



*Personal Computer
Hardware Reference Library*

Display Station
Emulation Adapter

Installation and Problem Determination Procedures

Version 3.0



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Emulation Adapter

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FEDERAL COMMUNICATIONS COMMISSION (FCC) STATEMENT REVISED BY IBM FOR THE IBM PERSONAL COMPUTER/DISPLAY STATION EMULATION ADAPTER

The IBM Personal Computer/Display Station Emulation Adapter (hereafter called adapter) is an FCC Class A device designed for installation in the IBM Personal Computer¹ to support attachment of the IBM Personal Computer as a peripheral to other properly supported and configured IBM Systems. This information is applicable only in the United States.

Warning: The IBM Personal Computer with the Adapter installed in it generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manuals, may cause interference to radio communications.

The IBM Personal Computer with the Adapter installed in it (hereafter called equipment) has been tested and found to comply with the limits for a Class A 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 commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

¹The IBM Personal Computer refers to any or all of the following: the IBM Personal Computer, the IBM Personal Computer XT, the IBM Personal Computer XT/370, the IBM Portable Personal Computer, the the IBM 3270 Personal Computer, or the IBM Personal Computer Expansion Unit.

Instructions Pursuant to FCC Part 15 Subpart J

1. This equipment should not be installed less than 30 meters (98.5 feet) from radio or television receivers or their receiving antennas.
2. This equipment should not receive its power from branch circuits that also power radio or television receivers.

If this equipment cannot comply with the above distance limitations:

1. Turn the equipment and the receiver on. If no interference is apparent, no further action need be taken.
2. If interference occurs, reorient or relocate the equipment, the receiver, or both.
3. If interference still occurs, contact your IBM Representative.

First Edition (June 1984)

Changes are periodically made to the information herein; these changes will be incorporated in new editions of this publication.

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Preface

This manual is designed to assist you in installing and testing your IBM Personal Computer/Display Station Emulation Adapter.

This manual is organized into six major sections:

Section 1: Hardware Installation

Section 1 provides step-by-step instructions for initial installation and testing of the IBM Personal Computer/Display Station Emulation Adapter. Once completed, the Display Station Emulation Adapter should be installed and functioning properly.

Section 2: Problem Determination Procedures

Section 2 provides step-by-step instructions to aid you in identifying the failing unit (System Unit or Expansion Unit) should a problem develop. You may be directed to have the failing unit serviced, use the Problem Determination Procedures in your *IBM Personal Computer Guide to Operation* manual, or perform a repair action.

Section 3: Creating The Display Station Emulation Adapter Integrated Diagnostics Diskette

Section 3 provides instruction that aids in merging the IBM Personal Computer Diagnostics, and the Display Station Emulation Adapter Diagnostics onto a single, separate diagnostic diskette (Display Station Emulation Adapter Integrated Diagnostics).

Section 4: Parts Catalog

Section 4 provides part numbers for the Display Station Emulation Adapter and the Display Station Emulation Adapter accessories.

Section 5: Advanced Display Station Emulation Diagnostics

Section 5 provides advanced diagnostic information designed for users with some technical expertise of the Personal Computer. This section requires you to have the IBM Personal Computer Advanced Diagnostic Diskette and the appropriate *IBM Personal Computer Hardware Maintenance and Service* manual.

Section 6: Hardware Description

Section 6 provides technical information about the Display Station Emulation Adapter including theory and signal description.

Related Publications

- *IBM Personal Computer Guide to Operations*, Part 6025000
- *IBM Personal Computer Technical Reference*, Part 6025005
- *IBM Personal Computer Hardware Maintenance and Service*, Part 6025072
- *IBM Personal Computer XT Guide to Operations*, Part 6936810
- *IBM Personal Computer XT Technical Reference*, Part 6936808
- *IBM Personal Computer XT Hardware Maintenance and Service*, Part 6936809
- *IBM Personal Computer XT/370 Guide to Operations: Part 1502245*
- *IBM Portable Personal Computer Guide to Operations: Part 6936571*
- *IBM Portable Personal Computer Hardware Maintenance and Service Addendum: Part 6936573*
- *IBM Portable Personal Computer Technical Reference Addendum: Part 6936572*
- *IBM 3270 Personal Computer Guide to Operations: Part 1837432.*

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SECTION 1. HARDWARE INSTALLATION

This section provides step-by-step instructions on how to install the IBM Personal Computer/Display Station Emulation Adapter hardware on your IBM Personal Computer, IBM Personal Computer XT, IBM Personal Computer XT/370, IBM Portable Personal Computer, the IBM 3270 Personal Computer, or the Expansion Unit¹.

Once you complete this section, the Display Station Emulation Adapter should be installed and working properly. Use the remaining sections in this manual if a problem develops or if you need parts information.

Inventory Checklist

Your IBM Personal Computer/Display Station Emulation Adapter carton contains the following items required for hardware installation. Please place a checkmark in the box to the left of each item as you remove it from the carton to ensure that all of the items are there:

- Display Station Emulation Adapter.
- Card Support Bracket.
- IBM Personal Computer/Display Station Emulation Adapter Diagnostic Aid Diskette (located in the back of this manual).
- Installation Instructions.

If any items are missing or damaged, contact your point of sale for information on what to do.

¹The term Expansion Unit refers to the IBM Personal Computer Expansion Unit.

Installation Requirements

- The IBM Personal Computer/Display Station Emulation Adapter may be installed in the IBM Personal Computer System Unit, the IBM Personal Computer XT System Unit, the IBM Personal Computer Expansion Unit, the IBM Portable Personal Computer System Unit, the IBM 3270 Personal Computer, or the IBM Personal Computer XT/370 Expansion Unit.
- If you are installing the Display Station Emulation Adapter in an IBM Portable Personal Computer, or an IBM 3270 Personal Computer, your *Guide to Operations* manual contains a section on adapter installation. Refer to pages 1-10 through 1-14 in this manual to make the proper switch settings before going to your *Guide to Operations* to complete the actual installation. When you complete the adapter installation, continue reading on page 1-20 of this manual to check out the Display Station Emulation Adapter.
- The following instructions depict the installation of the Display Station Emulation Adapter in the IBM Personal Computer XT System Unit. With the exception of minor differences, the instructions are the same for the IBM Personal Computer and the Expansion Unit. If you are installing the Display Station Emulation Adapter in a IBM Personal Computer XT/370, follow the instructions for the Expansion Unit.
- Where differences occur, perform only the instruction that pertains to your unit.

Tool Requirements

Use the following tools to install the IBM Personal Computer/Display Station Emulation Adapter hardware described in this section.

Required:

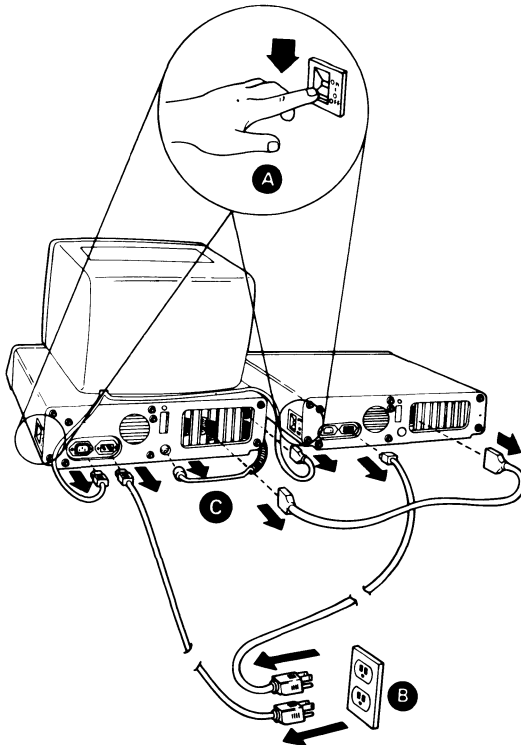
- Medium size flat blade screwdriver.

Optional:

- Medium screwstarter (may be helpful when installing screws).
- 3/16 inch wrench or 3/16 inch nutdriver (may be used instead of screwdriver when installing the adapter).
- 1/4 inch nutdriver.

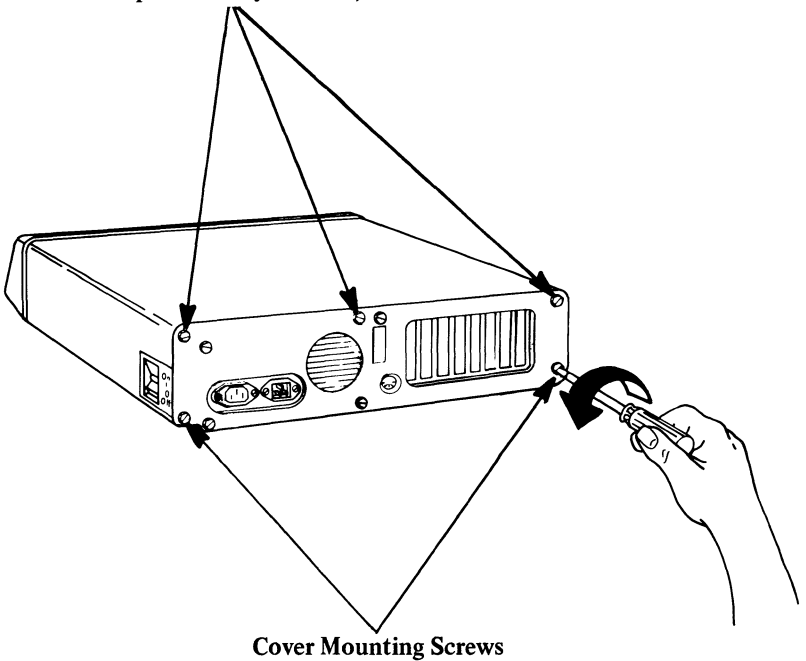
How to Install the Display Station Emulation Adapter

1. Position the System Unit and Expansion Unit (if attached) power switches to Off [A].
2. Position all power switches on external elements to Off.
3. Unplug the System Unit and Expansion Unit (if attached) and all other elements from the wall outlet. [B]
4. Disconnect all cables from the rear of the unit in which the Display Station Emulation Adapter is to be installed. [C]

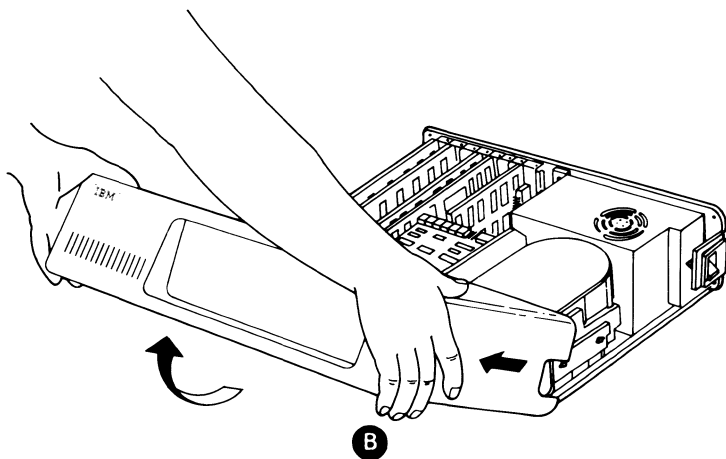
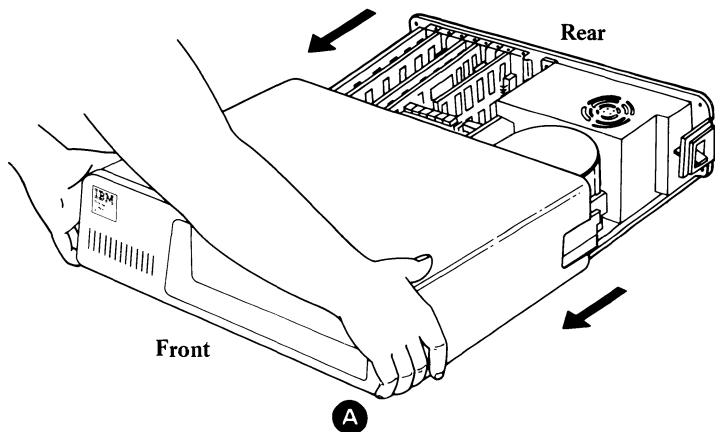


5. Set your keyboard and all other elements in an area away from the work surface.
6. Position the unit to allow access to the rear.
7. Use a flat blade screwdriver or 1/4 inch nutdriver to remove the five cover mounting screws by turning them counterclockwise as shown in the figure below. Save these screws for cover replacement.

Cover Mounting Screws
(These three screws may not
be present on your unit)

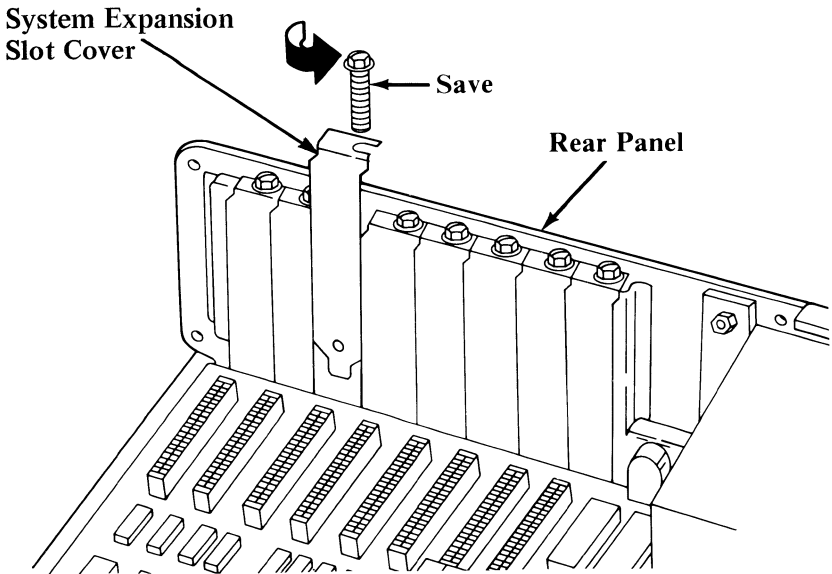


8. Carefully slide the unit's cover away from the rear and towards the front as indicated by the figure [A] below. When the cover goes no further, tilt the cover up [B], remove the cover from the base, and set the cover aside.

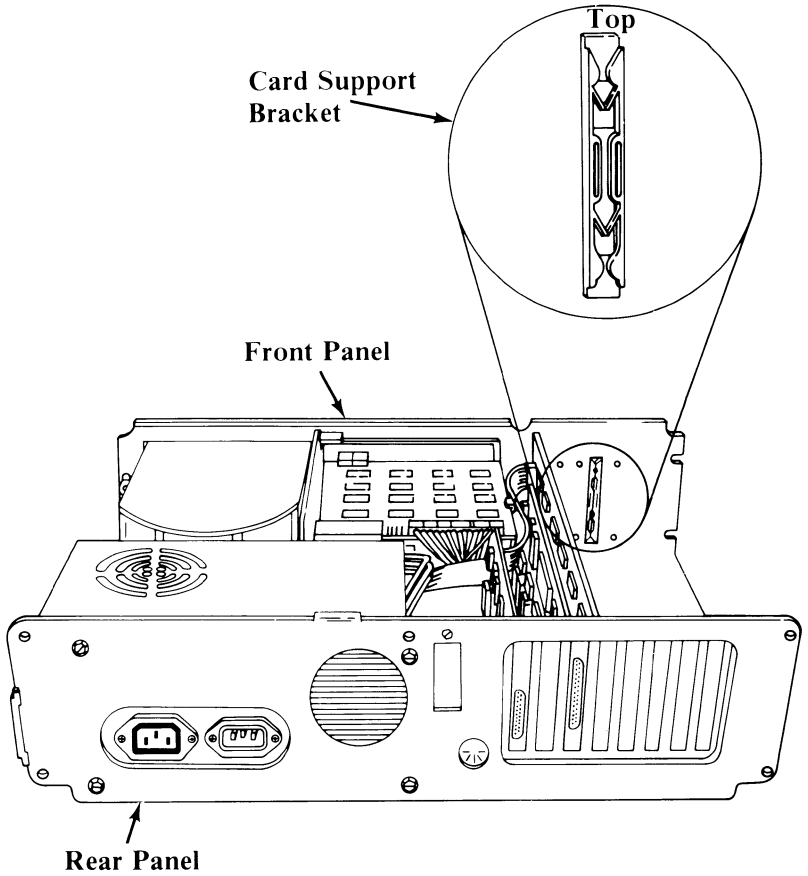


9. Look at the inside left rear of your unit.
 - If your unit is the IBM Personal Computer XT System Unit, there are eight system expansion slots. You may install the Display Station Emulation Adapter in any available slot, except 7 and 8.
 - If your unit is the IBM Personal Computer System Unit, there are five system expansion slots. You may install the Display Station Emulation Adapter in any available slot.
 - If your unit is the IBM Personal Computer Expansion Unit, there are eight system expansion slots. You may install the Display Station Emulation Adapter in any available slot, except 7 and 8.

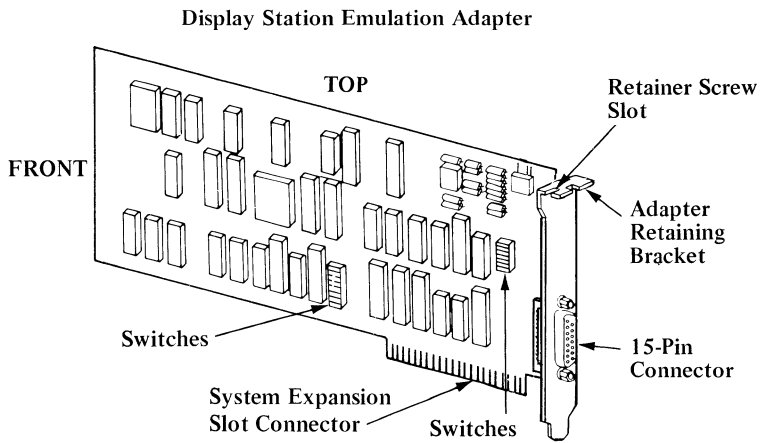
10. Use a flat blade screwdriver or a 3/16 inch nutdriver to remove the screw that holds the system expansion slot cover in place by turning it counterclockwise. Save this screw for the Adapter installation.



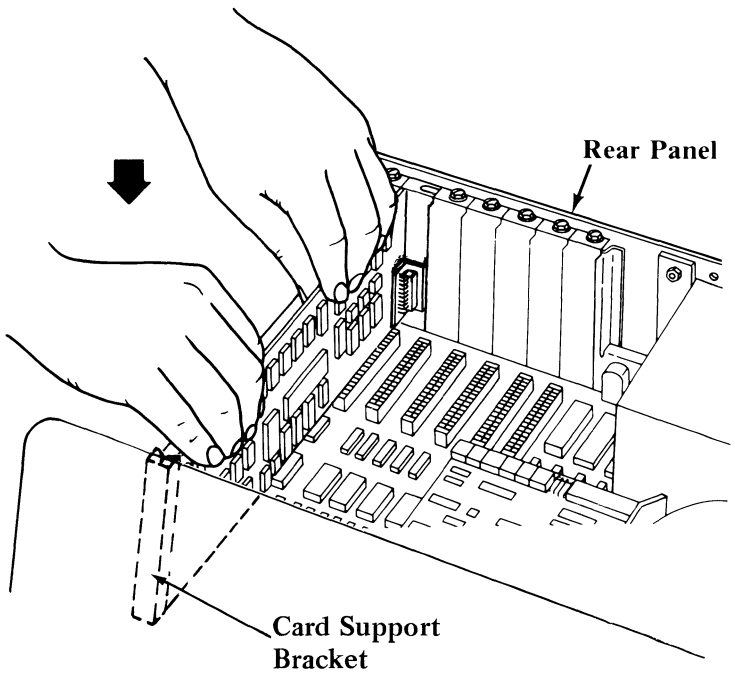
11. Press the card support bracket into the corresponding holes in the front panel of the unit.



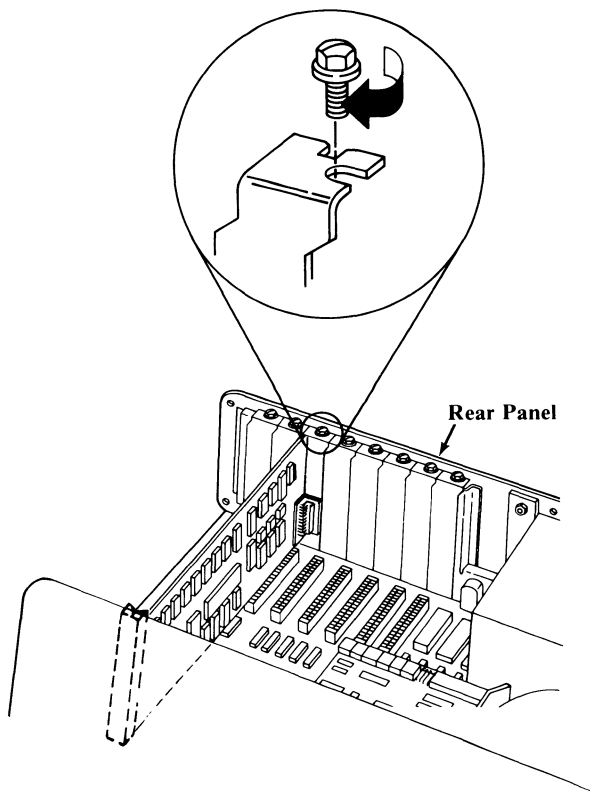
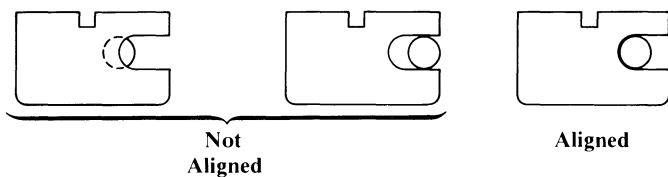
12. Look at the figure below to familiarize yourself with the Display Station Emulation Adapter.



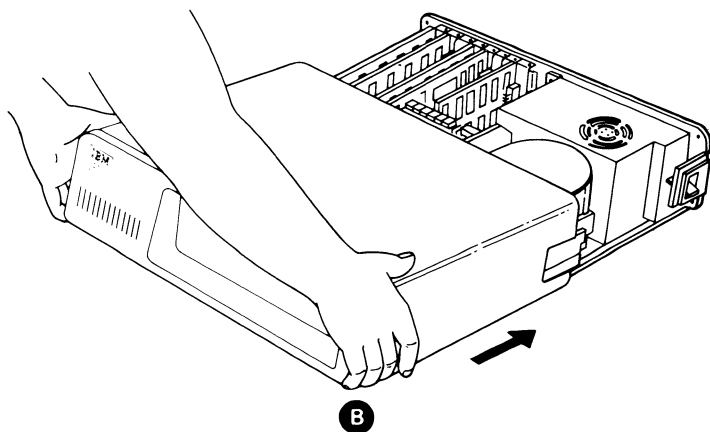
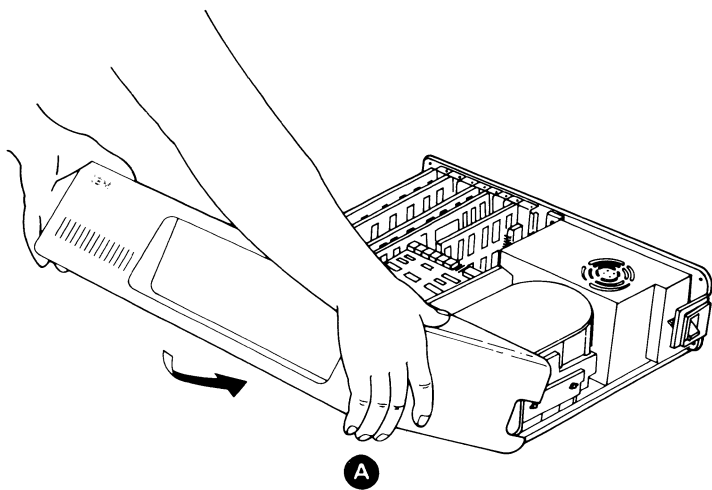
16. Hold the Display Station Emulation Adapter by the top corners, insert the Adapter into the Card Support Bracket, and then firmly press the Adapter into the system expansion slot.



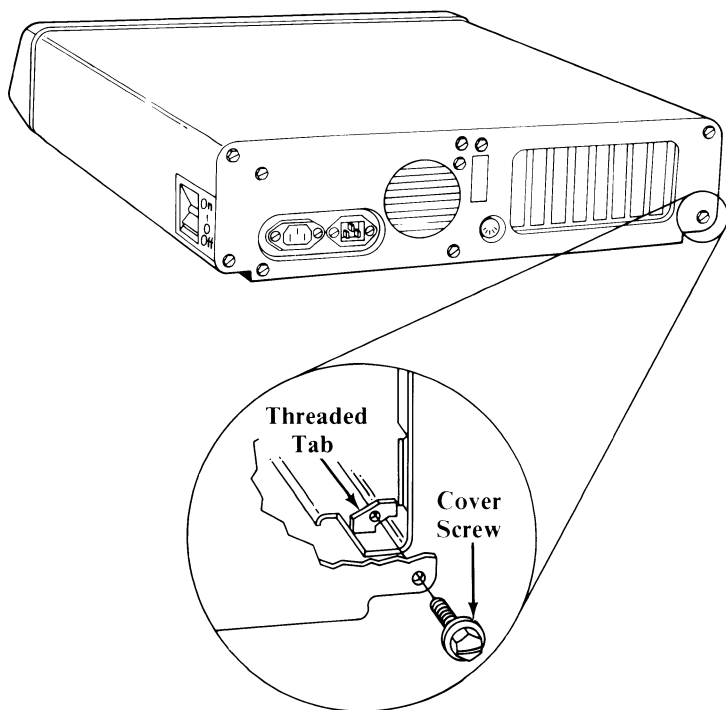
17. Align the slot in the Adapter Retaining Bracket with the hole in the rear panel of the unit. Start the screw (removed in Step 10) clockwise, and then tighten the screw with a flat blade screwdriver or 3/16 inch nutdriver.



18. Replace the unit cover by positioning the cover as shown [A], and carefully sliding it toward the rear of the unit. [B]



19. When the cover is all the way to the rear, insert and align the screws, removed in step 13, with the threaded tabs, then tighten the screws with a flat blade screwdriver by turning them clockwise.



13. Contact the lead operator or system implementor for the system to which your IBM Personal Computer will be attached and obtain the following information¹. This information is required to set the switches on the Display Station Emulation Adapter and should be recorded in the spaces next to each item.

Display Station Address: 35

Interrupt Level: 5

Terminate Option (ON/OFF): OFF

Place the Display Station Emulation Adapter on a flat surface with the switches facing up as shown in the figure on page 1-12.

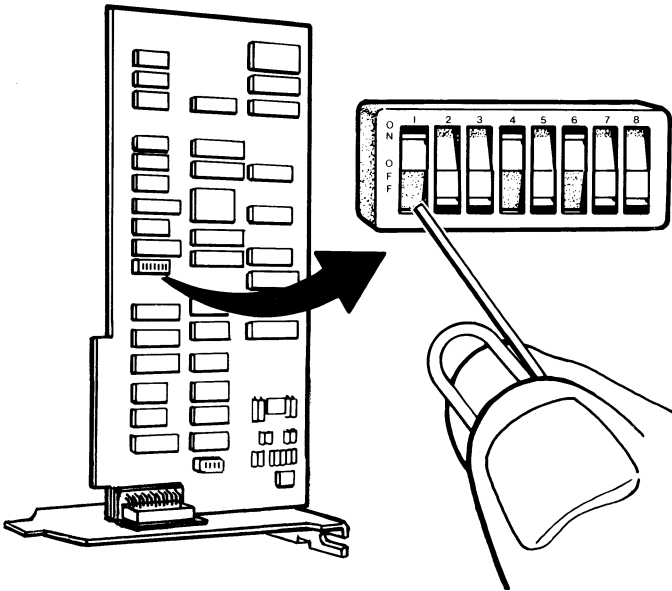
Continue on the next page.

¹Interrupt Level and Terminate Option switch setting information is contained in the user's guide included with your application software for the Display Station Emulation Adapter.

14. Set the switches on the 8-position switch assembly as follows:

Using an opened paper clip or a pointed object, set switches 1 through 8 as illustrated below.

SWITCH	1	2	3	4	5	6	7	8
POSITION	Off	On	On	Off	On	Off	On	see note



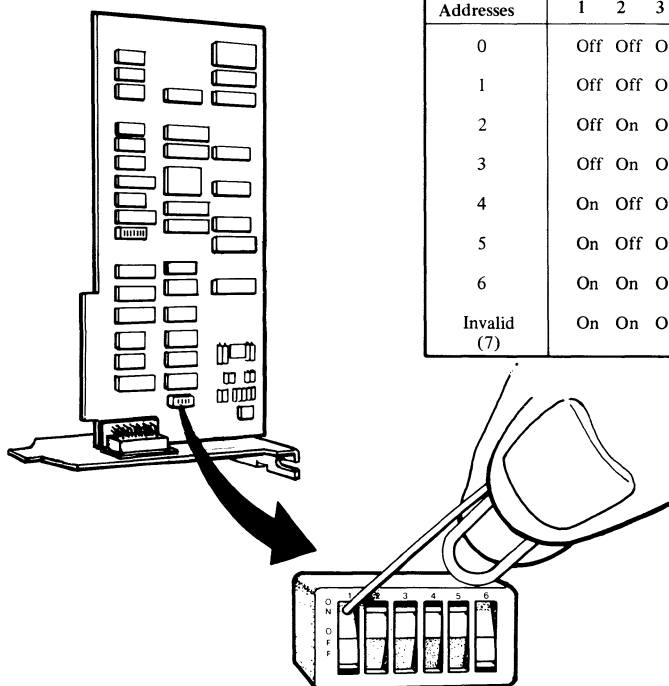
Switch 1 is illustrated in the Off position.

Note: If you recorded Interrupt Level 3 on the previous page, set switch 8 to On. If Interrupt Level 5 was recorded on the previous page, set switch 8 to Off.

15. Set the switches on the 6-position switch assembly as follows:
- Switches 1, 2, and 3 are used to set the Display Station Address.
 - The Display Station Address can be any number from 0 through 6.
 - Find your Display Station Address in Table 1 (recorded in Step 13), to determine the correct settings for switches 1, 2, and 3.
- a. Set switches 1, 2, and 3.

Table 1

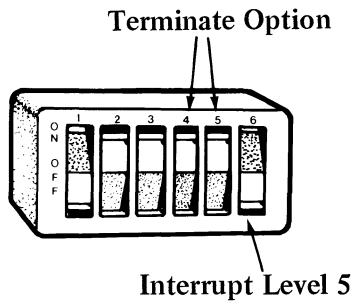
Display Station Addresses	Switch Settings		
	1	2	3
0	Off	Off	Off
1	Off	Off	On
2	Off	On	Off
3	Off	On	On
4	On	Off	Off
5	On	Off	On
6	On	On	Off
Invalid (7)	On	On	On



Continue on the next page.

b. Set switches 4 and 5 as follows:

- If you recorded ON for the Terminate Option in Step 13, set switches 4 and 5 to On.
- If you recorded OFF for the Terminate Option in Step 13, set switches 4 and 5 to Off.



c. Set switch 6 as follows:

- If you recorded Interrupt Level 5 in Step 13, set switch 6 to On.
- If you recorded Interrupt Level 3 in Step 13, set switch 6 to Off.

20. Your System Unit and Expansion Unit (if attached) are now ready to be recabled. Refer to your *IBM Personal Computer Guide To Operation* manual.
21. This completes the installation of the Display Station Emulation Adapter.

Continue with the “Display Station Emulation Adapter Checkout”.

Display Station Emulation Adapter Checkout

1. Read through this entire step and then perform the Power-On Self Test (POST) beginning with “Diagnostic Setup” on page 2-3 of this manual.
 - If the POST completes successfully, continue with step 2 on the next page. (Do not go to “Functional Testing”.)
 - If the POST detects a failure, perform the following: (Do not go to “Error Examples.”)
 - a. Position the power switches on the System Unit and the Expansion Unit (if attached) to Off.
 - b. Position all power switches on external elements to Off.
 - c. Unplug the System Unit and the Expansion Unit (if attached) from the wall outlet.
 - d. Remove the Display Station Emulation Adapter from the System Unit or Expansion Unit (if attached).
 - e. Perform the POST again.
 - f. If the POST detects a failure, use the “Problem Determination Procedures” section in your *IBM Personal Computer Guide To Operations* manual to resolve the problem.
 - g. If the POST completes successfully without having the adapter installed, verify that the Device Address switches on the Display Station Emulation Adapter are set correctly.

3. Read through this entire step and then continue with the diagnostic testing as follows:
 - a. Use the Problem Determination Procedures in your *IBM Personal Computer Guide To Operations* manual.
 - b. Begin with the “Diagnostic Testing” section of the PDPs and follow the instructions in each step.
 - c. Use the Display Station Emulation Adapter Integrated Diagnostics diskette from the back of this binder.

Do Not Use the IBM Personal Computer Diagnostics diskette in the *IBM Personal Computer Guide To Operations* binder when instructed to do so in the PDPs.

Note: If the Display Station Emulation Adapter does not appear on the “Installed Devices” screen, make sure you are using the Display Station Emulation Adapter Integrated Diagnostics diskette. If the diskette is correct, go to Step 4 on page 1-24 and perform instructions a through h.

Continue on the next page.

- d. If any error messages followed by an error code of 16XX display on the display screen, go to Step 4. (X can be any character).
- e. The Display Station Emulation Adapter diagnostics have completed successfully when the following message displays on the display screen:

Display Station Emulation Adapter Diagnostics
Completed Successfully — NO TROUBLE
FOUND.

- f. When the following message displays on the bottom of the display screen, press and then press (Enter).

RUN THE ON-LINE TEST (Y/N)?

- g. Go to the “Installed Devices” list in your *IBM Personal Computer Guide To Operations* manual and record that the Display Station Emulation Adapter is installed, and the name of the unit in which it is installed.
- h. Complete diagnostic testing using the Problem Determination Procedures (PDPs) in your *IBM Personal Computer Guide To Operations* manual and then proceed to “How To Install The Display Station Emulation Adapter Accessories” in this manual.

4. If any error messages followed by an error code of 16XX display on the display screen, perform the following steps: (X can be any character).
 - a. Position the power switches on the System Unit and the Expansion Unit (if attached) to Off.
 - b. Position all power switches on external elements to Off.
 - c. Unplug the System Unit and the Expansion Unit (if attached) from the wall outlet.
 - d. Remove the Display Station Emulation Adapter from the System Unit or Expansion Unit (if attached).
 - e. Verify that all switches on the adapter are set correctly. Refer to pages 1-11 through 1-14.
 - f. Make sure the Display Station Emulation Adapter is properly seated in the system expansion slot.
 - g. If the cause of the failure has been determined and repaired, complete the installation and run the diagnostics again.
 - h. If the cause of the failure has not been determined and repaired, contact your point-of-sale for the Display Station Emulation Adapter.

How to Install the Display Station Emulation Adapter Accessories

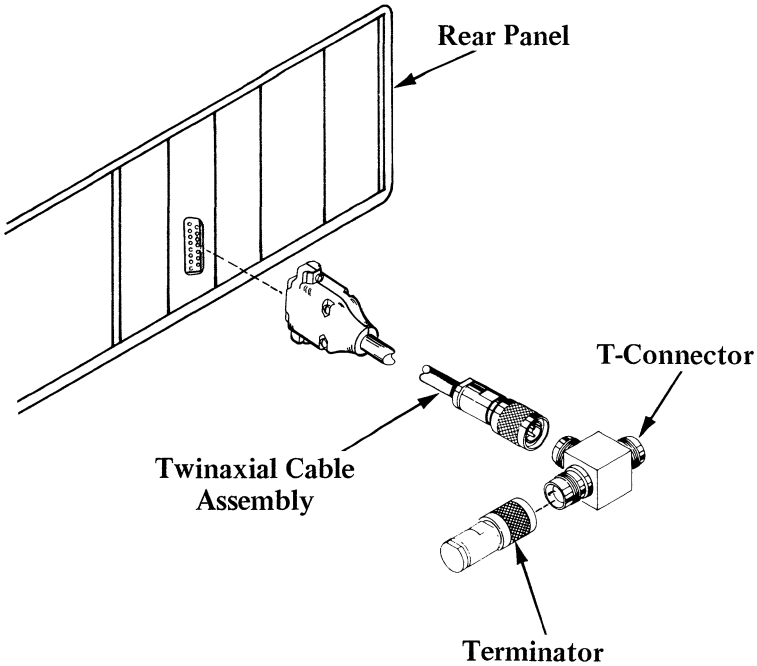
The following accessories may be required to connect your IBM Personal Computer to the system twinaxial cables:

- T-connector (IBM part 6851167, Amphenol¹ 82-5677, or equivalent)
- Twinaxial Cable Assembly (IBM part 6100218, or equivalent, 0.3 meter (1.0 ft.) maximum length)
- Terminator (IBM part 7362188, Amphenol 82-5587, or equivalent). A Terminator is required only if your IBM Personal Computer is the last or only display station on a twinaxial line.

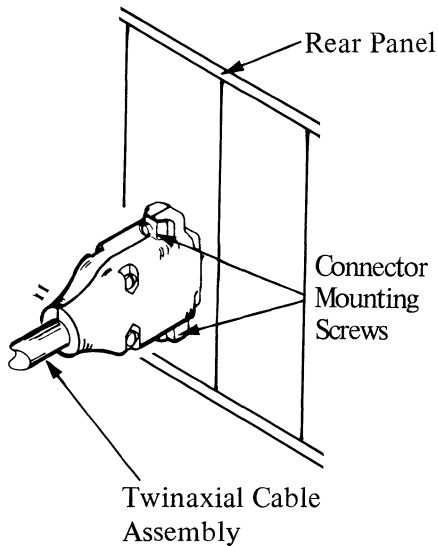
Note: The system to which your IBM Personal Computer will be attached may not use the Terminator accessory. If you recorded ON for the Terminate Option, the Terminator accessory is not used (Refer to page 1-11 of these installation instructions).

¹Amphenol — Trademark of Bunker Ramo Corporation

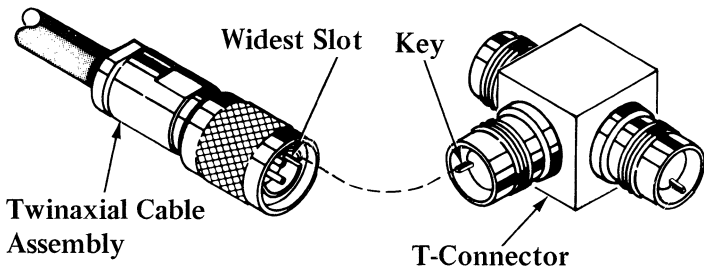
If the twinaxial cable and connectors were purchased separately, refer to “Twinaxial Cable Assembly Procedure” in Appendix A. The Twinaxial Cable Assembly should have a minimum length of 0.2 meters (8 inches) and a maximum length of 0.3 meters (1.0 ft.). Assemble the cable according to the instructions in Appendix A and then continue with step 1.



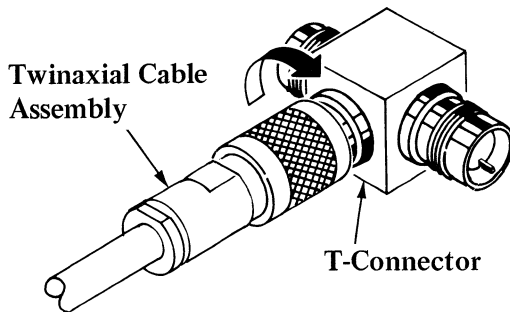
1. Connect the 15-pin connector end of the Twinaxial Cable Assembly to the Display Station Emulation Adapter external connector on the rear panel of the System Unit or the Expansion Unit (if attached). Tighten the connector mounting screws.



2. Connect the other end of the Twinaxial Cable Assembly to the center socket on the T-connector as follows:
 - a. Line up the widest slot in the Twinaxial Cable Assembly connector with the key in the center socket on the T-connector.



- b. Push the Twinaxial Cable Assembly connector into the center socket of the T-connector; then turn the retaining ring clockwise until it is tight.



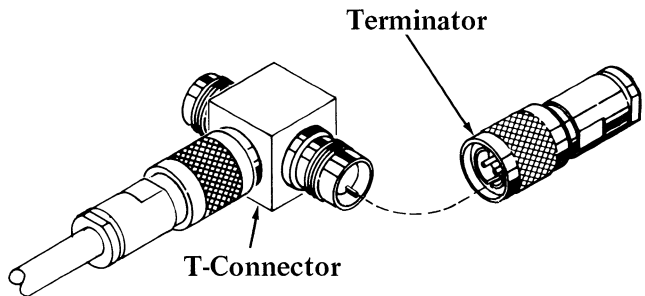
3. If you recorded ON for the Terminate Option setting on page 1-11 of these installation instructions, then accessory installation is complete.

Note: Do not install system twinaxial cables at this time. Application software documentation describes the system twinaxial cable installation.

4. If you recorded OFF for the Terminate Option setting on page 1-11 of these installation instructions, continue with this step.

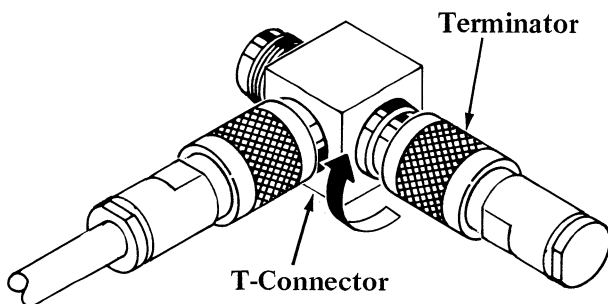
If your IBM Personal Computer is the last or only display station installed on the twinaxial line, install the Terminator on one of the end sockets of the T-connector as follows:

- a. Line up the widest slot in the Terminator with the key in one of the end sockets of the T-connector.



Continue on the next page.

- b. Push the Terminator into the end socket of the T-connector; then turn the retaining ring clockwise until tight.



Display Station Emulation Adapter accessory installation is complete.

Note: Do not install system twinaxial cables at this time. Application software documentation describes the system twinaxial cable installation.

SECTION 2. PROBLEM DETERMINATION PROCEDURES (PDPs)

Problem determination is a set of procedures to help you resolve operational or system failures. This guide directs you to make a series of observations and answer YES or NO when checking the results. By following the steps outlined in this guide you can determine what action to take to make your system operational again, or to determine if you need service.

Part of your problem determination procedure may include using the Display Station Emulation Adapter Integrated Diagnostics diskette. This diskette was created as part of the Display Station Emulation Adapter installation procedures and is located in the back of this binder. The Display Station Emulation Adapter Integrated Diagnostics diskette contains tests to help locate a problem with the Display Station Emulation Adapter.

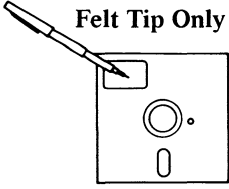
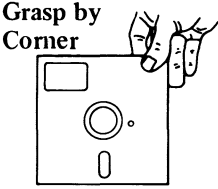
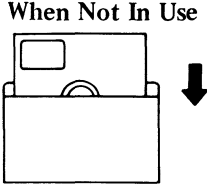
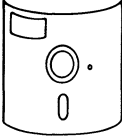
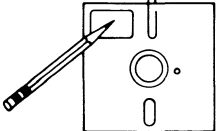
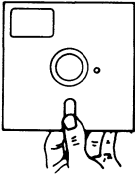
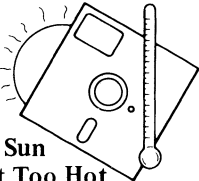
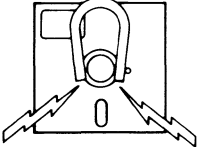
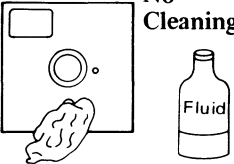
The Problem Determination Procedures help you isolate the source of a problem between either the System Unit or the Expansion Unit.

Diskette Handling Procedures

This series of Problem Determination Procedures (PDPs) uses a diskette.

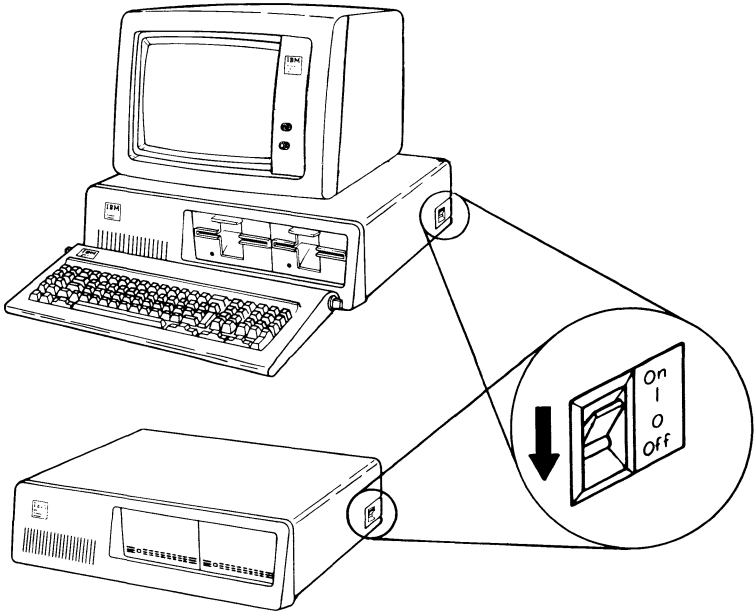
Refer to the following chart before continuing.

Do's and Don'ts for Handling Diskettes

DO's		
Felt Tip Only 	Grasp by Corner 	When Not In Use 
DON'Ts		
Don't Bend 	No Pencils, No Clips, No Ballpoints 	Don't Touch Disk 
No Sun Not Too Hot 	No Magnets 	No Cleaning 

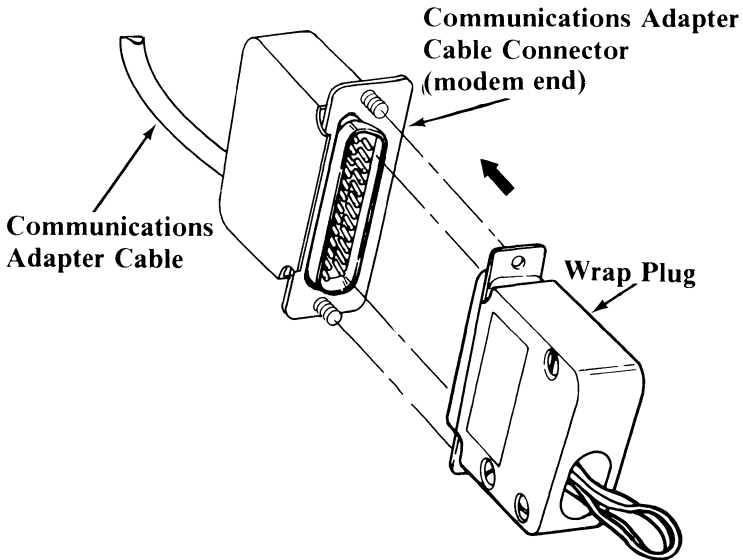
Diagnostic Setup

1. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
2. Position the power switches on all externally attached devices (printer, etc.) to Off.



3. If you do not have any IBM Communications Adapter Cables attached to your IBM Personal Computer, go to "Power-On Self Test" on the next page.
4. 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 Option Installation instructions for cable removal).
5. Refer to the figure below and install the wrap plug (IBM number 8529280) on the modem end of the cable (end furthest from the IBM Personal Computer).

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



Power-On Self Test

1. Turn the Brightness and Contrast knobs fully clockwise.
2. Position the power switches on all external devices (printer etc.) to On.
3. Position the power switch on the Expansion Unit (if attached) to On.
4. Check the IBM logo on your System Unit and proceed as follows:
 - If your system is the IBM Personal Computer, continue with step 5 on the next page.
 - If your system is the IBM Personal Computer XT, the IBM Portable Personal Computer, the IBM 3270 Personal Computer, or the IBM Personal Computer XT/370, go to step 6 on page 2-8.

5. Position the power switch on the System Unit to On. POST completes in 3 to 90 seconds depending on the amount of memory installed in your system.
 - a. Observe the Display Screen and listen to the System Unit. Note any responses that you see and hear.
 - b. The following three responses are correct:

1

One short beep will be heard when the test completes.

2

The "IBM Personal Computer BASIC" message displays.

```
The IBM Personal Computer Basic
Version X.XX Copyright IBM Corp. XXXX
XXXXXX Bytes Free
OK
```

```
1LIST 2RUN 3LOAD 4SAVE 5CONT 6LPT1 7TRON 8TROFF 9KEY 0SCREEN
```

If, at the end of POST, a diskette or an operating system from the fixed disk drive is automatically loaded, the initial screen from the diskette or operating system displays.

A blinking cursor appears.

- c. If you missed these responses, the following procedure runs the POST again:
- Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
 - Wait 5 seconds.
 - Position the power switch on the Expansion Unit (if attached) to On.
 - Position the power switch on the System Unit to On.

Were the three responses correct?

NO

- Go to “Error Examples” on page 2-10.

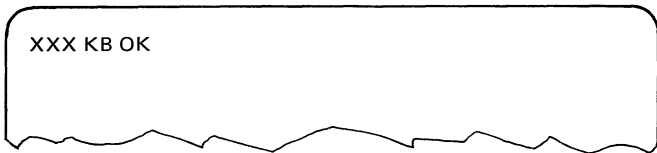
YES

- Adjust the Contrast and Brightness knobs for eye comfort.
- Go to “Functional Testing” on page 2-12.

6. Position the power switch on the System Unit to On. POST completes in 13 to 90 seconds depending on the amount of memory installed in your system.
 - a. Observe the Display Screen and listen to the System Unit. Note any responses that you see and hear.
 - b. The following three responses are correct:

1

An indication of the memory test displays 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.



2

One short beep indicates the test is complete.

3

The "IBM Personal Computer BASIC" message displays. If, at the end of POST, a diskette or an operating system from the fixed disk drive is automatically loaded, the initial screen from the diskette or operating system displays.

The IBM Personal Computer Basic
Version X.XX Copyright IBM Corp. XXXX
XXXXXX Bytes Free
OK

1LIST 2RUN 3LOAD " 4SAVE 5CONT 6LPT1 '7TRON 8TROFF 9KEY 0SCREEN

- c. If you missed these responses, the following procedure runs the POST again:
- Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
 - Wait 5 seconds.
 - Position the power switch on the Expansion Unit (if attached) to On.
 - Position the power switch on the System Unit to On.

Were the three responses correct?

NO

- Go to "Error Examples" on the next page.

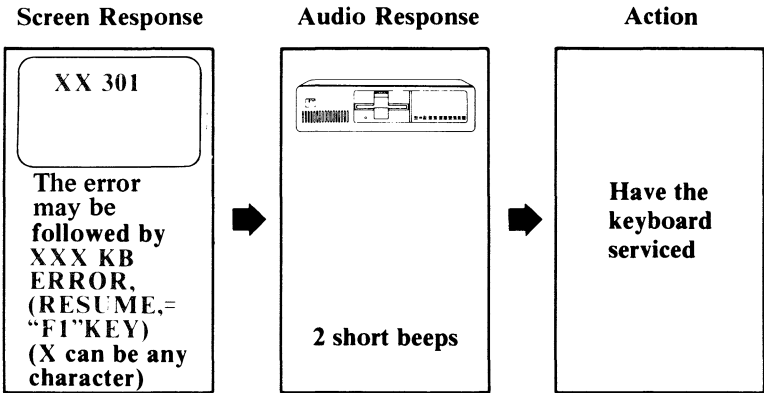
YES

- Adjust the Contrast and Brightness knobs for eye comfort.
- Go to "Functional Testing" on page 2-12.

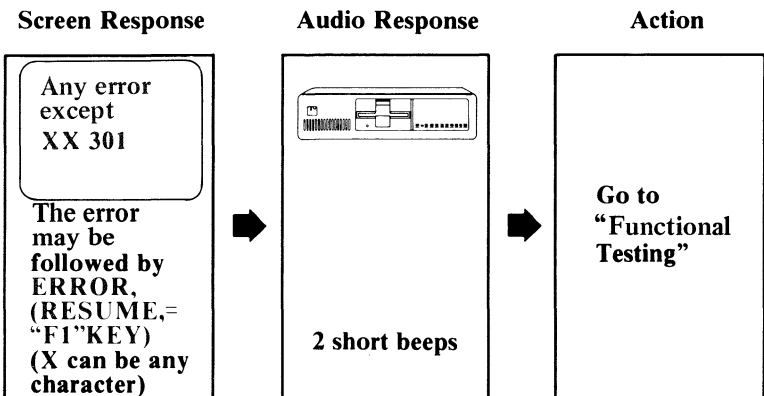
Error Examples

Find the incorrect response in the following examples, then follow the instructions in the box marked "Action". If you should have an incorrect response that is not shown in the following examples, use the Problem Determination Procedures in your *IBM Personal Computer Guide to Operations* manual to resolve the problem.

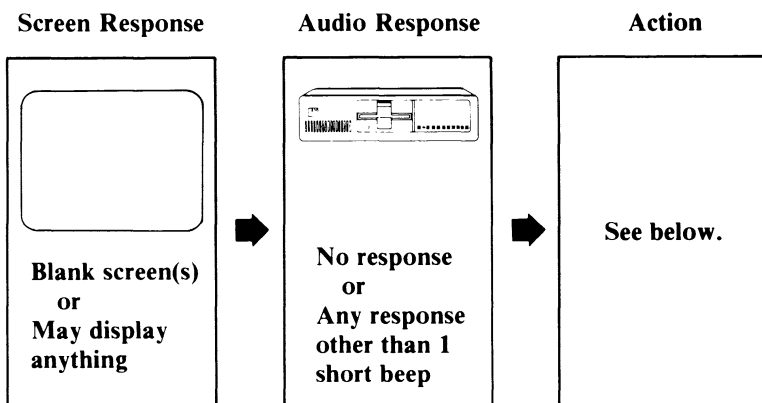
Example 1



Example 2



Example 3



Do you have an Expansion Unit attached?

NO

- Have the System Unit serviced.

YES

- Position the power switches on the System Unit and Expansion Unit to Off.
- Position the power switches on all external devices (printer, etc.) to Off.
- Disconnect the Expansion Unit Cable from the System Unit.
- Position the System Unit power switch to On.

If the error recurs, have the System Unit serviced. If the error changes, have the Expansion Unit and the Expansion Unit Cable serviced.

Functional Testing

1. Read through this entire step and then proceed as follows to continue diagnostic testing:
 - a. Use the Problem Determination Procedures in your *IBM Personal Computer Guide To Operations* manual.
 - b. Begin with the “Diagnostic Testing” section of the PDPs and follow the instructions in each step.
 - c. Use the Display Station Emulation Adapter Integrated Diagnostics diskette from the back of this binder.

Do Not Use the IBM Personal Computer Diagnostics diskette in the *IBM Personal Computer Guide To Operations* binder when instructed to do so in the PDPs.

Note: If the Display Station Emulation Adapter does not appear on the “Installed Devices” screen, make sure you are using the Display Station Emulation Adapter Integrated Diagnostics diskette.

Continue on the next page.

- d. When the following message displays on the display screen, return to this manual and continue with the Display Station Emulation Adapter PDPs on the next page.

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

- e. If you detect a failure while testing the Display Station Emulation Adapter, use the Display Station Emulation Adapter Diagnostics PDPs on the next page to resolve the problem.
- f. Use the Problem Determination Procedures in your *IBM Personal Computer Guide To Operations* manual to resolve all other failures.

Display Station Emulation Adapter Diagnostics

During the Display Station Emulation Adapter diagnostic tests, you may be asked to record an error message. This information is needed to aid you in getting your system serviced.

The following are examples of the error messages you may receive, and the probable reasons for the messages. A message ending in the numerals 00 means the test completed successfully.

Example 1

```
XX:XX:XX  
ERROR - SYSTEM UNIT 16XX
```

(X can be any character)

Have the system unit serviced.

Example 2

```
XX:XX:XX  
ERROR - EXPANSION UNIT 16XX
```

(X can be any character)

Have the expansion unit serviced.

1. The following message displays on the screen while the Display Station Emulation Adapter Diagnostics are running.

TESTING – DISPLAY STATION EMULATION ADAPTER

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

If the Display Station Emulation Adapter Diagnostics complete without an error, a NO TROUBLE FOUND message displays.

Continue on the next page.

2. Is the message “Display Station Emulation Adapter Diagnostics Completed Successfully — NO TROUBLE FOUND” displaying on the screen?

TESTING — DISPLAY STATION EMULATION ADAPTER

Use the PDPs in the Display Station Emulation Adapter “Installation and Problem Determination Procedures” manual.

Display Station Emulation Adapter Diagnostics Completed Successfully — NO TROUBLE FOUND.

Display Station Address Switches Are Set To X .

Interrupt Level Switches Are Set For Level X .

RUN THE ON-LINE TEST (Y/N)?

Note: Display Station Address X can be any number between 0 and 6. Interrupt Level X can be either 3 or 5.

NO

- Continue on the next page.

YES

- Verify that the Display Station Address and the Interrupt Level displayed on the screen are correct. Contact your lead operator or system implementor if you are not sure.
- Go to Page 2-19.

3. Is an error message similar to one of the following error messages displayed on the display screen?

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

Display Station Address Switches Are Set To X .

Interrupt Level Switches Are Set For Level X .

XX:XX:XX
ERROR – SYSTEM UNIT 16XX

PRESS ENTER TO CONTINUE
?

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

Display Station Address Switches Are Set To X .

Interrupt Level Switches Are Set For Level X .

XX:XX:XX
ERROR – EXPANSION UNIT 16XX

PRESS ENTER TO CONTINUE
?

NO

- Continue on the next page.

YES

- Record the error message and error code displayed on the display screen.
- Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
- If the following error message displayed, the System Unit is at fault. Have the System Unit serviced. Refer to "Service Information" on Page 2-25.

XX:XX:XX
ERROR — SYSTEM UNIT 16XX
(X can be any character).

- If the error message below displays, the Expansion Unit is at fault. Have the Expansion Unit serviced. Refer to "Service Information" on Page 2-25.

XX:XX:XX
ERROR — EXPANSION UNIT 16XX
(X can be any character).

4. If the Display Station Emulation Adapter is installed in the System Unit, have the System Unit serviced. Refer to “Service Information” on Page 2-25.

If the Display Station Emulation Adapter is installed in the Expansion Unit, have the Expansion Unit serviced. Refer to “Service Information” on Page 2-25.

Note: If the Display Station Emulation Adapter is installed in the System Unit, it is preceded by an “S” on the Installed Devices screen. If it is installed in the Expansion Unit, it is preceded by an “E” on the Installed Devices screen.

Display Station Emulation Adapter On-Line Test

The On-line Test checks whether or not your IBM Personal Computer/Display Station Emulation Adapter can communicate with a system through the twinaxial cables.

Do not perform this On-line Test until the following prerequisites have been met:

- The IBM Personal Computer connects to the twinaxial cable of the system you use to run the On-line test.
- The system is powered on and running a Licensed Program Product that communicates with your IBM Personal Computer/Display Station Emulation Adapter.

If you are not sure about one or more prerequisite, check with the system implementor or lead operator for the system to which your IBM Personal Computer is connected.

Note: For specific system Licensed Program Product requirements refer to the user's guide included with your application software for the Display Station Emulation Adapter.

1. Have the prerequisites for running the Display Station Emulation Adapter On-Line test been met?

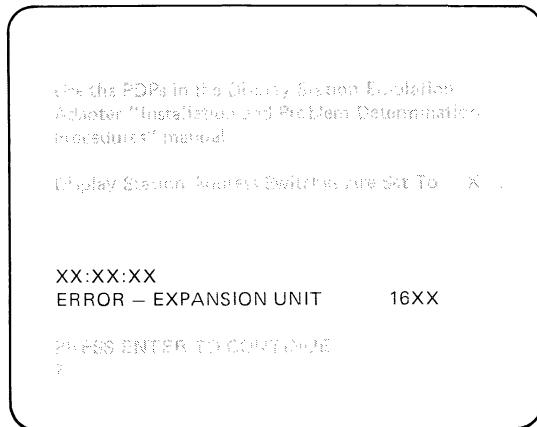
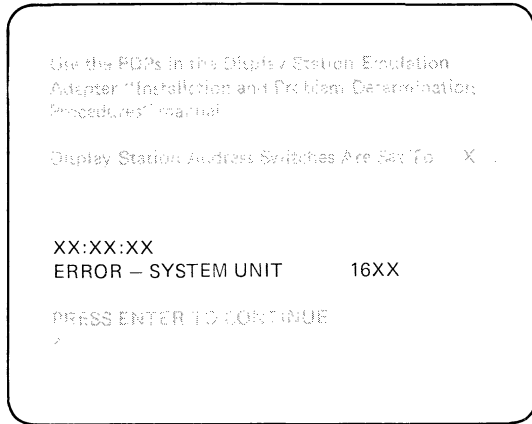
NO

- Press then
- Return to the "Problem Determination Procedures" section in your *IBM Personal Computer Guide To Operations* manual and complete diagnostic testing on the remaining devices.

YES

- Press then
- Continue on the next page.

2. Is an error message similar to one of the following error messages displayed on the display screen?



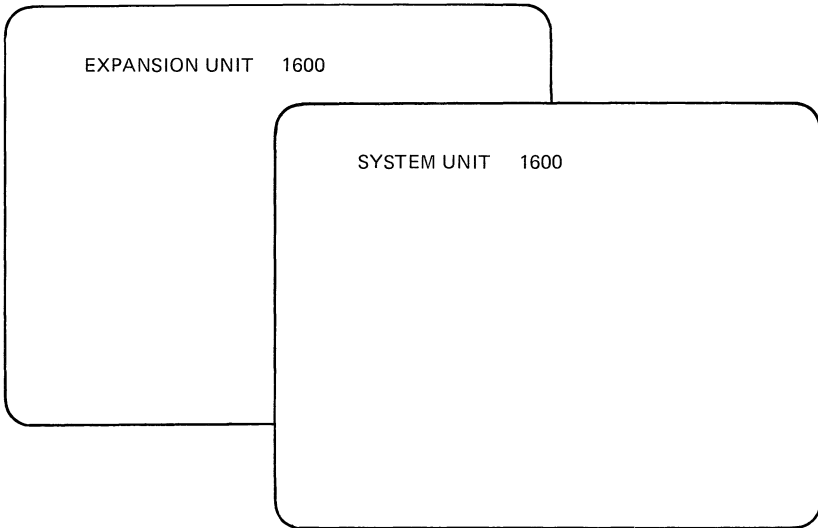
NO

- Continue on the next page.

YES

- Go to Page 2-23.

3. A message ending in 1600 displays on the display screen indicating the Display Station Emulation Adapter tests complete successfully.



Return to the “Problem Determination Procedures” section in your *IBM Personal Computer Guide To Operations* manual, and complete diagnostic testing on the remaining devices.

4. Perform the following checks:
 - a. Check with the system implementor or lead operator for the system to which your IBM Personal Computer is connected to make sure that the system is operating and able to recognize your IBM Personal Computer. (This may require activating your IBM Personal Computer on the system or other system operator action.)
 - b. Check with the system implementor or lead operator to make sure that your IBM Personal Computer has the correct Display Station Address switch setting. (The Display Station Address switch setting of your IBM Personal Computer may be displayed on the display screen.)
 - c. Your IBM Personal Computer may share a twinaxial cable with other display stations. If so, have the system implementor or lead operator check that each display station on the cable has the correct Display Station Address switch settings. The system implementor or lead operator should make sure that the twinaxial cable does not terminate at any other display station between your IBM Personal Computer and the system.
 - d. Make sure that the Terminator accessory (if required) is installed on the T-connector if your IBM Personal Computer is the last or only display station on the twinaxial cable. Check with the system implementor or lead operator if you are not sure.

Note: The system to which your IBM Personal Computer attaches may not use the Terminator accessory. Some IBM Systems use an on-card termination option.

Continue on the next page.

- e. Record the error message that is displayed on the display screen including the four-digit error code.
- f. Position the System Unit and Expansion Unit (if attached) power switches to Off.
- g. Check that the twinaxial cable connections to the T-connector are properly connected and tightened.
- h. Check the connectors on the twinaxial cable that runs from the external connector on the Display Station Emulation Adapter to the T-connector to be sure they are properly connected and tightened.

If you have not removed the problem after performing the checks listed above, have the failing unit serviced.

If you recorded the error message below, the System Unit is at fault. Have the System Unit serviced. Refer to "Service Information" on Page 2-25.

XX:XX:XX
ERROR — SYSTEM UNIT 16XX
(X can be any character)

If you recorded the following error message, the Expansion Unit is at fault. Have the Expansion Unit serviced. Refer to "Service Information" on Page 2-25.

XX:XX:XX
ERROR — EXPANSION UNIT 16XX
(X can be any character).

Service Information

WARNING: If the unit that you are having serviced contains a fixed disk drive, it is recommended that you make duplicate copies on diskettes for all files. Normal shipping and handling can result in permanent loss of data on your fixed disk drives. For example, if you have a ten megabyte fixed disk, and 320K diskettes, you will require approximately 32 diskettes to duplicate the entire fixed disk drive. Refer to the IBM Disk Operating System for a description of the BACKUP Command.

Once you determine which unit of your system has a problem, follow the procedures listed below:

1. Position the System Unit and Expansion Unit (if attached) power switches to Off.
2. Remove power cords from wall outlet.
3. Disconnect the twinaxial cable at the external connector on the Display Station Emulation Adapter.

Caution: Do not disconnect the twinaxial cables from the T-connector assembly. This affects other display stations connected to the same line.

4. Disconnect the failing unit.
5. Have the failing unit serviced.

Note: In using the Problem Determination Procedures you were asked to record an Error Message (including a four-digit error code, if provided). This information aids in getting your system serviced, and must be provided when returning the System Unit or Expansion Unit for service.

Notes:

SECTION 3. CREATE DISPLAY STATION EMULATION ADAPTER INTEGRATED DIAGNOSTICS DISKETTE

The following procedures assist you in creating a diagnostic diskette containing the IBM Personal Computer Diagnostics and the Display Station Emulation Adapter Diagnostics. The new diagnostics (Display Station Emulation Adapter Integrated Diagnostics) diskette is used for diagnostic testing of the Display Station Emulation Adapter along with your IBM Personal Computer. However, it can be used for diagnostic testing of other devices since it contains a copy of the IBM Personal Computer Diagnostics.

1. Position the power switch on the System Unit to Off.
 2. Insert your DOS diskette in drive A.
 3. Close the drive door.
 4. Position the power switch on the Expansion Unit (if attached) to On.
 5. Position the power switch on the System Unit to On.
 6. Position the power switches on all external elements to On.
 7. Enter the date and time when the prompts display on the display screen.
 8. The DOS prompt A> displays on the display screen.
- Continue on the next page.

9. Obtain a blank diskette.
10. Perform the procedures below and as described on the following pages:
 - a. Format a blank diskette.
 - b. Copy the IBM Personal Computer Diagnostics diskette.
 - c. Copy the Display Station Emulation Adapter Diagnostics.

Format Blank Diskette

Perform the following steps to format a blank diskette:

1. After the DOS prompt A>, type

FORMAT/1

and then press  (Enter).

2. When the following message displays on the display screen, remove the DOS diskette from drive A. Insert the blank diskette in drive A and press any key.

Insert new diskette for drive A:
and strike any key when ready

3. The following message displays while the diskette is being formatted:

Formatting...

4. When formatting completes, the following message displays on the display screen:

Formatting...Format complete
XXXXXXX bytes total disk space
XXXXXXX bytes available on disk
Format another (Y/N)?

Note: XXXXXXX is the number of bytes.

Continue on the next page.

5. If the number of bytes available on disk is not the same as the number of bytes total disk space, load another blank single-sided diskette in drive A, then press the key and repeat the Format procedure.
6. If the bytes available on disk equals the bytes total disk space, press the key.
7. Remove the formatted diskette from drive A.

Continue on the next page.

Copy the IBM Personal Computer Diagnostics Diskette

Perform the following steps to copy the IBM Personal Computer Diagnostics diskette:

1. Insert the DOS diskette in drive A.
2. After the DOS prompt `A>`, type

`DISKCOPY/1`

and then press  (Enter).

3. When the message below displays on the display screen, remove the DOS diskette from drive A. Obtain the IBM Personal Computer Diagnostics diskette from the back of the *IBM Personal Computer Guide To Operations* binder, insert it in drive A, and press any key. The IBM Personal Computer Diagnostics diskette must be Version 2.00¹ or greater.

Insert source diskette in drive A:
strike any key when ready

4. Continue by following the instructions on the display screen.

Note: The Source diskette is the IBM Personal Computer Diagnostics diskette. The Target diskette is the formatted blank diskette.

Continue on the next page.

¹Except for the IBM 3270 Personal Computer Diagnostics which may be Version 1.10 or greater.

5. When the Diskcopy program completes, the following message displays on the display screen:

Copy complete
Copy another (Y/N)?

6. Remove the formatted (target) diskette from drive A and insert the DOS diskette.
7. Press the key.
8. Label the formatted (target) diskette as follows:

**IBM Personal Computer Display Station
Emulation Adapter Integrated Diagnostics.**

Continue on the next page.

Copy Display Station Emulation Adapter Diagnostics

Perform the following steps to copy the Display Station Emulation Adapter Diagnostics:

1. Remove the DOS diskette from drive A.
2. Insert the Display Station Emulation Adapter Diagnostics diskette in drive A.

Note: The Display Station Emulation Adapter Diagnostics diskette must be Version 3.00 or greater.

3. If your system has two diskette drives, insert the Display Station Emulation Adapter Integrated Diagnostics diskette in drive B.
4. After the DOS prompt A> type

COPY DIAGDSEA.DGS B:

and then press  (Enter).

5. If your system has two diskette drives, skip to Step 7. Otherwise, continue with Step 6.
6. When the message below displays, remove the Display Station Emulation Adapter Diagnostics diskette from drive A. Insert the Display Station Emulation Adapter Integrated Diagnostics diskette in drive A and press any key.

Insert diskette for drive B: and strike any key when ready

7. When the following message displays on the display screen, copy is complete:

1 File(s) copied

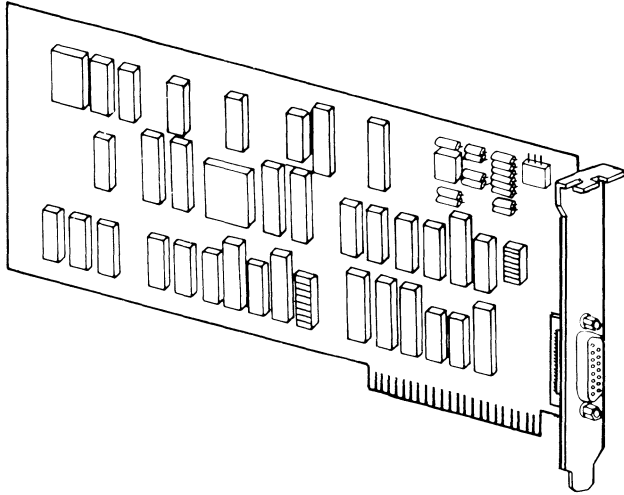
Continue on the next page.

Create Display Station Emulation Adapter Integrated Diagnostics Diskette 3-7

8. Remove the Display Station Emulation Adapter Integrated Diagnostics diskette from drive A. (Remove from drive B if your system has two diskette drives).
9. Write protect the Display Station Emulation Adapter Integrated Diagnostics diskette and store it in the back of this binder. Refer to the "Using DOS" section in your *IBM Personal Computer Guide To Operations* if you need additional information on Write protect.
10. Return the IBM Personal Computer Diagnostics diskette to the *IBM Personal Computer Guide To Operations* binder.
11. Return to the "Display Station Emulation Adapter Checkout" section in this manual and continue with Step 3.

SECTION 4. PARTS CATALOG

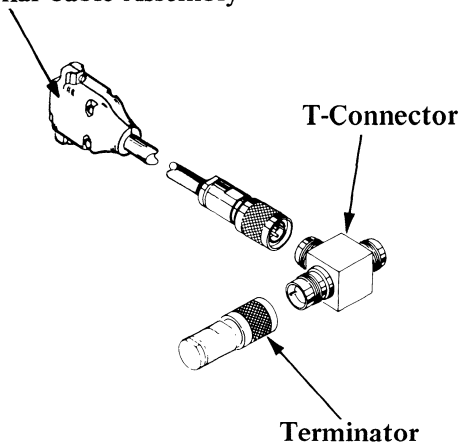
This section lists the part numbers for all the applicable hardware items associated with the Display Station Emulation Adapter.



Display Station Emulation Adapter

Part Number	Description	Units Per Assem.	Major Unit Code
6851206	Display Station Emulation Adapter	1	323
6851203	Bracket	1	
1785931	Screw Lock	2	

Twinaxial Cable Assembly



Display Station Emulation Adapter Accessories

IBM Part Number	Amphenol Part Number	Description	Units Per Assem.	Major Unit Code
6851167	82-5677	T-Connector	1	109
7362188	82-5587	Terminator	1	
6100218		Twinaxial Cable Assembly (Specify length of cable) 0.3 meter (1.0 ft.) max. 0.2 meter (8 inches) min.		
7362229	82-5589	Single connector	1	
7362211		Twinaxial cable	Note 1	
6100219	205205-2*	15-Pin connector	1	
1655337	66504-3*	Contact pins	15	
6100221	745172-2*	Cable clamp, cover	1	
	*These are AMP Part Numbers	Note 1: See Appendix A for additional information on ordering twinaxial cable and connectors.		

SECTION 5. ADVANCED DISPLAY STATION EMULATION ADAPTER DIAGNOSTICS

This section provides advanced diagnostics for the Display Station Emulation Adapter. You **must** have the IBM Personal Computer **Advanced** Diagnostics Diskette and the appropriate *IBM Personal Computer Hardware Maintenance and Service* manuals to use this section. This section is designed to be used by someone with a working knowledge of the IBM Personal Computer hardware.

It is not necessary to review this section on every service call, but it is a useful reference until you become familiar with the use of the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette and the Display Station Emulation Adapter Problem Isolation Charts.

Diagnostic Diskette Requirements

The Display Station Emulation Adapter Diagnostics are designed to run with the Diagnostic Control Program contained on the IBM Personal Computer Advanced Diagnostics diskette.

The IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette tests the Display Station Emulation Adapter as well as your IBM Personal Computer. This diskette is created by copying the IBM Personal Computer Advanced Diagnostics and the Display Station Emulation Adapter Diagnostics onto a blank diskette.

If you have not already created the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette, proceed as follows to create the diskette **before** using the Problem Isolation Charts in this manual.

Obtain the following items, then follow the instructions in Section 3 to create the diskette. **Substitute** the IBM Personal Computer **Advanced** Diagnostic Diskette for the IBM Personal Computer Diagnostic diskette where it is called for in the instructions in Section 3. Obtain:

- A blank diskette
- The IBM DOS diskette
- The IBM Personal Computer Advanced Diagnostics diskette
- The IBM Personal Computer/Display Station Emulation Adapter Diagnostics diskette

Note: The IBM Personal Computer Advanced Diagnostics diskette must be Version 2.00¹ or greater. The Display Station Emulation Adapter Diagnostics diskette must be Version 3.00 or greater.

¹Except for the IBM 3270 Personal Computer Diagnostics which may be Version 1.10 or greater.

Display Station Emulation Adapter Problem Isolation Chart Instructions

The Problem Isolation Charts in this section guide you through a series of steps designed to help you resolve Display Station Emulation Adapter problems.

The same Problem Isolation Charts are used whether the Display Station Emulation Adapter is installed in the IBM Personal Computer System Unit, the IBM Personal Computer XT System Unit, the IBM Personal Computer Expansion Unit, the IBM Portable Personal Computer, the IBM 3270 Personal Computer, or the IBM Personal Computer XT/370.

Where differences occur in the instructions between units, perform only those instructions that pertain to your unit. The instructions are preceded by the same IBM logo as the unit to which the instruction pertains.

If the Display Station Emulation Adapter is installed in an IBM Portable Personal Computer, or the IBM 3270 Personal Computer, follow the instructions for the IBM Personal Computer XT.

If the Display Station Emulation Adapter is installed in an IBM Personal Computer XT/370, follow the instructions for the Expansion Unit.

Always begin with the “Start” Problem Isolation Chart (PIC).

SECTION 3. PROBLEM ISOLATION

Start

This is the entry point for using all of the IBM Personal Computer/Display Station Emulation Adapter Problem Isolation Charts (PICs).

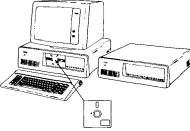
The failing symptom may be an audio error response during the Power On Self Test (POST), an error code from the Display Station Emulation Adapter diagnostics, an error code from the Display Station Emulation Adapter On-line test, or an unidentified problem associated with the Display Station Emulation Adapter.

Locate the failing symptom in the chart on the following pages for the probable cause, or proceed to page 3-4.

Depending on your failure indications, the “Start” PIC either directs you to the Display Station Emulation Adapter Diagnostics PIC, or to the removal or replacement of the Display Station Emulation Adapter.

Display Station Emulation Adapter Diagnostics

1. Adjust the Contrast and Brightness controls for eye comfort.
2. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
3. Insert the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette into drive A and then close the drive's door.
4. Position the power switches on all output devices (display, printer, etc.) to On.
5. Position the power switch on the Expansion Unit (if attached) to On.
6. Position the power switch on the System Unit to On.



CONTINUE →

Display Station Emulation Adapter On-line Test

The On-line test checks if the Display Station Emulation Adapter can communicate with a system through the twinaxial cables.

The following prerequisites are required to run the Display Station Emulation Adapter On-line test:

1. The IBM Personal Computer must be connected to the twinaxial cable of a system that supports the Display Station Emulation Adapter.
2. The system must be powered on and running a Licensed Program Product that communicates with the IBM Personal Computer/Display Station Emulation Adapter.

Note: For specific system Licensed Program Product requirements, refer to the user's guide included with your application software for the Display Station Emulation Adapter.

CONTINUE →

The Display Station Emulation Adapter Diagnostics and the Display Station Emulation Adapter On-line Test PICs guide you through a series of steps to identify the failing Field Replaceable Unit (FRU).

When using the PICs, you must always begin with the *Start* PIC. Answer the questions carefully and follow each instruction in sequence.

The example below shows a representative page from the PICs.

Allow sufficient time for the POST to run and the diagnostics to load from the diskette before answering the next question.

The IBM Personal Computer
ADVANCED DIAGNOSTICS
Version 2.XX (C) Copyright IBM Corp 1981, 1982

SELECT AN OPTION

0 – RUN DIAGNOSTIC ROUTINES
1 – FORMAT DISKETTE
2 – COPY DISKETTE
9 – EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED

? –

Did the above menu display on your display screen?

NO

- Use the Problem Isolation Charts (PICs) in your *IBM Personal Computer Hardware Maintenance and Service* manual. Begin at the "Start" PIC in that manual.

YES

- Position the power switch on the System Unit and Expansion Unit (if attached) to Off, and replace the defective Display Station Emulation Adapter. (See "Section 4, Removal/Replacement".)

Loading The Diagnostic Diskette

There are two ways to load the IBM Personal Computer/ Display Station Emulation Adapter Advanced Integrated Diagnostics diskette.

1

If your IBM Personal Computer is powered off:

1. Insert the Display Station Emulation Adapter Advanced Integrated Diagnostics diskette in drive A and close the drive door.
2. Position the power switch on the Expansion Unit (if attached) to On.
3. Position the power switch on the System Unit to On.
4. After Power On Self Test (POST) completes, the advanced diagnostics loads and the first diagnostic menu displays on the display screen.

2

If your IBM Personal Computer, is powered on:

1. Insert the Display Station Emulation Adapter Advanced Integrated Diagnostics diskette in drive A and close the drive door.
2. Press and hold and then press . Release all three keys.
3. The advanced diagnostics program loads and the first diagnostic menu displays on the display screen.

PROBLEM ISOLATION

Start

This is the entry point for using all of the IBM Personal Computer/Display Station Emulation Adapter Problem Isolation Charts (PICs).

The failing symptom may be:

- an audio error response during the Power On Self Test (POST)
- an error code from the Display Station Emulation Adapter diagnostics
- an error code from the Display Station Emulation Adapter On-line test
- an unidentified problem associated with the Display Station Emulation Adapter.

For the probable cause, locate the failing symptom in the chart on the following pages, or proceed to page 5-10.

Problem Isolation Chart

Failing Symptom	PIC	Page	Probable Cause
POST Failed	Start	5-10	
Unidentified Problem	Start	5-10	
Error Code			
1688 1684	Display Station Emulation Adapter Diagnostics	5-16	(1) Feature not installed (2) Wrong setting on the Device Address switches (3) Display Station Emulation Adapter
1674	Display Station Emulation Adapter Diagnostics	5-16	(1) Wrong setting on Display Station Address switches (2) Display Station Emulation Adapter

Failing Symptom	PIC	Page	Probable Cause
Error Code			
1668 1662	Display Station Emulation Adapter Diagnostics	5-16	(1) Wrong setting on interrupt level switches (2) Display Station Emulation Adapter
1664 1658 1654 1652 1644 1634 1624	Display Station Emulation Adapter Diagnostics	5-16	Display Station Emulation Adapter
1608 1604	Display Station Emulation Adapter Diagnostics	5-16	(1) Display Station Emulation Adapter (2) System Twinaxial Network Problem

In order to continue, you must have the following minimum components:

- System Unit with 48K bytes storage
- Keyboard
- 5¼ inch Diskette Drive and 5¼ inch Diskette Adapter
- IBM Display¹
- Display Station Emulation Adapter
- IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostic Diskette.

¹An equivalent Display (80 characters by 25 rows) may be used with an IBM Display Adapter.

1. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
2. Remove all non-IBM devices and prototype cards except the display.
3. Turn the Contrast and Brightness controls fully clockwise (IBM displays only).
4. See that all connectors are installed securely and in their proper locations.

Are all connectors installed securely and in the proper locations?

NO

- Reconnect or repair the connectors before continuing. Go to the next page.

YES

- Continue on the next page.

1. Plug the power cords of the System Unit and Expansion Unit (if attached) into a properly functioning, grounded wall outlet.
2. Position the power switch on the Expansion Unit (if attached) to On.
3. Refer to the IBM logo on your System Unit and proceed as follows:
 - a. If your system is the IBM Personal Computer XT, the IBM Portable Personal Computer, the IBM 3270 Personal Computer, or the IBM Personal Computer XT/370, go to page 5-14.
 - b. If your system is the IBM Personal Computer, continue on the next page.

When you power on the IBM Personal Computer the normal responses are:

- A cursor appears on the display screen in approximately 4 seconds.
- One short *beep* sounds after the Power On Self Test (POST) completes.
- The IBM Personal Computer BASIC and copyright statement displays if a diskette is not loaded or an operating system does not automatically load from the disk.

or

- The first diagnostic menu displays if the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics is loaded.

Position the power switch on the System Unit to On.

Note: If you missed the responses, power the System Unit Off, wait five seconds, and power On the System Unit again.

**Were the three responses correct?
(If error code 1701 or 1801 displays on the screen, answer NO).**

NO

- Go to page 5-15.

YES

- Go to page 5-16.

When you power on the IBM Personal Computer XT, the normal responses are:

- During memory test, the memory size in the top left corner of the screen increases in 16K bytes increments.
- One short *beep* sounds after the Power On Self Test (POST) completes.
- The IBM Personal Computer BASIC and copyright statement displays if a diskette is not loaded or if an operating system is not automatically loaded from the fixed disk. (If the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette is loaded, the first diagnostic menu displays.)

Position the power switch on the System Unit to On.

Note: If you missed the responses, power the System Unit Off, wait 5 seconds, and power the System Unit On again.

Were the three responses correct?

(If error code 1701 or 1801 displays on the display screen, answer NO).

NO

- Go to page 5-15.

YES

- Go to page 5-16.

1. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
2. Remove the power cords of the System Unit and Expansion Unit (if attached) from the wall outlet.
3. Remove the Display Station Emulation Adapter from the unit in which it is installed.
4. Plug the power cord of the System Unit and Expansion Unit (if attached) into the wall outlet.
5. Run the Power On Self Test (POST) again using the same procedures as before. (Refer to page 5-12.)

Were the three responses correct?

NO

- Use the Problem Isolation Charts (PICs) in your *IBM Personal Computer Hardware Maintenance and Service* manual. Begin at the "Start" PIC in that manual.

YES

- Position the power switch on the System Unit and Expansion Unit (if attached) to Off, and replace the defective Display Station Emulation Adapter.

Display Station Emulation Adapter Diagnostics

1. Adjust the Contrast and Brightness controls for eye comfort.
2. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
3. Insert the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette into drive A and then close the drive's door.
4. Position the power switches on all output devices (display, printer, etc.) to On.
5. Position the power switch on the Expansion Unit (if attached) to On.
6. Position the power switch on the System Unit to On.

The IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette should be loaded with the first menu displaying.

Before answering the next question, allow sufficient time for the POST to run and the diagnostics to load from the diskette.

The IBM Personal Computer
ADVANCED DIAGNOSTICS
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SELECT AN OPTION

0 – RUN DIAGNOSTIC ROUTINES
1 – FORMAT DISKETTE
2 – COPY DISKETTE
9 – EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED

? –

Did the above menu display on your display screen?

NO

- Position the System Unit power switch to Off and remove the diskette.
- Make sure the diskette is the IBM Personal Computer/Advanced Display Station Emulation Adapter Integrated Diagnostics diskette and that it was properly loaded.
- If the diskette was the wrong one, or was loaded improperly, go to page 5-16 and load the diagnostics again. Otherwise continue on the next page.

YES

- Go to page 5-20.

1. Position the power switch on the System Unit and Expansion Unit (if attached) to Off.
2. Remove the power cord of the System Unit and Expansion Unit (if attached) from the wall outlet.
3. Remove the Display Station Emulation Adapter from the unit in which it is installed.
4. Plug the power cord of the System Unit and Expansion Unit (if attached) into the wall outlet.
5. Insert the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette in drive A and close the drive's door.
6. Position the power switch on the Expansion Unit (if attached) to On.
7. Position the System Unit power switch to On.

Allow sufficient time for the POST to run and the diagnostics to load from the diskette before answering the next question.

The IBM Personal Computer
ADVANCED DIAGNOSTICS
Version 2.XX (C) Copyright IBM Corp 1981, 1982

SELECT AN OPTION

0 – RUN DIAGNOSTIC ROUTINES
1 – FORMAT DISKETTE
2 – COPY DISKETTE
9 – EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED

? –

Did the above menu display on your display screen?

NO

- Use the Problem Isolation Charts (PICs) in your *IBM Personal Computer Hardware Maintenance and Service* manual. Begin at the “Start” PIC in that manual.

YES

- Position the power switch on the System Unit and Expansion Unit (if attached) to Off, and replace the defective Display Station Emulation Adapter.

1. Press (RUN DIAGNOSTIC ROUTINES) then press (Enter).

Skip step 2 if you only have one display adapter installed.

2. Press or (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N)?) then press (Enter).

THE INSTALLED DEVICES ARE

- 1 – S SYSTEM BOARD
- 18 – S EXPANSION OPTION
- 2 – S 128KB MEMORY
- 3 – S KEYBOARD
- 4 – S MONOCHROME & PRINTER ADAPTER
- 5 – S COLOR/GRAPHICS MONITOR ADAPTER
- 6 – S 1 DISKETTE DRIVE(S) AND ADAPTER
- 9 – S PRINTER ADAPTER
- 11 – S ASYNC COMMUNICATIONS ADAPTER
- 12 – S ALT ASYNC COMMUNICATIONS ADPT
- 15 – S SDLC COMMUNICATIONS ADAPTER
- 16 – S DISPLAY STATION EMULATION ADAPTER
- 17 – S 1 FIXED DISK DRIVE(S) AND ADAPTER
- 14 – S MATRIX PRINTER

IS THE LIST CORRECT (Y/N)? –

Did the Installed Devices menu display on your display screen?

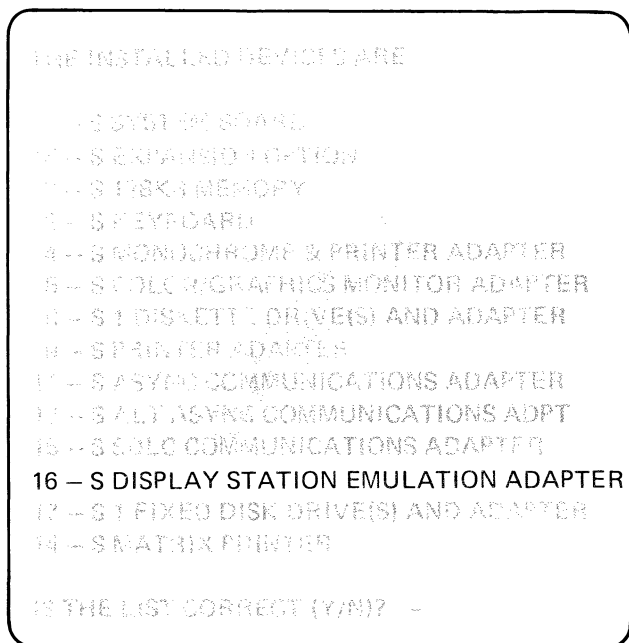
NO

- Use the Problem Isolation Charts (PICs) in your *IBM Personal Computer Hardware Maintenance and Service* manual. Begin at the “Start” PIC in that manual.

YES

- Continue on the next page.

The Display Station Emulation Adapter is preceded by an S on the Installed Devices screen if it is installed in the System Unit. It is preceded by an E if it is installed in the Expansion Unit.



Is the Display Station Emulation Adapter listed on the Installed Devices screen?

NO

- Continue on the next page.

YES

- Go to page 5-24.

1. Remove the diskette from drive A and make sure it is the IBM Personal Computer/Display Station Emulation Adapter Advanced Integrated Diagnostics diskette.
 - a. If the diskette is the wrong one, do not continue with the following steps. Go to page 5-16 and load the diagnostics again.
 - b. If the diskette is the correct one, insert the diskette into drive A, close the drive's door, and continue with the following steps.
2. Press (IS THE LIST CORRECT (Y/N)?) then press (Enter).
3. After pressing Enter, the following error message displays indicating that you answered "NO" to the question (IS THE LIST CORRECT?). *Do not* replace the system board.

ERROR — SYSTEM BOARD 199S

4. After the error message displays, the following instructions appear on the screen:

ENTER (A) TO ADD ITEMS
OR ENTER (D) TO DELETE ITEMS

5. Press (TO ADD ITEM), then press (Enter).

1. Press (IS THE LIST CORRECT (Y/N)?) then press (Enter).

The System Checkout menu should display.

SYSTEM CHECKOUT

0 – RUN TESTS ONE TIME
1 – RUN TESTS MULTIPLE TIMES
2 – LOG UTILITIES
9 – EXIT DIAGNOSTIC ROUTINES

ENTER THE ACTION DESIRED
? –

Do you need an explanation of this menu?

NO

- Go to page 5-26.

YES

- Continue on the next page.

- 0 — RUN TESTS ONE TIME — Runs a functional test of the installed devices.
- 1 — RUN TESTS MULTIPLE TIMES — Repeats the functional test as many times as you choose.
- 2 — LOG UTILITIES — The user has the option of choosing one of the following from a utilities program:
- START ERROR LOG
 - STOP ERROR LOG
 - LIST LOG
 - SET TIME OF DAY
 - DISPLAY TIME OF DAY
 - RETURN FROM UTILITIES
- START AND STOP ERROR LOG — Enables the user to log the errors that the diagnostics find. They can be stored or printed.
- LIST LOG — Displays logged errors contained on diskette.
- SET TIME OF DAY — When the user selects this function and sets the time of day, the machine keeps track of the time and displays it when asked to do so.
- DISPLAY TIME OF DAY — Displays the time of day when asked. If the system has been turned off since the Set Time of Day command was used, the clock restarts at 0 when the power is turned on.
- The contents of the clock are constantly updated. The clock value is set to 0 by the POST which means the clock contains elapsed time since POST was run. The contents may be modified by the Set Time of Day Command.
- RETURN FROM UTILITIES — Allows the user to exit the utilities program and return to the main menu.
- 9 — EXIT DIAGNOSTIC ROUTINES — Allows the user to return to the first diagnostic menu.

You are now ready to choose the type of test to run.

1. When you are ready to run the tests, press then press (Enter).
2. When a menu similar to the menu shown below displays on the display screen, type 16 and then press (Enter).

1 - S SYSTEM BOARD
18 - S EXPANSION OPTION
2 - S 128KB MEMORY
3 - S KEYBOARD
4 - S MONOCHROME & PRINTER ADAPTER
5 - S COLOR/GRAPHICS MONITOR ADAPTER
6 - S 1 DISKETTE DRIVE(S) AND ADAPTER
9 - S PRINTER ADAPTER
11 - S ASYNC COMMUNICATIONS ADAPTER
12 - S ALT ASYNC COMMUNICATIONS ADPT
15 - S SDLC COMMUNICATIONS ADAPTER
16 - S DISPLAY STATION EMULATION ADAPTER
17 - S 1 FIXED DISK DRIVE(S) AND ADAPTER
14 - S MATRIX PRINTER
ENTER THE NUMBER(S) OF OPTIONS TO TEST OR PRESS ENTER TO
SELECT ALL OPTIONS ? -

The following message displays on the display screen while the Display Station Emulation Adapter diagnostics are running.

TESTING – DISPLAY STATION EMULATION ADAPTER

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

CONTINUE 

If an error is detected by the Display Station Emulation Adapter diagnostics, an error message displays on the display screen.

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

Display Station Address Switches Are Set To X .

Interrupt Level Switches Are Set For Level X .

XX:XX:XX

ERROR – DISPLAY STATION EMULATION ADAPTER 16XX E

PRESS ENTER TO CONTINUE

?

Note: The Display Station Address displays only if a valid Display Station Address (0 through 6) is recognized by the diagnostics. The interrupt level (3 or 5) displays only if a valid interrupt occurs and is recognized by the diagnostics. All other X's shown on the screen above can be any number.

Did an error message similar to the above error message display on the display screen?

NO

- Go to page 5-30.

YES

- Perform the following steps:
 1. Write down the error code for reference in the following steps. Note the character following the error code. If the character is an E, the Display Station Emulation Adapter is installed in the Expansion Unit.

2. Position the power switch on the System Unit and the Expansion Unit (if attached) to Off.
3. Remove the Display Station Emulation Adapter from the System Unit or the Expansion Unit.
4. If you recorded an error code of 1688 or 1684 in step 1, check that the Device Address switches are set correctly. See pages 1-11 through 1-14 for the correct switch settings.
5. If you recorded an error code of 1674 in step 1, check that the Display Station Address switches are set to a valid Display Station Address (0 through 6). See pages 1-11 through 1-14 for the correct switch settings.
6. If you recorded an error code of 1668 or 1662 in step 1, check that either the Interrupt Level 3 or the Interrupt Level 5 switch is set On, *never both*. See pages 1-11 through 1-14 for the correct switch settings.

Are all switches set correctly?

NO

- Set all switches on the Display Station Emulation Adapter to the correct position. See pages 1-11 through 1-14 for the correct switch settings.
- Re-install the Display Station Emulation Adapter.
- Go to page 5-16 and run the diagnostics again.

YES

- Replace the defective Display Station Emulation Adapter.

If the Display Station Emulation Adapter diagnostics complete without an error, a NO TROUBLE FOUND message displays on the screen.

TESTING – DISPLAY STATION EMULATION ADAPTER

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

Display Station Emulation Adapter Diagnostics Completed Successfully – NO TROUBLE FOUND.

Display Station Address Switches Are Set To X .

Interrupt Level Switches Are Set For Level X .

RUN THE ON--LINE TEST (Y/N)?

Note: Display Station Address X can be any valid Display Station Address number 0 through 6. Interrupt Level X can be interrupt level 3 or 5.

**Is the "NO TROUBLE FOUND" message displayed on the display screen?
(This screen should appear within 10 seconds.)**

NO

- Position the power switch on the System Unit and the Expansion Unit (if attached) to Off. Replace the defective Display Station Emulation Adapter.

YES

- Write down the Display Station Address and the Interrupt Level displayed on the display screen for later reference in the PICs.

Display Station Emulation Adapter On-line Test

The On-line test checks if the Display Station Emulation Adapter can communicate with a system through the twinaxial cables.

The following prerequisites are required to run the Display Station Emulation Adapter On-line test:

1. The IBM Personal Computer must be connected to the twinaxial cable of a system that supports the Display Station Emulation Adapter.
2. The system must be powered on and running a Licensed Program Product that communicates with the IBM Personal Computer/Display Station Emulation Adapter.

Note: For specific system Licensed Program Product requirements, refer to the user's guide included with your application software for the Display Station Emulation Adapter.

CONTINUE 

Have the prerequisites for running the Display Station Emulation Adapter On-line Test been met?

NO

- Press (RUN THE ON-LINE TEST (Y/N)?)

then press (Enter) and continue on the next page.

YES

- Press (RUN THE ON-LINE TEST (Y/N)?), then press (Enter) and go to page 5-34.

Is the reported failing symptom a Display Station Emulation Adapter error code of XX08 or XX04? (“XX” can be either 16 or 00.)

NO

- **NO TROUBLE FOUND**

The “Run Tests Multiple Times” procedure on page 5-39 should assist you if the IBM Personal Computer/Display Station Emulation Adapter has an intermittent problem.

YES

- Position the power switch on the System Unit and the Expansion Unit (if attached) to Off. Replace the defective Display Station Emulation Adapter.

If an error is detected by the Display Station Emulation Adapter On-line Test, an error message displays on the screen.

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

Display Station Address Switches Are Set To X .

XX:XX:XX
ERROR – DISPLAY STATION EMULATION ADAPTER 16XX E
PRESS ENTER TO CONTINUE
?

Note: The Display Station Address displays only if a valid Display Station Address (0 through 6) is recognized by the diagnostics. All other Xs shown on the screen can be any number.

Did an error message similar to the above error message display on the display screen?

NO

- Go to page 5-37.

YES

- Continue on the next page.

Perform the following checks:

1. Make sure that the system, to which your IBM Personal Computer connects is operating and able to recognize the IBM Personal Computer. This may require activating your IBM Personal Computer on the system, or other system operator action.
2. Ensure the IBM Personal Computer/Display Station Emulation Adapter has the correct Display Station Address switch setting.
3. The IBM Personal Computer may be on a twinaxial cable with other display stations. If so, make sure that each display station on the cable has the correct Display Station Address switch setting.
4. Make sure that the twinaxial cable does not terminate at any other display station between your IBM Personal Computer and the system.
5. Make sure that the Terminator accessory (if required), is installed on the T-connector, if the IBM Personal Computer is the only or last display station on the twinaxial cable. Refer to your application software user's guide to determine if your system uses the Terminator accessory.

CONTINUE 

6. Check that the connectors on the twinaxial cable running from the external connector on the Display Station Emulation Adapter to the T-connector, are properly attached and tightened.
7. Check that the system twinaxial cable connections to the T-connector are properly attached and tightened.

Have you determined the cause of the failure while performing the checks?

NO

- Position the power switch on the System Unit and the Expansion Unit (if attached) to Off. Replace the defective Display Station Emulation Adapter.

YES

- Correct the cause of the failure and run the diagnostics and On-line test again starting on page 5-16.

When the Display Station Emulation Adapter tests complete successfully, the following message momentarily displays on the display screen, followed by the "SYSTEM CHECKOUT" menu.



DISPLAY STATION EMULATION ADAPTER 1600 S

Note: If the character following the four-digit completion code (1600) is an E, the Display Station Emulation Adapter is installed in the Expansion Unit.

CONTINUE 

1. Position the power switch to Off on the System Unit and on the Expansion Unit (if attached).
2. Remove the Display Station Emulation Adapter from the System Unit or the Expansion Unit.
3. Verify that the Display Station Address and the Interrupt Level switch settings on the adapter match the settings you recorded on page 5-30. See pages 1-11 through 1-14 for the correct switch settings.

Do the Display Station Address and Interrupt Level switch settings match the settings you recorded?

NO

- Position the power switch on the System Unit and the Expansion Unit (if attached) to Off. Replace the defective Display Station Emulation Adapter.

YES

- Position the power switch on the System Unit and the Expansion Unit (if attached) to Off. Reinstall the Display Station Emulation Adapter.
- You have now completed the IBM Personal Computer/Display Station Emulation Adapter PICs.

The following procedures should assist you if the IBM Personal Computer/Display Station Emulation Adapter has an intermittent problem.

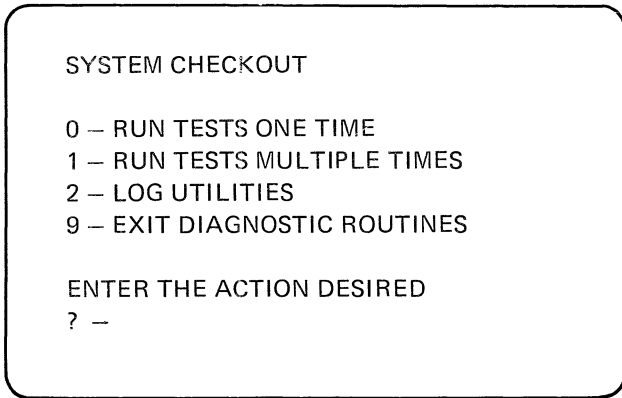
Display Station Emulation Adapter Intermittent Problems

The RUN TESTS MULTIPLE TIMES option on the SYSTEM CHECKOUT menu can help detect and isolate Display Station Emulation Adapter intermittent problems.

The LOG UTILITIES option on the SYSTEM CHECKOUT menu logs errors to a diskette or to the printer. (See "Utilities" on page 5-25 of this manual or reference your *IBM Personal Computer Hardware Maintenance and Service* manual for additional information.)

Either the Display Station Emulation Adapter diagnostics, the On-line Test, or both, may be run multiple times. To run the Display Station Emulation Adapter tests multiple times, perform the following steps after the SYSTEM CHECKOUT menu displays on the display screen:

1. Press then press (Enter).



CONTINUE 

2. When a menu similar to the following menu appears on the display screen, type 16 and then press (Enter).

```
1 - S SYSTEM BOARD
18 - S EXPANSION OPTION
2 - S 128KB MEMORY
3 - S KEYBOARD
4 - S MONOCHROME & PRINTER ADAPTER
5 - S COLOR/GRAPHICS MONITOR ADAPTER
6 - S 1 DISKETTE DRIVE(S) AND ADAPTER
9 - S PRINTER ADAPTER
11 - S ASYNC COMMUNICATIONS ADAPTER
12 - S ALT ASYNC COMMUNICATIONS ADPT
15 - S SDLC COMMUNICATIONS ADAPTER
16 - S DISPLAY STATION EMULATION ADAPTER
17 - S 1 FIXED DISK DRIVE(S) AND ADAPTER
14 - S MATRIX PRINTER
ENTER THE NUMBER(S) OF OPTIONS TO TEST OR PRESS ENTER TO
SELECT ALL OPTIONS ? -
```

3. When the following message displays on the display screen, type the number of times you want to run the tests, then press (Enter).

ENTER NUMBER OF TIMES TO RUN TESTS OR
PRESS ENTER TO RUN FOREVER

4. When the following message displays on the display screen, press or then press (Enter).

WAIT EACH TIME AN ERROR OCCURS (Y/N)?

The following message displays on the display screen.

DISPLAY STATION EMULATION ADAPTER

Use the PDPs in the Display Station Emulation Adapter "Installation and Problem Determination Procedures" manual.

RUN THE DISPLAY STATION EMULATION ADAPTER
DIAGNOSTICS MULTIPLE TIMES (Y/N) ?

5. Press then press (Enter) to run the Display Station Emulation Adapter diagnostics multiple times.
6. When the following message displays on the display screen, press then press (Enter) to run the Display Station Emulation Adapter On-line Test multiple times.

RUN THE DISPLAY STATION EMULATION
ADAPTER ON-LINE TESTS MULTIPLE TIMES
(Y/N)?

7. The Display Station Emulation Adapter tests now run the number of times you requested or, if the Wait On Error option was selected, stop on finding an error.

Notes:

SECTION 6. HARDWARE DESCRIPTION

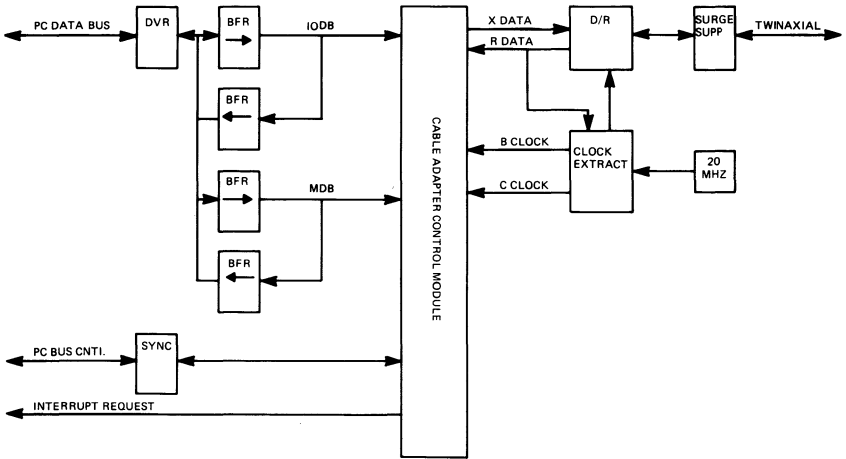
Introduction

The IBM Personal Computer/Display Station Emulation Adapter provides hardware to connect the IBM Personal Computer to the twinaxial cable of any system that supports the same type of twinaxial interface. The Display Station Emulation Adapter consists of the hardware (drivers, receivers, and circuitry) to handle incoming and outgoing communications between the IBM Personal Computer and a system.

The Display Station Emulation Adapter interfaces with the IBM Personal Computer through a System Expansion Slot.

The Display Station Emulation Adapter connects to the twinaxial cable by a 15-pin connector mounted on the rear of the Display Station Emulation Adapter.

Block Diagram



Functional Description

The Display Station Emulation Adapter receives and transmits bi-phase encoded data on the twinaxial cable at a rate of 1 MHz. A twinaxial driver/receiver module drives the twinaxial cable.

The circuitry on the Display Station Emulation Adapter provides the following functions:

- Serializing/deserializing of data
- Detection of transmission errors
- Parity generation
- Code violation detection
- Display Station address selection
- Bi-phase encode/decode function
- Real time poll status generation
 - Line parity error flag
 - Transmission acknowledge bit
 - Station busy flag
- Response to real time commands
 - Poll command
 - Activate write command
 - Activate read command

The twinaxial driver/receiver module and adapter logic drives a clock extraction circuit and a 20-MHz oscillator.

The Display Station Emulation Adapter contains seven interface registers that are used by the IBM Personal Computer to control the adapter functions. These registers are selected by address bits A2 through A0 of the I/O address.

The Display Station Emulation Adapter device address is selected by switches 1 through 7 of the 8-position switch assembly located on the adapter. The I/O address range for the adapter is from hexadecimal 250 through 257. The adapter address is located in bit positions A9 through A0 of the I/O address. The low-order three positions (A2 through A0) select the interface registers on the adapter.

The 8-position switch assembly also selects Interrupt Level 3 of the IBM Personal Computer by setting switch 8 to On.

The IBM Personal Computer display station address is selected by switches 1 through 3 on the 6-position switch assembly located on the adapter.

Optional on-card termination of the twinaxial cable is selected by setting switches 4 and 5 of the 6-position switch assembly to On.

The 6-position switch assembly also selects Interrupt Level 5 of the IBM Personal Computer by setting switch 6 to On.

The Display Station Emulation Adapter requires two direct memory address (DMA) channels of the DMA controller. Activate channel is assigned to DMA Port 1 and Command Queue channel is assigned to DMA Port 3.

The Display Station Emulation Adapter requires one Interrupt Request line to signal the IBM Personal Computer System Unit that the adapter requires attention.

The DMA Request and Interrupt Request signals originate in the Display Station Emulation Adapter. These signals are logically disconnected from the I/O Channel Interface following power-on reset or a transition from normal mode to diagnostic mode.

They remain logically disconnected from the I/O Channel Interface until an I/O Write command is issued to the Display Station Emulation Adapter.

This is done to allow the use by other devices of DMA Ports 1 and 3, and Interrupt Levels 3 or 5 when the Display Station Emulation Adapter is installed but not active.

Phase-Encoding

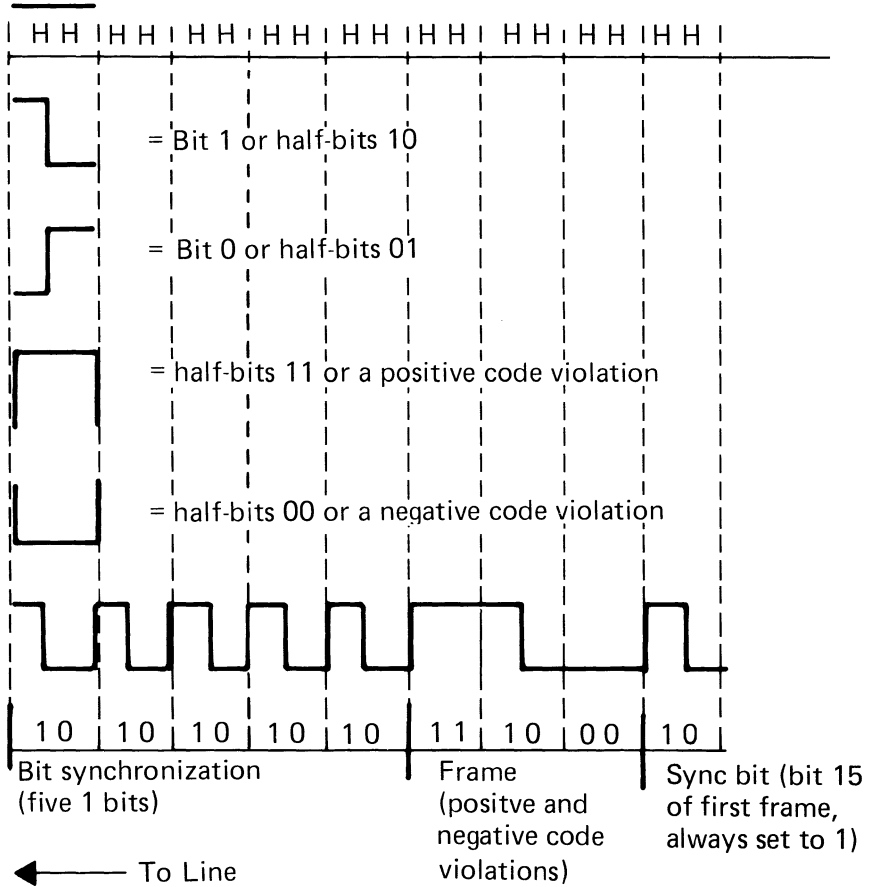
Data sent on the twinaxial cable is phase encoded so that a transition occurs during each bit time. Because the transition divides the bit cell into two parts, the term half-bit is used in the description that follows. The first half-bit is 0 if the signal is negative (low) during the first half-bit. The first half-bit is 1 if the signal is positive (high) during the first half-bit. Two half-bits make up a bit cell. Each half-bit must have opposing polarity to be valid.

A signal that remains positive for the two half-bits in a bit cell creates a positive code violation. A signal that remains negative for the two half-bits in a bit cell creates a negative code violation.

A negative-to-positive transition during the bit cell is a bit 0. A positive-to-negative transition during the bit cell is a bit 1.

When information is to be sent on the twinaxial cable, a group of five 1 bits (1010101010 half-bits) is sent to establish bit synchronization. Immediately after the 1 bits are sent, a group of 3 half-bits set to 1 and 3 half-bits set to 0 are sent to establish frame synchronization. This results in a positive code violation followed by a negative code violation.

Phase-Encoding



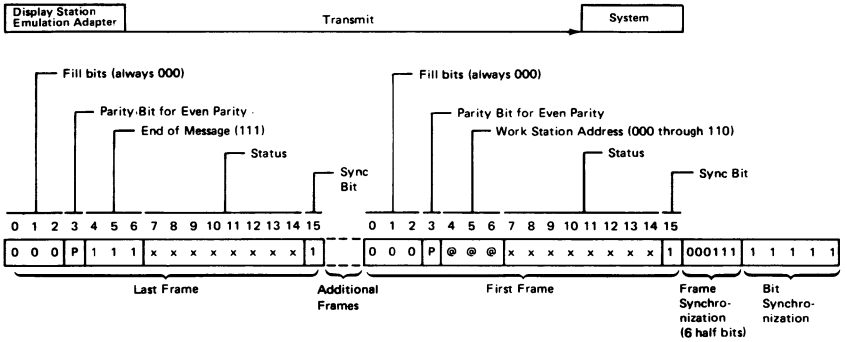
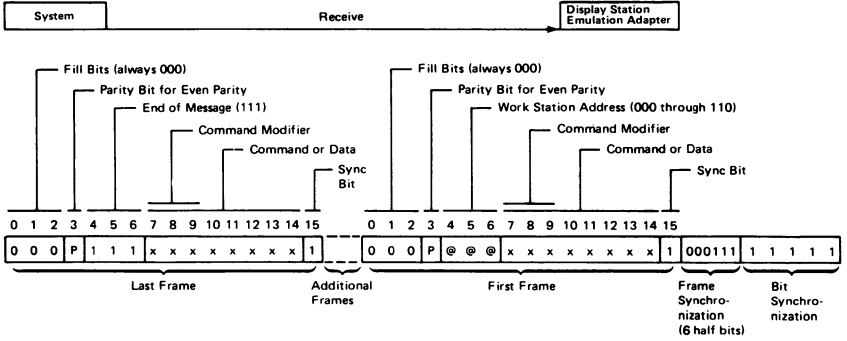
Frame Format

Communications between the IBM Personal Computer/ Display Station Emulation Adapter and a system through the twinaxial cable are carried by 16-bit frames. The twinaxial cable usually carries no signal between frames. However, it may carry a number of idle zeros. The maximum transmission rate is 1.0 MHz (16 microseconds per frame).

The 16-bit frame carries 13 bits of information in each direction. The fill bits, which are always 000, serve as a timing delay. The parity bit makes the number of active bits in the frame an even number. The Display Station Emulation Adapter decodes the address bits and responds to a specific address by sending a response that contains the display station address.

A display station address of 111 indicates an End of Message condition and causes a line turnaround. Bits 7 through 14 contain the data or commands used by the Display Station Emulation Adapter or the IBM Personal Computer. Bit 15, which is always On, is the synchronization bit for the Display Station Emulation Adapter.

Frame Format



Commands

Note: The binary number in parentheses next to the command represents bits number 10 through 14 of the command frame.

The following commands are twinaxial commands serviced by the Display Station Emulation Adapter. They require an emulation program loaded in the IBM Personal Computer in order to be active:

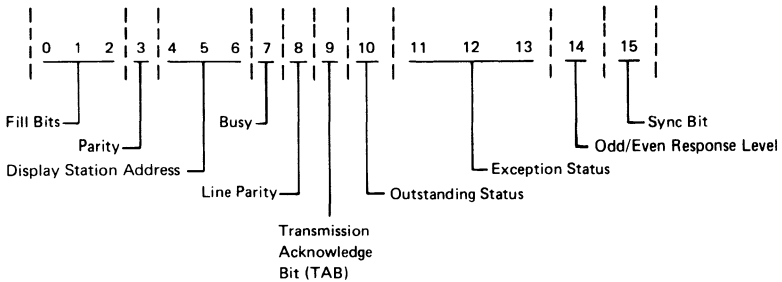
- **Poll (10000):** Command sent to the Display Station Emulation Adapter from a system. It initiates the transmission of one or two status words from the adapter per poll command. The poll command acknowledges and resets a line parity error from the Display Station Emulation Adapter. It also acknowledges receiving the last status transmission from the Display Station Emulation Adapter.
- **Write Activate (00001):** If enabled (via the Function Control Register) this command causes the Display Station Emulation Adapter to store the command/data portion of all subsequent frames of the message into a specified location in data storage.
- **Read Activate (00000):** If enabled (via the Function Control Register) this command causes the Display Station Emulation Adapter to send data frames to the twinaxial cable from a specified location in data storage.

These commands are serviced by the hardware. Commands not serviced by the hardware are not listed but may be found in the manuals associated with the products they are emulating.

Poll Response Frame

After the Display Station Emulation Adapter is polled following power-on a single response frame is returned to the system. The system receives the first response frame and then returns a set mode command to the Display Station Emulation Adapter.

A two-frame response is made to every poll command after the set mode command. The second frame contains a display station address of all 1's (indicating the last message frame) and the scan code located in bits 7 through 14. The first frame in the response contains the status information, as follows:



Bit 7

- 0 = Display station not busy
- 1 = Display station busy

Bit 8

- 0 = No line parity error found
- 1 = Line parity error found

Bit 9

- Initialized to zero at power-on.
- Toggles when the first command in the queue is executed, and after each transmission.
- Status is valid only during not busy time.

Bit 10

Indicates there is feature data or status from an I/O device to send to the system

Bits 11, 12, and 13

These three bits are encoded to indicate the exception status as follows:

Bit	11	12	13	Description
	0	0	0	No exception status
	0	0	1	Null or attribute error
	0	1	0	Activate not valid
	1	0	0	Command or device ID not valid
	1	0	1	Input queue or storage overrun
	1	1	0	Register value not valid
	1	1	1	Power-on transition

Bit 14

By analyzing bit 14, the system can determine if the information in the response frame received is the same as the previous response frame, or if the information has changed. Bit 14 is set to zero (0) after power-on. Any change in the response frame changes bit 14 from its previous condition.

Data Transfer

During data transfer the Display Station Emulation Adapter has three major functions:

- To respond to polling
- To shift data to the twinaxial cable for transmission to the system
- To receive data from the system twinaxial cable and decode the data for either or both of the following functions:
 - Commands
 - Transferring data to storage

The Display Station Emulation Adapter finds the display station address on the first frame of a transmitted message. When this address is received and recognized, and a response is returned, the polling is complete.

Data to be transmitted to the system moves from the IBM Personal Computer data storage, through a Serializer/Deserializer (SERDES) register, and to the twinaxial cable under control of the Display Station Emulation Adapter.

Received data moves into the SERDES until the synchronization bit is in the high-order position. The SERDES stops, permitting time for the data to transfer to the IBM Personal Computer data storage.

I/O Channel Interface

The following I/O Channel Interface signal and voltage lines are used:

System Board I/O Channel	A2<-----	+ D7	----->	Display Station Emulation Adapter
	A3<-----	+ D6	----->	
	A4<-----	+ D5	----->	
	A5<-----	+ D4	----->	
	A6<-----	+ D3	----->	
	A7<-----	+ D2	----->	
	A8<-----	+ D1	----->	
	A9<-----	+ D0	----->	
	A11 -----	+ AEN	----->	
	A22 -----	+ A9	----->	
	A23 -----	+ A8	----->	
	A24 -----	+ A7	----->	
	A25 -----	+ A6	----->	
	A26 -----	+ A5	----->	
	A27 -----	+ A4	----->	
	A28 -----	+ A3	----->	
	A29 -----	+ A2	----->	
	A30 -----	+ A1	----->	
	A31 -----	+ A0	----->	
	B1 -----	Ground	-----	
	B2 -----	+ Reset Drv	----->	
	B3 -----	+ 5 Volts	----->	
	B5 -----	- 5 Volts	----->	
	B10 -----	Ground	-----	
	B13 -----	- IOW	----->	
	B14 -----	- IOR	----->	
	B15 -----	- DACK3	----->	
	B16<-----	+ DRQ3	-----	
	B17 -----	- DACK1	----->	
	B18<-----	+ DRQ1	-----	
	B23<-----	+ IRQ5	-----	
B25<-----	+ IRQ3	-----		
B27 -----	+ T/C	----->		
B29 -----	+ 5 Volts	----->		
B31 -----	Ground	-----		

Display Station Emulation Adapter I/O Channel Interface Line Descriptions

Signal	I/O	Description
D0-D7	I/O	Data bits 0 to 7: These lines provide data bus bits 0 to 7 for the Display Station Emulation Adapter. D0 is the Least Significant Bit (LSB) and D7 is the Most Significant Bit (MSB). These lines are active HIGH.
A0-A9	I	Address bits 0 to 2: These lines are used to select an I/O Register on the Display Station Emulation Adapter. Address bits 3 to 9: These lines are used to address the Display Station Emulation Adapter. A0 is the Least Significant Bit (LSB) and A9 is the Most Significant Bit (MSB). These lines are active HIGH.

Signal	I/O	Description
AEN	I	Address Enable: When this line is active it tells the Display Station Emulation Adapter that the DMA Controller has control of the address bus, data bus, read command lines, and write command lines. This line is active HIGH.
RESET DRV	I	Reset Driver: This line is used to reset or initialize the Display Station Emulation Adapter logic upon power-on or during a low line voltage outage. This signal is synchronized to the falling edge of the system clock and is active HIGH.
$\overline{\text{IOW}}$	I	- I/O Write Command: This command line instructs the Display Station Emulation Adapter to read the data on the data bus. This signal is active LOW.
$\overline{\text{IOR}}$	I	- I/O Read Command: This command line instructs the Display Station Emulation Adapter to drive its data onto the data bus. This signal is active LOW.

Signal	I/O	Description
$\overline{\text{DACK1}}$	I	- DMA Acknowledge 1: This line acknowledges the DMA request for activate service. This signal is active LOW.
$\overline{\text{DACK3}}$	I	- DMA Acknowledge 3: This line acknowledges the DMA request for queue service. This signal is active LOW.
T/C	I	Terminal Count: This line provides a pulse to the Display Station Emulation Adapter when the terminal count for either DMA channel is reached. This signal is active HIGH.
DRQ1	O	DMA Request 1: The Display Station Emulation Adapter uses this line to request DMA service for activate service. A request is generated by bringing the line to an active level (HIGH). The line must be held high until the DACK1 line becomes active.

Signal	I/O	Description
DRQ3	O	DMA Request 3: The Display Station Emulation Adapter uses this line to request DMA service for the queue. It generates a request by bringing the line to an active level (HIGH). The line must be held high until the DACK3 line becomes active.
IRQ3 IRQ5	O	Interrupt Request 3 or 5: The Display Station Emulation Adapter uses one of these lines to signal the processor that it requires service. The signal used is selected by the position of the interrupt level 3 or 5 select switches. These signals are active HIGH.

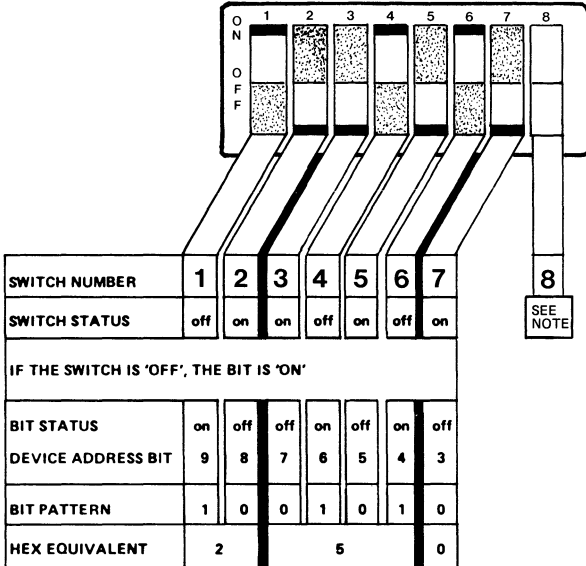
Display Station Emulation Adapter Switch Settings

Device Address Switch Assembly

The device address of the Display Station Emulation Adapter is selected by setting switches 1 through 7 of the 8-position switch assembly located on the adapter.

Setting the switch to On causes the corresponding I/O address bit to be Off. The device address has a range of hexadecimal 250 through 257. The setting shown below indicates a device address of hexadecimal 250. The low order 3 bits of the I/O address are used to select the interface registers on the adapter.

Switch position 8 is used to select the IBM Personal Computer interrupt level 3. When the switch is set to On interrupt level 3 is used. When the switch is Off, interrupt level 3 is disabled.



Note: Either interrupt level 3 or interrupt level 5 must be selected, *never* both. The interrupt level selected must be compatible with the emulation software.

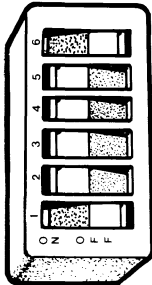
Display Station Address Switch Assembly

The display station address of the IBM Personal Computer is selected by setting switches 1 through 3 of the 6-position switch assembly located on the Display Station Emulation Adapter. Setting the switch to On causes the corresponding station address bit to be set to 1.

The switch settings shown below indicate that display station address 4 is selected. The switches must be set to a valid display station address (0 through 6) and each display station connected to the same twinaxial cable must have a unique address.

The twinaxial cable must terminate at the last display station on the line. Switches 4 and 5 are optional Terminate switches, and are used to terminate the twinaxial cable if the Terminator accessory is not used. The twinaxial cable is terminated with both the switches set to On and is not terminated with both switches set to Off. If the Terminator accessory is used to terminate the twinaxial cable, switches 4 and 5 are always set to Off.

Switch position 6 is used to select the IBM Personal Computer interrupt level 5. When the switch is set On interrupt level 5 is used. When the switch is Off, interrupt level 5 is disabled. The setting shown below indicates interrupt level 5.



- On – Interrupt Level 5 (See note.)
- Off – Terminate Option
- Off – Terminate Option
- Off – Station Address Switch 1
- Off – Station Address Switch 2
- On – Station Address Switch 4

Note: Either interrupt level 3 or interrupt level 5 must be selected, *never* both. The interrupt level selected must be compatible with the emulation software.

Physical and Electrical Characteristics

Dimensions

The Display Station Emulation Adapter is packaged on a single printed circuit card approximately 33.35 cm (13.01 inches) long and 10.69 cm (4.16 inches) high. The adapter contains one double sided 62-pin connector that fits into a System Expansion slot in the System Unit or the Expansion Unit.

Operating Environment

Environment: Class B

Particulate: Class 1

Gas: Class 1

Power Requirements

+ 5 Volts dc at 750 MA

- 5 Volts dc at 60 MA

APPENDIX A. TWINAXIAL CABLE PROCEDURES

Twinaxial Cable Ordering Procedure

You may order preassembled or bulk (unassembled) cables from IBM or from other sources. See the figure below for IBM part numbers.

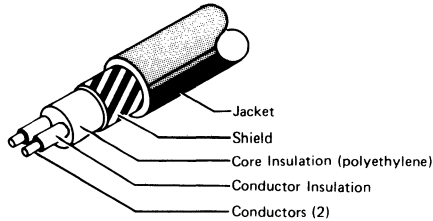
When ordering from sources other than IBM:

1. See "Twinaxial Cable Specifications" in this section for the bulk cable specifications you need.
2. Specify Amphenol part number 82-5589 or equivalent for the twinaxial cable connector.
3. Specify all of the following AMP part numbers or equivalent for each 15-pin connector:
 - P/N 205205-2, 15-pin connector, quantity 1
 - P/N 66504-3, contact pins, quantity 15
 - P/N 745172-2, cable clamp, cover, quantity 1

See "Twinaxial Cable Assembly Procedures" in this section for assembly instruction for cable connectors on bulk cables.

Part Name	Preassemble Cable IBM Part Numbers	Bulk Cable IBM Part Numbers
Cable	6100218 (Specify total length of each cable — 0.2 meter (8 inches) minimum length 0.3 meter (1.0 ft.) maximum length)	7362211 (Specify total length required)
Connector	Preassembled cable consists of cable and connector assembled to each end.	7362229 (single twinaxial connector) 6100219 (15-pin connector) 1655337 (contact pins (15)) 6100221 (cable clamp, cover)

Twinaxial Cable Specifications

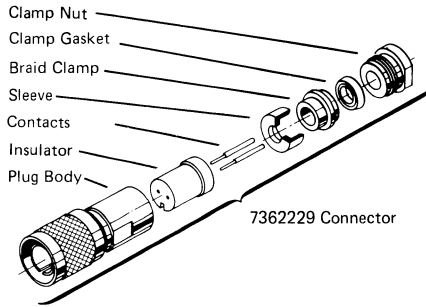


SPECIFICATIONS		
Conductor	AWG Wire Size Stranding Material Coating	20 7 x 28 Copper Tin (1 conductor only)
Core Insulation	Material Outside Diameter	Flame retardant polyethylene 6.1 millimeters (0.240 inch) nominal
Shield	Material Type Coverage	Copper 168 x AWG 34 95% minimum
Jacket	Material Color Average Single Wall Thickness Outside Diameter	Vinyl Black 0.76 millimeters (0.029 inch) 8.25 millimeters (0.325 inch) nominal
Ratings	Dielectric Strength	4,500 Vdc for 3 seconds at 28°C (82°F)
Capacitance		16.2 pF/foot maximum
Impedance Characteristic		111 ± 5% ohms at 0.5 MHz 107 ± 5% ohms at 1.0 MHz 105 ± 5% ohms at 2.0 MHz 105 ± 5% ohms at 10.0 MHz
Attenuation @ 100 MHz		4.5 db/100 feet maximum at 25°C (77°F) 4.7 db/100 feet maximum at 80°C (176°F)
Velocity of Propagation		61% to 71%
Operating Environment		-40°C to 80°C (-40°F to 176°F) 10% to 90% relative humidity

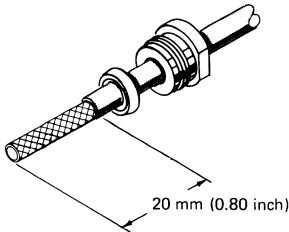
Note: Cable commercially designated Brand REX AWM Style 2498 or equivalent.

Twinaxial Cable Assembly Procedures

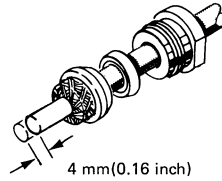
The following instructions and illustrations assist you in assembling the twinaxial cable and connectors. First, cut the twinaxial cable to a length of 0.2 meter (8 inches) to 0.3 meter (1.0 feet).



1. Cut one end of the cable so that it is sharp and square. Then slide a clamp nut and clamp gasket over the cable jacket and trim the jacket to the dimension given.

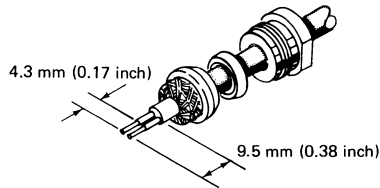


- Slide a braid clamp over the braid so that its inner shoulder contacts the cable jacket. Then, fold the braid back over the braid clamp and trim below the shoulder.



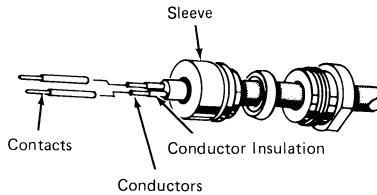
Note: Placement of braid wires over the braid clamp must be uniform to provide a good connection and to prevent breaking the shield strands.

- Cut the cable core insulation and the conductor insulation to the dimension shown. Do not damage the conductors or the conductor insulation. If the braid is frayed, retrim the braid as in step 2.

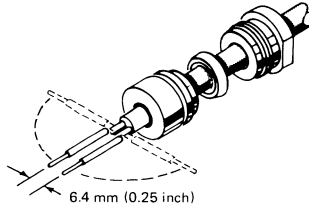


- Slide the sleeve over the cable core insulation and press the sleeve against the braid wires.

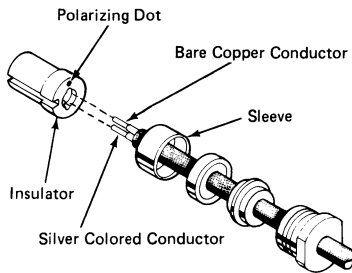
Using minimum heat, solder the contacts to the conductors with the contacts pressing against the conductor insulation. Remove any excess solder.



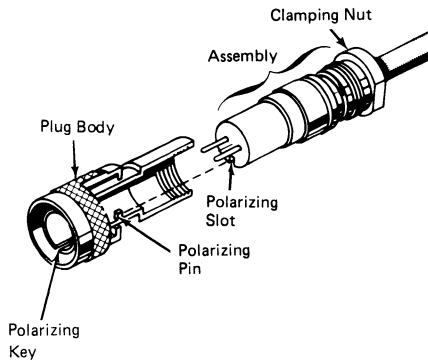
- Bend the conductors and the contacts out at right angles to the cable axis; then bend the conductors back to parallel. There should be approximately 6.4 millimeters (0.25 inch) between conductors.



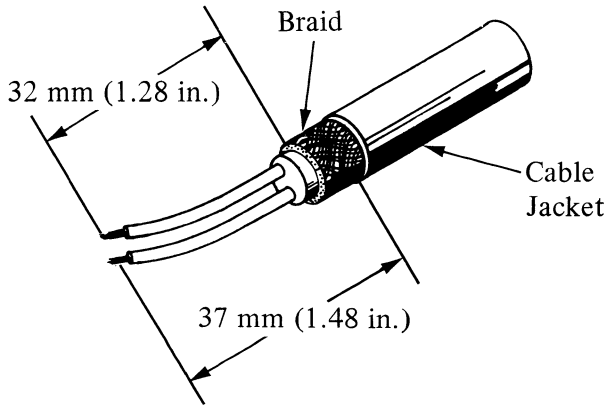
- Slide the insulator over the contacts and the cable so that the insulator presses against the sleeve. Press all parts together. The contact on the bare copper conductor of the cable goes into the insulator hole that has a dot next to it.



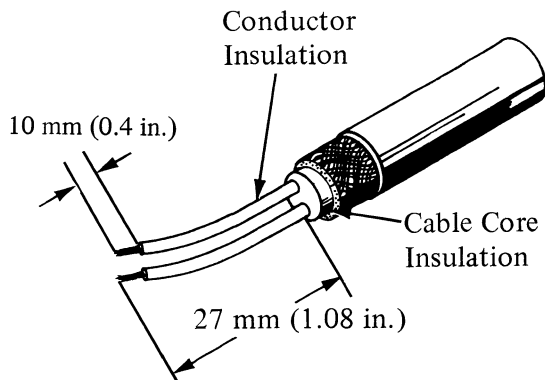
- Insert the assembly into the plug body, aligning the polarizing slot in the insulator with the polarizing pin inside the plug body. Hand tighten the clamping nut.



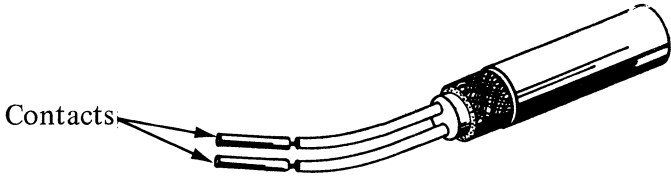
8. Make sure the other end of the cable is cut sharp and square. Trim the cable jacket and braid to the dimension shown.



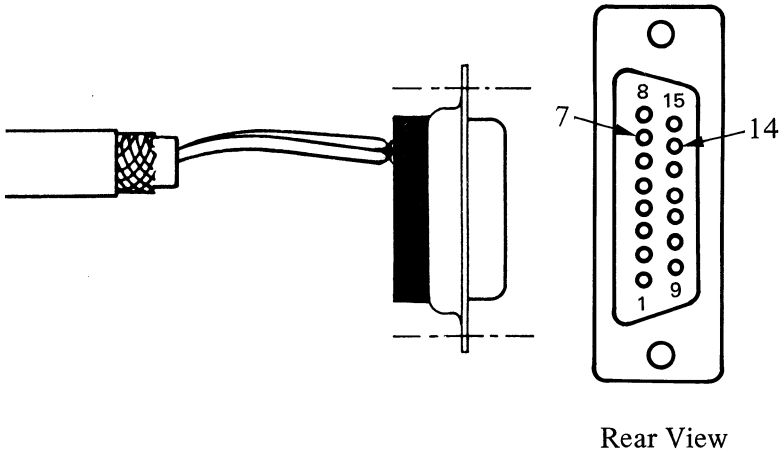
9. Cut the cable core insulation and the conductor insulation to the dimension shown. Do not damage the conductors or the conductor insulation.



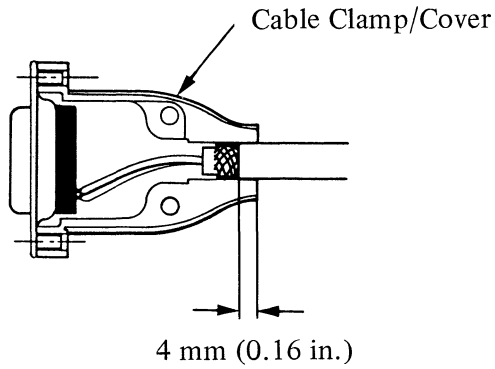
10. Using minimum heat, solder the contacts to the conductors. Remove any excess solder.



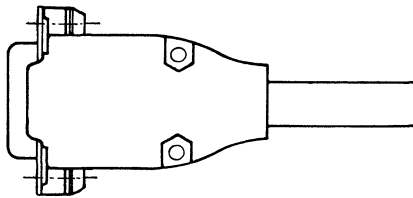
11. Insert the contact on the copper colored conductor into connector position 14. Insert the contact on the tin colored conductor into connector position 7. Insert the spare contacts into the remaining 13 connector positions. Reference "Connector Information" on page A-12.



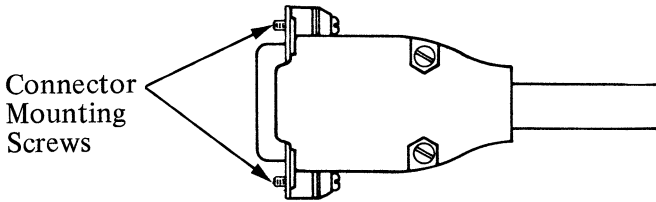
12. Place the cable clamp/cover on a flat surface and position the connector assembly as shown. The cable jacket should extend approximately 4 mm (.16 in.) into the cable clamp.



13. Position the other half of the cable clamp/cover on the connector assembly and press the assembly together.



14. While holding the assembly together, install the two connector retainer screws (and washers) through the cable/cover assembly. Fasten the assembly together with the two screws and nuts provided.



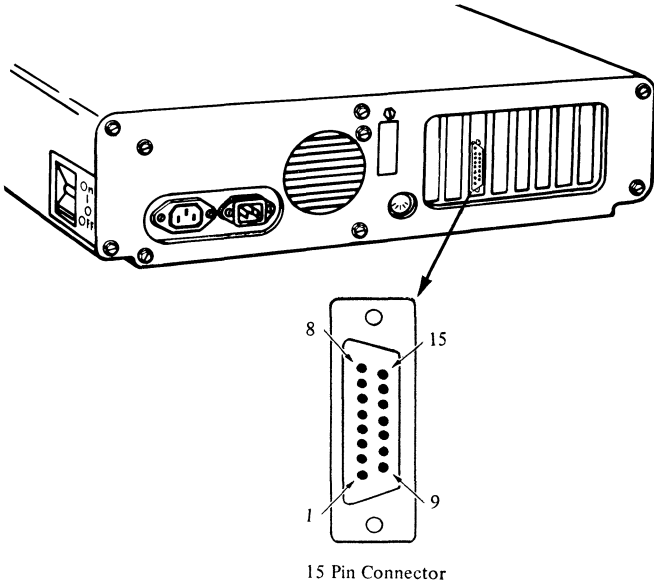
15. Check for shorts between the contacts and between each contact and the plug body. Make sure that the braid is making contact with the connector covers at both ends of the cable.

Twinaxial Cable Completion Tests

Cable installation should include tests to ensure there are no faults, no high resistance connections, and no circuit imbalances. The tests check for:

1. Open circuits in individual conductors or shields (broken circuit wire or poor connection to contacts).
2. Short circuits between conductors of the same pair (copper colored conductor and tin colored conductor are touching).
3. Short circuit on individual conductors, either between a conductor and a shield or between a conductor and a ground object, such as machine frame.
4. Reversed polarities.
 - The copper-colored conductor must be next to the insulator dot on the twinaxial connector.
 - The copper-colored conductor must be on pin 14 of the 15-pin connector.

Connector Information



15 Pin Connector

Signal Name-Description Pin

Twinaxial Cable	Not Used	1-6	Display Station Emulation Adapter
	Phase A	7	
	Not Used	8-13	
	Phase B (Copper)	14	
	Not Used	15	

Glossary

Terms not found in this glossary may be found in the *IBM Data Processing Glossary* (GC20-1699).

ac. Alternating current.

address. A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination.

audio. Sounds that can be heard by the human ear.

BASIC. Beginner's all-purpose symbolic instruction code. A programming language with a small collection of commands and a simple syntax, primarily designed for numerical applications.

bi-phase encoding. See phase-encoding.

bit. In binary notation, either of the characters 0 or 1.

bit cell. A cell comprised of two half-bits. Carries binary coding for 1 bit of information.

byte. A sequence of eight adjacent binary digits (bits) that are operated upon as a unit.

cabled. Connected by means of some kind of cable.

communicate. The transmission and reception of data.

cursor. A moveable spot of light on the display device, usually indicating where the next character will be entered.

data transfer. The sending of data from the data source and the receiving of the data at a data sink.

dc. Direct current.

device. A mechanical or electrical object with a specific purpose.

device address. The unique address of a particular device.

diskette. A thin, flexible magnetic disk enclosed in a semirigid protective jacket.

diskette drive. The device that rotates the diskette disk.

display station address. A unique address of an individual Display Station.

DMA. Direct memory address.

emulate. To imitate one system with another so that the imitating system accepts the same data and achieves the same results as the imitated system.

enable. Turned on.

EOQ. A display station command which designates the end of the command queue.

execution. The process of carrying out the instructions of a computer program by a computer.

FRU. Field replaceable unit.

half-bit. A bit cell divided into two parts during a transition cycle.

I/O. Input/Output.

LSB. Least significant bit.

microsecond. One-millionth of a second.

MSB. Most significant bit.

parity. Error detection.

PDP. Problem Determination Procedure.

phase-encoded. The method by which data is transmitted across twinaxial cables.

PIC. Problem isolation chart.

point of sale. The place you purchased your products.

polarity. Reference to either a positive or negative charge.

poll. The process of inviting data stations to transmit, one at a time.

POST. Power On Self Test.

SERDES. Serializer/deserializer.

system expansion slots. Slots located in the system unit or expansion unit which allow for additional devices to be installed on the IBM Personal Computer.

t-connector. A device that allows for three cables to be connected together.

terminated line. A transmission line with a resistance attached across its far end equal to the characteristic impedance of the line.

terminator. A device used to terminate a transmission line.

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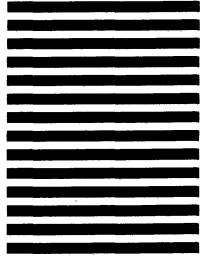
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