PREFACE

Hardware Maintenance and Service is the publication used to help isolate and repair any failure of a field replaceable unit (FRU) in the IBM Personal Computer. Users should have training on the IBM Personal Computer and be familiar with the Triplett Model 310 Multimeter* (or equivalent).

"Introduction" provides a general description of the IBM Personal Computer and its options.

"Introduction to Diagnostics" gives an explanation of the three main diagnostic aids and contains the diagnostic menu reference.

"Problem Isolation Charts" (PICs) provide step-by-step instructions to help the user isolate the failing FRU.

"Removal/Replacement and Adjustments" provide all necessary information to complete the repair after the failing FRU is identified.

Personal Computer component locations are shown in "Locations."

Switch settings are shown in "Switch Settings."

IBM part numbers are in "Parts Catalog."

Complete Personal Computer operating instructions are found in *Guide to Operations*, IBM item number 6025000. Detailed hardware design and interface information is found in *Technical Reference,* IBM item number 6025005.

*Manufactured by Triplett Corporation, Bluffton, Ohio 45817

Notes:

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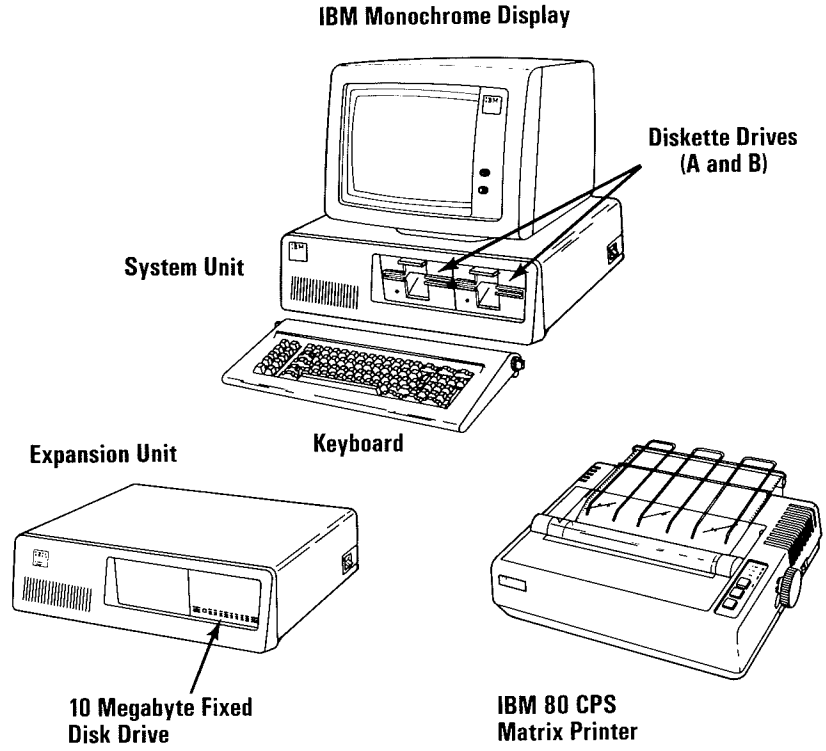
SECTION 1. INTRODUCTION

The IBM Personal Computer is a powerful small computer, which offers a wide variety of options to give the user the ability to tailor his system to meet his needs now, and growth potential for the future.



The system unit contains the processor, has five expansion slots for optional adapters, and can house two optional diskette drives and adapters.

Input to the system unit is through an 83-key keyboard, which includes a numeric keypad and 10 function keys. The keyboard is connected to the system unit by a 6 foot coiled cable, which allows the keyboard to be moved to a comfortable operating position.

The expansion unit is designed to upgrade the user's system. It contains a fixed disk drive, a fixed disk adapter and data/control cable, a receiver card and expansion slots for up to six user options. An expansion unit cable and extender card (to be installed in the system unit) are provided with the expansion unit option. A second fixed disk drive may be installed in the expansion unit.

Other options available for the IBM Personal Computer are:

- IBM Monochrome Display
- Color/Graphics Monitor Adapter
- IBM Color Display
- IBM Math Coprocessor
- Asynchronous Communications Adapter
- Alternate Asynchronous Communications Adapter
- Binary Synchronous Communications (BSC) Adapter
- Alternate Binary Synchronous Communications Adapter
- Synchronous Data Link Control (SDLC) Adapter
- Game Control Adapter
- Memory Expansion Options
- Prototype Card
- Printer Adapter
- IBM 80 CPS Matrix Printer
- IBM 80 CPS Graphics Printer

SECTION 2. INTRODUCTION TO DIAGNOSTICS

This section gives an explanation of three main diagnostic aids: the power-on self-test (POST), advanced diagnostics, and problem isolation charts (PICs). It is not necessary to go through this section on every service call, but it is a useful reference until you have a good command of the use of POST, advanced diagnostics, and PICs.

Power-On Self-Test

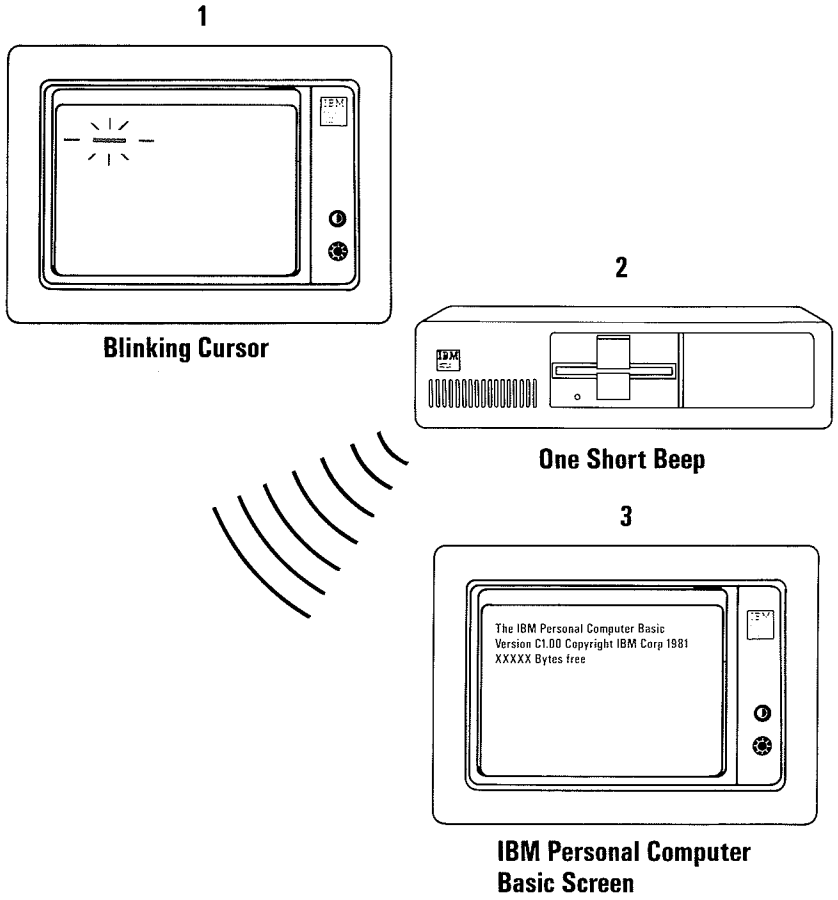
It is recommended that you go through POST and then advanced diagnostics each time you service the Personal Computer or add an option to it.

The power-on self-test runs each time the system unit is powered on. Depending on the amount of memory installed, the POST takes 13 to 90 seconds to complete.

Short tests check the following areas:

System board
Memory
Primary display
Keyboard
Diskette drive
Fixed disk drive
Expansion unit

1. If attached, set the expansion unit Power switch to On first.
2. Set the system unit Power switch to On.
3. Turn the brightness and contrast knobs fully clockwise.
4. A cursor appears on the display in approximately 4 seconds.
5. One short "beep" sounds after the POST.
6. The IBM Personal Computer BASIC screen will appear (if a diskette is not loaded or an operating system is not automatically loaded from a fixed disk drive).



Blinking Cursor

One Short Beep

IBM Personal Computer Basic Screen

Note: These three responses indicate POST completed successfully.

If the system unit fails to complete POST, you could receive an incorrect audio response, a blank screen, or an error message. These error codes may appear for only a short time at the end of POST. You should watch for these messages and make a note of them as soon as they appear. If multiple errors occur, you should troubleshoot the one that appears first.

POST Errors

Whenever a POST failure occurs, always make sure that all of the cables are properly connected and all switch settings are correct. Switch locations are in Section 4, "Locations" and switch settings are in Section 6, "Switch Settings."

The following is a list of some errors you can receive during POST:

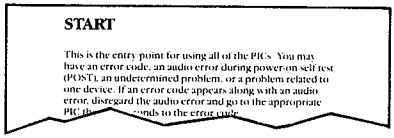
- A blank display
- An incorrect audio response (no beep or more than one beep)
- An error message like:
  601
  or XXXX 201 (X means any number could appear)
  or 1701
  or even a combination like:
  1801
  1701

Note: If you receive any error indications during or at the completion of POST, your next step will always be to note the error and then go to the "Start" page which is located in Section 3, page 3-2.

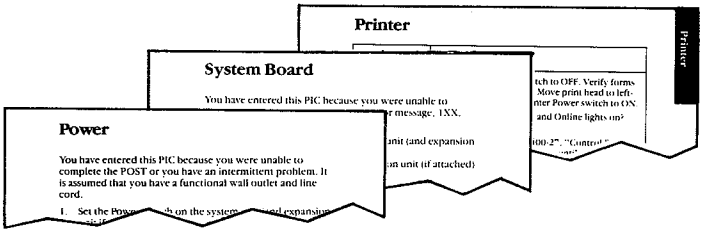
Problem Isolation Charts

How To Use

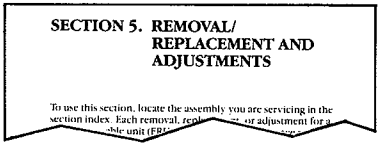
Always begin with "Start" on page 3-2.



Depending on your failure indications, "Start" directs you to one of the PICs.

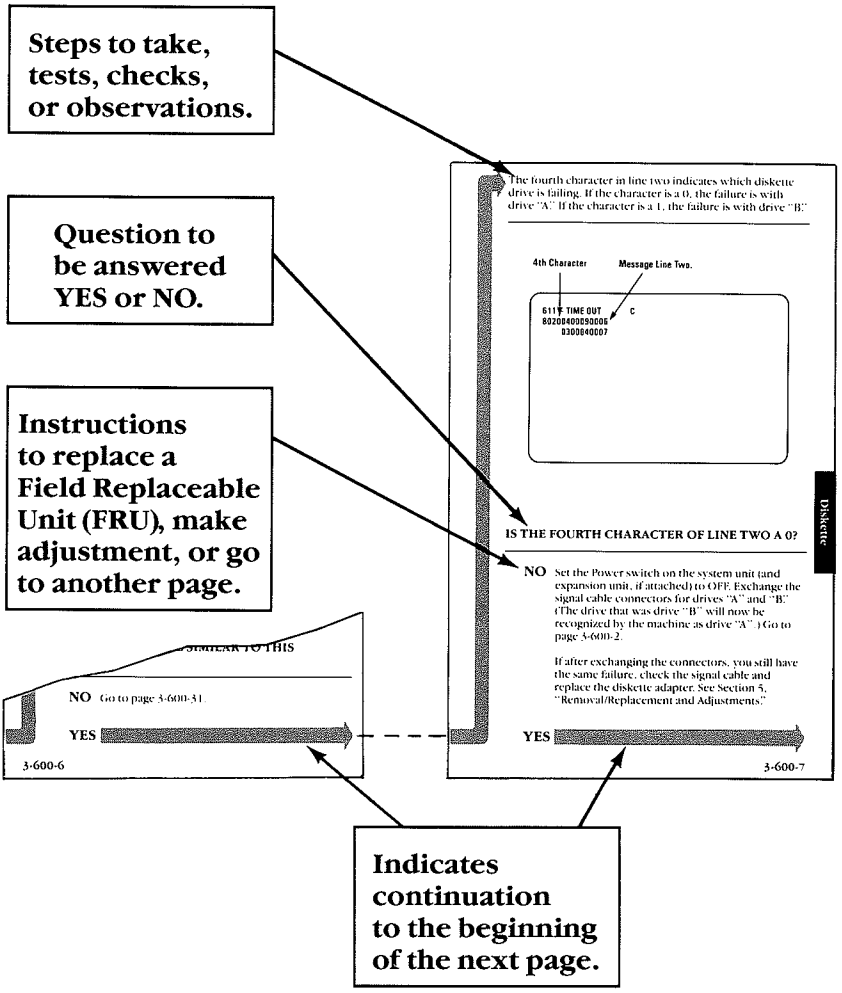


These PICs will guide you through a series of steps and the use of the Advanced Diagnostics diskette to identify the failing FRU.



The "Removal/Replacement and Adjustments" section will guide you to complete the repair.

The example below shows a representative page from the PICs.



Advanced Diagnostics

There are two ways to load the advanced diagnostics.

If your Personal Computer is off:

1. Insert the Advanced Diagnostics diskette in drive A and close the diskette drive door.
2. Set the expansion unit's (if attached) Power switch to On.
3. Set the system unit's Power switch to On.
4. After POST, the Advanced Diagnostics will load and Menu 1 will appear on the display.

If your Personal Computer is on:

1. Insert the Advanced Diagnostics diskette in drive A and close the diskette drive door.
2. Press and hold **Ctrl** and **Alt** then press **Del**. Release all three keys.
3. The Advanced Diagnostics will load and Menu 1 will appear on the display.

Special Key Functions

Special key functions for the Advanced Diagnostics are:

F7 Moves display message to the left (color graphics only).

F8 Moves display message to the right (color graphics only).

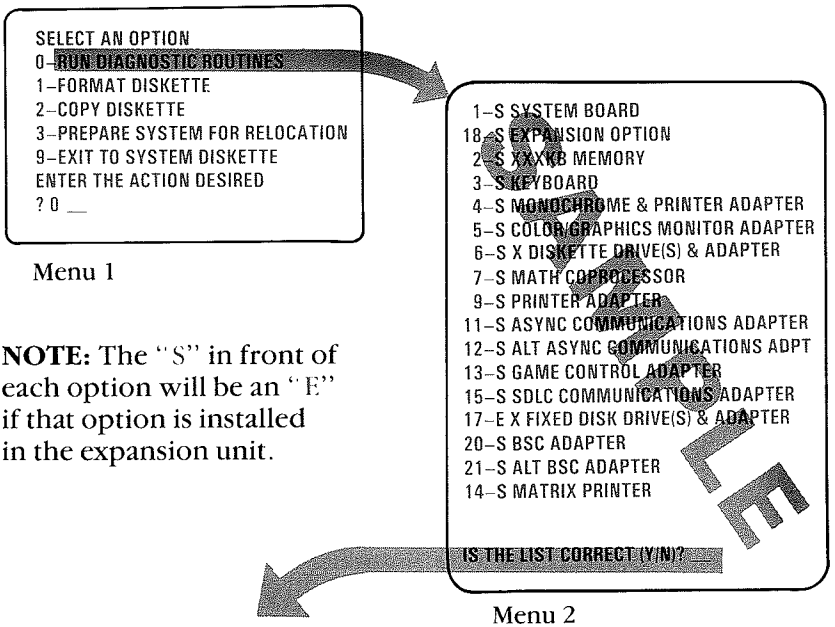
Ctrl + P – Directs screen output to printer.

Ctrl + N – Cancels output to printer.

Ctrl + C – Stops diagnostics and returns to Menu 2.

Ctrl + S – Stops diagnostics. Continues when any key is pressed.

Diagnostic Menu Reference



Menu 1

Menu 2

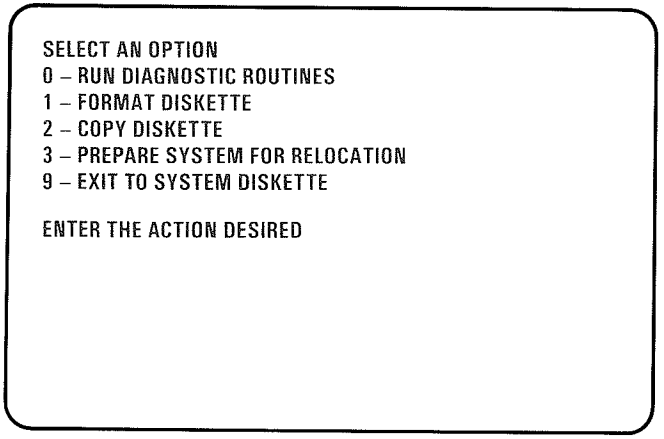
Menu 3

Menu 4

Menu 5

NOTE: The "S" in front of each option will be an "E" if that option is installed in the expansion unit.

Menu 1



0 – **RUN DIAGNOSTIC ROUTINES** – Starts the system checkout procedure (goes to Menu 2).

1 – **FORMAT DISKETTE** – Formats a diskette for use with diagnostics only.

2 – **COPY DISKETTE** – Copies Advanced Diagnostics diskette to another diskette.

3 – **PREPARE SYSTEM FOR RELOCATION** – Positions the fixed disk drive head in preparation to move the system.

9 – **EXIT TO SYSTEM DISKETTE** – Loads the program from the diskette in drive A.

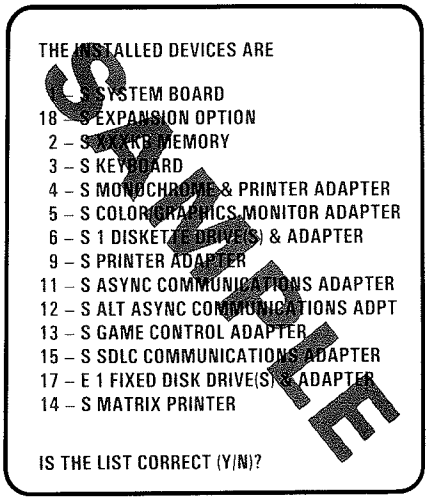
Note: If the monochrome display adapter and a color adapter are installed, the screen also displays:

"**IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N)?**"

Menu 2

The path to Menu 2 is:

- Menu 1



Y – Goes to System Checkout (Menu 3).

N – Allows you to add or delete items from the installed devices list.

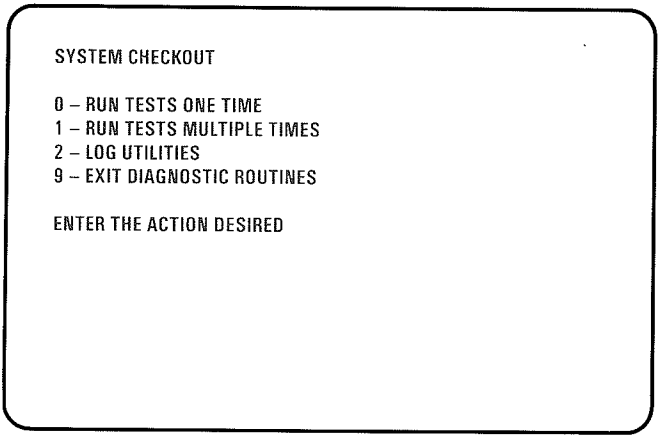
Note: If you enter "N" the screen will display an installed devices list error "199." Disregard that error at this time and continue with adding or deleting the option(s) in question.

After attempting to add or delete, answer "yes" to the installed devices list question, to continue running the diagnostics. Even if you are unable to correct the list, you still must answer "yes" to continue.

Menu 3

The path to Menu 3 is:

- Menu 1
- Menu 2



0 – **RUN TESTS ONE TIME** – Runs the diagnostic test(s) once (goes to Menu 4).

1 – **RUN TESTS MULTIPLE TIMES** – Runs the diagnostic test(s) one or more times without operator intervention (goes to Menu 4).

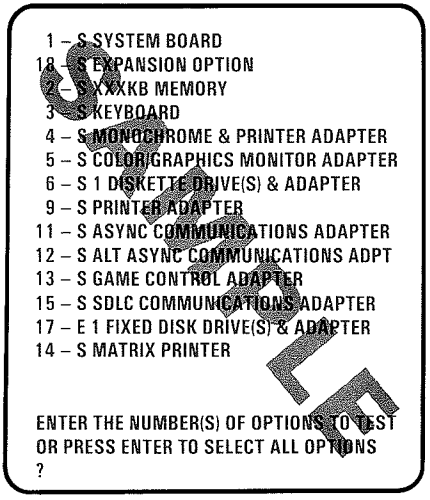
2 – **LOG UTILITIES** – Allows you to use the error log and time of day functions (goes to Menu 5).

9 – **EXIT DIAGNOSTICS ROUTINE** – Returns to Menu 1.

Menu 4

The path to Menu 4 is:

- Menu 1
- Menu 2
- Menu 3



Select the options to be tested by entering the corresponding numbers, separated by commas or spaces. To select all options, press Enter.

1 – **SYSTEM BOARD** – Tests key elements of the system board.

18 – **EXPANSION OPTION** – Tests expansion unit, cable, extender card, and receiver card. The expansion unit is tested second because it is actually an extension of the system board bus.

2 – **XXXKB MEMORY** – Tests all installed random access memory and verifies correct addressing.

3 – **KEYBOARD** – Tests all key positions, keyboard cable, and the reset function.

4 – **MONOCHROME & PRINTER ADAPTER** – Selects monochrome and printer adapter menu (Menu 6).

5 – **COLOR/GRAPHICS ADAPTER** – Selects color/graphics adapter menu (Menu 7).

6 – **X DISKETTE DRIVE(S) & ADAPTER** – Selects diskette drive adapter menu (Menu 8).

7 – **MATH COPROCESSOR** – Tests math coprocessor.

9 – **PRINTER ADAPTER** – Tests printer adapter with printer adapter wrap plug (IBM Part 8529228).

11 – **ASYNC COMMUNICATIONS ADAPTER** – Tests asynchronous communications adapter with wrap plug (IBM Part 8529280).

12 – **ALT ASYNC COMMUNICATIONS ADPT** – Tests alternate asynchronous communications adapter with wrap plug (IBM 8529280).

13 – **GAME CONTROL ADAPTER** – Tests game control adapter. Joy sticks are required to run test.

15 – **SDLC COMMUNICATIONS ADAPTER** – Tests the SDLC adapter and the IBM Communications Adapter Cable, if attached, with wrap plug (IBM Part 8529280).

17 – **X FIXED DISK DRIVE(S) AND ADAPTER** – Tests the fixed disk drive(s) and adapter (Menu 9).

20 – **BSC ADAPTER** – Tests the binary synchronous communications adapter and the IBM Communications Adapter Cable, if attached, with wrap plug (IBM Part 8529280).

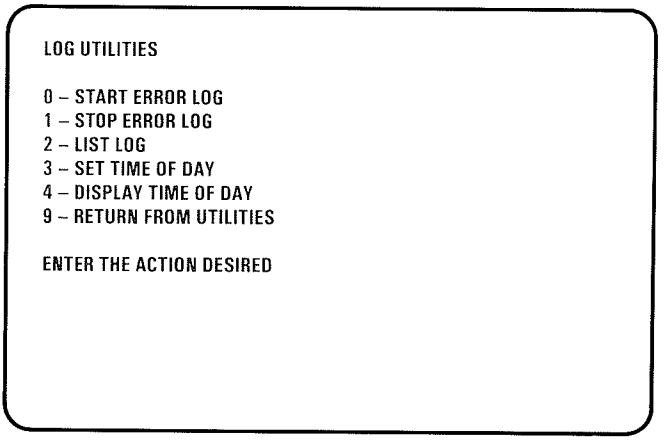
21 – **ALT BSC ADAPTER** – Tests the alternate binary synchronous communications adapter and the IBM Communications Adapter Cable, if attached, with wrap plug (IBM Part 8529280).

14 – **MATRIX PRINTER** – Tests the printer cable and prints character sets on the matrix printer.

Menu 5

The path to Menu 5 is:

- Menu 1
- Menu 2
- Menu 3



0 – **START ERROR LOG** – Starts a record of failures detected by diagnostic tests. You can choose to log to diskette or printer. If logging to diskette, use a copy of the Advanced Diagnostics that is not write protected.

1 – **STOP ERROR LOG** – Stops recording failures detected by diagnostic tests.

2 – **LIST LOG** – Lists logged failures from diskette to display.

3 – **SET TIME OF DAY** – Directs user to set current time of day, using a 24 hour clock.

4 – **DISPLAY TIME OF DAY** – If no time was set, displays elapsed time since diagnostic program was loaded.

9 – **RETURN FROM UTILITIES** – Returns to system checkout (Menu 3).

Menu 6

The path to Menu 6A is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4 (run tests once)

The path to Menu 6B is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4 (run tests multiple times)

```
IBM MONOCHROME DISPLAY AND
PRINTER ADAPTER TEST
 0 – DISPLAY ADAPTER TEST
 1 – DISPLAY ATTRIBUTES
 2 – CHARACTER SET
 3 – 80X25 DISPLAY
 4 – PRINTER ADAPTER TEST
 9 – EXIT TO MAIN MENU
10 – RUN ALL ABOVE TESTS
11 – VIDEO TEST
12 – SYNC TEST
ENTER NUMBER OF DESIRED ACTION
```

Menu 6A

```
CHOOSE OPTIONS FOR UNATTENDED MODE
IBM MONOCHROME DISPLAY AND
PRINTER ADAPTER TEST
 0 – DISPLAY ADAPTER TEST
 1 – DISPLAY ATTRIBUTES
 2 – CHARACTER SET
 3 – 80X25 DISPLAY
 4 – PRINTER ADAPTER TEST
 9 – EXIT TO MAIN MENU
10 – RUN ALL ABOVE TESTS
ENTER NUMBERS SEPARATED BY COMMAS
```

Menu 6B

0 – **DISPLAY ADAPTER TEST** – Exercises the monochrome display adapter, tests memory, and checks for correct addressing.

1 – **DISPLAY ATTRIBUTES** – Exercises display attribute logic for intensity, reverse video, blinking, non-display, and underline modes.

2 – **CHARACTER SET** – Checks character ROM by writing all available characters to the screen.

3 – **80X25 DISPLAY** – Fills screen with a ripple pattern of characters.

4 – **PRINTER ADAPTER TEST** – Checks the printer adapter portion of the monochrome display and printer adapter.

9 – EXIT TO MAIN MENU – Returns to Menu 3 or continues other tests.

10 – RUN ALL ABOVE TESTS – Runs tests 0, 1, 2, 3, and 4.

*11 – VIDEO TEST – Used for measurements of voltage levels on the video, intensity, and composite output signals.

*12 – SYNC TEST – Used for voltage measurements of the horizontal and vertical sync outputs.

Note: The display cable must be disconnected before running the sync test due to the change in sync frequency.

*Section 3, "Problem Isolation," gives instructions for measuring these voltages.

Menu 7

The path to Menu 7A is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4 (run tests once)

The path to Menu 7B is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4 (run tests multiple times)

```
COLOR/GRAPHICS MONITOR ADAPTER TEST
 0 - DISPLAY ADAPTER TEST
 1 - DISPLAY ATTRIBUTES
 2 - CHARACTER SET
 3 - 80X25 DISPLAY
 4 - 40X25 DISPLAY
 5 - 320X200 GRAPHICS
 6 - 640X200 GRAPHICS
 7 - LIGHT PEN TEST
 8 - SCREEN PAGING
 9 - EXIT TO MAIN MENU
10 - RUN ALL ABOVE TESTS
11 - VIDEO TEST
12 - SYNC TEST
ENTER NUMBER OF DESIRED ACTION
```

Menu 7A

```
CHOOSE OPTIONS FOR UNATTENDED MODE
COLOR/GRAPHICS MONITOR ADAPTER TEST
 0 - DISPLAY ADAPTER TEST
 1 - DISPLAY ATTRIBUTES
 2 - CHARACTER SET
 3 - 80X25 DISPLAY
 4 - 40X25 DISPLAY
 5 - 320X200 GRAPHICS
 6 - 640X200 GRAPHICS
 8 - SCREEN PAGING
 9 - EXIT TO MAIN MENU
10 - RUN ALL ABOVE TESTS
ENTER NUMBERS SEPARATED BY COMMAS
```

Menu 7B

Compare test displays to examples in Section 3, "Problem Isolation."

0 – **DISPLAY ADAPTER TEST** – Exercises the color display adapter, tests memory, and checks for correct addressing.

1 – **DISPLAY ATTRIBUTES** – Exercises display attribute logic for intensity, reverse video, blinking, non-display, and underline modes.

2 – **CHARACTER SET** – Checks character ROM by writing all available characters to the screen.

3 – **80X25 DISPLAY** – Fills screen with a ripple pattern of characters, using the 80x25 mode.

4 – **40X25 DISPLAY** – Fills the screen with a ripple pattern of characters with an intensified white border, using the 40x25 mode.

5 – 320X200 GRAPHICS – Exercises the 320x200 graphics mode. Also, illustrates color set 0 and color set 1.

6 – 640X200 GRAPHICS – Exercises the 640x200 mode.

7 – LIGHT PEN TEST – Checks light pen and related circuitry on the adapter.

8 – SCREEN PAGING – Exercises the addressing circuitry from the video controller chip to the adapter memory.

9 – EXIT TO MAIN MENU – Returns to Menu 3 or continues other tests.

10 – RUN ALL ABOVE TESTS – Runs Tests 0, 1, 2, 3, 4, 5, 6, 7, and 8.

*11 – VIDEO TEST – Used for measurements of voltage levels on the video, intensity, and composite output signals.

*12 – SYNC TEST – Used for voltage measurements of the horizontal and vertical sync outputs.

Note: The display cable must be disconnected before running the sync test due to the change in sync frequency.

*Section 3, "Problem Isolation," gives instructions for measuring these voltages.

Menu 8

The path to Menu 8 is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4

```
TESTING – 1 DISKETTE DRIVE(S) & ADAPTER

DISKETTE DIAGNOSTIC MENU

OPTION                          DRIVE
1 – SEQUENTIAL ACCESS           ONE DRIVE
2 – RANDOM SEEK                 ONE DRIVE
3 – VERIFY DISKETTE             ONE DRIVE
4 – SPEED TEST                  ONE DRIVE
9 – RETURN TO CONTROL PROGRAM

FOR OPTION 9
ENTER "9" AND "ENTER"
FOR OTHER OPTIONS (1 THRU 4)
ENTER OPTION, DRIVE AND "ENTER"
```

1 – SEQUENTIAL ACCESS ONE DRIVE – Tests the basic diskette operations along with a sequential write, read, and compare of data to all sectors of the diskette.

2 – RANDOM SEEK ONE DRIVE – Tests the basic diskette operations along with a series of 50 random seeks each followed by a write, read, and compare of data.

3 – VERIFY DISKETTE ONE DRIVE – Verifies each sector, and also verifies that data can be accessed without an error.

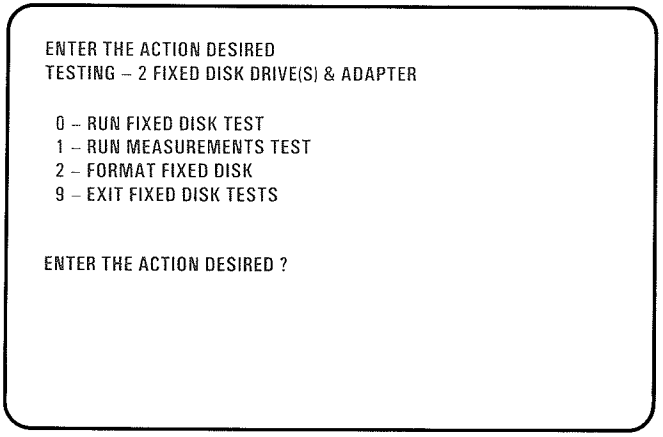
4 – SPEED TEST ONE DRIVE – Measures the time for one revolution of the diskette. The range is from 198 to 202 milliseconds.

9 – RETURN TO CONTROL PROGRAM – Returns to system checkout (Menu 3) or continues other tests.

Menu 9

The path to Menu 9 is:

- Menu 1
- Menu 2
- Menu 3
- Menu 4 (run tests once)



0 – **RUN FIXED DISK TEST** – Tests the fixed disk adapter and fixed disk drive (C or D) read and write operation.

1 – **RUN MEASUREMENTS TEST** – Used for measuring voltage levels on selected test points.

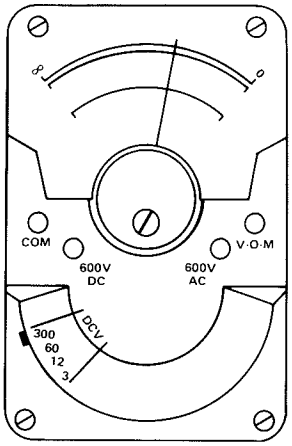
2 – **FORMAT FIXED DISK** – Formats the fixed disk drive. All data on the fixed disk drive is destroyed when this option is selected.

9 – **EXIT FIXED DISK TESTS** – Returns to System Checkout (Menu 3).

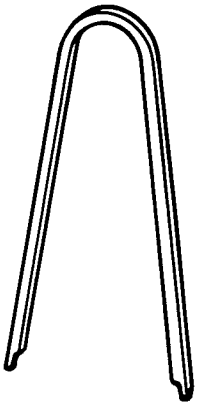
Special Tools

The following special tools are required to service the IBM Personal Computer.

A. A meter similar to the Triplett Model 310*.



B. A tweezer-type module puller similar to the one shown below. (Used for removal of the 16K and 64K memory modules.)



*Manufactured by the Triplett Corporation, Buffton, Ohio 45817

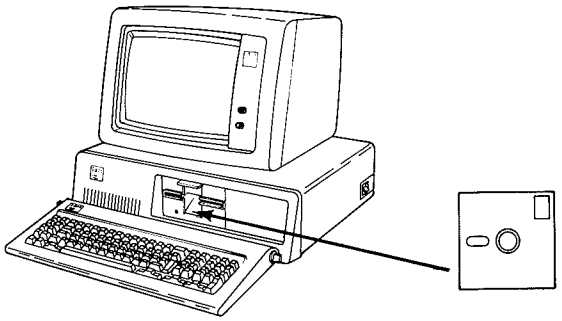
SECTION 3. PROBLEM ISOLATION

START

This is the entry point for using all of the PICs. You may have an error code, an audio error during the power-on self-test (POST), an undetermined problem, or a problem related to one device. If an error code appears along with an audio error, disregard the audio error and go to the PIC that corresponds to the error code.

In order to continue:

1. You must have the following minimum components:
   - System Unit
   - Keyboard
   - Input device (diskette drive and Advanced Diagnostics diskette)
   - Output device (display)
2. Refer to Section 4, "Locations" and Section 6, "Switch Settings" and ensure that the switches in your machine are set correctly and that all option parameters have been met.



ARE THE OPTION PARAMETERS AND SWITCH SETTINGS CORRECT?

NO Install options to match the option parameters and set the switch settings to match the system configuration. If this did not correct the failure, continue to the next page.

YES 

Choose the area in the left column that relates to your situation and follow the chart from there to the appropriate PIC.

Note: If the last two digits of a code are zeros, the device was tested successfully.

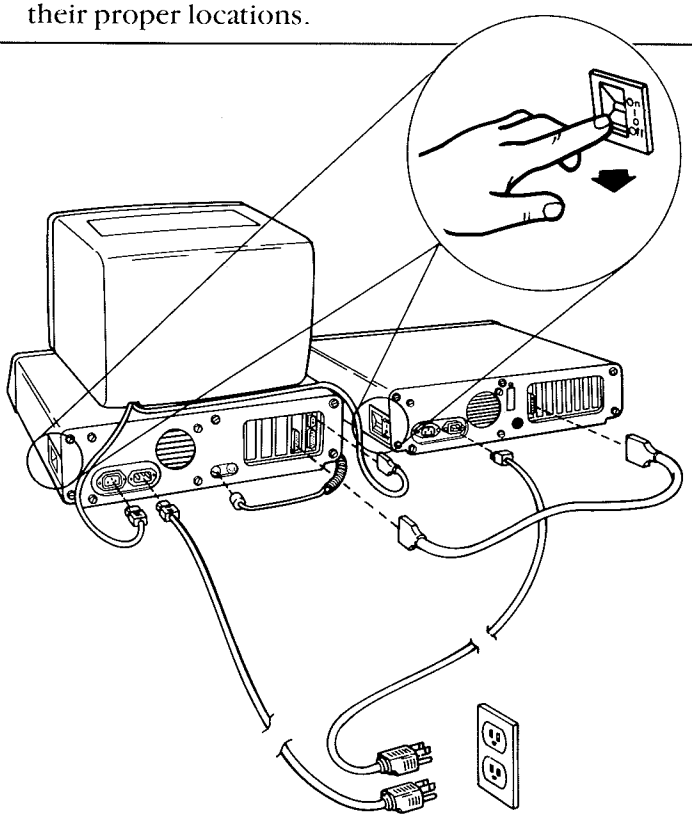
Problem Type	Error Code	PIC	Page
Audio Error Responses or Undetermined Problem		Undetermined Problem	3-010-1
Error Code or Problem Related To One Device	02X	Power	3-020-1
	1XX	System Board	3-100-1
	20X or XXXX XX20X	Memory	3-200-1
	30X or XX30X	Keyboard	3-300-1
	4XX	Display (Monochrome)	3-400-1
	5XX	Display (Color/Graphics)	3-500-1
	6XX	Diskette Drive	3-600-1
	7XX	Math Coprocessor	3-700-1
	9XX	Printer Adapter	3-900-1
	11XX	Asynchronous Comm.	3-1100-1
	12XX	Alt. Asynchronous Comm.	3-1200-1
	13XX	Game Control Adapter	3-1300-1
	14XX	Printer	3-1400-1
	15XX	SDLC Comm. Adapter	3-1500-1
	17XX	Fixed Disk Drive	3-1700-1
	18XX	Expansion Unit	3-1800-1
	20XX	BSC Adapter	3-2000-1
	21XX	Alt. BSC Adapter	3-2100-1

Go to the appropriate PIC.

Notes:

Undetermined Problem

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove all non-IBM devices and modified options (prototype card) 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.



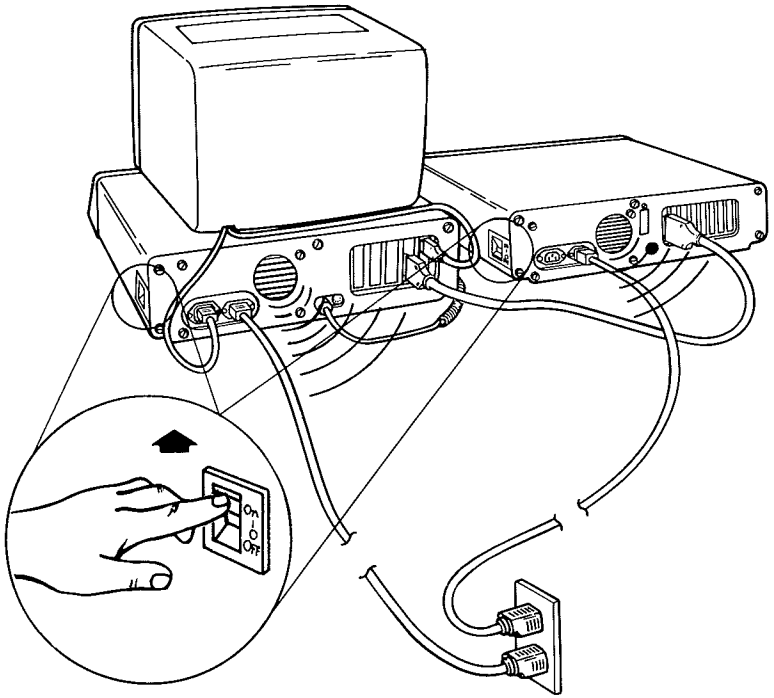
ARE ALL CONNECTORS INSTALLED SECURELY AND IN THE PROPER LOCATIONS?

NO Reconnect or repair the connectors, If this has not corrected your failure, go to the next page.

YES

1. Plug the system unit's (and expansion unit's) power cord(s) into a functioning, grounded wall outlet.
2. Set the expansion unit (if attached) Power switch to On first.
3. Set the system unit Power switch to On.

Note: If the system unit (and expansion unit) work properly except for the fan(s) not running, replace the power supply in the unit with the failing fan. See Section 5, "Removal/Replacement and Adjustments."



IS THE POWER SUPPLY FAN(S) RUNNING?

NO Check the system unit (and expansion unit) power cord(s) for continuity. Go to PIC 3-020-1, "Power."

YES

When the IBM Personal Computer is powered on, the normal responses are:

1. While memory is tested, the cursor blinks in the top left corner of the screen.
2. One short beep is heard when POST completes.
3. The IBM Personal Computer Basic screen appears if a diskette is not loaded or an operating system is not automatically loaded from the fixed disk. (If the Advanced Diagnostics diskette is loaded, the first diagnostic menu should be displayed.)
   When a failing system is powered on, there may be one or more of the following responses:
   - A blank display
   - An incorrect audio response
   - An error message like:

     601
     or XXXX **201** (X means any number could appear)

     or 1701

     or even a combination like:
     1801
     1701

If a combination of error codes appear, always trouble-shoot the error code that appears first.

CONTINUE

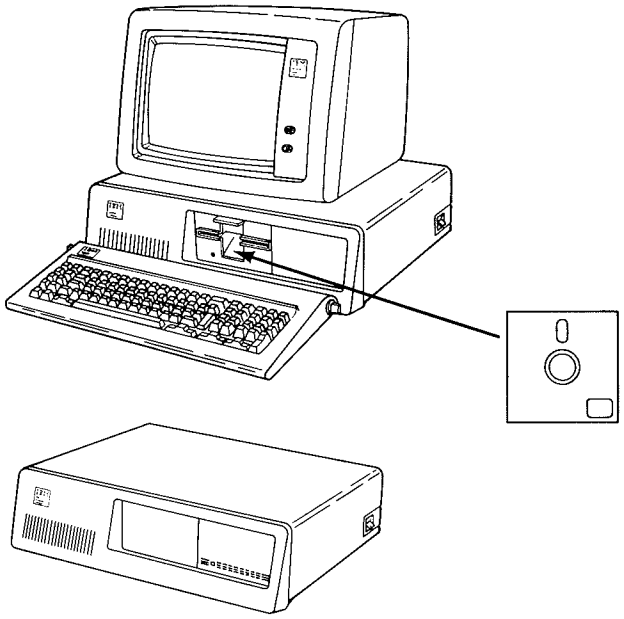
Error Indication	PIC Title	Page
No display and no beep	Power	3-020-1
Continuous beep	Power	3-020-1
Repeating short beeps	Power	3-020-1
1 long and 1 short beep	System Board	3-100-1
1 long and 2 short beeps	Display	3-400-1
1 short beep and blank or incorrect display	Display	3-400-1
1 short beep and Personal Computer BASIC statement	Diskette	3-600-1
101	System Board	3-100-1
131	System Board	3-100-1
201	Memory	3-200-1
301	Keyboard	3-300-1
xx301	Keyboard	3-300-1
601	Diskette	3-600-1
(XXXX201) Parity Check X	Memory	3-200-1
Parity Check X	Power	3-020-1
Keyboard not functional	Keyboard	3-300-1
Printer problems	Printer	3-1400-1
1701	Fixed Disk Drive	3-1700-1
1801	Expansion Unit	3-1800-1

DID YOU PERFORM THE STEPS ON THE PREVIOUS PAGES WITHOUT RECEIVING AN ERROR INDICATION THAT MATCHES ONE FROM THE TABLE ABOVE OR FROM THE TABLE ON PAGE 3-3?

NO Go to the PIC that corresponds to your error indication.

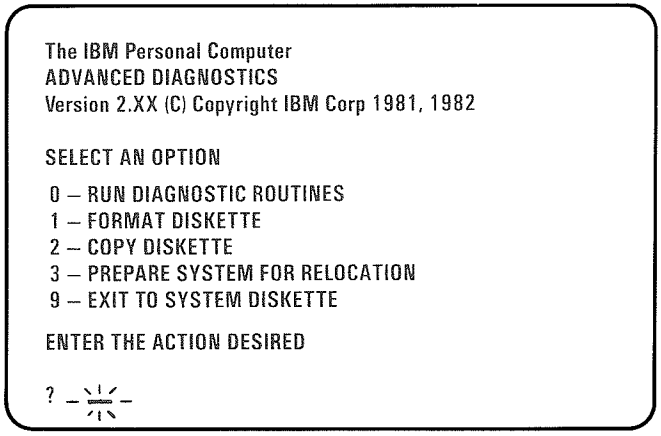
YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert the Advanced Diagnostics diskette into drive A and then close the drive's door.
3. Power On all output devices (display, printer, etc.).
4. Set the expansion unit (if attached) power switch to On first.
5. Set the system unit power switch to On.



CONTINUE

Your Advanced Diagnostics diskette should be loaded and the first menu displayed.



DID THE ABOVE MESSAGE APPEAR ON YOUR DISPLAY?

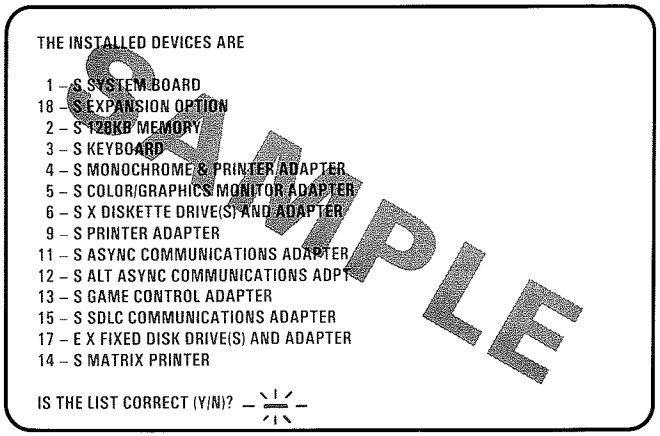
NO If you received an error code, go to the error table on page 3-3. If You did not receive an error code, go to page 3-010-11.

YES

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

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

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



DID THE INSTALLED DEVICES MENU APPEAR ON YOUR DISPLAY?

NO Go to page 3-300-1, "Keyboard."

YES

Press Y or N (IS THE LIST CORRECT (Y/N)?) then press Enter. (If the list is incorrect, follow the instructions on the display to correct the list before answering yes. Then make sure the switch settings are correct. See Section 6, "Switch Settings.")

The system checkout menu should be displayed.

```
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 Choose the type of test you would like to perform and go to page 3-010-10.

YES

0 – RUN TESTS ONE TIME – Runs a functional test of the installed devices.

1 – RUN TEST MULTIPLE TIMES – Repeats the functional test as many times as you choose.

2 – 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 output to diskette or printer.

LIST LOG – Will display logged errors contained on diskette.

SET TIME OF DAY – When the user selects this function and sets the time of day, the machine will keep track of the time and display it when asked to do so.

DISPLAY TIME OF DAY – Will display the time of day when asked. If the system has been turned off since the set time of day was used, the clock will restart at 0 when power is turned on.

The contents of the clock are constantly updated. The value is set to 0 by the POST which means the clock contains the time since POST was run. The contents may be modified by the set time of day function.

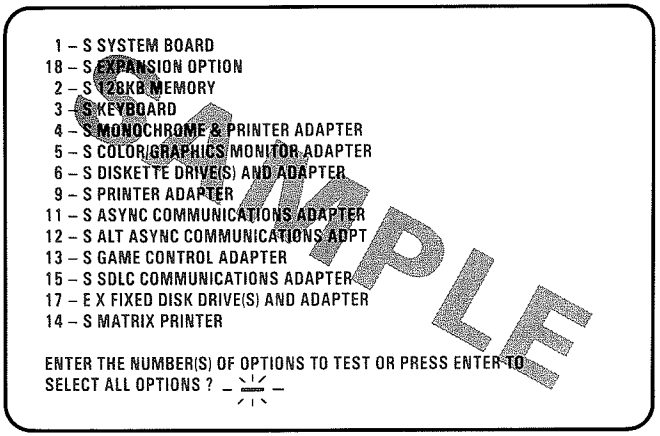
RETURN FROM UTILITIES – Allows the user to exit the utilities program and return to the main menu.

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. Follow the instructions on your screen.

CONTINUE

1. When you are ready to run the tests, press 0 or 1 and then press Enter. The menu shown below will appear on your screen.
2. Follow the instructions on the screen to select the devices you wish to test, or press Enter to test all installed devices.



DID YOU SELECT A SINGLE DEVICE TO TEST?

NO You selected more than one device to test. If you receive an error message, refer to the PIC indicated by the error message. If you do not receive an error message, you may have an intermittent problem. Start an error log and rerun the diagnostics to see if a failing symptom can be found.

YES Go to the appropriate PIC for the device you are testing.

DO YOU HAVE A MATH COPROCESSOR INSTALLED IN YOUR SYSTEM UNIT?

NO Go to PIC 3-600-1.

YES 

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the Math Coprocessor. See Section 5, "Removal/Replacement and Adjustments."
3. Set switch 2 on the system board to the on position. See Section 6, "Switch Settings."
4. Insert your Advanced Diagnostics diskette in drive A.
5. Set the Power switch on the expansion unit (if attached) and the system unit to On.

DID THE FAILING SYMPTOM REMAIN?

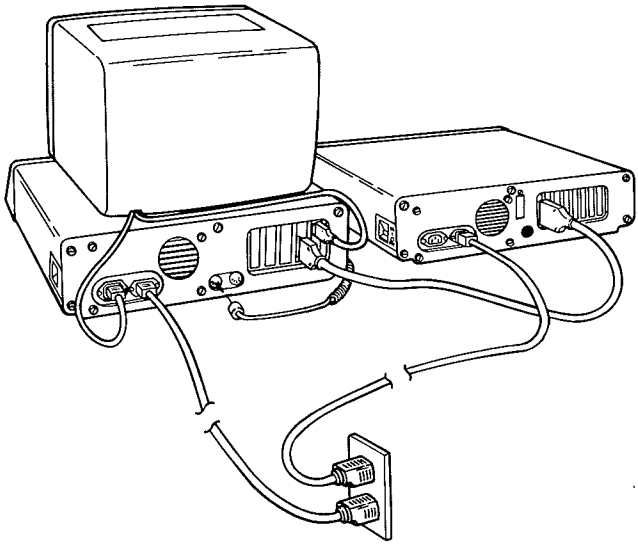
NO Replace the Math Coprocessor and the 8088 processor. See Section 5, "Removal/Replacement and Adjustments."

YES Reinstall your Math Coprocessor. See Section 5, "Removal/Replacement and Adjustments." Set switch 2 on the system board off. See Section 6, "Switch Settings." Go to PIC 3-600-1.

Power

You have entered this PIC because you were unable to complete POST or you have an intermittent problem. It is assumed you have a functional wall outlet and line cord.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Unplug system unit's (and expansion unit's) power cord(s) from the wall outlet.
3. Remove the keyboard and external devices attached to option adapters except the display and expansion unit.
4. Plug the power cord(s) into the wall outlet.
5. Set the Power switch on the expansion unit (if attached) and system unit to On.



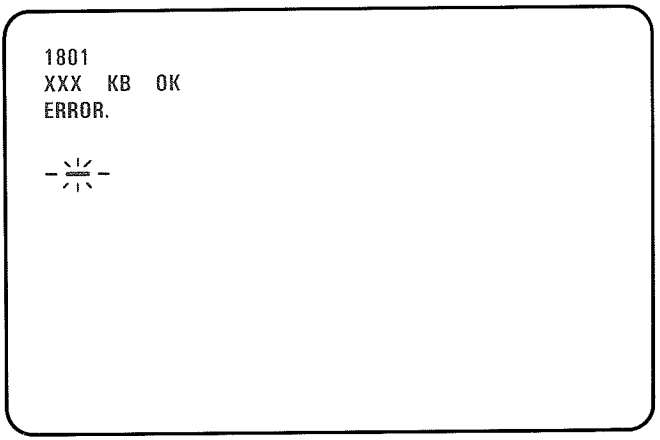
DID THE FAILING SYMPTOM REMAIN?

NO Reconnect the external devices to the system unit one at a time until the failing symptom returns: then replace the device causing the failure.

Note: Power must be turned off before connecting each device.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Connect the keyboard to the rear of the system unit.
3. Disconnect the expansion unit cable (if attached) at the system unit.
4. Set the system unit Power switch to On. (If an 1801 error code is displayed at this time, disregard it.)



DID THE FAILING SYMPTOM REMAIN?

NO Go to page 3-020-14.

YES

You may have a failing option adapter. Follow the procedure listed below.

1. Set the Power switch on the system unit to Off.
2. Remove one option adapter from the system board (do not remove the diskette adapter or display adapter until all other adapters have been removed; remove the display adapter last).
3. Set the Power switch on the system unit to On.
4. Repeat steps 1, 2, and 3 until the failing adapter is located or all adapters are removed.

DID THE FAILING SYMPTOM REMAIN?

NO Replace the last device removed. See Section 5, "Removal/Replacement and Adjustments."

Note: Removal of the display adapter will normally result in one long and two short beeps.

YES

You may have a failing coprocessor.

DO YOU HAVE A MATH COPROCESSOR INSTALLED IN YOUR SYSTEM UNIT?

NO Go to page 3-020-6.

YES

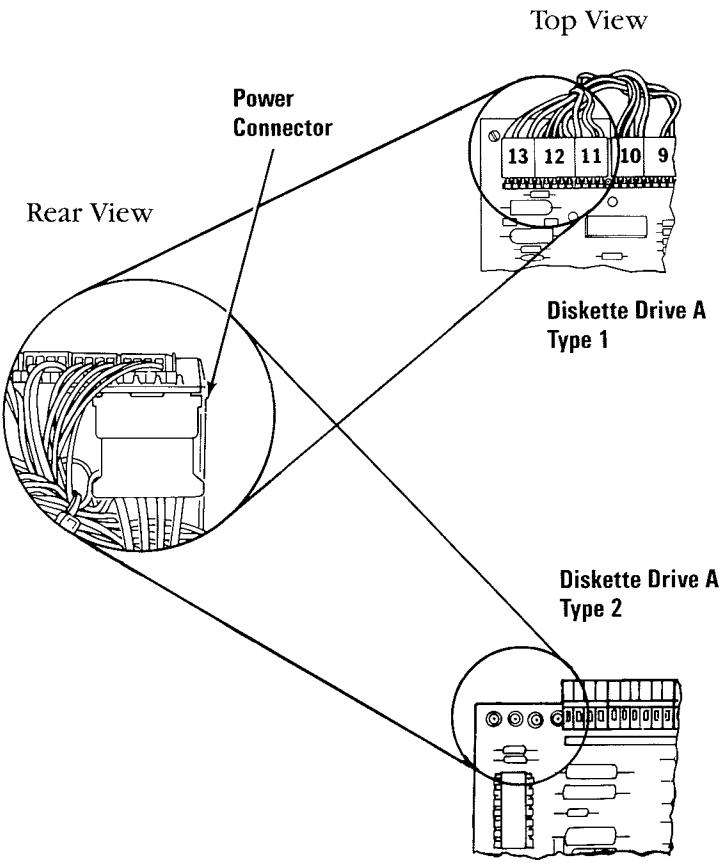
1. Set the Power switch on the system unit to Off.
2. Remove the IBM Math Coprocessor from the system unit. See Section 5, "Removal/Replacement and Adjustments."
3. Set the Power switch on the system unit to On.

DID THE FAILING SYMPTOM REMAIN?

NO Replace the IBM Math Coprocessor and the 8088 Processor. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit to Off.
2. Remove the power connector from the system unit diskette drive A.
3. Set the Power switch on the system unit to On.

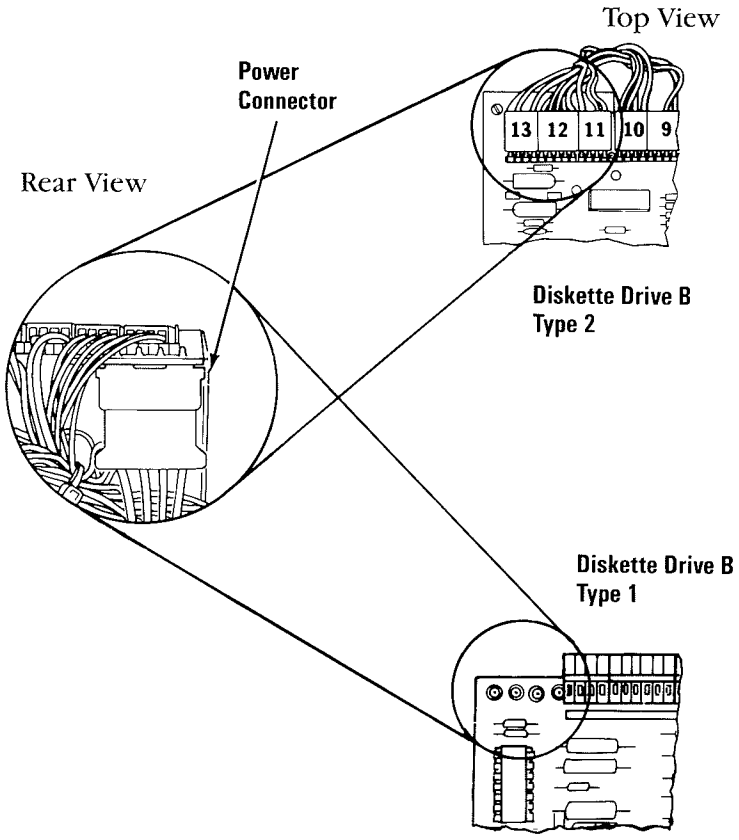


DID THE FAILING SYMPTOM REMAIN?

NO Replace:
1. Diskette drive logic printed circuit board.
2. Diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit to Off.
2. Remove the power connector from the system unit diskette drive B. Leave drive A disconnected.
3. Set the Power switch on the system unit to On.

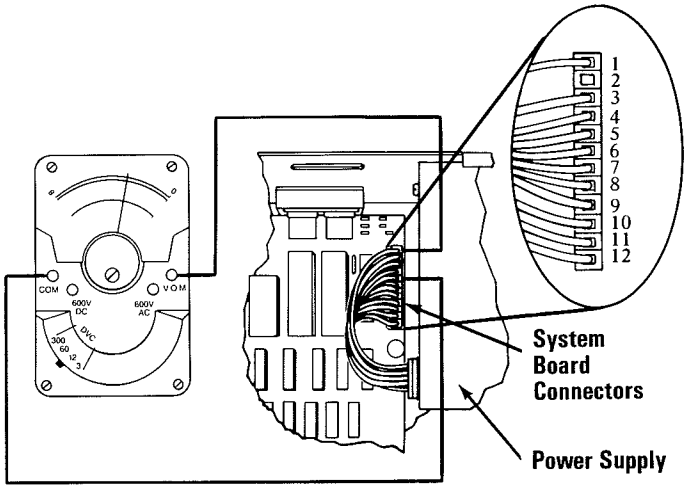


DID THE FAILING SYMPTOM REMAIN?

NO Replace Diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set your meter to the 12 Vdc scale. Connect the common lead to pin 5 and the voltage lead to pin 1 of the system board power connectors (refer to the diagram below).
2. Set the Power switch on the system unit to On.
3. Check for a voltage reading of 2.4 to 5.2 Vdc.



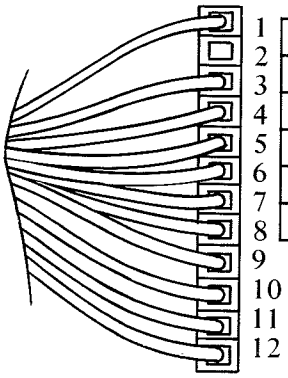
DO YOU HAVE 2.4 TO 5.2 VDC BETWEEN PINS 1 AND 5?

NO Go to page 3-020-13.

YES

Now check the rest of the power supply output voltages to the system board.

1. Leave your meter set on the 12 Vdc scale.
2. Check the system board power connectors for the voltages listed in the chart below.



Voltage Connectors			
Min Vdc	Max Vdc	–Lead	+ Lead
+ 4.8	+ 5.2	5	10
+ 4.5	+ 5.4	9	6
+11.5	+12.6	7	3
+10.8	+12.9	4	8

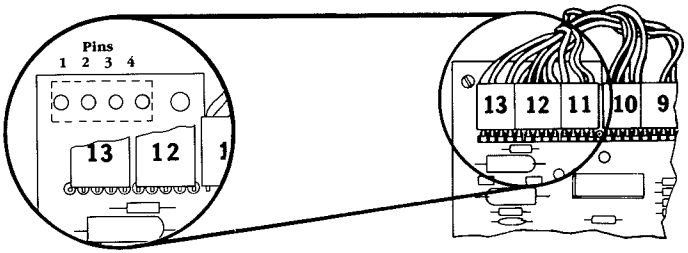
ARE THE SYSTEM BOARD POWER CONNECTOR VOLTAGES CORRECT?

NO Replace the power supply. See Section 5, "Removal/Replacement and Adjustments."

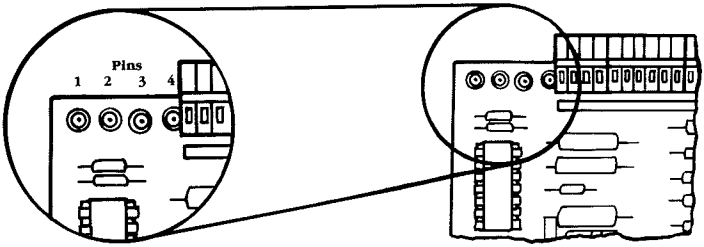
YES

1. Set the Power switch on the system unit to Off.
2. Reconnect the diskette drive A power supply connector.
3. Set the Power switch on the system unit to On.
4. Refer to the diagram below for the proper voltage reading.

Diskette Drive Power Connector.			
Min Vdc	Max Vdc	–Lead	+ Lead
+ 4.8	+ 5.2	2	4
+ 11.5	+ 12.6	3	1



Type 1 Diskette Drive



Type 2 Diskette Drive

WERE THE ABOVE VOLTAGE LEVELS PRESENT BETWEEN THE PINS INDICATED?

NO Replace the power supply. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit to Off.
2. Reconnect the diskette drive B power supply connector.
3. Set the Power switch on the system unit to On.
4. Refer to the diagram below for the proper voltage readings.

Diskette Drive Power Connector			
Min Vdc	**Max Vdc**	**– Lead**	**+ Lead**
+ 4.8	+ 5.2	2	4
+ 11.5	+ 12.6	3	1

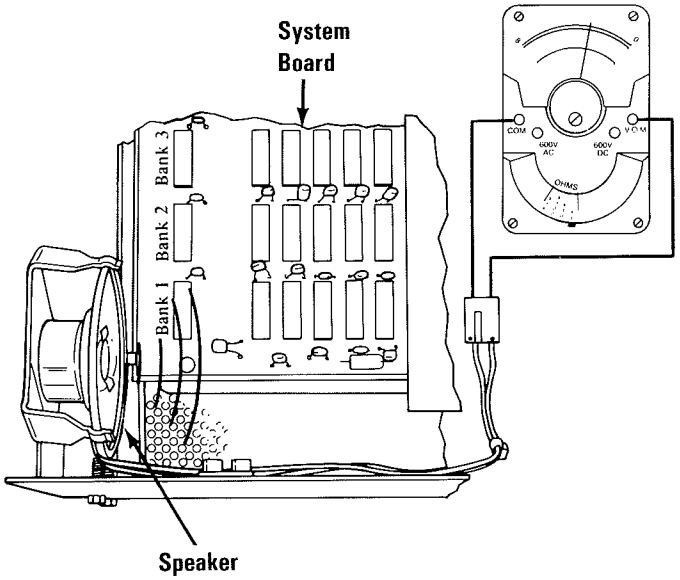
WERE THE ABOVE VOLTAGE LEVELS PRESENT BETWEEN THE PINS INDICATED?

NO Replace the power supply. See Section 5, "Removal/Replacement and Adjustments."

YES

Check the speaker circuit if you have no beep.

1. Set the Power switch on the system unit to Off.
2. Set your meter to the Ohms (x1) scale.
3. Remove the speaker connector from the system board.
4. Connect the meter leads to the speaker as shown.



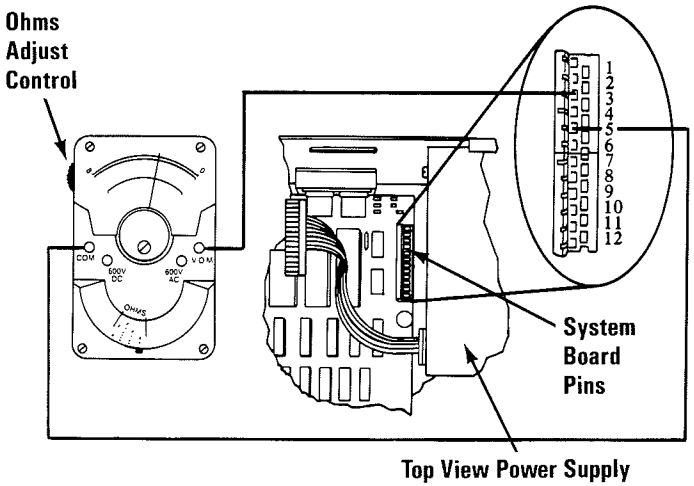
IS THERE CONTINUITY AT THE SPEAKER CONNECTOR?

NO Replace the speaker. See Section 5, "Removal/ Replacement and Adjustments."

YES Replace the system board. See Section 5, "Removal/Replacement and Adjustments."

1. Set the Power switch on the system unit to Off.
2. Set the meter switch on the Ohm's (x1) scale.
3. Remove the system board power connectors from the system board.
4. Remove all option adapters from the system board and take the resistance measurements on the system board pins as indicated on the chart below.

System Board Resistance Chart		
Min Resistance	**COM Lead**	**VOM Lead**
6 Ohms	5	3
48 Ohms	6	4
17 Ohms	7	9
.8 Ohms	8	10
.8 Ohms	8	11
.8 Ohms	8	12



ARE ANY OF THE RESISTANCE MEASUREMENTS BELOW THE MINIMUM SHOWN IN THE CHART?

NO You have a bad power supply. See Section 5, "Removal/Replacement and Adjustments."

YES You have a bad system board. See Section 5, "Removal/Replacement and Adjustments."

1. Set the Power switch on the system unit and expansion unit to Off.
2. Reconnect the expansion unit cable.
3. Insert the Advanced Diagnostics diskette in drive A.
4. Set the system unit Power switch to On.
5. When the 1801 error code is displayed at this time, disregard it.
6. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 7 if you only have one display adapter installed.)

7. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N)?) then press Enter.
8. Press Y or N (IS THE LIST CORRECT (Y/N)?) then press Enter.
9. Press 0 (RUN TESTS ONE TIME) then press Enter.
10. Select 18 (EXPANSION OPTION) then press Enter.

```
TESTING – EXPANSION OPTION
  X:XX:XX
ERROR – EXPANSION OPTION   1820 E
  Data – XXXX = XX / XX   SW = X
PRESS ENTER TO CONTINUE
? –
```

DID YOU GET AN 1820 ERROR CODE?

NO Replace the extender card. See Section 5, "Removal/Replacement and Adjustments."

YES 

You may have a failing option adapter. Follow the procedure listed below.

1. Set the Power switch on the system unit and expansion unit to Off.
2. Remove one option adapter from the expansion board (except the receiver card).
3. Set the Power switch on the expansion unit and system unit to On.
4. Repeat steps 1, 2 and 3 until the failing adapter is located or all adapters are removed.

DID THE FAILING SYMPTOM REMAIN?

NO Replace the last device removed. See Section 5, "Removal/Replacement and Adjustments."

Note: Removal of the display adapter will normally result in one long and two short beeps.

YES Replace the: 1. Receiver card.
2. Expansion board. See Section 5, "Removal/Replacement and Adjustments."

Notes:

System Board

You have entered this PIC because you were unable to complete the POST, or you have an error message, indicating a system board failure.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert the Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.

DID THE POST COMPLETE WITHOUT A 1XX ERROR MESSAGE?

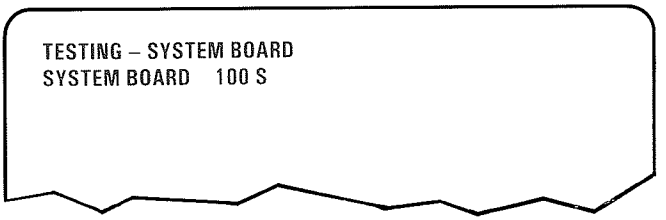
NO Replace the system board. See Section 5, "Removal/Replacement and Adjustments."

YES 

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

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

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N)?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is incorrect, follow the instructions on your screen to correct the list before answering yes.)
4. Press 1 (RUN TESTS MULTIPLE TIMES) then press Enter.
5. Press 1 (SYSTEM BOARD) then press Enter.
6. Select the number of times to run the test, then press Enter. (Press Enter to run tests continuously.)
7. Press Y (WAIT EACH TIME AN ERROR OCCURS (Y/N) ?) then press Enter.



DID YOU COMPLETE THE TEST WITHOUT A 1XX ERROR MESSAGE?

NO If you received a 1XX error message, replace your system board. See Section 5, "Removal/ Replacement and Adjustments."

Note: A 199 error message indicates your options question was answered "No." Do not replace the system board. Refer to 3-010-1, "Undetermined Problem," and verify the installed devices.

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should request technical assistance.

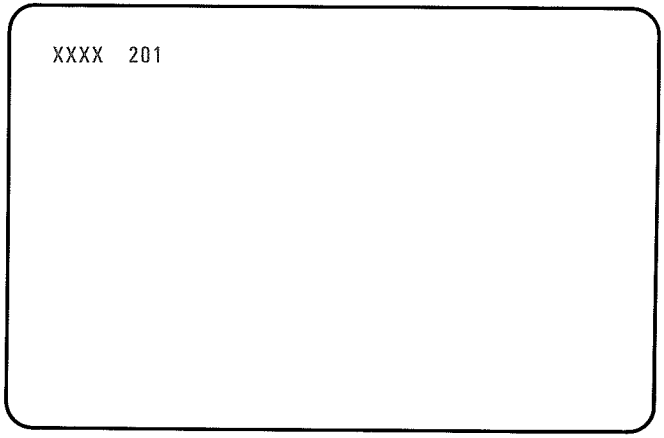
Notes:

Memory

You have entered this PIC because you were unable to complete POST, or you have an error message indicating a memory failure.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert the Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.
4. Watch the display carefully. An error code will only be displayed for about 1 second and may be replaced by a parity-check message.

   You may receive an error message similar to the example shown below. If you do, write down the four-character error code (X can be any number or letter).

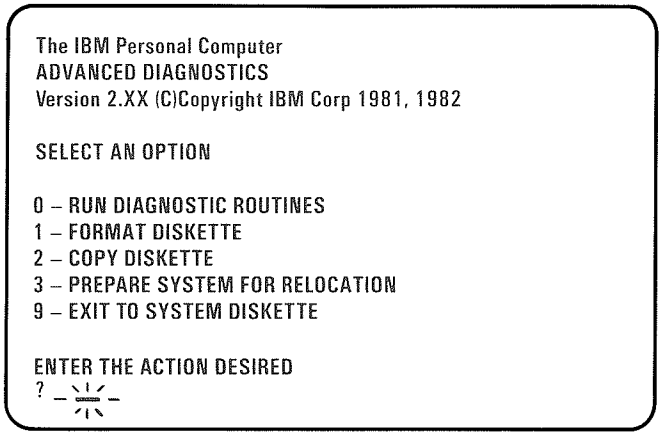


DID POST COMPLETE WITHOUT AN ERROR MESSAGE SIMILAR TO THE EXAMPLE SHOWN ABOVE?

NO Go to page 3-200-5.

YES

The first diagnostic menu should be on your display.



DID THE ABOVE MESSAGE APPEAR ON YOUR SCREEN?

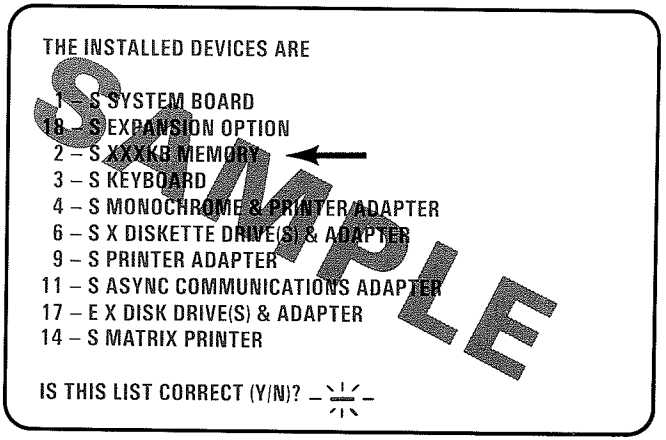
NO Go to page 3-020-1, "Power."

YES

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you have only one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N)?).
3. The installed devices list should be displayed. Check the amount of memory listed on your display (indicated by the arrow in the example below).



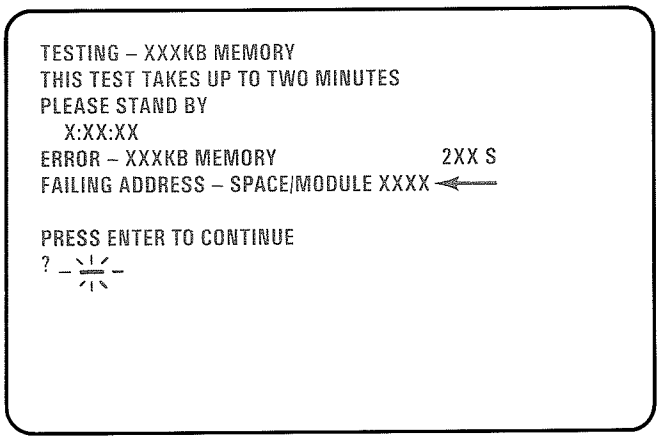
DOES THE AMOUNT OF MEMORY LISTED MATCH THE AMOUNT OF MEMORY IN YOUR SYSTEM?

NO Go to page 3-200-23.

YES

1. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is incorrect, follow the instructions on the display to correct the list before answering yes.)
2. Press 0 (RUN TEST ONE TIME) then press Enter.
3. Press 2 (XXXKB MEMORY) then press Enter.

You may receive an error message similar to the example below. If so, make a note of the four-character error code (indicated by the arrow below).



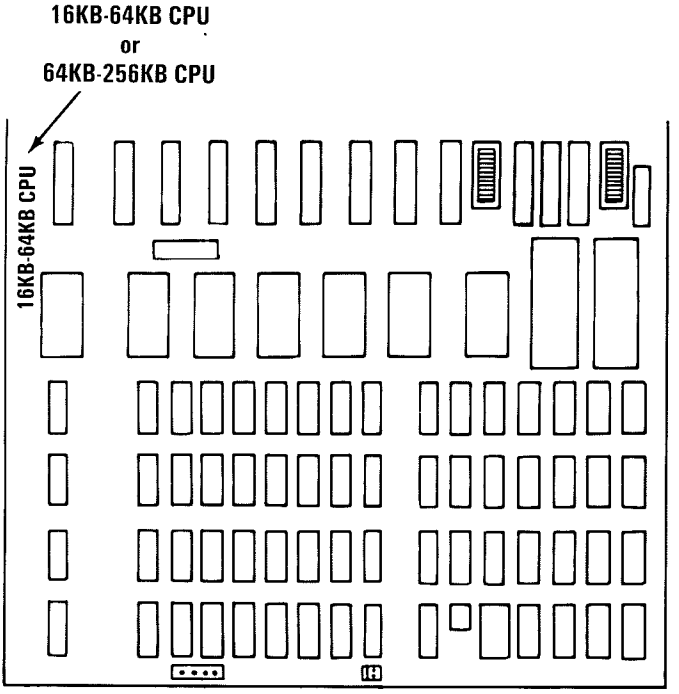
DID YOU RECEIVE AN ERROR MESSAGE SIMILAR TO THE EXAMPLE ABOVE?

NO Go to page 3-200-25.

YES

1. Refer to the figure below to determine if your system board uses 16K memory modules or 64K memory modules.

   The system board is labeled either 16KB-64KB CPU or 64KB-256KB CPU.



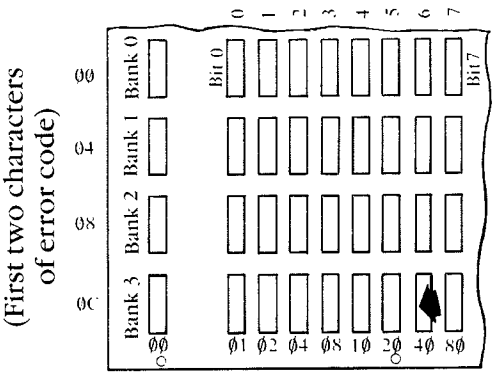
System Board
(Top View)

IS YOUR SYSTEM BOARD LABELED 16KB-64KB CPU?

NO Go to page 3-200-12.

YES

A memory failure displays the failing address in the form of a four-character alphanumeric code, followed by 201. If the first character of the four-character error code is 0, you have a system board failure. The second character 0,4,8, or C indicates which bank has the failing module. The third and fourth characters of the four-character error code indicate which bit (module) of the bank failed (P,0,1,2,3,4,5,6, or 7). For example, error code 0C40 201 corresponds to the failing module indicated by the arrow, in bank 3, bit 6.



(Last two characters of error code)
Top View of System Board

WAS THE FIRST CHARACTER OF THE FOUR-CHARACTER CODE SOMETHING OTHER THAN 0?

NO Replace the failing 16K module. See Section 5, "Removal/Replacement and Adjustments." If the last two characters of the error code do not match any of the module positions, replace the entire bank.

After replacing the module(s), go to page 3-200-1 and rerun the diagnostics. If you get the same error message again, make sure the new module(s) is installed correctly and is undamaged. If the problem remains, replace the system board.

YES

1. If your system does not have any 32KB memory expansion adapters, go to page 3-200-8.
2. Use the table below to find the first two characters of your error code and the corresponding switch settings.
3. Compare these switch settings with those of all the 32KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Two Characters of Error Code	32KB Expansion Option Switch Settings					
	1	2	3	4	5	6-8
10 or 14	ON	ON	ON	OFF	ON	N/A
18 or 1C	ON	ON	ON	OFF	OFF	N/A
20 or 24	ON	ON	OFF	ON	ON	N/A
28 or 2C	ON	ON	OFF	ON	OFF	N/A
30 or 34	ON	ON	OFF	OFF	ON	N/A
38 or 3C	ON	ON	OFF	OFF	OFF	N/A
40 or 44	ON	OFF	ON	ON	ON	N/A
48 or 4C	ON	OFF	ON	ON	OFF	N/A
50 or 54	ON	OFF	ON	OFF	ON	N/A
58 or 5C	ON	OFF	ON	OFF	OFF	N/A
60 or 64	ON	OFF	OFF	ON	ON	N/A
68 or 6C	ON	OFF	OFF	ON	OFF	N/A
70 or 74	ON	OFF	OFF	OFF	ON	N/A
78 or 7C	ON	OFF	OFF	OFF	OFF	N/A
80 or 84	OFF	ON	ON	ON	ON	N/A

WERE THE SWITCH SETTINGS IN YOUR MACHINE DIFFERENT FROM THE SWITCH SETTINGS IN THE CHART?

NO Replace the failing 32KB memory expansion adapter. See Section 5, "Removal/Replacement and Adjustments." After replacing the adapter, go to page 3-200-1 and rerun the diagnostics.

YES

1. If your system does not have any 64KB memory expansion adapters, go to page 3-200-9.
2. Use the table below to find the first character of your error code and the corresponding switch settings.
3. Compare these switch settings with those of all the 64KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Character of Error Code	64KB Expansion Option Switch Setting				
	1	2	3	4	5-8
1	ON	ON	ON	OFF	N/A
2	ON	ON	OFF	ON	N/A
3	ON	ON	OFF	OFF	N/A
4	ON	OFF	ON	ON	N/A
5	ON	OFF	ON	OFF	N/A
6	ON	OFF	OFF	ON	N/A
7	ON	OFF	OFF	OFF	N/A

WERE THE SWITCH SETTINGS IN YOUR MACHINE DIFFERENT FROM THE SWITCH SETTINGS IN THE TABLE?

NO Replace the failing 64KB memory expansion adapter. See Section 5, "Removal/Replacement and Adjustments." After replacing the memory expansion adapter, go to page 3-200-1 and rerun the diagnostics.

YES

1. Use the table below to find the first character of your error code and the corresponding switch settings.
2. Compare these switch settings with those of all the 64/256 KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Character of Error Code	64/256KB Expansion Option Switch Settings				
	1	2	3	4	5-8
1,2,3, or 4	ON	ON	ON	OFF	N/A
5,6, or 7	ON	OFF	ON	OFF	N/A

DOES YOUR SYSTEM HAVE A 64/256KB MEMORY EXPANSION ADAPTER WITH SWITCH SETTINGS THAT MATCH THOSE OF YOUR ERROR CODE?

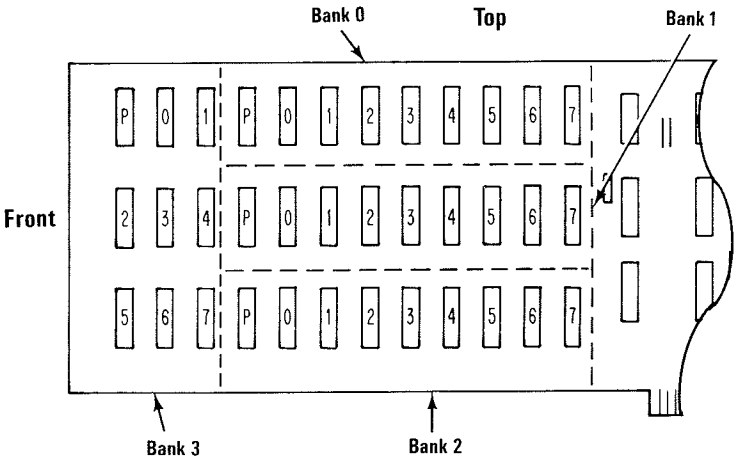
NO Go to Section 6, "Switch Settings," and compare your switch settings with the switch settings in the charts. Make the necessary corrections, then go to page 3-200-1 and rerun the diagnostics.

YES

The failing 64/256KB memory expansion adapter is the one with the switch settings that match those for your error code.

When the third and fourth characters of the error code are 00,01,02,04,08,10,20,40 or 80, the failure is one of the pluggable 64K memory modules.

Third and Fourth Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	P	0	1	2	3	4	5	6	7



ARE THE THIRD AND FOURTH CHARACTERS OF THE ERROR CODE 00,01,02,04,08,10,20,40, OR 80?

NO Replace the 64/256KB memory expansion option card. Remove all the 64K modules from the failing card and install them on the new card. See Section 5, "Removal/Replacement and Adjustments." After replacing the memory expansion adapter, go to page 3-200-1 and rerun the diagnostics.

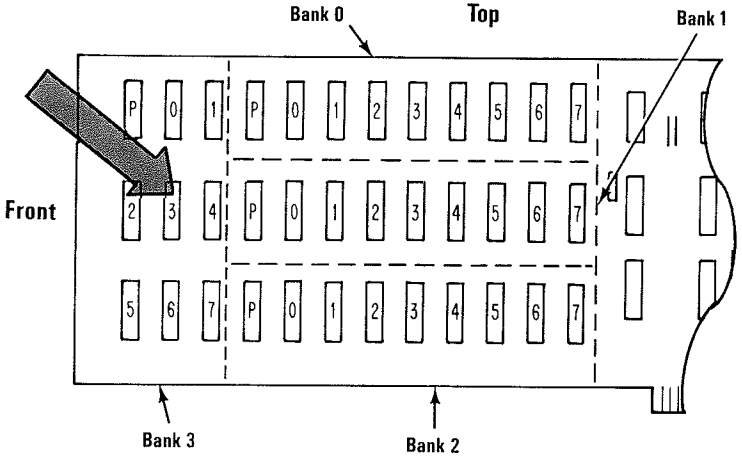
YES

The first character of your error code identifies the bank that has the failing module. The third and fourth characters identify the failing bit (module). For example, error code 4008 201 corresponds to a failing module identified by the arrow in bank 3, bit (module) 3.

1. Replace the failing 64K module. See Section 5, "Removal/Replacement and Adjustments."

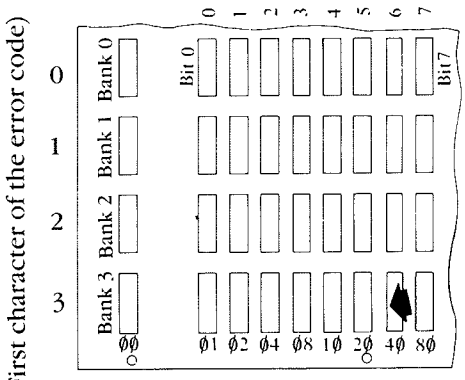
First Character of Error Code	1 or 5	2 or 6	3 or 7	4
Bank	Bank 0	Bank 1	Bank 2	Bank 3

Third and Fourth Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	P	0	1	2	3	4	5	6	7



Go to page 3-200-18.

A memory failure displays the failing address in the form of a four-character alphanumeric code, followed by 201. If the first character of the four-character error code is 0, 1, 2, or 3, you have a system board failure. The 0, 1, 2, or 3 indicates which bank has the failing module. The third and fourth characters of the four-character error code indicate which bit (module) of the bank failed (P,0,1,2,3,4,5,6, or 7). For example, error code 3040 201 corresponds to the failing module indicated by the arrow, in bank 3, bit 6.



Top View of System Board

WAS THE FIRST CHARACTER OF THE FOUR-CHARACTER CODE SOMETHING OTHER THAN 0, 1, 2, OR 3?

NO Replace the failing 64K module. See Section 5, "Removal/Replacement and Adjustments." If the last two characters of the error code do not match any of the module positions, replace the entire bank.

After replacing the module, go to page 3-200-1 and rerun the diagnostics. If you get the same error message again, make sure the new module(s) is installed correctly and is undamaged. If the problem remains, replace the system board.

YES

1. If your system does not have any 32KB memory expansion adapters, go to page 3-200-14.
2. Use the table below to find the first two characters of your error code and the corresponding switch settings.
3. Compare these switch settings with those of all the 32KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Two Characters of Error Code	32KB Expansion Option Switch Settings					
	1	2	3	4	5	6-8
40 or 44	ON	OFF	ON	ON	ON	N/A
48 or 4C	ON	OFF	ON	ON	OFF	N/A
50 or 54	ON	OFF	ON	OFF	ON	N/A
58 or 5C	ON	OFF	ON	OFF	OFF	N/A
60 or 64	ON	OFF	OFF	ON	ON	N/A
68 or 6C	ON	OFF	OFF	ON	OFF	N/A
70 or 74	ON	OFF	OFF	OFF	ON	N/A
78 or 7C	ON	OFF	OFF	OFF	OFF	N/A
80 or 84	OFF	ON	ON	ON	ON	N/A
88 or 8C	OFF	ON	ON	ON	OFF	N/A
90 or 94	OFF	ON	ON	OFF	ON	N/A

WERE THE SWITCH SETTINGS IN YOUR MACHINE DIFFERENT FROM THE SWITCH SETTINGS IN THE CHART?

NO Replace the failing 32KB memory expansion adapter. See Section 5, "Removal/Replacement and Adjustments." After replacing the adapter, go to page 3-200-1 and rerun the diagnostics.

YES

1. If your system does not have any 64KB memory expansion adapters, go to page 3-200-15.
2. Use the table below to find the first character of your error code and the corresponding switch settings.
3. Compare these switch settings with those of all the 64KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Character of Error Code	64KB Expansion Option Switch Settings				
	1	2	3	4	5-8
4	ON	OFF	ON	ON	N/A
5	ON	OFF	ON	OFF	N/A
6	ON	OFF	OFF	ON	N/A
7	ON	OFF	OFF	OFF	N/A
8	OFF	ON	ON	ON	N/A
9	OFF	ON	ON	OFF	N/A

WERE THE SWITCH SETTINGS IN YOUR MACHINE DIFFERENT FROM THE SWITCH SETTINGS IN THE TABLE?

NO Replace the failing 64KB memory expansion adapter. See Section 5, "Removal/Replacement and Adjustments." After replacing the memory expansion adapter, go to page 3-200-1 and rerun the diagnostics.

YES

1. Use the table below to find the first character of your error code and the corresponding switch settings.
2. Compare these switch settings with those of all the 64/256 KB memory expansion adapters in your system. The failing option is the one with the switch settings that match those in the table.

First Character of Error Code	64/256KB Expansion Option Switch Settings				
	1	2	3	4	5-8
4,5,6, or 7	ON	OFF	ON	ON	N/A
8, or 9	OFF	ON	ON	ON	N/A

DOES YOUR SYSTEM HAVE A 64/256KB MEMORY EXPANSION ADAPTER WITH SWITCH SETTINGS THAT MATCH THOSE OF YOUR ERROR CODE?

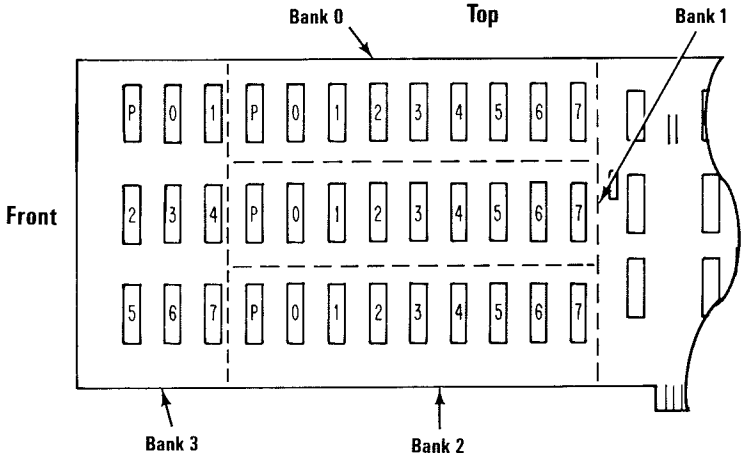
NO Go to Section 6, "Switch Settings," and compare your switch settings with the switch settings in the charts. Make the necessary corrections, then go to page 3-200-1 and rerun the diagnostics.

YES

The failing 64/256KB memory expansion adapter is the one with the switch settings that match those for your error code.

When the third and fourth characters of the error code are 00,01,02,04,08,10,20,40 or 80, the failure is one of the pluggable 64K memory modules.

Third and Fourth Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	P	0	1	2	3	4	5	6	7



ARE THE THIRD AND FOURTH CHARACTERS OF THE ERROR CODE 00,01,02,04,08,10,20,40 OR 80?

NO Replace the 64/256KB memory expansion option card. Remove all the 64K modules from the failing card and install them on the new card. See Section 5, "Removal/Replacement and Adjustments." After replacing the memory expansion adapter, go to page 3-200-1 and rerun the diagnostics.

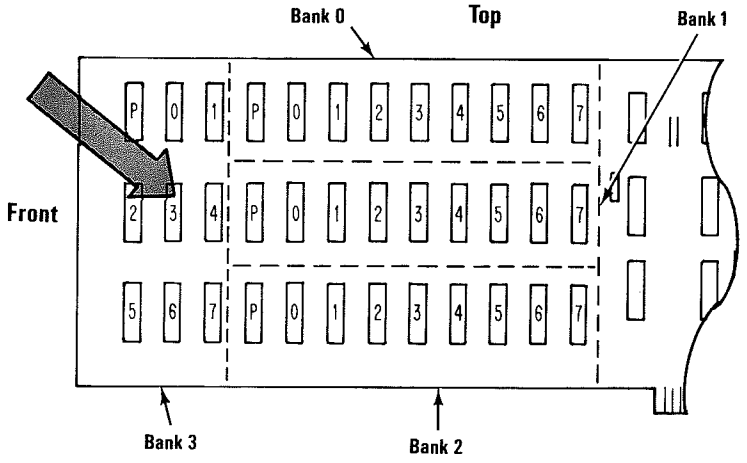
YES

The first character of your error code identifies the bank that has the failing module. The third and fourth characters identify the failing bit (module). For example, error code 7008 201 corresponds to a failing module identified by the arrow in bank 3, bit (module) 3.

1. Replace the failing 64K module. See Section 5, "Removal/Replacement and Adjustments."

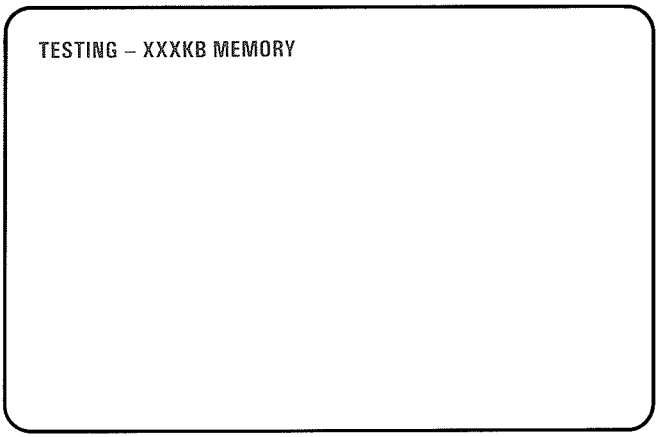
First Character of Error Code	4 or 8	5 or 9	6	7
Bank	Bank 0	Bank 1	Bank 2	Bank 3

Third and Fourth Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	P	0	1	2	3	4	5	6	7



CONTINUE

Go to page 3-200-1 and rerun the diagnostics. After the diagnostics are complete, return to this page.



DID YOU RECEIVE A MESSAGE OTHER THAN 200 S?

NO Your system memory is functioning correctly.

YES

Compare this error code with the note you made when you ran the diagnostic tests on page 3-200-4. Disregard the second character in both codes.

```
TESTING – XXXKB MEMORY
THIS TEST TAKES UP TO TWO MINUTES
PLEASE STAND BY
X:XX:XX
ERROR – XXXKB MEMORY                    2XX  S
FAILING ADDRESS – SPACE/MODULE XXXX

PRESS ENTER TO CONTINUE
```

ARE THE FIRST, THIRD, AND FOURTH CHARACTERS OF THE NEW ERROR CODE IDENTICAL TO THOSE OF THE PREVIOUS ERROR CODE?

NO The memory has another failure. Make a note of the new error code. Go to page 3-200-5 and follow the PIC again.

YES

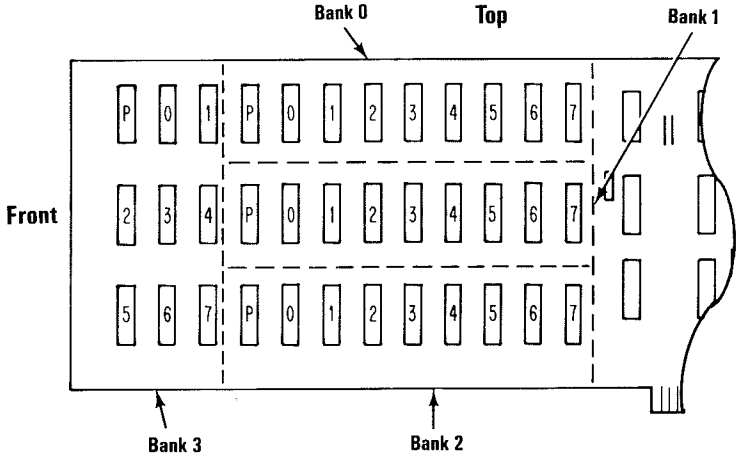
The same 64/256KB memory expansion adapter still has a failing module. With this type of failure, the first character is not correctly identifying the failing bank.

The third and fourth characters are still identifying the failing bit (module) correctly.

1. Replace the module in one of the banks that has not yet had a module replaced.
2. Go to page 3-200-1 and rerun the diagnostics. After the diagnostics are completed, return to this page and answer the question below.

Third and Fourth

Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	**P**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**



DID YOU RECEIVE A MESSAGE OTHER THAN 200 S?

NO Your system memory is now functioning correctly.

YES

Compare this error code with the note you made when you ran the diagnostic tests on page 3-200-4. Disregard the second character in both codes.

```
TESTING – XXXKB MEMORY
THIS TEST TAKES UP TO TWO MINUTES
PLEASE STAND BY
X:XX:XX
ERROR – XXXKB MEMORY                    2XX   S
FAILING ADDRESS – SPACE/MODULE XXXX

PRESS ENTER TO CONTINUE
```

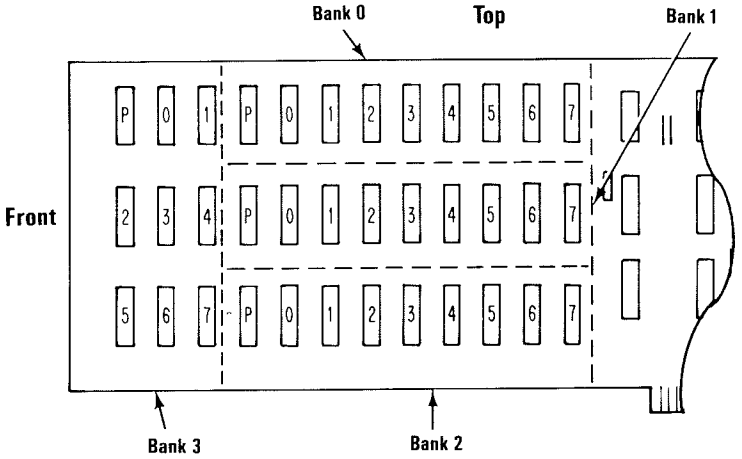
ARE THE FIRST THIRD, AND FOURTH CHARACTERS OF THE NEW ERROR CODE IDENTICAL TO THOSE OF THE PREVIOUS ERROR CODE?

NO The memory has another failure. Make a note of the new error code. Go to page 3-200-5 and follow the PIC again.

YES

The failing module may be in one of the other banks that has not yet had a module replaced.

Third and Fourth Characters of Error Code	00	01	02	04	08	10	20	40	80
Bit	P	0	1	2	3	4	5	6	7

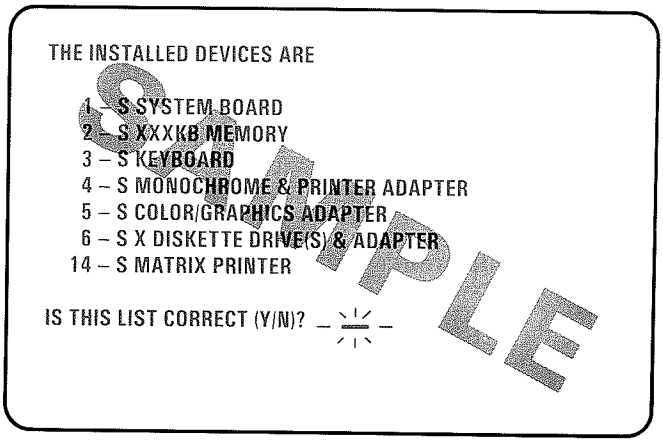


HAVE YOU REPLACED THE FAILING MODULE IN EACH OF THE FOUR BANKS?

NO Go to page 3-200-20.

YES Replace the 64/256KB memory expansion adapter. Remove all 64K modules from the failing adapter and install them on the new adapter. See Section 5, "Removal/Replacement and Adjustments." After replacing the memory expansion adapter, go to page 3-200-1 and rerun the diagnostics.

Go to Section 6, "Switch Settings," and compare your switch settings with those in the charts. Then return to this page.



WERE THE SWITCH SETTINGS CORRECT FOR THE AMOUNT OF MEMORY INSTALLED IN YOUR SYSTEM?

NO Correct the switch settings, then go to page 3-200-1 and rerun the diagnostics.

YES

1. Press N then press Enter.
   The amount of memory on your display does not match the amount of memory installed in your system, but the switches are set correctly.
2. Follow the instructions on the display to correct the amount of memory shown on the installed devices list.

```
THE INSTALLED DEVICES ARE

        1 - S SYSTEM BOARD
        2 - S XXXKB MEMORY
        3 - S KEYBOARD
        4 - S MONOCHROME & PRINTER ADAPTER
        5 - S COLOR/GRAPHICS ADAPTER
        6 - S X DISKETTE DRIVE(S) & ADAPTER
       14 - S MATRIX PRINTER

IS THIS LIST CORRECT (Y/N)?
  X:XX:XX
ERROR - SYSTEM BOARD                199  S

ENTER (A) TO ADD ITEMS
OR ENTER (D) TO DELETE ITEMS
? -
```

DOES THE AMOUNT OF MEMORY LISTED ON YOUR DISPLAY MATCH THE AMOUNT OF MEMORY IN YOUR SYSTEM?

NO You have entered the wrong amount of memory. Follow the instructions on the display again and correct the amount of memory shown on the installed devices list.

YES Go to page 3-200-4.

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should request technical assistance.

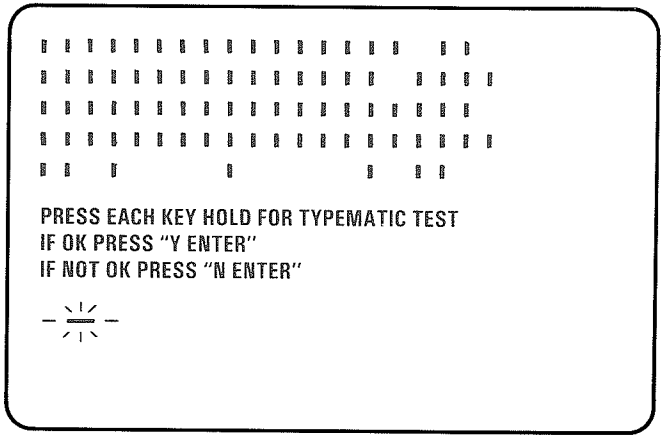
Notes:

Keyboard

If you have visibly broken parts, see Section 5, "Removal/ Replacement and Adjustments."

1. Insert your Advanced Diagnostics diskette and proceed with running diagnostic routines.
2. Select the keyboard test 3 and perform the test displayed on the screen.
3. If any key does not function properly, press N and Enter.

If you have a 3XX error code or a non-functioning keyboard, before performing the keyboard test, go to page 3-300-2.



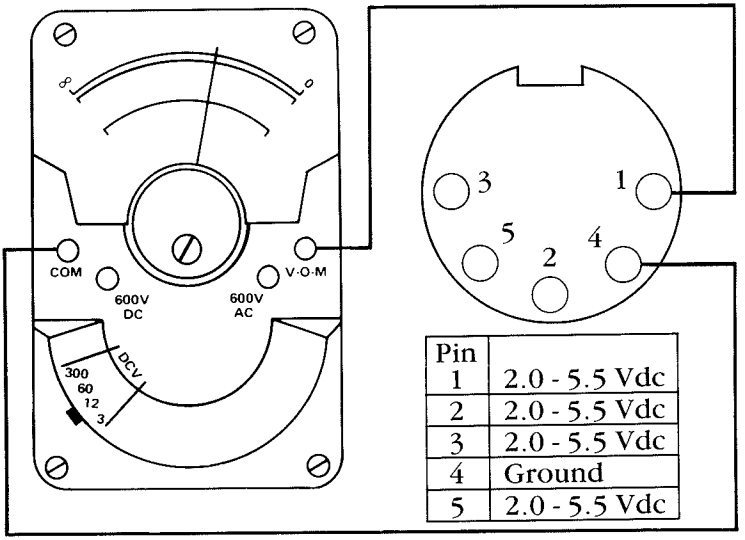
AFTER PERFORMING THE TEST ON THE SCREEN, DID YOU HAVE A 3XX ERROR CODE?

NO Go to page 3-300-3.

YES

1. Set the Power switch on the system unit, (and expansion unit, if attached) to Off.
2. Remove the keyboard connector from the system unit.
3. Set the expansion unit (if attached) and system unit power switches to On.
4. Check the keyboard connector at the system unit for the appropriate voltages, as shown in the diagram.

(Rear View of System Unit)



Pin	
1	2.0 - 5.5 Vdc
2	2.0 - 5.5 Vdc
3	2.0 - 5.5 Vdc
4	Ground
5	2.0 - 5.5 Vdc

ARE ALL THE VOLTAGES CORRECT?

NO Replace the system board. See Section 5, "Removal/Replacement and Adjustments."

YES Check the keyboard cable connectors for damage, then replace keyboard assembly. See Section 5, "Removal/Replacement and Adjustments."

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

---

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unresolved problem, you should seek technical assistance.

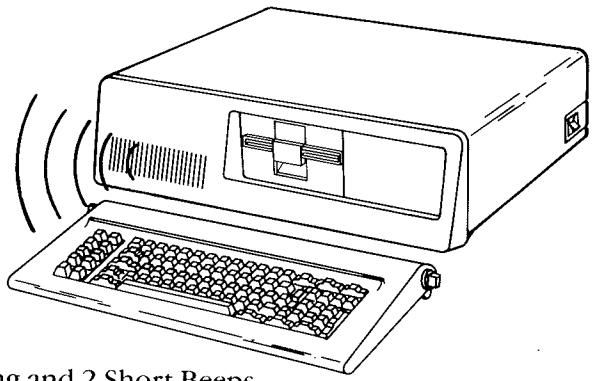
Notes:

Display (Monochrome)

You have entered this PIC because you were unable to complete POST, you have visually detected a display problem, or you have an error message indicating a display problem.

If you have determined that you have a color display problem, or you only have a color display, go to color display PICs on page 3-500-1.

1. Set the Power switch on the system unit, (and the expansion unit, if attached) to Off.
2. Remove the Monochrome Display connector from the system unit.
3. Insert your Advanced Diagnostics diskette in drive A.
4. Set the Power switch on the expansion unit (if attached) and the system unit to On.
5. Note any audio messages during POST.



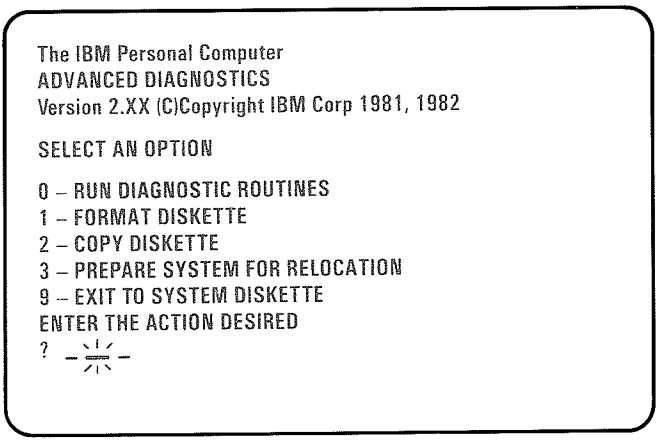
1 Long and 2 Short Beeps

IS YOUR ERROR INDICATION SOMETHING OTHER THAN ONE LONG AND TWO SHORT BEEPS?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES 

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Reconnect the display.
3. Set the Power switch on the expansion unit, (if attached) and system unit to On.
4. Be sure your brightness and contrast controls are turned fully clockwise.

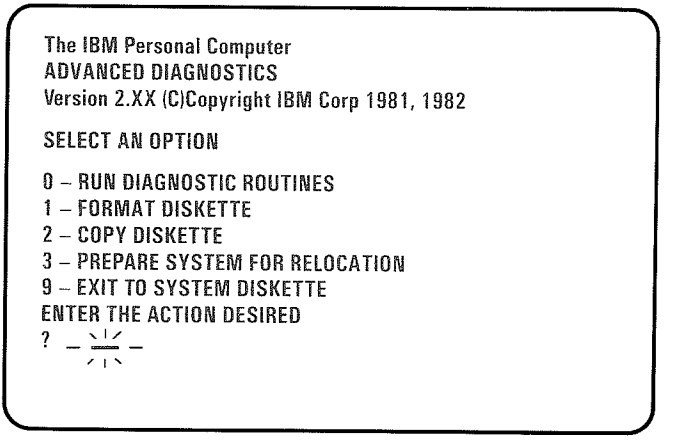


IS THE ABOVE MESSAGE STABLE AND READABLE ON YOUR DISPLAY?

NO Go to page 3-400-14

YES

Your display may function properly except for a cursor which is out of its normal position or missing.

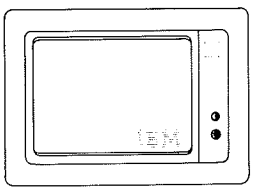


IS THE CURSOR VISIBLE AND IS IT IN THE CORRECT POSITION ON YOUR DISPLAY?

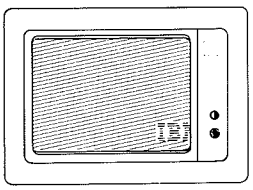
NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

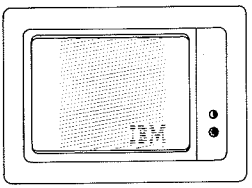
Your display may be distorted or the characters may be the wrong size, as shown in the examples:



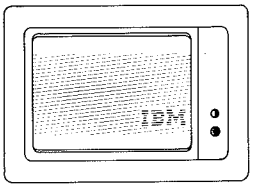
Too Dim



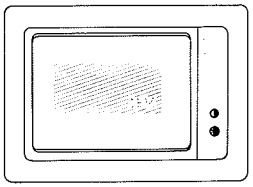
Too Wide



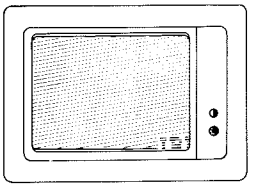
Too Narrow



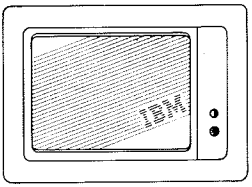
Too Short



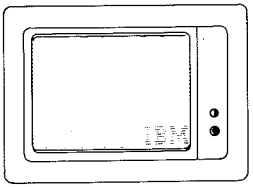
Shrunk



Changes Size When Brightness Control Turned



Tilted



Out of Focus

IS YOUR SYMPTOM SOMETHING OTHER THAN A DISPLAY SIMILAR TO ONE OF THE EXAMPLES?

NO Replace your display. See Section 5, "Removal/ Replacement and Adjustments."

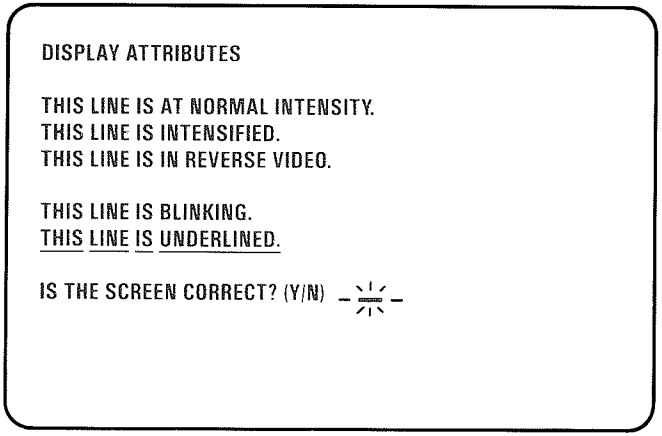
YES

Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you only have one display adapter installed)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter (If the list is incorrect, follow the instructions on the display to correct the list before answering yes.)
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Press 4 (MONOCHROME & PRINTER ADAPTER) then press Enter.
6. Select 10 (RUN ALL TESTS) then press Enter.

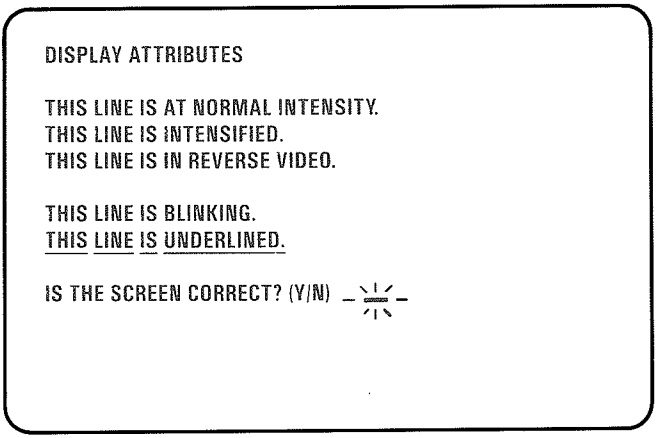


IS THE ABOVE SCREEN DISPLAYED WITHOUT A 401 ERROR MESSAGE?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

Adjust your brightness and contrast controls until the intensified line is brighter than the other lines.

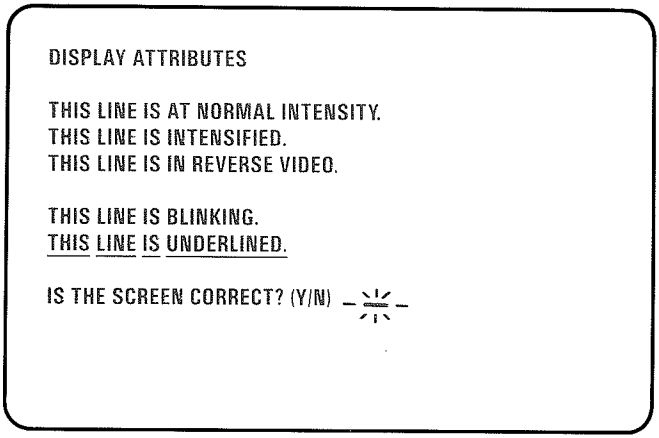


WERE YOU ABLE TO ADJUST FOR AN INTENSIFIED LINE?

NO Go to page 3-400-14.

YES

Each line on your display should match the description of that line.

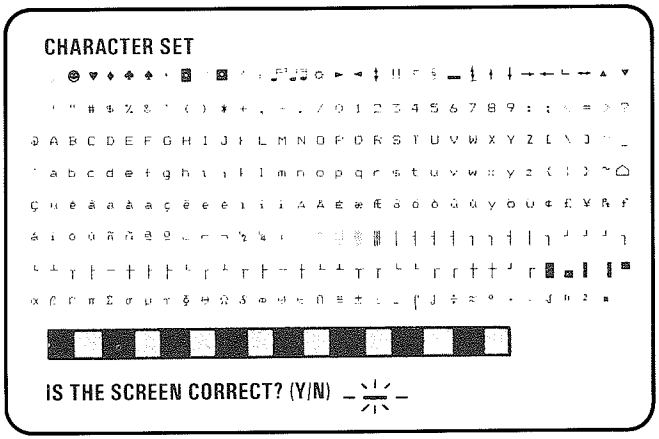


DO THE LINES ON YOUR DISPLAY MATCH THEIR DESCRIPTIONS?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Press Y then press Enter.
2. Each character on your display should match the character shown on the screen below.

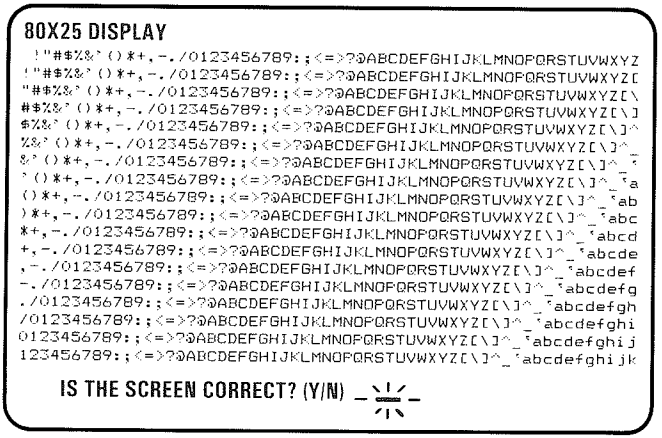


DO THE CHARACTERS ON YOUR DISPLAY MATCH THE CHARACTERS ON THE SCREEN?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Press Y then press Enter.
2. Each character on your display should match the character shown on the screen below.



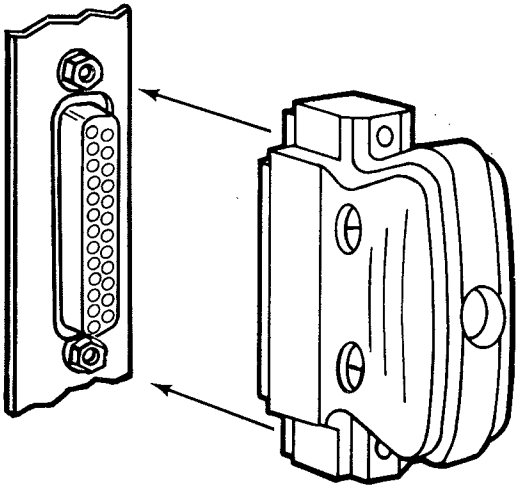
DO THE CHARACTERS ON YOUR DISPLAY MATCH THE CHARACTERS ON THE SCREEN?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Disconnect the printer cable.
2. Install the printer adapter wrap plug as shown in the diagram below. If you run the test without installing the wrap plug, you will receive an invalid error message.

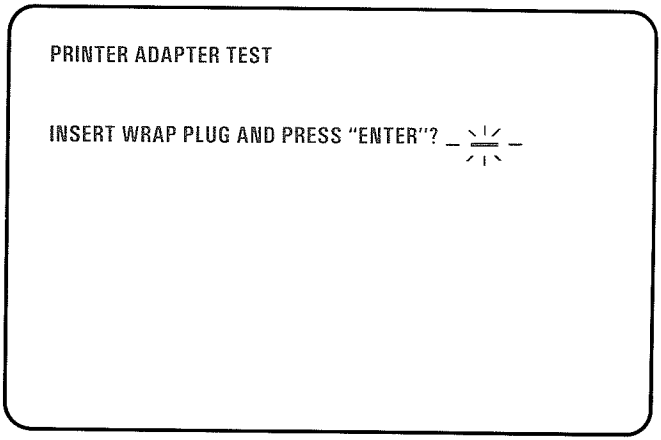
IBM Monochrome Display and Printer Adapter



Printer
Adapter Wrap Plug
(IBM Part 8529228)

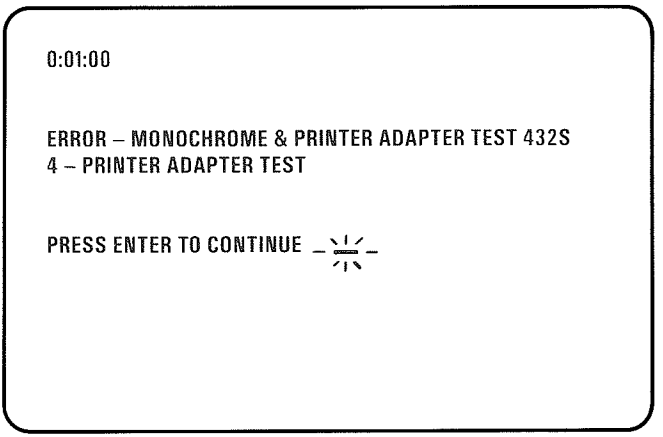
CONTINUE

1. Press Y then press Enter.
2. The wrap plug should be installed.



CONTINUE

1. Press Enter to begin the wrap test.
2. An error message similar to the one shown below may appear on your screen.



DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

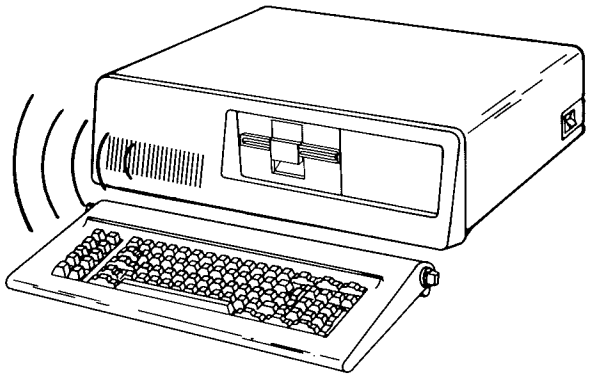
You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unresolved problem, you should seek technical assistance.

You will use audio responses to guide yourself through the diagnostics.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and system unit to On.



CONTINUE

Press the following keys in the sequence listed and listen for the "BEEP" each time you press Enter.

Note: Use the numbers on the top row of the keyboard; do not use the numeric keypad.

Steps	Test Selection	Audio Response
1. Press 0	Run diagnostics	None
2. Press Enter		1 Beep

Note: If you do not have a color adapter installed, skip steps 3 & 4.

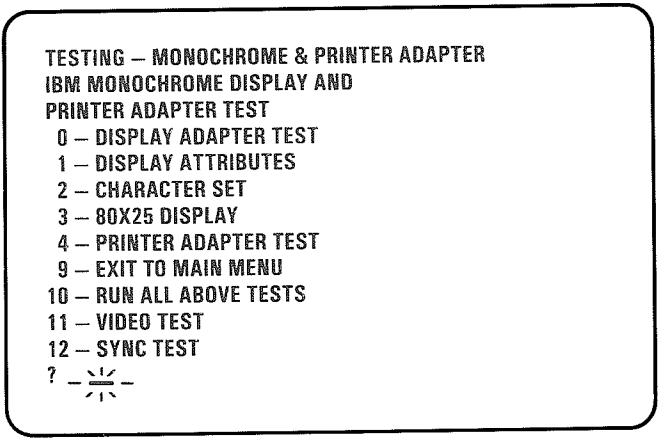
3. Press Y or N	Is a monitor attached to every display adapter?	None
4. Press Enter		1 Beep
5. Press Y	Are the options correct?	None
6. Press Enter		1 Beep
7. Press 0	Run test one time	None
8. Press Enter		1 Beep
9. Press 4	Select monochrome display & printer adapter test	None
10. Press Enter		2 Beeps

WERE YOU ABLE TO COMPLETE THE AUDIO RESPONSE DIAGNOSTICS BY PRESSING THE ABOVE SEQUENCE OF KEYS?

NO You may have a power supply or connector problem. Check your connectors or go to PIC 3-020-1, "Power."

YES

Your display should match the screen below.



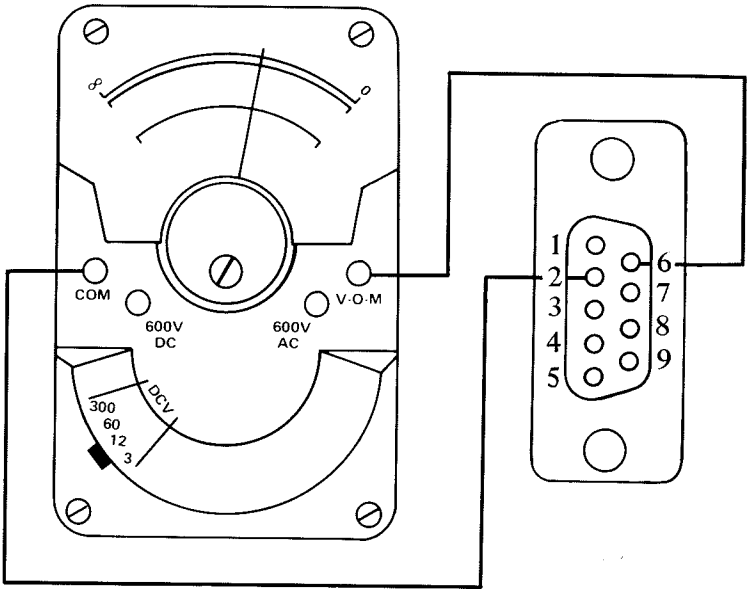
ARE ALL CHARACTERS ON YOUR SCREEN CORRECT AND READABLE?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

Note: If your display is completely blank or is in complete reverse video, continue on the next page.

YES

1. Select 11, then press Enter. Selecting this test should place a test signal on pins 6 and 7 of the nine pin connector.
2. Remove the display signal cable.
3. Measure the voltage present between pins 2 and 7. The voltage should read between 2.4 Vdc and 3.8 Vdc.
4. Measure the voltage present between pins 2 and 6. The voltage should read between 2.4 Vdc and 3.8 Vdc.

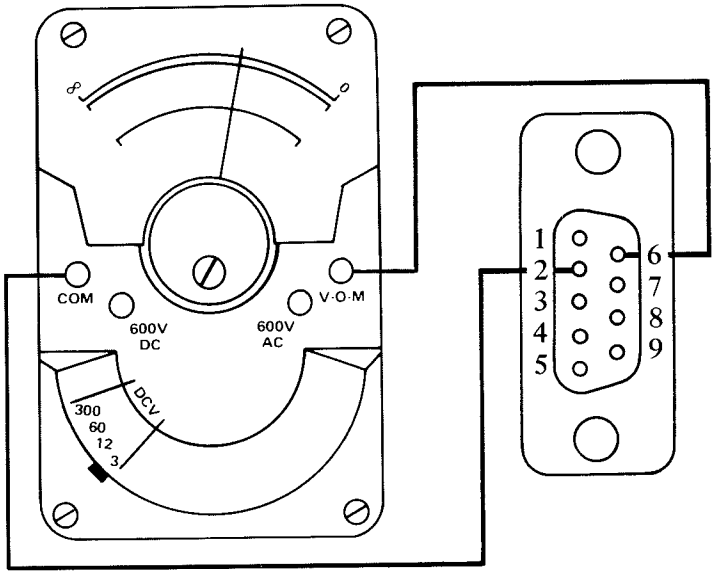


ARE THE VOLTAGE READINGS CORRECT?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Press Enter. Selecting this test changes the test signal on pins 6 and 7 of the nine pin connector.
2. Measure the voltage present between pins 2 and 7. The voltage should read between 0 Vdc and 0.5 Vdc.
3. Measure the voltage present between pins 2 and 6. The voltage should read between 0 Vdc and 0.5 Vdc.

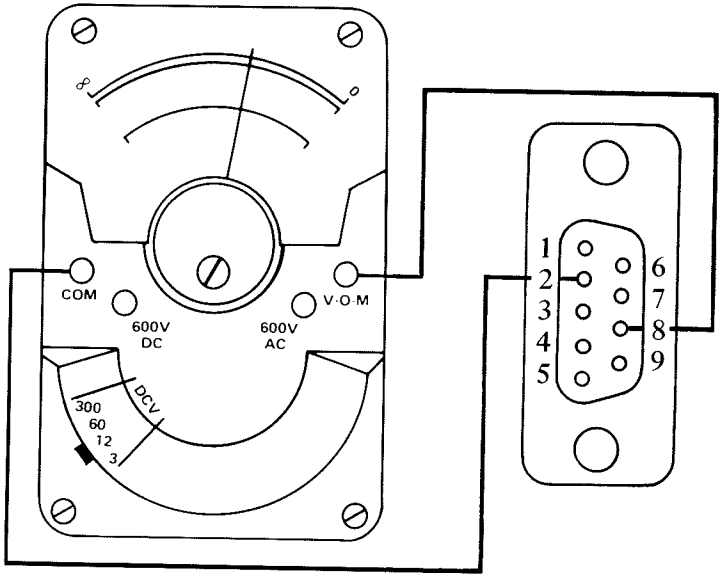


ARE THE VOLTAGE READINGS CORRECT?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Press Enter, and wait for two "BEEPS." Selecting this test places a test signal on pins 8 and 9 of the nine pin connector.
2. Measure the voltage present between pins 2 and 8. The voltage should read between 0.4 Vdc and 1.1 Vdc.
3. Measure the voltage present between pins 2 and 9. The voltage should read between 3.0 Vdc and 4.2 Vdc.

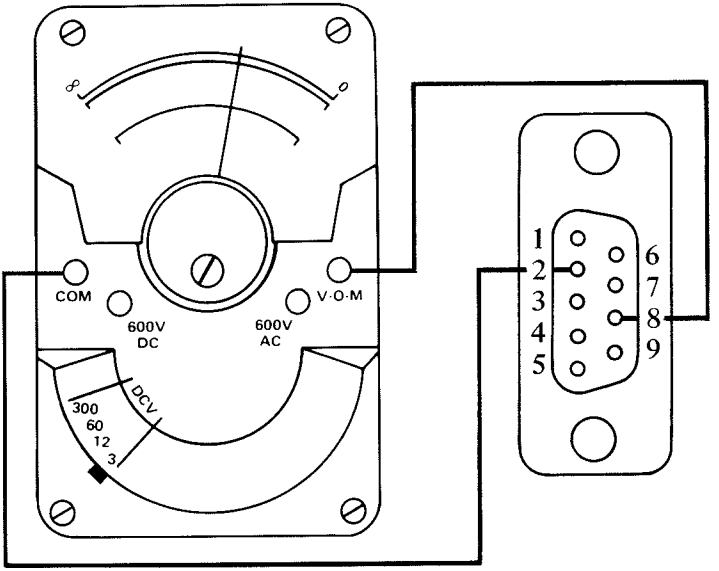


ARE THE VOLTAGE READINGS CORRECT?

NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES

1. Select 12 then press Enter. Selecting this test changes the test signal on pins 8 and 9 of the nine pin connector.
2. Measure the voltage present between pins 2 and 8. The voltage should read between 1.5 Vdc and 2.5 Vdc.
3. Measure the voltage present between pins 2 and 9. The voltage should read between 1.8 Vdc and 2.6 Vdc.



ARE THE VOLTAGE READINGS CORRECT?

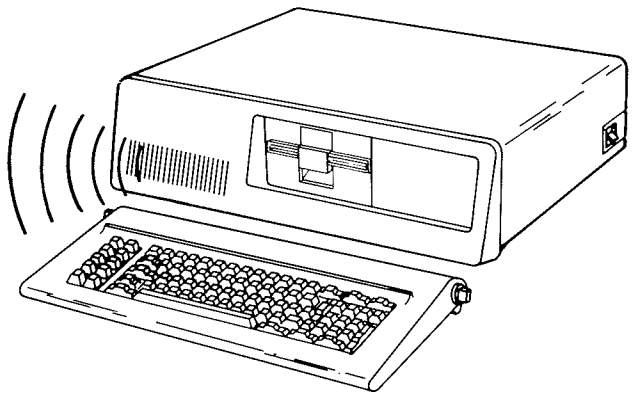
NO Replace your IBM Monochrome Display and Printer Adapter. See Section 5, "Removal/ Replacement and Adjustments."

YES Replace your display. See Section 5, "Removal/ Replacement and Adjustments."

Display (Color/Graphics)

You have entered this PIC because you were unable to complete POST, you visually detected a color/graphics problem, or you have an error message indicating a color/graphics problem.

1. Set the Power switch on the system unit (and the expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette.
3. Set the Power switch on the expansion unit, (if attached) and the system unit to On.
4. If your display has a separate power switch, set it to On.
5. Turn your brightness and contrast controls fully clockwise.
6. Note any audio responses during POST.



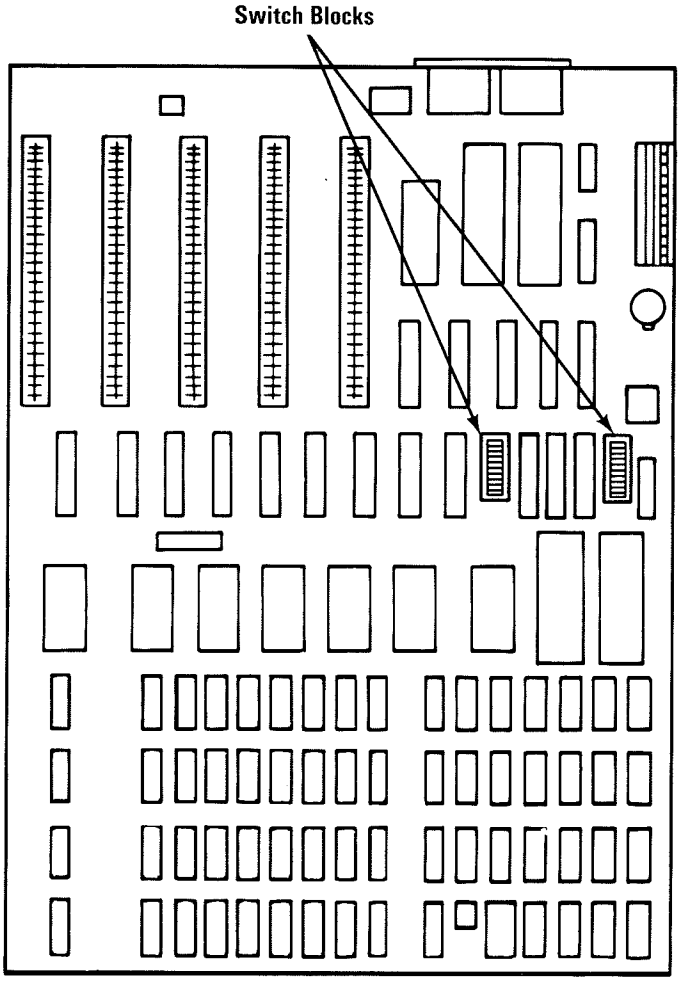
1 Long and 2 Short Beeps

IS YOUR ERROR INDICATION ONE LONG AND TWO SHORT BEEPS?

NO Go to page 3-500-4.

YES

Compare the switch settings on your machine, to those shown in Section 6, "Switch Settings."

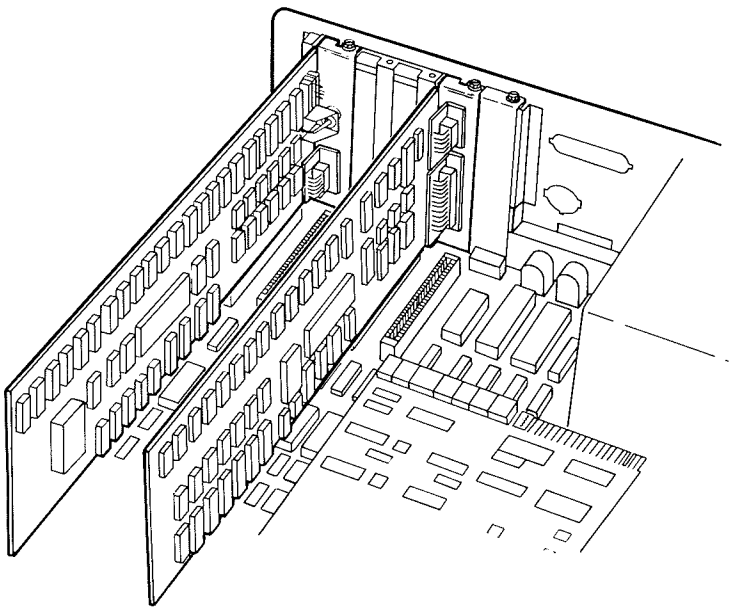


ARE THE SWITCHES IN YOUR MACHINE SET CORRECTLY?

NO Correct the switch settings and verify that the system is operating correctly.

YES

Examine your system to determine how many display adapters are installed.



DO YOU HAVE TWO DISPLAY ADAPTERS INSTALLED?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

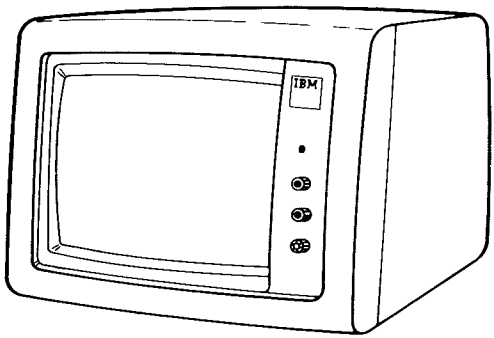
YES Replace the Monochrome Display and Printer Adapter. See Section 5, "Removal/Replacement and Adjustments."

Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you have only one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter (If the list is incorrect, follow the instructions on the display to correct the list before answering yes).
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Press 5 (COLOR/GRAPHICS MONITOR ADAPTER) then press Enter.
6. Select 10 (RUN ALL TESTS) then press Enter.



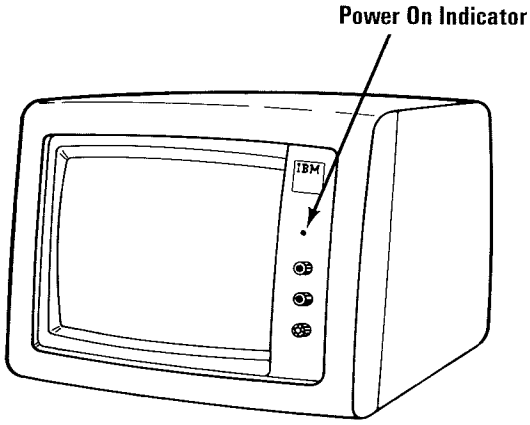
IS THE SCREEN DARK (NO ILLUMINATION)?

NO Go to page 3-500-8.

YES 

If you do not have an IBM Color Display, continue on page 3-500-25.

Check the power on indicator on your IBM Color Display.

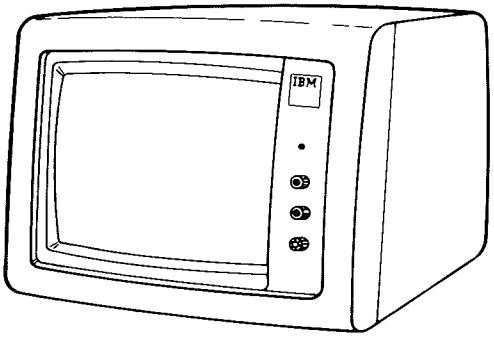


IS THE POWER ON INDICATOR LIGHTED?

NO Go to page 3-500-7.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Set the Power switch on the display to Off.
3. Disconnect the IBM Color Display signal cable from the back of the color/graphics adapter.
4. Set the Power switch on the display to On.



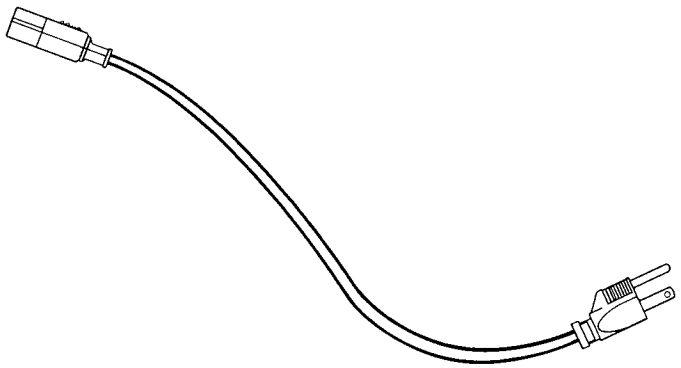
IS THE SCREEN STILL DARK (NO ILLUMINATION)?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the IBM Color Display. See Section 5, "Removal/Replacement and Adjustments."

The power cord may not be supplying power to your display.

Check continuity on the display power cord.

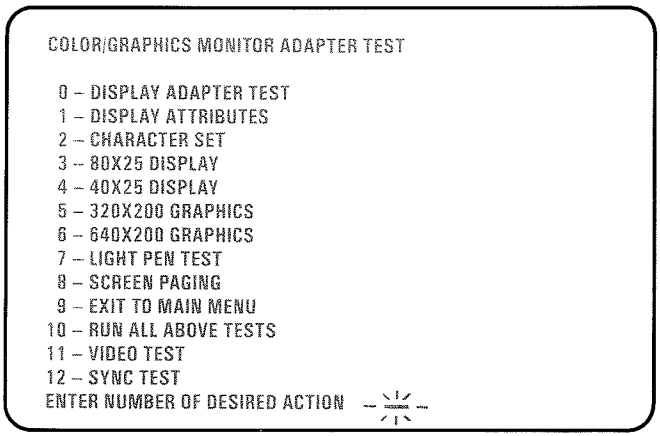


DID THE POWER CORD CHECK OUT GOOD?

NO Replace the power cord.

YES Replace the IBM Color Display. See Section 5, "Removal/Replacement and Adjustments."

Diagnostics should have successfully loaded and the screen shown below should be displayed.



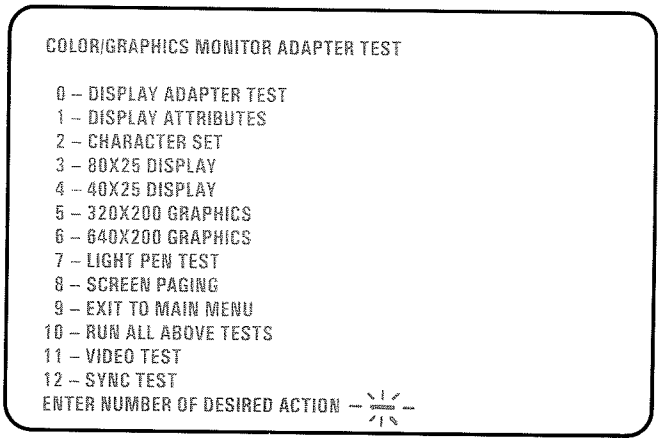
IS THE ABOVE SCREEN STABLE AND READABLE ON YOUR DISPLAY?

NO If you do not have an IBM Color Display, go to page 3-500-25.

If you have an IBM Color Display, go to Section 5, "Removal/Replacement and Adjustments," and perform the vertical hold adjustment. Then begin this page again. If you have already attempted this adjustment, and still do not have a stable and readable screen, go to page 3-500-25.

YES

Your display may function correctly except that the cursor is out of its normal position or is missing.



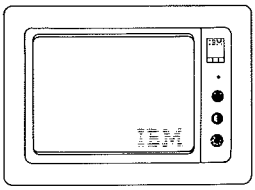
IS THE CURSOR VISIBLE AND CORRECTLY POSITIONED ON YOUR DISPLAY?

NO Replace your Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

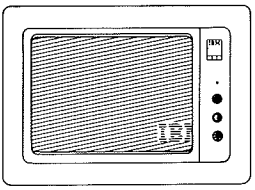
YES

Your display may be distorted or the characters may be the wrong size, as shown in the examples below.

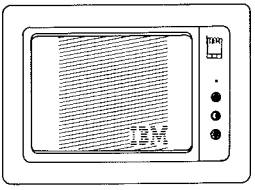
If the characters are the wrong size, go to Section 5, "Removal/Replacement and Adjustments" and perform the vertical size adjustment. Then answer the question below.



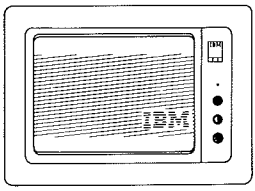
Too Dim



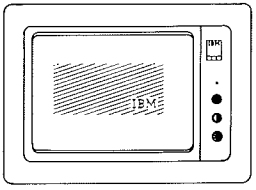
Too Wide



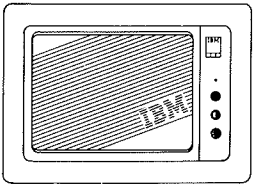
Too Narrow



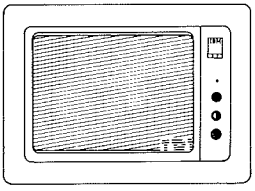
Too Short



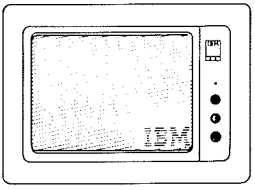
Shrunken



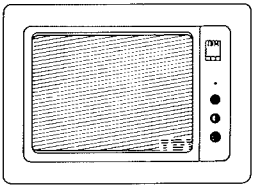
Tilted



Changes Size When Brightness Control Turned



Out of Focus



Characters Shifted Left or Right, or Up or Down, Off the Display Area

IS YOUR SYMPTOM DIFFERENT FROM THE EXAMPLES SHOWN?

NO Replace your display. See Section 5, "Removal/Replacement and Adjustments."

YES

Select 10 then press Enter.

The Color/Graphics Monitor Adapter tests should run without a 501 error code being displayed.

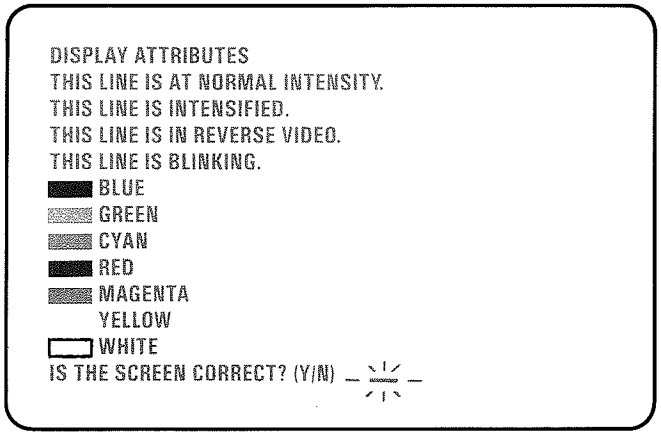
DID THE TESTS RUN WITHOUT A 501 ERROR CODE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

If you have an IBM Color Display or other direct drive color monitor, go to the next page.

Composite color displays may be limited to two color shades, the darker shade on top.



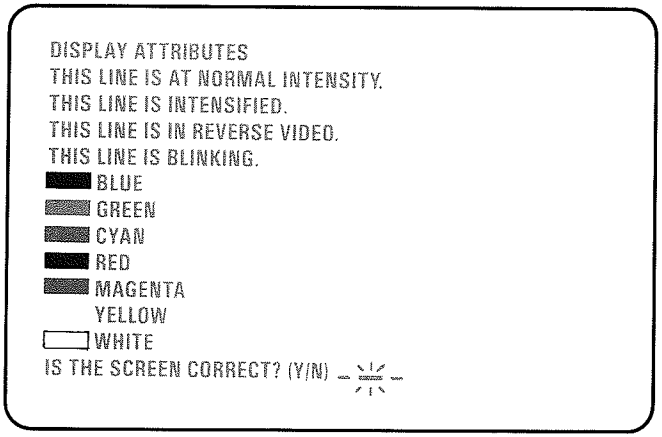
ARE ALL THE COLORS PRESENT AND OF CORRECT HUE ON THE DISPLAY?

NO If you have a composite monitor, go to Section 5, "Removal/Replacement and Adjustments," and perform the color trimmer capacitor adjustment. Then return to this page. If you have already performed this adjustment, then go to page 3-500-25.

YES

Direct drive displays may not support the intensified line. If you do not have an IBM Color Display, continue on the next page.

Adjust the brightness and contrast controls until the intensified line is brighter than the other lines.



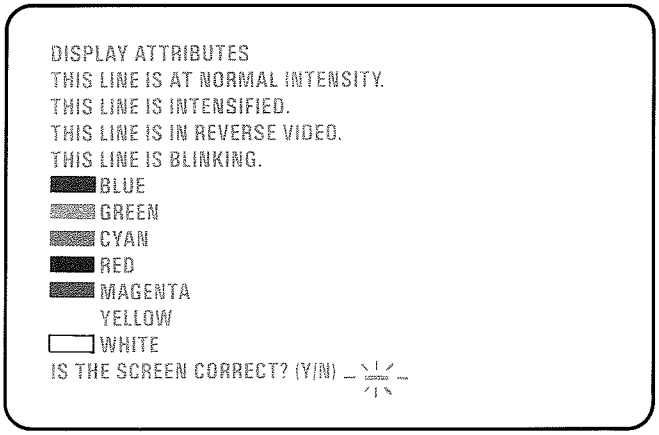
WERE YOU ABLE TO ADJUST FOR AN INTENSIFIED LINE?

NO Go to page 3-500-25.

YES

On composite monitors, the colors will appear in two shades with the darker shade on top. Direct drive monitors may not support the intensified line.

The appearance of each line on your display should match the description on that same line.

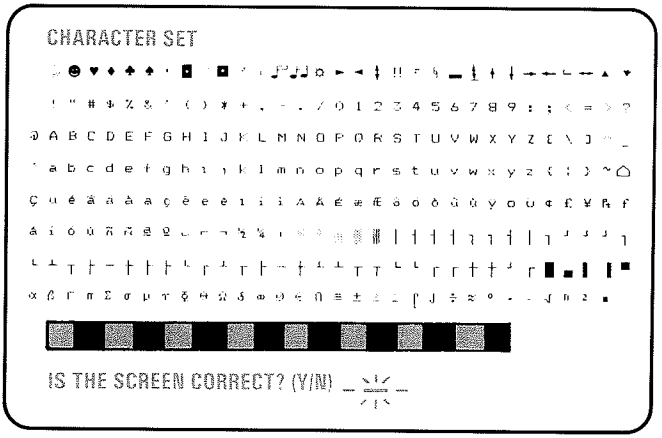


DO ALL THE LINES MATCH THEIR DESCRIPTIONS?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display.

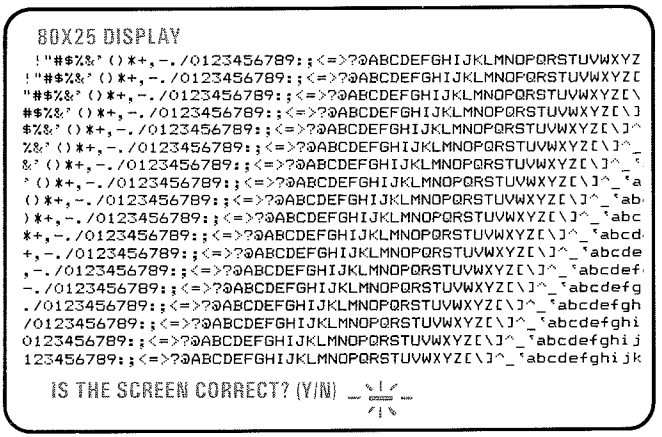


ARE ALL THE CHARACTERS PRESENT AND CORRECT (NO EXTRA DOTS IN CHARACTER BOXES OR MISSING DOTS FROM CHARACTER FIGURE)?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display. The border should be black.

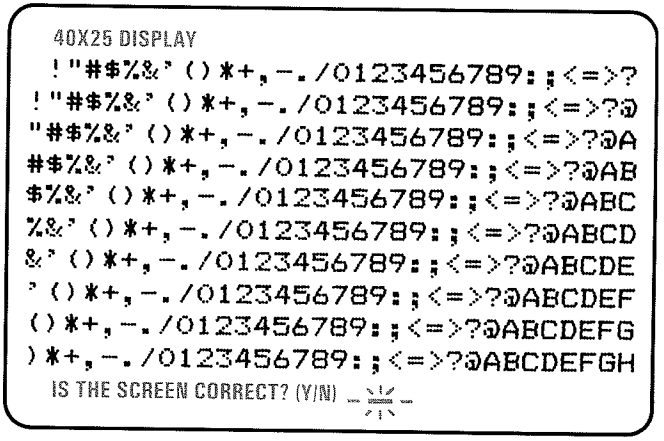


IS THE BORDER BLACK AND ARE THE CHARACTERS PRESENT AND COMPLETE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display. The border should be white.

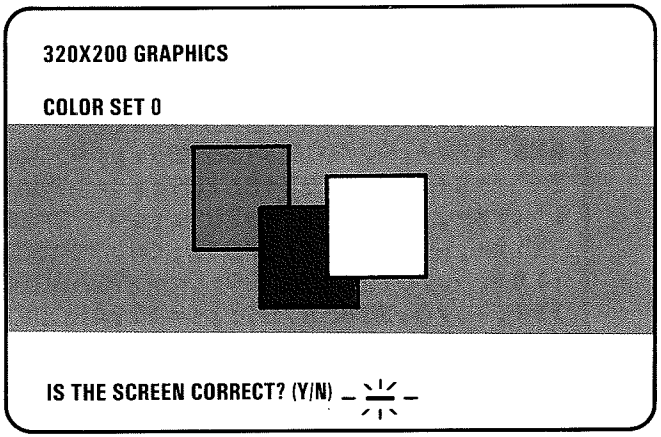


IS THE BORDER WHITE AND ARE THE CHARACTERS PRESENT AND COMPLETE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display. The background should be dark cyan. From left-to-right, the boxes should be intensified green, intensified red and intensified yellow. The characters are printed in intensified yellow.

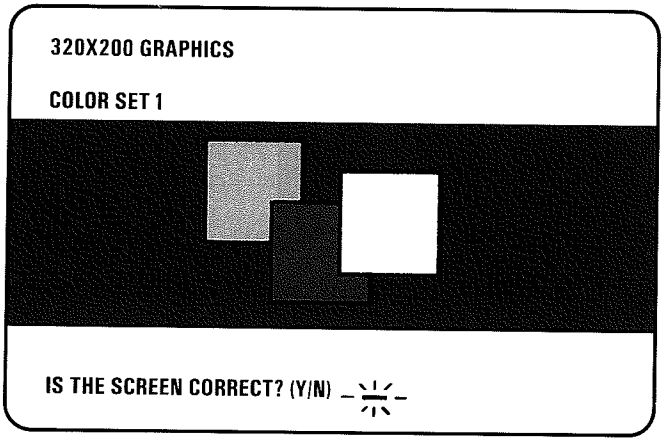


IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display. The background should be intensified red. From left-to-right, the boxes should be dark cyan, dark magenta and non-intensified white (light gray). The characters are printed in dark magenta.

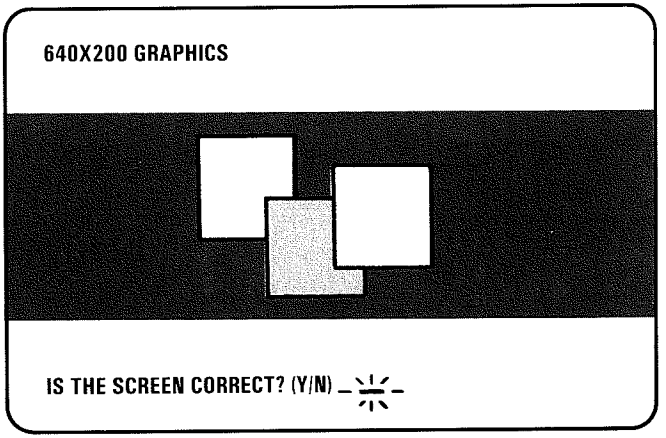


IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display. The background should be black. From left-to-right, the boxes should be gray, gray and white. The characters are printed in white.

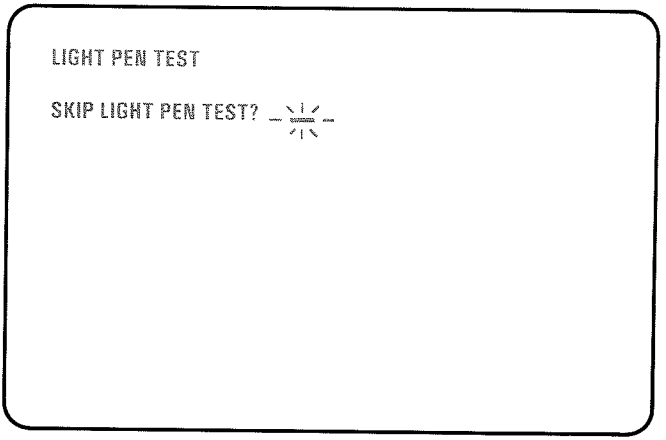


IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

Press Y, then press Enter. The screen shown below should appear on your display.



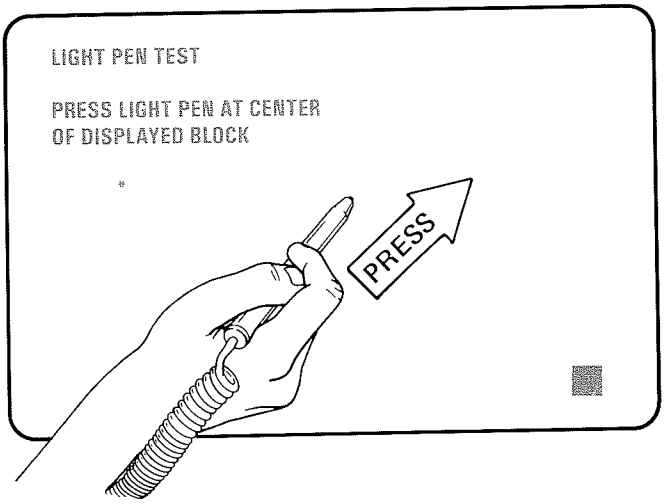
DO YOU HAVE A LIGHT PEN INSTALLED?

NO Go to page 3-500-23.

YES

This is a timed test. If you wait longer than 60 seconds to respond or if you are not careful where you place the top of the pen before you push it, you may receive an error message.

1. Position the tip of the light pen in the center of the block and press the pen toward the display as shown below. The displayed block will be replaced by an asterisk(*). Repeat this procedure for each new block that appears.
2. Press N and then press Enter to start the test.



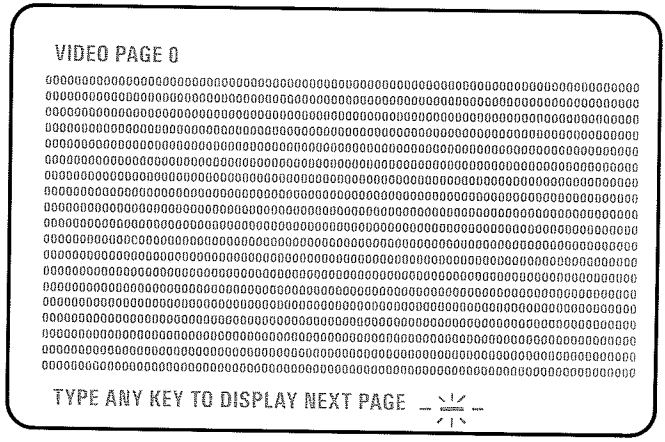
WERE YOU ABLE TO COMPLETE THE LIGHT PEN TEST (DISPLAY CHANGES TO VIDEO PAGE 0)?

NO Replace the light pen.

YES

If the light pen test completed successfully, skip steps 1 and 2 on this page.

1. If you skipped the light pen test, video page 0 is not on your display yet, press Y, then Enter.
2. Video page 0 should have appeared on your display.
3. Follow the instructions on your display to check the internal video addressing function of the Color/ Graphics Monitor Adapter. Look for any discrepancy in the sequence of numbers 0 through 7 and back to 0.



WERE ALL 8 PAGES DISPLAYED?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unresolved problem, you should seek technical assistance.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette.
3. Set the Power switch on the expansion unit, (if attached) and system unit to On.
4. Press the following keys in the sequence listed and listen for the "BEEP" each time you press Enter.

Note: Use the numbers on the top row of the keyboard; do not use the numeric keypad.

Steps	Test Selection	Audio Response
1. Press 0	Run diagnostics	None
2. Press Enter		1 Beep

Note: If you do not have a monochrome adapter installed, skip steps 3 & 4.

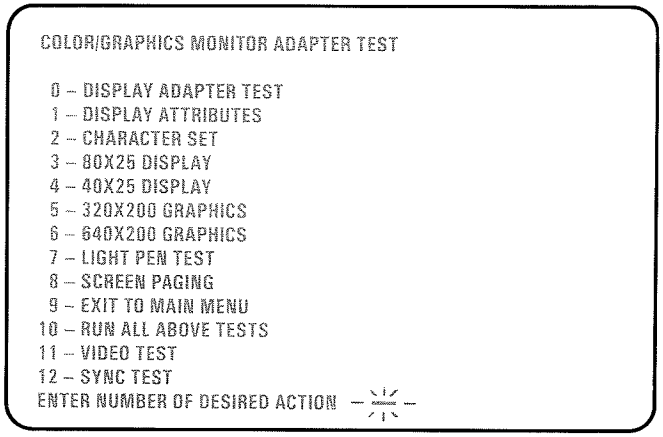
3. Press Y or N	Is a monitor attached to every display adapter?	None
4. Press Enter		1 Beep
5. Press Y	Are the options correct?	None
6. Press Enter		1 Beep
7. Press 0	Run test one time	None
8. Press Enter		1 Beep
9. Press 5	Select color/ graphics monitor adapter tests	None
10. Press Enter		2 Beeps

WERE YOU ABLE TO COMPLETE THE AUDIO RESPONSE DIAGNOSITCS BY PRESSING THE ABOVE SEQUENCE OF KEYS?

NO You may have a power supply or connector problem. Check your connectors. If your Color/ Graphics Monitor Adapter is installed in the system unit, go to PIC 3-020-1, "Power." If the adapter is in the expansion unit, go to PIC 3-1800-1, "Expansion Unit."

YES 

Your display should match the screen below.



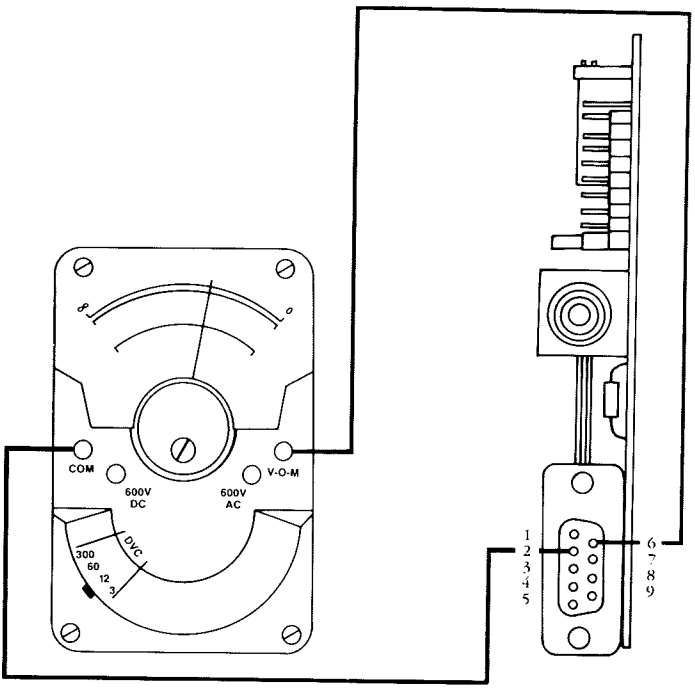
ARE ALL CHARACTERS ON YOUR SCREEN CORRECT AND READABLE?

NO Replace your Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

Note: If your display is completely blank continue on the next page.

YES

1. Disconnect the color display signal cable.
2. Select 11 then press Enter.
3. Measure the voltage present between pin 2 (ground) and pins 3, 4, 5, 6 (signal) of the nine pin connector. The voltages should all read between 2.4 and 5.5 Vdc.
4. Measure the voltage present between the outer edge (ground) and the center conductor (signal) of the phono-jack. The voltage should read between 1.5 and 2.4 Vdc.

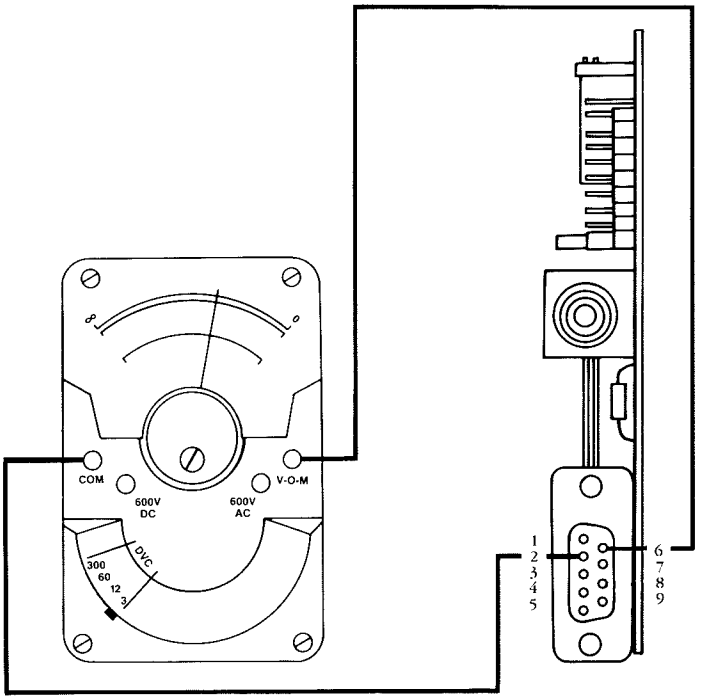


WERE ALL THE VOLTAGE READINGS CORRECT?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Press Enter.
2. Measure the voltage present between pin 2 (ground) and pins 3, 4, 5, 6 (signal) of the nine pin connector. The voltages should all read between 0.0 and 0.5 Vdc.
3. Measure the voltage present between the outer edge (ground) and the center conductor (signal) of the phono-jack. The voltage should read between 0.0 and 0.9 Vdc.



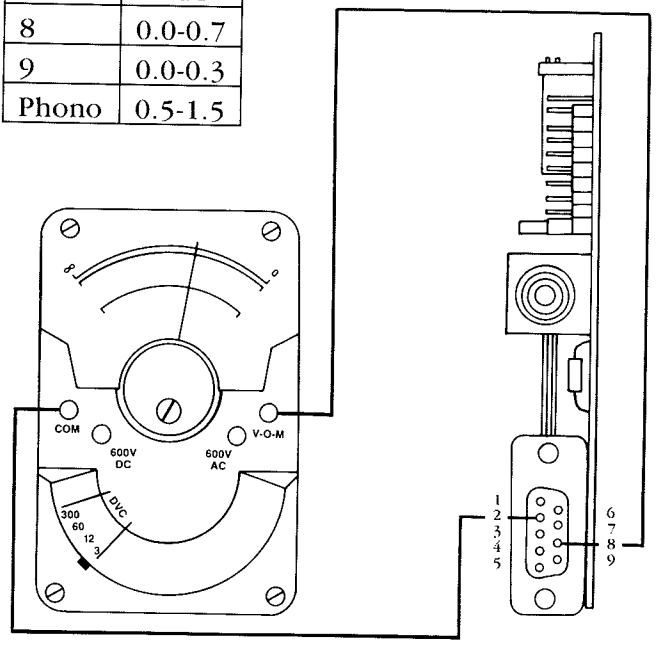
WERE ALL THE VOLTAGE READINGS CORRECT?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Press 9 and listen for two "BEEPS."
2. Measure the voltage present between pin 2 (ground) and pin 8 (signal) of the nine pin connector. The voltage should read between 0.0 and 0.7 Vdc.
3. Measure the voltage present between pin 2 (ground) and pin 9 (signal) of the nine pin connector. The voltage should read between 0.0 and 0.3 Vdc.
4. Measure the voltage present between the outer edge (ground) and the center conductor (signal) of the phono-jack. The voltage should read between 0.5 and 1.5 Vdc.

Pin	Vdc
8	0.0-0.7
9	0.0-0.3
Phono	0.5-1.5



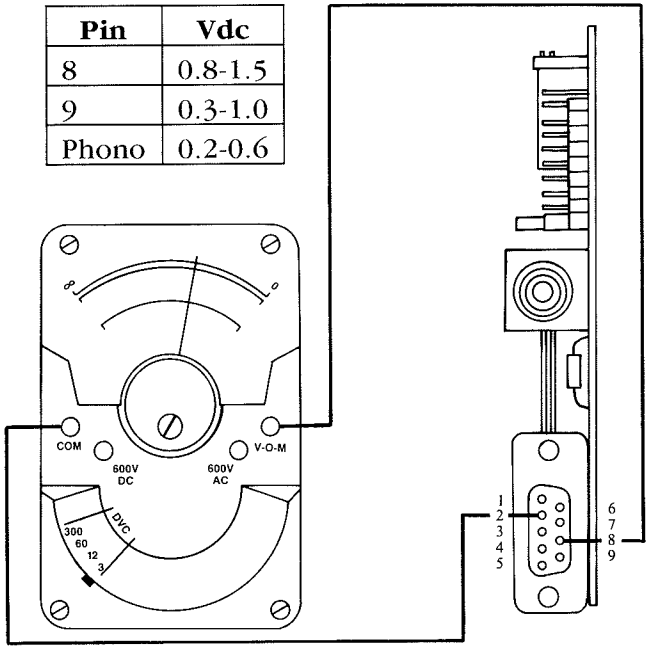
WERE ALL THE VOLTAGE READINGS CORRECT?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Select 12 then press Enter.
2. Measure the voltage present between pin 2 (ground) and pin 8 (signal) of the nine pin connector. The voltage should read between 0.8 and 1.5 Vdc.
3. Measure the voltage present between pin 2 (ground) and pin 9 (signal) of the nine pin connector. The voltage should read between 0.3 and 1.0 Vdc.
4. Measure the voltage present between the outer edge (ground) and the center conductor (signal) of the phono-jack. The voltage should read between 0.2 and 0.6 Vdc.

Pin	Vdc
8	0.8-1.5
9	0.3-1.0
Phono	0.2-0.6



WERE ALL THE VOLTAGE READINGS CORRECT?

NO Replace the Color/Graphics Monitor Adapter. See Section 5, "Removal/Replacement and Adjustments."

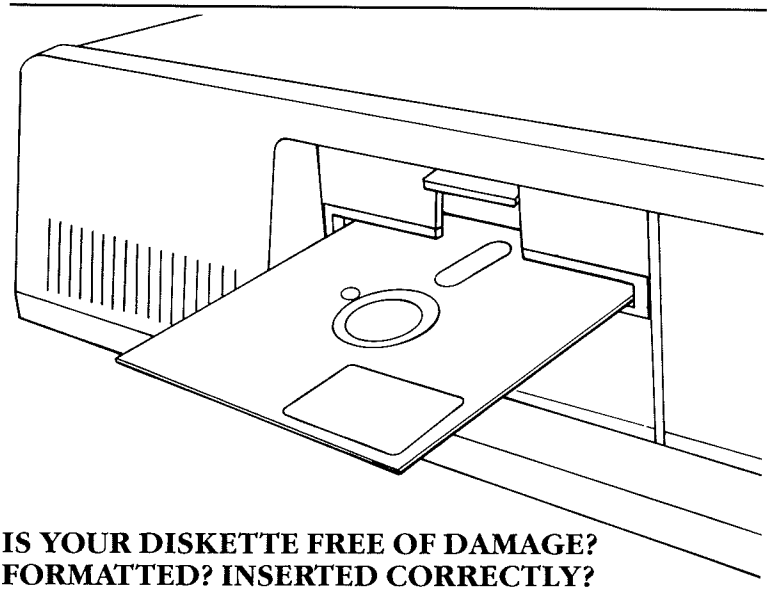
YES Replace your color display. See Section 5, Removal/Replacement and Adjustments."

5-1/4 Inch Diskette Drive Assembly

You have entered this PIC because you have a 6XX error code or have identified a diskette drive assembly problem. If your diskette drive assembly has visible obstructions or broken parts, remove them or replace the appropriate FRU. Check your diskette for damage.

Note: This table shows the meter readings that are acceptable, when checking for voltages described as "approximately X Vdc."

Requested Voltage Reading	Minimum	Maximum
Approximately 0 Vdc	0.0 Vdc	0.8 Vdc
Approximately 0.2 Vdc	0.2 Vdc	0.2 Vdc
Approximately 0.5 Vdc	0.5 Vdc	1.0 Vdc
Approximately 5.0 Vdc	2.0 Vdc	5.5 Vdc
Approximately 12 Vdc	11.2 Vdc	12.6 Vdc



IS YOUR DISKETTE FREE OF DAMAGE? FORMATTED? INSERTED CORRECTLY?

NO Use another diskette or insert the diskette correctly, then repeat the test that failed to verify this corrected your 6XX error.

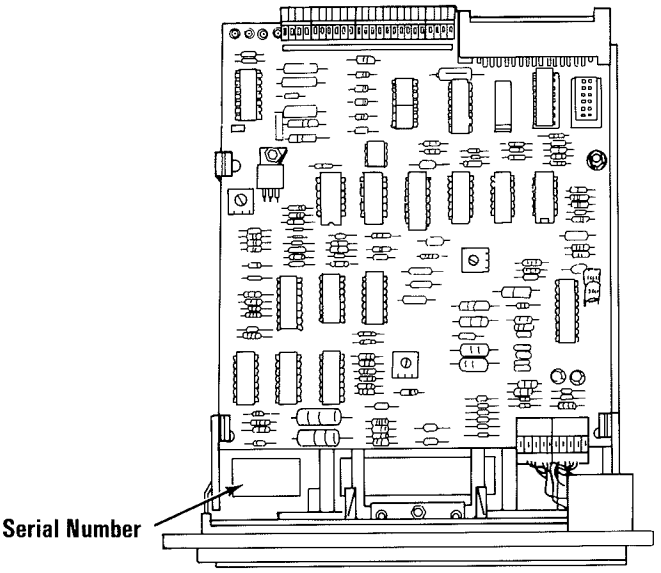
YES 

1. Refer to the illustration below and locate the serial number on the diskette drive castings. Do not remove any parts; the number is visible from the top of the drive.

   Type 1 diskette drives have an A, B, or no character in front of the serial number.

   Type 2 diskette drives have a D in front of the serial number.

2. Determine if your diskette drive is a type 1 or type 2 drive.

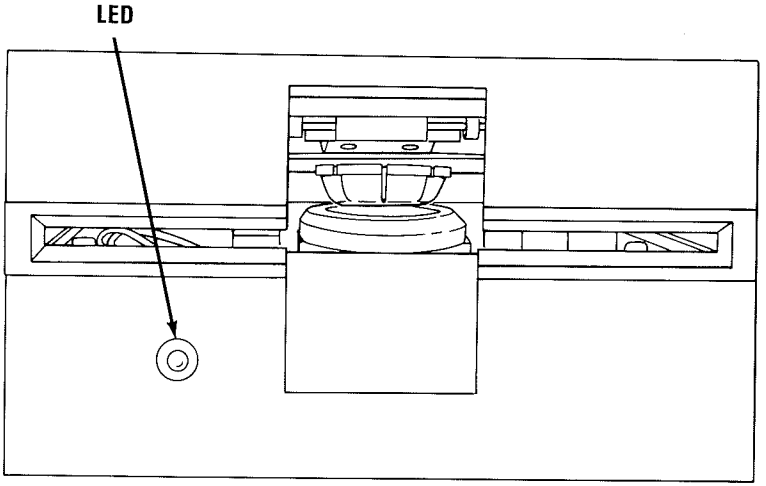


IS THE DISKETTE DRIVE A TYPE 1?

NO Go to page 3-600-41.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Check the diskette drive connectors for damage or incorrect connection.
3. Ensure diskette assembly mounting screws are tight.
4. Insert your Advanced Diagnostics diskette in drive A.
5. Set the Power switch on the expansion unit (if attached) and system unit to On and observe the LED on drive A.



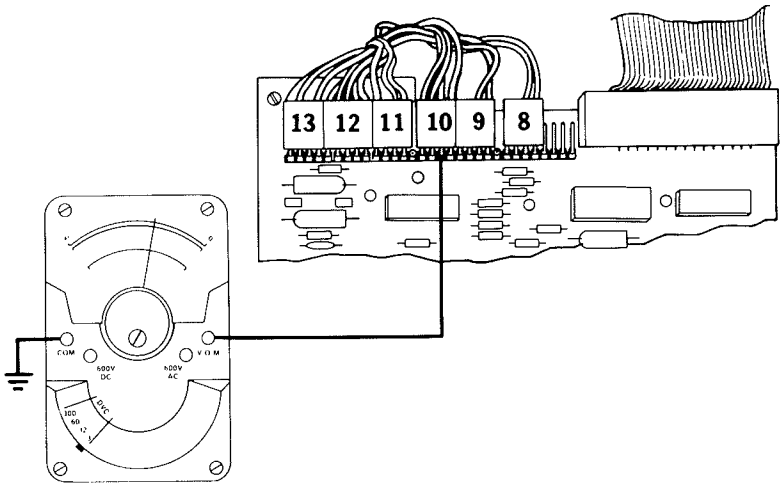
DID THE LED ON DRIVE A LIGHT BEFORE THE "BEEP" AT THE END OF THE POWER-ON SELF TEST?

NO Go to page 3-600-11.

YES

Remove your diskette. Check the voltage from P10-2 to ground while inserting a diskette in drive A. The voltage should decrease from approximately 0.5 Vdc to approximately 0 Vdc as the diskette is inserted.

WARNING: Do not short the pins together when taking voltage readings; damage to the boards may occur.

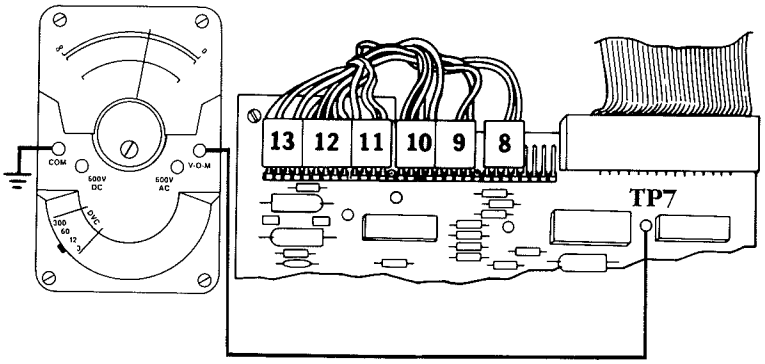


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

Remove your diskette. Check the voltage from TP-7 to ground while inserting a diskette. The voltage should decrease from approximately 5.0 Vdc to approximately 0 Vdc as the diskette is inserted.

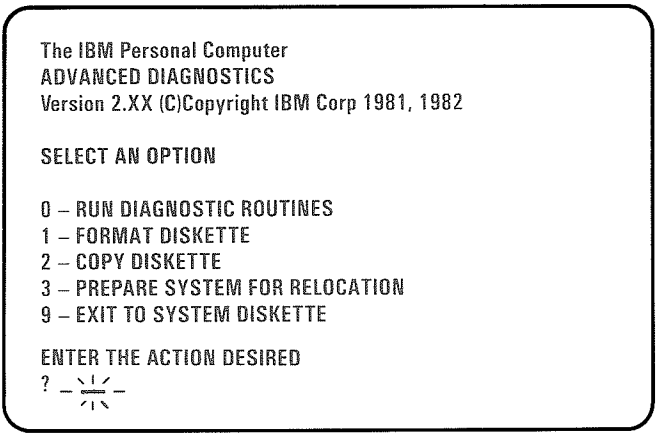


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

The Advanced Diagnostics diskette should have loaded, and the first diagnostic menu should be on your display.



IS THIS MENU ON YOUR DISPLAY?

NO Go to page 3-600-15.

YES

Follow the steps below to test the write protect feature.

1. Select option 1 (FORMAT DISKETTE) by pressing the 1 and then press Enter.
2. Select the drive to be tested (A or B) and insert a scratch diskette that is write protected into the selected drive, then press Enter.
3. The message illustrated below will be displayed if the write protect feature is working properly.

```
FORMAT NOT COMPLETED
WRITE PROTECTED DISKETTE
DRIVE B, TRACK 0, HEAD 0, SECTOR 0
```


WAS THIS MESSAGE DISPLAYED?

NO Go to page 3-600-37.

YES

Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you have only one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter (if the list is incorrect, follow the instructions on the screen to correct the list before answering yes).
4. Press 1 (RUN TESTS MULTIPLE TIMES) then press Enter.
5. Press 6 (X DISKETTE DRIVE(S) AND ADAPTER) then press Enter.
6. Press 1 (ENTER NUMBER OF TIMES TO RUN TESTS) then press Enter.
7. Press Y (WAIT EACH TIME AN ERROR OCCURS (Y/N) ?) then press Enter.

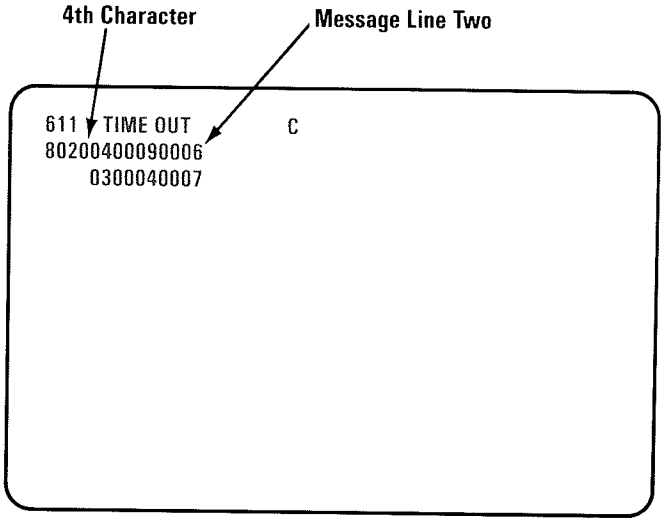
```
611 TIME OUT          C
80210200090006
     0301020005
```

DID AN ERROR CODE SIMILAR TO THIS APPEAR?

NO Go to page 3-600-34.

YES

The fourth character in line 2 indicates which diskette drive is failing. If the character is a 0, the failure is with drive A. If the character is a 1, the failure is with drive B.



IS THE FOURTH CHARACTER OF LINE TWO A 0?

NO Set the Power switch on the system unit (and expansion unit, if attached) to Off. Exchange the signal cable connectors for drives A and B. (The drive that was drive B will now be recognized by the machine as drive A.) Go to page 3-600-2.

If you still have the same failure after exchanging connectors go to page 3-600-35.

YES

Repeat steps 1 thru 7 on page 3-600-8 using another formatted diskette. Then return to this page.

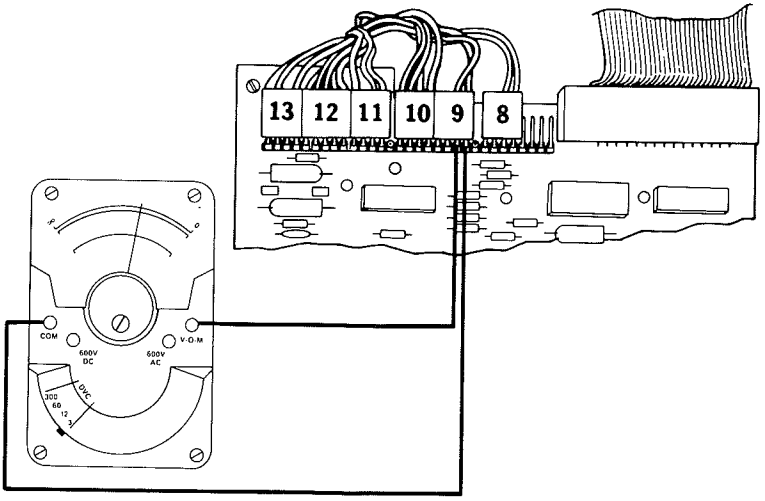
Error Code	Page
606	3-600-32
607	3-600-37
608	3-600-32
611	3-600-32
612	3-600-31
613	3-600-31
621	3-600-31
622	3-600-31
623	3-600-31
624	3-600-31
625	3-600-31
626	3-600-31

DO YOU STILL HAVE AN ERROR?

NO Replace the diskette you used for the first test.

YES Find your error code in the table and go to the page listed.

You may have a bad LED. If the diagnostic routines run correctly but the LED does not light, check for a minimum voltage of 1.5 Vdc between P9-1 and P9-2 on the diskette drive printed circuit board when the spindle is turning.

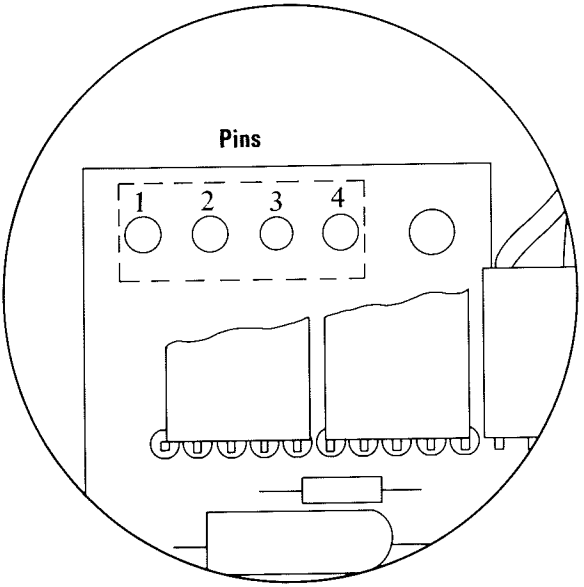


DID THE LED FAIL TO LIGHT, BUT THE DIAGNOSTICS RAN CORRECTLY AND THE VOLTAGE MEASURED AT LEAST 1.5 Vdc?

NO Continue on the next page.

YES Replace the LED assembly. See Section 5, "Removal/Replacement and Adjustments."

Check the power connector on diskette drive A for the voltages listed in the table below.



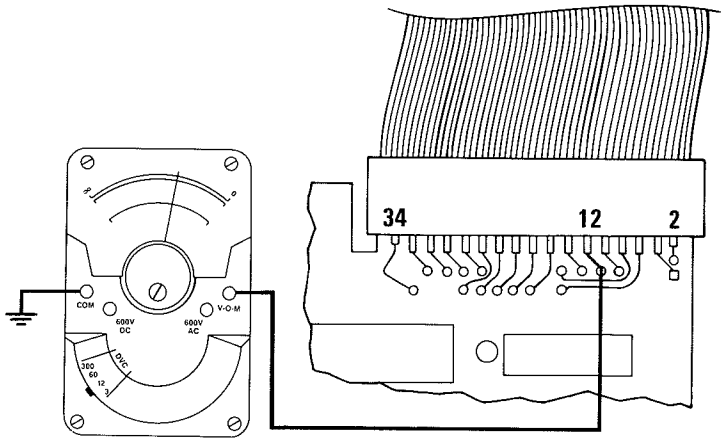
Diskette Drive Power Connector			
Min Vdc	Max Vdc	–Lead	+ Lead
+ 4.8	+ 5.2	2	4
+ 11.5	+ 12.6	3	1

ARE THE VOLTAGES WITHIN THE LIMITS SHOWN IN THE TABLE?

NO Go to PIC 3-020-1, "Power."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Ensure the terminating resistor is correctly inserted. It should be installed in the printed circuit board of drive A and should not be in the printed circuit board of drive B. See Section 4, "Locations."
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.
4. Check the voltage at pin 12 on the diskette signal cable's connector for approximately 5.0 Vdc at the start of POST.

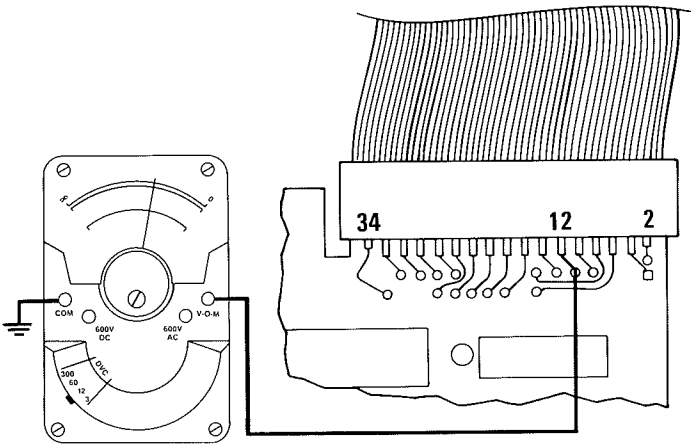


WAS THE VOLTAGE APPROXIMATELY 5.0 Vdc AT THE START OF POST?

NO Replace the diskette drive printed circuit board. (See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check that the voltage at pin 12 on the signal cable's connector decreases from approximately 5.0 Vdc at the start of POST, to approximately 0 Vdc during POST.

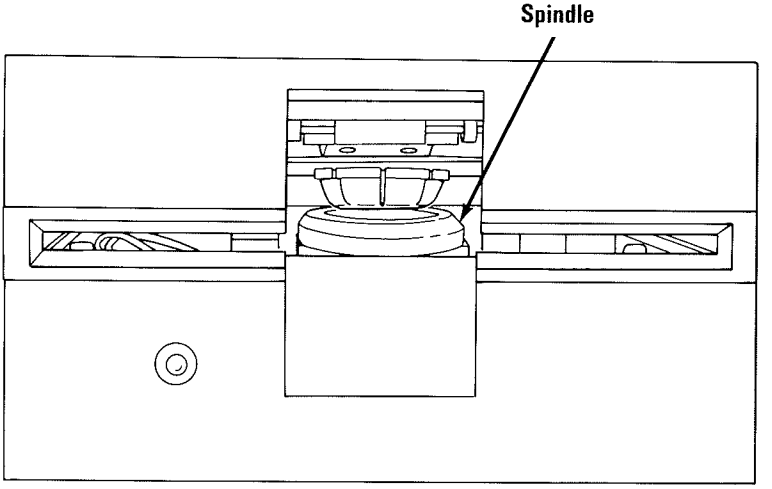


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc DURING POST?

NO Go to page 3-600-35.

YES Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

1. Remove the diskette.
2. Set the Power switch on the system unit (and expansion unit, if attached) to Off and wait 5 seconds.
3. Set the Power switch on the expansion unit (if attached) and system unit to On.
4. Observe the spindle during POST.



Front View-Diskette Drive

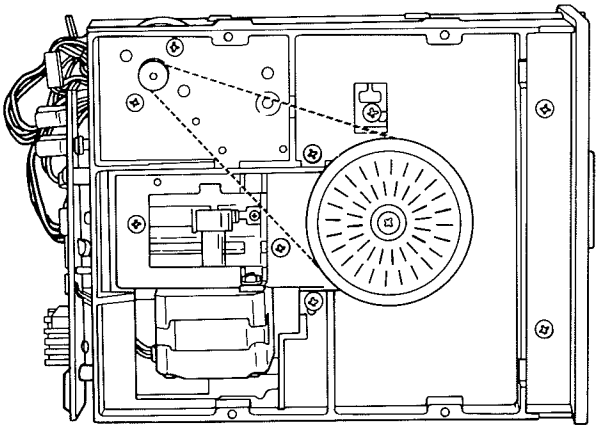
DID THE SPINDLE BEGIN TO ROTATE ON DRIVE A BEFORE THE "BEEP" AT THE END OF POST?

NO Go to page 3-600-24.

YES 

Use the drive motor preliminary speed test to check the speed of the diskette drive. See Section 5, "Removal/ Replacement and Adjustments."

Note: A fluorescent light is needed to see the strobe effect on this test.



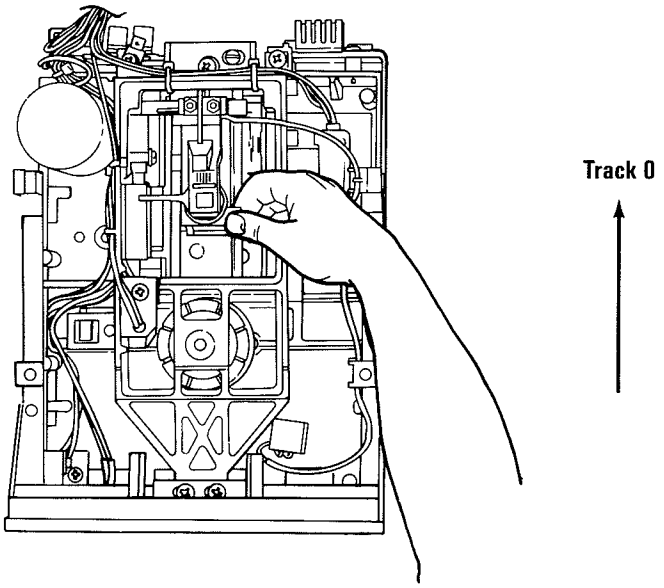
WAS THE SPEED OF THE DISKETTE DRIVE CORRECT?

NO Adjust the speed of the diskette drive. If unable to adjust go to page 3-600-26.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.

Note: The head is moved under power by a stepper motor. When you move the head by hand, you will feel some resistance, but the head should not bind.



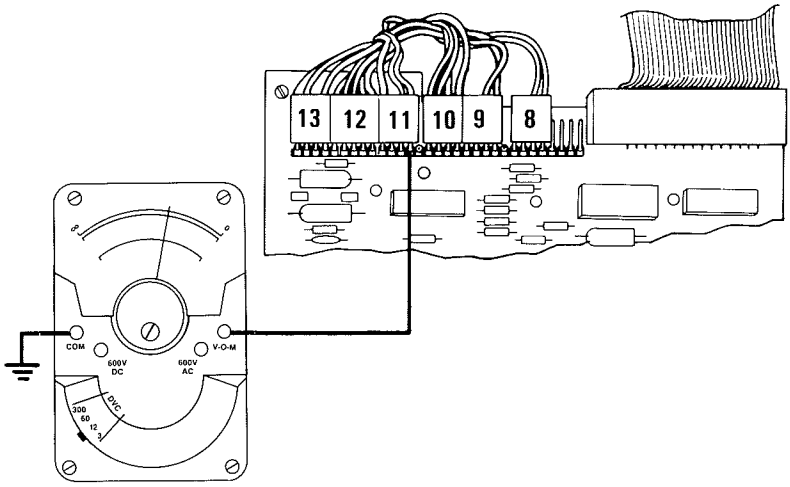
DID THE HEAD MOVE TO TRACK 0 WITH NO BINDS?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. With the head still at track 0, reinstall the diskette drive printed circuit board. See Section 5, "Removal/ Replacement and Adjustments."
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check the voltage at P11-1. It should be approximately 0 Vdc before the LED lights at the end of POST.

Note: The head may move away from track 0 during this test. If you run this test a second time, reposition the head to track 0.

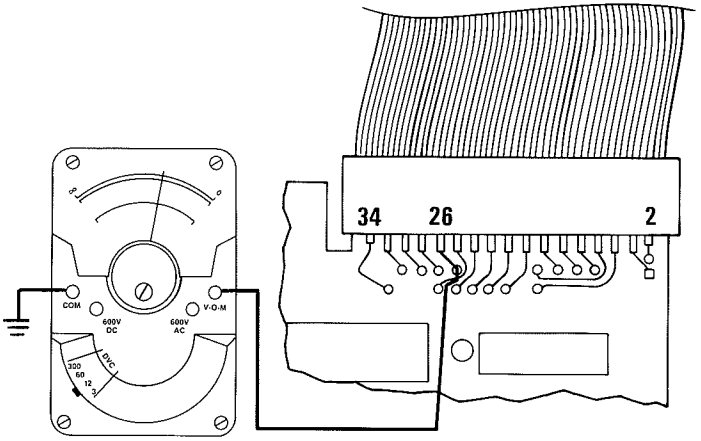


IS THE VOLTAGE CORRECT?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.
4. Reinstall the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
5. Set the Power switch on the expansion unit (if attached) and the system unit to On.
6. The voltage at pin 26 on the signal cable's connector should be 5.0 Vdc at the start of POST.

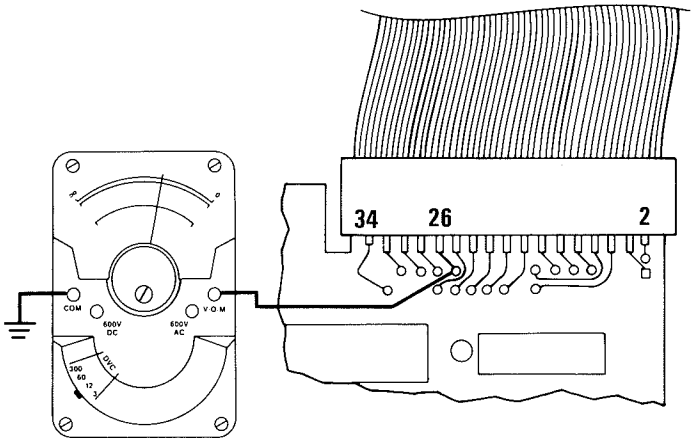


WAS THE VOLTAGE APPROXIMATELY 5.0 Vdc AT THE START OF POST?

NO Go to page 3-600-35.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.
4. Reinstall the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
5. Set the Power switch on the expansion unit (if attached) and system unit to On.
6. The voltage at pin 26 on the signal cable's connector should read approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc as the LED lights at the end of POST.

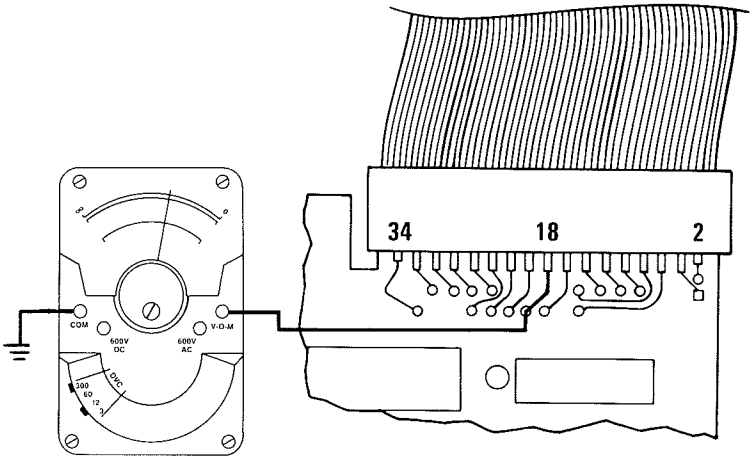


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Ensure the terminating resistor is correctly inserted. It should be installed in the printed circuit board of drive A and should not be in the printed circuit board of drive B. See Section 4, "Locations."
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.
4. Check the voltage at pin 18 of the signal cable's connector. The voltage should be approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc before the "beep" at the end of the POST.

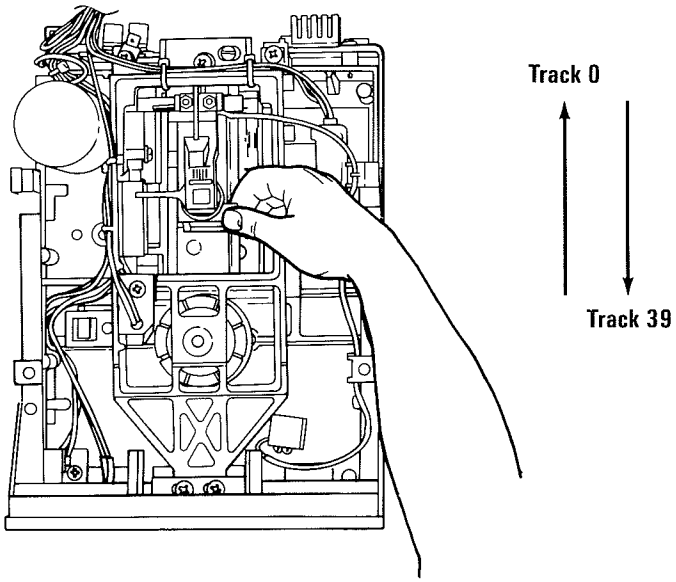


DID THE VOLTAGE AT PIN 18 DECREASE TO APPROXIMATELY 0 Vdc?

NO Go to page 3-600-35.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Partially remove the diskette drive printed circuit board. Leave all connectors on except P5 and P6. See Section 5, "Removal/Replacement and Adjustments."
3. Lift the diskette drive printed circuit board just enough to observe the head assembly.
4. Move the head assembly away from track 0.
5. Set the Power switch on the expansion unit (if attached) and the system unit to On.
6. Observe the motion of the head assembly.

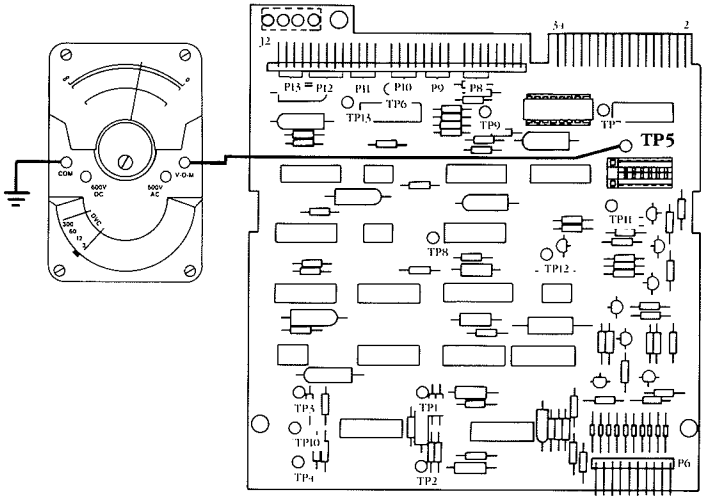


DOES THE HEAD ASSEMBLY MOVE TO TRACK 0 AND THEN AWAY FROM IT BEFORE THE END OF THE POST?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Reinstall the diskette drive printed circuit board, P5 and P6. See Section 5, "Removal/Replacement and Adjustments."
3. Insert your Advanced Diagnostics diskette.
4. Set the Power switch on the expansion unit (if attached) and the system unit to On.
5. Check for an increase in voltage (approximately 0.2 Vdc) at TP-5 of the diskette drive printed circuit board while the LED is on during POST.

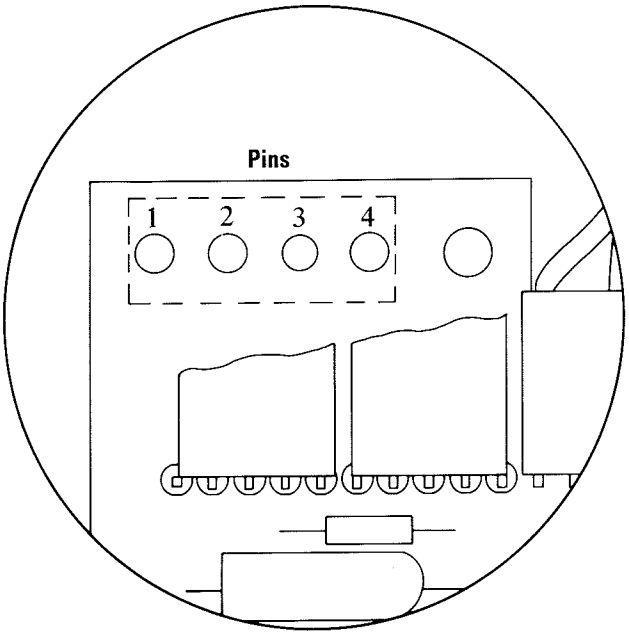


DOES THE VOLTAGE AT TP-5 INCREASE WHEN THE LED IS ON?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES Go to page 3-600-35.

Check the diskette drive's power connector for the voltages listed in the table below.



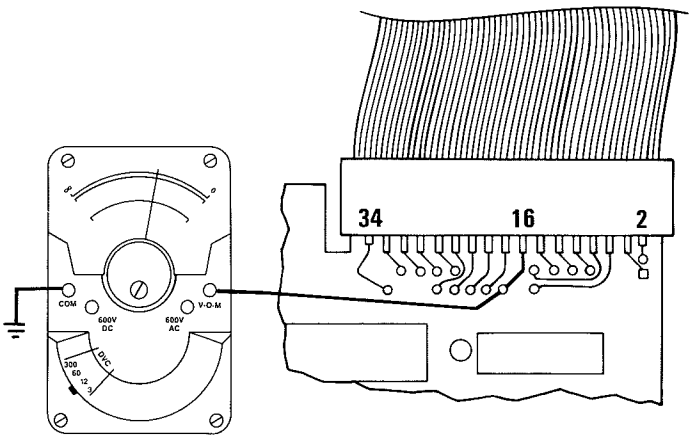
Diskette Drive Power Connector			
Min Vdc	Max Vdc	– Lead	+ Lead
+ 4.8	+ 5.2	2	4
+ 11.5	+ 12.6	3	1

ARE THE VOLTAGES WITHIN THE LIMITS SHOWN IN THE TABLE?

NO Go to PIC 3-020-1, "Power."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check for the voltage at pin 16 on the signal cable's connector. The voltage should be approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc before the "BEEP" at the end of POST.

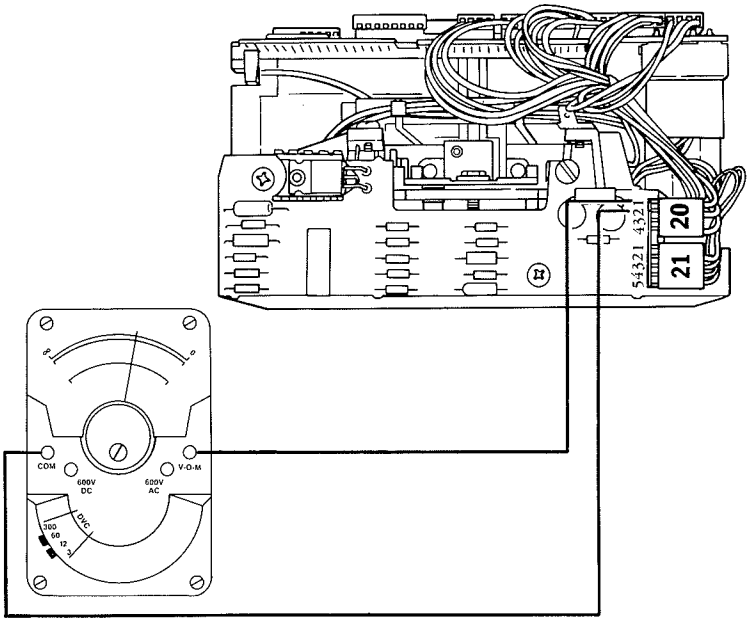


DID THE VOLTAGE AT PIN 16 DECREASE TO APPROXIMATELY 0 Vdc?

NO Go to page 3-600-35.

YES

Check for a voltage of approximately 12 Vdc between P20-1 and P20-2 on the servo board.

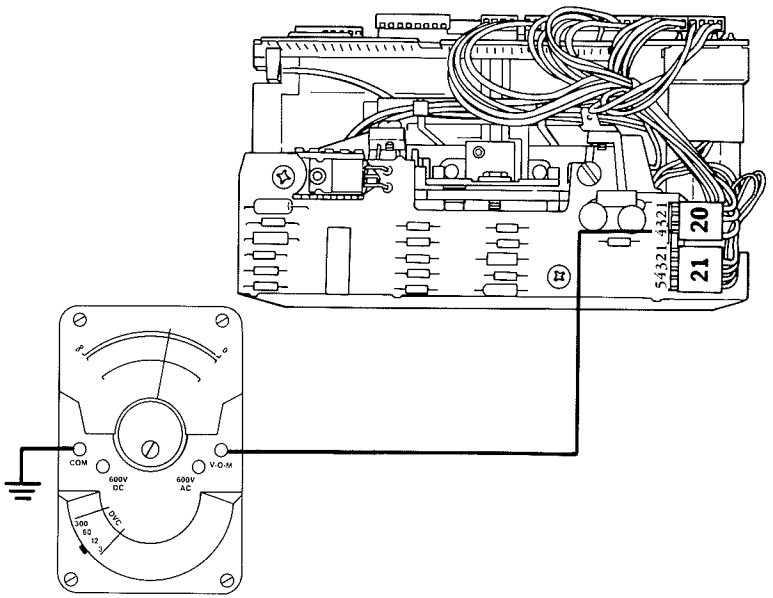


IS THE VOLTAGE APPROXIMATELY 12 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check the voltage at P20-4. It should start at approximately 5.0 Vdc and should decrease to approximately 0 Vdc when the LED is on.

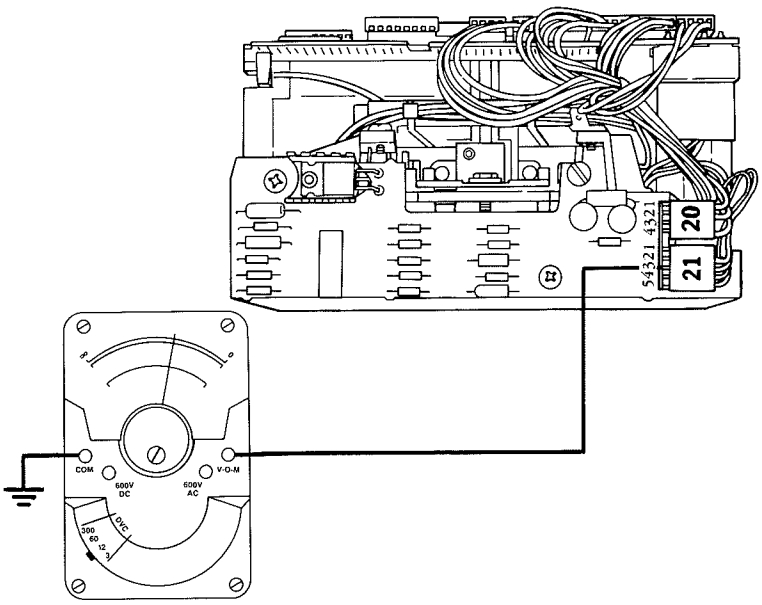


DID THE VOLTAGE AT P20-4 DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

Check for a voltage of 3 Vdc to 9 Vdc at P21-3 when the LED is on.

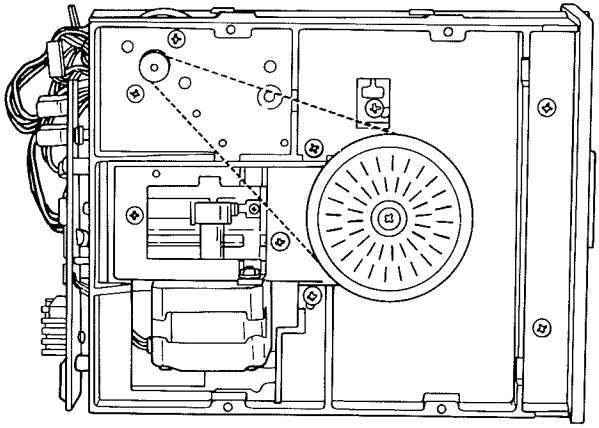


IS THE VOLTAGE CORRECT?

NO Replace the servo board. See Section 5, "Removal/Replacement and Adjustments."

YES

Check the diskette drive belt.



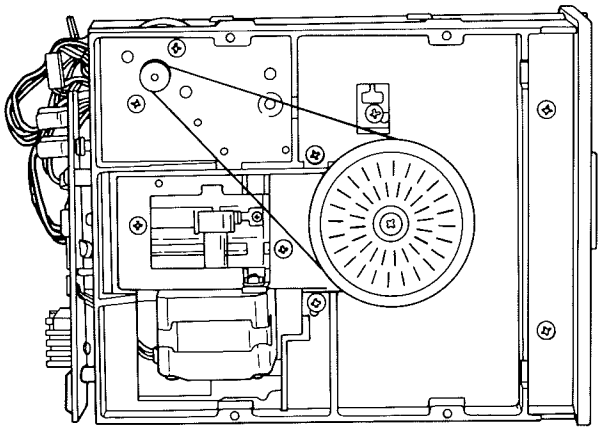
Bottom View

IS THE DRIVE BELT INSTALLED ON THE PULLEYS CORRECTLY AND IN GOOD CONDITION?

NO Replace the drive belt. See Section 5, "Removal/ Replacement and Adjustments."

YES

Remove the diskette drive belt and turn the spindle to ensure it turns freely and without binds.



Bottom View

DOES THE SPINDLE TURN FREELY?

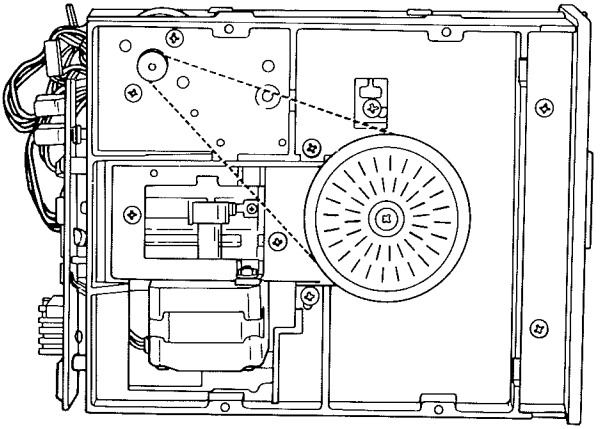
NO Replace the spindle assembly. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive motor. See Section 5, "Removal/Replacement and Adjustments."

1. Use the drive motor preliminary speed adjustment to check the diskette drive speed. See Section 5, "Removal/Replacement and Adjustments." Adjust the speed if necessary.

   Note: A fluorescent light is needed to see the strobe effect on this test.

2. Refer to steps 1 thru 7 on page 3-600-8 to run diagnostic tests on a formatted diskette. Then return to this page.



DO YOU STILL HAVE AN ERROR CODE?

NO Run diagnostic tests to verify you have fixed the problem.

YES Go to page 3-600-32 and follow the instructions for your error code.

Do not use this table, unless you are directed here by an earlier step in this PIC.

Diskette Drive Error Codes

Error Code	Probable Cause	Corrective Action
606	Your signal cable, diskette drive adapter, or diskette drive assembly has failed.	Go to page 3-600-35 and check the continuity of the signal cable. If you still have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."
607	Write Protect Error	Go to page-3-600-37
608	There is a problem with your Advanced Diagnostics diskette.	Use your backup copy of the Advanced Diagnostics diskette.
611	Your signal cable, diskette drive adapter, or diskette drive has failed.	Go to page 3-600-35 and check the continuity of the signal cable. If you have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."

Do not use this table, unless you are directed here by an earlier step in this PIC.

Diskette Drive Error Codes

Error Code	Probable Cause	Corrective Action
612	Your signal cable or diskette drive adapter has failed.	Go to page 3-600-35.
613	Your signal cable or diskette drive adapter has failed.	Go to page 3-600-35.
621 622 623 624 625 626	Your signal cable, diskette drive adapter, or diskette drive has failed.	Go to page 3-600-35 and check the continuity of the signal cable. If you still have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."

Insert a scratch diskette in each diskette drive and then press Enter.

The screen will display the configuration of the diskette drive(s) installed in your system. The XXXKB is the type of drive(s), 160KB or 320KB.

Note: 160KB drives do not have a read/write head connected to P5. See Section 4, "Locations."

```
TESTING – 1 DISKETTE DRIVE(S) AND ADAPTER
DISKETTE A: IS A 320KB DRIVE
1 DISKETTE DRIVE(S) AND ADAPTER          600S
```

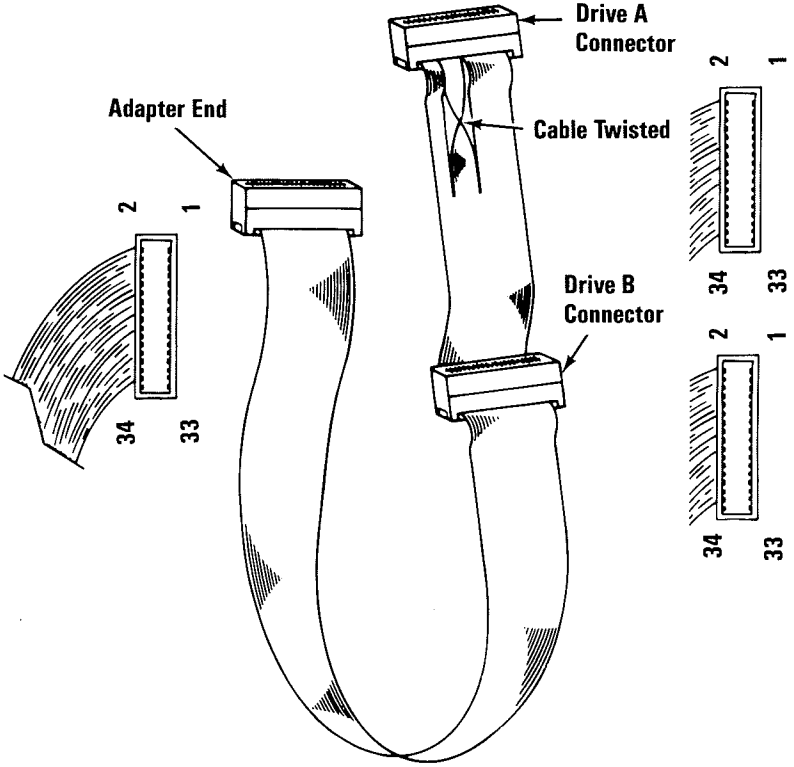
ARE THE DISKETTE DRIVE(S) CORRECT?

NO Replace the diskette drive assembly that is shown incorrectly in the message. See Section 5, "Removal/Replacement and Adjustments."

YES Go to page 3-600-40.

You may have a bad connection or a broken wire. Perform the following continuity check of the diskette drive signal cable.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Disconnect the diskette drive signal cable from the diskette adapter and the diskette drive.
3. Carefully inspect the cable connectors for bent or broken contacts. Inspect the connectors on the adapter and on the diskette drive's printed circuit board for cracks or corrosion.
4. Set meter on the Ohms (x1) scale.
5. Refer to the tables on the next page and check the continuity of the signal cable. The meter should indicate approximately 0 ohms resistance.



Note: Check continuity pin number to pin number except the pins preceded by an asterisk.

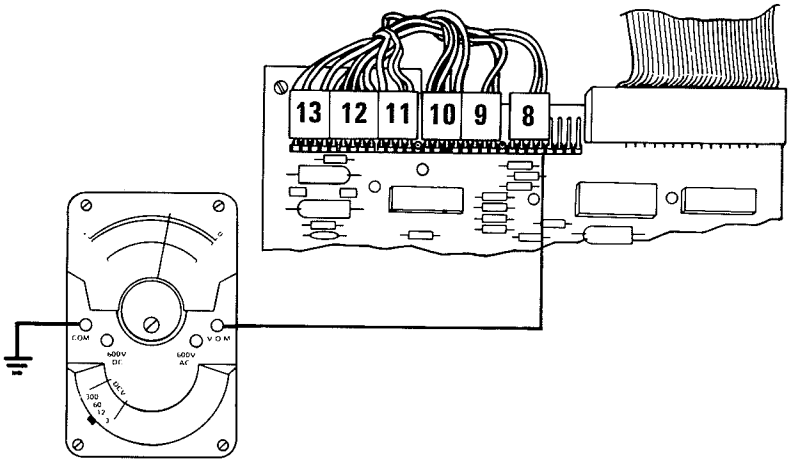
Diskette Drive A Signal-Cable Connector		Diskette Drive B Signal-Cable Connector	
Even Pin Numbering		Even Pin Numbering	
Diskette	Adapter	Diskette	Adapter
2	2	2	2
4	4	4	4
6	6	6	6
8	8	8	8
*10	16	10	10
*12	14	12	12
*14	12	14	14
*16	10	16	16
18	18	18	18
20	20	20	20
22	22	22	22
24	24	24	24
26	26	26	26
28	28	28	28
30	30	30	30
32	32	32	32
34	34	34	34
Odd Pin Numbering		Odd Pin Numbering	
Diskette	Adapter	Diskette	Adapter
1	1	1	1
3	3	3	3
5	5	5	5
7	7	7	7
9	9	9	9
*11	15	11	11
13	13	13	13
*15	11	15	15
17	17	17	17
19	19	19	19
21	21	21	21
23	23	23	23
25	25	25	25
27	27	27	27
29	29	29	29
31	31	31	31
33	33	33	33

WAS THE CONTINUITY OF THE SIGNAL CABLE CORRECT?

NO Replace the signal cable. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive adapter. See Section 5, "Removal/Replacement and Adjustments."

1. Remove your diskette.
2. Check the voltage from P8-1 to ground while partially inserting and removing a diskette from the drive. This will operate the write protect switch. The voltage should increase from approximately 0 Vdc to approximately 5.0 Vdc each time the switch is operated.

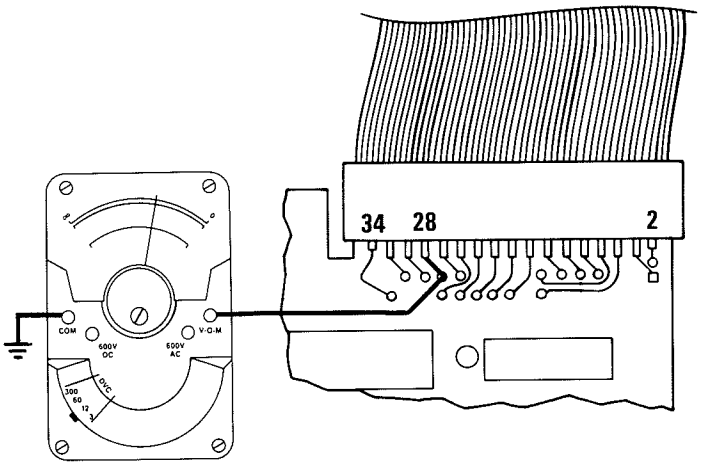


DID THE VOLTAGE INCREASE FROM APPROXIMATELY 0 Vdc TO APPROXIMATELY 5.0 Vdc EACH TIME THE SWITCH WAS OPERATED?

NO Replace the write protect switch. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Remove your diskette.
2. Check the voltage at J1-28. The voltage should be approximately 5.0 Vdc.

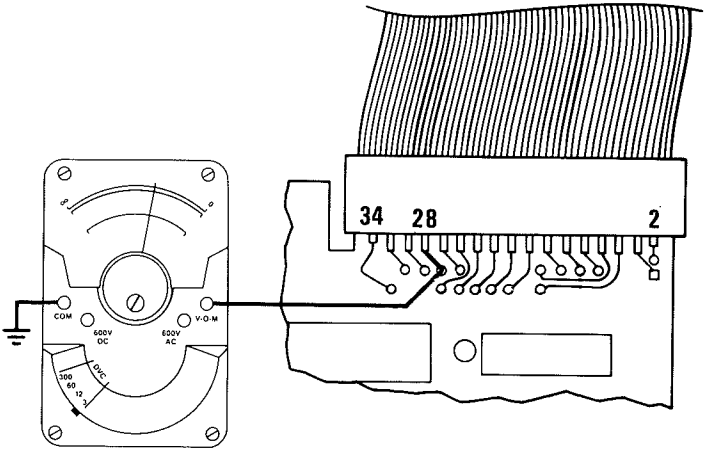


IS THE VOLTAGE APPROXIMATELY 5.0 Vdc?

NO Go to page 3-600-35.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Partially insert and remove a diskette from the diskette drive to operate the write protect switch, and measure the voltage at J1-28 when the LED is lit. The voltage should be approximately 5.0 Vdc and decrease to approximately 0 Vdc each time the write protect switch is operated. To test drive B exchange the signal cable connectors and perform the same steps.



DID THE VOLTAGE CHANGE FROM APPROXIMATELY 5.0 Vdc TO APPROXIMATELY 0 Vdc EACH TIME THE WRITE PROTECT SWITCH WAS OPERATED WHILE THE LED WAS LIT?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive adapter. See Section 5, "Removal/Replacement and Adjustments."

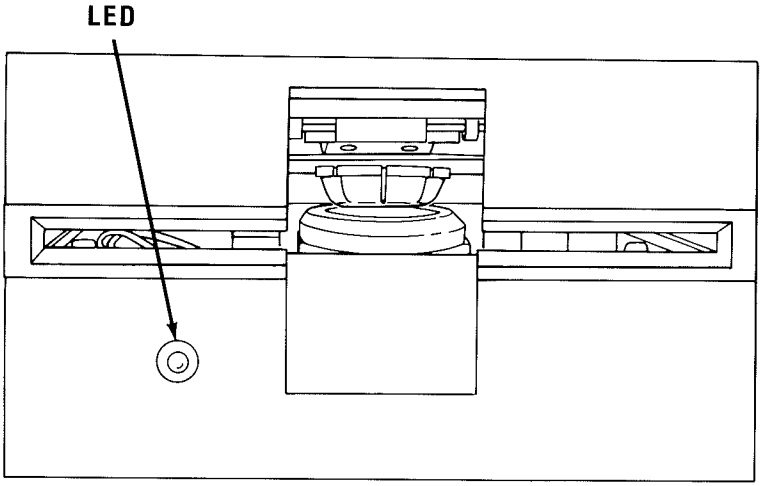
You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

---

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should request technical assistance.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Check the diskette drive connectors for damage or incorrect connection.
3. Ensure diskette assembly mounting screws are tight.
4. Insert your Advanced Diagnostics diskette in drive A.
5. Set the Power switch on the expansion unit (if attached) and system unit to On and observe the LED on drive A.



DID THE LED ON DRIVE A LIGHT BEFORE THE "BEEP" AT THE END OF THE POWER-ON SELF TEST?

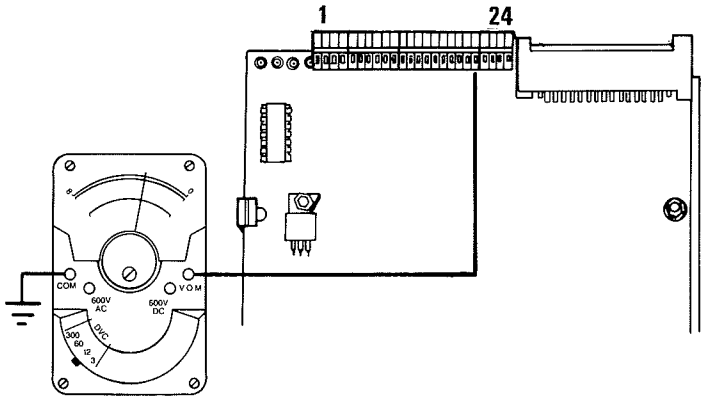
NO Go to page 3-600-49.

YES

1. Remove your diskette.
2. Check the voltage from J3-20 to ground while inserting a diskette in drive A. The voltage should be approximately 0 Vdc and increase to approximately 5.0 Vdc as the diskette is inserted.

WARNING: Do not short the pins together when taking voltage readings; damage to the boards may occur.

J-3 Connectors

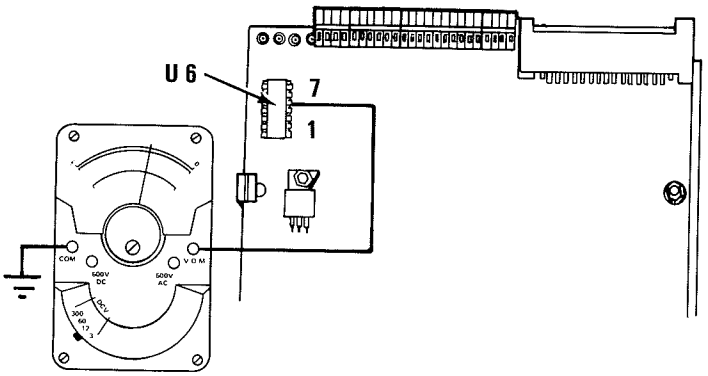


DID THE VOLTAGE INCREASE TO APPROXIMATELY 5 Vdc?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Remove your diskette.
2. Check the voltage from U6-pin 5 to ground while inserting a diskette. The voltage should decrease from approximately 5.0 Vdc to approximately 0 Vdc as the diskette is inserted.



DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

The Advanced Diagnostics diskette should have loaded, and the first diagnostic menu should be on your display.

```
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
3 – PREPARE SYSTEM FOR RELOCATION
9 – EXIT TO SYSTEM DISKETTE
ENTER THE ACTION DESIRED
? _
```

IS THIS MENU ON YOUR DISPLAY?

NO Go to page 3-600-53.

YES

Follow the steps below to test the write protect feature.

1. Select option 1 (FORMAT DISKETTE) by pressing the 1 and then press Enter.
2. Select the drive to be tested (A or B) and insert a scratch diskette that is write protected into the selected drive, then press Enter.
3. The message illustrated below will be displayed if the write protect feature is working properly.

```
FORMAT NOT COMPLETED
WRITE PROTECTED DISKETTE
DRIVE B, TRACK 0, HEAD 0, SECTOR 0
```


WAS THIS MESSAGE DISPLAYED?

NO Go to page 3-600-73.

YES

Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you have only one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is incorrect, follow the instructions on the screen to correct the list before answering yes).
4. Press 1 (RUN TESTS MULTIPLE TIMES) then press Enter.
5. Press 6 (X DISKETTE DRIVE(S) AND ADAPTER) then press Enter.
6. Press 1 (ENTER NUMBER OF TIMES TO RUN TESTS) then press Enter.
7. Press Y (WAIT EACH TIME AN ERROR OCCURS (Y/N) ?) then press Enter.

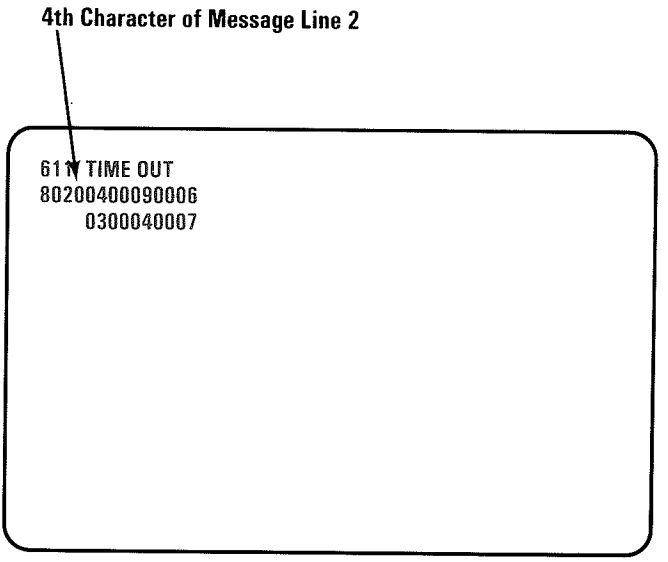
```
611 TIME OUT        C
80210200090006
    0301020005
```

DID AN ERROR CODE SIMILAR TO THIS APPEAR?

NO Go to page 3-600-70.

YES

The fourth character in line 2 indicates which diskette drive is failing. If the character is a 0, the failure is with drive A. If the character is a 1, the failure is with drive B.



IS THE FOURTH CHARACTER OF LINE TWO A 0?

NO Set the Power switch on the system unit (and expansion unit, if attached) to Off.
Exchange the signal cable connectors for drives A and B (the drive that was drive B will now be recognized by the machine as drive A). Go to page 3-600-2.

If you still have the same failure after exchanging connectors, go to page 3-600-71.

YES

Repeat steps 1 through 7 on page 3-600-46 using another formatted diskette. Then return to this page.

Error Code	Page
606	3-600-68
607	3-600-73
608	3-600-68
611	3-600-68
612	3-600-67
613	3-600-67
621	3-600-67
622	3-600-67
623	3-600-67
624	3-600-67
625	3-600-67
626	3-600-67

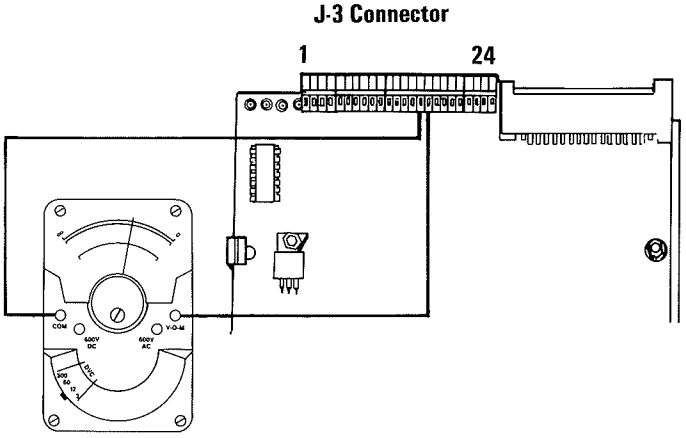
DO YOU STILL HAVE AN ERROR?

NO Replace the diskette you used for the first test.

YES Find your error code in the table and go to the page listed.

If the diagnostic routines run correctly but the LED does not light, you may have a bad LED.

1. Connect the voltage lead of your meter to J3-16 and the common lead to J3-15 of the diskette printed circuit board.
2. Check for a minimum of 1.5 Vdc when the spindle is turning.

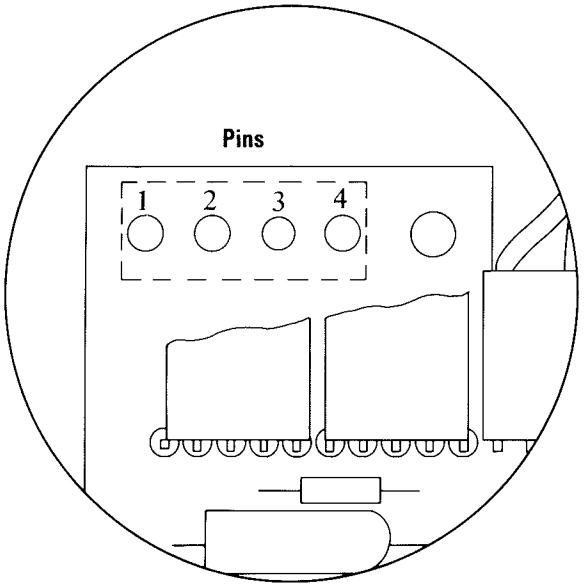


DID THE LED FAIL TO LIGHT, BUT THE DIAGNOSTICS RAN CORRECTLY, AND THE VOLTAGE MEASURED AT LEAST 1.5 Vdc?

NO Continue on the next page.

YES Replace the LED assembly. See Section 5, "Removal/Replacement and Adjustments."

Check the power connector on diskette drive A for the voltages listed in the table below.



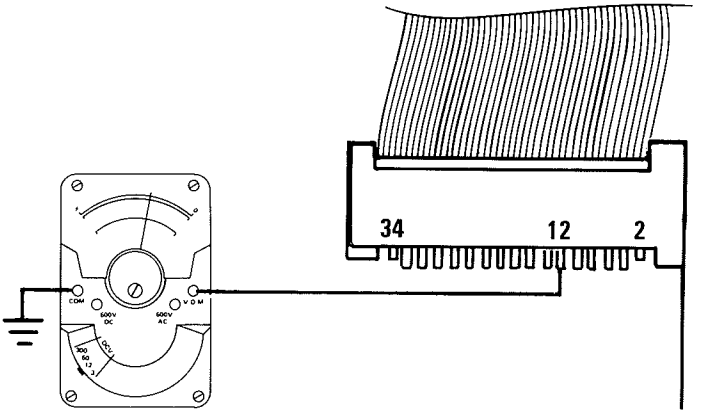
Diskette Drive Power Connector			
Min Vdc	Max Vdc	−Lead	+Lead
+ 4.8	+ 5.2	2	4
+11.5	+12.6	3	1

ARE THE VOLTAGES WITHIN THE LIMITS SHOWN IN THE TABLE?

NO Go to PIC 3-020-1, "Power."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Ensure the terminating resistor is correctly inserted. It should be installed in the printed circuit board of drive A and should not be in the printed circuit board of drive B. See Section 4, "Locations."
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.
4. Check the voltage at pin 12 on the diskette signal cable's connector for approximately 5.0 Vdc at the start of POST.

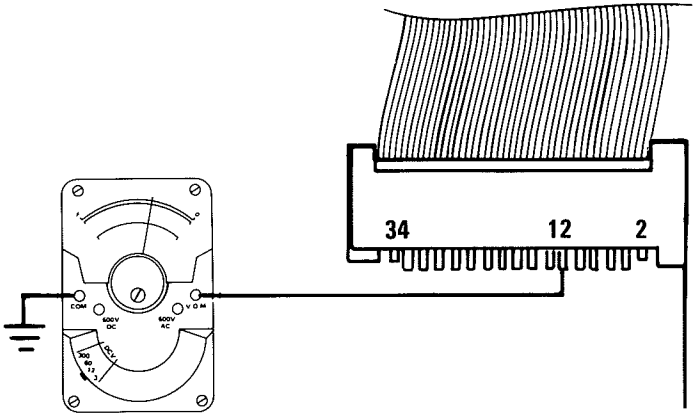


WAS THE VOLTAGE APPROXIMATELY 5.0 Vdc AT THE START OF POST?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check that the voltage at pin 12 on the signal cable connector decreased from approximately 5.0 Vdc at the start of POST, to approximately 0 Vdc during POST.

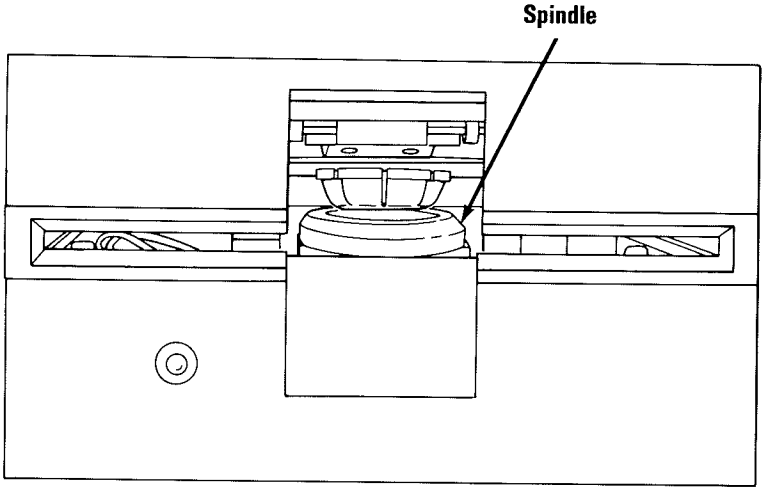


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc DURING POST?

NO Go to page 3-600-71.

YES Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

1. Remove the diskette.
2. Set the Power switch on the system unit (and expansion unit, if attached) to Off and wait 5 seconds.
3. Set the Power switch on the expansion unit (if attached) and system unit to On.
4. Observe the spindle during POST.



Front View-Diskette Drive

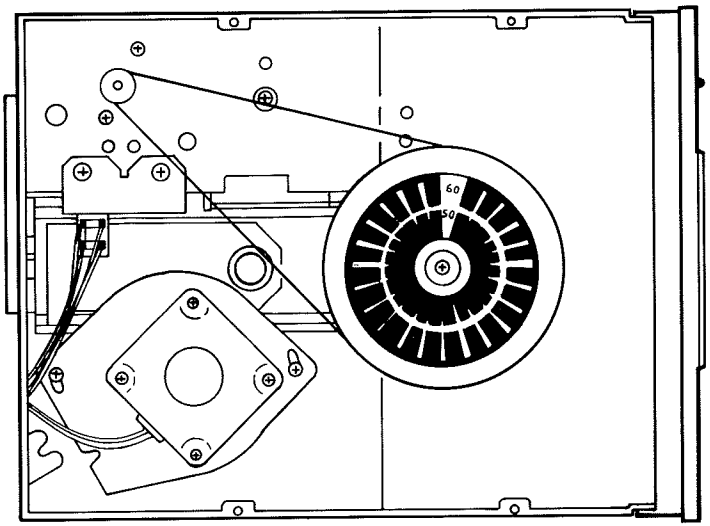
DID THE SPINDLE BEGIN TO ROTATE ON DRIVE A BEFORE THE "BEEP" AT THE END OF POST?

NO Go to page 3-600-62.

YES

Use the drive motor preliminary speed adjustment to check the speed of the diskette drive. See Section 5 "Removal/ Replacement and Adjustments."

Note: A fluorescent light is needed to see the strobe effect on this test.



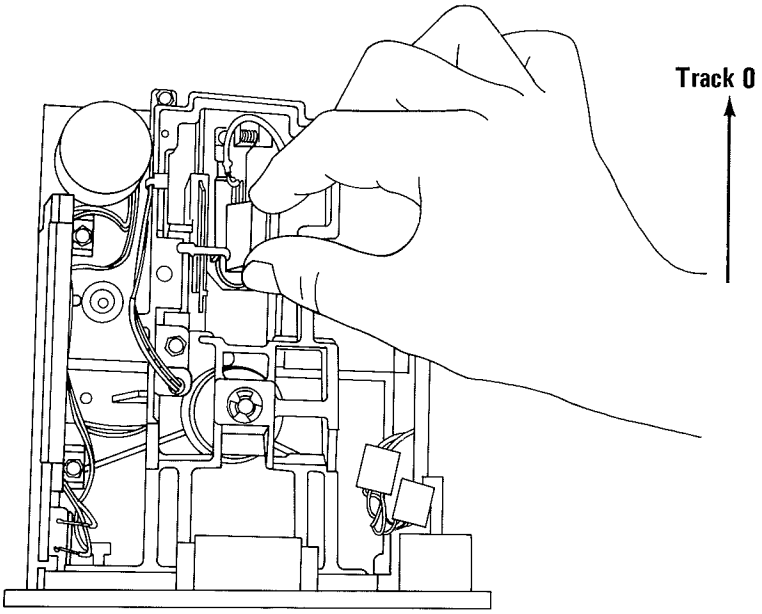
WAS THE SPEED OF THE DISKETTE DRIVE CORRECT?

NO Adjust the speed of the diskette drive. If unable to adjust, go to page 3-600-64.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.

Note: The head is moved under power by a stepper motor. When you move the head by hand, you will feel some resistance, but the head should not bind.



DID THE HEAD MOVE TO TRACK 0 WITH NO BINDS?

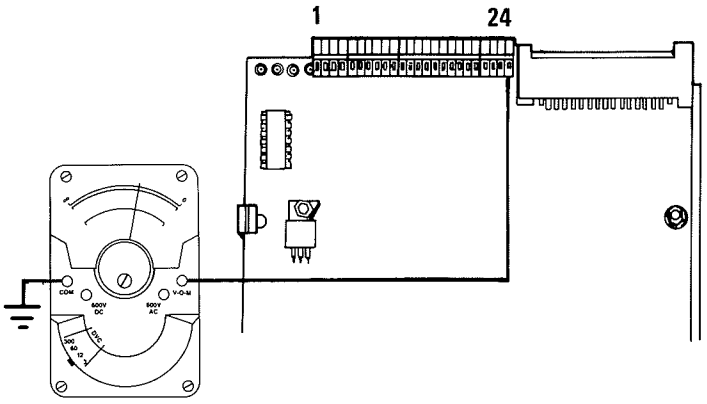
NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. With the head still at track 0, reinstall the diskette drive printed circuit board. See Section 5, "Removal/ Replacement and Adjustments."
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check the voltage at J3-24. It should be approximately 5.0 Vdc before the LED lights at the end of POST.

Note: The head may move away from track 0 during this test. If you run this test a second time, reposition the head to track 0.

J-3 Connector

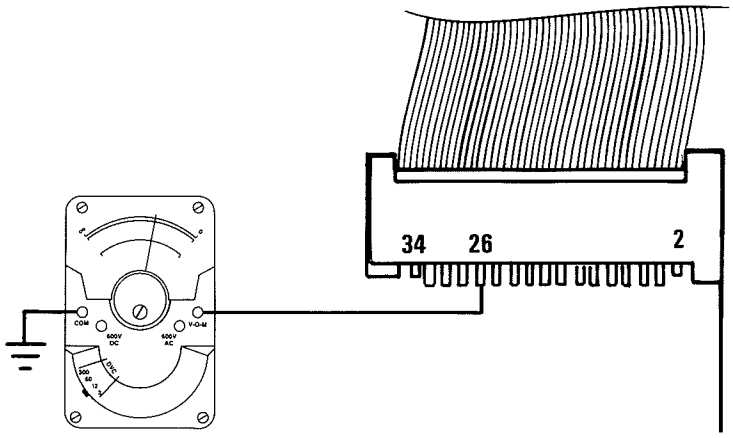


WAS THE VOLTAGE APPROXIMATELY 5.0 Vdc?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.
4. Reinstall the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
5. Set the Power switch on the expansion unit (if attached) and the system unit to On.
6. The voltage at pin 26 on the signal cable's connector should read approximately 5.0 Vdc at the start of POST.

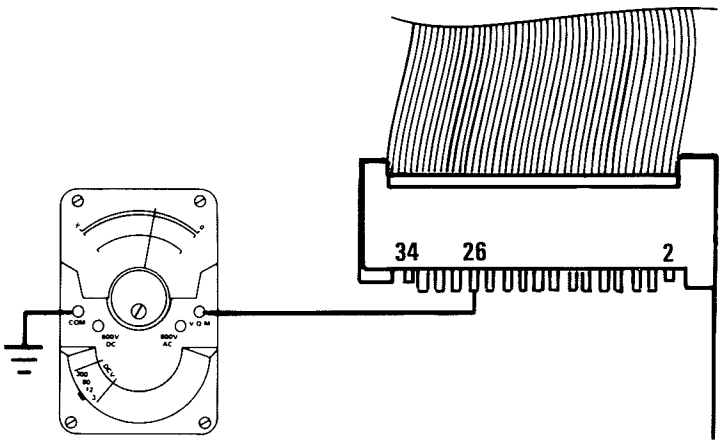


WAS THE VOLTAGE APPROXIMATELY 5.0 Vdc AT THE START OF POST?

NO Go to page 3-600-71.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Move the read/write head assembly to the rear of the diskette drive assembly until it reaches track 0.
4. Reinstall the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
5. Set the Power switch on the expansion unit (if attached) and system unit to On.
6. The voltage at pin 26 on the signal cable's connector should read approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc as the LED lights at the end of POST.

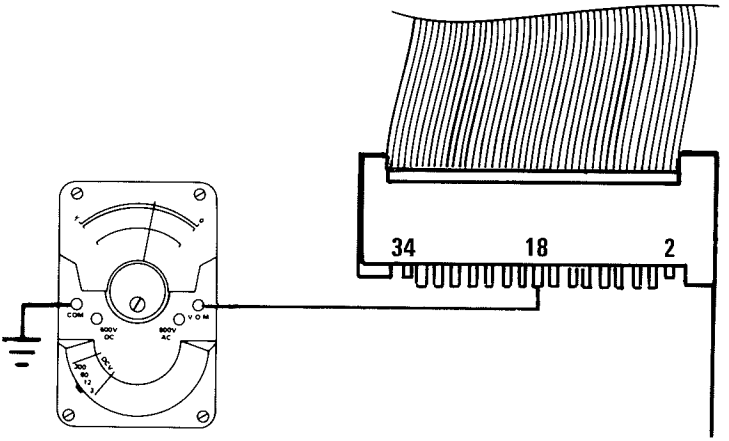


DID THE VOLTAGE DECREASE TO APPROXIMATELY 0 Vdc?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Ensure the terminating resistor is correctly inserted. It should be installed in the printed circuit board of drive A and should not be in the printed circuit board of drive B. See Section 4, "Locations."
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.
4. Check the voltage at pin 18 of the signal cable's connector. The voltage should be approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc before the "beep" at the end of POST.

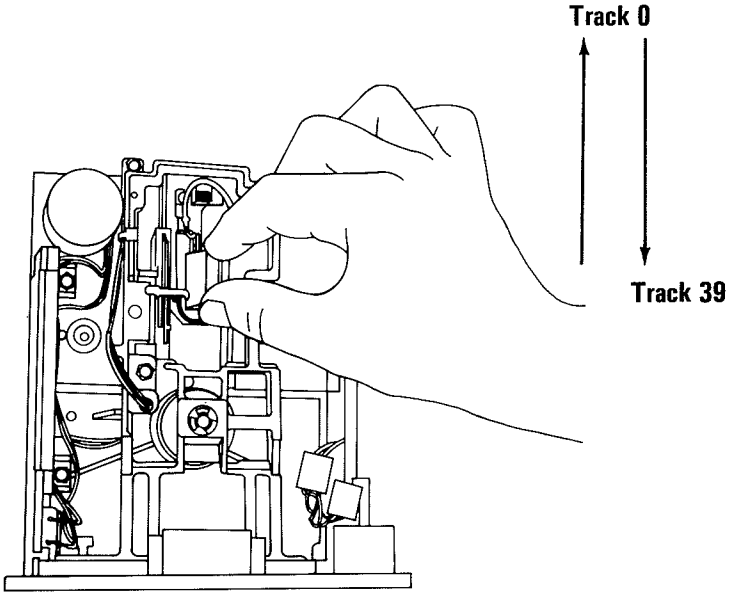


DID THE VOLTAGE AT PIN 18 DECREASE TO APPROXIMATELY 0 Vdc?

NO Go to page 3-600-71.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Partially remove the diskette drive printed circuit board. Leave all connectors on except HD0 and HD1. See Section 5, "Removal/Replacement and Adjustments."
3. Lift the diskette drive printed circuit board just enough to observe the head assembly.
4. Move the head assembly away from track 0.
5. Set the Power switch on the expansion unit (if attached) and the system unit to On.
6. Observe the motion of the head assembly.

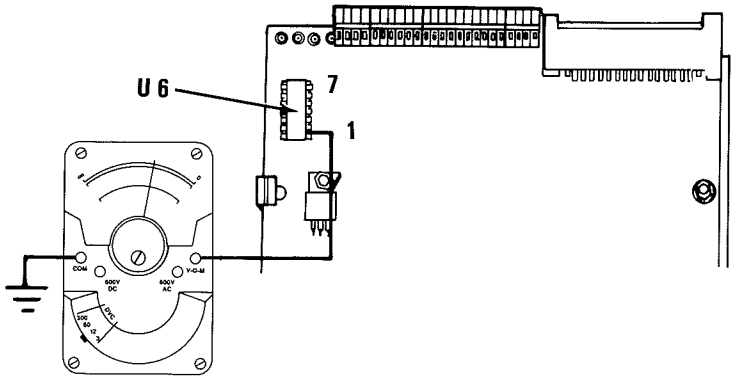


DOES THE HEAD ASSEMBLY MOVE TO TRACK 0 AND THEN AWAY FROM IT BEFORE THE END OF THE POST?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Reinstall the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."
3. Insert your Advanced Diagnostics diskette.
4. Set the Power switch on the expansion unit (if attached) and the system unit to On.
5. Check for an increase in voltage (approximately 0.2 Vdc) at U6-pin 1 of the diskette drive printed circuit board while the LED is on during POST.

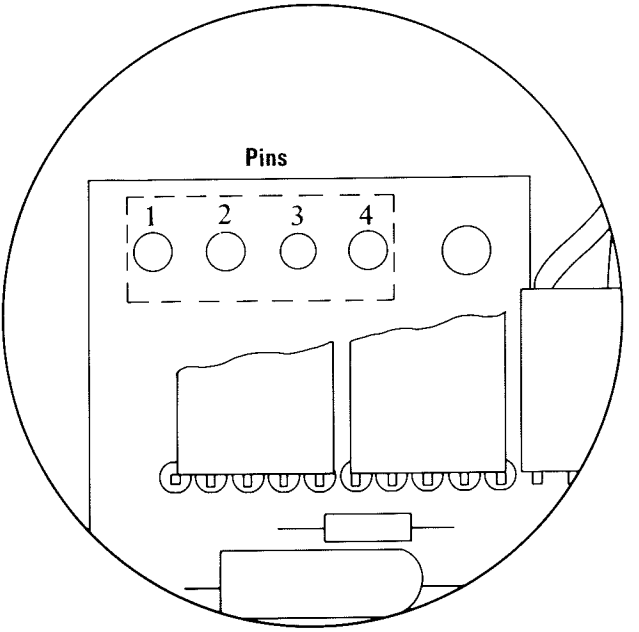


DOES THE VOLTAGE AT U6-PIN 1 INCREASE WHEN THE LED IS ON?

NO Replace the diskette drive assembly. See Section 5, "Removal/Replacement and Adjustments."

YES Go to page 3-600-71.

Check the diskette drive's power connector for the voltages listed in the table below.



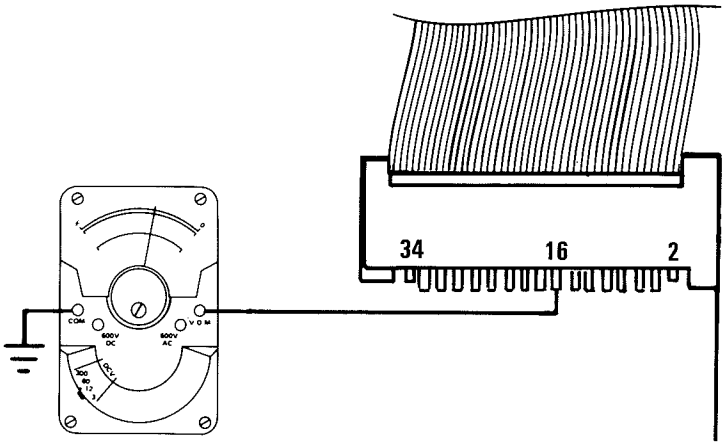
Diskette Drive Power Connector			
Min Vdc	Max Vdc	– Lead	+ Lead
+ 4.8	+ 5.2	2	4
+ 11.5	+ 12.6	3	1

ARE THE VOLTAGES WITHIN THE LIMITS SHOWN IN THE TABLE?

NO Go to PIC 3-020-1, "Power."

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Check for the voltage at pin 16 on the signal cable's connector. The voltage should be approximately 5.0 Vdc at the start of POST and should decrease to approximately 0 Vdc before the "beep" at the end of POST.

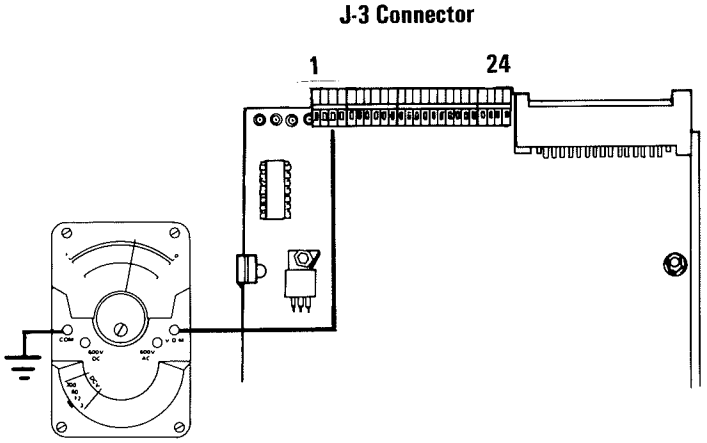


DID THE VOLTAGE AT PIN 16 DECREASE TO APPROXIMATELY 0 Vdc?

NO Go to page 3-600-71.

YES

Check for a voltage of 3 to 9 Vdc at J3-3 when the LED is on.

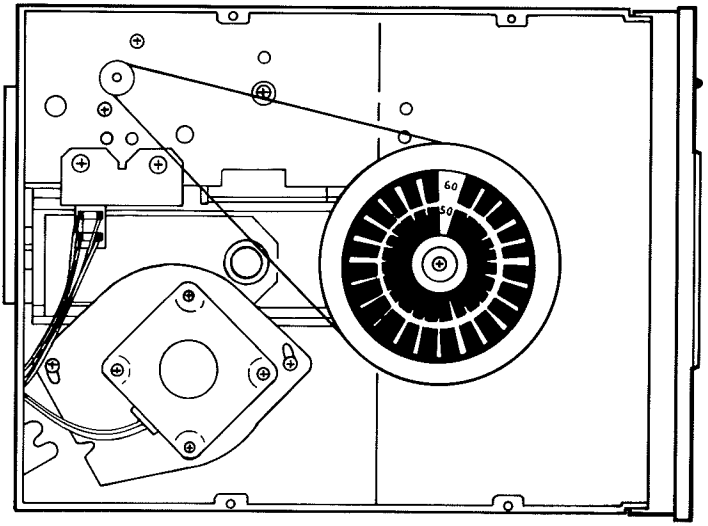


WAS THE VOLTAGE CORRECT?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES

Check the diskette drive belt.

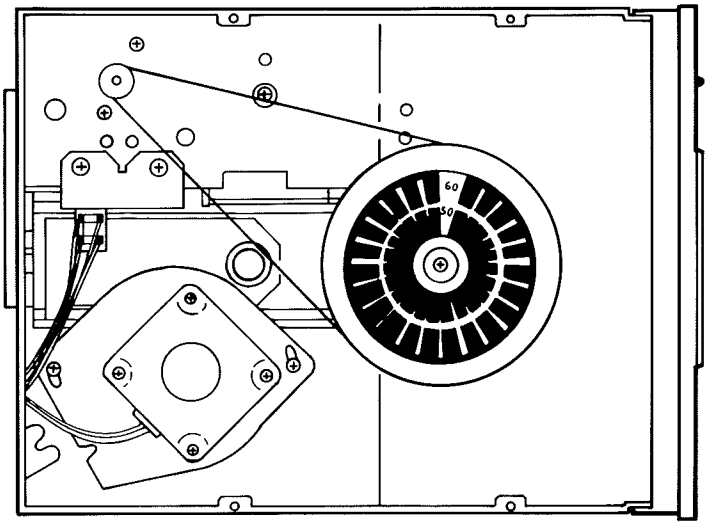


IS THE DRIVE BELT INSTALLED ON THE PULLEYS CORRECTLY AND IN GOOD CONDITION?

NO Replace the drive belt. See Section 5, "Removal/Replacement and Adjustments."

YES

Remove the diskette drive belt and turn the spindle to ensure it turns freely and without binds.



DOES THE SPINDLE TURN FREELY?

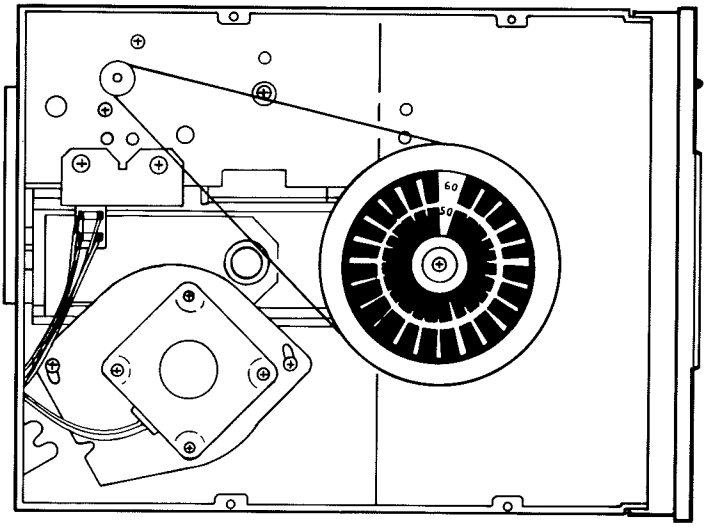
NO Replace the spindle assembly. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive motor. See Section 5, "Removal/Replacement and Adjustments."

1. Use the drive motor preliminary speed adjustment to check the diskette drive speed. See Section 5, "Removal/Replacement and Adjustments." Adjust the speed if necessary.

   Note: A fluorescent light is needed to see the strobe effect on this test.

2. Refer to steps 1 thru 7 on page 3-600-46 to run diagnostic tests on a formatted diskette. Then return to this page.



DO YOU STILL HAVE AN ERROR CODE?

NO Run diagnostic tests to verify you have fixed the problem.

YES Go to page 3-600-68 and follow the instructions for your error code.

Do not use this table, unless you are directed here by an earlier step in this PIC.

Diskette Drive Error Codes

Error Code	Probable Cause	Corrective Action
606	Your signal cable, diskette drive adapter, or diskette drive assembly has failed.	Go to page 3-600-71 and check the continuity of the signal cable. If you still have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."
607	Write Protect Error	Go to page-3-600-73.
608	There is a problem with your Advanced Diagnostics diskette.	Use your backup copy of the Advanced Diagnostics diskette.
611	Your signal cable, diskette drive adapter, or diskette drive has failed.	Go to page 3-600-71 and check the continuity of the signal cable. If you have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."

Do not use this table, unless you are directed here by an earlier step in this PIC.

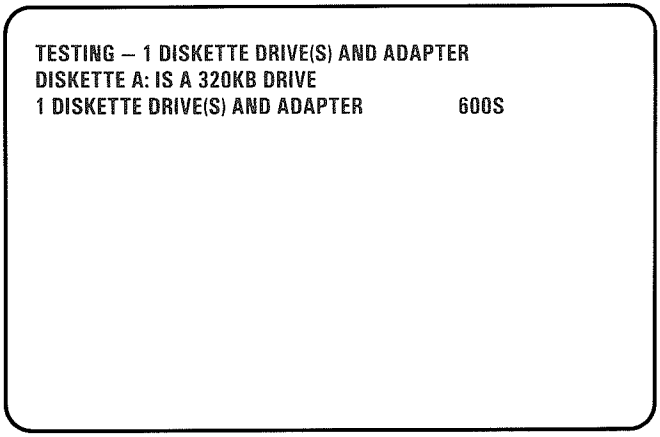
Diskette Drive Error Codes

Error Code	Probable Cause	Corrective Action
612	Your signal cable, or diskette drive adapter has failed.	Go to page 3-600-71.
613	Your signal cable or diskette drive adapter has failed.	Go to page-3-600-71.
621 622 623 624 625 626	Your signal cable, diskette drive adapter, or diskette drive has failed.	Go to page 3-600-71 and check the continuity of the signal cable. If you still have the same error replace the diskette drive. See Section 5, "Removal/Replacement and Adjustments."

Insert a scratch diskette in each diskette drive and then press Enter.

The screen will display the configuration of the diskette drive(s) installed in your system. The XXXKB is the type of drive(s).

Note: All type 2 diskette drives are 320KB.



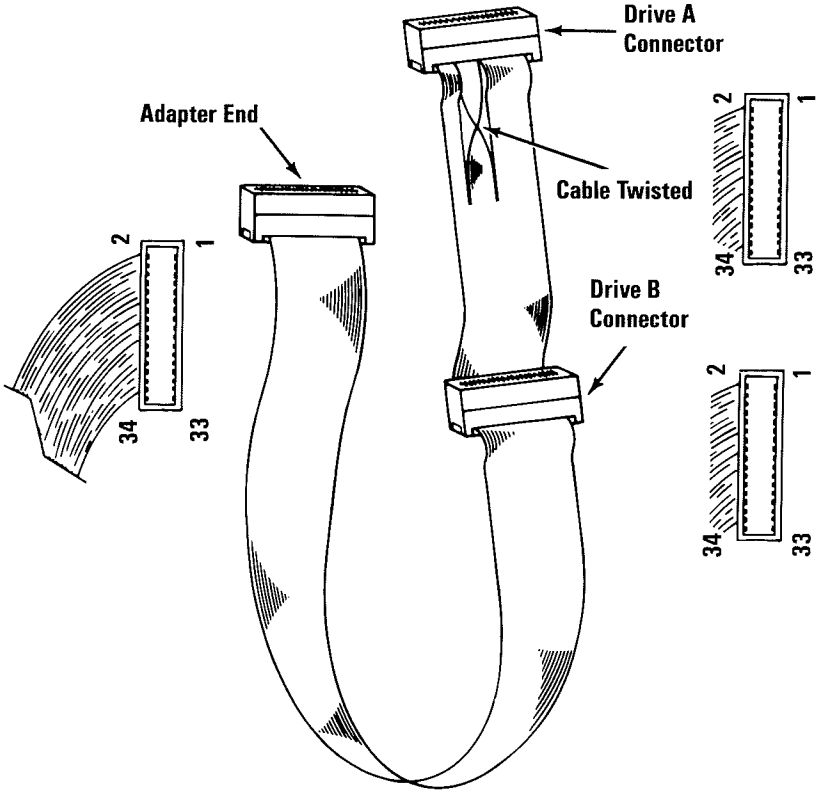
ARE THE DISKETTE DRIVE(S) CORRECT?

NO Replace the diskette drive assembly that is shown incorrectly in the message. See Section 5, "Removal/Replacement and Adjustments."

YES Go to page 3-600-76.

You may have a bad connection or a broken wire. Perform the following continuity check of the diskette drive signal cable.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Disconnect the diskette drive signal cable from the diskette adapter and the diskette drive.
3. Carefully inspect the cable connectors for bent or broken contacts. Inspect the connectors on the adapter and on the diskette drive printed circuit board for cracks or corrosion.
4. Set meter on the Ohms (x1) scale.
5. Refer to the tables on the next page and check the continuity of the signal cable. The meter should indicate approximately 0 ohms resistance.



Note: Check continuity pin number to pin number except the pins preceded by an asterisk.

Diskette Drive A Signal-Cable Connector		Diskette Drive B Signal-Cable Connector	
Even Pin Numbering		Even Pin Numbering	
Diskette	Adapter	Diskette	Adapter
2	2	2	2
4	4	4	4
6	6	6	6
8	8	8	8
*10	16	10	10
*12	14	12	12
*14	12	14	14
*16	10	16	16
18	18	18	18
20	20	20	20
22	22	22	22
24	24	24	24
26	26	26	26
28	28	28	28
30	30	30	30
32	32	32	32
34	34	34	34
Odd Pin Numbering		Odd Pin Numbering	
Diskette	Adapter	Diskette	Adapter
1	1	1	1
3	3	3	3
5	5	5	5
7	7	7	7
9	9	9	9
*11	15	11	11
13	13	13	13
*15	11	15	15
17	17	17	17
19	19	19	19
21	21	21	21
23	23	23	23
25	25	25	25
27	27	27	27
29	29	29	29
31	31	31	31
33	33	33	33

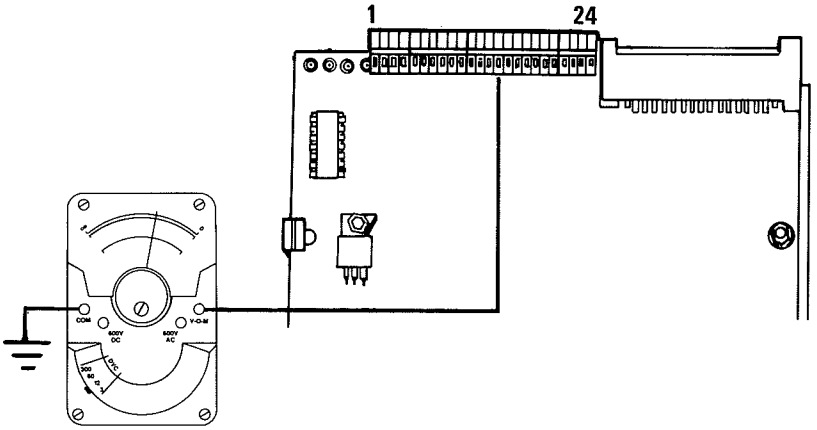
WAS THE CONTINUITY OF THE SIGNAL CABLE CORRECT?

NO Replace the signal cable. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive adapter. See Section 5, "Removal/Replacement and Adjustments."

1. Remove your diskette.
2. Check the voltage from J3-14 to ground while partially inserting and removing a diskette from the drive. This will operate the write protect switch. The voltage should decrease from approximately 5.0 Vdc to approximately 0 Vdc each time the switch is operated.

J-3 Connector

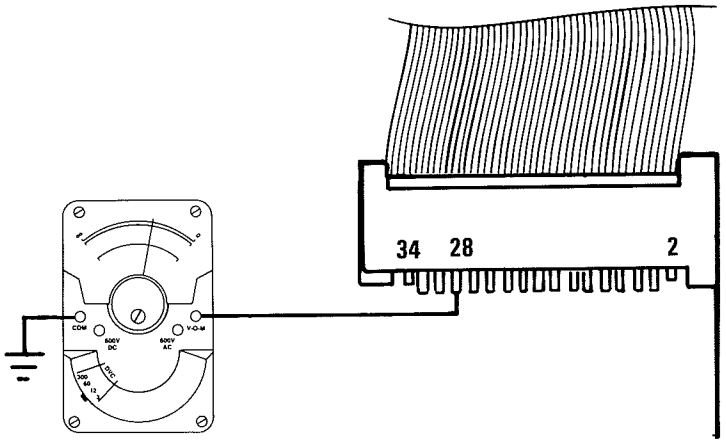


DID THE VOLTAGE DECREASE FROM APPROXIMATELY 5.0 Vdc TO APPROXIMATELY 0 Vdc EACH TIME THE SWITCH WAS OPERATED?

NO Replace the write protect switch. See Section 5, "Removal/Replacement and Adjustments."

YES

1. Remove your diskette.
2. Check the voltage at J1-28. The voltage should be approximately 5.0 Vdc.

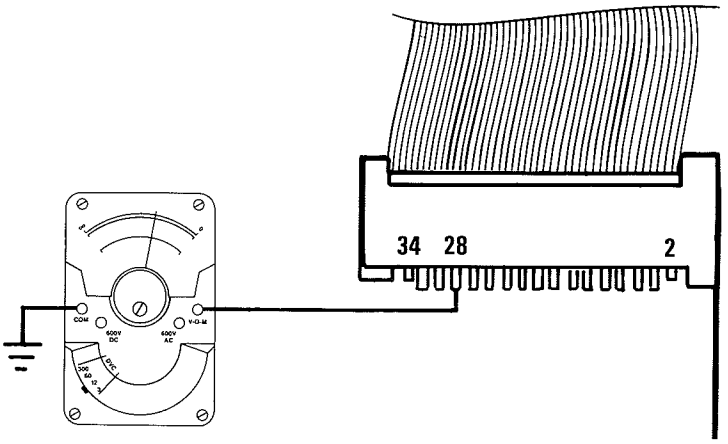


IS THE VOLTAGE APPROXIMATELY 5.0 Vdc?

NO Go to page 3-600-71.

YES

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off for 5 seconds.
2. Set the Power switch on the expansion unit (if attached) and the system unit to On.
3. Partially insert and remove a diskette from the diskette drive to operate the write protect switch, and measure the voltage at J1-28 while the LED is lit. The voltage should be approximately 5.0 Vdc and decrease to approximately 0 Vdc each time the write protect switch is operated. To test drive B exchange the signal cable connectors and perform the same steps.



DID THE VOLTAGE CHANGE FROM APPROXIMATELY 5.0 Vdc TO APPROXIMATELY 0 Vdc EACH TIME THE WRITE PROTECT SWITCH WAS OPERATED WHILE THE LED WAS LIT?

NO Replace the diskette drive printed circuit board. See Section 5, "Removal/Replacement and Adjustments."

YES Replace the diskette drive adapter. See Section 5, "Removal/Replacement and Adjustments."

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

---

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should request technical assistance.

Math Coprocessor

You have entered this PIC because you have a 7XX error code or have identified a Math Coprocessor problem. Follow the steps on this page to run the diagnostic routines.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.

The menu below should be displayed.

```
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
3 – PREPARE SYSTEM FOR RELOCATION
9 – EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? _
```

CONTINUE

Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you have only one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is incorrect, follow the instructions on your screen and correct the list before answering yes.)
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Press 7 (MATH COPROCESSOR) then press Enter.

   The message on the screen below should appear for ten seconds or less.

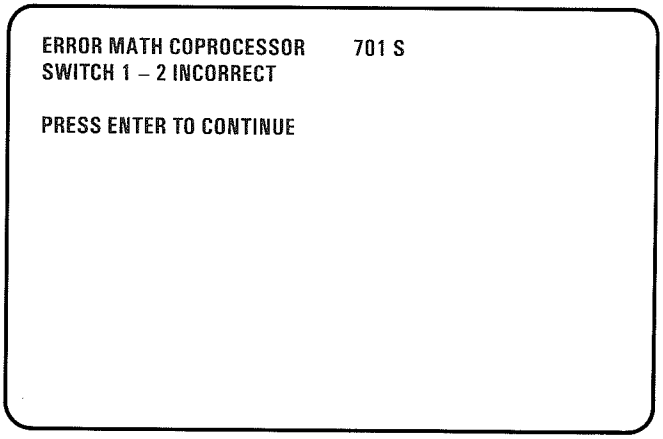
```
TESTING MATH COPROCESSOR
```

WAS THIS MESSAGE DISPLAYED FOR TEN SECONDS OR LESS?

NO Replace the Math Coprocessor and 8088 processor. See Section 5, "Removal/Replacement and Adjustments."

YES

You may receive an error message similar to the one below.

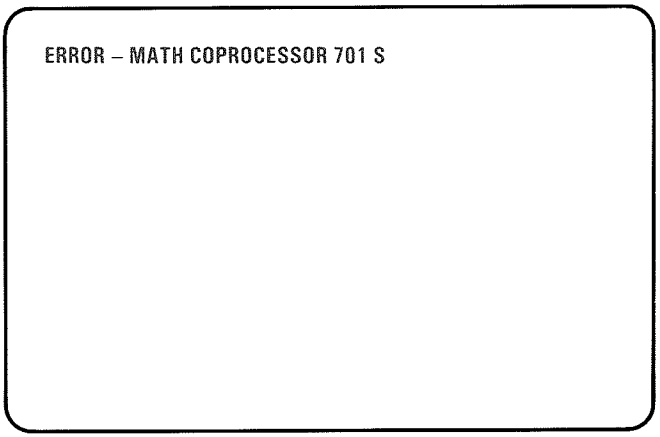


DID YOU COMPLETE THE TEST WITHOUT THIS ERROR MESSAGE?

NO Set all Power switches to Off. Set switch block 1, switch 2 to Off (see Section 6, "Switch Settings") and run the test again. If the switch is in the correct position remove the Math Coprocessor and the 8088 processor from the system board. Replace the system board. See Section 5, "Removal/Replacement and Adjustments."

YES

You may receive an error message similar to the one below.



DID YOU COMPLETE THE TEST WITHOUT THIS ERROR MESSAGE?

NO Replace the Math Coprocessor and 8088 processor. See Section 5, "Removal/Replacement and Adjustments."

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should request technical assistance.

Notes:

Printer Adapter

You have entered this PIC because you have a 90X error code or have identified a printer adapter problem. Follow the steps on this page to run the diagnostic routines.

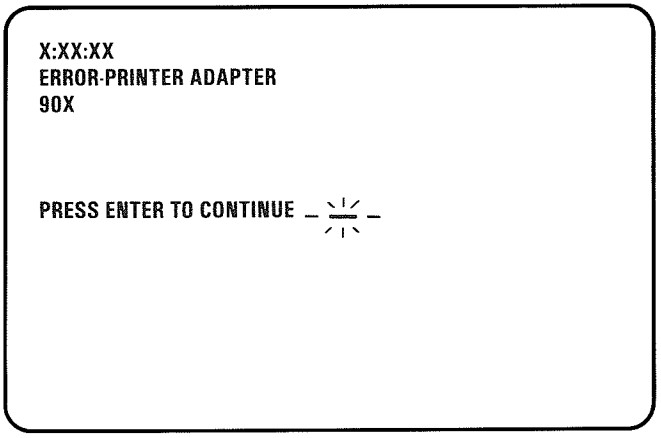
1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Remove the option cable from the option adapter.
3. Load the Advanced Diagnostics diskette in drive A.
4. Set the Power switch on the expansion unit (if attached) and system unit to On.
5. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

CONTINUE 

(Skip the next step if you only have one display adapter installed)

1. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
2. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is incorrect, follow the instructions on the display to correct the list before answering yes.)
3. Press 0 (RUN TESTS ONE TIME) then press Enter.
4. Press 9 (PRINTER ADAPTER) then press Enter.

You may receive an error message similar to the one below.



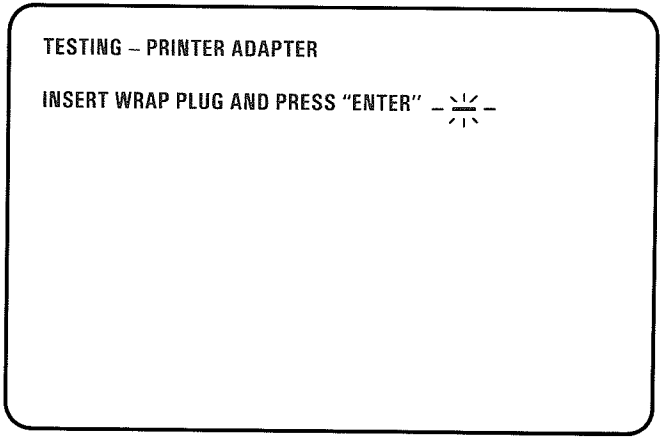
DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO Replace the printer adapter. See Section 5, "Removal/Replacement and Adjustments."

YES

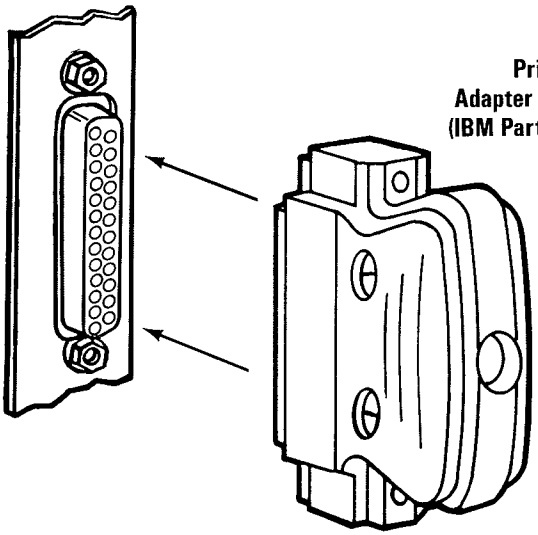
If you did not receive an error message, you would have received a message similar to the one below.

Note: Do not press Enter at this time.



CONTINUE

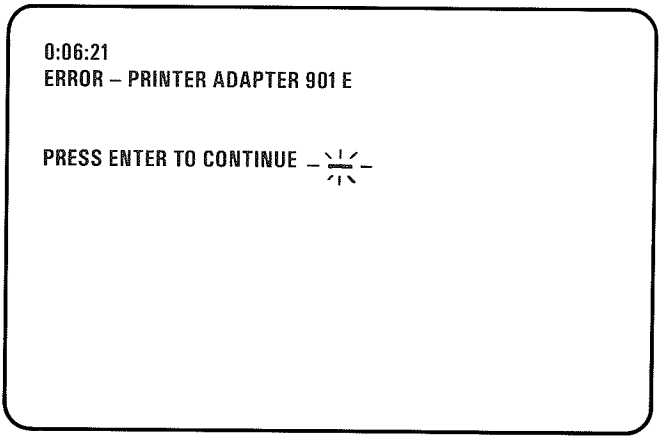
Install the printer adapter wrap plug, as shown below. (If you do not install the wrap plug, you will receive an invalid error message.)



Printer Adapter Wrap Plug (IBM Part 8529228)

CONTINUE

Press Enter to begin the test. An error message similar to the one shown below may appear.



DID YOU RECEIVE AN ERROR MESSAGE?

NO Remove the printer adapter wrap plug. You may want to run additional tests on the printer attached to this adapter. See PIC 3-1400-1, "Printer."

YES Replace the printer adapter. See Section 5, "Removal/Replacement and Adjustments."

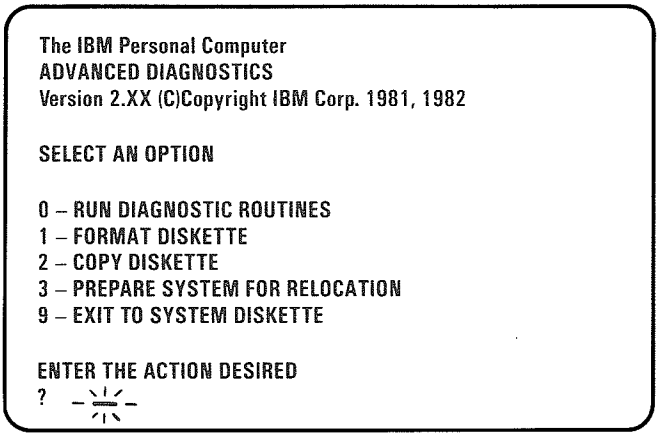
Notes:

Asynchronous Communications

You have entered this PIC because you have an 11XX error code or have identified a problem with asynchronous communications.
Before running the diagnostic routines, refer to Section 4, "Locations" and ensure that the following conditions are met:
The primary asynchronous communications adapter must be set for "Primary Asynchronous Adapter" operation.
If there is a second asynchronous communications adapter, it must be set for "Alternate Asynchronous Adapter" operation.
All asynchronous communications adapters must be set for RS232-C operation.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.

The screen shown below should be displayed.



CONTINUE

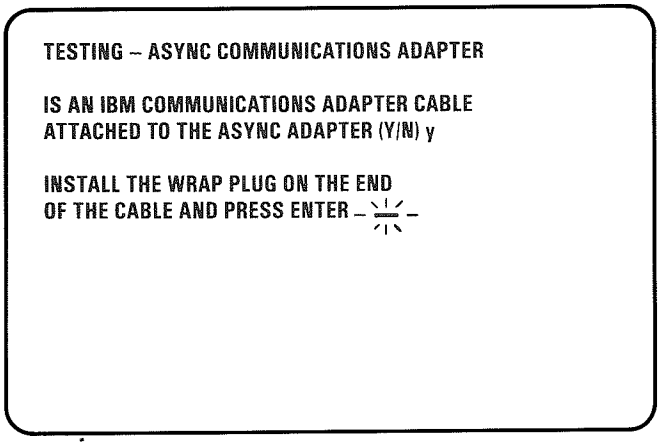
Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES), then press Enter.

(Skip Step 2 if you only have one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is not correct, follow the instructions on your display and correct the list before answering yes.)
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Select 11 (ASYNC COMMUNICATIONS ADAPTER) then press Enter.
6. Press Y or N (IS AN IBM COMMUNICATIONS CABLE ATTACHED?) then press Enter.

The screen should now say to install the wrap plug on either the async adapter, or on the IBM Communications Cable.

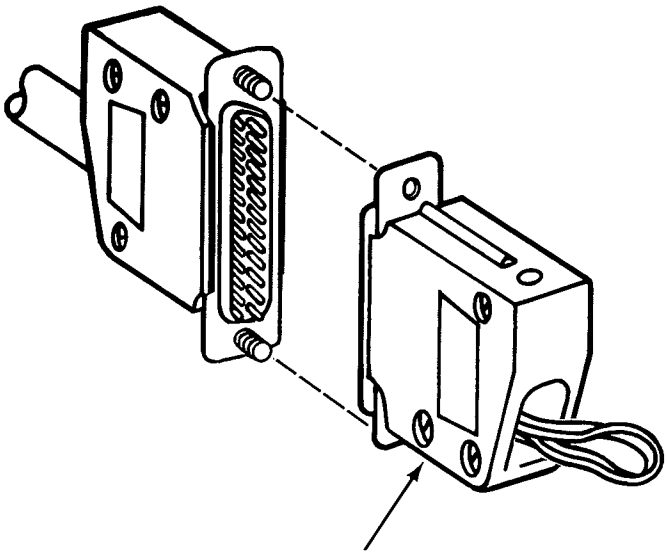


IS AN IBM COMMUNICATIONS CABLE ATTACHED?

NO Go to page 3-1100-4.

YES

1. Refer to the figure below and install the wrap plug on the modem end of the IBM Communications Adapter Cable.
2. Press Enter to begin the test. The test may take up to 15 seconds.



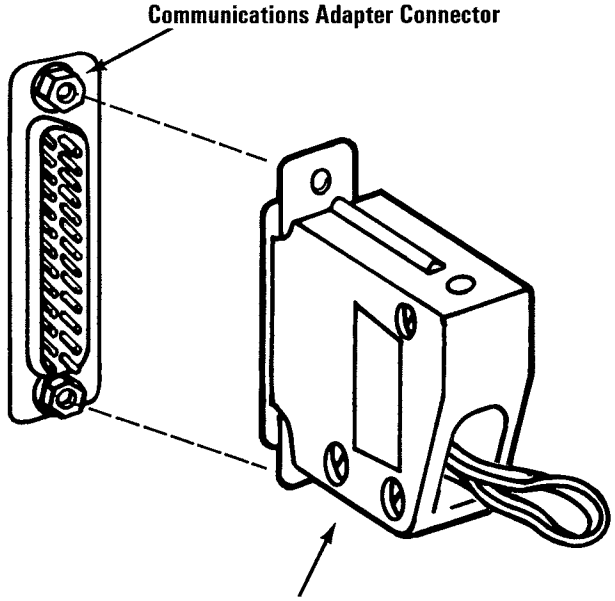
IBM Communications Adapter Wrap Plug (IBM Part 8529280)

DOES THE MESSAGE ON YOUR DISPLAY INSTRUCT YOU TO INSTALL THE WRAP PLUG ON THE ASYNC ADAPTER?

NO Go to page 3-1100-5.

YES

1. Remove the communications cable (if attached) from the async adapter.
2. Refer to the figure below and install the wrap plug on the async adapter.
3. Press Enter to begin the test. The test may take up to 15 seconds.



DID THE TEST RUN WITHOUT AN ERROR?

NO If the error message says to replace the cable, do so. If it says to replace the async adapter, do so. See Section 5, "Removal/Replacement and Adjustments."

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should seek technical assistance.

Notes:

Alternate Asynchronous Communications

You have entered this PIC because you have a 12XX error code or have identified a problem with alternate asynchronous communications.
Before running the diagnostic routines, refer to Section 4, "Locations" and ensure that the following conditions are met:
The primary asynchronous communications adapter must be set for "Primary Asynchronous Adapter" operation.
There must be a second asynchronous communications adapter, set for "Alternate Asynchronous Adapter" operation.
Both asynchronous communications adapters must be set for RS232-C operation.

1. Set the Power switch on the system unit (and expansion unit, if attached) to Off.
2. Insert your Advanced Diagnostics diskette in drive A.
3. Set the Power switch on the expansion unit (if attached) and the system unit to On.

The screen shown below should be displayed.

```
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
3 – PREPARE SYSTEM FOR RELOCATION
9 – EXIT TO SYSTEM DISKETTE

ENTER THE ACTION DESIRED
? –
```


CONTINUE

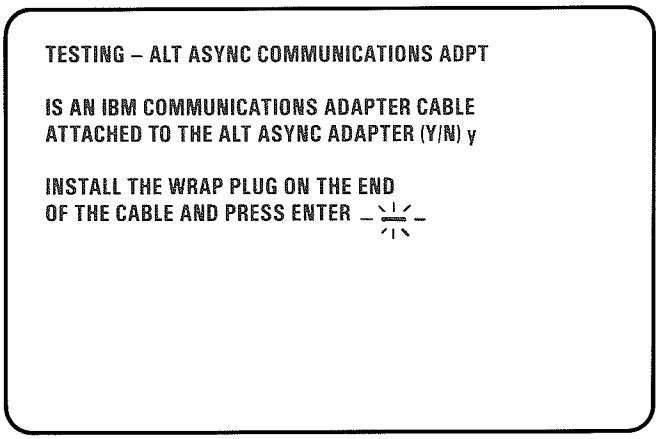
Follow the steps below to run the diagnostic routines.

1. Press 0 (RUN DIAGNOSTIC ROUTINES) then press Enter.

(Skip Step 2 if you only have one display adapter installed.)

2. Press Y or N (IS A MONITOR ATTACHED TO EVERY DISPLAY ADAPTER (Y/N) ?) then press Enter.
3. Press Y or N (IS THE LIST CORRECT (Y/N) ?) then press Enter. (If the list is not correct, follow the instructions on your display and correct the list before answering yes.)
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Select 12 (ALT ASYNC COMMUNICATIONS ADAPTER) then press Enter.
6. Press Y or N (IS AN IBM COMMUNICATIONS CABLE ATTACHED?) then press Enter.

The screen should now say to install the wrap plug on either the alternate async adapter, or on the IBM Communications Cable.

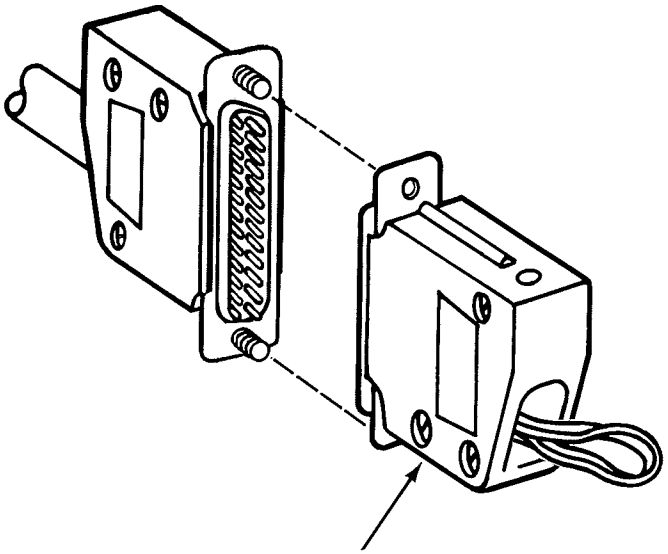


IS AN IBM COMMUNICATIONS CABLE ATTACHED?

NO Go to page 3-1200-4.

YES

1. Refer to the figure below and install the wrap plug on the modem end of the IBM Communications Adapter Cable.
2. Press Enter to begin the test. The test may take up to 15 seconds.



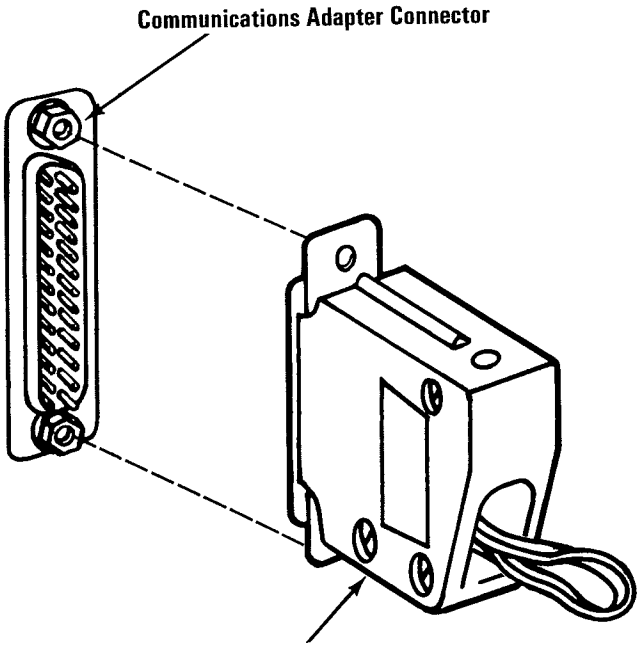
IBM Communications Adapter Wrap Plug (IBM Part 8529280)

DOES THE MESSAGE ON YOUR DISPLAY INSTRUCT YOU TO INSTALL THE WRAP PLUG ON THE ALTERNATE ASYNC ADAPTER?

NO Go to page 3-1200-5.

YES

1. Remove the communications cable (if attached) from the alternate async adapter.
2. Refer to the figure below and install the wrap plug on the alternate async adapter.
3. Press Enter to begin the test. The test may take up to 15 seconds.



DID THE TEST RUN WITHOUT AN ERROR?

NO If the error message says to replace the cable, do so. If it says to replace the alternate async adapter, do so. See Section 5, "Removal/Replacement and Adjustments."

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

If you have followed these procedures and still have an unsolved problem, you should seek technical assistance.

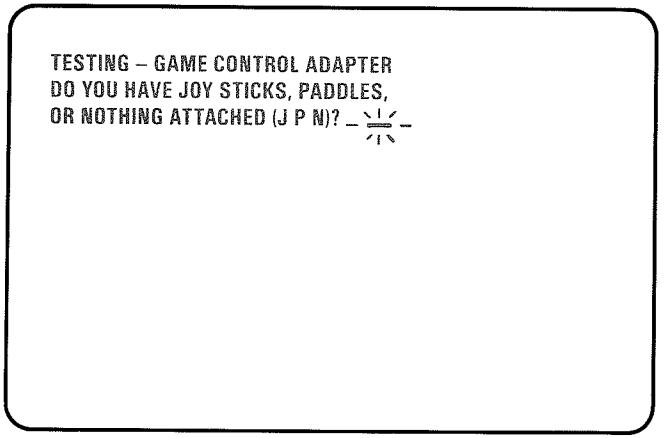
Notes:

Game Control Adapter

You have entered this PIC because you suspect a game control adapter problem or you have an error indicating a game control adapter problem.

1. If you have not already done so, load your Advanced Diagnostics diskette.
2. Press 0 and Enter (RUN DIAGNOSTIC ROUTINES).
3. Verify the installed devices and follow the instructions on the screen to add the game control adapter to the list if it is missing.
4. Press 0 (RUN TESTS ONE TIME) then press Enter.
5. Select 13 (GAME CONTROL ADAPTER) then press Enter.

The following message will appear on your display.



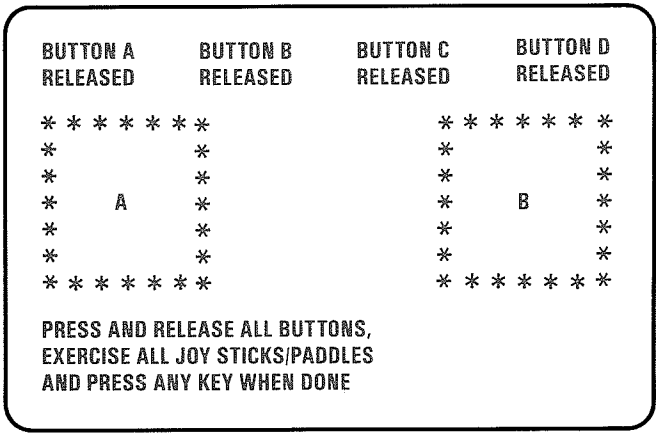
ARE THE JOY STICKS OR PADDLES INSTALLED?

NO Connect the joy sticks or paddles and go to page 3-1300-2.

YES 

1. Press J (joy sticks) or P (paddles) and Enter. Note: If you select N, the routine will exit to the "System Checkout" menu.
2. When the screen displays "HOW MANY BUTTONS DO YOU HAVE (2/4)?"; press 2 or 4 then Enter. Be sure not to choose 4 if you only have 2 buttons.

The following screen will appear.



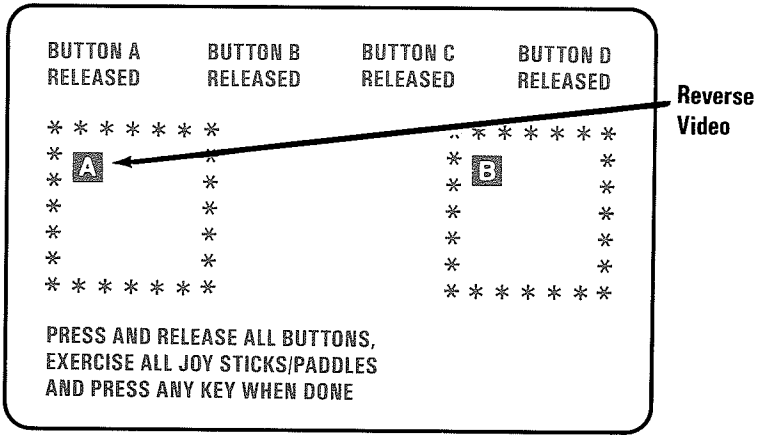
DID THE SCREEN APPEAR WITHOUT AN ERROR CODE?

NO Replace the game control adapter.

YES

Check the joy sticks next. If one or all of the joy sticks/paddles appear on the screen in reverse video you should check the connector before continuing.

1. Move the paddles/joy sticks in all directions on all the installed joy sticks/paddles.
2. Watch to see that the letter inside the box on the display moves in all directions without going into reverse video.

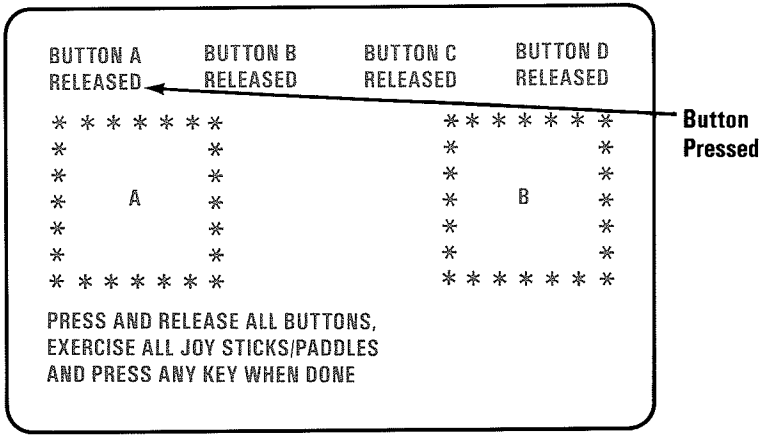


DID ALL JOY STICKS/PADDLES MOVE IN ALL DIRECTIONS WITHOUT GOING INTO REVERSE VIDEO?

NO If the joy sticks/paddles move but go into reverse at the boundary of the box, replace joy sticks. If one joy stick/paddle does not move and stays in reverse video, replace joy sticks. If one or all joy sticks/paddles stay in reverse video but can move, replace game control adapter. See Section 5, "Removal Replacement and Adjustments."

YES

1. Press and release all buttons on the joy sticks/paddles. All the buttons must be pressed or an error code will occur.
   When a button is pressed the corresponding prompt on the display transfers from RELEASED to PRESSED.
2. After pressing all buttons on the joy sticks/paddles, press any key on the keyboard.



DID THE TEST COMPLETE WITHOUT AN ERROR CODE?

NO If all buttons showed PRESSED when tested, replace game control. See Section 5, "Removal Replacement and Adjustments."
If one or all of the buttons did not show PRESSED when tested, replace joy stick/paddles.

YES

You have gone through the PICs without solving your problem. The following steps should help you find additional audio or visual symptoms.

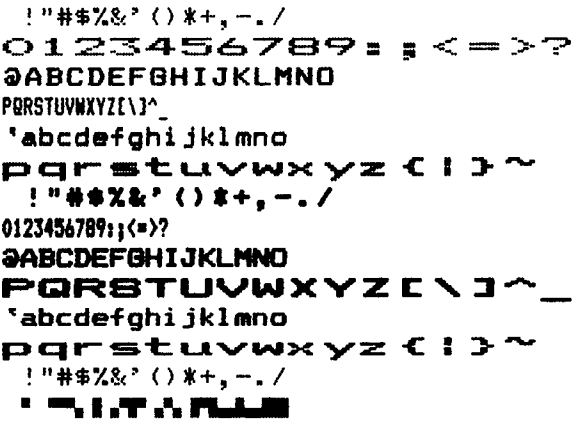
1. Check the entire system for loose or damaged connectors.
2. Return to page 3-2 and review "Start."
3. Select "UTILITIES" in the diagnostic menu, start an error log, and select "RUN TESTS MULTIPLE TIMES." This will allow you to operate the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to page 3-2, "Start," or the appropriate PIC for the symptom you received.

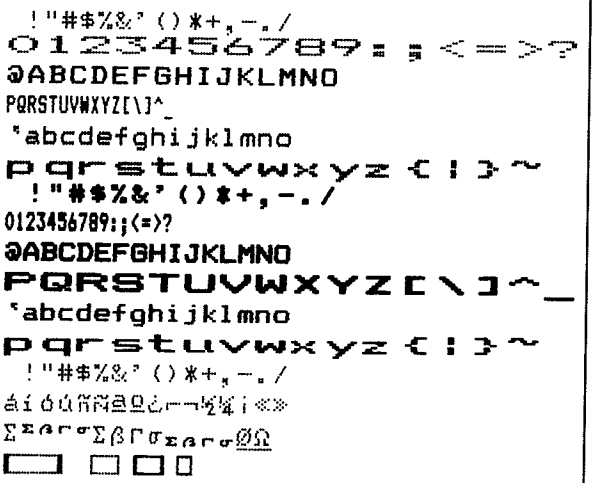
If you have followed these procedures and still have an unsolved problem, you should seek technical assistance.

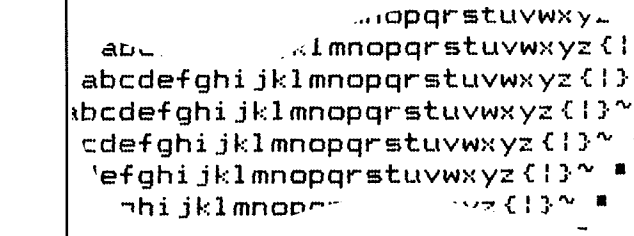
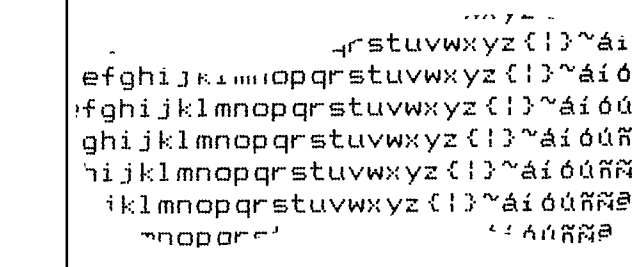
Notes:

Printer

Error Description	Diagnostic Action
1400 Printer Entry	1. Set Printer Power switch to OFF. Verify forms are properly inserted. Move print head to left-most position. Set Printer Power switch to ON. Are the Power, Ready and Online lights on? YES: Go to step 2. NO: Go to page 3-1400-27, "Control Panel," and follow each step until failing FRU is isolated. 2. Press Online switch. Does Online light go out? YES: Go to step 3. NO: Go to page 3-1400-27, "Control Panel." 3. Press Line Feed and Forms Feed. Do forms step when each switch is pressed? YES: Go to step 4. NO: Do forms step when either the Line Feed or the Forms Feed is pressed? YES: Go to page 3-1400-27, "Control Panel." NO: Go to page 3-1400-16, "Forms Do Not Advance," and follow each step until failing FRU is isolated. 4. Remove forms. Press Online switch. Does alarm sound and No Paper light go on? YES: Power Off. Reload forms. Power On. Go to step 5. NO: Go to page 3-1400-27, "Control Panel."

Error Description	Diagnostic Action
1400 Printer Entry	5. Load Advanced Diagnostics diskette if not already loaded. Is option 14 missing from menu? YES: Go to step 6. NO: Run option 14. Does the printer fail to print? YES: Go to step 6. NO: Compare printout with this one. **IBM 80 CPS Matrix Printer**  Continued on the next page.

Error Description	Diagnostic Action
1400 Printer Entry	Step 5 continued. **IBM 80 CPS Graphics Printer**  Any errors? YES: Go to step 6. NO: Go to page 3-1400-6, "Failure Symptom" chart. If a failure symptom still exists, proceed to the corresponding PIC and follow each step until the failing FRU is isolated.

Error Description	Diagnostic Action
1400 Printer Entry	6. Power off the printer and the system unit. Disconnect the signal cable at the printer and the system unit. Run the Offline Diagnostic Test (see page 3-1400-35). Does the printer fail to print? YES: Go to page 3-1400-12, "No Printing," and follow each step until the failing FRU is isolated. NO: Compare the printout with the one below. **IBM 80 CPS Matrix Printer**  **IBM 80 CPS Graphics Printer**  Any errors? YES: Go to page 3-1400-6, "Failure Symptom" chart. Proceed to the corresponding page and follow each step in PIC procedure until the failing FRU is isolated. NO: Go to step 7.

Error Description	Diagnostic Action
1400 Printer Entry	7. Load the Advanced Diagnostics diskette and set the Power switch on the expansion unit (if attached) and the system unit to On. Advance to diagnostic menu 4. Note: If the signal cable was connected to a monochrome display, and printer adapter, option 4 should be displayed. If the cable was connected to a printer adapter, option 9 should be displayed. Is the correct option (4 or 9) missing? YES: Replace the adapter. See Section 5, "Removal/Replacement and Adjustments." NO: Run the diagnostic routines for the option adapter installed. Did the diagnostics run error free? YES: Go to step 8. NO: Replace the adapter. See Section 5, "Removal/Replacement and Adjustments." 8. Check the printer cable. See Section 4, "Locations." Check all pins, pin to pin, on the cable for shorts or opens. Any shorts or opens? YES: Replace printer cable. NO: Replace control cards in printer. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Power Supply Check	1. Set printer power switch to OFF. Unplug printer power cord. Position Printer power switch to ON. Measure 2 to 12 ohms between voltage terminals on power cord. Does the resistance = 2 to 12 ohms? YES: Go to step 3. NO: Check for open fuse. See Section 4, "Locations." Is the fuse open? YES: Replace fuse. See Section 5, "Removal/Replacement and Adjustments." Power off. Plug in printer power cord. Power on for 1 minute. Does the fuse open? YES: Go to step 2. NO: Problem resolved. NO: Check for approximately 12 ohms on primary side of power transformer. See Section 4, "Locations." Does the resistance = 12 ohms? **DANGER:** Static voltage may be present on the fuse-filter card. Use extreme caution in this area. YES: Replace fuse-filter card. See Section 5, "Removal/Replacement and Adjustments." NO: Replace power transformer. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Power Supply Check	2. Set printer Power switch to OFF. Unplug printer cord. Replace fuse. See Section 5, "Removal/Replacement and Adjustments." Disconnect power transformer connector from fuse-filter card. See Section 4, "Locations." Plug in printer power cord. Power on for 1 minute then power off. Unplug printer power cord and check for open fuse. Is the fuse open? **DANGER:** Static voltage may be present on the fuse-filter card. Use extreme caution. YES: Replace Fuse-Filter card. See Section 5, "Removal/Replacement and Adjustments." NO: Replace power transformer. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Power Supply Check	3. Disconnect CN2. See Section 4, "Locations." Plug in printer power cord. Set printer Power switch to ON. Measure voltages on the plug side of CN2 according to the chart below.

DANGER: Line voltage is present on the AC filter, circuit board and transformer. Caution should be exercised when measuring secondary voltages.

Color	+ Lead	– Lead	Min. Voltage	Max. Voltage
Gray	CN2-1	CN2-2	7.6 Vac	10.4 Vac
Orange	CN2-3	CN2-4	19.5 Vac	26.5 Vac
Red	CN2-5	CN2-6	8.1 Vac	10.9 Vac
Blue	CN2-7	CN2-8	13.0 Vac	17.6 Vac

Are the voltages in range?

YES: Go to step 4.
NO: Replace power transformer. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Power Supply Check	4. Set the printer Power switch to OFF. Connect CN2. See Section 4, "Locations." Power ON then measure voltages at CN3 (see Section 4, "Locations") as shown in the chart below. Use the ground pin on the drive circuit card. **DANGER:** Line voltage is present on the AC filter, circuit board and transformer. Caution should be exercised when measuring DC voltages.

Pin No.	Min. Voltage	Max. Voltage
CN3-16	4.5 Vdc	5.5 Vdc
CN3-20	11.0 Vdc	15.4 Vdc

Are + 5 and + 14 Vdc within range?

YES: Go to step 5.
NO: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments."

<table>
<tr><th>Error Description</th><th>Diagnostic Action</th></tr>
<tr><td>Power Supply Check</td><td>
5. Measure the +24 Vdc (use ground pin on the driver circuit card).
<table>
<tr><th>Pin No.</th><th>Min. Voltage</th><th>Max. Voltage</th></tr>
<tr><td>CN3-18</td><td>21.6 Vdc</td><td>26.4 Vdc</td></tr>
</table>
Is +24 Vdc within range?

YES: Power supply checks good.
NO: Go to step 6.

6. Measure DC voltages (on 60-volt scale) on pins CN6-1 and CN6-2 located on control circuit card (use the DC ground pin on the driver circuit card for common lead). Find the difference in the two readings.

Is the difference 0.5 to 0.9 Vdc?

YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments."
NO: Replace the heat sink/power transistor assembly. See Section 5, "Removal/Replacement and Adjustments."
</td></tr>
</table>

Error Description	Diagnostic Action
NO Printing	1. Does print head carriage move back and forth normally when attempting to print? YES: Go to page 3-1400-21, "Row(s) of print dots missing." NO: Go to step 2. 2. Check for a loose or broken carriage belt. Replace if broken, adjust if loose. See Section 5, "Removal/Replacement and Adjustments." 3. Remove ribbon cartridge. Turn knob on cartridge to check for jamming. Replace if jammed. See Section 5, "Removal/ Replacement and Adjustments." 4. Check print head for broken wires. Replace print head if wires are damaged. See Section 5, "Removal/Replacement and Adjustments." 5. Set printer Power switch to OFF. Move print head assembly and check for smooth mechanical operation. Is there smooth operation? YES: Go to step 6. NO: Check for worn or broken gears in Carriage Drive assembly. Are any gears worn or broken? YES: Replace carriage drive assembly. See Section 5, "Removal/ Replacement and Adjustments." NO: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
No Printing	6. Set the printer Power switch to ON. Move the print head to the left-most position. Check for an Up level (approximately +5 Vdc) to a Down level (approximately 0 Vdc) meter deflection at CN6-20 on the driver circuit card (see Section 4, "Locations") while moving the print head to the center of the print line. Use the ground pin on the driver circuit card for common. Is there an Up level to a Down level meter deflection? YES: Go to step 7. NO: Is there a constant Down level? YES: Go to page 3-1400-7, "Power Supply Check." Replace the left margin sensor if the power supply checks good. See Section 5, "Removal/Replacement and Adjustments." NO: Set the printer Power switch OFF. Check continuity from CN6-20 (driver circuit card) to left margin sensor terminal 1 and from CN6-15 to left margin sensor terminal 2. See Section 4, "Locations." Is either line open? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Replace left margin sensor. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
No Printing	7. Check for a meter deflection from an Up level (approximately + 5 Vdc) to a Down level (approximately 0 Vdc) on pin CN6-19 on the driver circuit card (see Section 4, "Locations,") while applying slight left or right pressure to the print head without advancing the print head to the next detented position. Use the driver circuit card ground pin for common. Is there an Up level to a Down level meter deflection? YES: Go to step 8. NO: Is there a constant Up level? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Check for + 5 Vdc at CN5-18. See Section 4, "Locations." Is there + 5 Vdc? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Go to page 3-1400-7 "Power Supply Check."

Error Description	Diagnostic Action
No Printing	8. Set printer Power switch to OFF. Measure resistance between pin CN6-13, (driver circuit card), and pins CN6-21, 22, 23 and 24 (stepper motor coils) on cable end for a reading of approximately 45 ohms. Does the resistance = 45 ohms? YES: Replace control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments."
Print Head Carriage Not Moving	1. Go to page 3-1400-12, "No Printing."

Error Description	Diagnostic Action
Forms Do Not Advance **Overprinting** **Forms Jamming or Tearing**	1. Check position of forms feeding into printer. Forms path must be parallel to printer sides. Reposition forms for parallel feeding. 2. Check forms path for any obstructions (for example, jagged edges on forms box, torn paper in print mechanism). Remove any obstructions. 3. Inspect left and right forms tractors. — Poor positioning — Loose covers — Loose lock levers — Worn springs — Broken feed pins Replace left or right forms tractors if damaged. See Section 5, "Removal/Replacement and Adjustments." 4. Check for a loose or broken carriage belt. Check for broken cogs on the belt. Adjust if loose or replace if broken. See Section 5, "Removal/Replacement and Adjustments." 5. Inspect print head for broken wires. Replace if wires damaged. See Section 5, "Removal/Replacement and Adjustments." 6. Check print head gap adjustment. Adjust if out of tolerance. See Section 5, "Removal/Replacement and Adjustments." 7. Check for bent or pitted ribbon shield. Replace shield if damaged. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Forms Do Not Advance **Overprinting** **Forms Jamming or Tearing**	8. Check for damaged platen. Replace print mechanism assembly if platen is damaged. See Section 5, "Removal/Replacement and Adjustments." 9. Set printer Power switch to OFF. Advance forms by turning forms advance knob. Check intermediate gear for worn or broken teeth and replace gears if damaged. Check left and right tractors for broken feedpins and replace if broken. See Section 5, "Removal/ Replacement and Adjustments." 10. Check for 45 ohms resistance on forms feed motor coils between pin CN6-14 and pins CN6-25, 26, 27 and 28 on driver circuit card. See Section 4, "Locations." Does the resistance = 45 ohms? YES: Check for +24 Vdc at CN3-18. See Section 4, "Locations." Is there +24 Vdc? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: See page 3-1400-7, "Power Supply Check." NO: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Ribbon Jammed	1. Remove ribbon cartridge. Try a print operation to verify that print head carriage functions normally. If carriage fails, see page 3-1400-12, "No Printing." 2. Check ribbon cartridge for binding by manually advancing ribbon and replace if binding. 3. Visually check for worn or broken ribbon drive gears and replace carriage drive assembly if damaged. See Section 5, "Removal/ Replacement and Adjustments." 4. Check for bent ribbon shield and replace if necessary. See Section 5, "Removal/ Replacement and Adjustments." 5. Check print head for broken or binding wires. Replace print head if wires are broken or bound. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Printing Too Light **Poor Print Quality**	1. Check for adequate ink on ribbon or damaged ribbon and replace cartridge if needed. 2. Check ribbon cartridge for binding by manually advancing ribbon and replace if binding. 3. Visually check for worn or broken ribbon drive gears and replace carriage drive assembly if damaged. See Section 5, "Removal/ Replacement and Adjustments." 4. Check for bent ribbon shield and replace if necessary. See Section 5, "Removal/ Replacement and Adjustments." 5. Check print head for broken or binding wires. Replace print head if wires are broken or bound. See Section 5, "Removal/Replacement and Adjustments." 6. Verify that print head gap is 0.6 to 0.65 mm (.024 to .026") with the lever in the center position. See Section 5, "Removal/ Replacement and Adjustments." 7. Check print head for loose mounting. See Section 5, "Removal/Replacement and Adjustments." 8. Check for loose or damaged platen, print head carriage shafts, or print mechanism frame. Replace print mechanism if needed. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Smudged Printing	1. Check ribbon cartridge for — Jammed — Seated improperly — Excessive ink — Oily or dirty 2. Check for dirty, oily, or damaged platen. Replace print mechanism if platen is damaged. See Section 5, "Removal/Replacement and Adjustments." 3. Check for dirty print head and print wires. Clean if dirty. 4. Check for dirty or bent ribbon shield and replace shield if damaged. See Section 5, "Removal/Replacement and Adjustments." 5. Visually check for worn or broken ribbon drive gears and replace carriage drive assembly if damaged. See Section 5, "Removal/ Replacement and Adjustments."
Uneven Printing **Top/bottom of character** **Left/right of print line**	1. No adjustment can be made, replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Row(s) of Print Dots Missing	1. Check ribbon for damage (folds, holes, tears). Replace cartridge if damaged. 2. Verify print head gap adjustment is between 0.6 to 0.65 mm (.024 to .026") at center position of adjusting lever. See Section 5, "Removal/Replacement and Adjustments." 3. Check for damaged platen. Replace print mechanism if platen is damaged. See Section 5, "Removal/Replacement and Adjustments." 4. Check print head for broken wires. If wires are broken, replace print head. See Section 5, "Removal/Replacement and Adjustments." 5. Remove CN6 on driver circuit card. See Section 4, "Locations." Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 [male side]). Does the resistance = 22 ohms? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Disconnect print head cable and check pins 1 through 9 on print head cable for approximately 22 ohms in respect to common. See Section 4, "Locations." Does the resistance = 22 ohms? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Replace print head. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Random Print Dots Missing	1. Check ribbon for damage (folds, holes, tears). Replace cartridge if damaged. 2. Verify print head gap adjustment is between 0.6 to 0.65 mm (.024 to .026") at center position of adjusting lever. See Section 5, "Removal/Replacement and Adjustments." 3. Check for damaged platen. Replace print mechanism if platen is damaged. See Section 5, "Removal/Replacement and Adjustments." 4. Check print head for broken wires. If wires are broken, replace print head. See Section 5, "Removal/Replacement and Adjustments." 5. Remove CN6 on driver circuit card. See Section 4, "Locations." Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 [male side]). Does the resistance = 22 ohms? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Disconnect print head cable and check pins 1 through 9 on print head cable for approximately 22 ohms in respect to common. See Section 4, "Locations." Does the resistance = 22 ohms? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Replace print head. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Extra Print Dots	1. Run "Offline Diagnostic Test" (see page 3-1400-35). Examine the / and Y — characters for extra dots. 2. Remove CN6 on driver circuit card. See Section 4, "Locations." Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 [male side]). Does the resistance = 22 ohms? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Disconnect print head cable and check pins 1 through 9 on print head cable for approximately 22 ohms in respect to common. See Section 4, "Locations." Does the resistance = 22 ohms? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Replace print head. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Extra Print Dots	1. Measure resistance between pins CN6-1 to 9 (see Section 4, "Locations") with respect to every other pin. Are any pins shorted together? NO: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." YES: Disconnect print head cable and recheck pins CN6-1 to 9 with respect to every other pin. Are any pins shorted together? YES: Replace print mechanism assembly. See Section 5, "Removal/Replacement and Adjustments." NO: Replace print head. See Section 5, "Removal/Replacement and Adjustments."
Printing Continues Beyond End-of-Forms	1. Set printer Power switch to OFF. Check continuity of end-of-forms switch from pin CN6-18 on driver circuit card (see Section 4, "Locations") to the ground pin on driver circuit card (open when forms inserted and shorted when forms removed). Replace print mechanism assembly if switch fails. See Section 5, "Removal/Replacement and Adjustments." 2. Check for + 5 Vdc at CN6-18 on driver circuit card (see Section 4, "Locations") with forms inserted. Check power supply if 0 Vdc. Use ground pin on the driver card.
Doublespacing or Abnormal Characters	1. Replace both control cards. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
False End-of-Forms Alarm	1. Is the no paper light off? YES: Go to step 2. NO: Are forms inserted properly? YES: Go to page 3-1400-24, "Printing Continues Beyond End-of-Forms." NO: Insert forms properly. 2. Power printer off, then Power back on. Is the alarm still sounding? YES: Measure for +10.5 to 12.5 Vdc on pin 1 of control panel. See Section 4, "Locations." Is there +12 Vdc? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Replace Control Panel. See Section 5, "Removal/Replacement and Adjustments." NO: Run Offline Diagnostic Test. See page 3-1400-35. Does alarm sound? YES: Replace print mechanism. See Section 5, "Removal/Replacement and Adjustments." NO: Go to page 3-1400-1, "Printer Entry," if printer failure is still suspected.

Error Description	Diagnostic Action
Uneven Horizontal Spacing	1. Check for a loose print head carriage belt, and adjust belt tension if needed. See Section 5, "Removal/Replacement and Adjustments." 2. Check for a loosely mounted print head. See Section 5, "Removal/Replacement and Adjustments." 3. Check for worn gears in carriage drive assembly, and replace assembly if needed. See Section 5, "Removal/Replacement and Adjustments." 4. Check for bent or binding carriage shafts, and replace print mechanism assembly if needed.See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Control Panel	1. Set printer Power switch to ON. Measure voltages at CN3 as shown in the chart below. Use ground on the Driver Circuit card.

Pin No.	Min. Voltage	Max. Voltage
CN-3-16	4.5 Vdc	5.5 Vdc
CN3-20	11.0 Vdc	15.4 Vdc
CN3-18	21.6 Vdc	26.4 Vdc

Are all voltages correct?

YES: Go to step 2.
NO: Go to page 3-1400-7, "Power Supply Check."

2. Power off the printer. Disconnect the printer cable at the printer. Insert forms and power on.

   Are the Power, Ready, and Online lights on?

   YES: Go to step 6.
   NO: Is the alarm sounding and the no paper light on?

      YES: Go to page 3-1400-25, "False End-of-Forms Alarm."
      NO: Go to step 3.

Error Description	Diagnostic Action
Control Panel	3. Is the power light on? YES: Go to step 4. NO: Measure for approximately +10 Vdc to +12 Vdc at pin 9 on the control panel. Use pin 8 for ground. See Section 4, "Locations." Is there +12 Vdc? YES: Replace control panel. See Section 5, "Removal/Replacement and Adjustments." NO: Go to page 3-1400-7, "Power Supply Check." 4. Is the online light on? YES: Go to step 5. NO: Measure for approximately +10 to +12 Vdc at pin 1 on control panel. Use ground pin on driver circuit card. See Section 4, "Locations." Is there +12 Vdc? YES: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Replace control panel. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Control Panel	5. Is the ready light on? YES: Go to step 6. NO: Measure for approximately +10 to +12 Vdc at pin 4 on the control panel. Use ground pin on the driver circuit card. See Section 4, "Locations." Is there +12 Vdc? YES: Replace control cards. See Section 5, "Removal/Replacement and Adjustments." NO: Replace control panel. See Section 5, "Removal/Replacement and Adjustments."

Error Description	Diagnostic Action
Control Panel	6. Set the printer Power switch to OFF. Insert forms under end-of-forms switch. Set the printer Power switch to ON. Press the online switch. Is the online light off? YES: Go to step 7. NO: Measure for approximately +4 to +5.5 Vdc on pin 5 of control panel. Use pin 8 for ground. See Section 4, "Locations." Is there +5 Vdc? NO: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." YES: Press and hold online switch. Measure 0 to +1.5 Vdc on pin 5 of control panel. Is there +1.5 Vdc? YES: Replace both control cards. See Section 5, "Removal/ Replacement and Adjustments." NO: Replace control panel. See Section 5, "Removal/ Replacement and Adjustments."

Error Description	Diagnostic Action
Control Panel	7. Press the line feed switch. Do forms step? YES: Go to step 8. NO: Measure for approximately +4 to +5.5 Vdc on pin 7 of control panel. Use pin 8 for ground. See Section 4, "Locations." Is there +5 Vdc? NO: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." YES: Press and hold line feed switch. Measure 0 to +1.5 Vdc on pin 7 of control panel. Is there +1.5 Vdc? YES: Replace both control cards. See Section 5, "Removal/ Replacement and Adjustments." NO: Replace control panel. See Section 5, "Removal/ Replacement and Adjustments."

Error Description	Diagnostic Action
Control Panel	8. Press the forms feed switch. Do forms advance? YES: Go to step 9. NO: Measure for approximately +4 to +5.5 Vdc on pin 6 of control panel. Use pin 8 for ground. See Section 4, "Locations." Is there +5 Vdc? NO: Replace both control cards. See Section 5, "Removal/Replacement and Adjustments." YES: Press and hold form feed switch. Measure 0 to +1.5 Vdc on pin 6 of control panel. Is there +1.5 Vdc? YES: Replace both control cards. See Section 5, "Removal/ Replacement and Adjustments." NO: Replace control panel. See Section 5, "Removal/ Replacement and Adjustments."