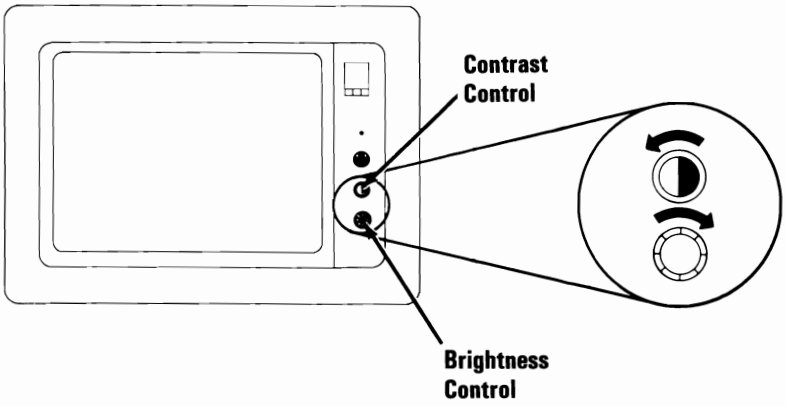


28 Does the intensity of the characters decrease?

YES - Go to the next step.

NO - Have the display serviced.

29 Turn the Brightness control fully clockwise. Turn the Contrast control fully counterclockwise.

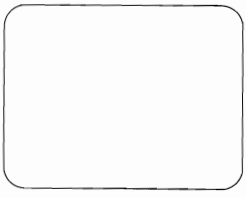


30 Does the intensity of the characters decrease?

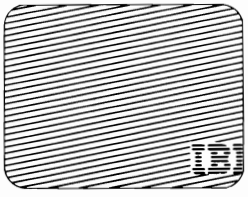
YES - Go to the next step.

NO - Have the display serviced.

31 Turn the Contrast control fully clockwise. Look at the following examples.

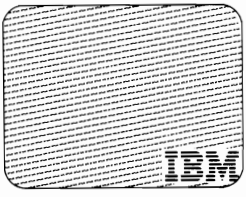


Too Dim

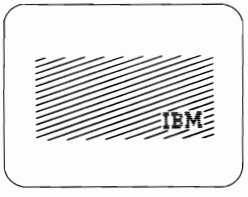


Too Wide

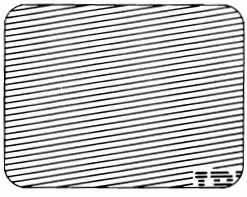
Too Narrow



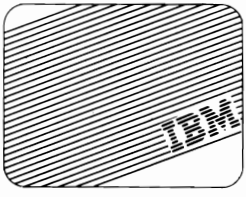
Out of Focus



Shrunken



Characters shifted left or right or up and down off the display area



Tilted

32 Is the problem similar to one of the examples?

YES - Have your display serviced.

NO - Go to "Diagnostic Testing" on page Test 000-1 earlier in this section.

Section 3. Operating Your IBM Portable Personal Computer

Contents

Introduction 3-3

System Unit 3-5

Keyboard 3-7
- The Typewriter Area 3-8
- The Typewriter Area on International Keyboards 3-13
- Special Keys when Using DOS with an International Keyboard 3-14
  - Special Characters 3-14
  - Dead Key Characters 3-15
  - Additional Characters 3-15
- Changing back to the U.S. English Format .. 3-17
- The Numeric Keypad 3-18
- Cursor Controls 3-20
- Function Keys 3-23

Diskette Drive 3-25

IBM Portable Personal Computer Display 3-29

Expansion Unit 3-31

IBM Color Display 3-33
- Controls 3-33
- Vertical Hold Adjustment 3-34
- Vertical Size Adjustment 3-35

Other Monitors **3-37**
Interface Information 3-39
Auxiliary Connectors 3-40

Introduction

This section contains instructions on how to begin using your IBM Portable Personal Computer. Included is information on the system unit, keyboard, diskette drive, IBM Portable Personal Computer Display, expansion unit, IBM Color Display, and other monitors.

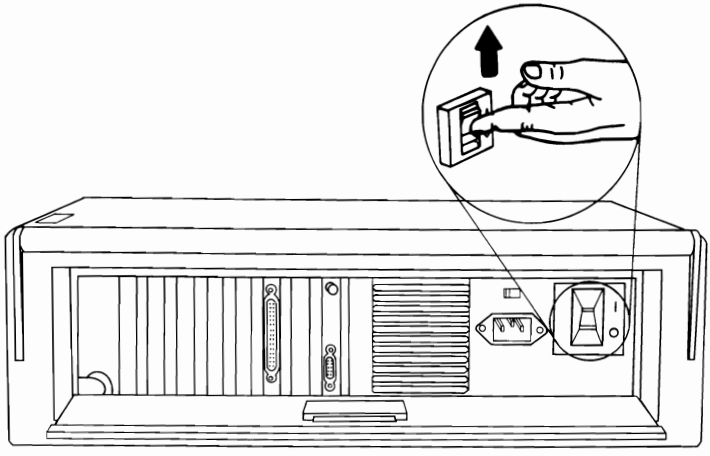
At this time, it is not necessary for you to read all of the information in this section. You should read only the information that pertains to your IBM Portable Personal Computer and the options you have attached.

Notes:

System Unit

The main component of your IBM Portable Personal Computer is the system unit. It accomplishes all of the processing and controlling operations for your system through a set of instructions called a program. The IBM Portable Personal Computer comes with the programming language, "IBM BASIC," already installed, and most programs are written in that language. However, you also can write programs for your IBM Portable Personal Computer in several other IBM supported programming languages. Although a reference manual for IBM BASIC is included with your system unit, prior knowledge of general programming concepts is very helpful for writing programs for your IBM Portable Personal Computer. In addition, various program packages are available at your Authorized IBM Personal Computer Dealer to satisfy a variety of your business and personal needs.

The system unit stores data on the diskette drive using an operating system, such as the IBM Disk Operating System (DOS). IBM DOS allows the system unit to store and retrieve data from the diskette drive. The *DOS* reference manual and the IBM *BASIC* manual explain the commands needed to store or retrieve data. If you choose to write your own operating system, the IBM Personal Computer XT *Technical Reference* manual (P/N 6936808) will be helpful in providing the necessary information.

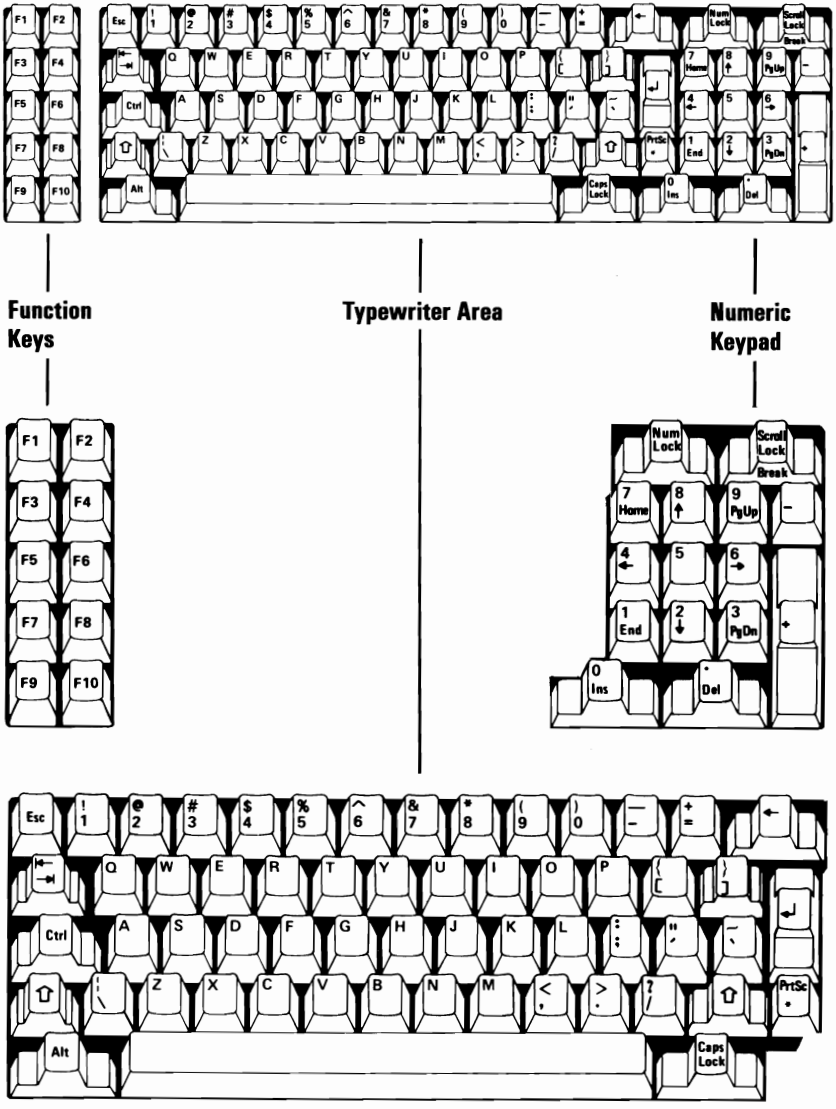


To operate the system unit, you simply set the Power switch to On. Your commands to the system can then be entered through the keyboard. You will see your commands and the system responses on your display. If a printer is attached to your system unit, you may also request a printed copy of almost any data in the system.

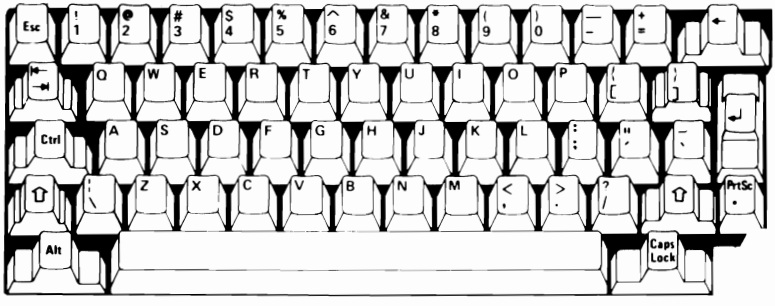
Keyboard

The keyboard is divided into three sections: the typewriter area, the function keys and the numeric keypad.

All keys on the keyboard are typematic. This means they repeat their function for as long as you press them.



The Typewriter Area

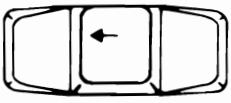


Key positions in the typewriter area are much like those of a standard typewriter. There are, however, some additional keys that perform control functions for the IBM Portable Personal Computer.

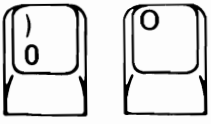
The Caps Lock key when pressed once, locks the characters A through Z in the uppercase position. You can get lowercase characters while Caps Lock is on by pressing the Shift key. Pressing the Caps Lock key again releases the uppercase mode for characters A through Z.

This is the Enter key. Its uses are defined by the programming language or application program you are using. Refer to the appropriate manual for its specific function.

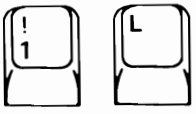
When the Print Screen key is pressed with the Shift key, a copy of the information on the screen is printed. If the information consists of alphanumeric characters, such as a program listing, it will be duplicated on the printer. If the information is a graphic representation, it can be reproduced only on a printer that supports graphic printing, such as the IBM Personal Computer Graphics Printer.



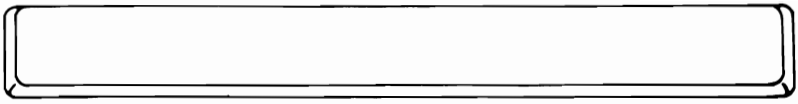
The Backspace key, when pressed, erases the character at the cursor position and moves the cursor one position to the left.



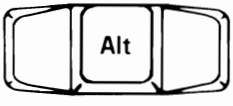
When typing data on your computer, you should be aware that the number 0 and the letter O are not interchangeable.



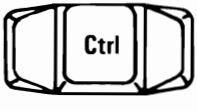
As with the zero and the O, the number 1 and the lowercase L are not interchangeable.



When pressed, the Spacebar moves the cursor to the right. Any character the cursor moves over is replaced with a blank.

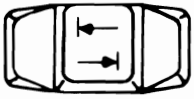


The Alternate key, when pressed with any alphabetic key, provides an easy way of entering BASIC keywords. Press the Alt key and an alphabetic key, and the BASIC keyword is entered. ASCII codes also can be entered with the Alt key and the numeric keypad. For more information about the Alt key, see the BASIC Reference manual, part number 6025010.

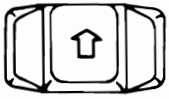


The Control key performs a variety of functions. These are defined in your operating system manual or application program manual.

The Escape key functions also are defined in your operating system or application program manual.



Press the Tab key and the cursor moves to the next tab stop. Tab stops are defined in your operating system or application program manual.



The typewriter area has two Shift keys. Pressing either of these changes the keys in the typewriter area to uppercase. Alphabetic characters are displayed as capital letters; when other keys in the typewriter area are pressed, the characters shown on the upper portion of these keys are displayed.

The Typewriter Area on International Keyboards

Each time you switch your IBM Portable Personal Computer on, the system unit decodes the keys you press as if a U. S. English keyboard were attached. For other keyboards, some of the letters and numbers may be in different positions on the keyboard, and the correct characters will not appear on the screen when you press the keys.

If you purchased your IBM Portable Personal Computer with a keyboard for a language other than U.S. English, there are two ways to get the proper characters to appear on your screen.

If you did not purchase the IBM *Disk Operating System* (DOS), use the U.S. English keyboard template in Section 6, "Templates". The template is printed so you can cut it out and use it like a "map" of the U.S. English keyboard while you are typing. You will then know which keys display characters different from those on the keytops of your keyboard. Remember, you will need to use the template only if you did not purchase the IBM *Disk Operating System* (DOS) for your IBM Portable Personal Computer.

If you purchased DOS, the DOS diskette has programs that will decode the keys you press so that the proper characters are read by the computer and appear on the screen.

> **Note:** For DOS version 2.0 or higher. The DOS manual has instructions to make DOS automatically set up your keyboard every time you start the Disk Operating System. Be sure to read the section "Getting DOS Started," in your DOS manual before using your keyboard.

Special Keys when Using DOS with an International Keyboard

An international keyboard is any keyboard for the IBM Portable Personal Computer other than U.S. English. If you have a U.S. English keyboard and will be typing only in English, you may want to skip this discussion and go to the procedure for creating your National DOS diskette. (You still need to create the diskette because DOS still must know which keyboard you have, even though it's for U.S. English.)

The DOS diskette has files that convert messages from any keyboard to different characters on the screen for various languages. Once you have performed the National DOS Diskette creation procedure found in your DOS 2.0 manual, the following rules will apply when using an international keyboard.

Remember, DOS must be started from the National DOS diskette you create (or from a copy of it on the fixed disk drive) to use an international keyboard and the following rules. Otherwise, your IBM Portable Personal Computer decodes all the keys on your keyboard as if it were a U.S. English keyboard, and you may need the U.S. English keyboard template from Section 6, "Templates."

Special Characters

The keyboard files on the DOS diskette allow you to type some special characters with multiple keystrokes.

You can type two basic kinds of special characters on the IBM Portable Personal Computer when using DOS. One kind you create by pressing a special key, which we'll call a "dead key." A dead key causes nothing to appear on the screen when you first press it. The

computer just waits for you to press another key, then combines the two to make the special character. Dead keys are not on the U.K., Italian, or U.S. English keyboards. The other kind of special characters (we'll call them additional characters) are typed using the Alt key on the left side of the typewriter area. We will describe these two types of special characters in more detail on the following pages.

Dead Key Characters

Dead key characters are used to accent certain other characters on the keyboard. The accent (dead) key is pressed first, causing no cursor movement or display of the character. Next the letter you want to accent is pressed, and the entire character is read by the computer and displayed on the screen. Dead keys and the keys you can use them with are shaded on your keyboard template. If you need to have the dead key displayed by itself, press the Dead key, then the spacebar and the accent will be placed on the screen by itself (except for the .. character, which cannot be displayed by itself.)

> **Note:** One thing to remember when you're using the dead keys: if you press a dead key and then a key that is not allowed (not shaded on the keyboard template), it causes unpredictable characters to appear on the screen.

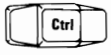
Additional Characters

Additional characters require the use of the Alt (and sometimes the Ctrl) keys. There are Alt/Ctrl characters, which are printed on the FRONT of the keys, and ASCII characters, which are listed on the back of each keyboard template.

The characters on the front faces of the keys are special ones you may need when programming in computer languages, such as BASIC. These characters are not present on the U.S. English or U.K. English keyboards, but you should keep them in mind if you ever want to use a language other than English. If you are using a National DOS diskette for either U.K. English or U.S. English keyboards, you may want to set up a National DOS diskette now for another language so that you can try this example.

To type one of these characters, hold down the Alt and Ctrl keys (these keys are below and above the left Shift key) and press the key with the desired character on its front face.

Example:

Press and hold 

and

Press the key with the [character on its front face.

The left hand bracket ([) appears on the screen.

The four-keystroke Alternate characters are available to you with every keyboard. The characters are the same for all keyboards. They enter special three-digit ASCII codes to display characters that you could not otherwise type.

To type a special character, hold down the Alt key. Then using the numeric keypad (below the Num Lock key), type the three-digit ASCII code that corresponds to the character you wish to see displayed. When you release the Alt key, the character will appear on the screen.

Example:

Press and hold

Using the Numeric Keypad, type

143

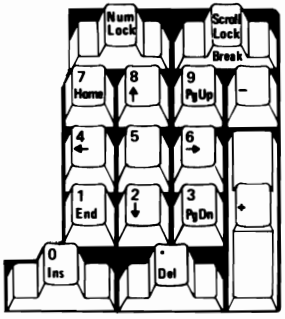
Release the Alt key. This special character appears:

Å

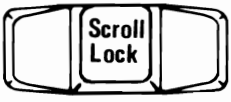
Changing back to the U.S. English Format

You can switch from a keyboard selected by the National DOS diskette to U.S. English and back again at any time. To do this, press and hold the Alt and Ctrl keys (on the left side of the keyboard), then press the F1 key. To return to the previously loaded National DOS keyboard, press and hold the Ctrl and Alt keys and press the F2 key.

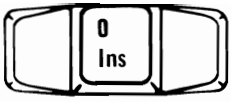
The Numeric Keypad



Pressing the Numeric Lock key once places keys 0 through 9 in the numeric mode. Pressing the Numeric Lock key again returns keys 0 through 9 to cursor control.

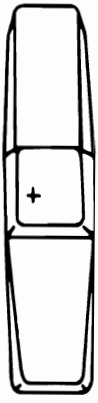


The Scroll Lock key is defined in your operating system or application program manual.



Pressing the Insert key enables you to add characters in the middle of a line. Press the key again and you are back to normal operation.

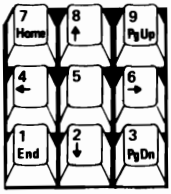
Press the Delete key and the character at the current cursor position is erased; all characters to the right of the deleted character move one position to the left.

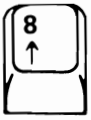


The Plus and Minus keys have no program-defined functions. When pressed, they simply enter a plus or minus sign on the screen.

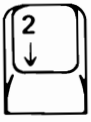
Cursor Controls

A cursor is a movable spot of light on your screen, usually indicating where the next character is to be entered, replaced, or deleted.

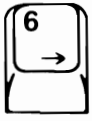




Cursor Up moves the cursor up one line.



Cursor Down moves the cursor down one line.



Cursor Right moves the cursor one character position to the right.

Cursor Left moves the cursor one character position to the left.

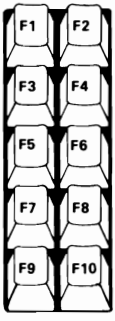
Press the Home key and the cursor moves to the top left corner of your screen.

End moves the cursor one position to the right of the last character on the line.

Page Up is a program-controlled key; for information, see your operating system or application program manual.

Page Down also is a program-controlled key; see your operating system or application program manual for information.

Function Keys



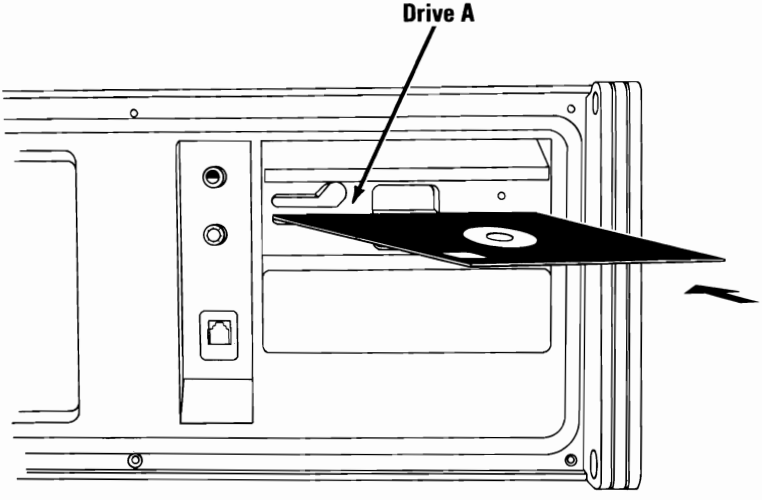
The function keys, F1 through F10, are always controlled by a program. Their functions are defined in your operating system or application program manual.

Notes:

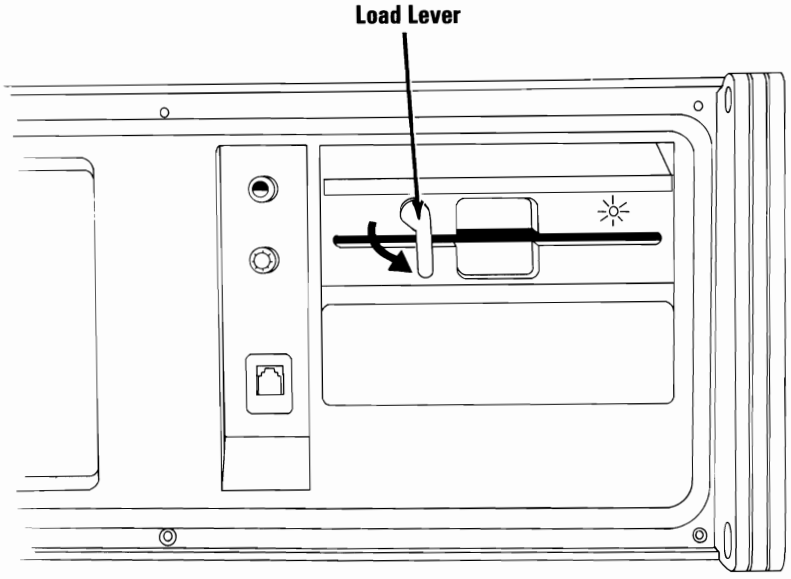
Diskette Drive

The diskette drive is probably the most-used device in your system, besides the keyboard. It is used to load and store programs and data. If two diskette drives are installed in your system unit, the top diskette drive is referred to as drive A and the bottom one as drive B. For proper operation, follow the procedure below:

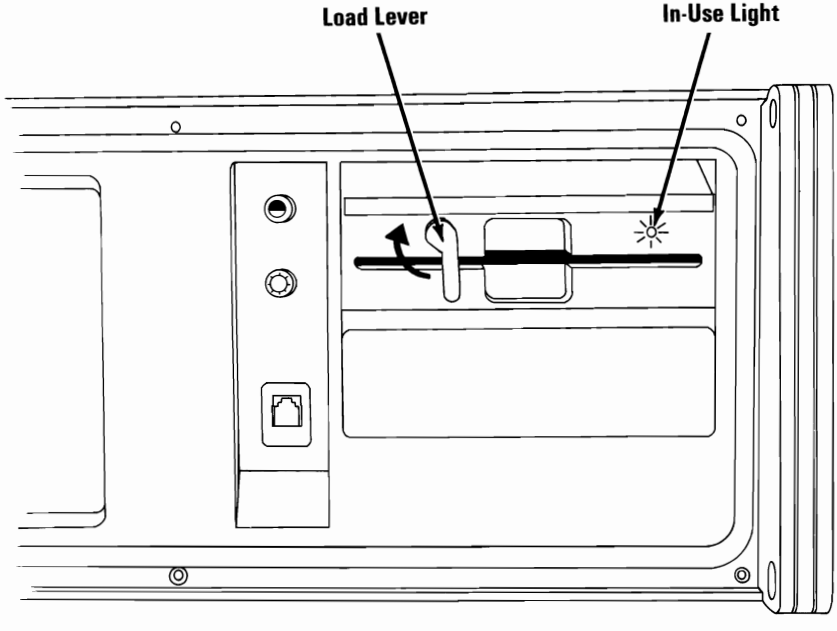
1 Insert the diskette into the drive.



2 Close the diskette drive by rotating the load lever counterclockwise.



3 When the system is using the diskette drive, the In-Use light on the front of the drive will be on. To remove a diskette from the drive, rotate the load lever clockwise and pull out the diskette.

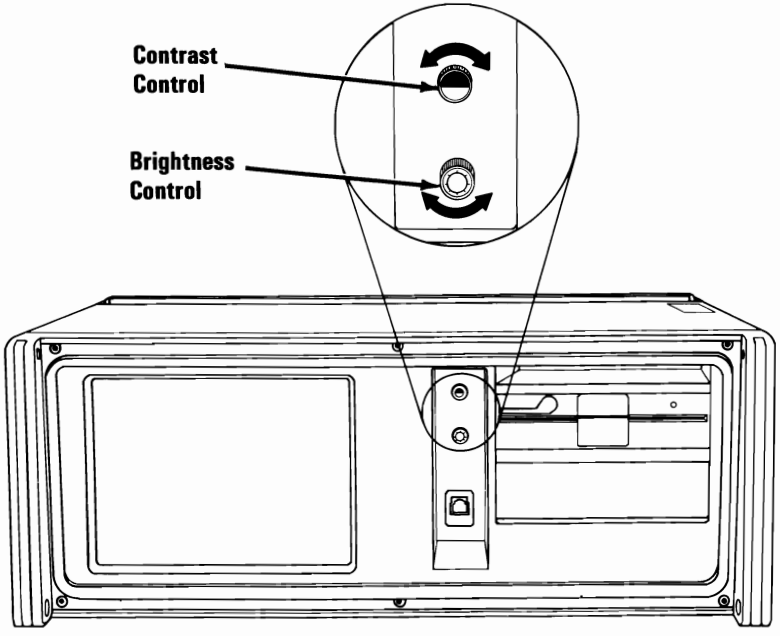


Notes:

IBM Portable Personal Computer Display

Controls

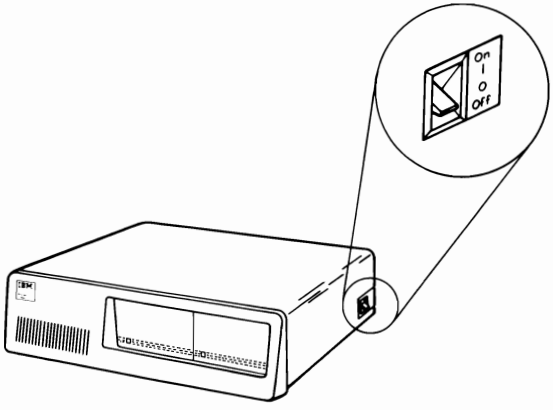
Adjust the Contrast and Brightness controls for eye comfort.



Notes:

Expansion Unit

The expansion unit comes with a fixed disk drive, a fixed disk adapter, a power supply, and a receiver card. An extender card must be installed in the one long expansion slot of your system unit. A cable connects to the extender card and receiver card to complete the electrical connection between the system unit and expansion unit. Six expansion slots are available in the expansion unit where options may be installed. Space also is provided for the installation of an additional fixed disk drive.



The expansion unit has only one control -- the Power switch. Whenever power is to be applied to the IBM Portable Personal Computer, the Power switch on the expansion unit must be set to On first. If this is not done, an error message appears on the display. To recover, set the Power switches on both the system unit and expansion unit to Off. Set the Power switch on the expansion unit to On first, then the Power switch on the system unit.

Notes:

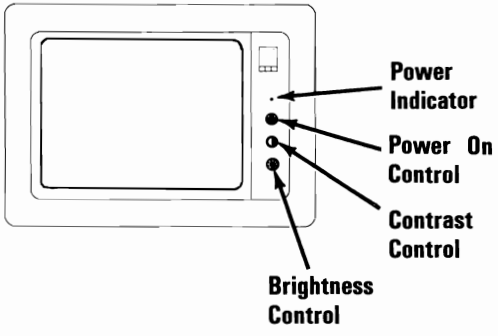
IBM Color Display

Controls

The Power-On control, when turned clockwise, applies power to the IBM Color Display, and removes power when turned counterclockwise. The Power-On indicator lights when the display is on.

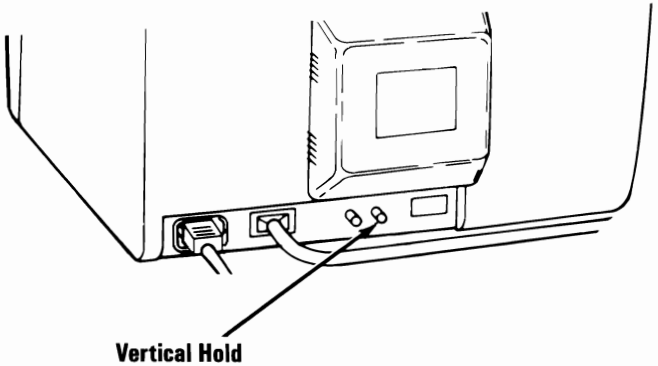
The Brightness control, when turned clockwise, increases the brightness of the entire screen, and reduces the brightness when turned counterclockwise.

When the Contrast control is turned clockwise, it increases the brightness of black, blue, green, cyan, red, magenta, brown, and white, and reduces the brightness of these colors when turned counterclockwise.



Vertical Hold Adjustment

This adjustment is required only if your IBM Color Display has a vertical-hold problem (screen is rolling from top to bottom or from bottom to top.)



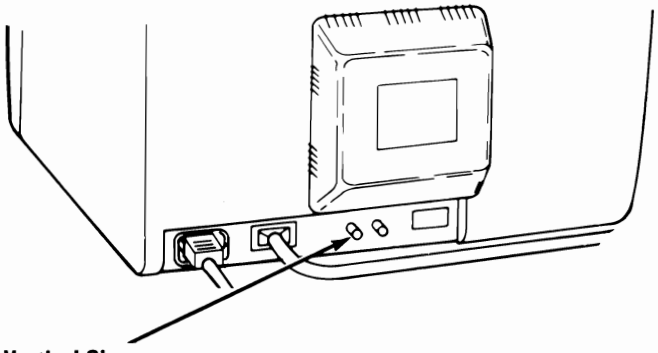
1 Set the Power switch on the system unit, and the Power control on the display, to On.

2 Wait for the POST to finish.

3 Turn the Vertical Hold control clockwise as far as it will go, then turn it counterclockwise until the screen stops rolling and is steady.

Vertical Size Adjustment

This adjustment is required only if the character size on your IBM Color Display is incorrect.



1 Set the Power switch on the system unit to Off. (If the expansion unit is attached, also set its Power switch to Off.)

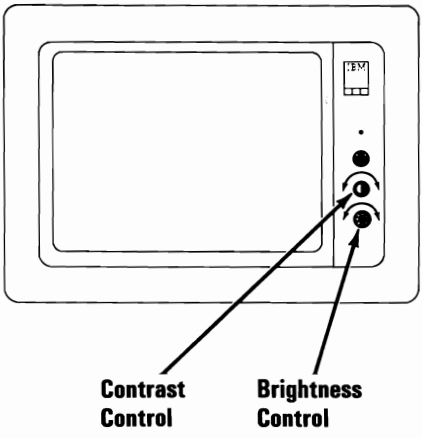
2 Set the display's Power control to On.

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 the black areas at the top and bottom of the screen disappear. If one of the black areas disappears before the other, continue to turn the control until the second black area also disappears.

6 Adjust the Brightness and Contrast controls for eye comfort.



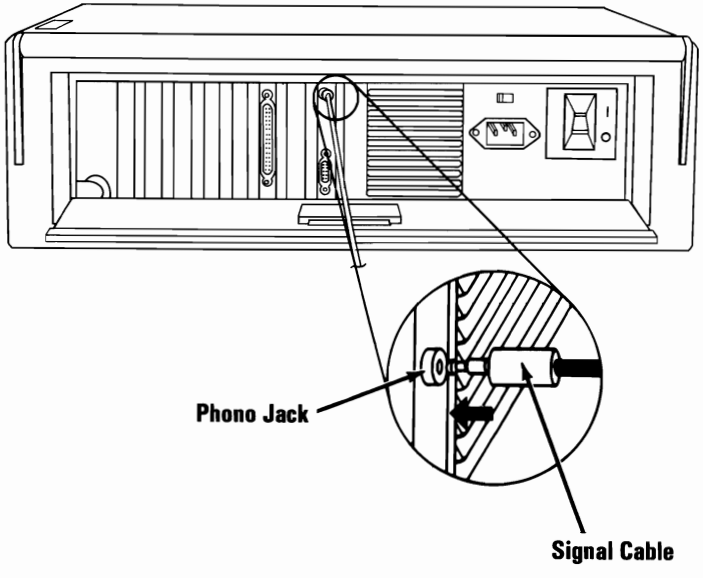
Other Monitors

You can connect an external (75 ohm) composite video monitor or a television to your IBM Portable Personal Computer. An R.F. modulator must be used when connecting a television set.

1 Set the Power switch on the system unit to Off.

2 Unplug the system unit's power cord from the wall outlet.

3 Connect the signal cable from your monitor or from the R.F. modulator to the composite signal phono jack.

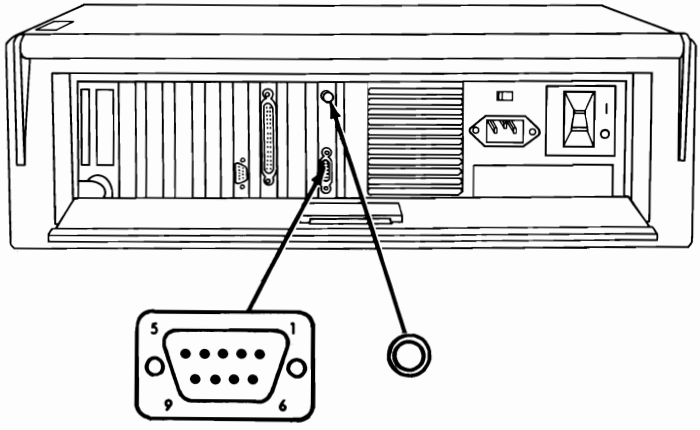


4 Plug the system unit's power cord into the wall outlet.

5 Set the Power switch on the system unit to On.

Note: Only televisions compatible with the U.S. Television Broadcast Standard can be connected to the IBM Portable Personal Computer.

Interface Information



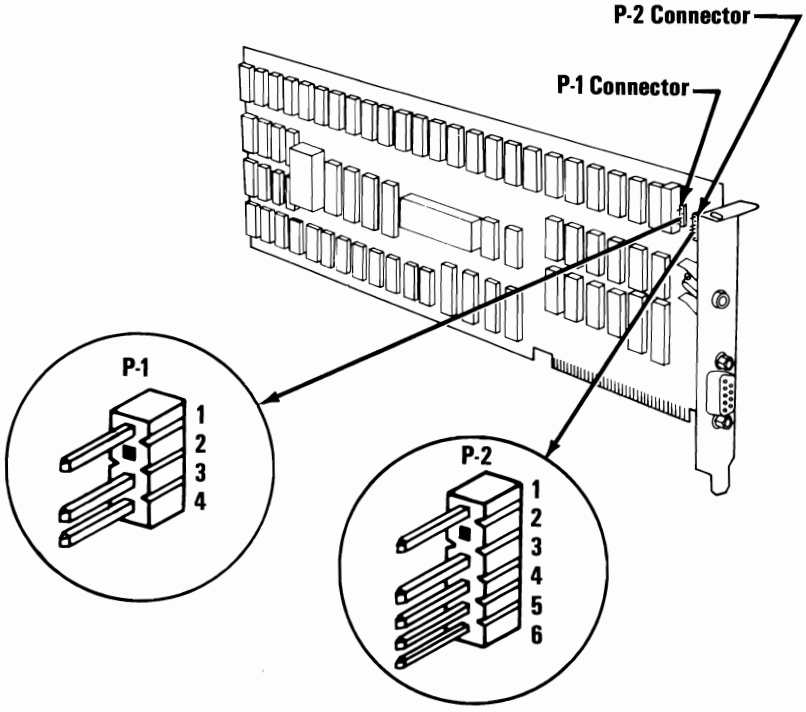
Composite Signal Phono Jack

9 Pin Direct Drive Signal

	Signal Name – Description	Pin	
Direct Drive Monitor	Ground	1	Color/Graphics Monitor Adapter
	Ground	2	
	Red	3	
	Green	4	
	Blue	5	
	Intensity	6	
	Not used	7	
	Horizontal Drive	8	
	Vertical Drive	9	

	Signal Name – Description	Pin	
Composite Monitor	1.5 Volts Video Signal	1	Color/Graphics Monitor Adapter
	Chassis Ground	2	

Auxiliary Connectors



	P-1 Connector	Pin	
IBM Portable Personal Computer Display Connector	+12 Volts	1	Color/Graphics Monitor Adapter Auxiliary Connector
	(Key) Not used	2	
	Composite Video Output	3	
	Logic Ground	4	

	P-2 Connector	Pin	
Light Pen Attachment	+Light Pen Input	1	Color/Graphics Monitor Adapter Auxiliary Connector
	Not used	2	
	+Light Pen Switch	3	
	Ground	4	
	+5 Volts	5	
	+12 Volts	6	

Section 4. Option Installation

Contents

Introduction 4-3

Requirements 4-5
- Installation Requirements 4-5
- Tools Required 4-6

Installation Procedures 4-7

Switch Settings 4-77
- Introduction 4-77
- System Board Switch Settings 4-78
- 64/256KB Memory Expansion Option Switch Setting 4-84
- Extender Card Switch Setting 4-85

Notes:

Introduction

This section, when used with the instructions provided with the purchased option shows you how to install an option in your IBM Portable Personal Computer.

The procedures for the installation of the Math Coprocessor and a second IBM Personal Computer Slimline Diskette Drive are difficult. We strongly recommend that you have IBM or an Authorized IBM Personal Computer Dealer install these options for you.

If you wish to install either of these two options yourself, a complete installation procedure is included in this section. Review the "Installation Requirements" and the "Tools Required" that follow to make sure you have everything you need before you proceed.

Some of the options that you can install may require changes to the switches on the system board or on the option. Switch setting charts are provided at the end of the "Installation Procedures" to show which position the switches must be set to reflect the addition of the option.

Notes:

Requirements

Installation Requirements

- If you have not installed your IBM Portable Personal Computer, go to Section 1, "Introduction/Installation" and install your system unit to ensure that it is working properly. After you have completed your setup you will be told to install your options.

- Provide a flat work surface large enough to hold the system unit and all options you wish to install. Make sure the work area is close to a properly grounded electrical outlet that has enough receptacles to plug in your system unit and the options you are about to install that require their own power source.

- Two adapters are installed in the basic IBM Portable Personal Computer: the 5-1/4 Inch Diskette Drive Adapter and the Color/Graphics Monitor Adapter. If these adapters are removed during the installation of an option they must be returned to the same expansion slot from which they were removed.

- The IBM Portable Personal Computer has five expansion slots available for installation of options. Expansion slot 2 is long enough to fit any option. Expansion slots 4 and 5 can fit options that have an overall length of less than 127-mm (5-in.). Expansion slots 6 and 7 can fit options that have an overall length of less than 120-mm (4-3/4-in.).

- If you have not done so, read the instructions that came with your option. Follow any instructions, then return to these procedures.

Tools Required

- Medium-size, flat-blade screwdriver
- 5.5-mm (7/32-in.) open-ended wrench
- Optional
  - Medium screwstarter
  - 3-mm allen wrench

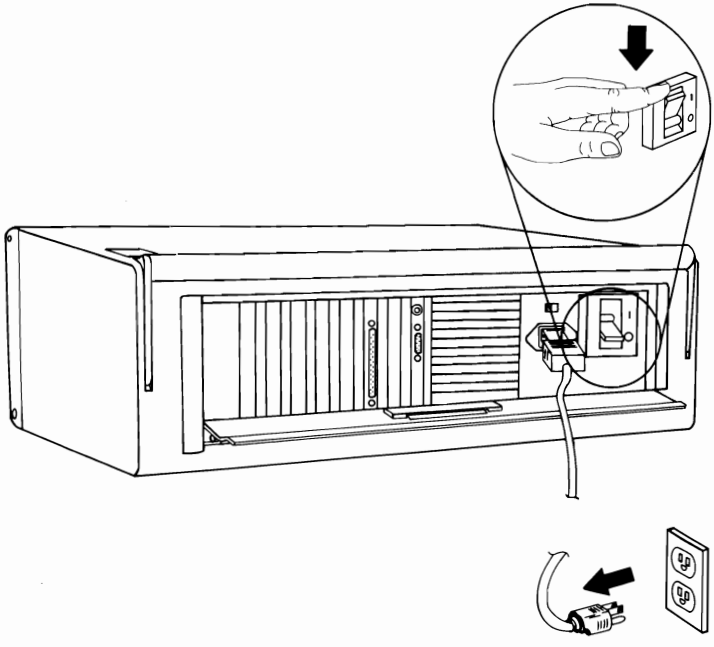
Installation Procedures

1 Set the Power switch on the system unit to Off. (If the expansion unit is attached, also set its Power switch to Off.)

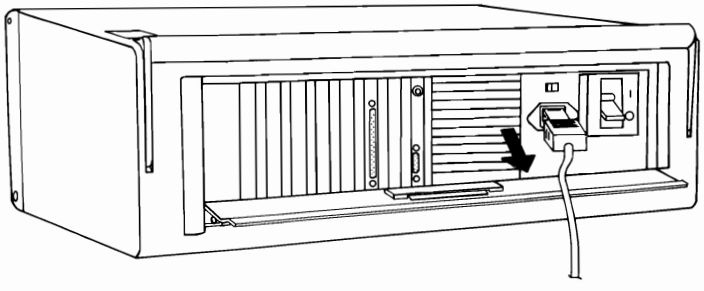
2 Set the Power switches on all external devices to Off.

3 Unplug the system unit's power cord from the wall outlet. (If the expansion unit is attached, also unplug its power cord.)

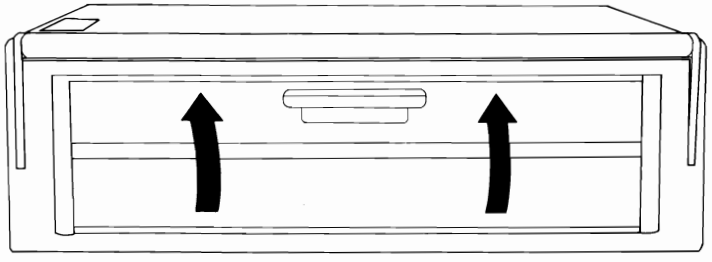
4 Unplug all external-device power cords from the wall outlets.



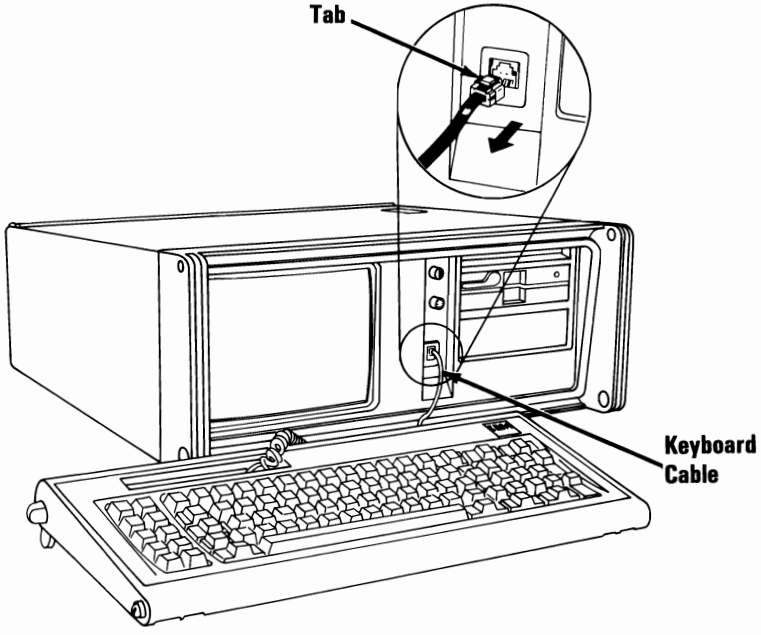
5 Place the system unit so that the rear faces you. Disconnect all cables and the power cord from the rear of the system unit.



6 Close the system access panel.

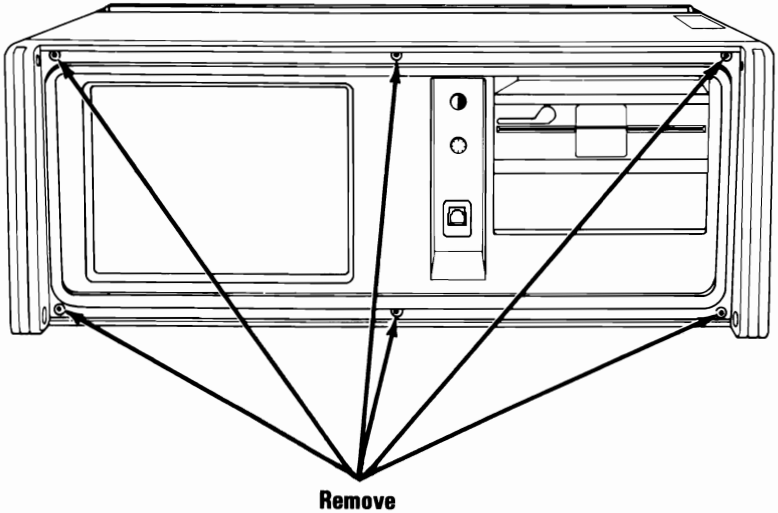


7 Place the system unit so that the front faces you. Disconnect the keyboard cable by pressing the tab on the top of the keyboard cable connector and pulling the connector straight out as shown below.



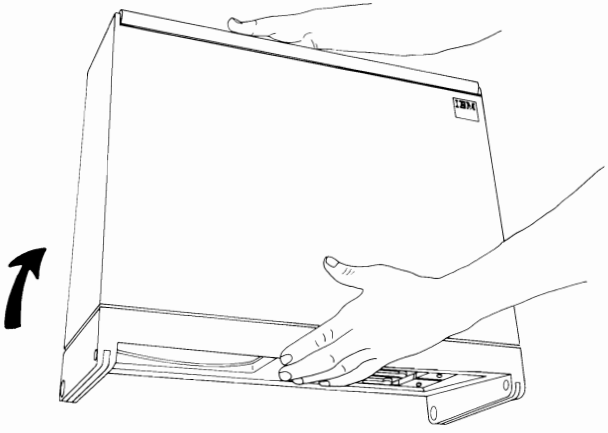
8 Move the keyboard and all external devices away from the work area.

9 Remove the six cover mounting screws on the front panel of the system unit by turning them counterclockwise with a flat-blade screwdriver or a 3-mm allen wrench. Save the screws for installation of the cover.

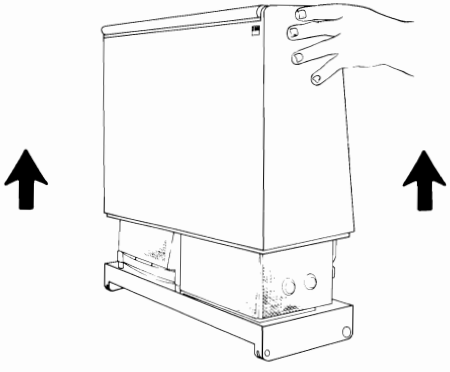


10 Carefully tilt the system unit up so it rests on its front panel.

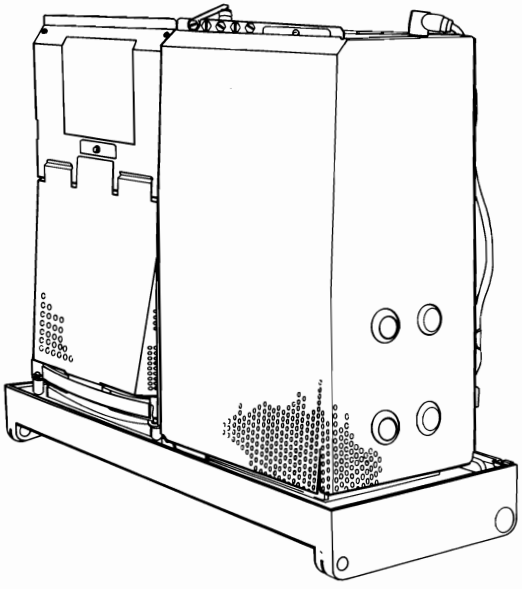
CAUTION
The system unit cover is now loose. Before tilting the system unit up, center it on the work area to ensure it will not fall off the table.

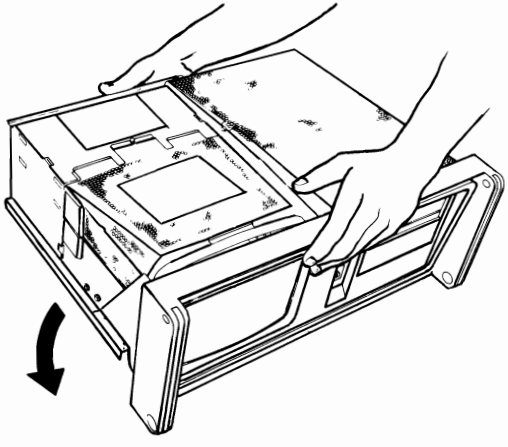


11 Slide the system-unit cover up until it clears the frame of the system unit. Set the cover aside.

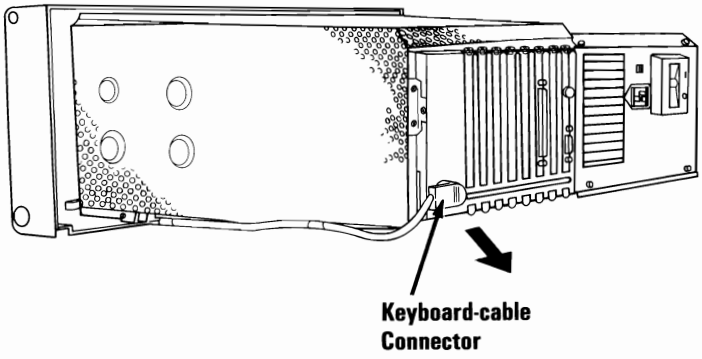


12 Carefully return the system unit to its operating position, as shown below.

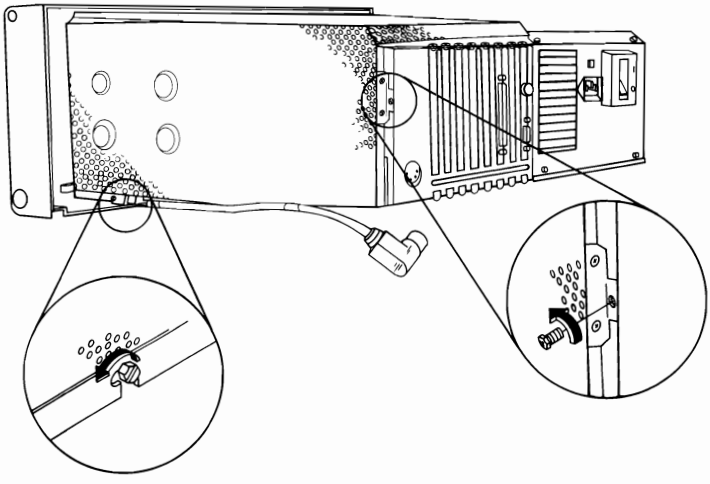




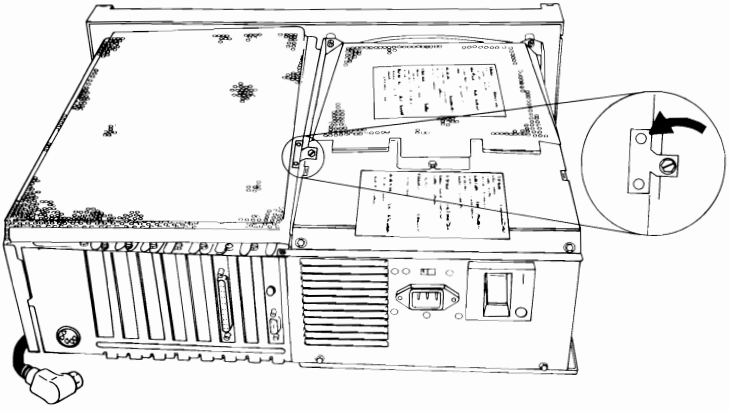
13 Place the system unit so the right side faces you. Disconnect the internal keyboard-cable connector, as shown below.



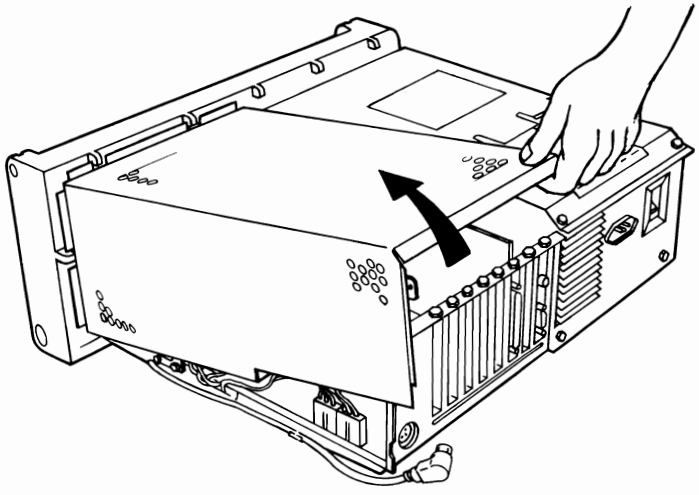
14 Remove the two mounting screws that hold the shield by turning the screws counterclockwise with a flat-blade screwdriver as shown below.



15 Place the system unit so the rear faces you. Remove the third mounting screw on the shield as shown below.

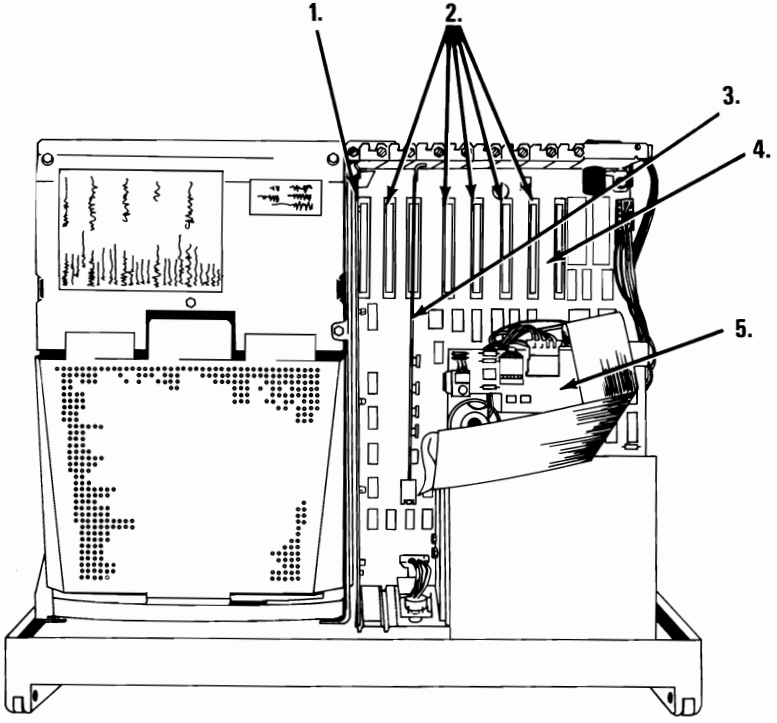


16 Carefully lift the shield from the system unit. Set the shield aside.



17 Study the figure below. It shows you some of the features that will be referred to in the following installation procedures.

1. Color/Graphics Monitor Adapter
2. Expansion slots - connector for internal option cards
3. Diskette Drive Adapter
4. System Board
5. Diskette Drives

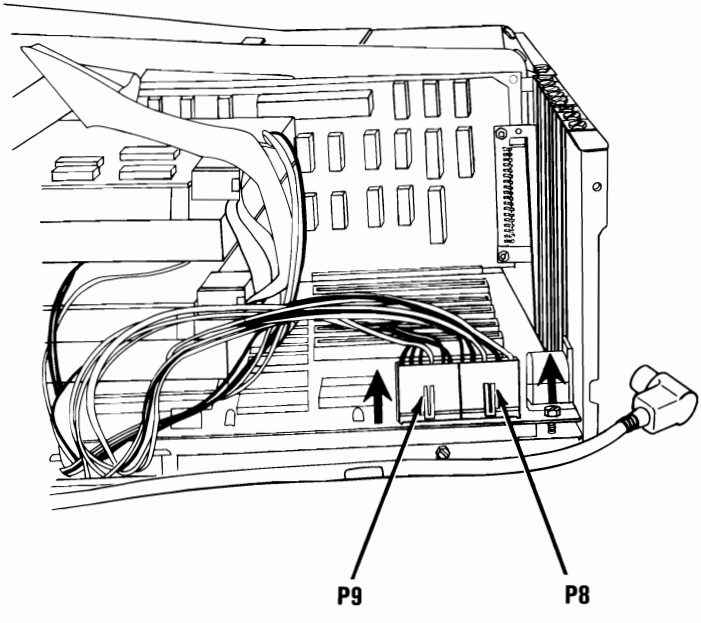


Install your options in the order listed below:

Option to be installed	Go to
o IBM Math Coprocessor	Step 18
o IBM Personal Computer Slimline Diskette Drive	Step 18
o Other internal options	Step 63

18 Place the system unit so the right side faces you. Disconnect power supply connectors P8 and P9 from the system board and move them out of the way.

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



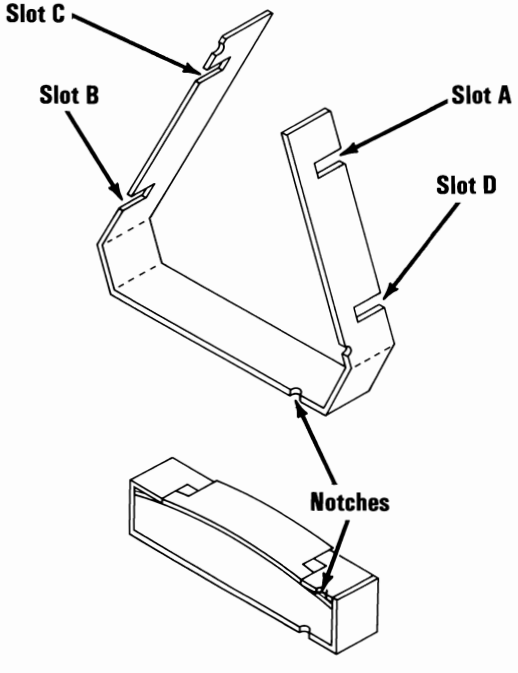
Are you installing an IBM Math Coprocessor?

YES - Continue with the next step.

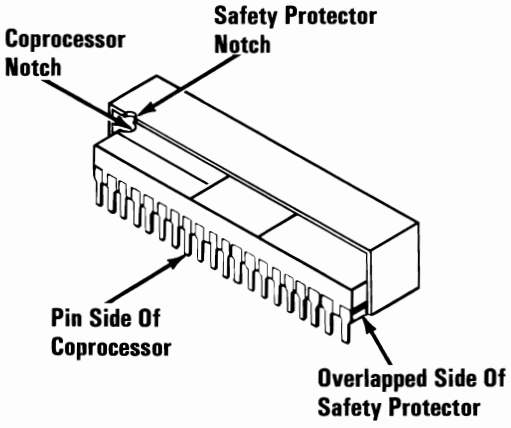
NO - To install the IBM Personal Computer Slimline Diskette Drive, go to step 28.

Note: Before you install the Math Coprocessor, install the safety protector. The Math Coprocessor can be identified by its gold-colored pins.

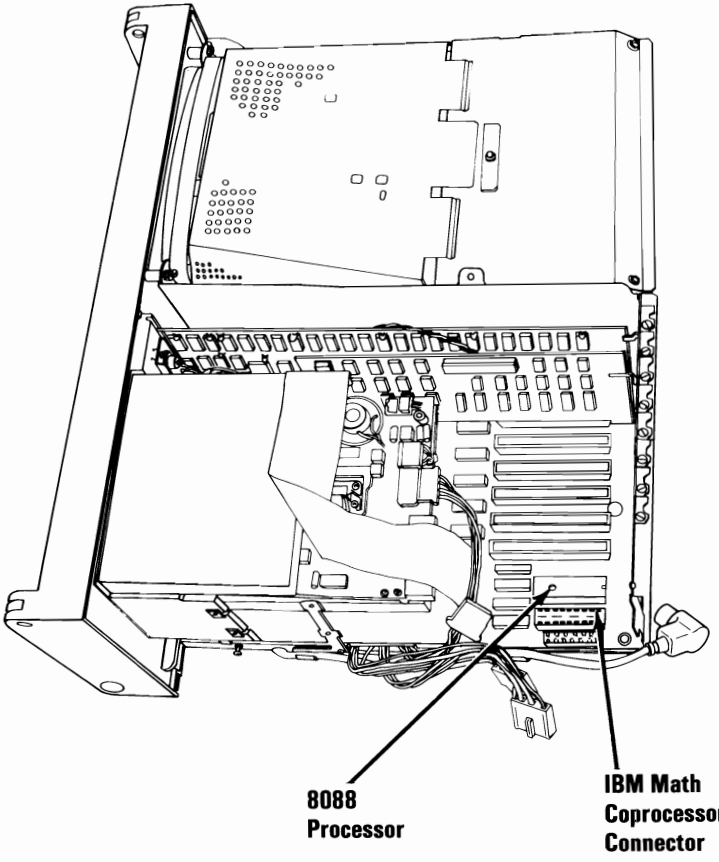
19 Assemble the safety protector as shown in the figure below. Insert slot A into slot B, then insert slot C into slot D.



20 Install the safety protector on the coprocessor as shown below. Make sure the notch in the safety protector is on the same end as the notch in the coprocessor. The overlapped portions of the safety protector should be on the bottom or pin side of the coprocessor.



21 Study the figure below and become familiar with the system board. Note the location of the coprocessor connector on the system board as shown below.

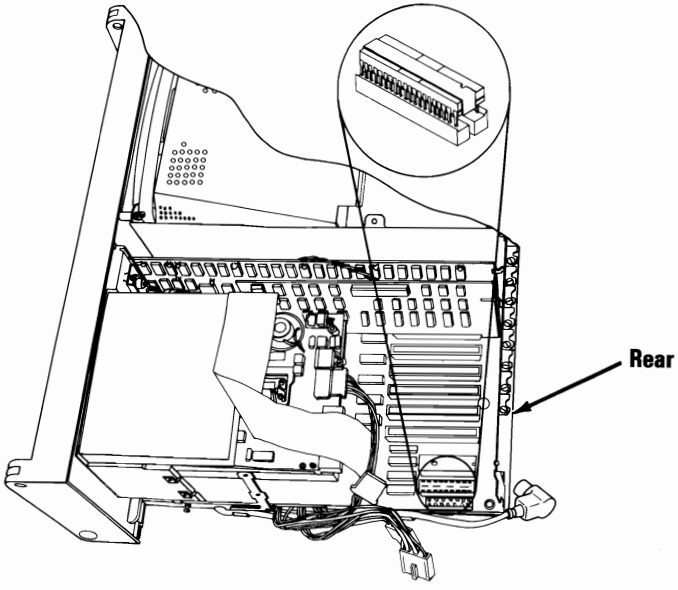


22 Compare your coprocessor with the one in the figure below. Find the notch in your coprocessor safety protector shown in the figure. This notch must face the 8088 processor and be toward the rear of the system board. If this is not possible, the safety protector was not assembled correctly. Go back to step 19.

Warning:

- The coprocessor is static sensitive. Maintain personal grounding by touching the system frame with one hand while installing the coprocessor.
- Incorrect placement of the coprocessor can result in damage to the system board or the coprocessor.
- The pins on the coprocessor are easily bent.

23 Carefully align the pins to the connector and firmly press the coprocessor into place.

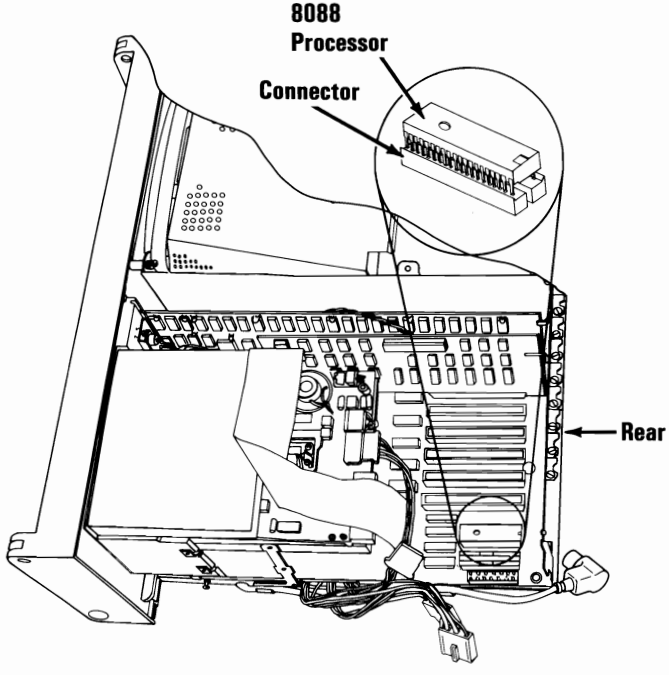


Note: You must change the 8088 processor to ensure compatibility with the IBM Math Coprocessor.

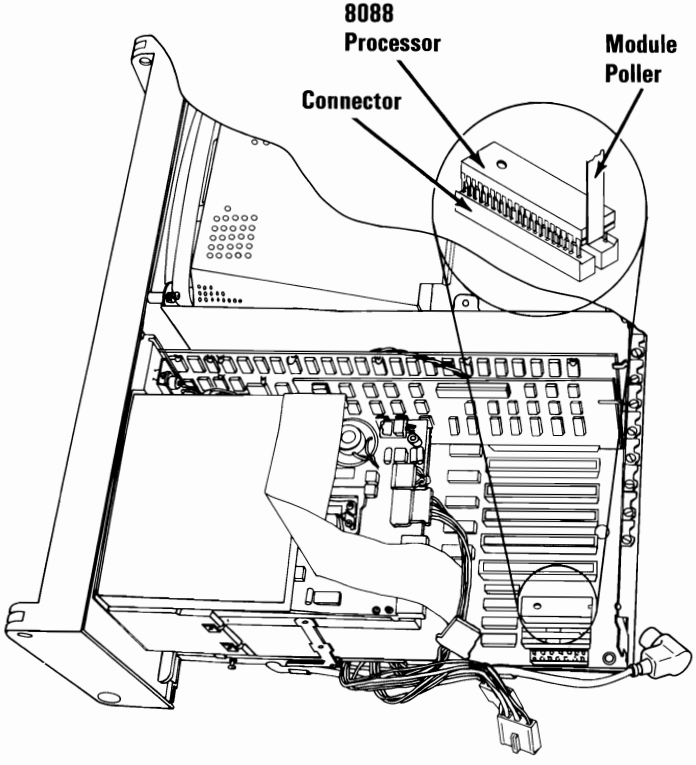
Warning:

- The 8088 Processor is static sensitive. Maintain personal grounding by touching the system frame with one hand while removing the 8088.
- When inserting the module puller at the end of the 8088 that faces the rear of the system unit, be careful not to damage the components mounted on the system board.

24 Study the figure below and become familiar with the system board. This shows the location of the 8088 Processor.



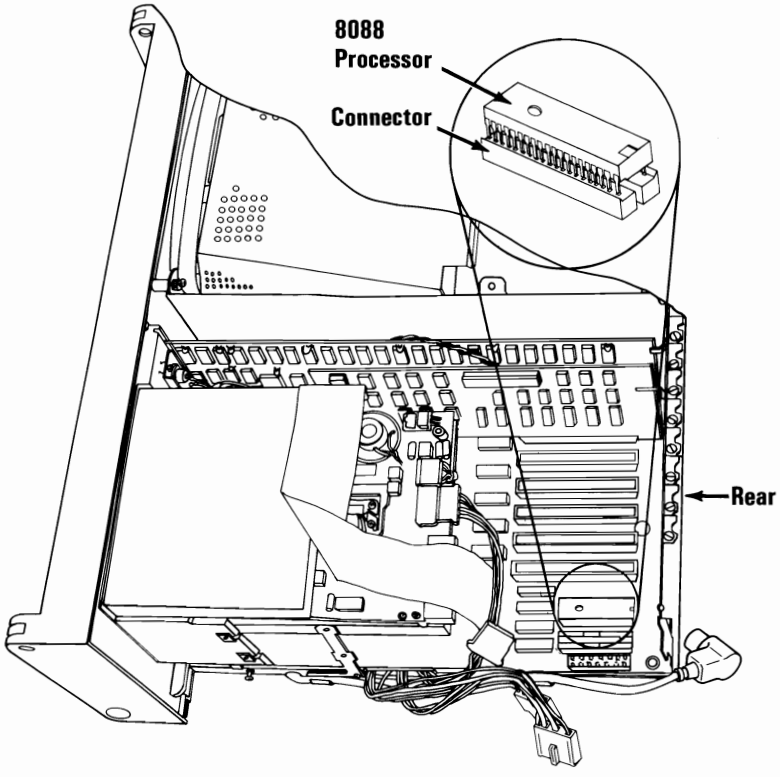
25 Carefully insert the module puller between one end of the 8088 and its connector as shown below. Rock the module puller from side to side until the end of the 8088 raises slightly. Repeat this procedure at alternate ends until the 8088 is free of the connector. Remove the 8088 from the system board and set it aside.



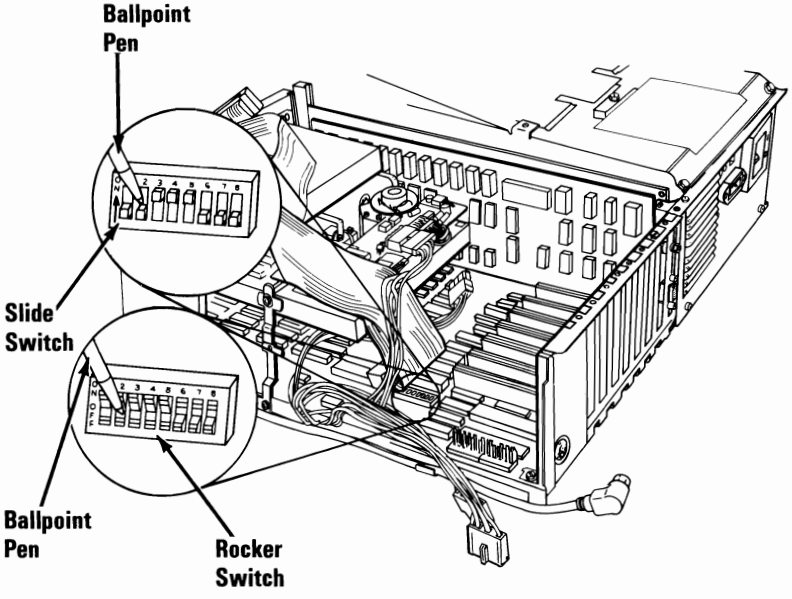
Warning:

- The 8088 Processor is static sensitive. Maintain personal grounding by touching the system frame with one hand while installing the 8088 processor.
- Incorrect placement of the 8088 can result in damage to the system board or to the 8088.
- The pins on the 8088 are easily bent.

26 The new 8088 processor can be identified by its shiny plastic surface. Be sure the notch in the 8088 is facing the rear of the system unit. Carefully align the pins with the connector and firmly press the new 8088 in place.



27 You must set a system board switch to reflect the installation of the IBM Math Coprocessor Option. Study the figure below. There are two types of switch blocks on the system board: rocker switch block and slide switch block. Identify the type of switches on your system board. Set Switch 2 to the Off position.



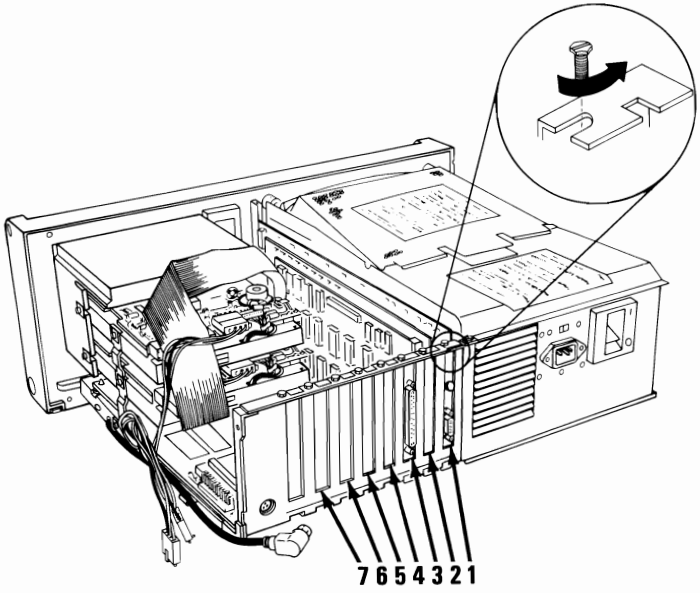
Do you have another internal option to install?

YES - Go to Step 17.

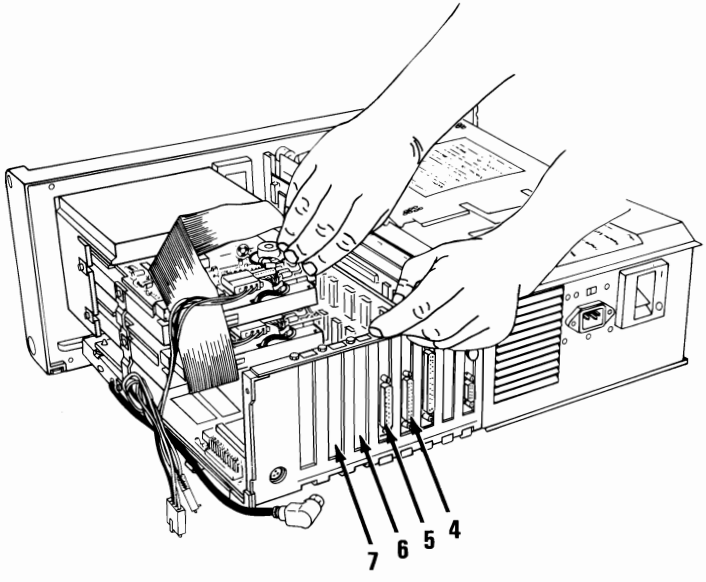
NO - Make sure you set your system board switch, then go to Step 62 to install your covers.

28 Place the system unit so the rear faces you. Remove the screws that hold the adapter retaining brackets on all Adapter cards with a flat-blade screwdriver or a 5.5-mm (7/32-in.) open-ended wrench.

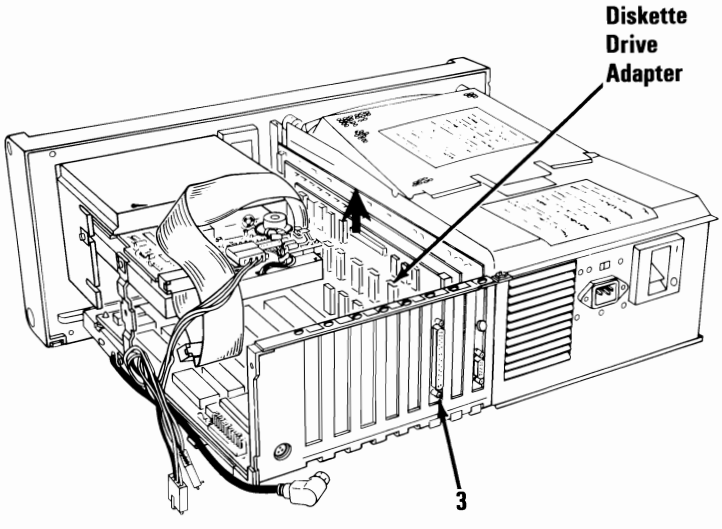
- Expansion slot 1 - Color/Graphics Monitor Adapter
- Expansion slot 2
- Expansion slot 3 - Diskette Drive Adapter
- Expansion slot 4
- Expansion slot 5
- Expansion slot 6
- Expansion slot 7



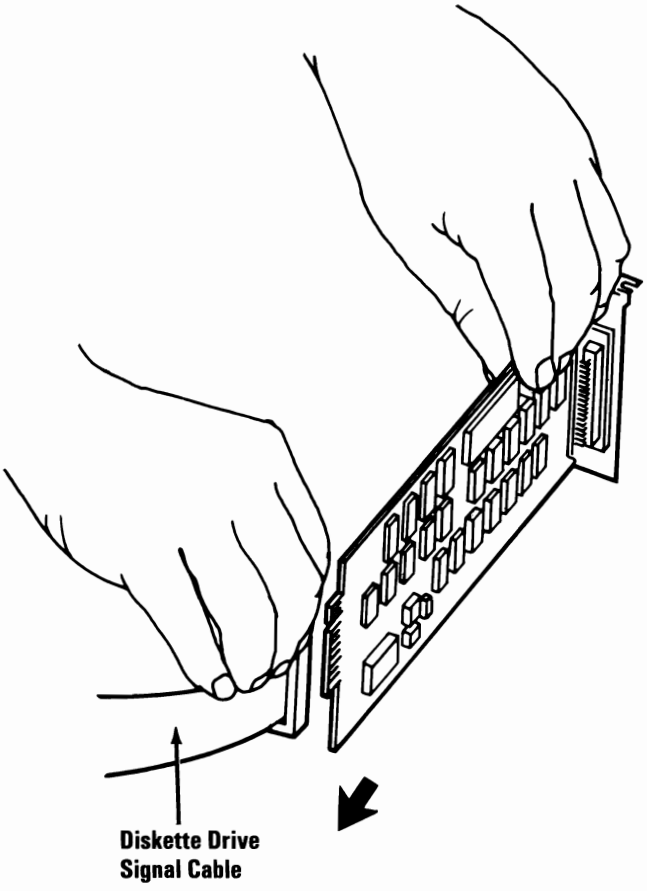
29 If you have an option installed in expansion slots 4 through 7, grasp the option by the top corners and pull straight up until it is loose from the expansion slot. Set the option aside.



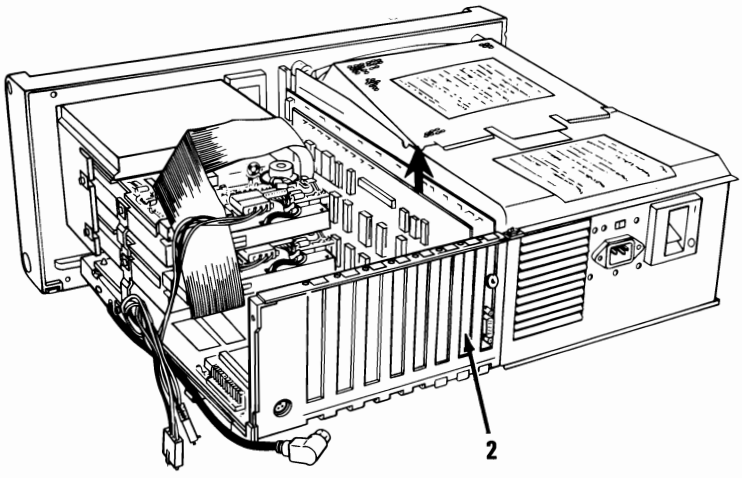
30 Grasp the Diskette Drive Adapter in expansion slot 3 by the top corners and pull straight up until it is loose from the expansion slot.



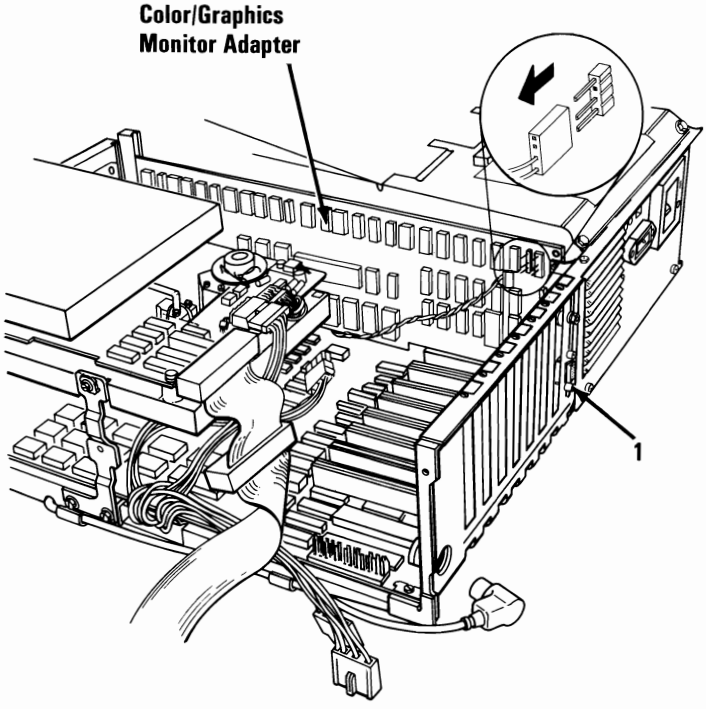
31 Disconnect the Diskette Drive Signal Cable from the front of the adapter. Set the Diskette Drive Adapter aside.



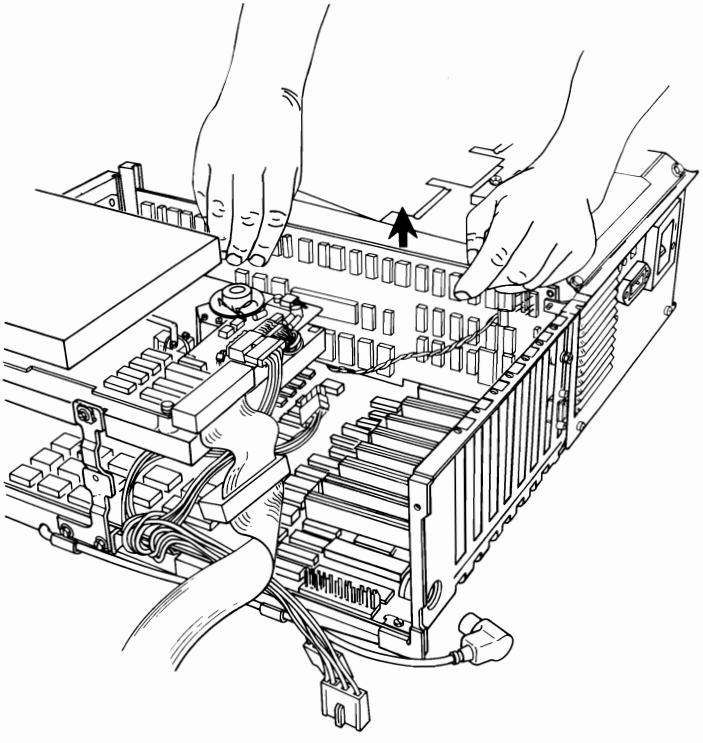
32 If you have an option installed in expansion slot number 2, grasp the option by the top corners and pull straight up until it is loose from the expansion slot. Set the option aside.



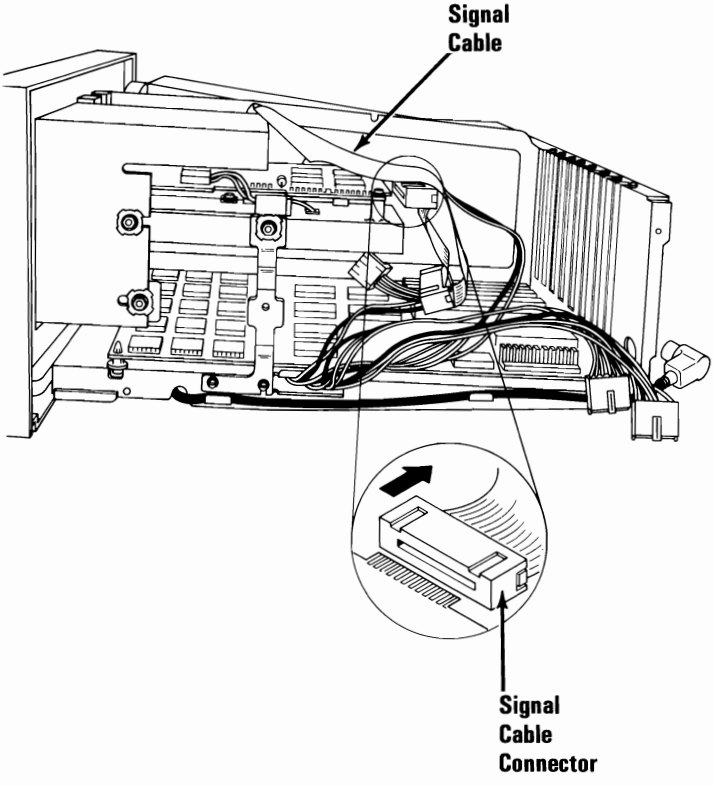
33 Before removing the Color/Graphics Monitor Adapter in expansion slot 1, disconnect the 3-pin connector that comes from the display as shown in the figure below.



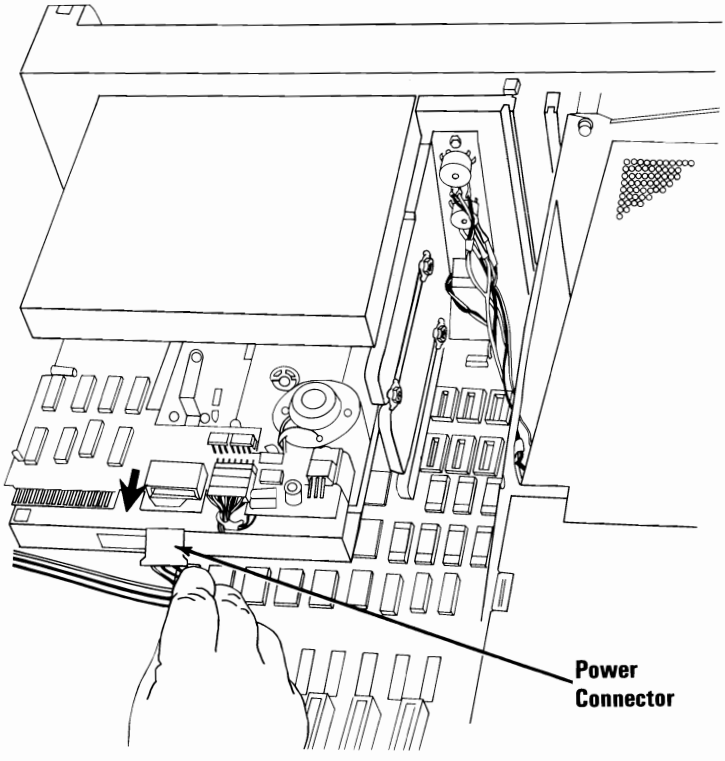
34 Grasp the Color/Graphics Monitor Adapter by the top corners and pull straight up until it is loose from the expansion slot. Set the adapter aside.



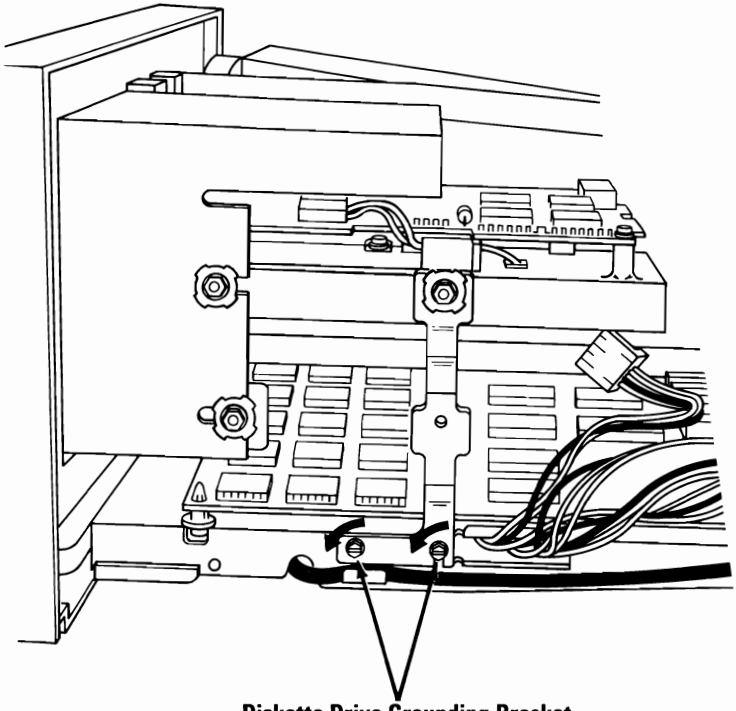
35 Disconnect and remove the signal cable from the back of your diskette drive. Set the cable aside.



36 Disconnect the power connector P10 or P11 from the diskette drive.

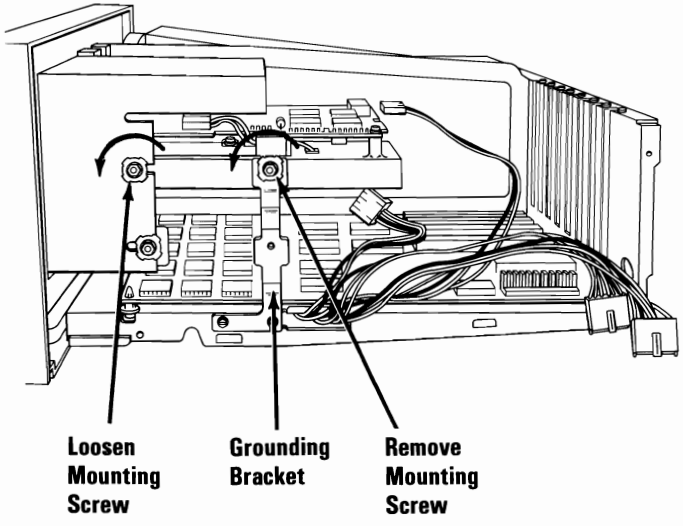


37 Place your system unit so that the right side faces you. Use a flat-blade screwdriver or a 5.5-mm (7/32-in.) open-ended wrench and remove the two mounting screws that hold the diskette drive grounding bracket.

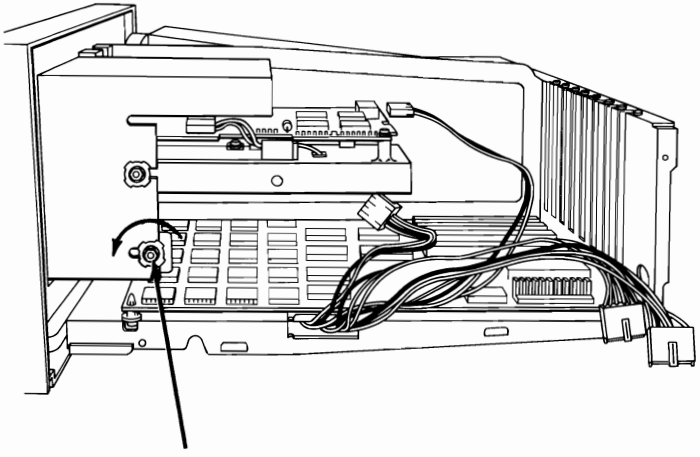


Diskette Drive Grounding Bracket Mounting Screws

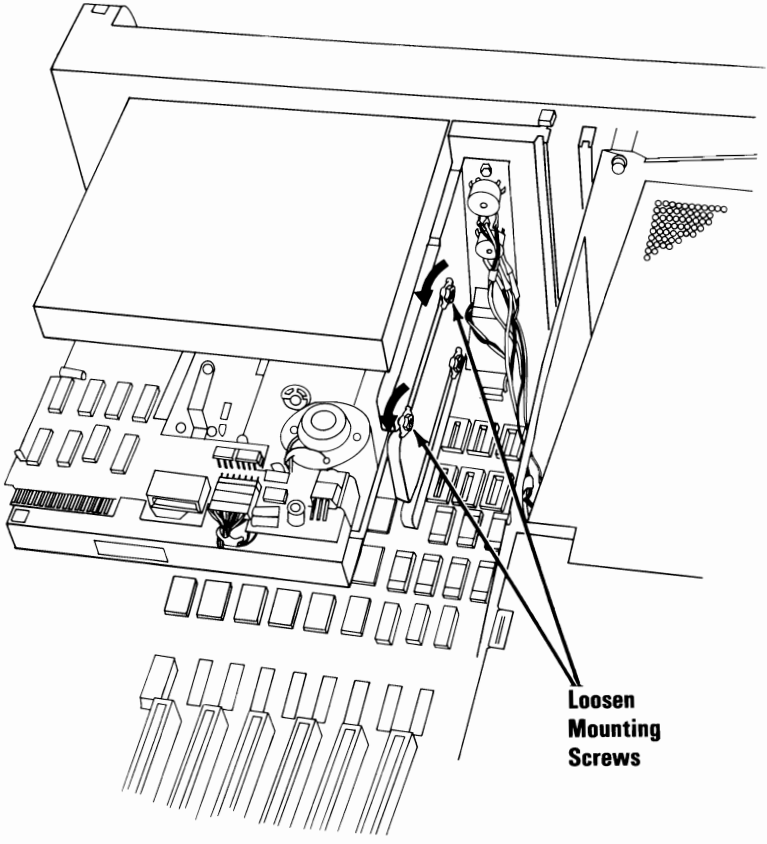
38 Use a 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench and remove the right diskette drive mounting screw. Loosen the left diskette drive mounting screw. Remove the grounding bracket and place it aside.



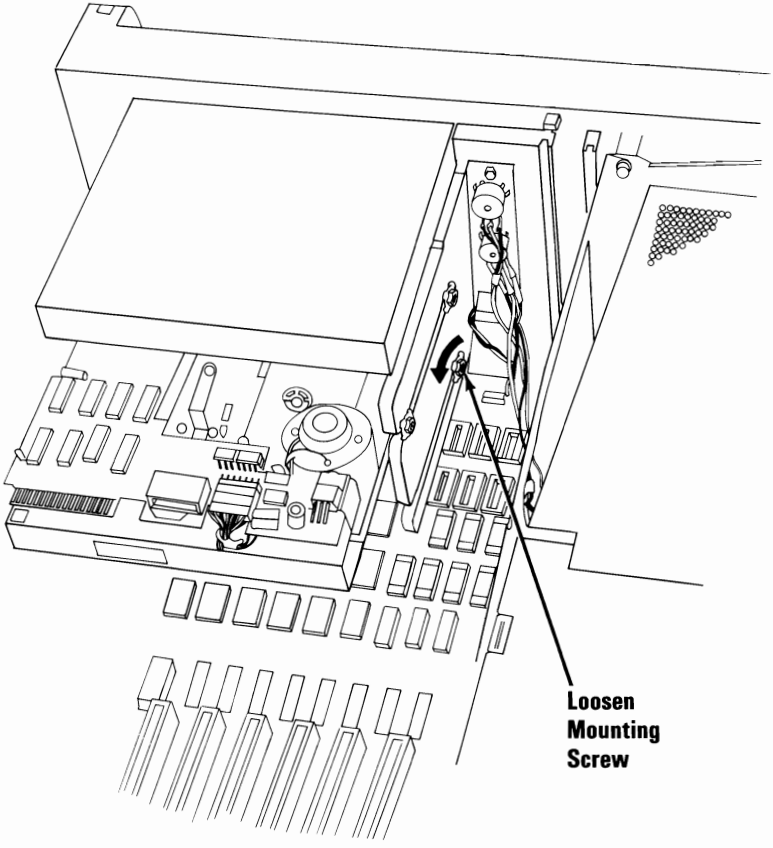
39 Loosen the mounting screw to the front-panel face plate with a 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench.



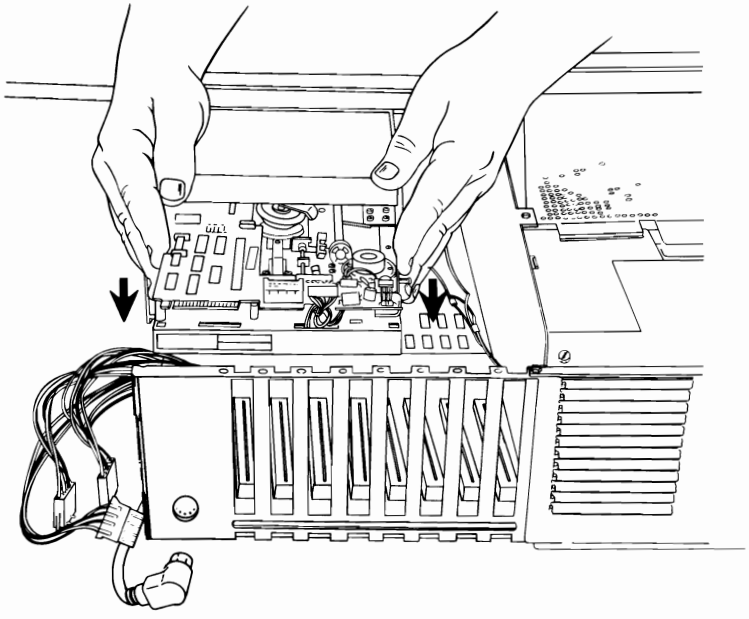
40 Place the system unit so the rear faces you. Use a 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench to loosen the diskette drive mounting screws on the right side (Do not remove the screws from the threaded screw holes).



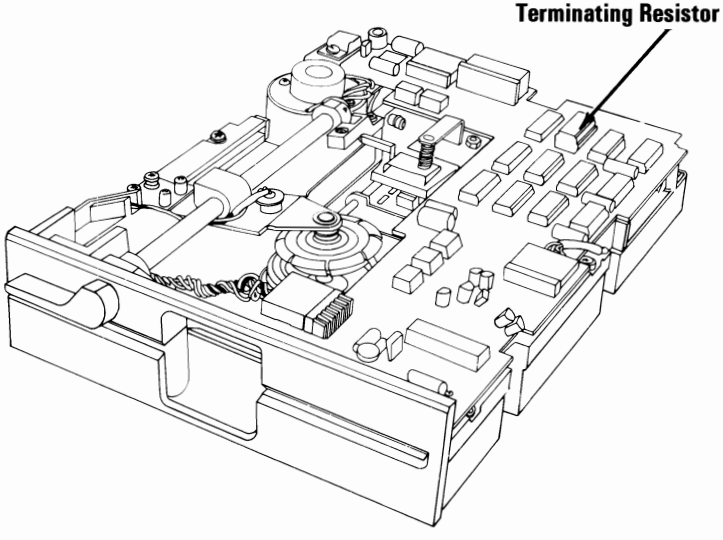
41 Loosen the mounting screw to the front-panel face plate with a 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench.



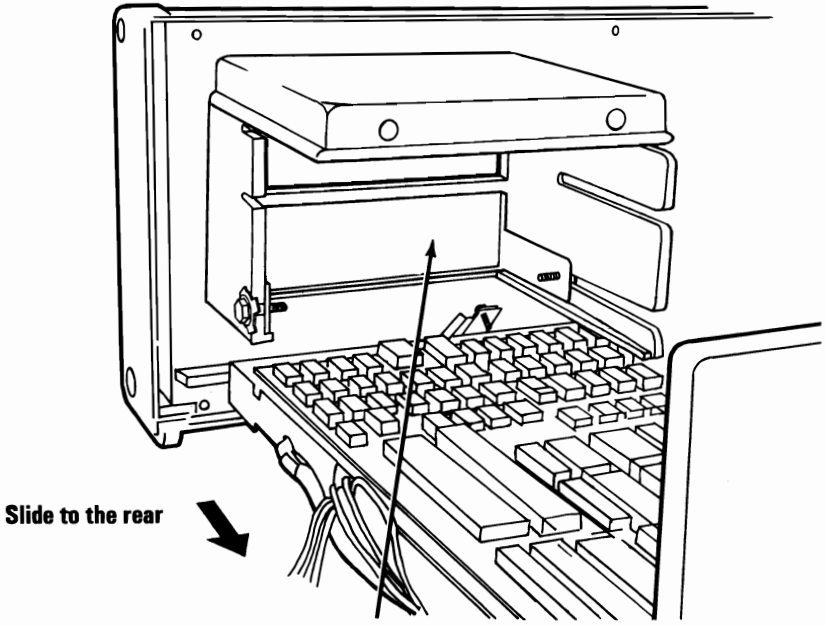
42 Slide the diskette drive out of its mounting bracket by sliding it to the rear. Set the diskette drive aside.



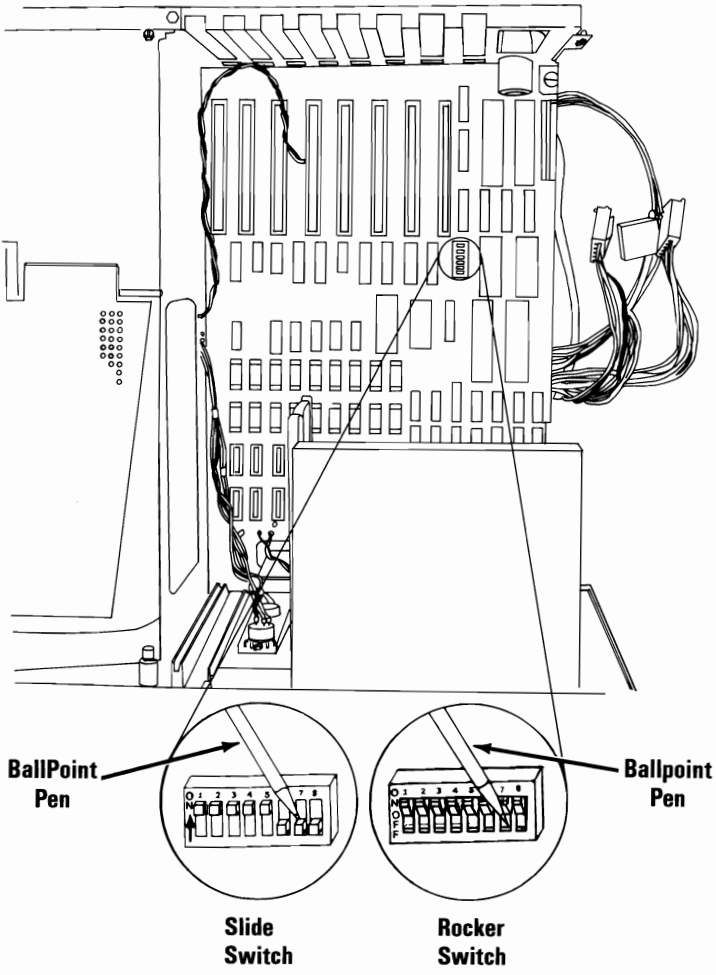
43 Study the figure below and note the location of the terminating resistor on the diskette drive you just removed (drive A). Make sure this diskette drive with the terminating resistor is installed in the top position. Ensure that the lower diskette drive (drive B) does not have the terminating resistor installed.



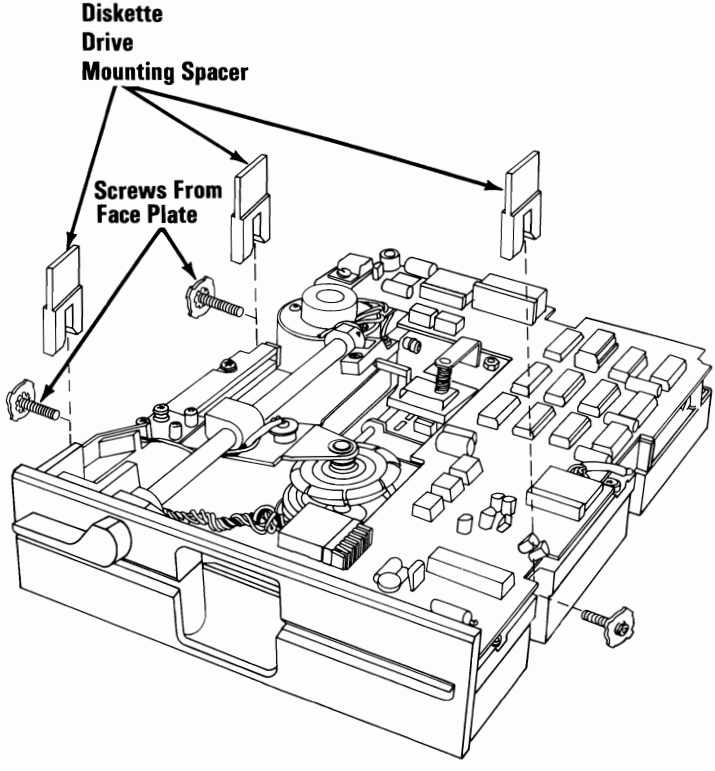
44 Slide the front-panel face plate to the rear and set it on the work area. Remove the two mounting screws and use them for the installation of your new diskette drive.



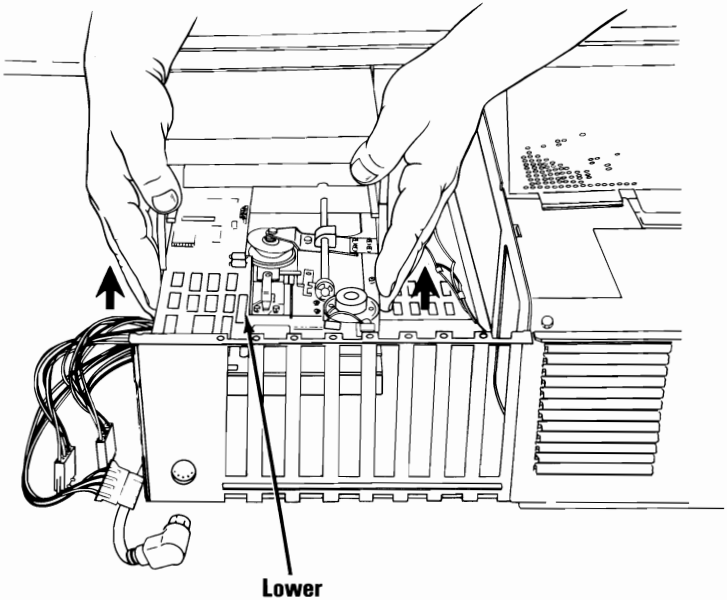
45 You must set a system board switch to reflect the installation of your second diskette drive. Study the figure below. There are two types of switch blocks on the system board: rocker switch block and slide switch block. Identify the type of switches on your system board. Set Switch 7 to the Off position.



46 Set your new diskette drive on a flat surface. Install the two mounting screws just removed from the front-panel face plate in the threaded screw holes on the left side of the new diskette drive. Install one of the two screws that came with your option in the front mounting hole on the right side of the new diskette drive. **Do not tighten.** Note the location of the three diskette drive mounting spacers in the figure below, slide them over the screws, and ensure that they are positioned in the recesses provided.

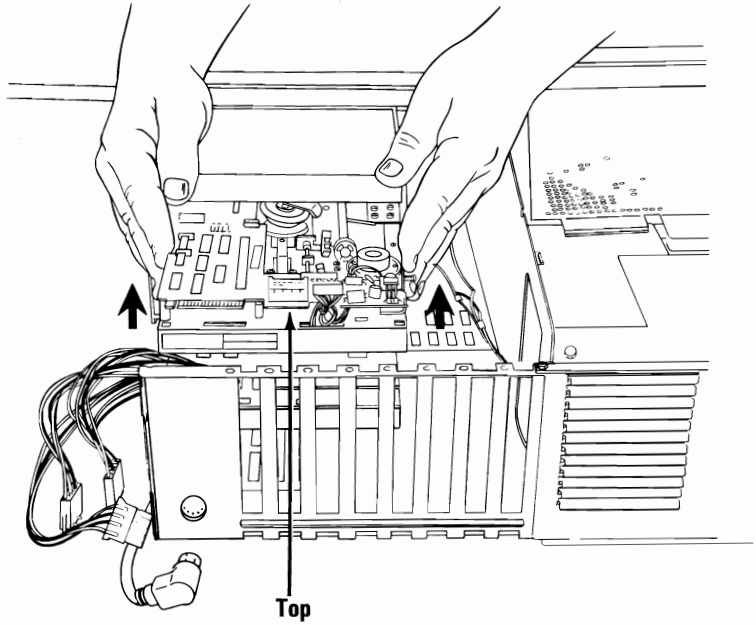


47 Install the new diskette drive (drive B) by sliding it into the lower mounting brackets as shown in the figure below. Be sure that the three diskette drive mounting spacers are located between the diskette drive and the mounting brackets.

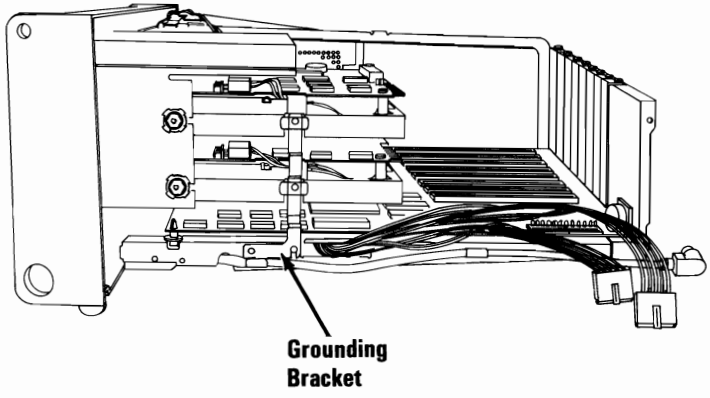


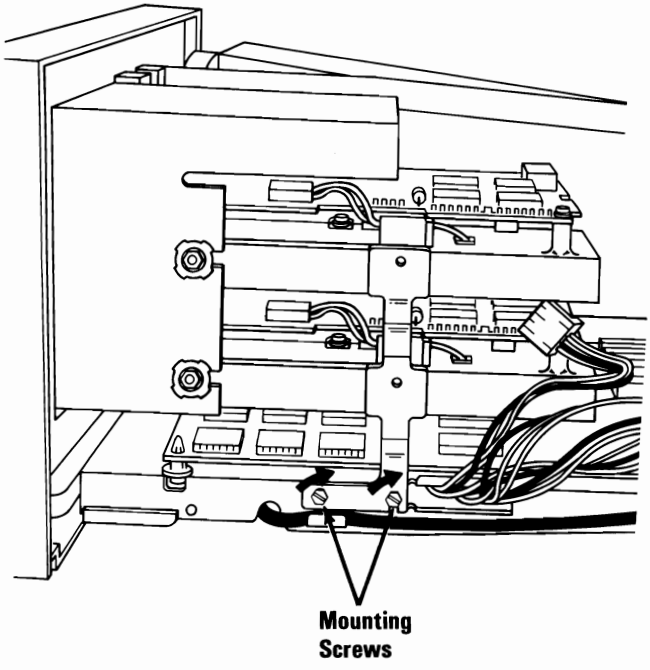
48 Install the top diskette drive (drive A) by sliding it into the top mounting brackets as shown below.

Note: Make sure this diskette drive has the terminating resistor installed on it and that the three diskette drive mounting spacers are positioned correctly.

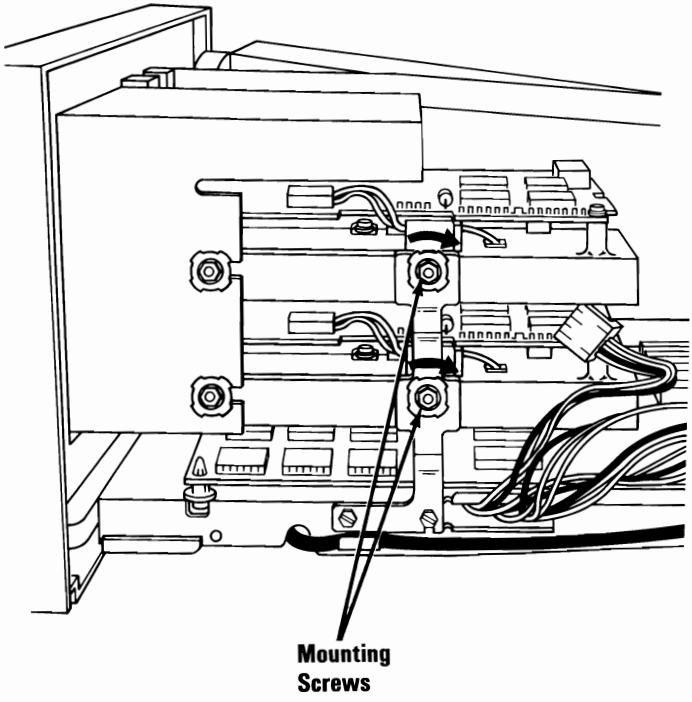


49 Place the system unit so the right side faces you. Place the grounding bracket as shown below and insert the two grounding bracket mounting screws in the threaded screw holes. **Do not tighten.**

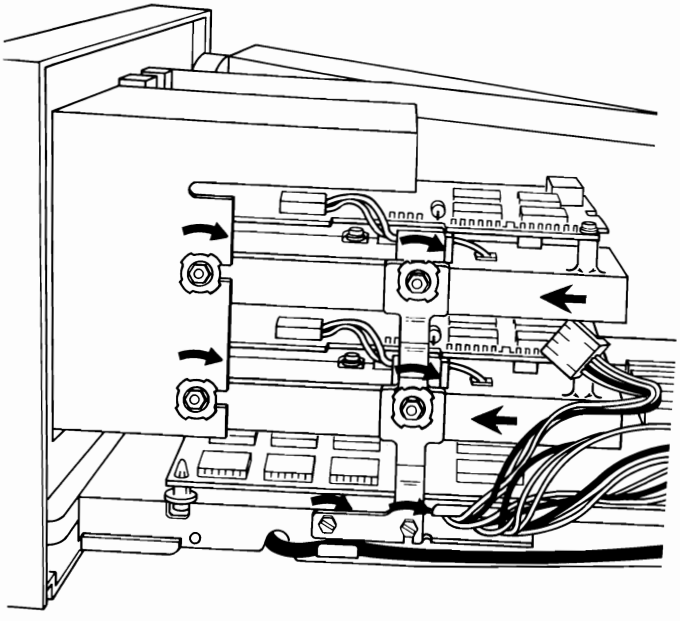




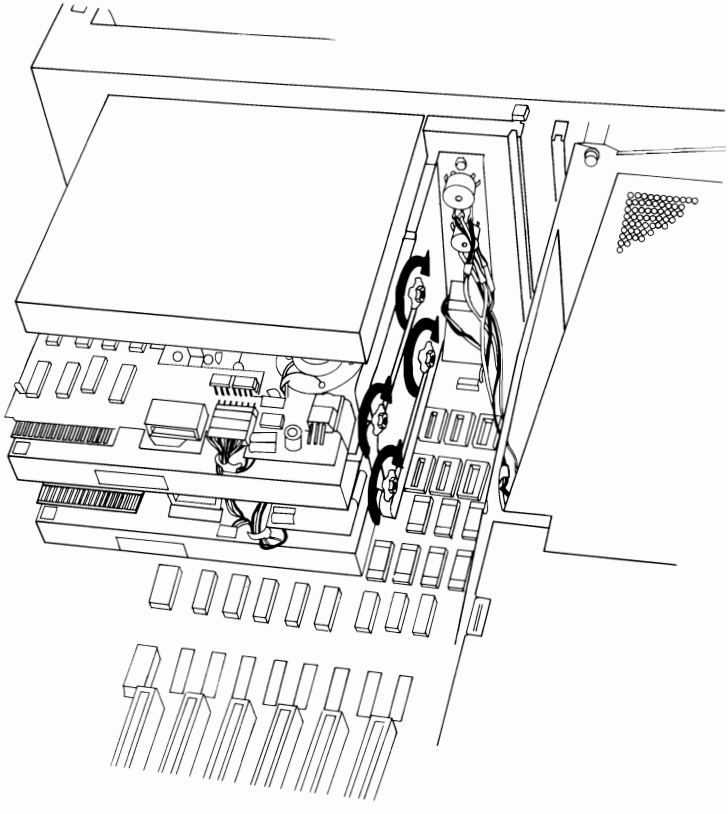
50 Insert the diskette drive mounting screws into the right diskette drive mounting holes. **Do not tighten.**



51 Align the diskette drives so they are flush (tight against) with the front panel. Use a flat-blade screwdriver, 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench to tighten the diskette drive mounting screws and two diskette drive grounding bracket screws.

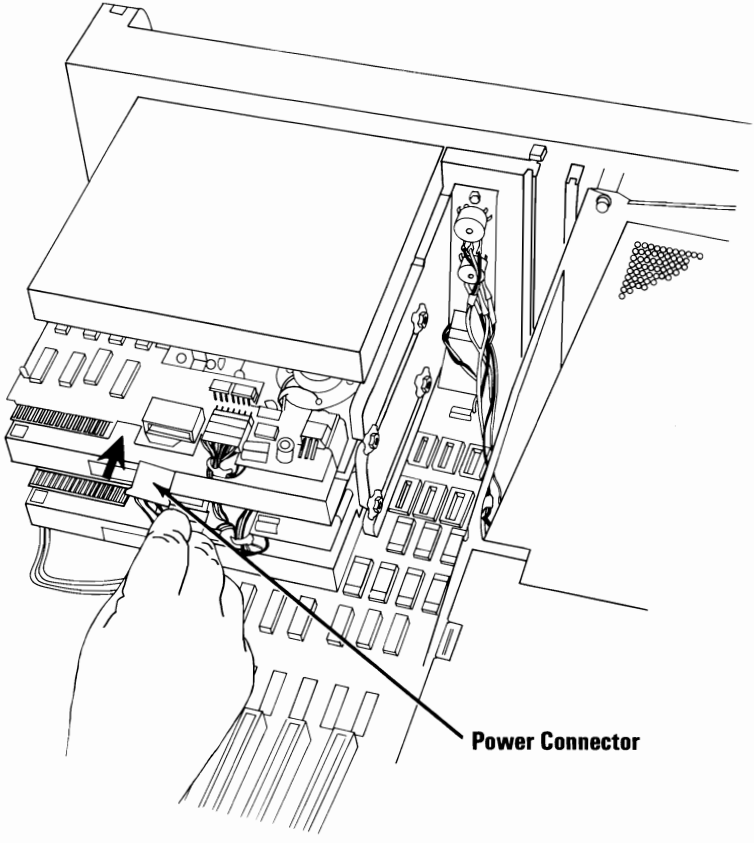


52 Place the system unit so the rear faces you. Use a 5.5-mm (7/32-in.) open-ended wrench or a 3-mm allen wrench to tighten the screws mounted on the right side of the diskette drives.

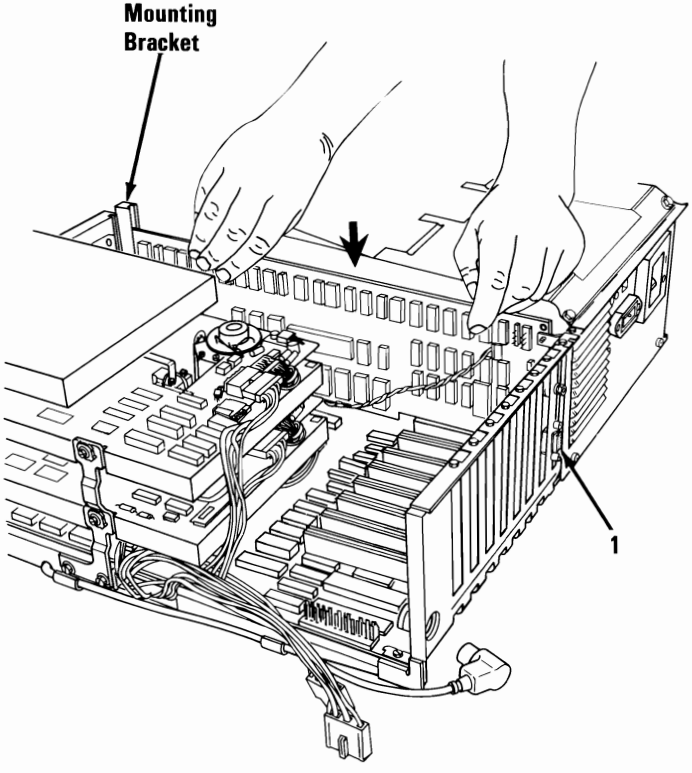


53 Connect the power connectors (P10, P11) to your diskette drives.

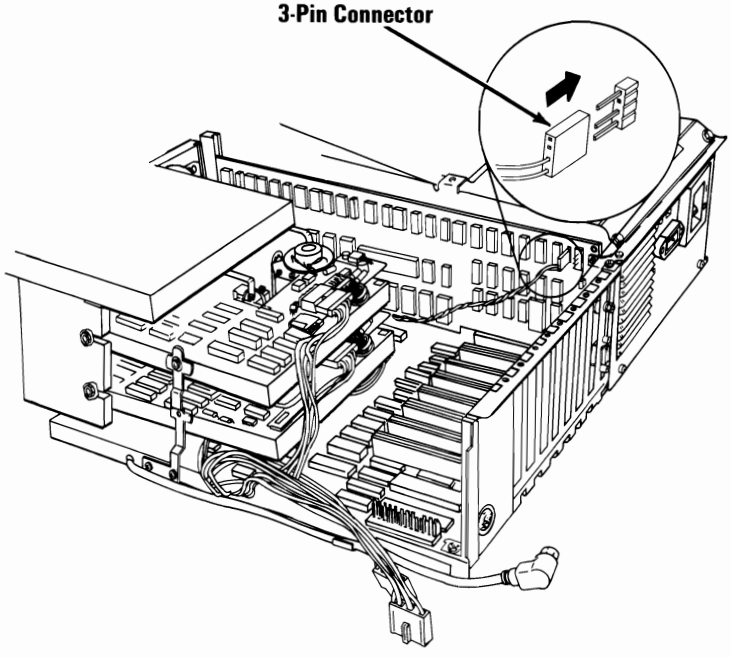
Note: The diskette drive power connectors can be connected to either drive.



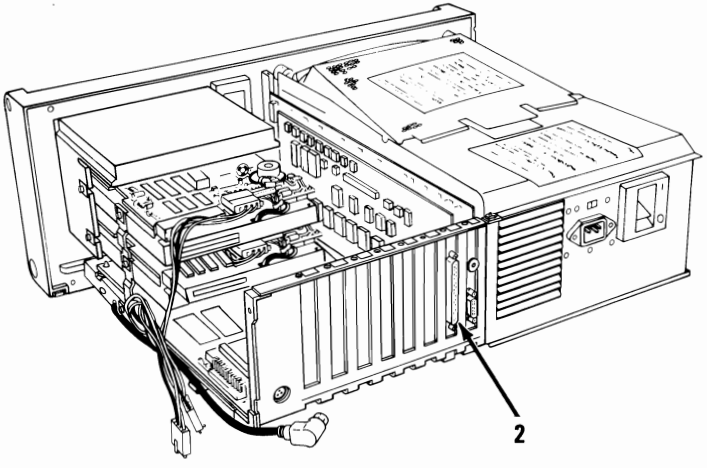
54 Install your Color/Graphic Monitor Adapter by holding the top corners and firmly press the adapter into expansion slot 1. Make sure the front of the adapter is seated in the slotted mounting bracket on the front panel.



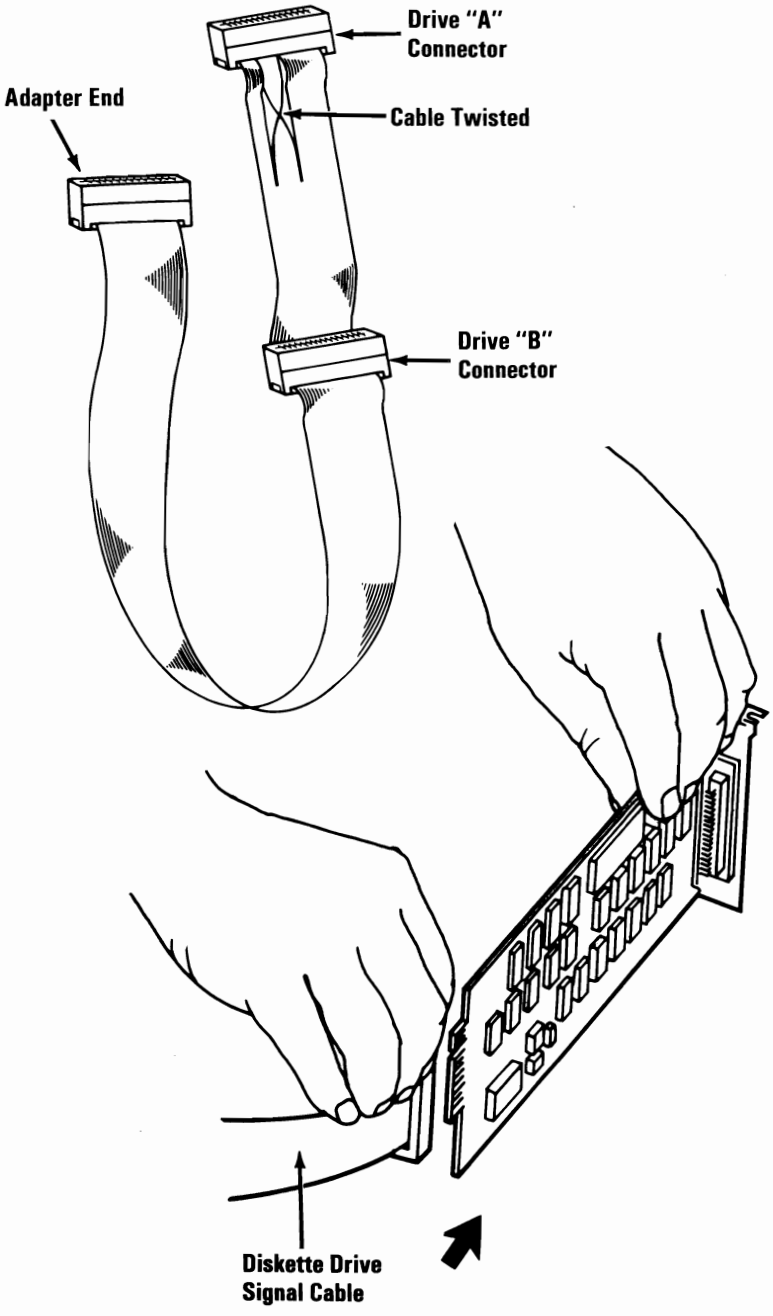
55 Connect the 3-pin connector from the display cable to the three pins at the rear of the option. As shown in the figure below.



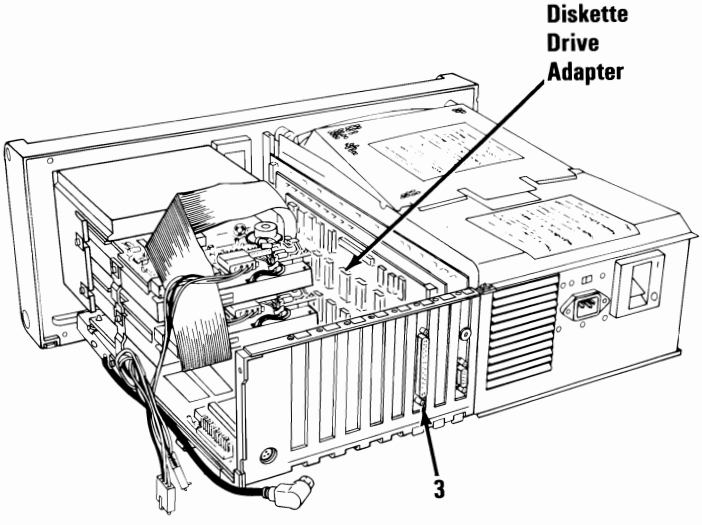
56 If you removed an option from slot number 2, install the option by holding the top corners and firmly press the option into the expansion slot. If this option is as long as the Color/Graphics Monitor Adapter just installed, make sure the front of the option is seated in the card support bracket on the front panel.



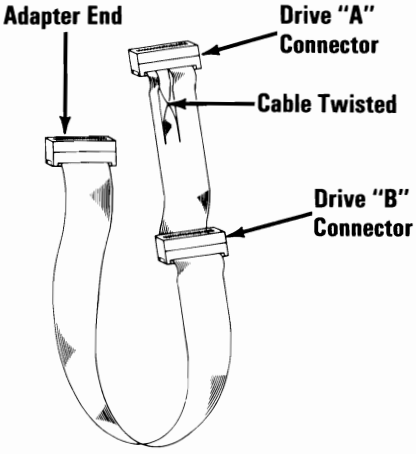
57 Connect the Diskette Drive Signal Cable to the front end of your Diskette Drive Adapter as shown below.

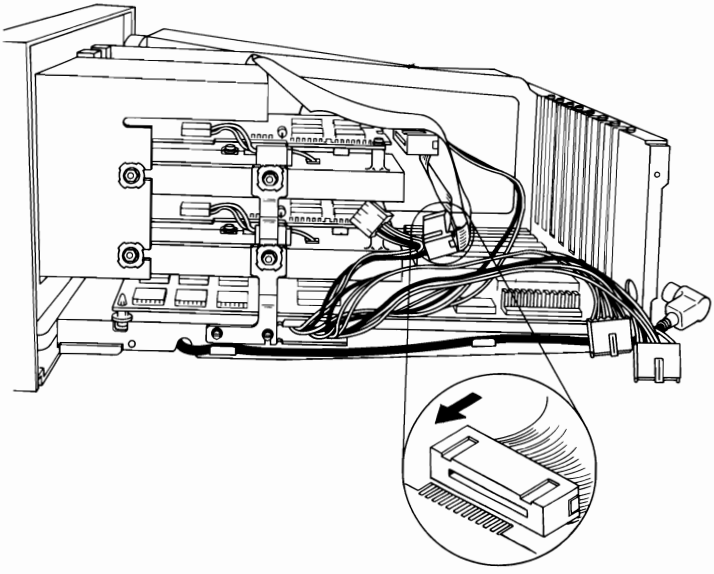


58 Install your Diskette Drive Adapter in your system unit by holding the top corners and firmly press the option into expansion slot 3.



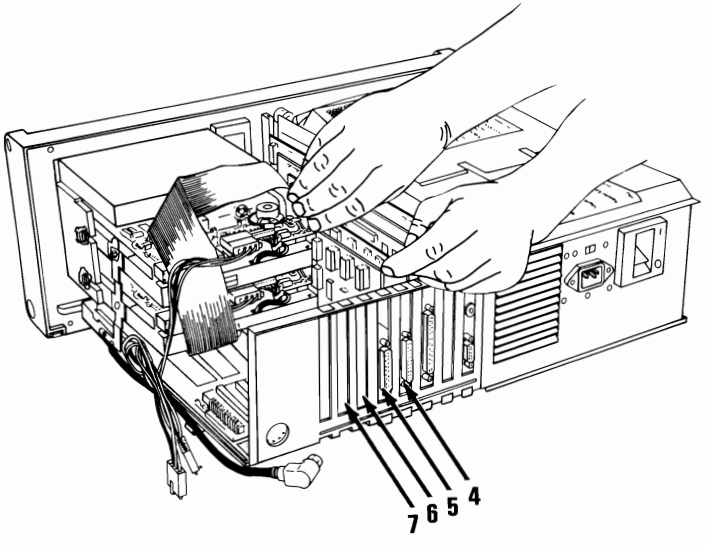
59 Connect the signal cable connector with two groups of wires on the bottom diskette drive, then connect the remaining connector to the top diskette drive as shown below.



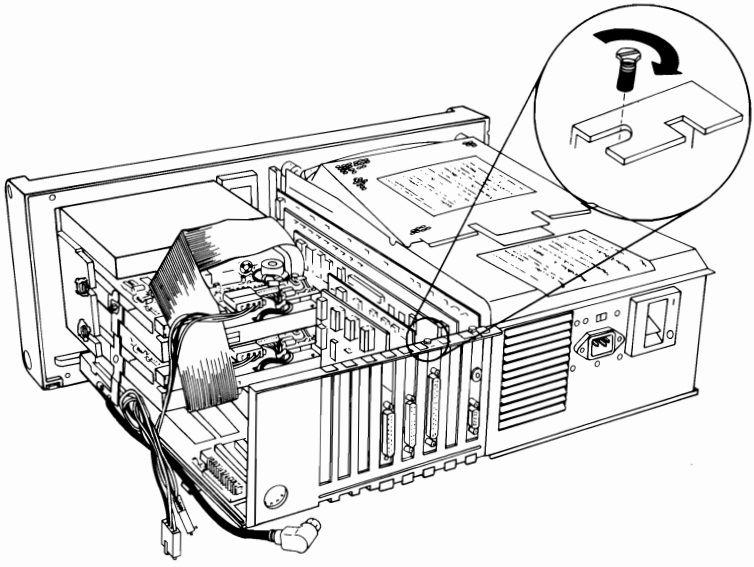


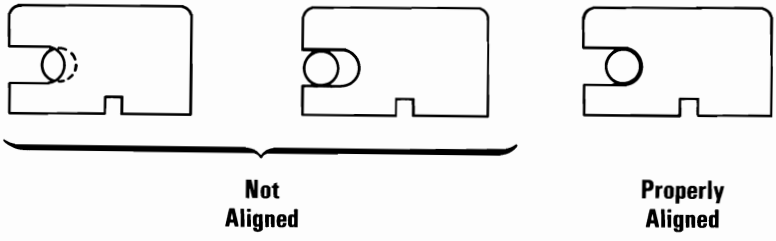
60 If you removed an option from expansion slots 4 through 7, install the option by holding the top corners and firmly press it into expansion slot number 4, 5, 6, or 7.

Note: Make sure you have the right length option going into the proper expansion slot.

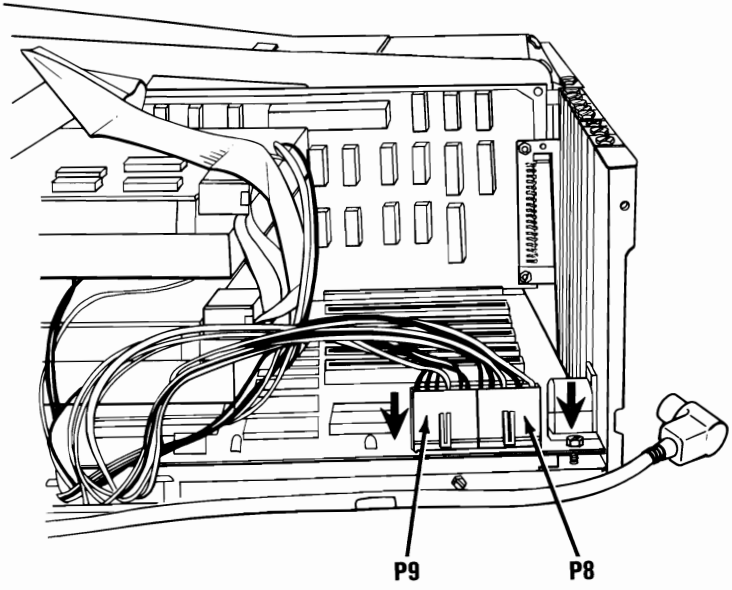


61 For each of the adapters just installed in the expansion slots, align the slots in the adapter retaining brackets with the hole in the rear panel of the system unit. Insert the screw and tighten with a flat-blade screwdriver or a 5.5-mm (7/32-in.) open-ended wrench.





62 Connect the power supply connectors P8 and P9 to the system board. Look at the illustration below to determine where they are connected.

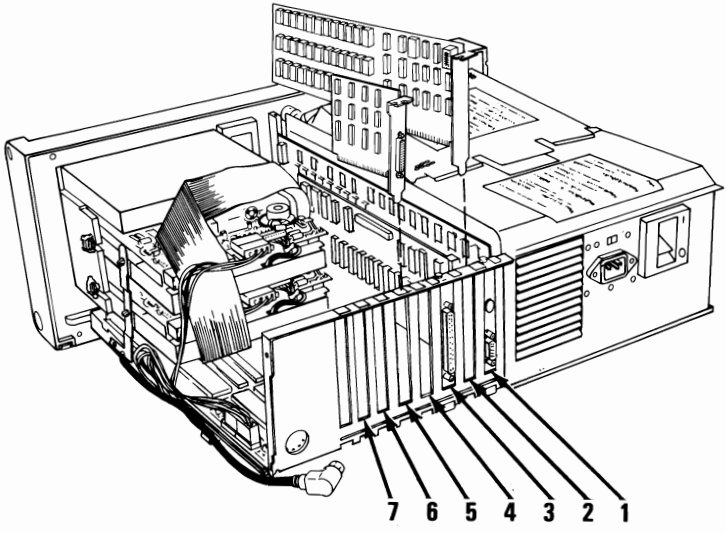


Do you have an additional option to install in one of your expansion slots?

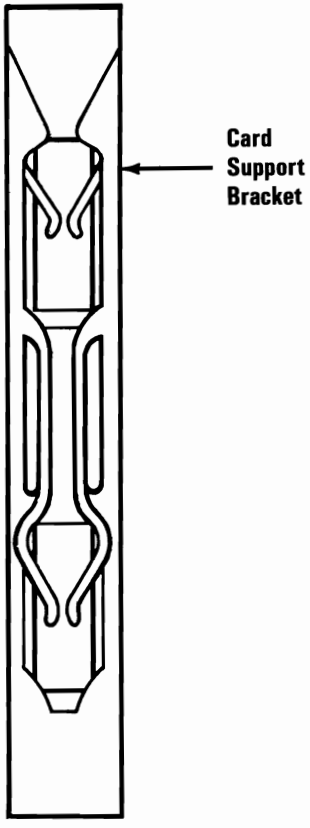
YES - Remove the option from its carton and go to the next step. If you are installing an IBM Personal Computer Slimline Diskette Drive return to Step 18.

NO - Go to Step 69.

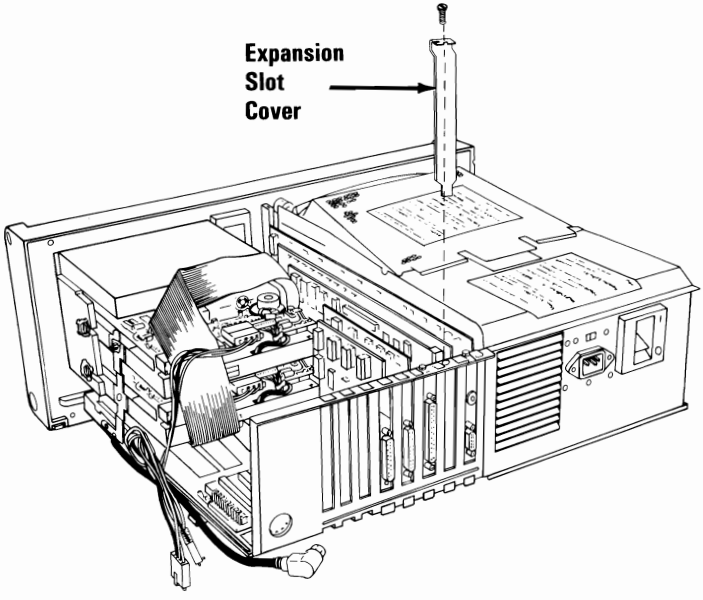
63 Study the figure below and become familiar with the various lengths of the options. All options will fit into expansion slot 2. Expansion slots 4 and 5 can fit options that have any overall length of less than 127-mm (5-in.). Expansion slots 6 and 7 can fit any options that have an overall length of less than 120-mm (4 3/4-in.). Decide which expansion slot you will be installing your option. Continue with the next step.



64 Some options come with instructions to install a card support bracket in your system unit. The IBM Portable Personal Computer has a card support bracket already installed, so discard the bracket packaged with the option. Continue with the next step.

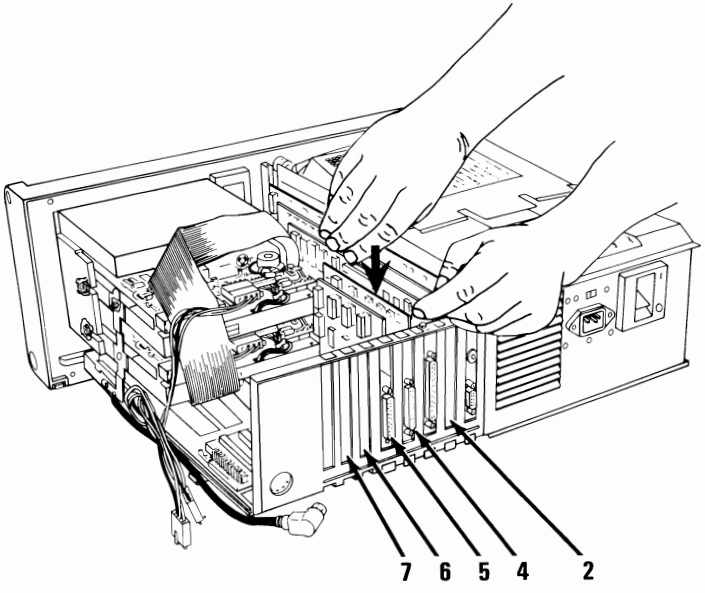


65 Place your system unit so the rear faces you. Use a flat-blade screwdriver or 5.5-mm (7/32-in.) open-ended wrench and remove the screw holding the expansion slot cover in place. Remove the expansion slot cover.



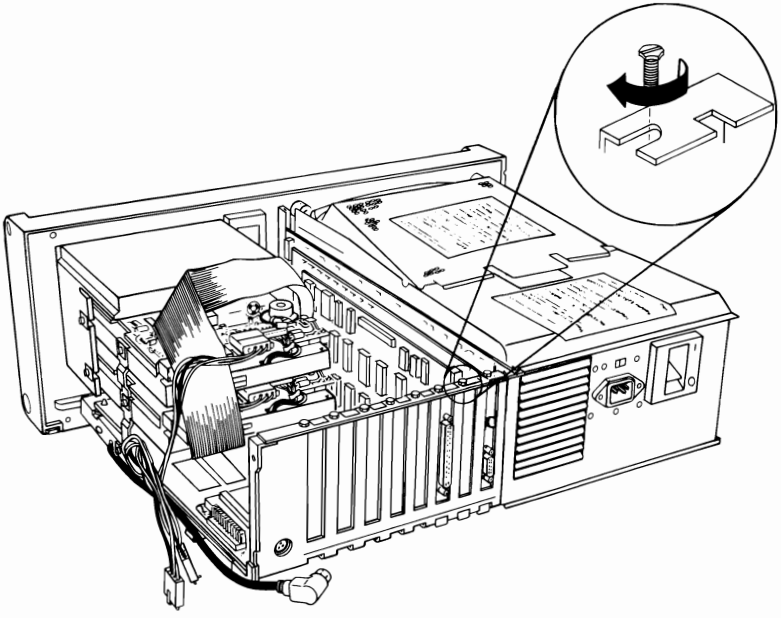
66 Hold the option by the top corners and firmly press it into expansion slot 2, 4, 5, 6, or 7.

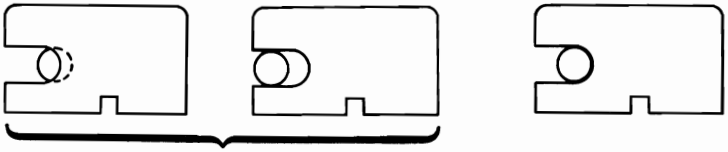
Note: Expansion slots 4 and 5 can fit options that have any overall length of less than 127-mm (5-in.). Expansion slots 6 and 7 can fit any options that have an overall length of less than 120-mm (4 3/4-in.).



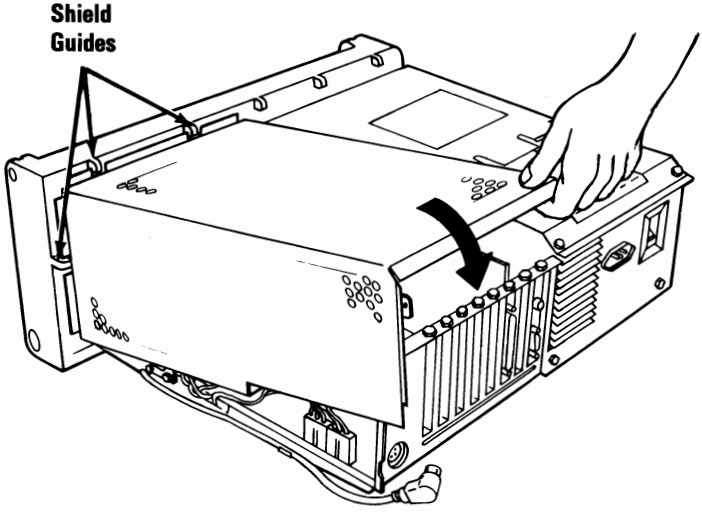
67 Align the slot of the option retaining bracket with the threaded screw hole in the rear panel of the system unit.

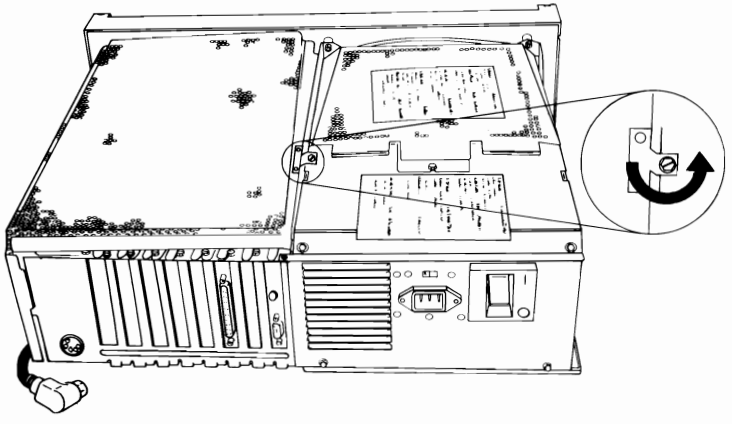
68 Insert the screw and tighten it clockwise with a flat-blade screwdriver or 5.5-mm (7/32-in.) open-ended wrench.



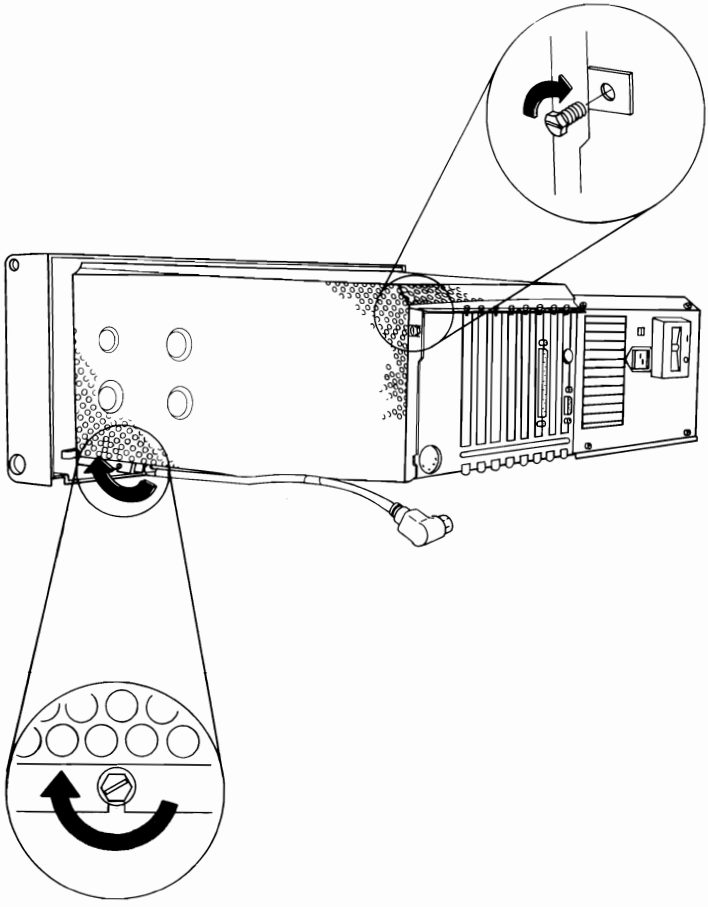


69 Install the shield by placing the notches over the guides in the front panel, then lower the shield. Insert and tighten the mounting screw clockwise with a flat-blade screwdriver.

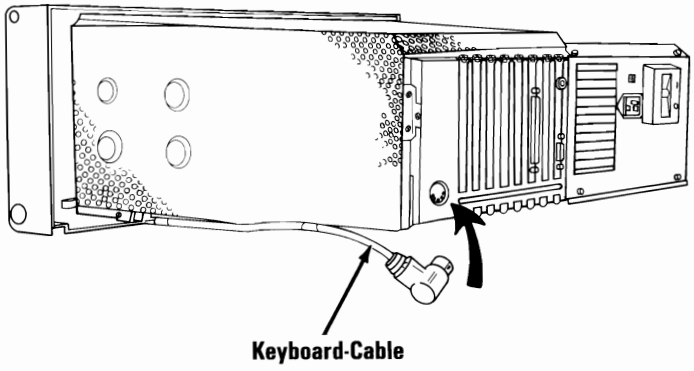




70 Place your system unit so the right side faces you. Install the two shield mounting screws and tighten clockwise with a flat-blade screwdriver.

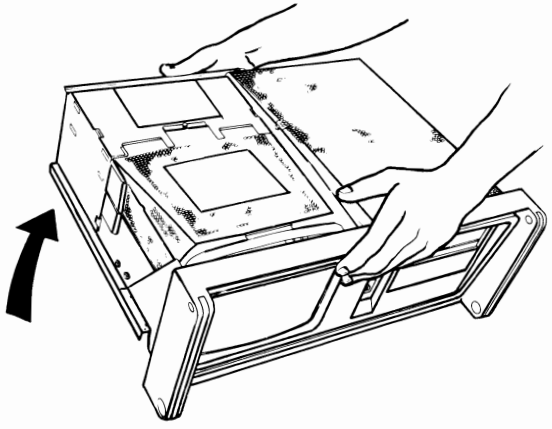


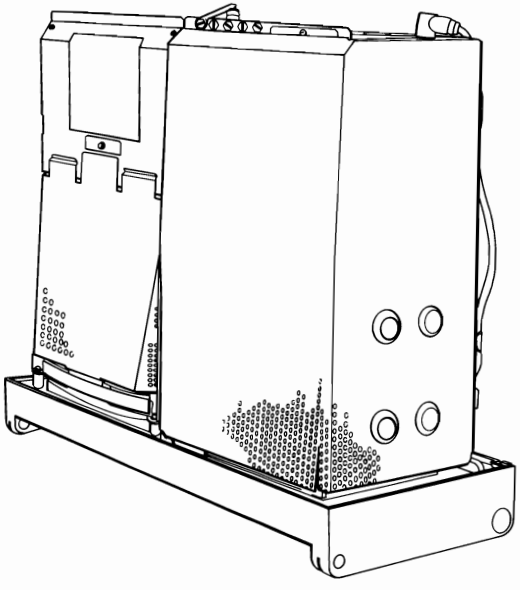
71 Connect the internal keyboard-cable as shown below.



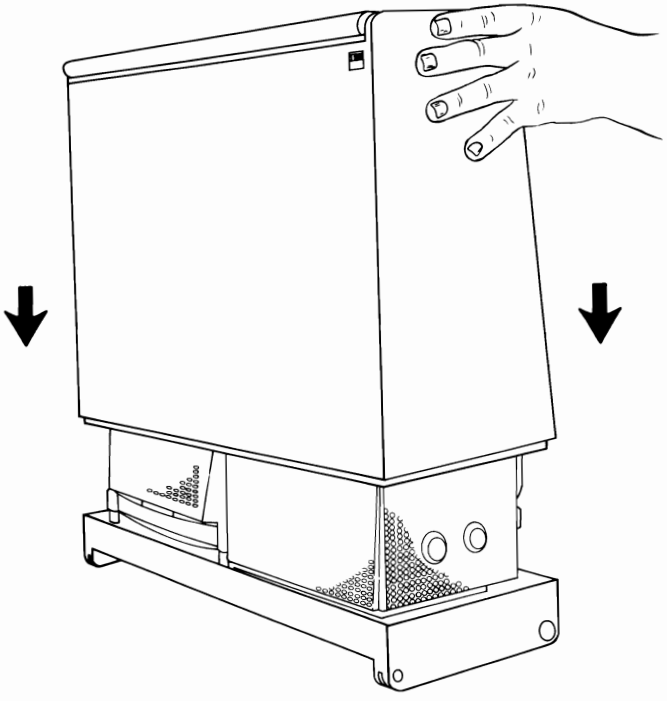
72 Place the system unit so the front faces you. Carefully tilt the system unit up so it rests on its front panel.

CAUTION
Before tilting the system unit up, center it on the work area to ensure it will not fall off the table.



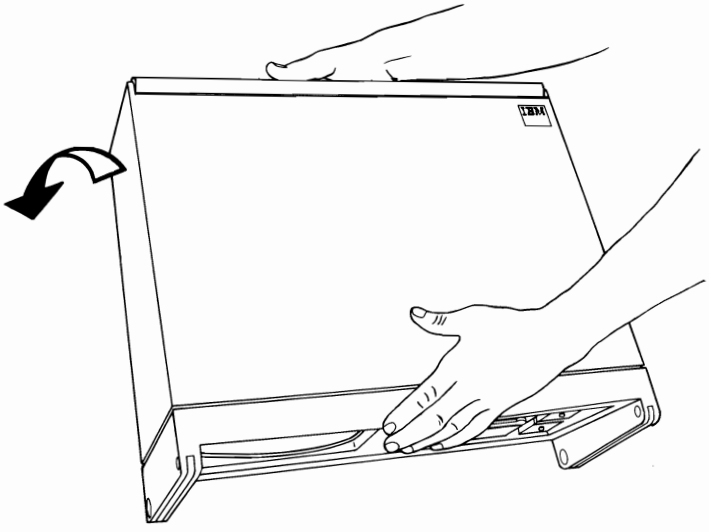


73 Slide the system-unit cover down until it fits into the front panel.

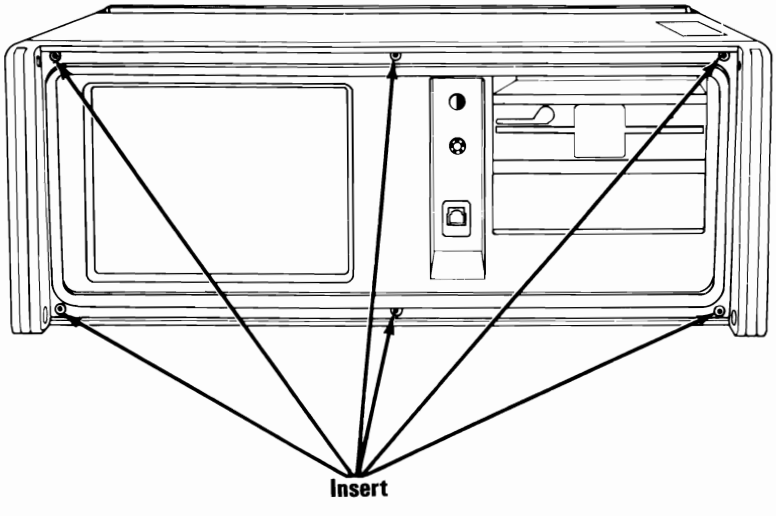


74 Carefully return the system unit to its operating position.

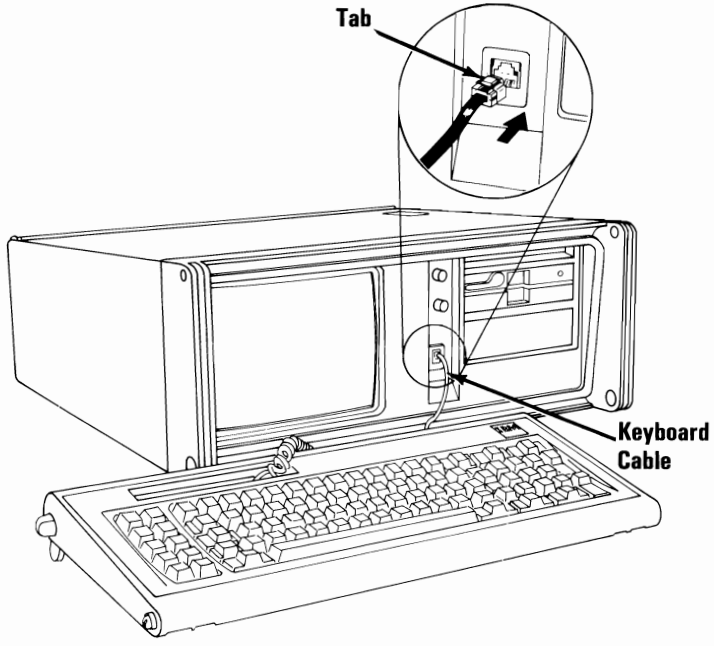
CAUTION
The system unit cover is loose. Be careful when lowering the system unit to its operating position.



75 Insert the six mounting screws in the front panel. Tighten the screws clockwise with a flat-blade screwdriver or a 3-mm allen wrench.



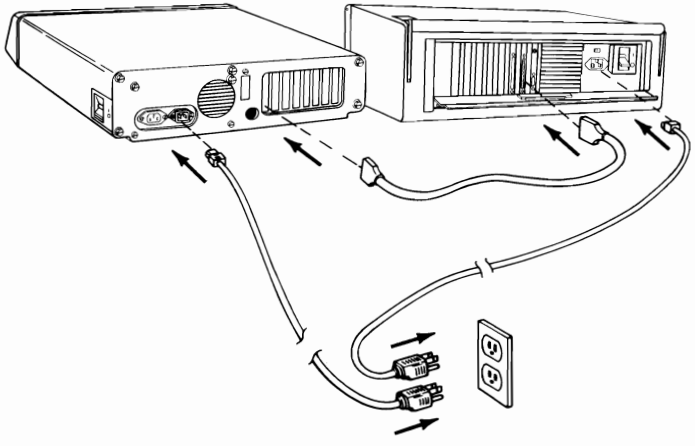
76 Connect the keyboard cable to the system unit.



77 Connect all cables and the power cord to the rear of the system unit.

78 Plug the system unit's power cord into the wall outlet (If the expansion unit is attached, also plug in its power cord.)

79 Plug all external-device power cords into the wall outlets.



80 Your system unit is now ready for the power-on self test (POST). Go to Section 1, "Introduction/Installation" for a description of this test.

Note: If you have any problems after the installation, one of the following is the most likely cause:

- Cables are connected incorrectly.
- Switches are set incorrectly.
- Other options may have loosened.
- The option you just installed is defective.

Notes:

Switch Settings

Introduction

This section includes the system board switch block location and the switch settings for the following options:

- Math Coprocessor
- Type of display connected
- Number of diskette drives installed

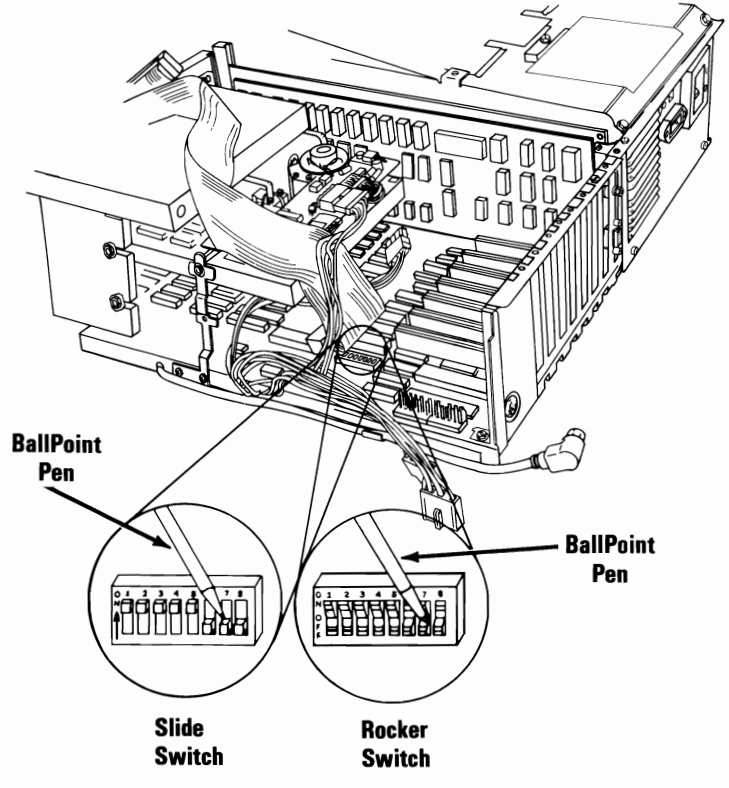
Also included are the switch block location and the switch settings for the 64/256KB Memory Expansion Option and the Extender Card.

The switch settings are necessary for the system to address the attached components, and to specify the amount of memory installed in the system unit.

System Board Switch Settings

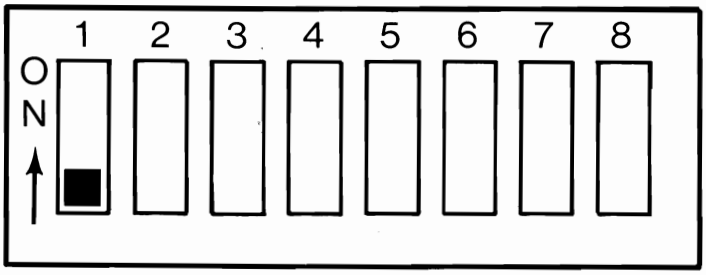
System Board Switch Block Location

The following figure shows where the switch block is on the system board.



Switch Settings

The positions of these eight switches indicate: if your system has the Math Coprocessor; the amount of memory on the system board; the type of display you are using; and the number of diskette drives installed. See the figure below.



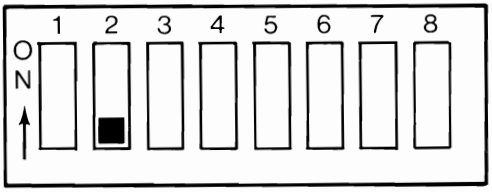
Switch	Function
1	Normal operation; always off.
2	Math Coprocessor.
3-4	Amount of system board memory.
5-6	Type of display you are using.
7-8	Number of diskette drives installed.

Math Coprocessor Switch Settings

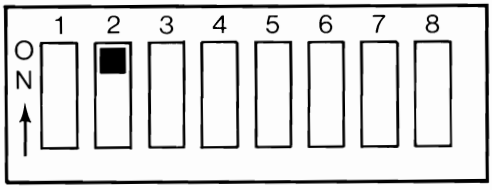
The following figure shows the setting for switch 2.

Warning: Before you change any switch settings, make a note of how the switches are presently set.

With Coprocessor



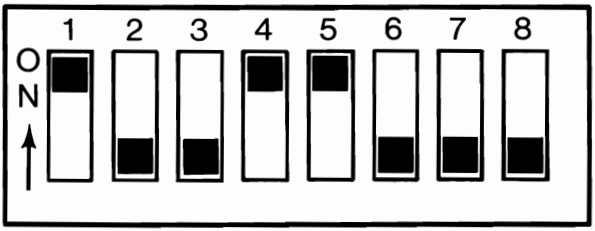
Without Coprocessor



Amount of System Board Memory

The settings for switches 3 and 4 are preset at 256K, the maximum amount of memory that can be installed on the system board.

256K

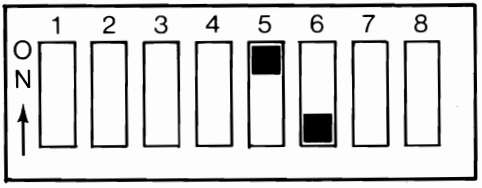


The following figure shows the settings for switches 5 and 6.

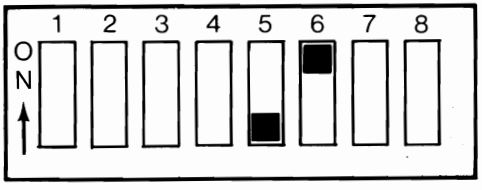
Note: The switch settings do not have to be adjusted for the IBM Color Display.

Warning: Before you change any switch settings, make a note of how the switches are presently set.

Normal Setting with no External Display or IBM Color Display or other color display in the 80X25 color mode



IBM Color Display or other color display in the 40X25 color mode



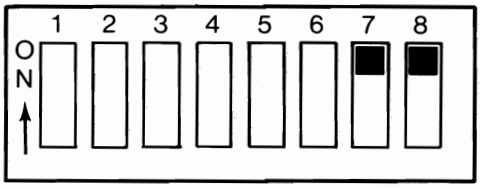
Note: The 40x25 mode means 40 characters across the screen and 25 lines down the screen. The 40x25 mode is normally used with a home television. The 80x25 mode means 80 characters across the screen and 25 lines down the screen. This mode, when used with home televisions and various displays, can cause loss of character quality.

Diskette Drive Switch Settings

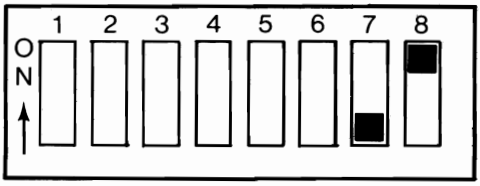
The following figure shows the settings for switches 7 and 8.

Warning: Before you change any switch settings, make a note of how the switches are presently set.

1 Drive



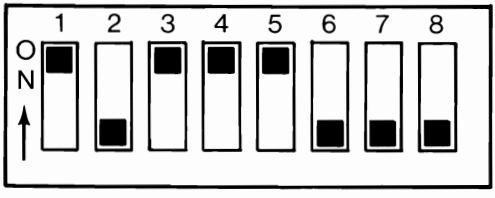
2 Drives



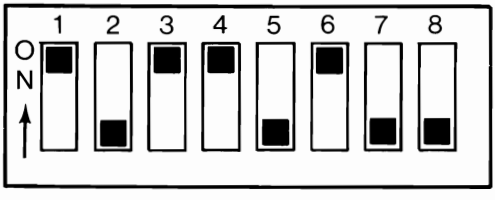
64/256KB Memory Expansion Option Switch Setting

Switch settings on the IBM 64/256KB Memory Expansion Option indicate the total amount of memory on the system board and Memory Expansion Option. The following figures show the settings for the various amounts of total memory.

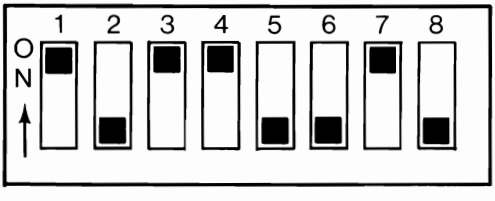
320K Total Memory



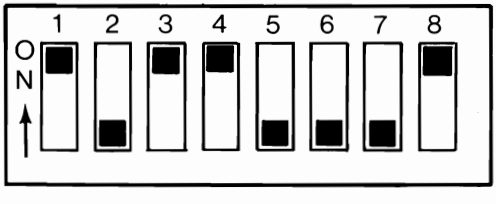
384K Total Memory



448K Total Memory



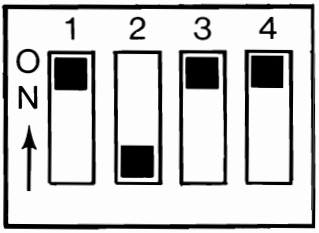
512K Total Memory



Extender Card Switch Setting

If an expansion unit is installed with your system unit, the extender card switches must be set to reflect the total amount of memory on your system board, as shown in the following figure.

256K



Notes:

OPTIONS PACKAGE

This option package has been included with the *Guide to Operations* to allow you to install Personal Computer and Personal Computer XT Options in your IBM Portable Personal Computer.

Insert these instructions in the back of the "Option Installation" section in the *Guide to Operations* manual. The list below shows the options included in this package.

- Printer Adapter
- 64/256KB Memory Expansion Option
- 64KB Memory Module Kit
- Prototype Card
- IBM Communications Adapter Cable
- Game Control Adapter
- IBM Math Coprocessor
- Asynchronous Communications Adapter
- Binary Synchronous Communications Adapter
- Synchronous Data Link Control (SDLC) Communications Adapter
- IBM Personal Computer Expansion Unit
- IBM Personal Computer Cluster Adapter

If you plan to install any of the options listed above in your IBM Portable Personal Computer, follow these steps:

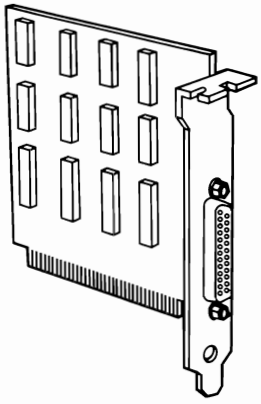
1. Locate the installation instructions that came with your newly purchased option package.
2. Compare the date on the lower left corner of the cover page of that packet with the date on the same option in this package.
3. Follow the instructions with the later date and keep that set in the "Option Installation" section of your *Guide to Operations.*

For warranty information refer to the publication that came with your option.

January 1984
6322900

Notes:

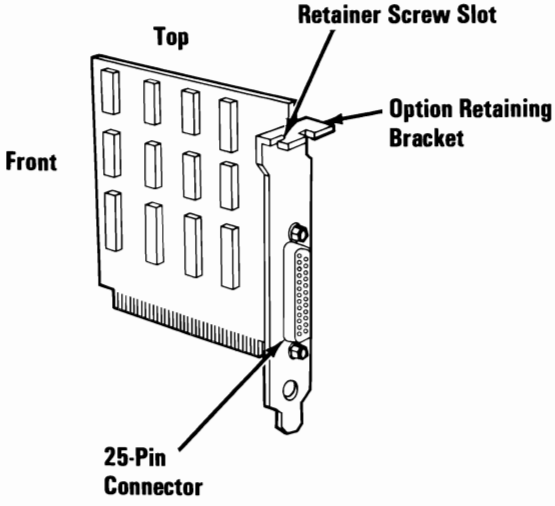
Printer Adapter Instructions



This option consists of the Printer Adapter. If it is missing or damaged, notify your place of purchase.

Specific Instructions

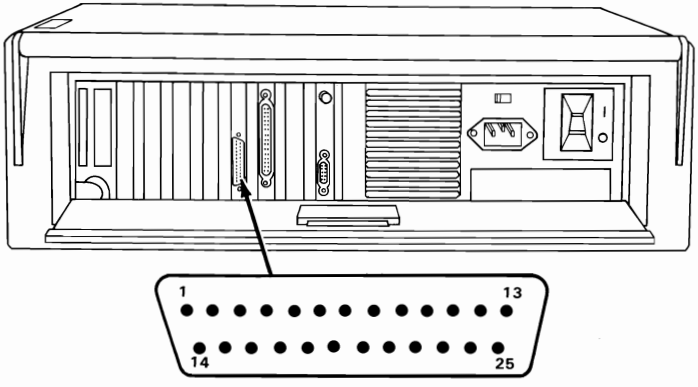
1 Study the figure below and become familiar with the Printer Adapter.



2 The Printer Adapter can be installed in any expansion slot 4 through 7 of your IBM Portable Personal Computer. If the expansion slots are occupied install this option in expansion slot 2.

3 To install this option go to "Option Installation" in the *Guide to Operations*.

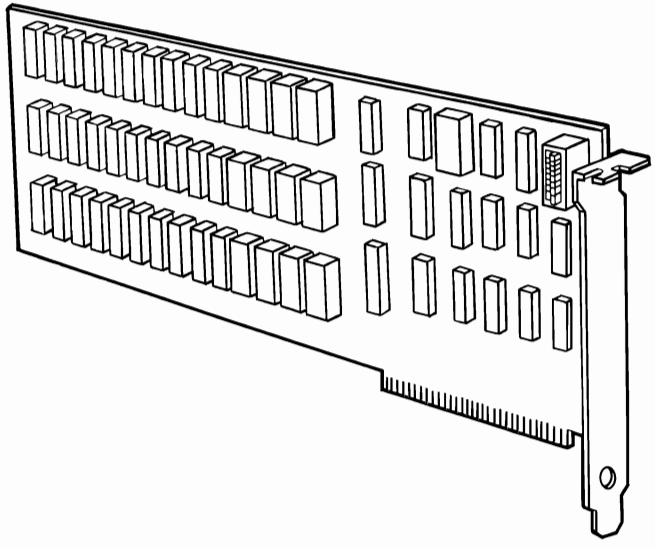
Connector Information



25-Pin Connector

	Signal Name - Description	Pin	
IBM Printers	– Strobe	1	Printer Adapter
	+ Data Bit 0	2	
	+ Data Bit 1	3	
	+ Data Bit 2	4	
	+ Data Bit 3	5	
	+ Data Bit 4	6	
	+ Data Bit 5	7	
	+ Data Bit 6	8	
	+ Data Bit 7	9	
	– Acknowledge	10	
	+ Busy	11	
	+ Page End	12	
	+ Select	13	
	– Auto Feed	14	
	– Error	15	
	– Initiate	16	
	– Selection	17	
	Ground	18	
	Ground	19	
	Ground	20	
	Ground	21	
	Ground	22	
	Ground	23	
	Ground	24	
	Ground	25	

64/256KB Memory Expansion Option Instructions



This option consists of the 64/256KB Memory Expansion Option. If it is missing or damaged, notify your place of purchase.

Requirements

- The 64/256KB Memory Expansion Option comes with 64K of total memory. You may install 64KB Memory Module Kits on this option to increase its memory up to 256K.

- If you have purchased memory module kits to install on this option, you must install them before installing the 64/256KB Memory Expansion Option on your system board.

Specific Instructions

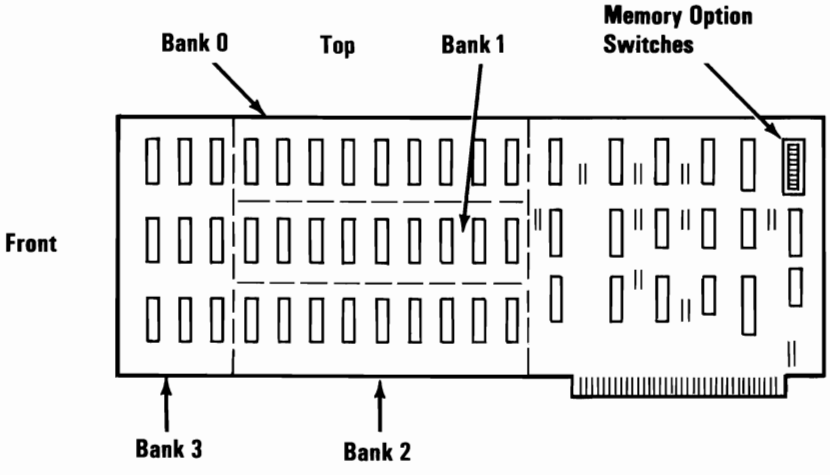
Are you going to install additional memory modules on your 64/256KB Memory Expansion Option before installing it on the system board?

YES Go to Step 1.

NO Go to Step 4.

1 Place the option on a flat surface with the switch block and components facing up. Study the figure below and become familiar with the 64/256KB Memory Expansion Option.

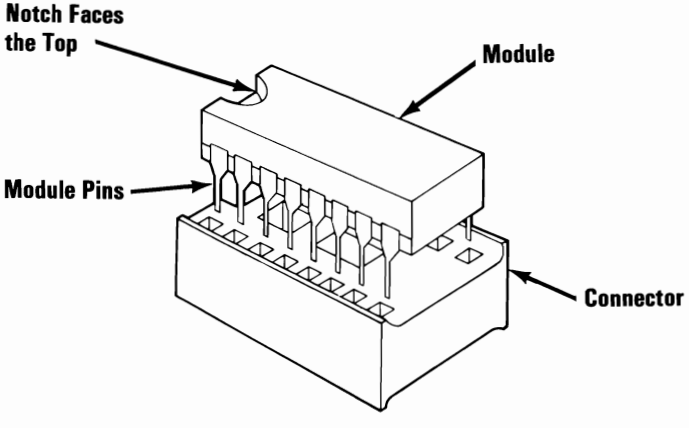
- Bank 0 has factory installed modules.
- Each IBM 64KB Memory Module Kit has 9 Modules.
- The first 64K kit must be installed in Bank 1, the second in bank 2, and the third in bank 3.



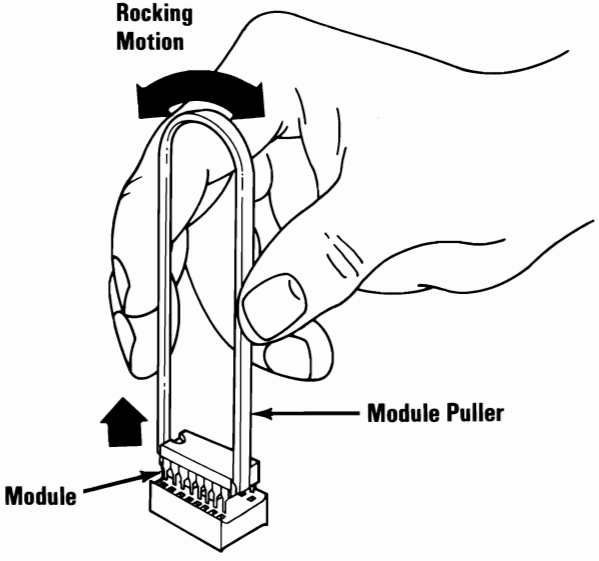
2 Align the module pins and the connector with the notch facing the top of the 64/256KB Memory Expansion Option. Firmly press each of the nine modules in place.

- If the pins do not align properly, carefully bend the pins until they do.

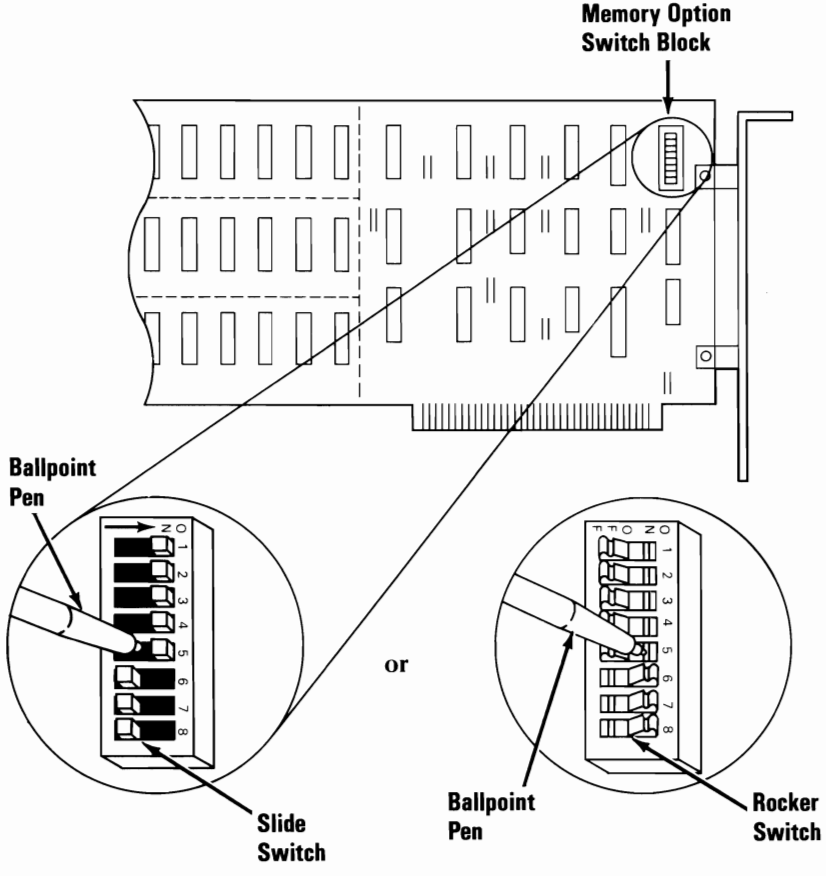
  Warning: The pins on the module are easily bent. Check to ensure that alignment is correct before pressing them into place.



3 Check to see that all of the pins on each module are seated properly in the connectors and that all the notches are facing the top of the option. If the modules are incorrectly installed, you can remove the modules with a module puller, as shown below.

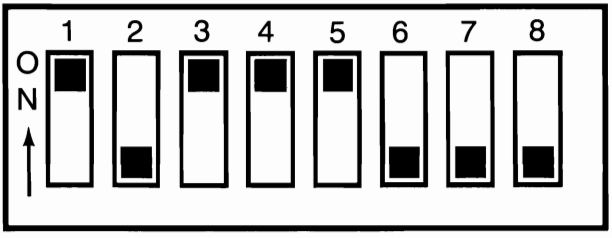


4 Place the 64/256KB Memory Expansion Option on a flat surface with the switch block facing up. Study the figure below. There are two types of switch blocks: rocker switch block and slide switch block. Identify the type of switches on your option. Go to the charts on the next page to make the proper switch setting.

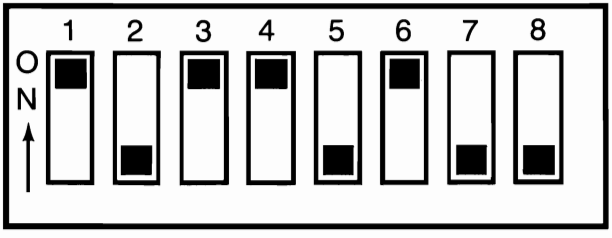


5 Switch settings on the 64/256KB Memory Expansion Option indicate the total amount of memory on the system board and the Memory Expansion Option. The following figures show the settings for the various amounts of total memory. Set the switches on your 64/256KB Memory Expansion Option now.

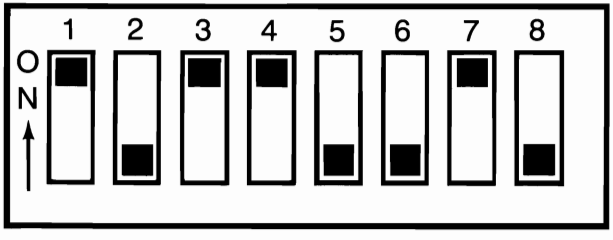
320K Total Memory



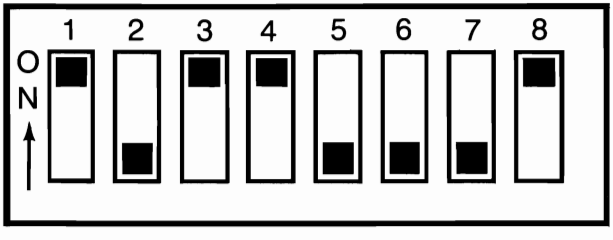
384K Total Memory



448K Total Memory

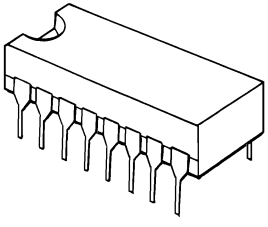


512K Total Memory



6 To install the 64/256KB Memory Expansion Option go to the "Option Installation" section in the *Guide to Operations*.

64KB Memory Module Kit Instructions



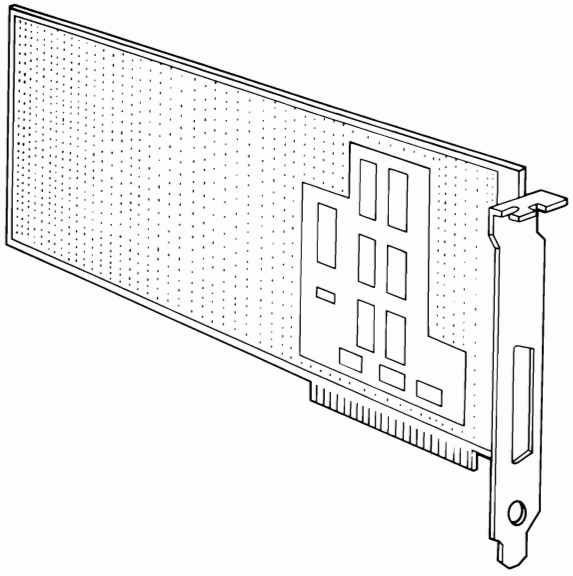
This option consists of nine memory modules. If any are missing or damaged, notify your place of purchase.

Specific Instructions

The system board of the IBM Portable Personal Computer comes standard with 256K of total memory. You can only install the memory modules on a 64/256KB Memory Expansion Option.

To install the modules on the 64/256KB Memory Expansion Option, go to the Option Instructions that came with that option.

Prototype Card Instructions



This option consists of the following:

- Prototype Card
- Support bracket
- Retaining bracket and mounting screws

If any of these items are missing or damaged, notify your place of purchase.

IBM's Limited Warranty applies to the Prototype Card option only as it was manufactured; it ceases to apply once the card is altered or modified. Examine this card carefully before making modifications.

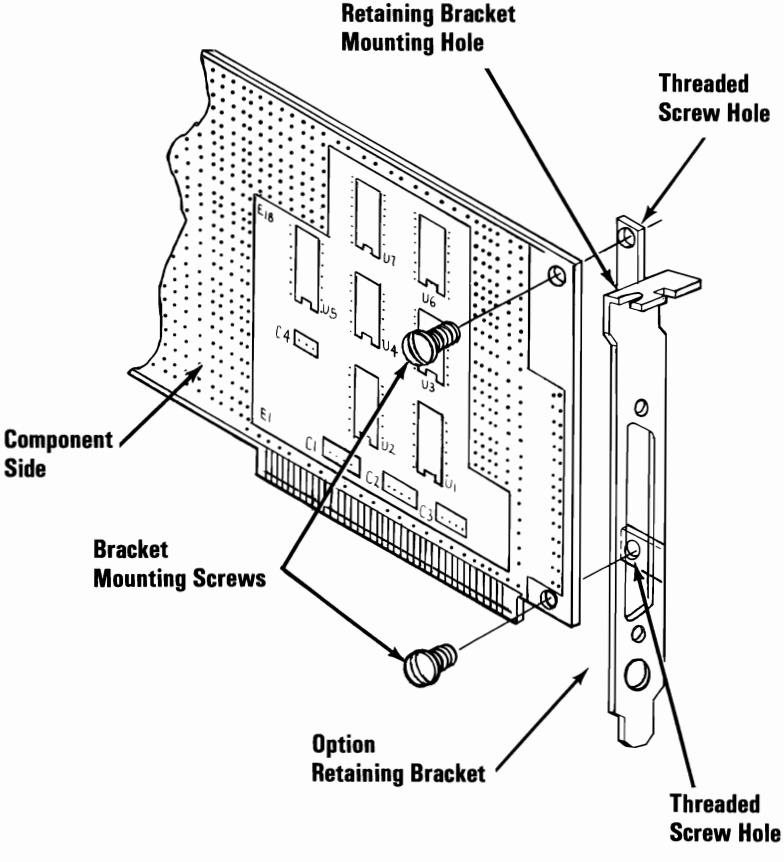
Note: As sold by the manufacturer, this Prototype Card does not require certification under the FCC's rules for Class B devices. The user is responsible for any interference to radio or TV reception that may be caused by a user-modified Prototype Card.

Specific Instructions

1 The Prototype Card can only be installed in option expansion slot number 2.

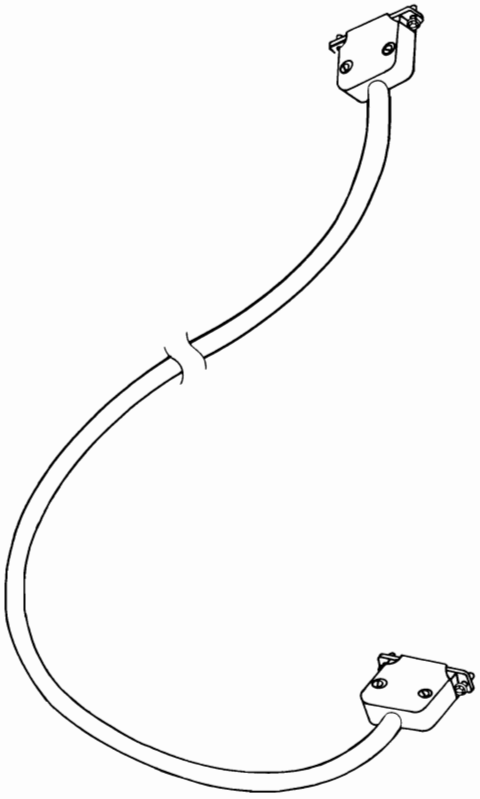
> **Note:** The IBM Portable Personal Computer has a built in support bracket on the front panel. You can discard the support bracket that came with this option.

2 Attach the retaining bracket to the pin side of the Prototype Card. (The retaining bracket and screws are in your option package.)



3 To install the Prototype Card go to "Option Installation" in the *Guide to Operations*.

IBM Communications Adapter Cable Instructions



This option consists of the IBM Communications Adapter Cable and Wrap Plug.

If either item is missing or damaged, notify your place of purchase.

Installation Requirements

- If your system unit has not yet been set up, do so now.
- The communications adapter to which you are connecting this option should already be installed in your system. If not, refer to the communications adapter option instructions, and install it before continuing.
- The non-IBM devices shown in this manual are for illustration only; their use here does not constitute a recommendation or an endorsement by IBM. Selection, interconnection, and use of another manufacturer's device are the sole responsibility of the customer.

Tool Required

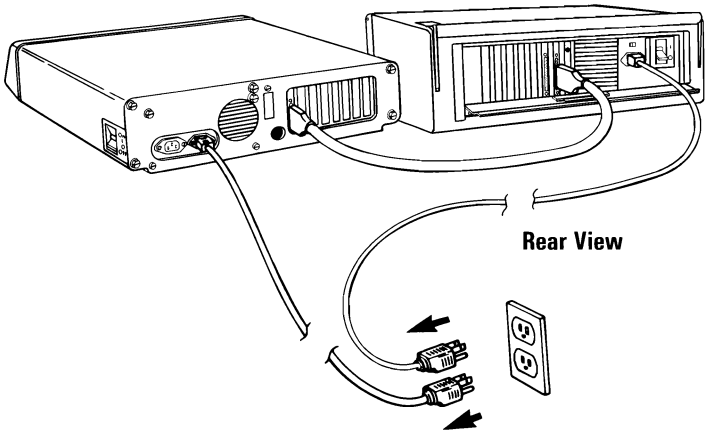
- Small, flat-blade screwdriver

Specific Instructions

1 Set the Power switch on the system unit to Off. (If the expansion unit is attached, also set its Power switch Off.)

2 Set the Power switches on all external devices to Off.

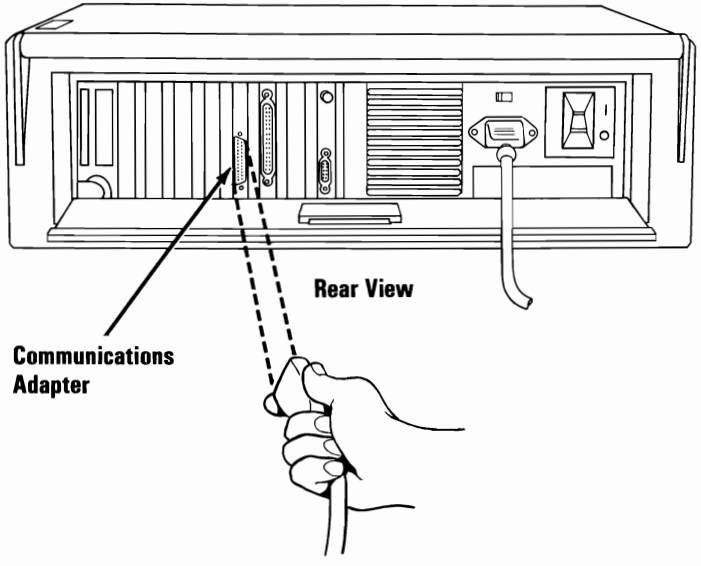
3 Unplug the system unit's power cord from the wall outlet. (If the expansion unit is attached, also unplug its power cord.)



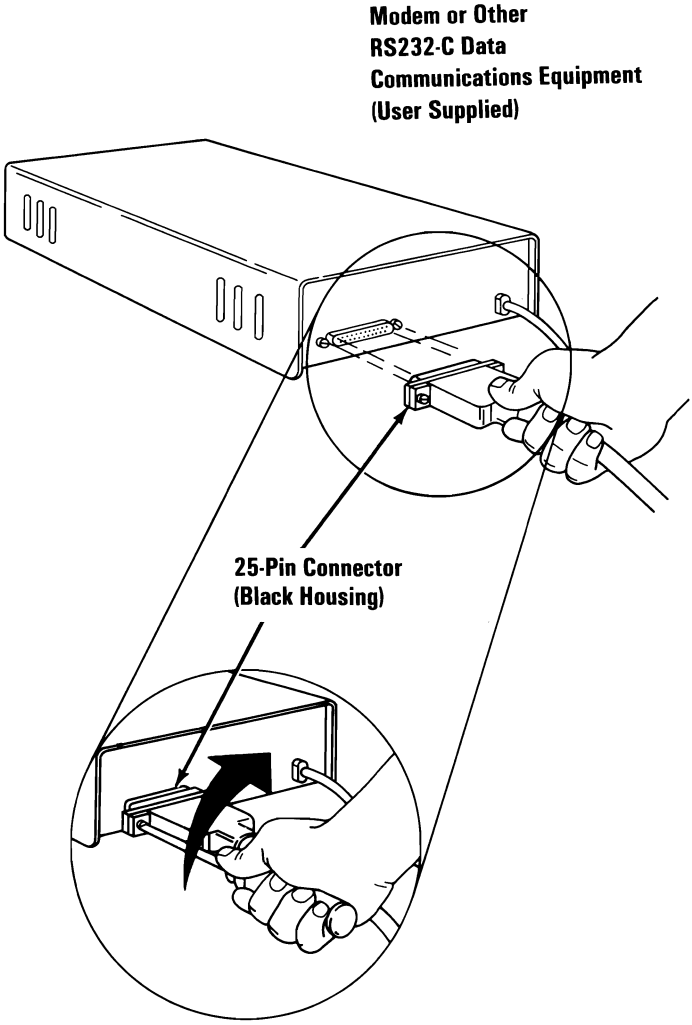
Rear View

4 Place your system unit to allow access to the rear.

5 Connect the cable (silver-colored end) to the communications adapter connector at the rear of the system unit, as shown, and tighten the screws clockwise.

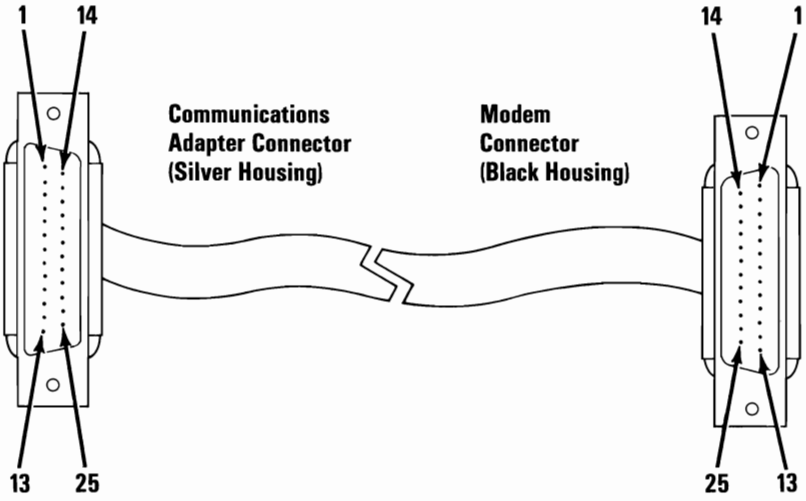


6 Connect the other end of the Communications Adapter Cable as shown in the example, and tighten the screws clockwise.



7 Plug in the system unit's power cord into the wall outlet. (If an expansion unit is attached plug its power cord in also.)

Connector Information

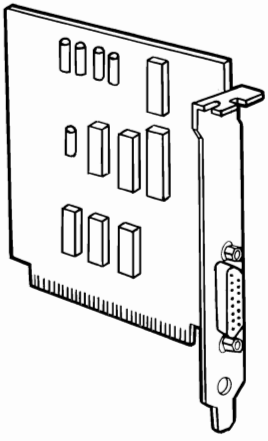


Communications Adapter Cable

Communications Adapter Connector Pin #	Name	Modem Connector Pin #
NC	Outer Cable Shield	1
2	Transmitted Data	2
3	Received Data	3
4	Request to Send	4
5	Clear to Send	5
6	Data Set Ready	6
7	Signal Ground (Inner Lead Shields)	7
8	Received Line Signal Detector	8
NC		NC
NC		NC
11	Select Standby	11
NC		NC
NC		NC
NC		NC
15	Transmitter Signal Element Timing	15
NC		NC
17	Receiver Signal Element Timing	17
18	Test	18
NC		NC
20	Data Terminal Ready	20
NC		NC
22	Ring Indicator	22
23	Data Signal Rate Selector	23
NC		NC
25	Test Indicate	25

Notes:

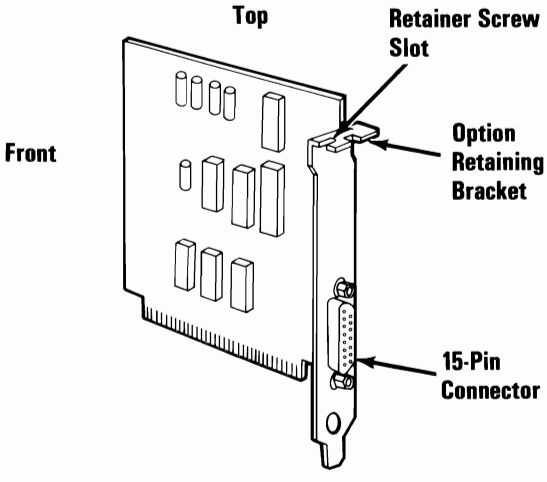
Game Control Adapter Instructions



This option consists of the Game Control Adapter. If it is missing or damaged, notify your place of purchase.

Specific Instructions

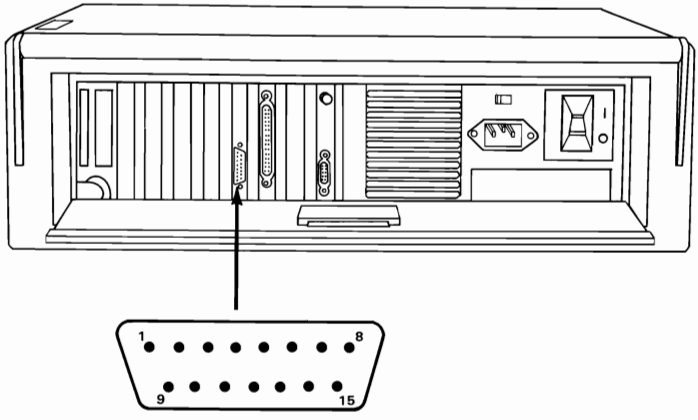
1 Study the figure below and become familiar with the Game Control Adapter.



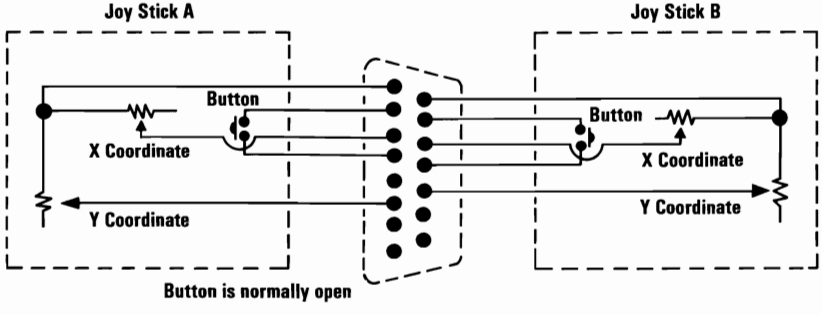
2 The Game Control Adapter can be installed in any expansion slot 4 through 7 of your IBM Portable Personal Computer. If the expansion slots are occupied install this option in expansion slot 2.

3 To install this option go to "Option Installation" in the *Guide to Operations*.

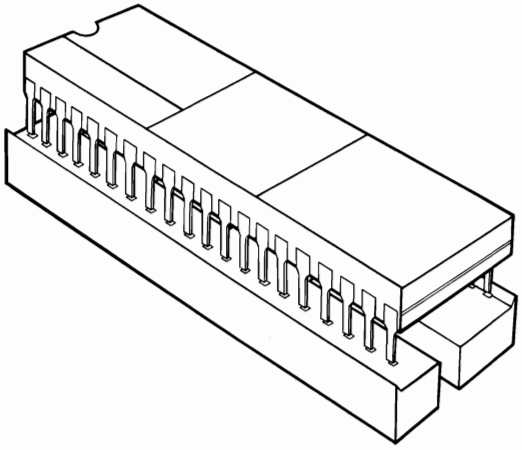
Connector Information



	Signal Name - Description	Pin	
External Device	+5 Vdc	1	Game Control Adapter
	Button 4	2	
	Position 0	3	
	Ground	4	
	Ground	5	
	Position 1	6	
	Button 5	7	
	+5 Vdc	8	
	+5 Vdc	9	
	Button 6	10	
	Position 2	11	
	Ground	12	
	Position 3	13	
	Button 7	14	
	+5 Vdc	15	



IBM Math Coprocessor Instructions



This option consists of the following:

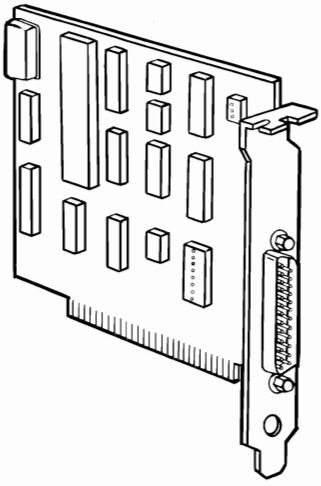
- 8088 Processor
- Math Coprocessor
- Module puller
- Safety protector

If any items are missing or damaged, notify your place of purchase.

Specific Instructions

We strongly recommend that the IBM Math Coprocessor be installed by IBM or an Authorized IBM Personal Computer Dealer. However, if you wish to install this option yourself, follow the installation procedures in the "Option Installation" section of your *Guide to Operations*.

Asynchronous Communications Adapter Instruction

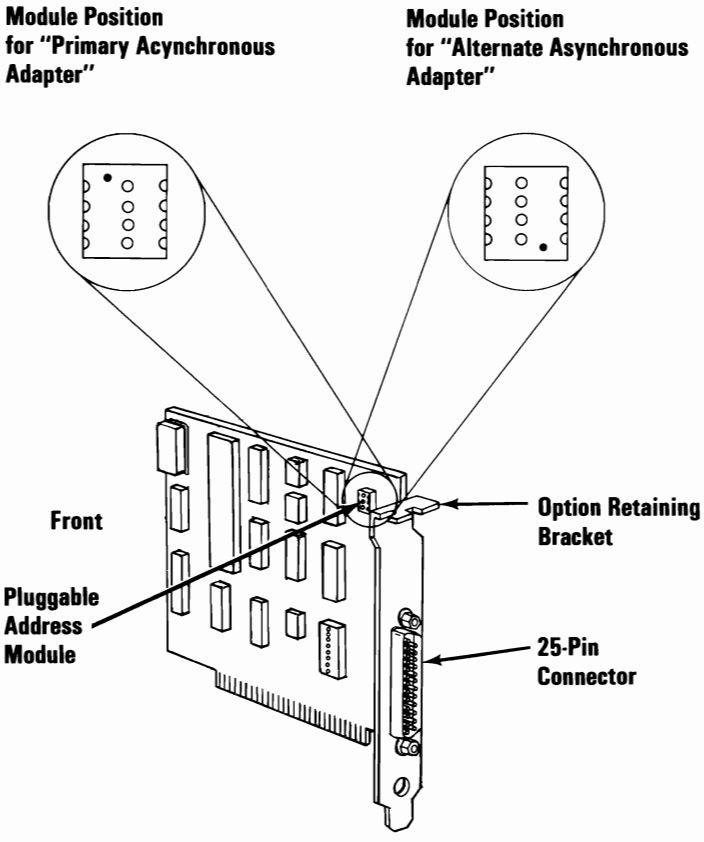


This option consists of the Asynchronous Communications Adapter. If it is missing or damaged, notify your place of purchase.

Specific Instructions

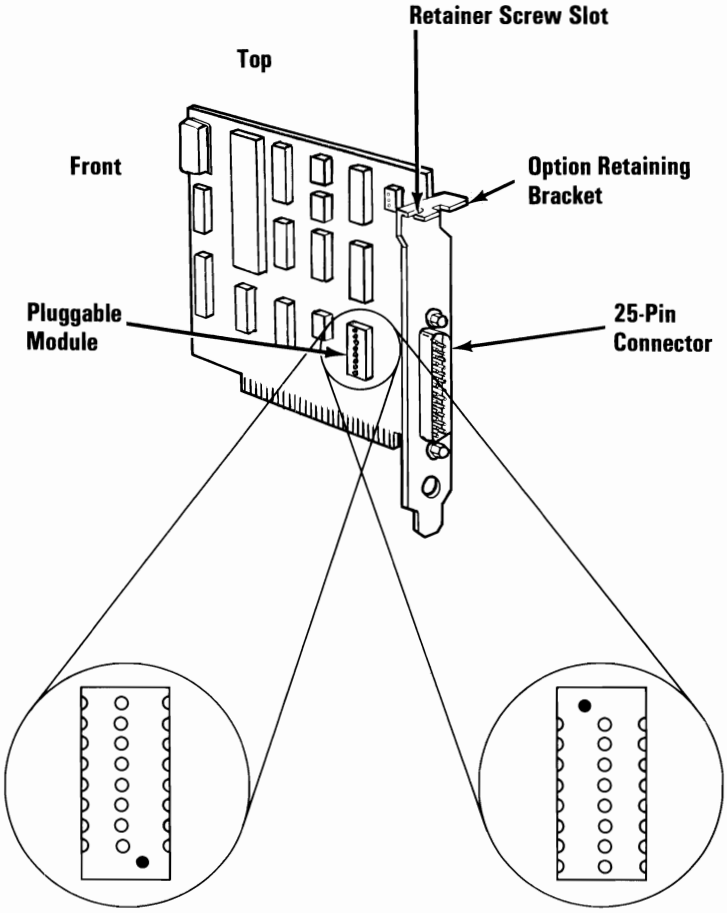
Note: If this is the first Asynchronous Communication Adapter to be installed in your system, go to the Step 2.

1 The figure below shows the pluggable address module on the Asynchronous Communications Adapter. On the second Asynchronous Communications Adapter to be installed in your system, remove the pluggable address module and insert it in the position shown for "Alternate Asynchronous Adapter." Then go to the next step.



2 The possible interfaces for the Asynchronous Communications Adapter are the current-loop and RS232-C. Arrange the pluggable module for the interface that suits your application, as shown in the figure below.

Note: The pluggable module may have a dust cover. Simply lift the cover to remove.

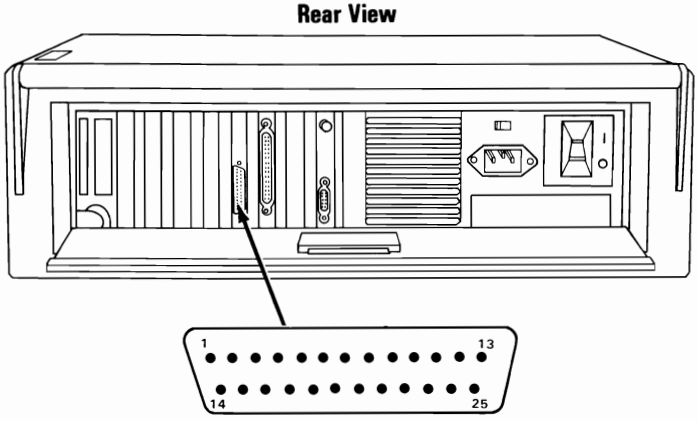


Note: There is a small black jumper included with this option in its own plastic bag. This jumper will not be used with your IBM Portable Personal Computer.

3 The Asynchronous Communications Adapter can be installed in either expansion slot 4 or 5 of your IBM Portable Personal Computer. If the expansion slots are occupied install this option in expansion slot 2.

4 To install this option go to "Option Installation" in the *Guide to Operations*.

Connector Information

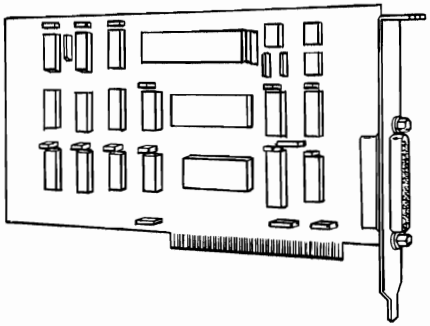


25-Pin Connector

	Signal Name - Description	Pin	
	NC	1	
	Transmitted Data	2	
	Received Data	3	
	Request to Send	4	
	Clear to Send	5	
	Data Set Ready	6	
	Signal Ground	7	
	Received Line Signal Detector	8	
	+ Transmit Current Loop Return	9	
	NC	10	
	Transmit Current Loop Data	11	**Asynchronous**
External	NC	12	**Communications**
Device	NC	13	**Adapter**
	NC	14	
	NC	15	
	NC	16	
	NC	17	
	+ Receive Current Loop Data	18	
	NC	19	
	Data Terminal Ready	20	
	NC	21	
	Ring Indicator	22	
	NC	23	
	NC	24	
	Receive Current Loop Return	25	

Notes:

Binary Synchronous Communications Adapter Instructions

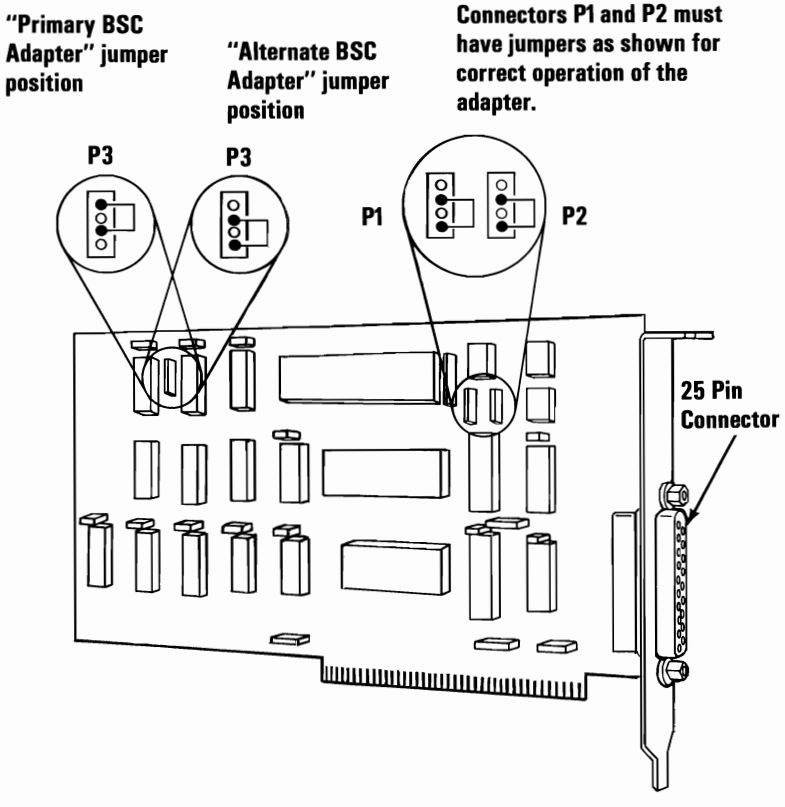


This option consists of the Binary Synchronous Communications Adapter. If it is missing or damaged, notify your place of purchase.

Specific Instructions

1 Study the figure below and become familiar with the Binary Synchronous Communications (BSC) Adapter. The "primary" and "alternate" modes are determined by the position of the jumper clip. Installing the jumper on pins 2 and 4 selects the "primary" BSC adapter mode. Installing the jumper clip on pins 1 and 3 selects the "alternate" BSC adapter mode.

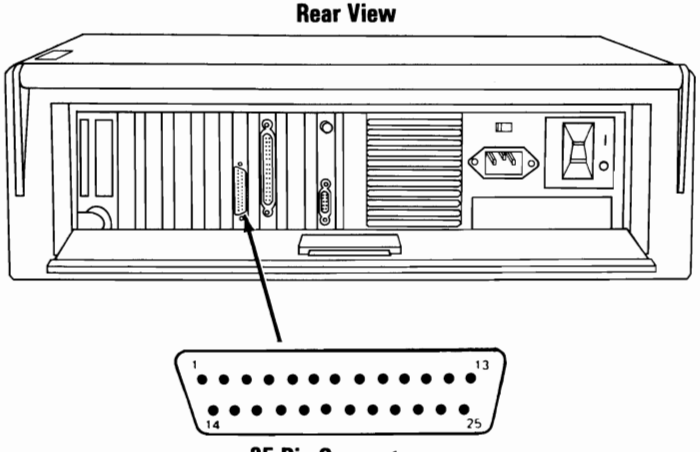
Install the jumper clip on the pins you have selected.



2 The Binary Synchronous Communications Adapter can only be installed in expansion slot 2 of your IBM Portable Personal Computer.

3 To install this option go to "Option Installation" in the *Guide to Operations*.

Connector Information

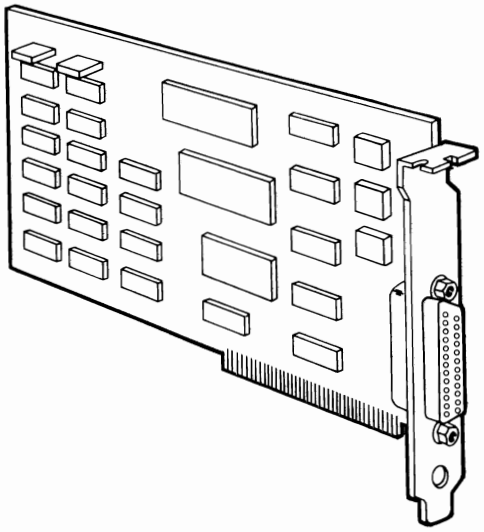


25-Pin Connector

	Signal Name - Description		Pin	
	No Connection		1	
	Transmitted Data	←	2	
	Received Data	→	3	
	Request to Send	←	4	
	Clear to Send	→	5	
	Data Set Ready	→	6	
	Signal Ground		7	
	Received Line Signal Detector	→	8	
	No Connection		9	
	No Connection		10	
	*Select Standby	←	11	**Binary**
External	No Connection		12	**Synchronous**
Device	No Connection		13	**Communications**
	No Connection		14	**Adapter**
	Transmitter Signal Element Timing	→	15	
	No Connection		16	
	Receiver Signal Element Timing	→	17	
	*Test (IBM Modems Only)	←	18	
	No Connection		19	
	Data Terminal Ready	←	20	
	No Connection		21	
	Ring Indicator	→	22	
	Data Signal Rate Selector	←	23	
	No Connection		24	
	*Test Indicate (IBM Modems Only)	→	25	

*Not standardized by EIA (Electronics Industry Assoc.)

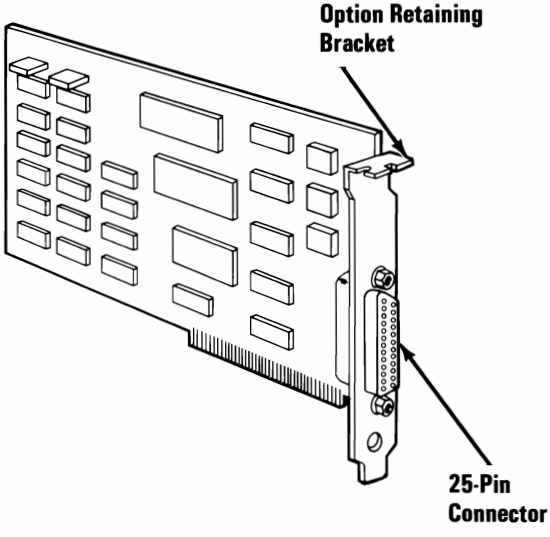
Synchronous Data Link Control (SDLC) Communications Adapter Instructions



This option consists of the Synchronous Data Link Control (SDLC) Communications Adapter. If it is missing or damaged, notify your place of purchase.

Specific Instructions

1 Study the figure below and become familiar with the SDLC Communications Adapter.

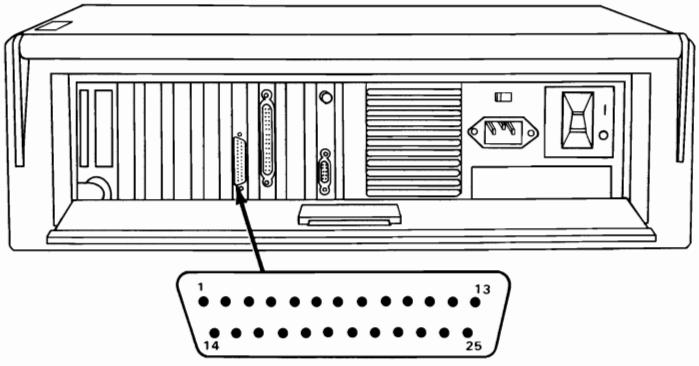


2 The Synchronous Data Link Control Communications Adapter can only be installed in expansion slot 2 of your IBM Portable Personal Computer.

3 To install this option go to "Option Installation" in the *Guide to Operations*.

Connector Information

Rear View

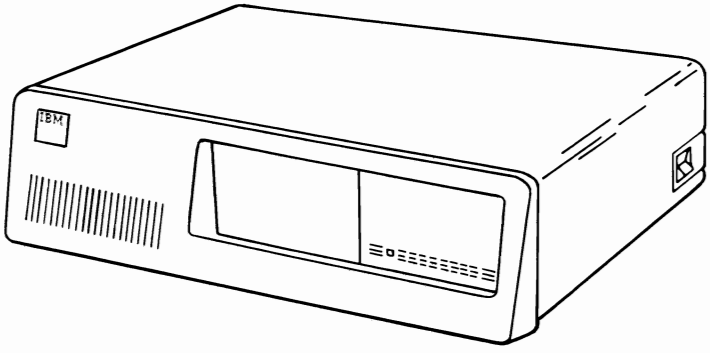


25-Pin Connector

	Signal Name - Description	Pin	
External Device	No Connection	1	**Synchronous Data Link Control Communications Adapter**
	Transmitted Data	2	
	Received Data	3	
	Request to Send	4	
	Clear to Send	5	
	Data Set Ready	6	
	Signal Ground	7	
	Received Line Signal Detector	8	
	No Connection	9	
	No Connection	10	
	*Select Standby	11	
	No Connection	12	
	No Connection	13	
	No Connection	14	
	Transmitter Signal Element Timing	15	
	No Connection	16	
	Receiver Signal Element Timing	17	
	*Test (IBM Modems Only)	18	
	No Connection	19	
	Data Terminal Ready	20	
	No Connection	21	
	Ring Indicator	22	
	Data Signal Rate Selector	23	
	No Connection	24	
	*Test Indicate (IBM Modems Only)	25	

*Not standardized by EIA (Electronics Industry Assoc.).

IBM Personal Computer Expansion Unit Instructions



This option consists of the following:

- Expansion Unit
  - Receiver card (installed)
  - 10M fixed disk drive (installed)
  - Data control cable (installed)
- Extender card
- Expansion unit cable
- BIOS Kit ROM Module (not to be used)
- Power cord
- Switch Setting Charts

If any items are missing or damaged, notify your place of purchase.

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

Warning: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

INSTRUCTIONS TO USER

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, reference manuals, and the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
- If peripherals not offered by IBM are used with this equipment, it is suggested that you use shielded, grounded cables with in-line filters, if necessary.

If necessary consult your dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

CAUTION
This product is equipped with a line cord and plug designed for the user's safety. It is to be used with a properly grounded receptacle to avoid possible electrical shock.

Notes:

CONTENTS

Installation Requirements 6
Tools Required 7
Specific Instructions 8

Installation Requirements

The expansion unit comes equipped with a fixed disk drive, a fixed disk adapter, a power supply, and a receiver card. An extender card must be installed in expansion slot 2 of your system unit. A cable connects to the extender card and the receiver card to complete the electrical connection between the system unit and expansion unit. With the extender card installed, the expansion unit has six expansion slots available where options may be installed. Space also is provided for the installation of an additional fixed disk drive.

The expansion unit has only one control -- the Power switch. **Whenever power is to be applied to the IBM Portable Personal Computer, the Power switch on the expansion unit must be set to On first.** If this is not done, an error message appears on the display. To recover from this error condition, set the Power switches on both the system unit and expansion unit to Off. Then set the Power switch on the expansion unit to On, then the Power switch on the system unit.

The BIOS kit ROM module sent with the expansion unit cannot be used on an IBM Portable Personal Computer. Discard the module.

Tool Required

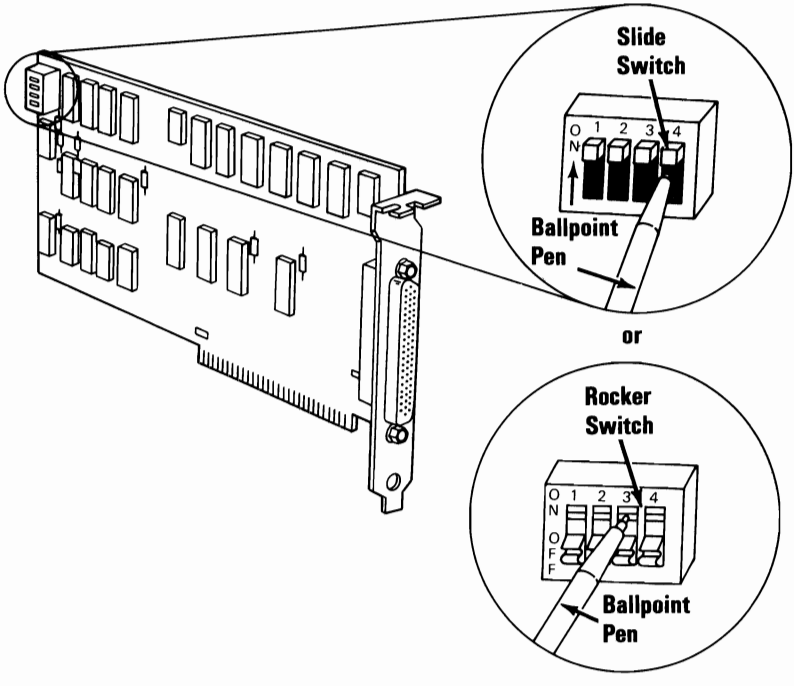
- Medium-size, flat-blade screwdriver

  Optional:

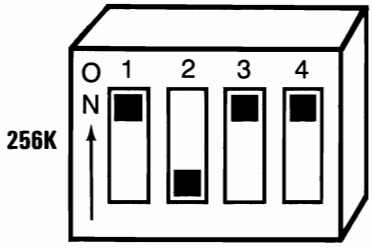
  - Medium screwstarter
  - 5.5-mm (3/16-inch) open-ended wrench

Specific Instructions

1 Place the Extender Card on a flat surface with the switch block facing up. Study the figure below. There are two types of switch blocks: rocker switch block and slide switch block. Identify the type of switches on your option. Go to the charts on the next page to make the proper switch setting.



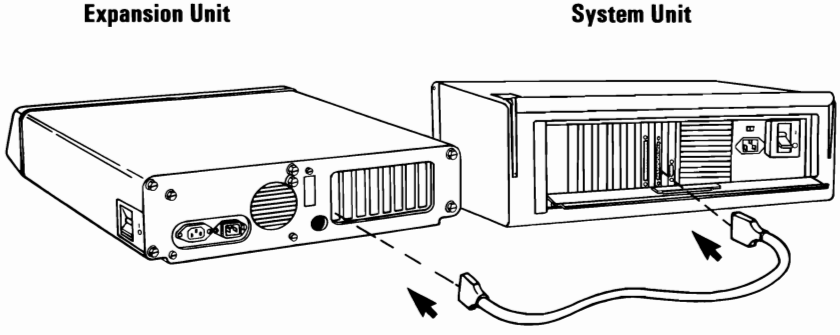
2 Switch settings on the Extender Card must reflect the total amount of memory on the system board. The following figure shows the setting for the amount of total memory. Set the switches on your Extender Card now.



The Extender Card can only be installed in expansion slot 2 of your IBM Portable Personal Computer. To install this Extender Card go to the "Option Installation" section of the *Guide to Operations* for complete installation instructions. After you have installed the Extender Card return here for cabling instructions.

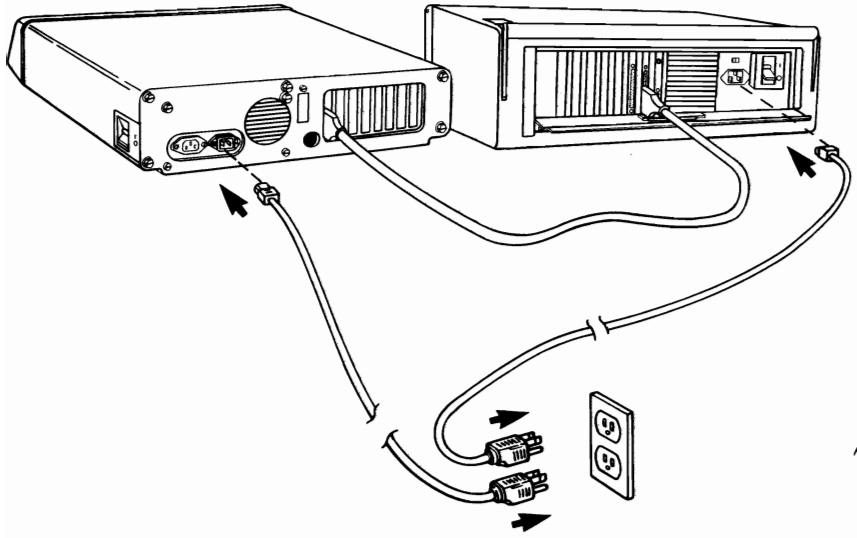
3 Ensure that the Power switches on the system unit and expansion unit are set to Off.

4 Connect the expansion unit cable to the system unit and expansion unit, as shown below.



5 Plug the expansion unit power cord into the rear of the expansion unit, as shown below.

6 Plug the Power cord(s) into the wall outlet.



CAUTION
This product is equipped with a line cord and plug designed for the user's safety. It is to be used with a properly grounded power receptacle to avoid possible electrical shock.

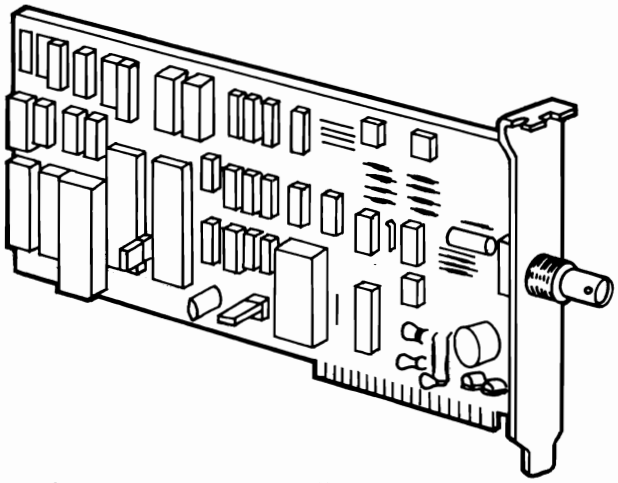
7 Your system unit is now ready for a power-on self test (POST). Go to your *Guide to Operations*, "Introduction/Installation" section for a description of this test.

Note: If you have any problems after installation, one of the following is the most likely cause:

- Improper cabling
- Incorrect switch settings
- Other options may have loosened
- The Extender Card or Receiver Card is defective.

Notes:

IBM Personal Computer Cluster Adapter Option Installation and Operating Instructions



This option consists of the following:

- IBM Personal Computer Cluster Adapter
- Terminating plug (used with Problem Determination Procedures)

If any items are missing or damaged, notify your place of purchase.

FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

INSTRUCTIONS TO USER

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, reference manuals, and the service manual, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
- Ensure that card mounting screws, attachment connector screws, and ground wires are tightly secured.
- Ensure that card slot covers are in place when no card is installed.
- If peripherals not offered by IBM are used with this equipment, it is suggested to use shielded, grounded cables, with in-line filters if necessary.

If necessary, consult your dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

CAUTION: This product is equipped with a line cord and plug designed for the user's safety. It is to be used with a properly grounded power receptacle to avoid electrical shock.

Installation Requirements

- To protect from lightning, IBM requires one grounding point on the coaxial cable and that neither the frame nor covers of the IBM Personal Computer be used as the grounding point. Contact a qualified technician for installation in compliance with local electrical codes.

- The IBM Personal Computer Cluster Adapter is designed to interconnect up to 64 IBM Personal Computers using RG 59U coaxial cable.

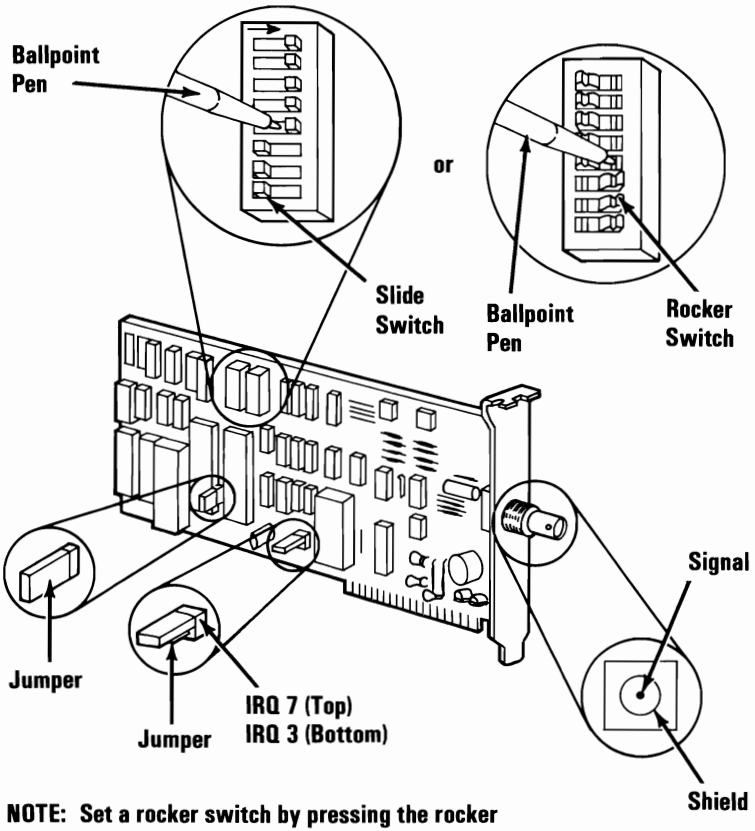
- An Installation Manager is needed to plan, install, and maintain the Cluster (A Cluster is all of the Personal Computers, Cluster Adapters, and coaxial wiring). As the Cluster is being installed, it is necessary for the installation manager to develop a Cluster Map. The Cluster Map can be a diagram or listing of the Personal Computer location, the adapter number assigned, the station (a station is a Personal Computer on the Cluster) address, and the order in which the stations are connected.

Look at the figure below and become familiar with the Cluster Adapter, the location of the two switch blocks, and the location of the two jumpers.

The two switch blocks set the adapter number, the station address, and remote initial program load (IPL is a request for an operating program from another station on the Cluster). Special software is required for this function.

The two jumpers must be installed as shown.

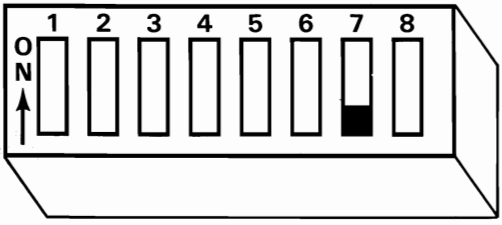
Set the switches as described under "Cluster Adapter Switch Settings."



NOTE: Set a rocker switch by pressing the rocker down to the desired position.

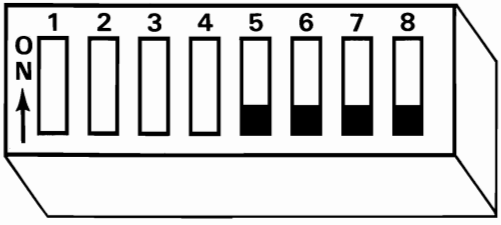
Cluster Adapter Switch Settings

The two switch blocks on the Cluster Adapter are eight-position switches. The settings of the switch positions on the following pages determine the adapter number, the station address, and remote IPL (On/Off).



Switch Block 1

Switches	Function
1-6	Station address
7	Reserved (Always Off)
8	Remote IPL (On/Off)

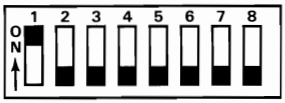
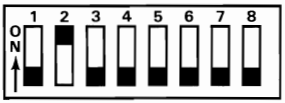
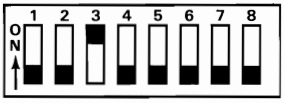
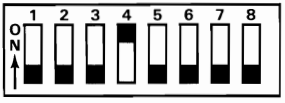


Switch Block 2

Switches	Function
1-2-3-4	Adaper number
5-6-7-8	Always Off

The following figure shows the settings for switches 1 through 4 of Switch Block 2 for Cluster adapter numbers 1 through 4.

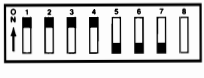
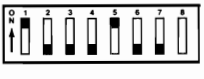
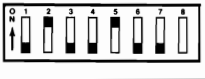
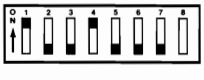
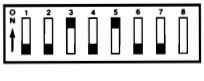
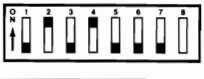
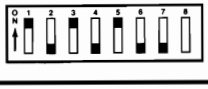
Switches 5 through 8 of Switch Block 2 are always set to Off.

Select Adapter 1: **Switch Block 2, Switch 1**	
Select Adapter 2: **Switch Block 2, Switch 2**	
Select Adapter 3: **Switch Block 2, Switch 3**	
Select Adapter 4: **Switch Block 2, Switch 4**	

Note: If one Cluster Adapter is installed in an IBM Personal Computer, it must be set as adapter number 1. Each additional adapter must have a different Cluster adapter number.

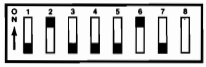
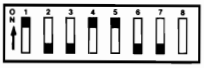
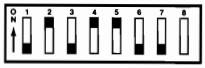
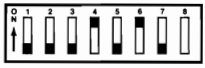
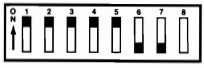
The following figure shows the settings for switches 1 through 6 of Switch Block 1 for station addresses 0 to 21.

Switch 7 of Switch Block 1 is always set to Off.

Station Address	Switch Block 1	Station Address	Switch Block 1
0		11	
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10		21	

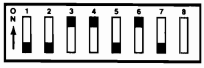
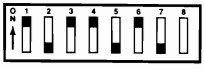
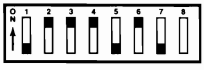
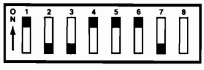
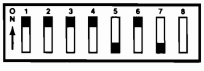
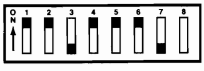
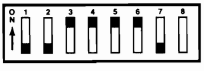
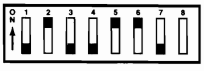
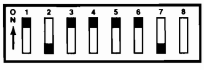
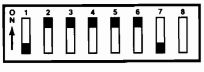
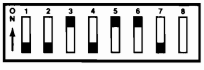
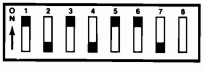
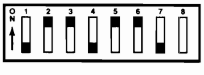
The following figure shows the settings for switches 1 through 6 of Switch Block 1 for station addresses 22 to 43.

Switch 7 of Switch Block 1 is always set to Off.

Station Address	Switch Block 1	Station Address	Switch Block 1
22		33	
23		34	
24		35	
25		36	
26		37	
27		38	
28		39	
29		40	
30		41	
31		42	
32		43	

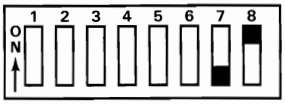
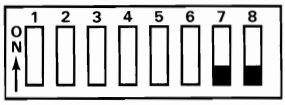
The following figure shows the settings for switches 1 through 6 of Switch Block 1 for station addresses 44 to 63.

Switch 7 of Switch Block 1 is always set to Off.

Station Address	Switch Block 1	Station Address	Switch Block 1
44		55	
45		56	
46		57	
47		58	
48		59	
49		60	
50		61	
51		62	
52		63	
53			
54			

The following figure shows the setting for switch 8 of Switch Block 1.

With switch 8 of Switch Block 1 set to On, the Personal Computer will request an IPL from another station on the Cluster. This request delays POST completion by 30 seconds.

Remote IPL ON: Switch Block 1, Switch 8	
Remote IPL OFF: Switch Block 1, Switch 8	

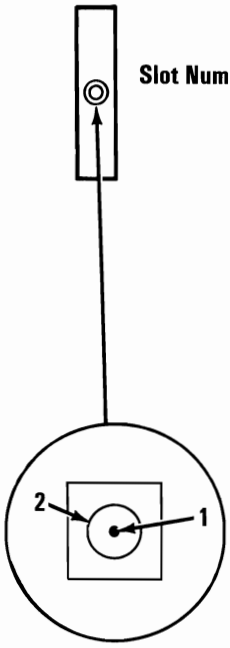
Fill in the necessary information for the adapter number, station address, and remote IPL in step 4 of the "Test 2200" section.

The IBM Cluster Adapter can be installed in your system unit or your expansion unit. If your are installing this option in your IBM Portable Personal Computer, it can only be installed in expansion slot 2.

When you have completed installation of the Cluster Adapter, contact your Installation Manager for installation of the coaxial cable.

To install this option go to "Option Installation" in the *Guide to Operation*.

Connector Information



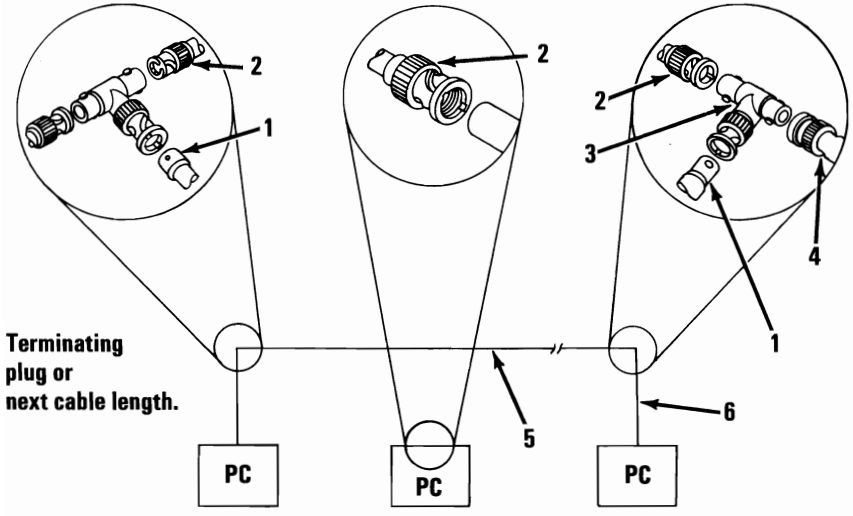
Coaxial Connector

Signal Name - Description		
Cluster Adapter	Outer Conductor	1
	Inner Conductor	2
		Cluster Adapter

Cluster Information

The following is a sample Cluster and the parts required to install the Cluster cable. All parts shown are available in the IBM Personal Computer Cluster Cable Kit (IBM Option 1501207).

One terminating plug (IBM number 6320352) must be installed at each end of the main coaxial bus and only two terminating plugs can be on the coaxial cable.



Sample Cluster

Figure Reference	Amp* Part Number	Description
1	225396-2	Cable End, Plug
2	225395-2	Cable End, Jack
3	329518	"T" Connector
4	6320352	Terminating Resistor - 1 Required at each end of Cluster Bus
5	RG59U	Cluster Bus Maximum Length - 1000 Meters
6	RG59U	Cluster Drop Maximum Length - 9 Meters Minimum Length - 1 Meter

*Amp is a trademark of Amphenol Corp.

INVENTORY CHECKLIST

Your Printer Cable carton contains the following:

☐ Printer Cable

☑ Limited Warranty *(Printed on Back of Inventory Checklist)*

If any items are missing or damaged, consult your place of purchase for information on what to do.

Refer to IBM 80 CPS Matrix Printer for connecting cable, located in Guide to Operations Section 5. "Options."

LIMITED WARRANTY

The International Business Machines Corporation warrants this IBM Personal Computer Product to be in good working order for a period of 90 days from the date of purchase from IBM or an authorized IBM Personal Computer dealer. Should this Product fail to be in good working order at any time during this 90-day warranty period, IBM will, at its option, repair or replace this Product at no additional charge except as set forth below. Repair parts and replacement Products will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts and Products become the property of IBM. This limited warranty does not include service to repair damage to the Product resulting from accident, disaster, misuse, abuse, or non-IBM modification of the Product.

Limited Warranty service may be obtained by delivering the Product during the 90-day warranty period to an authorized IBM Personal Computer dealer or IBM Service Center and providing proof of purchase date. If this Product is delivered by mail, you agree to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location and to use the original shipping container or equivalent. Contact an authorized IBM Personal Computer dealer or write to IBM Personal Computer, Sales and Service, P.O. Box 1328-W, Boca Raton, Florida 33432, for further information.

ALL EXPRESS AND IMPLIED WARRANTIES FOR THIS PRODUCT INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF 90 DAYS FROM THE DATE OF PURCHASE, AND NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

Section 5. Moving Your IBM Portable Personal Computer

Contents

Moving Your System Unit **5-3**

System Setup **5-9**

Moving Your Options **5-15**
- Preparation of Your Expansion Unit 5-15
- Short Distance Move 5-18
- Long Distance Move 5-19
  - All Units 5-19
- System Unit 5-20
- IBM Portable Personal Computer Keyboard . 5-21
- Expansion Unit 5-22
- IBM Color Display 5-23
- IBM Personal Computer Graphics Printer .. 5-24

Installation At Your New Location **5-25**

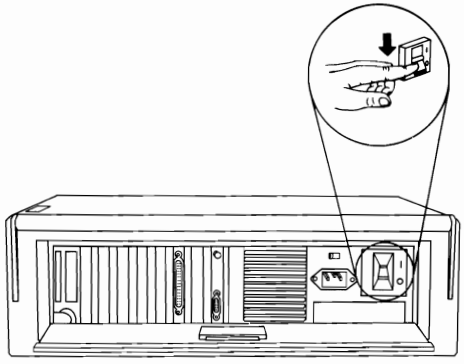
Notes:

Moving Your System Unit

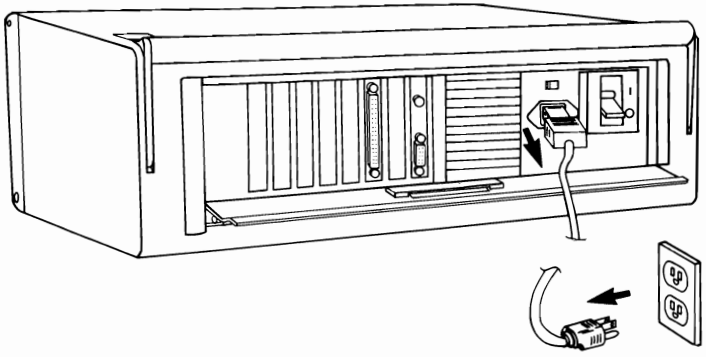
Note: If you are also moving your expansion unit with your IBM Portable Personal Computer go to "Moving Your Options" now. It is found later in this section.

1 Set the Power switch on the system unit to Off.

2 Set the Power switches on all external devices to Off.

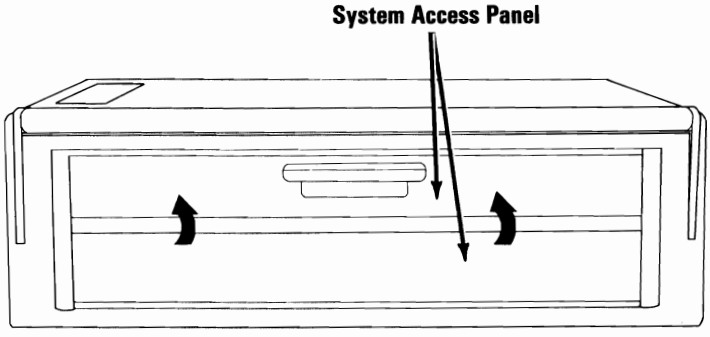


3 Unplug the system unit's power cord from the wall outlet. (If the expansion unit is attached, unplug its power cord also.) Disconnect all cables and the power cord from the rear of the system unit.

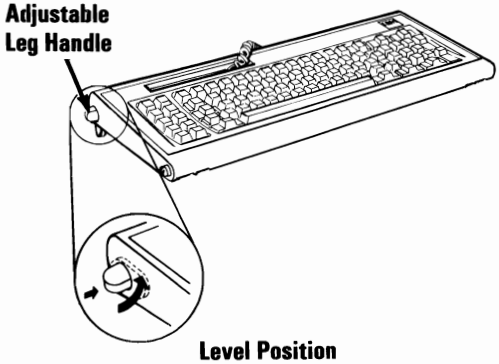


4 Coil the system unit's power cord and place it in the power-cord storage pocket on the carrying case.

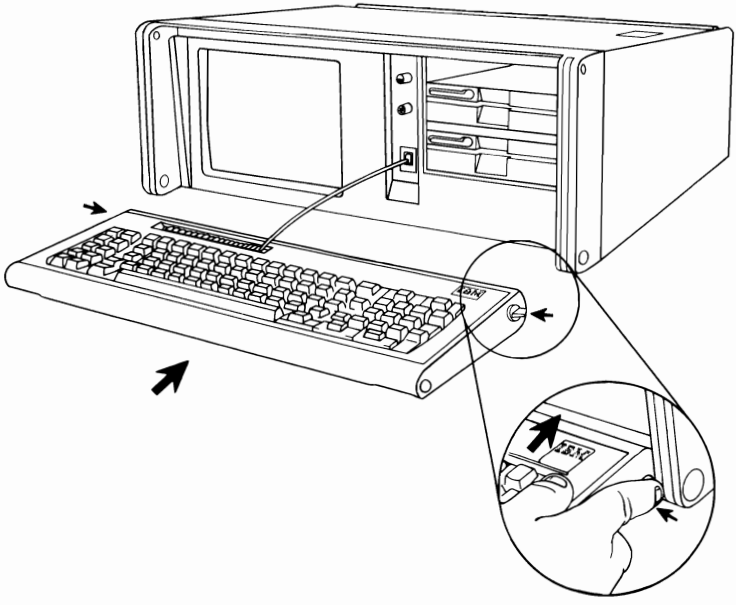
5 Close the system access panel by raising the hinged panel.



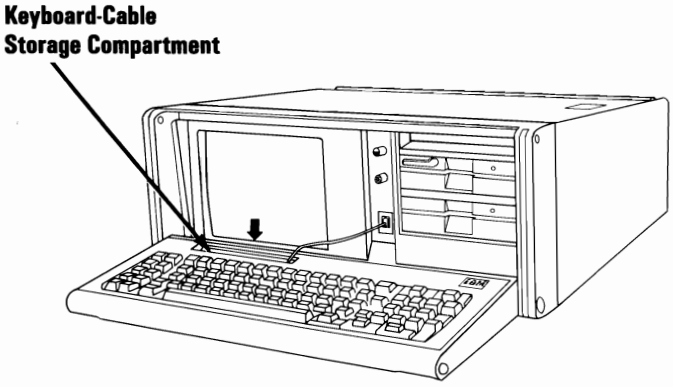
6 If the keyboard is separated from the front panel, press in firmly on the adjustable leg handles of the keyboard and place the legs in the closed position as shown.



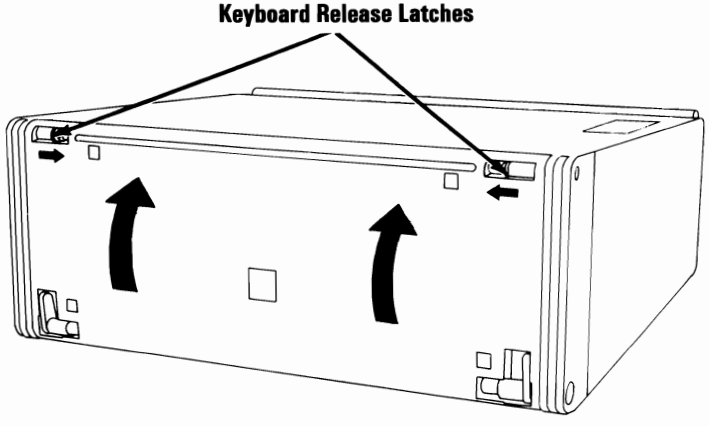
7 Press the adjustable leg handles in again and slide them into the bottom holes on the front panel.



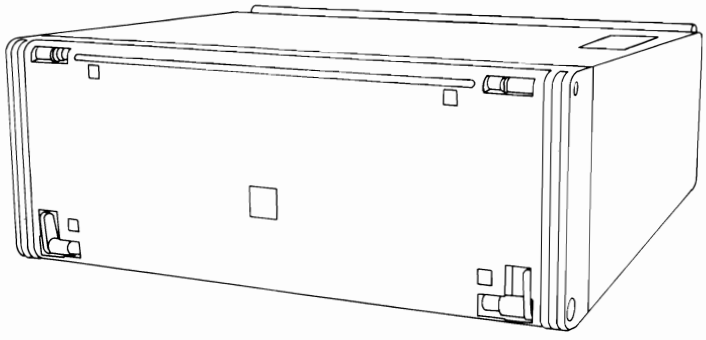
8 If the keyboard cable is extended, store the coiled portion of the cable in the keyboard-cable storage compartment.



9 Pivot the keyboard up. Press the two keyboard release latches toward the center of the system while pushing the keyboard against the front panel. Release the latches.

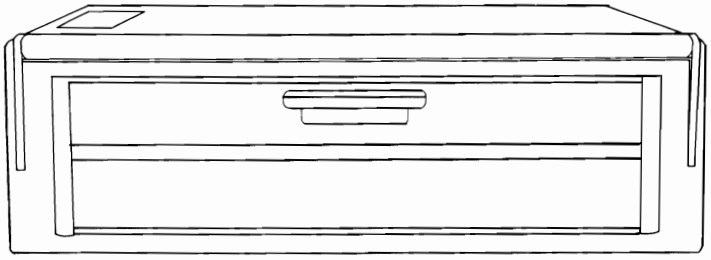


The system unit is now ready to be moved.



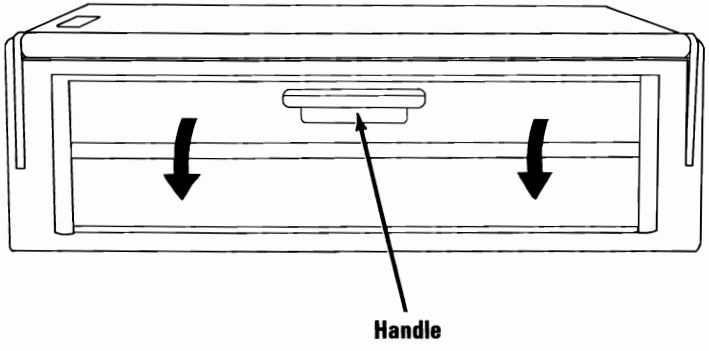
Notes:

1 Place your system unit in the position shown.



Rear View

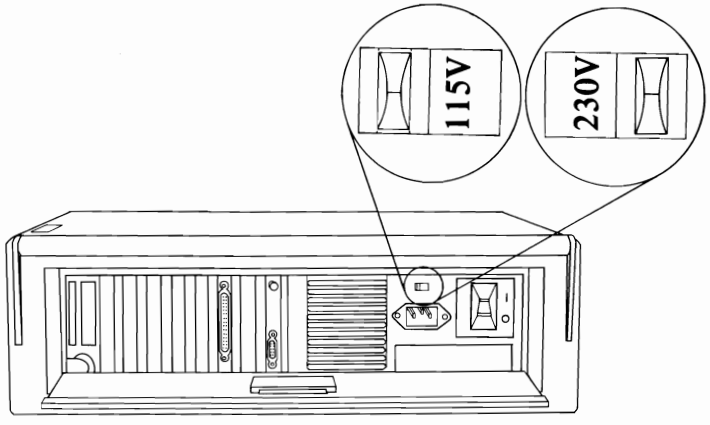
2 Open the system access panel by pulling the handle in the center of the panel as shown below. Lower the hinged panel.



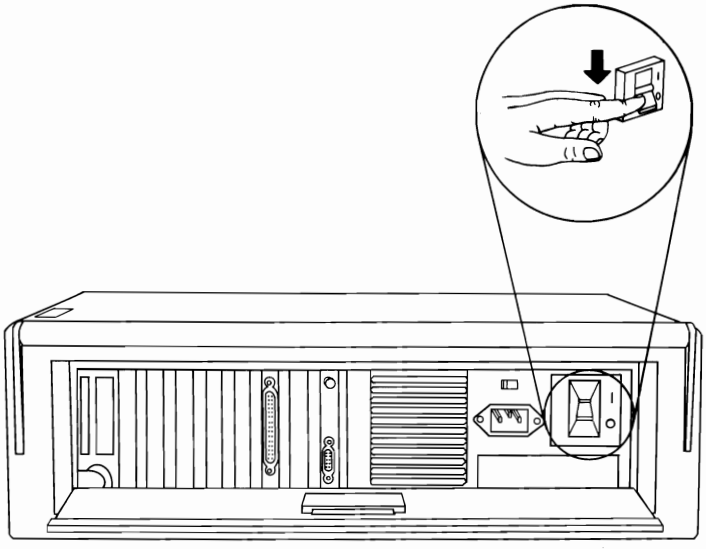
Remove the power cord from the power-cord storage pocket in the carrying case.

4 Check the setting of the input-voltage selector switch to be sure it matches your power source.

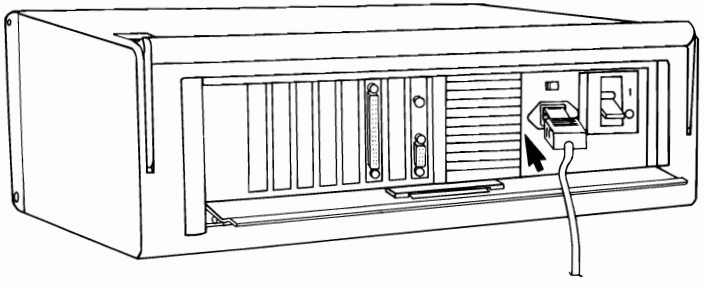
Warning: Damage to your system unit can result if the incorrect voltage setting is used.

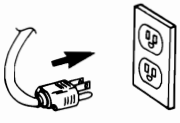


5 Set the Power switch on the system unit to Off.



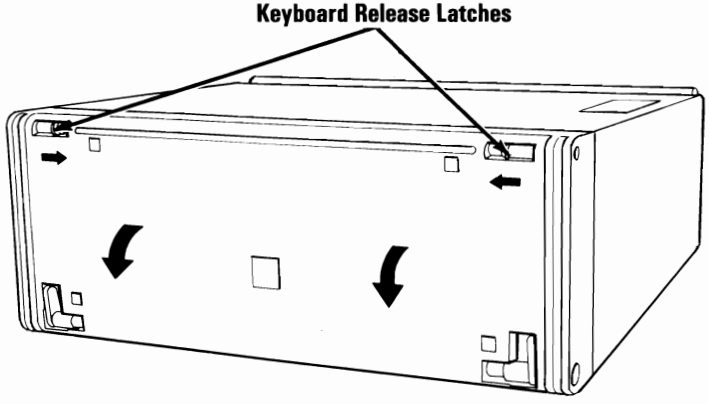
6 Connect the power cord to the system unit.

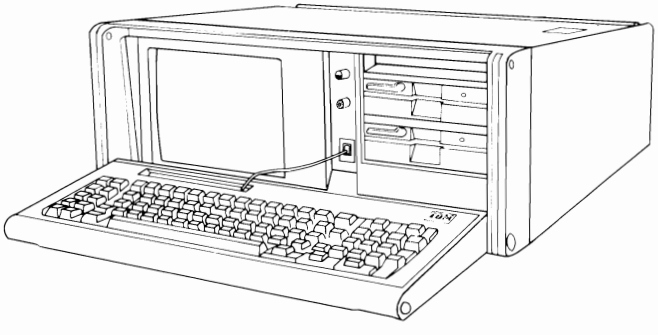




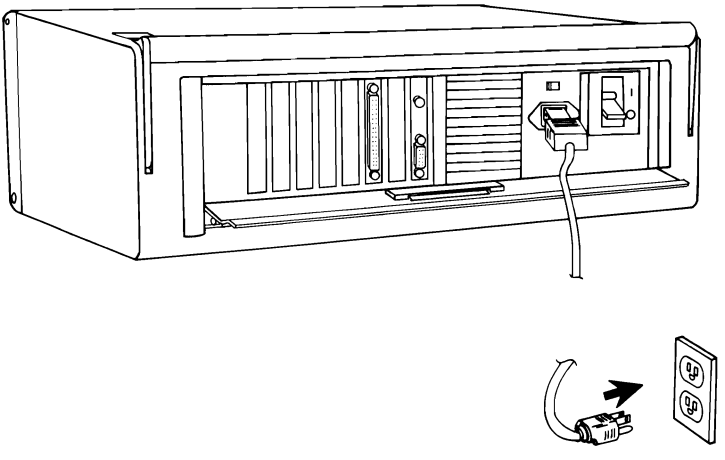
7 Place your system unit so the front of the unit faces you.

8 Push the keyboard release latches toward the center of the system as shown. Lower the keyboard to the working surface. Ensure that the keyboard cable is connected to the system unit.

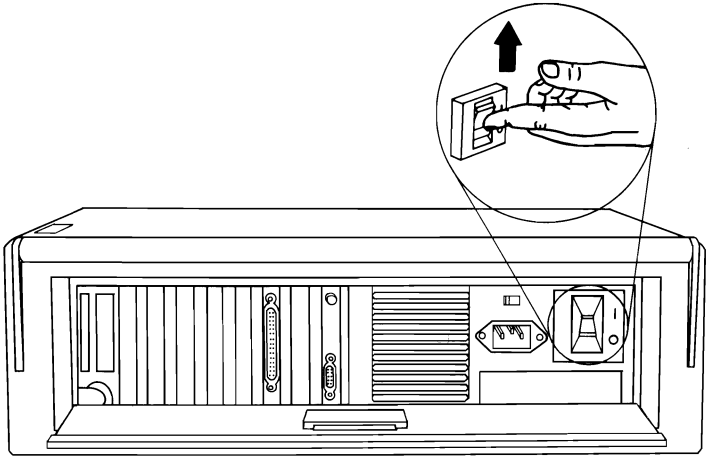




9 Plug the power cord into the wall outlet.



10 Set the Power switch on the system unit to On.



Notes:

Moving Your Options

Preparation of Your Expansion Unit

Warning: Before moving your expansion unit, you should copy all disk files onto diskettes. Normal shipping and handling can result in permanent loss of the data on your fixed disk drives. Depending on the amount of data stored, you may need as many as 32 diskettes to backup each fixed disk drive. Refer to the IBM Disk Operating System manual for a description of the Backup command.

1 Insert the Diagnostics diskette into drive A.

2 Set the Power switch on the expansion unit, if attached, to On.

3 Set the Power switch on the system unit to On.

The following message will appear on your screen.

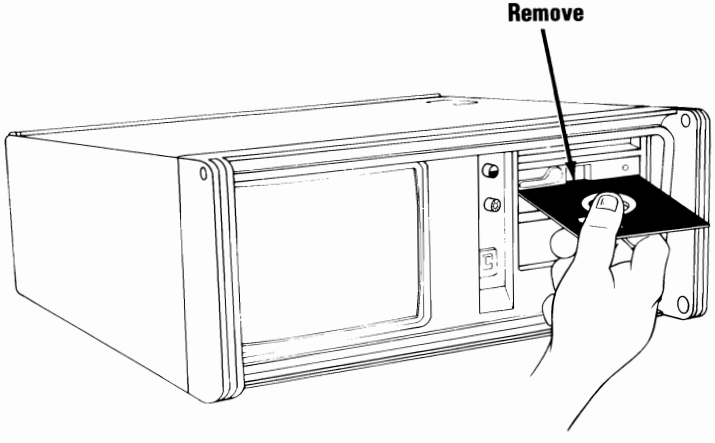
```
SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
?
```

4 Press 3 then press ↵.

The following message will appear on your screen.

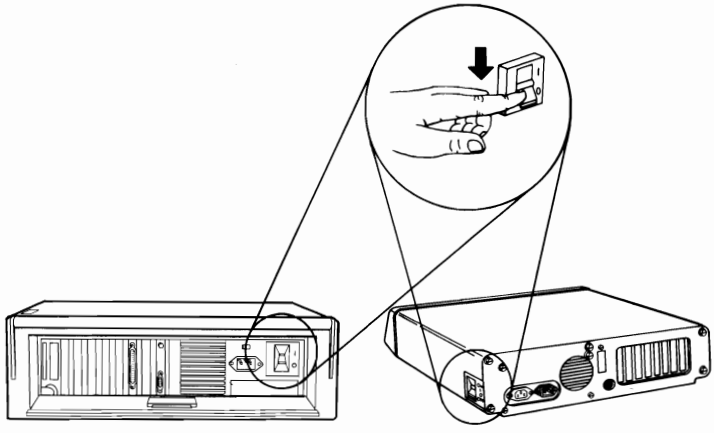
```
SELECT AN OPTION

0 - RUN DIAGNOSTIC ROUTINES
1 - FORMAT DISKETTE
2 - COPY DISKETTE
3 - PREPARE SYSTEM FOR RELOCATION
9 - EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? 3

SYSTEM READY FOR RELOCATION
```

5 Remove the diskette from the diskette drive and insert it into the back of this manual.

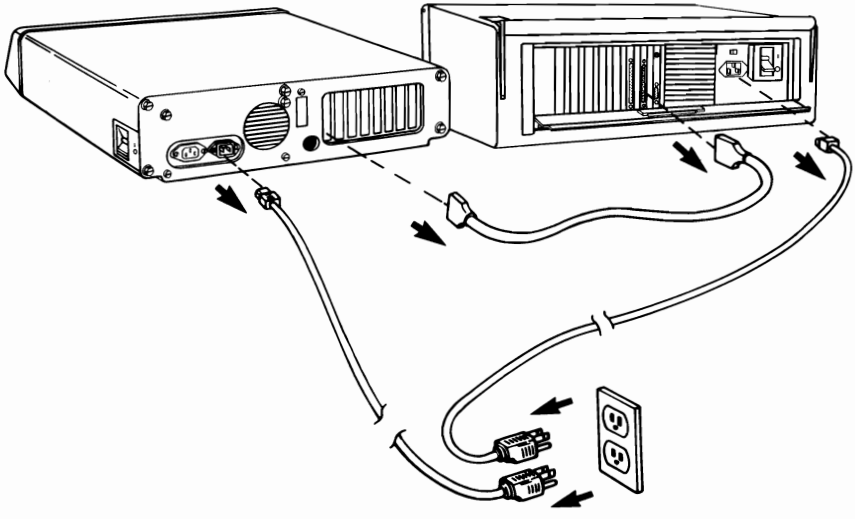


6 Set the Power switch on the system unit to Off.

7 Set the Power switches on all external devices to Off.



8 Unplug the system unit's and expansion unit's power cord from the wall outlet. Disconnect all cables and power cords from the rear of the units.



Short Distance Move

> **Note:** By "short distance," we mean any distance where trucking is not involved. An example would be moving from one office or floor to another.

Coil the options' cables, and bind them with tape, then tape them to the options.

IBM recommends that each unit be moved separately.

Long Distance Move

All Units

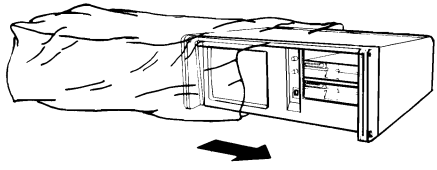
If you are shipping your IBM Portable Personal Computer over a distance and do not have control over its treatment, you may wish to protect it by placing it in a carton.

If you saved the original shipping cartons and packing material, pack your IBM Portable Personal Computer and options in them.

If you are using different cartons, cushion well to avoid damage.

System Unit

1



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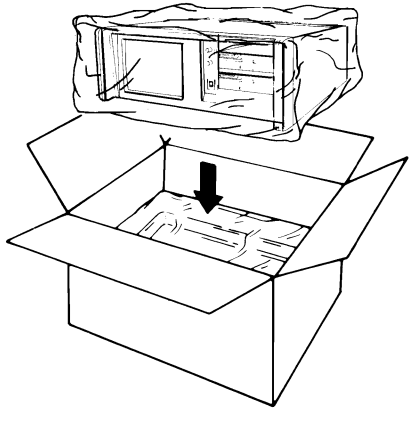

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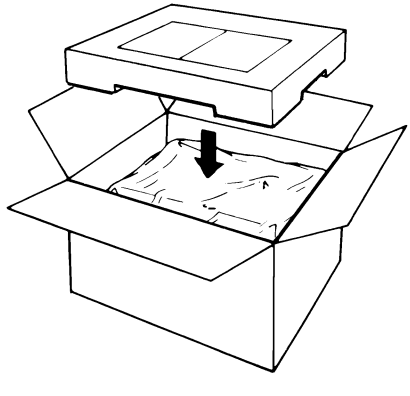
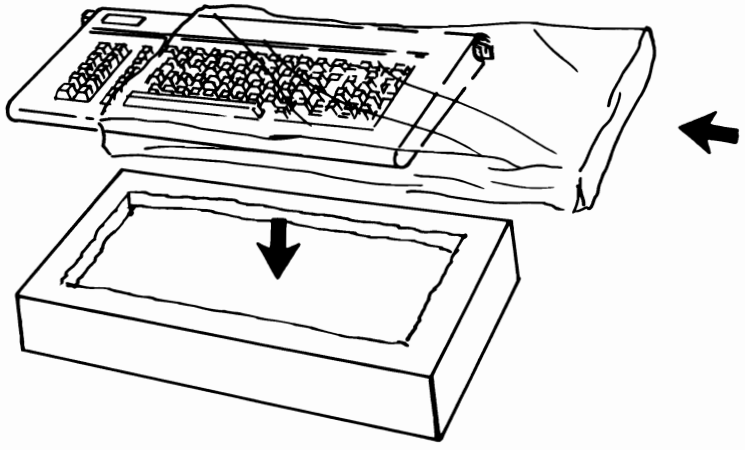


IBM Portable Personal Computer Keyboard

1



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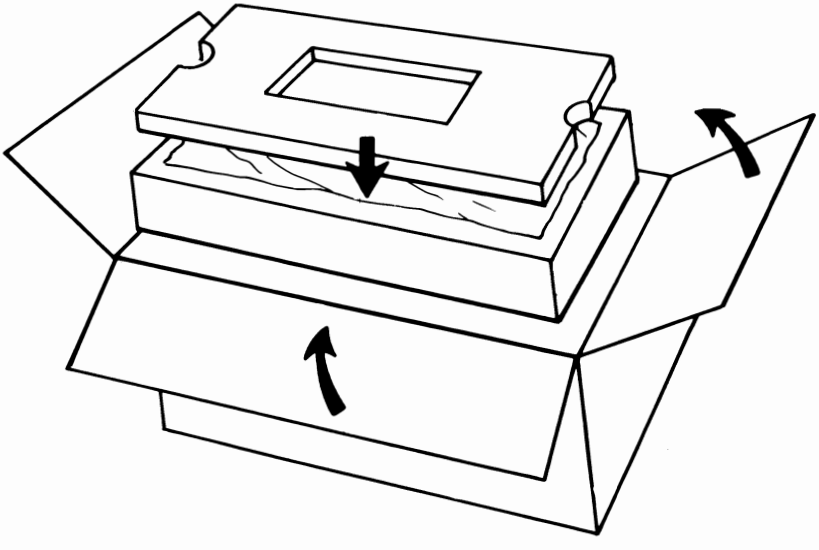
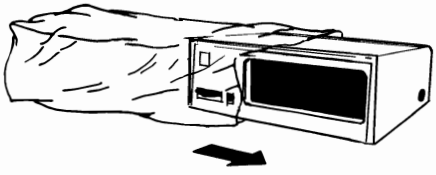


Expansion Unit

1



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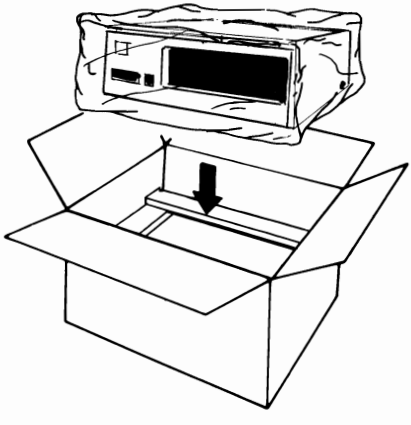

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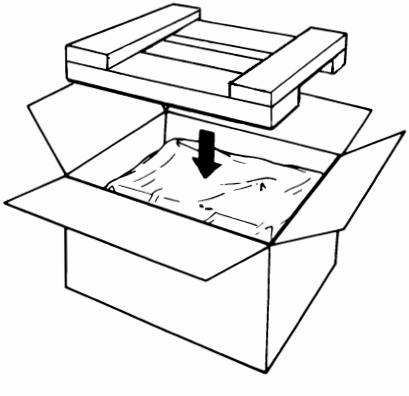
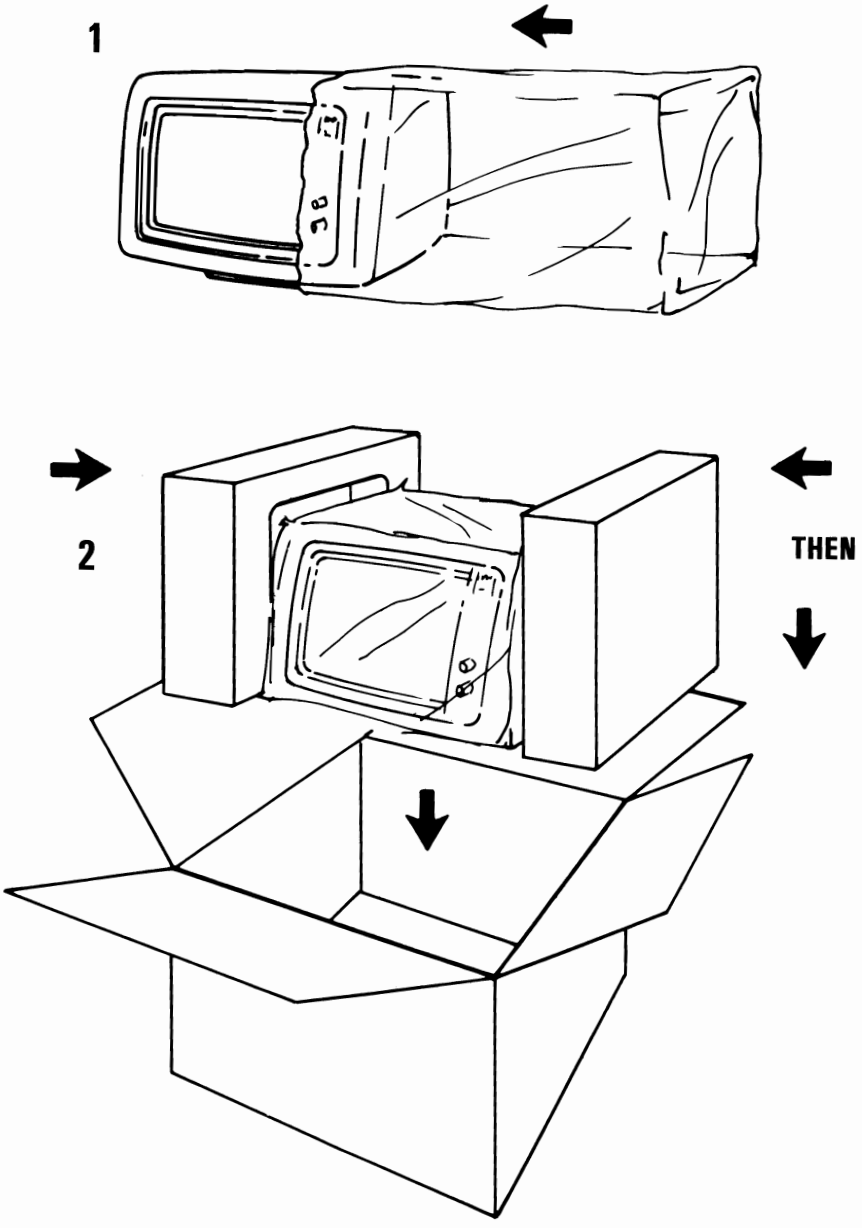
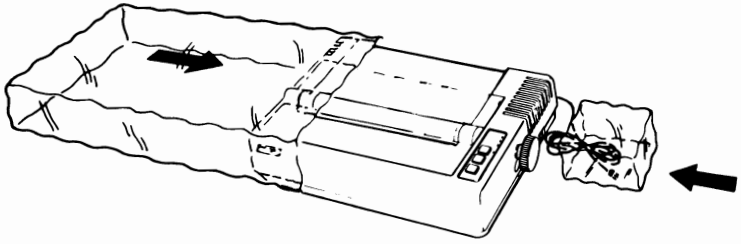


IBM Color Display



1



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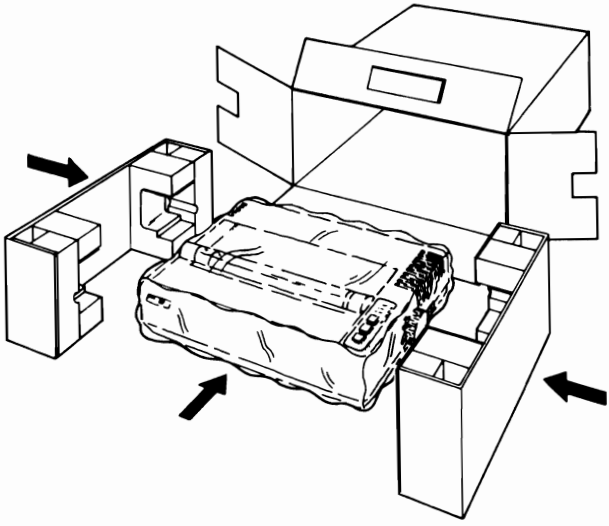

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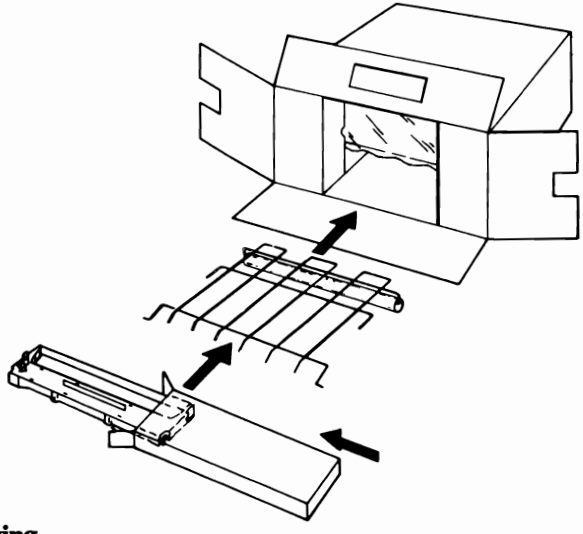


Installation At Your New Location

When your system arrives at your new location, carefully unpack it.

For setting up and cabling your IBM Portable Personal Computer and options, refer to "System Cabling" in Section 1 of this manual.

Notes:

Section 6. Keyboard Templates

Contents

Introduction 6-3

French 6-5

Italian 6-7

Spanish 6-9

German 6-11

U.S. English 6-13

U.K. English 6-15

Notes:

Introduction

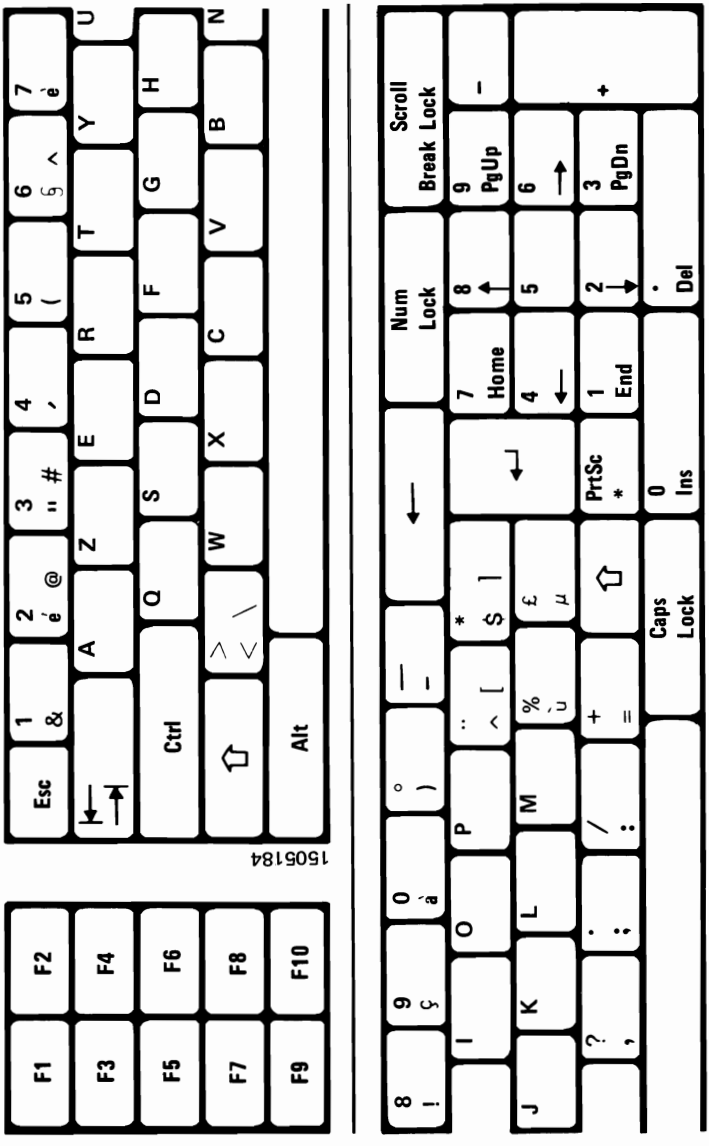
This section has figures showing the layouts of all available keyboards. These figures are intended to be cut out (or reproduced) and used as templates for the various languages provided on a National DOS diskette. If you do not use DOS, your keyboard converts all keystrokes as if you had a U.S. English keyboard, and you should use the U.S. English template as a guide.

Each figure in this section consists of two parts. Tape the parts together to form the template and set the template in the pencil tray above the keys.

Notes:

French

Note: This template is intended for use by the owner of this manual. If the owner transfers this manual, copies of the template must be destroyed or transferred with the manual.



Note: This template is intended for use by the owner of this manual. If the owner transfers this manual, copies of the template must be destroyed or transferred with the manual.

CARACTERES SUPPLEMENTAIRES

1. Appuyez et maintenez

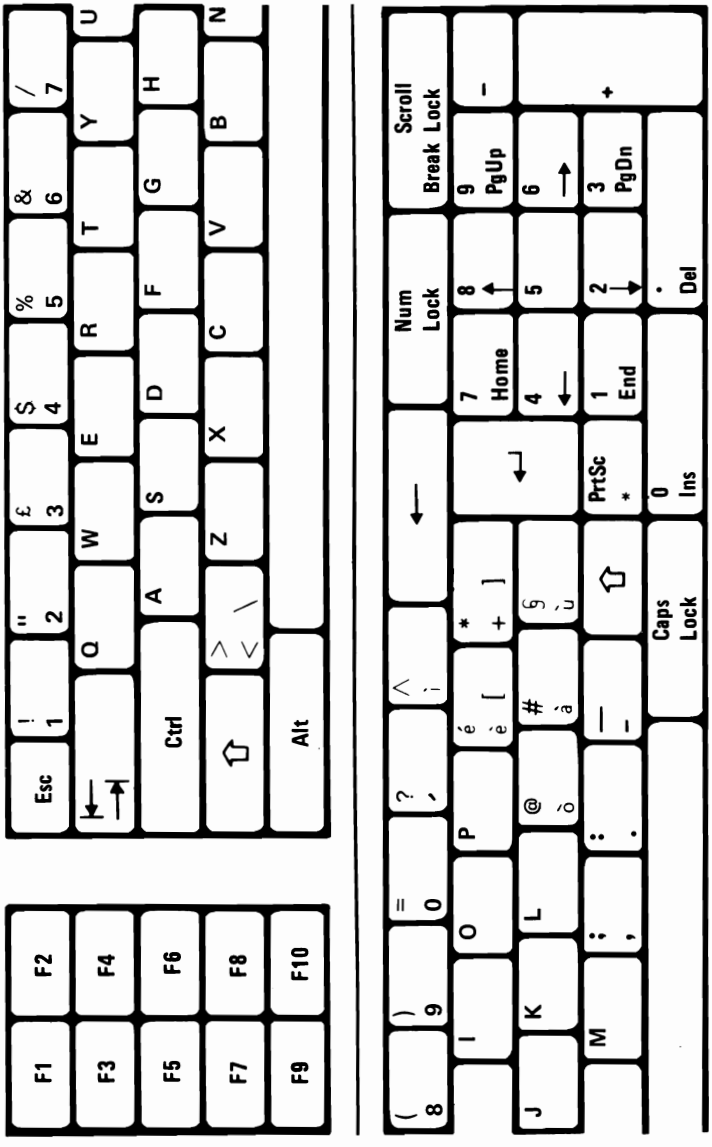
2. Frappez le code de trois chiffres sur le clavier numérique.

3. Relâchez

96	`	143	Å	160	á	169	⌐	226	Γ	235	δ	244	⌠	254	■
123	{	144	É	161	í	170	¬	227	π	236	∞	245	⌡		
124	|	145	æ	162	ó	171	½	228	Σ	237	Ø	246	÷		
125	}	146	Æ	163	ú	172	¼	229	σ	238	∈	247	≈		
126	~	149	ò	164	ñ	173	¡	230	µ	239	∩	249	∙		
127	⌂	155	¢	165	Ñ	174	«	231	τ	240	≡	250	·		
128	Ç	157	¥	166	ª	175	»	232	Φ	241	±	251	√		
134	å	158	Pts	167	º	224	α	233	Θ	242	≥	252	ⁿ		
141	ì	159	ƒ	168	¿	225	ß	234	Ω	243	≤	253	²		

Italian

Note: This template is intended for use by the owner of this manual. If the owner transfers this manual, copies of the template must be destroyed or transferred with the manual.



Note: This template is intended for use by the owner of this manual. If the owner transfers this manual, copies of the template must be destroyed or transferred with the manual.

CARATTERI AGGIUNTIVI

1. Premere e tenere premuto il tasto

2. Battere un codice di tre cifre sulla tastiera numerica.

3. Rilasciare il tasto

96	`	132	ä	144	É	155	¢	165	Ñ	174	«	231	τ	240	≡	249	•		
123	{	134	å	145	æ	157	¥	166	ª	175	»	232	Φ	241	±	250	·		
124	|	135	ç	146	Æ	158	Pts	167	º	224	α	233	Θ	242	≥	251	√		
125	}	136	ê	147	ô	159	ƒ	168	¿	225	ß	234	Ω	243	≤	252	n		
126	~	137	ë	148	ö	160	á	169	⌐	226	Γ	235	δ	244	⌠	253	2		
127	⌂	139	ï	150	û	161	í	170	¬	227	π	236	∞	245	⌡	254	■		
128	Ç	140	î	152	ÿ	162	ó	171	½	228	Σ	237	Ø	246	÷	255			
129	ü	142	Ä	153	Ö	163	ú	172	¼	229	σ	238	ε	247	≈				
131	â	143	Å	154	Ü	164	ñ	173	¡	230	μ	239	∩	248	°				

Spanish

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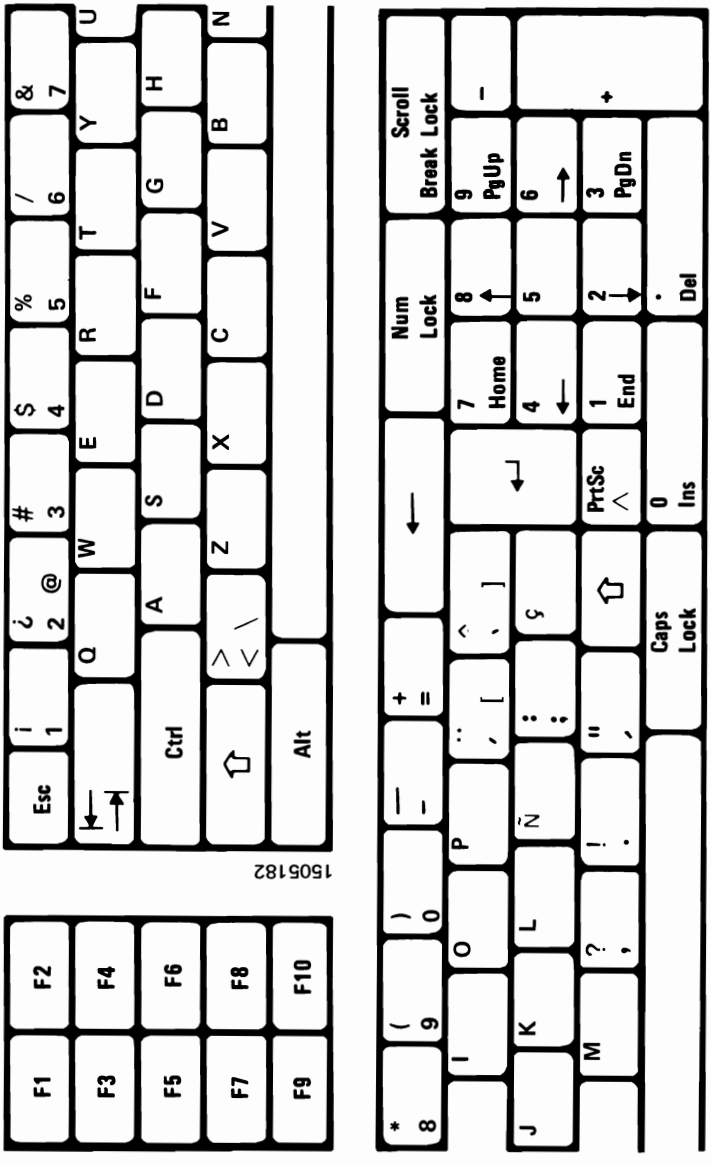
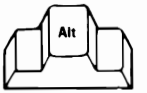
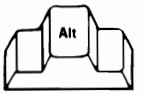


CARACTERES ADICIONALES

1. Pulse y mantenga pulsada la tecla 

2. Teclee un código de 3 digitos en el teclado numérico (Lado derecho del teclado)

3. Libere 

123	{	156	£	172	¼	230	μ	239	∩	248	°
124	¦	157	¥	174	«	231	τ	240	≡	249	•
125	}	158	Pts	175	»	232	Φ	241	±	250	·
126	~	159	ƒ	224	α	233	Θ	242	≥	251	√
127	⌂	166	ª	225	ß	234	Ω	243	≤	252	ⁿ
134	å	167	º	226	Γ	235	δ	244	⌠	253	²
145	æ	169	⌐	227	π	236	∞	245	⌡	254	■
146	Æ	170	¬	228	Σ	237	Ø	246	÷		
155	¢	171	½	229	σ	238	∈	247	≈		

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German

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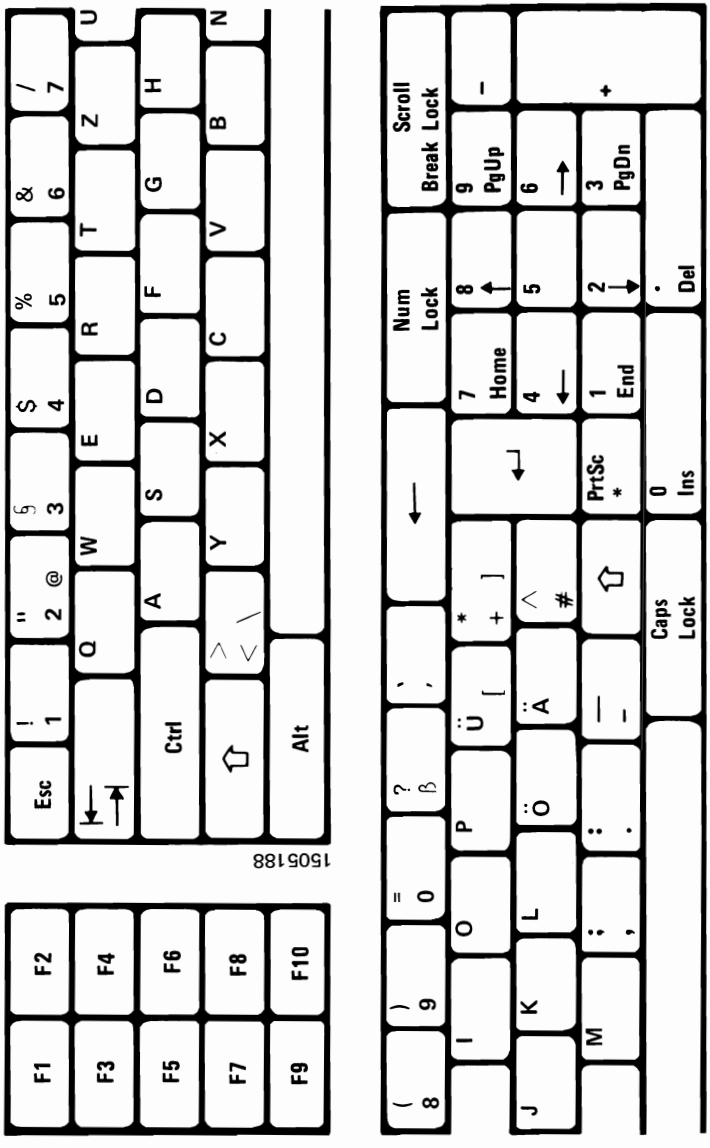

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ZUSÄTZLICHE ZEICHEN

1.

Betätigen und halten.

2. Ein 3-Zahlencode auf der Addiermaschinentastatur eingeben.

3.

loslassen.

123	{	136	ê	152	ÿ	167	º	224	α	234	Ω	243	≤	252	n
124	|	139	ï	155	¢	168	¿	226	Γ	235	δ	244	⌠	253	2
125	}	140	î	156	£	169	⌐	227	π	236	∞	245	⌡	254	■
126	~	141	ì	157	¥	170	¬	228	Σ	237	Ø	246	÷		
127	⌂	143	Å	158	Pts	171	½	229	σ	238	ε	247	≈		
128	Ç	145	æ	159	ƒ	172	¼	230	µ	239	∩	248	°		
131	â	146	Æ	164	ñ	173	¡	231	τ	240	≡	249	•		
134	ä	147	ô	165	Ñ	174	«	232	Φ	241	±	250	·		
135	ç	150	û	166	ª	175	»	233	Θ	242	≥	251	√		

U.S. English

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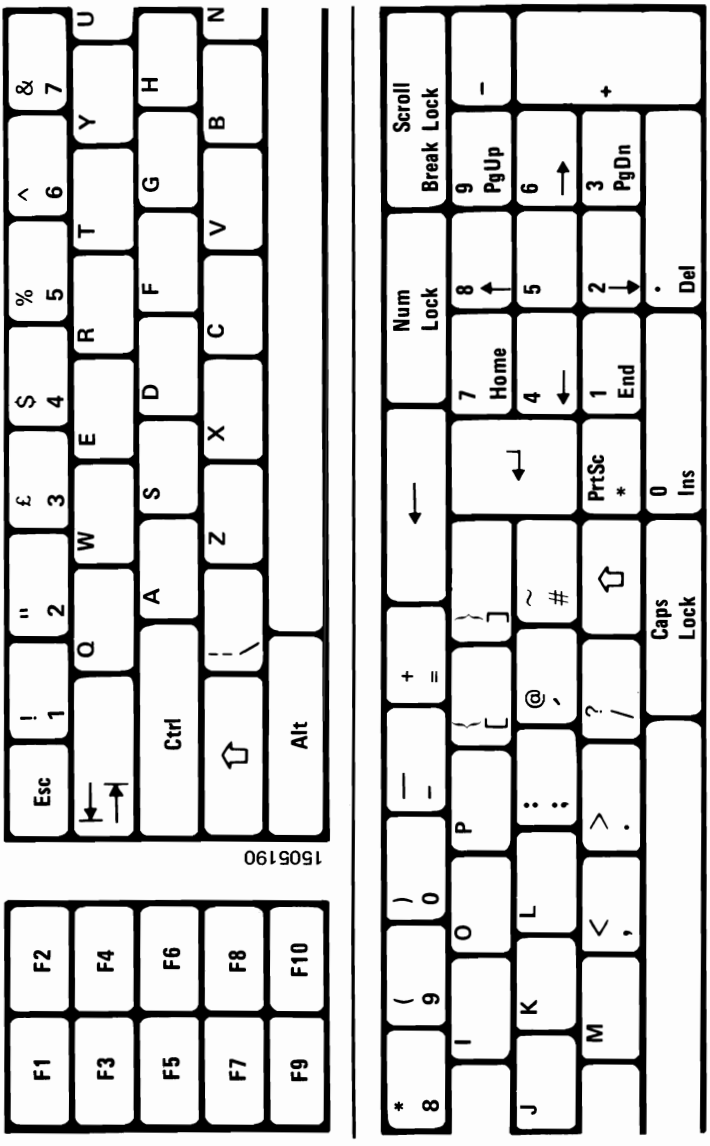

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ADDITIONAL CHARACTERS

1. Press and hold

2. Type 3 digit code on numeric keypad.

3. Release

127 ⌂	136 ê	145 æ	154 Ü	163 ú	172 ¼	229 σ	239 ∩	248 °
128 Ç	137 ë	146 Æ	155 ¢	164 ñ	173 ¡	230 µ	240 ≡	249 •
129 ü	138 è	147 ô	156 £	165 Ñ	174 «	231 τ	241 ±	250 ·
130 é	139 ï	148 ö	157 ¥	166 ª	175 »	232 Φ	242 ≥	251 √
131 â	140 î	149 ò	158 Pts	167 º	224 α	234 Ω	243 ≤	252 n
132 ä	141 ì	150 û	159 ƒ	168 ¿	225 ß	235 δ	244 ⌠	253 ²
133 à	142 Ä	151 ù	160 á	169 ⌐	226 Γ	236 ∞	245 ⌡	254 ■
134 å	143 Å	152 ÿ	161 í	170 ¬	227 π	237 Ø	246 ÷	255
135 ç	144 É	153 Ö	162 ó	171 ½	228 Σ	238 ∈	247 ≈

U.K. English

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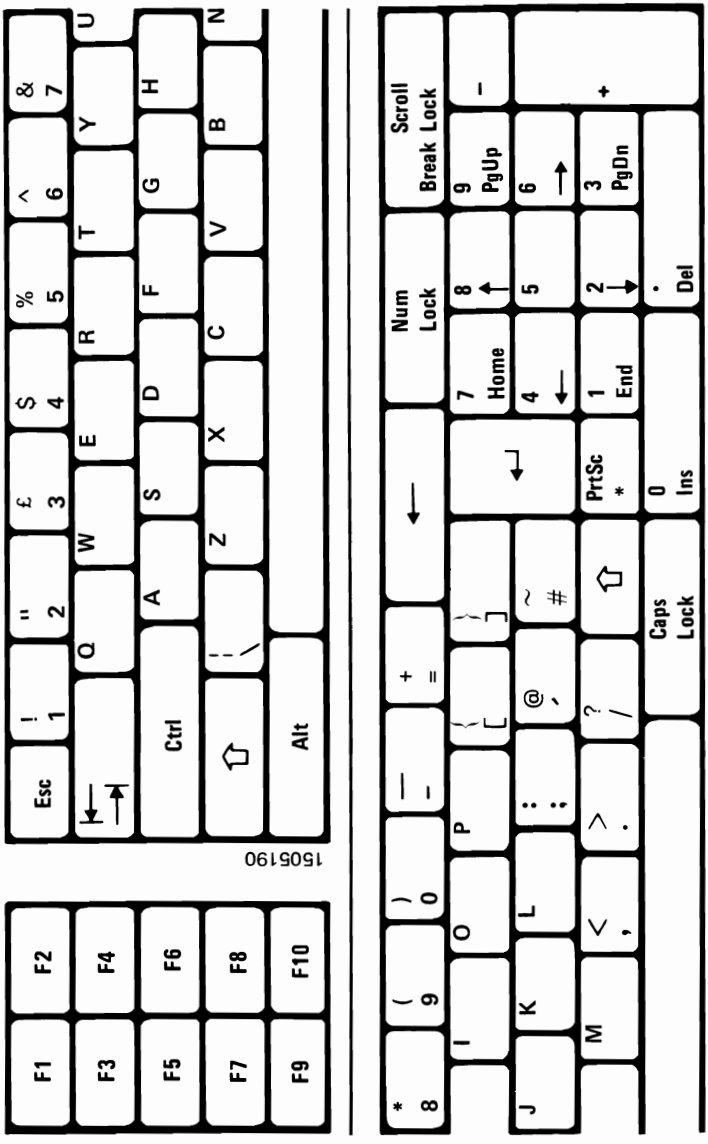

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ADDITIONAL CHARACTERS

1. Press and hold

2. Type 3 digit code on numeric keypad.
3. Release

96	`	135	ç	144	É	153	Ö	163	ú	172	¼	229	σ	238	∈	247	≈
127	⌂	136	ê	145	æ	154	Ü	164	ñ	173	¡	230	µ	239	∩	248	°
128	Ç	137	ë	146	Æ	155	¢	165	Ñ	174	«	231	τ	240	≡	249	∙
129	ü	138	è	147	ô	157	¥	166	ª	175	»	232	Φ	241	±	250	·
130	é	139	ï	148	ö	158	Pts	167	º	224	α	233	Θ	242	≥	251	√
131	â	140	î	149	ò	159	ƒ	168	¿	225	ß	234	Ω	243	≤	252	n
132	ä	141	ì	150	û	160	á	169	⌐	226	Γ	235	δ	244	⌠	253	²
133	à	142	Ä	151	ù	161	í	170	¬	227	π	236	∞	245	⌡	254	■
134	å	143	Å	152	ÿ	162	ó	171	½	228	Σ	237	Ø	246	÷		

Glossary

ASCII. American National Standard Code for Information Interchange. The standard code using a coded character set consisting of 7-bit coded characters (8 bits including parity check). The ASCII set consists of control characters and graphic characters.

backup. To duplicate data from a fixed disk drive (or diskette) to a diskette. This action insures availability of data in the event of loss or damage to the original data.

BASIC. (beginner's all-purpose symbolic instruction code). A program language that uses common English words.

byte. In the IBM Portable Personal Computer, a sequence of eight adjacent binary digits that are operated on as a unit and that constitute the smallest addressable unit in the system.

control character. A character whose occurrence in a particular context initiates, modifies, or stops a control operation.

cps. Characters per second. A term used to express the printing speed of a printer.

cursor. A movable spot of light on the screen of a display, usually indicating where the next character is to be entered, replaced, or deleted.

data. All information entered into or used by the computer.

diagnostic. Pertaining to the detection and isolation of a malfunction or mistake.

diagnostic diskette. A diskette used by computer users and service personel to diagnose hardware problems.

diskette. A thin flexible, magnetic disk and a semi-rigid protective jacket, in which the disk is permanently enclosed.

diskette drive. A device that uses diskettes for storage and retrieval of data.

DOS. Disk Operating System. A program that interacts with the processor and the disk or diskette drive to control the flow of data.

fixed disk. A disk of rigid material with a magnetic coating, used for mass storage and retrieval of data.

formatting. The preparation of a disk or diskette for use by the computer.

formatted disk/diskette. A disk/diskette that can be used by the computer for the storage of data.

graphic character. A character, other than a control character, that is normally represented by a symbol.

joystick. For the IBM Portable Personal Computer, a user-supplied device that connects to the Game Control Adapter.

Kb. Kilobyte. A kilobyte equals 1024 bytes of information.

Mb. Megabyte. A megabyte equals 1,048,576 bytes of information.

modem. A device that allows computers to exchange information over telephone lines.

operating system. A program that supervises the execution of user programs by the computer.

POST. power-on self test. A series of diagnostics tests that are executed each time the Power switch on the IBM Portable Personal Computer is set to On.

prototype card. A blank circuit card that can be used to create custom adapters.

SDLC. Synchronous Data Link Control. A data link over which communications are conducted.

typematic keys. Keyboard buttons that repeat their function when held down.

Notes:

Index

A

adjustments
color display 3-33
internal display 1-24
keyboard 1-19
vertical hold 3-34
vertical size 3-35
Alternate key 3-11
ASCII codes
Alternate key 3-11
charts 6-3

B

Backspace key 3-10
BASIC
BASIC language 3-5
message 1-18
brightness control
color display 3-33
internal display 1-24, 3-29

C

Caps Lock key 3-8
checking electrical connections 2-1
color display
    brightness 3-33
    contrast 3-33
    controls 3-33
    operations 3-33
    packing 5-23
    problems 2-1
    rolling screen 3-34
    vertical size adjustment 3-35
    verticle hold 3-34
color/graphics monitor adapter
    auxiliary connectors 3-40
    interface information 3-39
communications problems 2-1
contrast control
    color display 3-33
    internal display 1-24, 3-29
Control key 3-11
controls
    brightness 3-29, 3-33
    color diplay 3-33
    contrast 3-29, 3-33
    diskette drive 3-25
    internal display 1-24, 3-29
    vertical hold 3-34
    vertical size 3-35
cursor 3-20
cursor control keys 3-20

D

dead keys 3-15
Delete key 3-19
Diagnostics 2-1
diskette
    care 1-25
    diagnostic 2-1
    Diagnostics diskette 5-15
    handling 1-25
    National DOS diskette 3-13
diskette drive
    data errors 1-26
    drive A 3-25
    In-Use light 3-27
    load lever 3-26
    operation 3-25
display
    color 3-33
    composite 3-37
    internal 1-24
    internal display 1-24
    loading 3-25
DOS
    introduction 3-5
    National DOS diskette 3-13, 6-3

E

End key 3-21
Enter key 3-9
error messages 2-1
Escape key 3-12
examples
    error 2-1

error messages 2-1
expansion unit
error message 3-31
fixed disk 3-31
moving 5-15
packing 5-22
problem determination 2-1
extender card 3-31
Extender Card Switch Setting 4-85

F

fixed disk
backup 5-15
expansion unit 3-31
moving 5-15
problems 2-1
function keys 3-23

G

grounded plug 1-15

H

Home key 3-21
how to
determine problems 2-1
write program 3-5

I

IBM Disk Operating System (DOS) 3-5
In-Use light 3-27
Insert key 3-19
installation
  after move 5-9
  after shipping 5-25
  composite display 3-37
  keyboard 1-13
  system unit 1-9
  television 3-37
internal display
  brightness 1-24, 3-29
  contrast 1-24, 3-29
  controls 1-24, 3-29
  operation 3-29
  problems 2-1
international keyboard keys
  ASCII 3-15
  dead key 3-14
  four-keystroke 3-16
  front face 3-15
international keyboards 3-13
introduction
  composite display 3-37
  keyboard 3-7
  system unit 1-3

K

keyboard
  adjustable leg handles 1-19
  installation 1-13
  international 3-13

packing 5-21
positions 1-19
problems 2-1
templates 3-13, 6-3
keyboard keys
Alternate key 3-11
Backspace 3-10
Caps Lock 3-8
Control 3-11
cursor control 3-20
Cursor Down 3-20
Cursor Left 3-21
Cursor Right 3-20
Cursor Up 3-20
dead key characters 3-15
Delete 3-19
End 3-21
Enter 3-9
Escape 3-12
function keys 3-23
Home 3-21
Insert 3-19
Minus 3-19
number 0 3-10
number 1 3-10
numeric keypad 3-18
Numeric Lock 3-18
Page Down 3-22
Page Up 3-22
Plus 3-19
Print Screen 3-9
Scroll Lock 3-18
Shift 3-12
Spacebar 3-11
Tab 3-12
typematic 3-7
typewriter area 3-8
keyboard templates 6-3

L

lights
diskette In-Use 3-27
In-Use 3-27
Power-On indicator 3-33
load lever 3-26

M

memory
system board 1-3
test 1-17
Memory Expansion Option Switch Setting 4-84
Minus key 3-19
moving
expansion unit 5-15
fixed disk 5-15
long distance 5-19
options 5-15
printer 5-24
setup 5-9
short distance 5-18
system unit 5-3

N

National DOS diskette 3-13
Numeric Lock key 3-18

O

operating
    color display 3-33
    diskette drive 3-25
    expansion unit 3-31
    internal display 3-29
    system unit 3-6
    systems 3-5
operating system
    BASIC 3-5
    DOS 3-5
options
    color display 3-33
    expansion slots 3-31
    expansion unit 3-31
    external 1-6
    internal 1-7
    moving 5-15

P

packing
    all units 5-19
    color display 5-23
    expansion unit 5-22
    keyboard 5-21
    printer 5-24
Page Down key 3-22
Page Up key 3-22
Plus key 3-19
power supply
    input-voltage selector switch 1-12
    introduction 1-3
power switch

expansion unit 3-31
system unit 1-12, 3-6
power-on self test 1-16
POST errors 2-1
Print Screen key 3-9
printer
moving 5-24
problems 2-1
problem determination 2-1
problems 2-1

S

Scroll Lock key 3-18
setup
system unit 1-9
Shift key 3-12
shipping
color display 5-23
expansion unit 5-22
keyboard 5-21
options 5-19
printer 5-24
system unit 5-19
shipping cardboard 1-14
Spacebar 3-11
switch settings
Diskette Drive Switch Settings 4-83
Math Coprocessor Switch Settings 4-80
system board switch block location 4-78
system board switch settings 4-78
Type of Display Switch Settings 4-82
system cabling 1-26
system unit
access panel 1-9
display 1-24

features 1-5
introduction 1-3
moving 5-3
problems 2-1
setup 1-9, 5-9

T

Tab key 3-12
television
arrangement 1-26
connection 3-37
installation 3-37
screen alignment 2-1
templates
international keyboard 3-13
typematic 3-7
typewriter area 3-8

W

wrap plug 2-1

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