

April 2011

IMPORTANT

1. The motherboard described in this document is the first motherboard, the 16KB-64KB one.

Examples:

** Pages 200-3 and 200-4: Do not apply to the later 64KB-256KB motherboard (different bank size).*

** Page 4-7: Part number shown for the system board (motherboard) is for the 16KB-64KB one.*

2. If the BIOS on the 16KB-64KB motherboard has been upgraded to the third revision one, then the switch settings shown for SW2 ("switch 2", on pages 5-6 and 5-8) on the motherboard no longer apply.

The BIOS revision can be determined by examination of the seven digit number on motherboard chip U33.

First revision: 5700051

Second revision: 5700671

Third revision: 1501476



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Hardware Maintenance and Service

6025075

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

Associated Documentation

- Guide to Operations, Part 6025003
- Technical Reference, Part 6025008
- BASIC, Part 6025013

First Edition (August 1981)

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

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A Product Comment Form is provided at the back of this publication. If this form has been removed, address comment to: IBM Corp., Personal Computer, P.O. Box 1328, Boca Raton, Florida 33432. IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligations whatever.

PREFACE

The Hardware Maintenance and Service manual is the publication you use to isolate and repair any failure of a Field Replaceable Unit (FRU).

The user should have training on the IBM Personal Computer and be familiar with the Triplet Model 310 Multimeter* (or equivalent).

This manual is organized into ten (10) major sections:

- Section 0 – How-to-Use
- Section 1 – Introduction
- Section 2 – Problem Isolation (PICs)
- Section 3 – Removal/Replacement
- Section 4 – Parts Catalog
- Section 5 – Locations
- Section 6 – Preventive Maintenance (PM)
- Section 7 – Reserved
- Section 8 – Glossary
- Section 9 – Index

The “*Problem Isolation*” section of this manual provides step-by-step instructions that aid the user in identifying the failing FRU. When the FRU has been identified, the “*Removal/Replacement*” section provides all the necessary information to complete the repair activity (i.e., adjustments, replacements, etc.).

This manual also provides operational instructions, hardware and design information only to the extent necessary to locate the failing FRU. Complete “Operating Instructions” can be found in “Guide to Operations”, IBM Part 6025003. Hardware design and interface information can be found in “Technical Reference”, IBM Part 6025008.

*Manufactured by Triplet Corporation, Bluffton, Ohio 45817

Notes:



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Memory	200-1
Keyboard	300-1
Display (Monochrome)	400-1
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Notes:



SECTION 0. HOW TO USE



Always begin with the “Start” PIC.



Start

This is the entry point for using all of the PICs. You may have an error code, an audio error response during the Power-On Self Test (POST), a problem related to one device, or an unidentified problem. 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, this is an indication of a successful test of the device being tested.)

010

Depending on your failure indications, PIC 010 (“Start”) directs you to one of the other PICs.



Printer

Error Description	Diagnostic Action
	Position Printer Power switch to OFF. Verify forms are properly inserted. Move print head to left-most position. Position Printer Power switch to ON.
	Are the Power, Ready, and Online lights on?
YES	Go to step 2.
NO	Go to page 1400-26, “Control Panel.”
	Position Online Switch!

System Board

You have entered this PIC because you were unable to ... or you have an error message indicating a ... Insert your Advanced Diagnostics ... and proceed with running diagnostic ... devices installed, choose “Run Test ... System Board (see display). Press ... and ... (Enter). Then follow the ... will appear on your display. ... per of times to run tests. ... (see) you will see (im)

020

Power

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

1. Turn off the System Unit Power switch and remove the AC power cord from the wall outlet.
2. Remove the keyboard and the optional cassette player, if used.
3. Remove all external devices attached to the Option Adapters except the Display.
4. Plug the AC power cord into the wall outlet.
5. Position the System Unit Power switch On.

100

1400

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

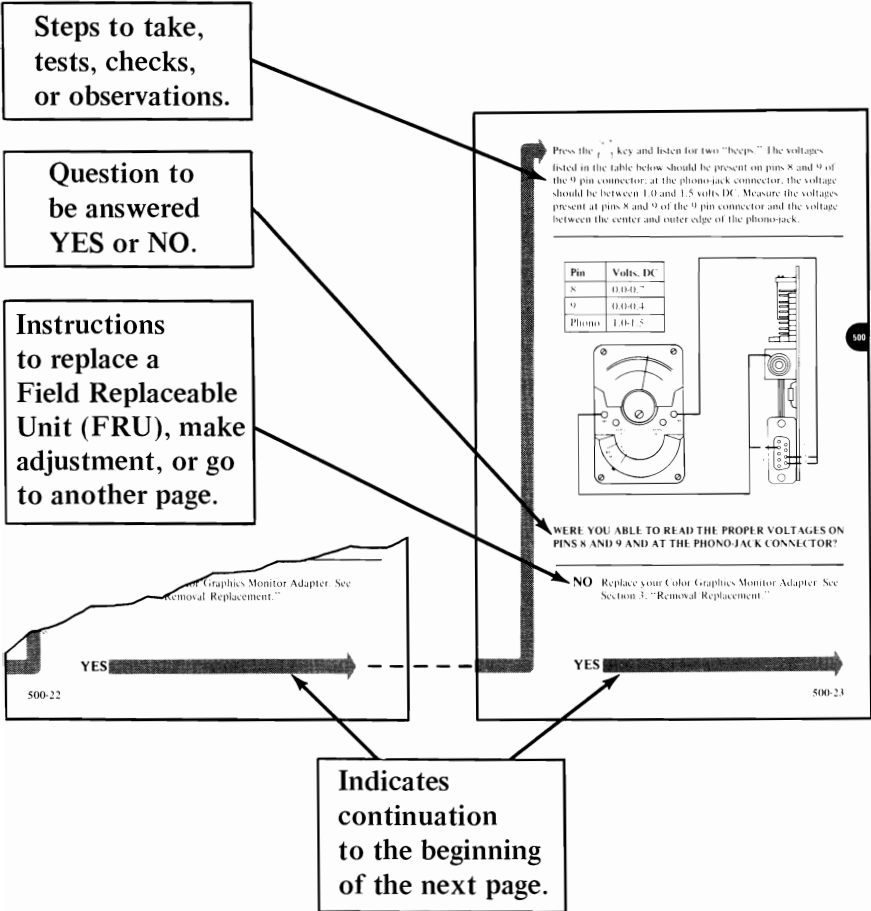


SECTION 3. REMOVAL/REPLACEMENT

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

When using the PICs, you must always start with PIC 010, "Start." Answer the questions carefully and follow each instruction in sequence.

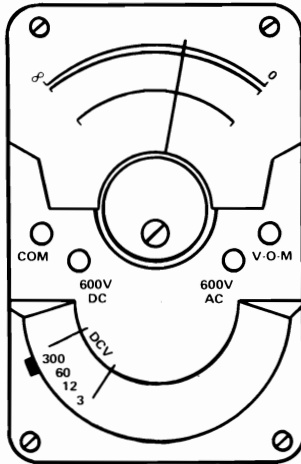
The example below shows a representative page from the PICs.



Special Tools

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

- A. A meter similar to the Triplet model 310*.



- B. A tweezer-type module puller similar to the one shown below. (Used for removal of the 16KB Memory Expansion Kit.)



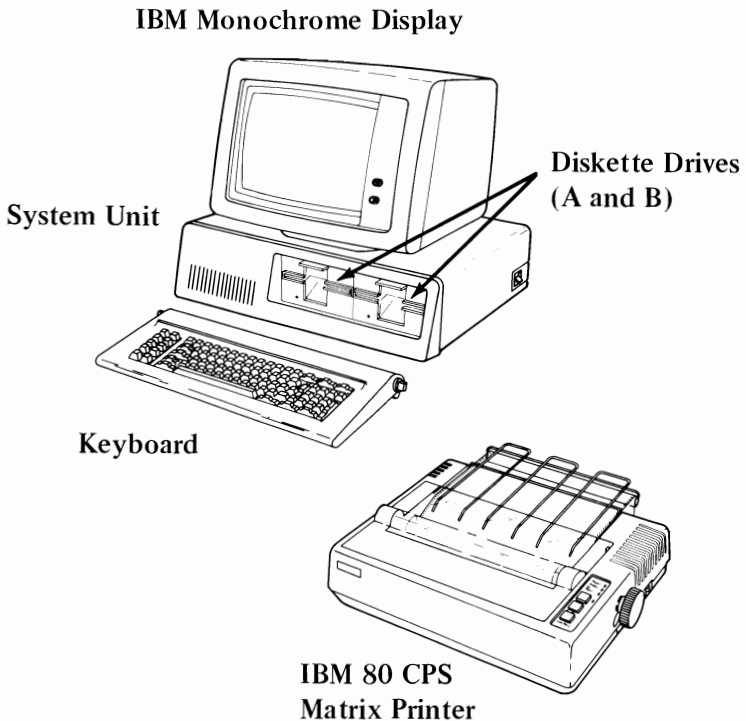
*Manufactured by the Triplet Corporation, Buffton, Ohio 45817

Notes:



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 and can house two *optional* 5-1/4" Diskette Drives. The System Unit also contains five expansion slots for *optional* adapters or memory expansion *options*.

Input to the System Unit is via an 83-key Keyboard which includes a numeric keypad and 10 function keys. The Keyboard is connected with a six foot coiled cable which allows the Keyboard to be moved to a comfortable operating position.

The *optional* IBM 80 CPS Matrix Printer features 80 character per second, bi-directional printing. Characters can be printed normally, enlarged, condensed, or emphasized. The characters or graphics can be printed on multi-part forms in widths from 4" to 10".

Other *options* available for the IBM Personal Computer are:

- IBM Monochrome Display
- Color/Graphics Adapter
- Asynchronous Communications Adapter
- Game Control Adapter
- Memory Expansion Options

SECTION 2. PROBLEM ISOLATION

010	START	010
020	POWER	020
100	SYSTEM BOARD	100
200	MEMORY	200
300	KEYBOARD	300
400	DISPLAY (MONOCHROME)	400
500	DISPLAY (COLOR/GRAPHICS)	500
600	DISKETTE DRIVE	600
700	RESERVED	700
800	RESERVED	800
900	PARALLEL PRINTER ADAPTER	900
1000	RESERVED	1000
1100	ASYNCHRONOUS COMMUNICATIONS ADAPTER	1100
1200	RESERVED	1200
1300	GAME CONTROL ADAPTER	1300
1400	PRINTER	1400

Notes:



Start

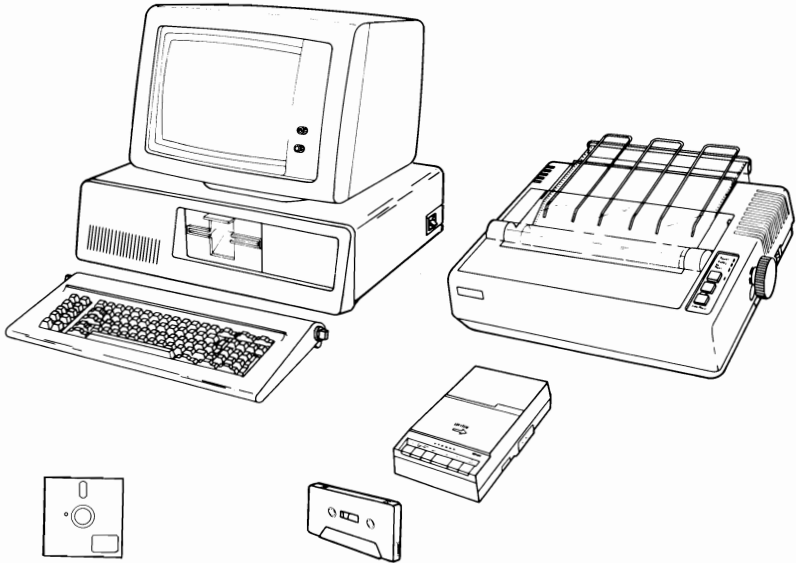
This is the entry point for using all of the PICs. You may have an error code, an audio error response during the Power On Self Test (POST), a problem related to one device, or an unidentified problem.

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, this is an indication of a successful test of the device being tested.)

Problem Type	Error Code	PIC	Page
Audio Error Response		Start	010-1
	02X	Power	020-1
Unidentified Problem	1XX	System Board	100-1
	20XorXXXX20X	Memory	200-1
	30XorXXX30X	Keyboard	300-1
	4XX	Display (Monochrome)	400-1
	5XX	Display (Color/ Graphics)	500-1
	6XX	Diskette Drive	600-1
Error Code	90X	Parallel Printer Adapter	900-1
Problem Related to One Device	110X	Asynchronous Comm. Adapter	1100-1
	130X	Game Control Adapter	1300-1
	140X	Printer	1400-1

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

1. System Unit
2. Keyboard
3. Input device
 - Diskette Drive and Advanced Diagnostic diskette or
 - Cassette player and Advanced Diagnostic cassette.
4. Output device
 - Display or
 - Printer



DO THE SWITCH SETTINGS ACCURATELY REFLECT THE CONFIGURATION OF YOUR SYSTEM? (SEE SECTION 5, "LOCATIONS", FOR THE PROPER SWITCH SETTINGS.)

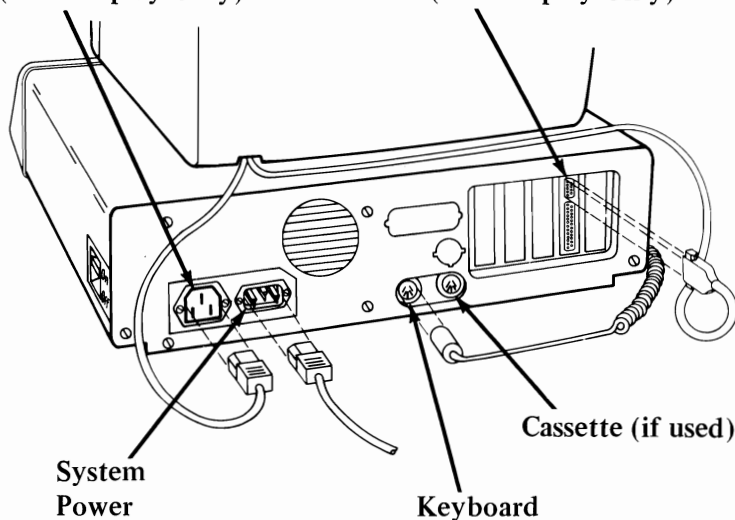
NO If the configuration has changed, be sure the device which was changed is not the cause of your failure. Set the switches to reflect the present configuration.

YES

1. Position the System Unit Power switch to the Off position and remove the AC power cord from the wall outlet.
2. Remove all non-IBM devices except the display or optional cassette player.
3. Turn the Contrast and Brightness controls fully clockwise.
4. See that all connectors are installed securely and in their proper locations.

Display Power
(IBM Display Only)

Display Signal
(IBM Display Only)



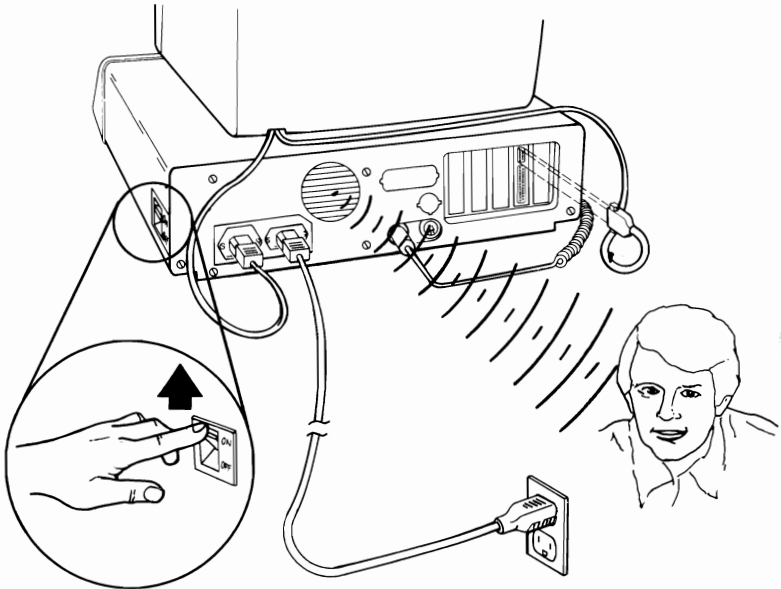
ARE ALL CONNECTORS INSTALLED SECURELY AND IN THE PROPER LOCATIONS?

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

YES 

1. Insert your Advanced Diagnostic diskette or cassette.
2. Plug the System Unit power cord into a properly functioning, grounded wall outlet.
3. Position the System Unit Power switch to the On position and listen for the power supply fan.

Note: If the system works properly except for the fan not running; replace the power supply (see Section 3, "Removal/Replacement").



IS THE POWER SUPPLY FAN RUNNING?

NO Check the System Unit power cord for continuity and replace it if necessary. Go to PIC 020, "Power".

YES

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

1. A cursor appears on the display in approximately 4 seconds.
2. One short “beep” after the POST.
3. The “IBM Personal Computer BASIC” and copyright statement on the display. (If the Advanced Diagnostic diskette is loaded, the first diagnostic menu should appear on the display.)

When a failing system is powered on, there may be one or more of the following responses:

1. Audio error responses (Beeps).
2. Error Codes (101, 301, etc.).

Note: These error codes may appear for only a short time at the end of the POST.

3. Blank or incorrect display.

Position the System Unit Power switch to Off. Wait 5 seconds and position the power switch to On. Make a note of all failure symptoms.

CONTINUE

Error Indication	PIC Title	Page
No "beep"	Power	020-1
Continuous beep	Power	020-1
Repeating Short beep	Power	020-1
1 Long and 1 Short beep	System Board	100-1
1 Long and 2 Short beeps	Display	400-1
1 Short beep and blank or incorrect display	Display	400-1
1 Short beep and Personal Computer BASIC statement	Diskette	600-1
101	System Board	100-1
131	System Board	100-1
201	Memory	200-1
301	Keyboard	300-1
xx301	Keyboard	300-1
601	Diskette	600-1
(XXXX201) Parity Check X	Memory	200-1
Parity Check X	Power	020-1
Keyboard not functional	Keyboard	300-1
Printer problems	Printer	1400-1

DID YOU PERFORM THE STEPS ON THE PREVIOUS PAGES WITHOUT RECEIVING ONE OF THE ABOVE ERROR INDICATIONS?

NO Refer to the table above for the type of error indication you received and then go to the appropriate PIC.

YES 

You may have a failure and not receive any of the previous error indications. Make note of the symptom you are experiencing.

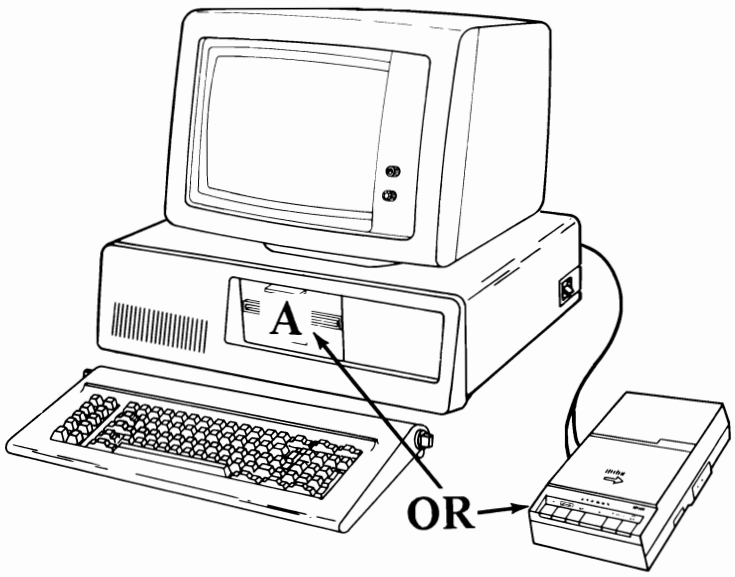
Notes:

IS YOUR SYSTEM OPERATING WITHOUT ANY FAILURE SYMPTOMS?

NO Go to PIC 020, "Power".


YES 




1. Position the System Unit Power switch to Off.
 2. Check the following:
 - The necessary power cords are installed
 - The input and output devices are powered on.
 - The Advanced Diagnostic Diskette is inserted in Diskette Drive "A" or the Advanced Diagnostics cassette is in the cassette player.
 3. Position the System Unit Power switch to On.
-

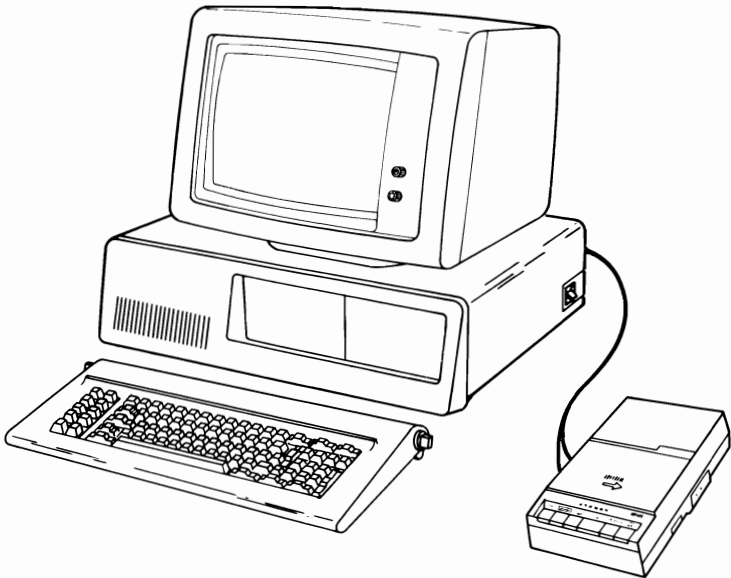


ARE YOU LOADING YOUR DIAGNOSTICS FROM A CASSETTE?

NO Continue on page 010-10.

YES 

1. Connect the cables to your cassette recorder.
 2. Be sure that your cassette is rewound and the recorder is on.
 3. After the Basic display has appeared, press  (Load), type "ldcass", then press  (Enter).
 4. Wait 15-30 seconds for "ldcass .B found" and "OK" to appear on the screen, then press  (Run).
 5. Wait approximately 2 minutes for the diagnostics to be read from the cassette.
-

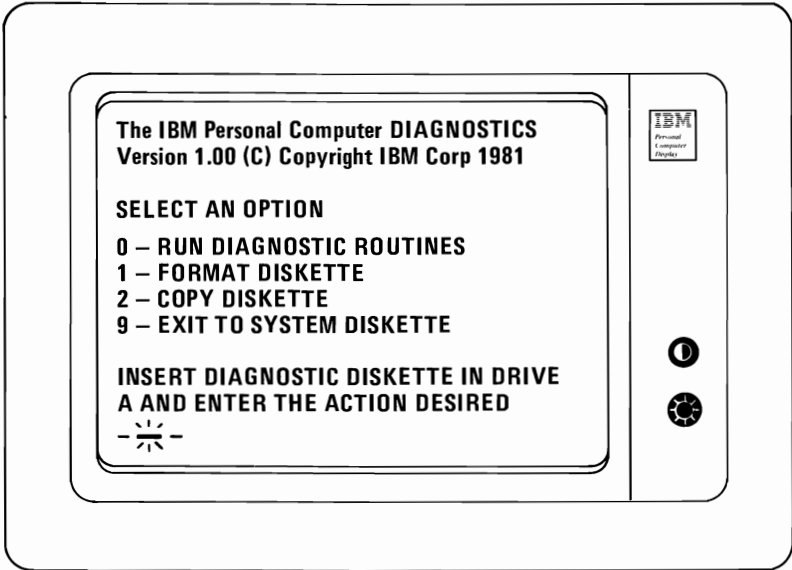


HAVE YOU COMPLETED THE STEPS LISTED ABOVE FOR LOADING THE DIAGNOSTIC CASSETTE?

NO Complete the steps above before continuing.

YES Go to page 010-11.

Your Advanced Diagnostics should be loaded from either cassette or diskette.



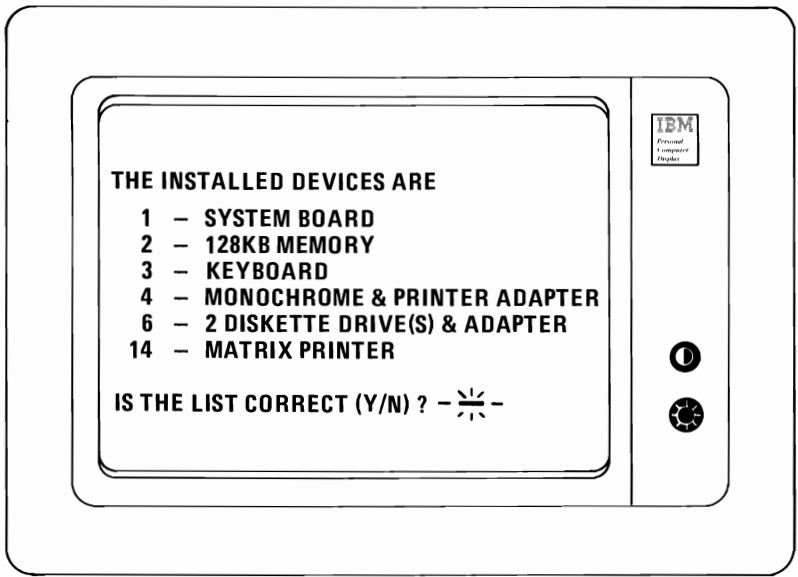
**DID THE ABOVE MESSAGE APPEAR ON YOUR DISPLAY
WITHOUT AN ERROR CODE?**

NO Refer to pages 010-6 and 010-7 for the error
indication codes.



YES 

Press  (Run Diagnostics Routines), then  (Enter).

The installed devices list will appear. It is important that you verify the installed devices.





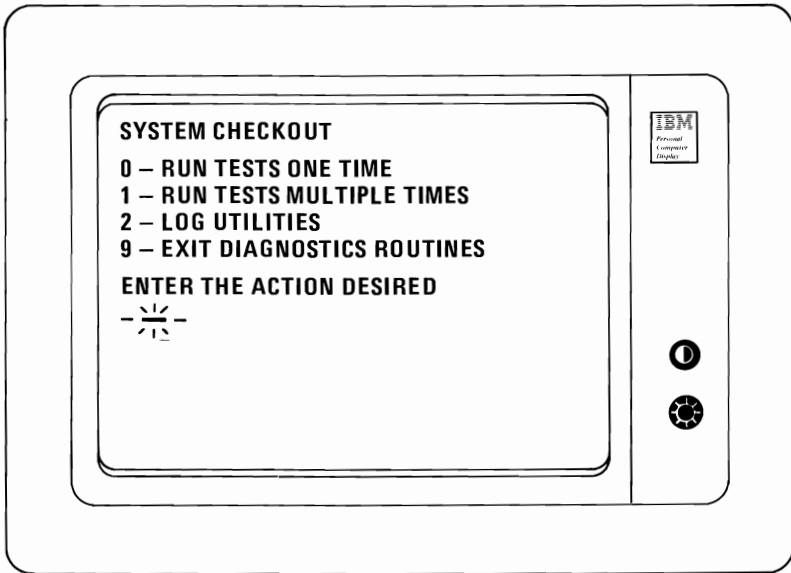
ARE THE INSTALLED DEVICES CORRECT?

NO Press  and  (Enter) and follow the

Display to add or delete a device to match your system's configuration. Check your switch settings to be sure that they reflect the configuration of your system (See Section 5, "Locations"). Set the switches correctly before continuing.

YES 

Press  (Yes) and  (Enter). This will bring up the system checkout menu.



DO YOU NEED AN EXPLANATION OF THIS MENU?

NO Choose the type of test you would like to perform and go to page 010-14.

YES 

0 - **Run Test** - Run 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 to Main Menu.

Start and Stop Error Log - Enables the user to log the errors that the diagnostics find. They can be output to diskette, cassette, or printer.

List Log - Will display logged errors contained on cassette tape or 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. However, when the cassette player is used, the clock will stop until the cassette player is no longer in use.

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.




9 - **Exit Diagnostic Routines** - Allows the user to exit the utilities program and return to the main menu.

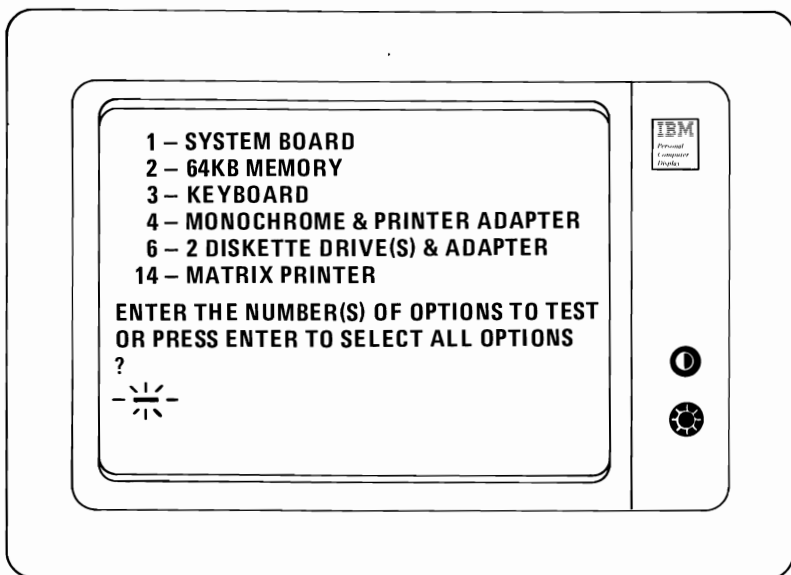
YOU ARE NOW READY TO CHOOSE THE TYPE OF TEST TO RUN, FOLLOW THE INSTRUCTIONS ON YOUR DISPLAY.

CONTINUE 

You should have pressed  ,  ,  , or 

and  Enter. Follow the instructions on the screen. If you

receive an error message, refer to the PIC indicated by the error message. Pressing keys  or  will bring up the display on this page. Pressing  will bring up the utilities menu described on the previous page. In either case, follow the directions given on the display. Choose the appropriate option to be tested.



ARE YOU READY TO CHOOSE AN OPTION TO TEST?

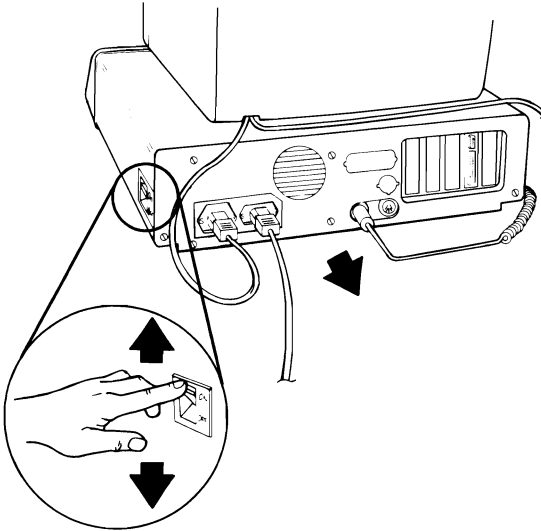
NO Press  Enter to select all options.

YES Go to the appropriate PIC for the device you are testing. (See page 010-1.)

Power

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

1. Turn off the System Unit Power switch and remove the AC power cord from the wall outlet.
2. Remove the Keyboard and the optional cassette player, if used.
3. Remove all external devices attached to the Option Adapters except the Display.
4. Plug the AC power cord into the wall outlet.
5. Position the System Unit Power switch On.

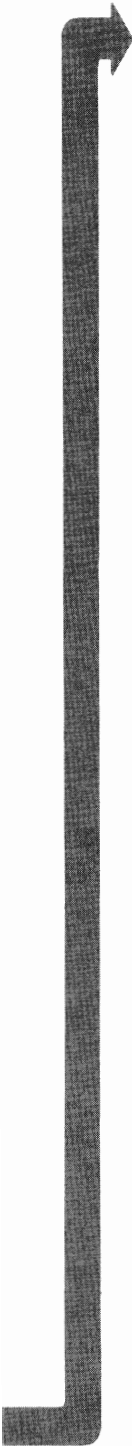


DID THE FAILING SYMPTOM REMAIN?

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.

YES





You may have a failing Option Adapter. Follow the procedure listed below.

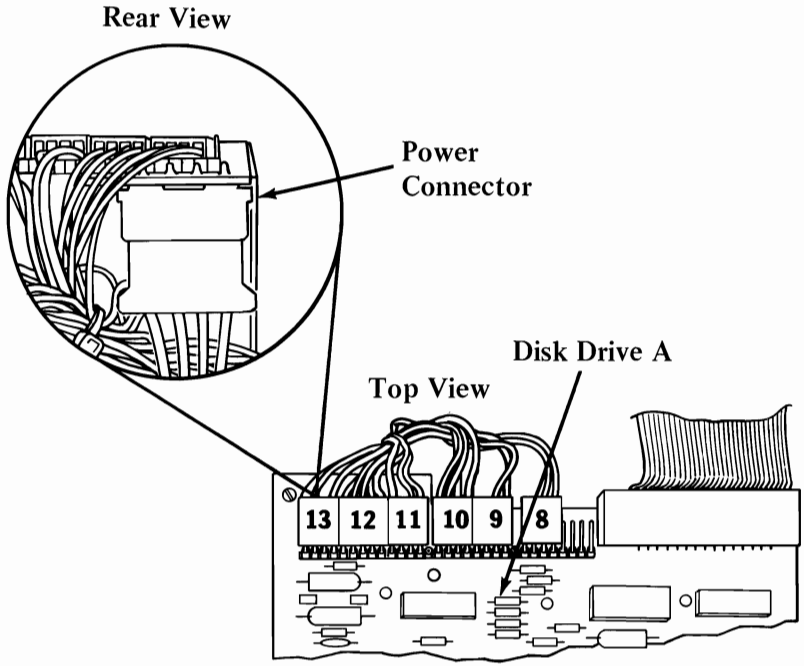
1. Position the System Unit Power switch to OFF.
 2. Remove one Option Adapter from the System Board (do not remove the diskette adapter or display adapter until all other adapters have been removed; remove the display adapter last).
 3. Position the System Unit Power switch to On and check for the failing symptom.
 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 3, "Removal/Replacement."
(**Note:** Removal of the Display Adapter will normally result in two sets of one long and two short beeps. A change in these symptoms to other than two sets of one long and two short "beeps", did not necessarily resolve the failure.)

YES 

1. Position the System Unit Power switch to Off.
2. Remove the power connector from Diskette Drive "A."
3. Position the System Unit Power switch to On.

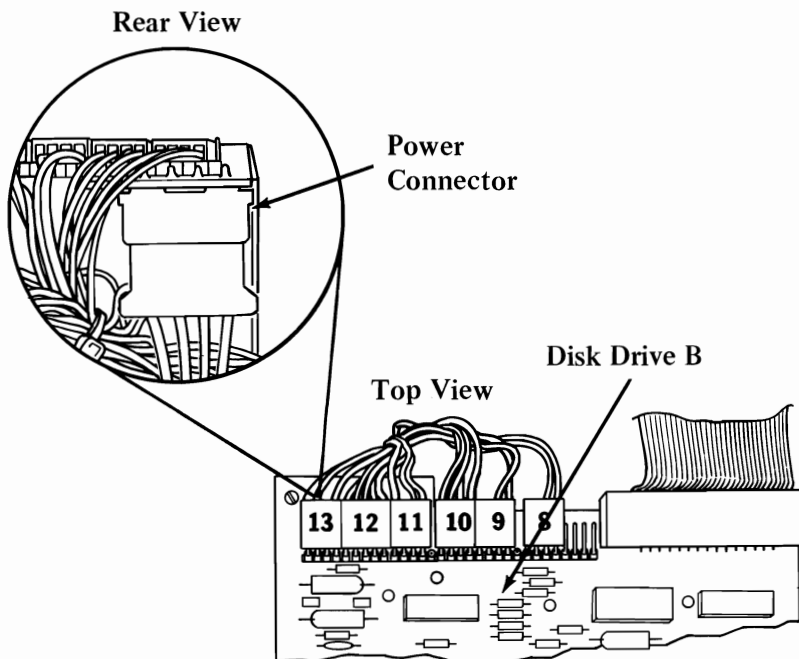


DID THE FAILING SYMPTOM REMAIN?

- NO** Replace:
1. Diskette Logic Printed Circuit Board.
 2. Diskette Drive assembly.
- See Section 3, "Removal/Replacement."

YES

1. Position the System Unit Power switch to Off.
 2. If you have two Diskette Drives, remove the power connector from Diskette Drive "B." Leave Diskette Drive "A" disconnected.
 3. Position the System Unit Power switch to On.
-

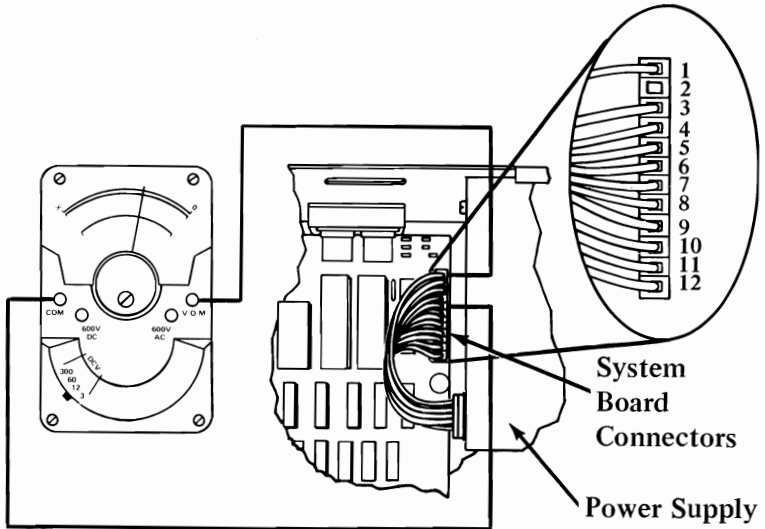


DID THE FAILING SYMPTOM REMAIN?

- NO** Replace:
1. Diskette Logic Printed Circuit Board.
 2. Diskette Drive assembly.
- See Section 3, "Removal/Replacement."

YES

1. Set your multimeter to the 12 Vdc scale and connect the *common* lead to Pin 5 and the *voltage* lead to Pin 1 of the System Board power connectors (Refer to the diagram).
2. Position the System Unit Power switch to On.
3. Check for a voltage reading of 2.4 to 5.25 Vdc.



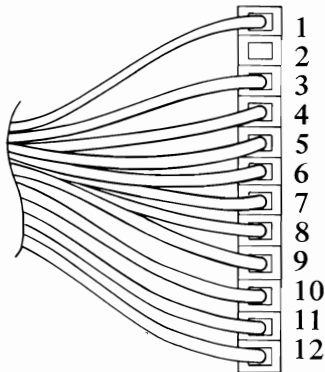
DO YOU HAVE 2.4 TO 5.25 Vdc BETWEEN PINS 1 AND 5?

NO Go to page 020-9.

YES

Now check the rest of the power supply output voltages to the System Board.

1. Leave your multimeter set on 12 Vdc scale.
2. Check the System Board power connector for the voltages listed in the table.



Voltage Connectors

Min VDC	Max VDC	-Lead	+Lead
+ 4.8	+ 5.25	5	10
+ 4.5	+ 5.40	9	6
+11.52	+12.60	7	3
+10.80	+12.96	4	8

ARE THE SYSTEM BOARD POWER CONNECTOR VOLTAGES CORRECT?

NO Replace the power supply. See Section 3, "Removal/Replacement."

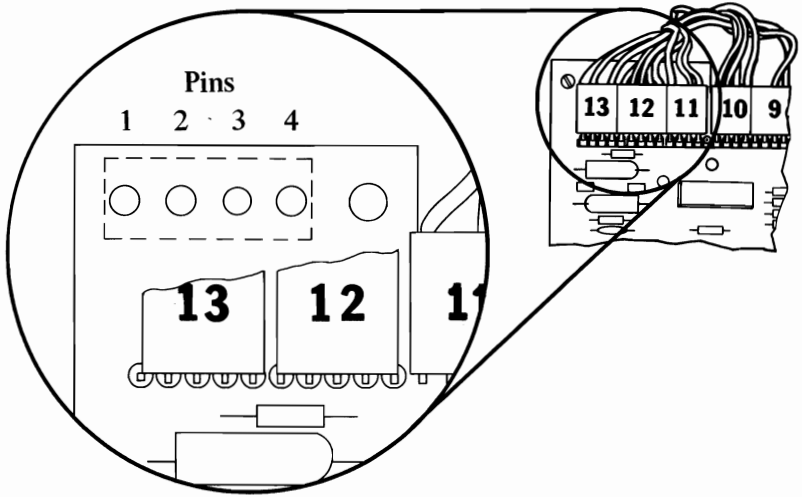
YES

If you have a Diskette Drive, check the Diskette Drive power connector. (If not, continue on page 020-8.)

1. Reconnect the diskette power supply connectors.
2. Refer to the diagram below for the proper voltage readings. You should get the same readings on both connectors if your system has two diskette drives.

020

Disk Drive Power Connector			
Min VDC	Max VDC	-Lead	+Lead
+ 4.8	+ 5.25	2	4
+11.52	+12.60	3	1



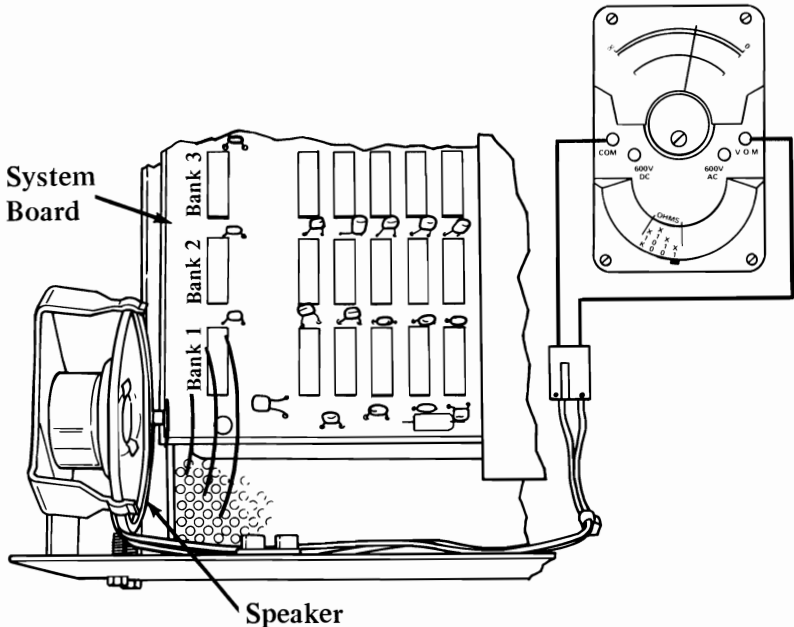
WERE THE ABOVE VOLTAGE LEVELS PRESENT BETWEEN THESE PINS INDICATED?

NO Replace the power supply. See Section 3, "Removal/Replacement."

YES

Check the speaker circuit if you have no beep.

1. Set your multimeter to the OHMS (x 1) scale.
2. Remove the speaker connector from the System Board.
3. Connect leads to the speaker as shown.



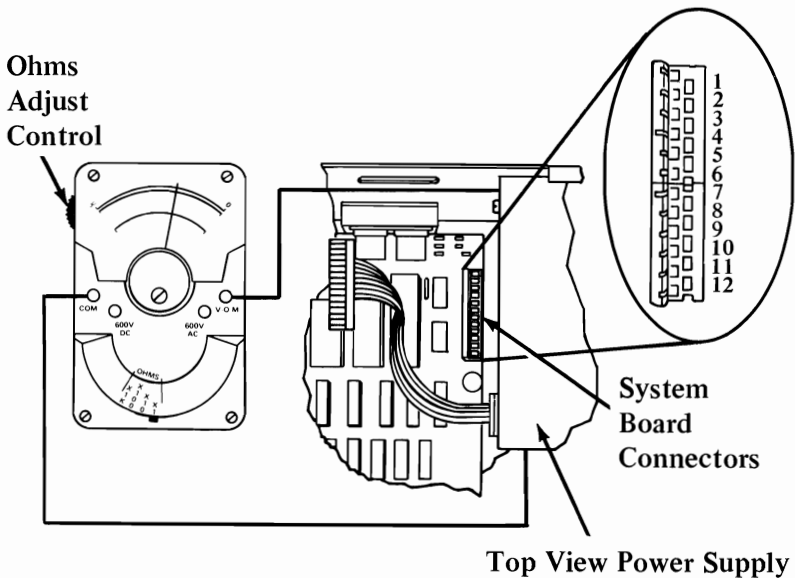
IS THERE CONTINUITY AT THE SPEAKER CONNECTOR?

NO Replace the speaker. See Section 3, "Removal/Replacement."

YES Replace your System Board. See Section 3, "Removal/Replacement."

1. Position the System Unit Power switch to Off.
2. Set the meter switch on the OHM's (x1) scale.
3. Remove the System Board connectors from the System Board and take resistance measurements on the System Board pins as shown below.

Common lead	5	6	7	8	8	8
Ohm lead	3	4	9	10	11	12
Minimum Resistance	6 ohms	48 ohms	17 ohms	0.8 ohms	0.8 ohms	0.8 ohms



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

NO You have a bad power supply. See Section 3, "Removal/Replacement."

YES You have a bad system unit board. See Section 3, "Removal/Replacement."



Notes:




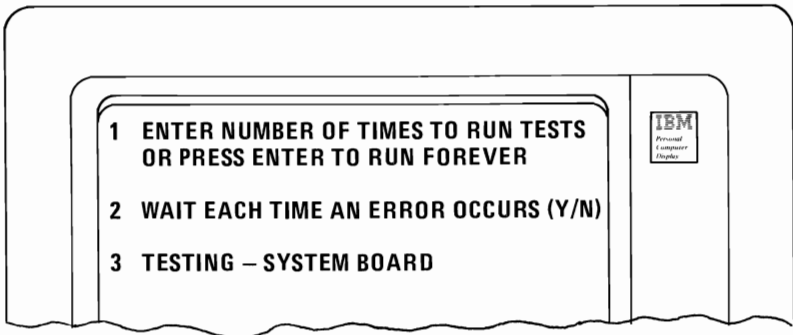
System Unit Board

You have entered this PIC because you were unable to complete the POST or you have an error message indicating a System Board failure. Insert your Advanced Diagnostic diskette or cassette and proceed with running diagnostic routines. Verify the devices installed, choose "Run Test Multiple Times" and System Board (see display).

100

Press  (System Board) and  (Enter). Then follow the instructions which will appear on your display.

1. Enter the number of times to run tests.
2. Answer  (YES) to wait each time an error occurs.
3. Wait for test results.




DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO If you received an error message, replace your System Unit Board. See Section 3, "Removal/Replacement."

Note: A 199 Error message indicates your options question was answered "No". Do not replace the System Board. Refer to the Start PIC and verify the installed devices.

YES 



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

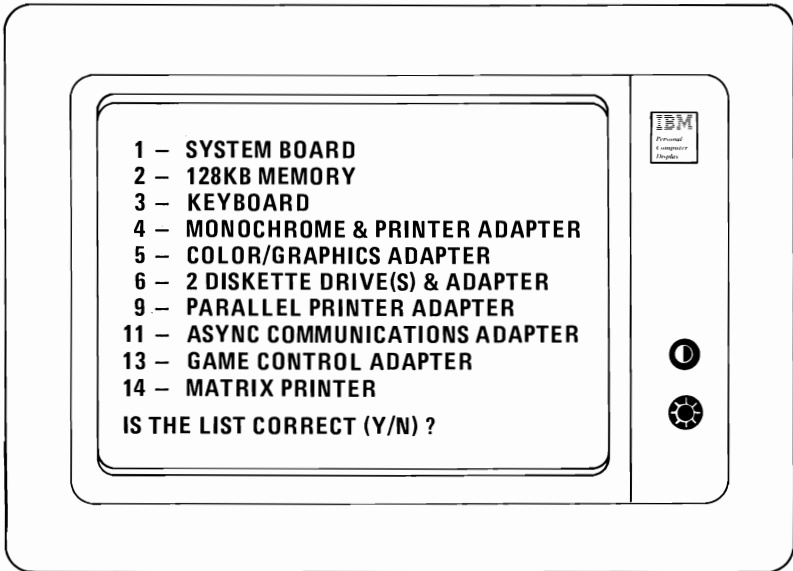
1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, "Start."
3. Select "Utilities" in the diagnostic menu, start an error log, and select "Run tests multiple times." This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 "Start" or the appropriate PIC for that symptom.

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

Memory

You have entered this PIC because you were unable to complete the POST or you have an error message, indicating a Memory failure. If you have a Memory error message, go to page 200-3 to identify the failing module. Insert your Advanced Diagnostic diskette or cassette and proceed with running diagnostic routines. Verify the devices installed. The actual Memory size of your machine must match the message on your display.

200









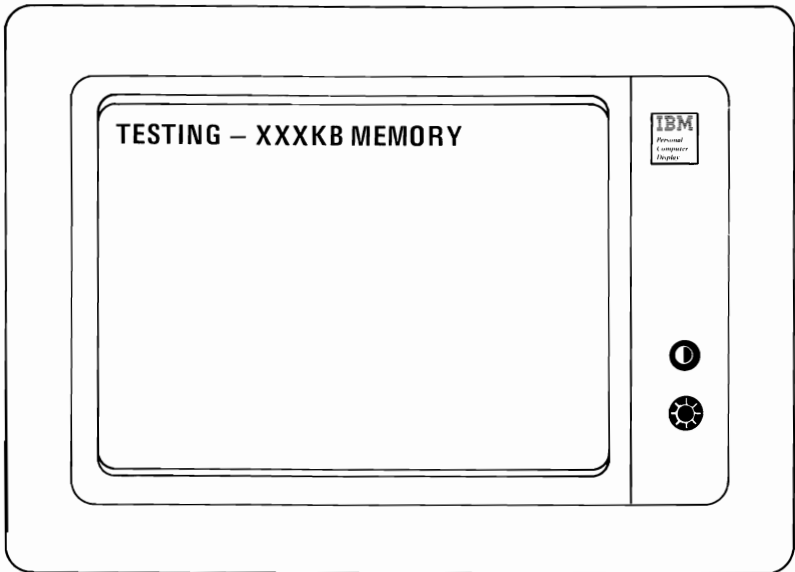
DOES THE AMOUNT OF MEMORY IN YOUR SYSTEM MATCH THE MEMORY SIZE INDICATED ON YOUR DISPLAY?

NO Refer to Section 5, "Locations" of this manual for proper switch settings. If the switch settings are correct, replace the System Unit Board. See Section 3, "Removal/Replacement."

YES



Press  and  (Enter) to bring up the system checkout menu; press  and  (Enter); press  (XXXKB Memory) and  (Enter).

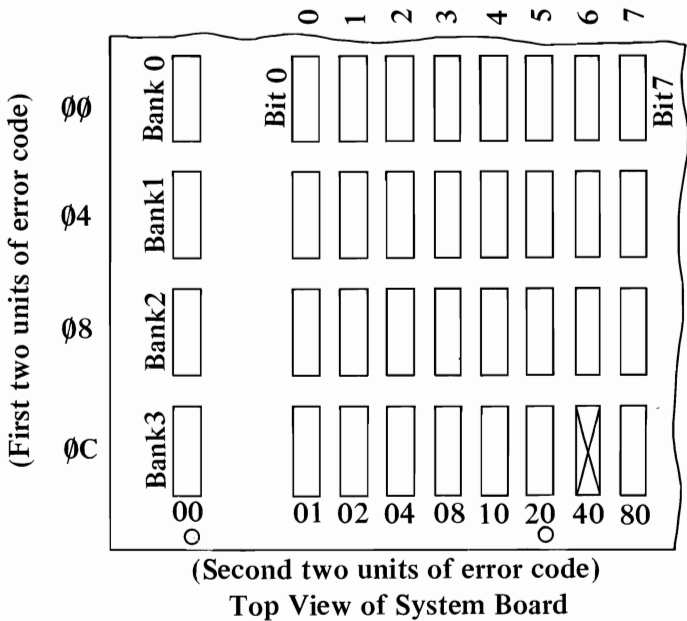


DID YOU RECEIVE AN ERROR MESSAGE?

NO Go to page 200-5.

YES 

If you received an error message, your Memory has a failing module. Use the failing address space and module information to replace the correct module. A System Board Memory failure will be displayed in the form of a four digit alphanumeric code (such as 0C 40) followed by 201. This alphanumeric code will identify the failing memory module to be replaced. This example is shown on the System Board diagram. The failing module is identified by an "X", and is in bank 3, bit 6.



WERE THE FIRST TWO DIGITS OF THE ALPHANUMERIC CODE OTHER THAN 00, 08, or 0C?

NO Replace the failing module. See Section 3, "Removal/Replacement."

YES

If the first two characters of the error code are other than 00, 04, 08, or 0C, the failing Memory Expansion Option should be replaced. If there is more than one Memory Expansion Option, use the following table to establish the failing option. THE CARD WITH THE SWITCH SETTINGS CORRESPONDING TO THE FIRST TWO CHARACTERS OF THE ERROR CODE IS THE FAILING CARD.

First two units of the error code	32KB Expansion option switch settings				
	1	2	3	4	5
10 or 14	On	On	On	Off	On
18 or 1C	On	On	On	Off	Off
20 or 24	On	On	Off	On	On
28 or 2C	On	On	Off	On	Off
30 or 34	On	On	Off	Off	On
38 or 3C	On	On	Off	Off	Off

First two units of the error code	64KB Expansion option switch settings				
	1	2	3	4	5
10 or 14	On	On	On	Off	N/A
18 or 1C	On	On	On	Off	N/A
20 or 24	On	On	Off	On	N/A
28 or 2C	On	On	Off	On	N/A
30 or 34	On	On	Off	Off	N/A
38 or 3C	On	On	Off	Off	N/A

Refer to the table above and replace the appropriate expansion card.

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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, “Start.”
3. Select “Utilities” in the diagnostic menu, start an error log, and select “Run tests multiple times.” This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010, “Start” or the appropriate PIC for that symptom.

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



Notes:



Keyboard

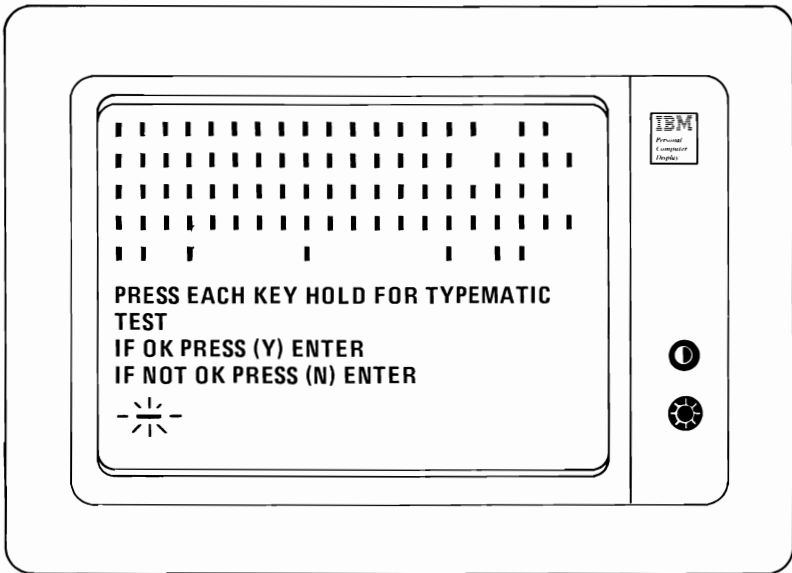
If you have visibly broken parts, see Section 3, "Removal/Replacement." Insert your Advanced Diagnostic diskette or cassette and proceed with running the diagnostic routines. Select the

Keyboard Test (3) and perform the test displayed on the screen. If

any key did not function properly, press  and  (Enter).

If you have a 3XX error code before performing the Keyboard Test, go to page 300-2.

300

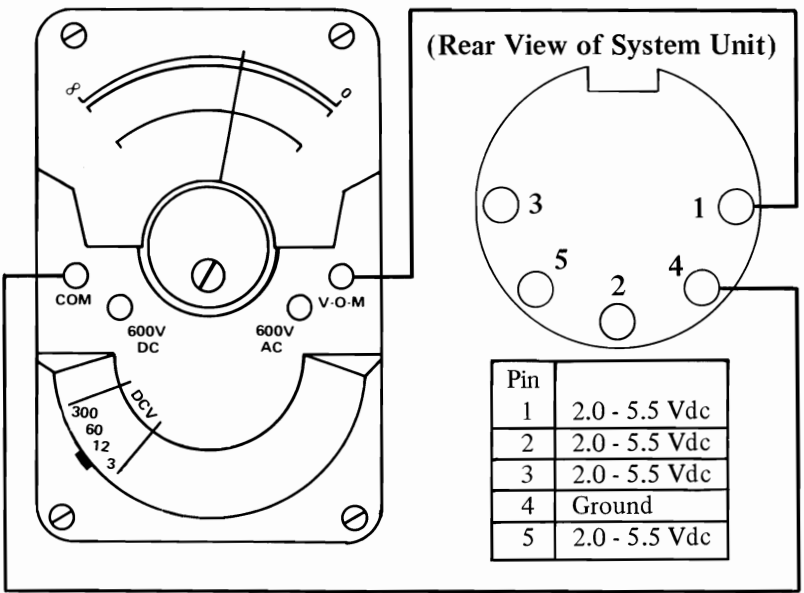


AFTER PERFORMING THE TEST ON THE SCREEN, DID YOU HAVE A 3XX ERROR CODE?

NO Go to page 300-3.

YES 

Position the System Unit Power switch to Off, remove the keyboard connector at the System Unit, then power on. Check the keyboard connector at the System Unit for the appropriate voltages, as shown in the diagram.



ARE ALL THE VOLTAGES CORRECT?

NO Replace the System Board. See Section 3, "Removal/Replacement."

YES Check keyboard cable connectors for damage, then replace keyboard assembly. See Section 3, "Removal/Replacement."

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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, "Start."
3. Select "Utilities" in the diagnostic menu, start an error log, and select "Run tests multiple times." This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 "Start" or the appropriate PIC for that symptom.

300

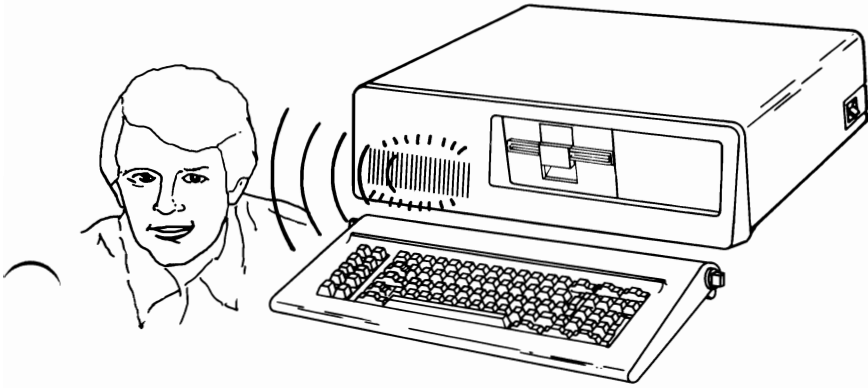
If you have followed these procedures and still have an unresolved problem, you should seek technical assistance.

Notes:



Display (Monochrome)

You have entered this PIC because you were not able to complete the POST, you have visually detected a Display problem or you have an error message, indicating a Display problem. Set the System Unit Power switch Off, remove the Display connector from the System Unit, insert your Advanced Diagnostic diskette or cassette, and set the power switch to On. Note any audio messages during the POST.



400

1 Long and 2 Short Beeps



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

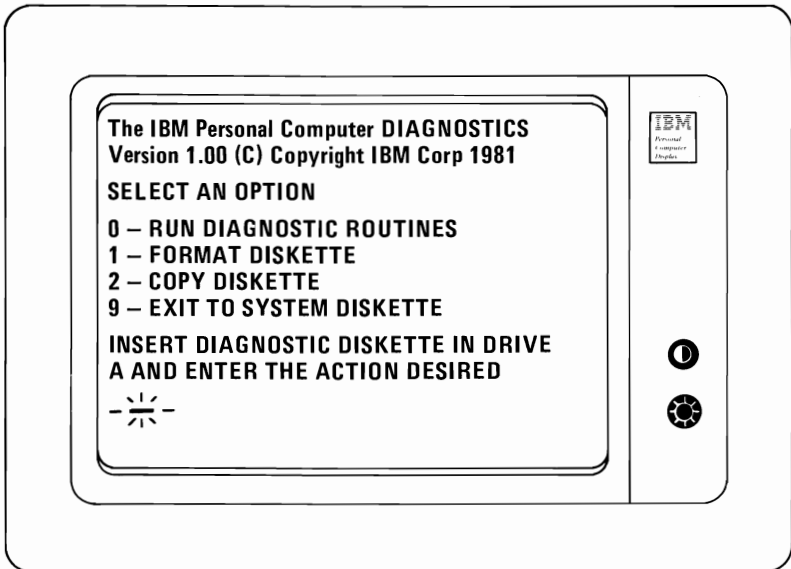
NO Replace your *IBM Monochrome Display and Parallel Printer Adapter* or your *Color/Graphics Monitor Adapter*. See Section 3, "Removal/Replacement."

If you are using a *Color/Graphics Monitor Adapter*, begin at PIC 500.

YES 

Position the System Unit Power switch to Off, reconnect the Display and power On. Be sure your Contrast and Brightness controls are turned up, clockwise.

(Note: If the Message on your display is too far to the left or right to read the entire message, press  to move the message to the right or  to move to the left.)

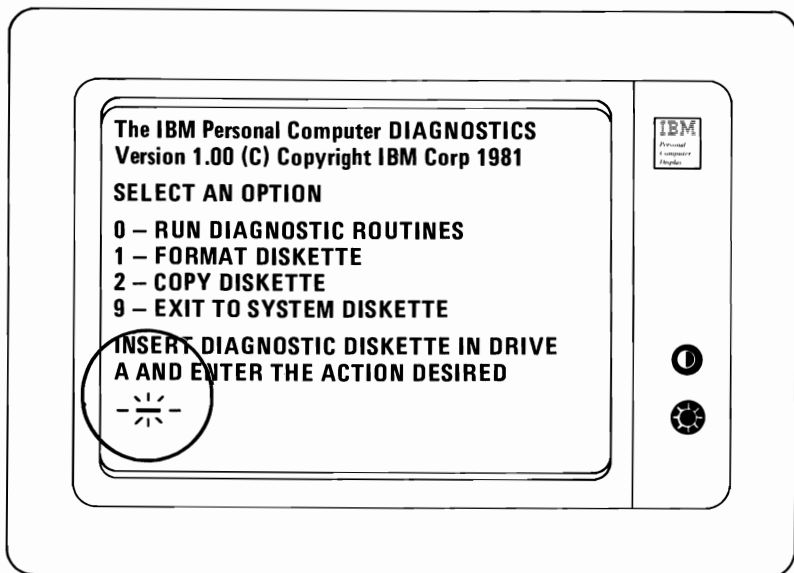


**WAS THE ABOVE MESSAGE STABLE AND READABLE
ON YOUR DISPLAY?**

NO Go to page 400-14.

YES 

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



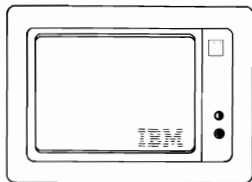
400

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

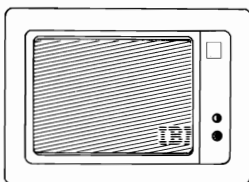
NO Replace your *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 

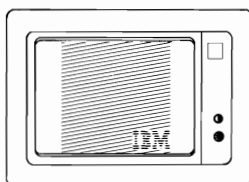
Your Display may be distorted or the characters may be the wrong size, as shown in the examples:



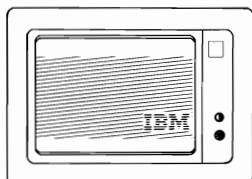
Too Dim



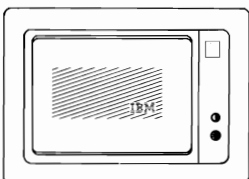
Too Wide



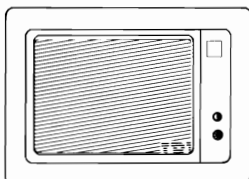
Too Narrow



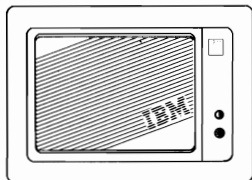
Too Short



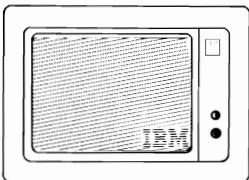
Shrunk



*Changes Size When
Brightness Control
Turned*



Tilted






Out of Focus

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

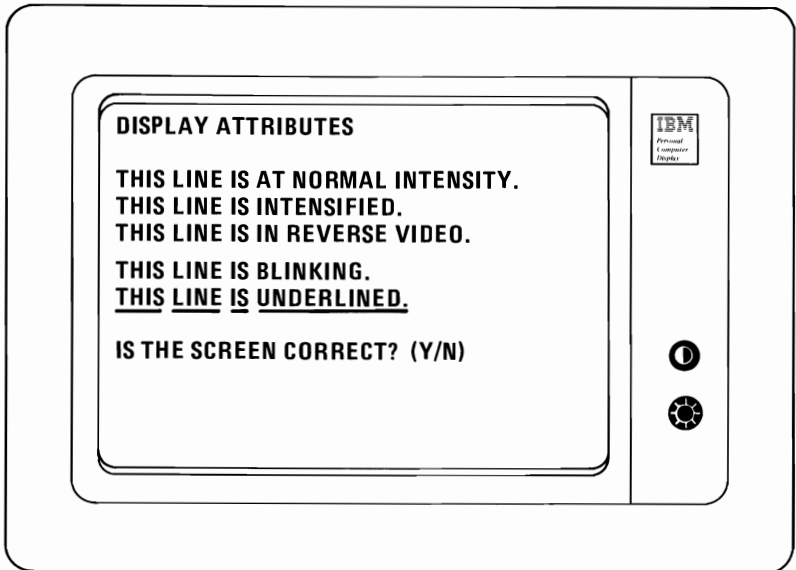
NO Replace your Display. See Section 3, "Removal/Replacement."

YES 

Continue running diagnostic routines. Verify the installed devices (refer to your Display for menu). Choose the Monochrome Display and Printer Adapter test (4). Press

 and  and  (Enter). If you received a "401"

error message at this point, replace your *IBM Monochrome Display and Parallel Printer Adapter*. Adjust your Brightness and Contrast controls until the intensified line is brighter than the other lines.



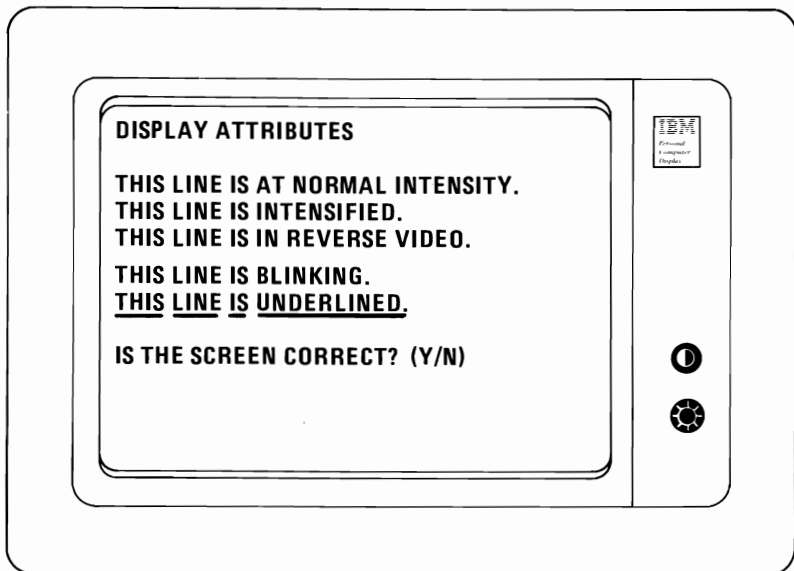
400

WERE YOU ABLE TO ADJUST FOR AN INTENSIFIED LINE?

NO Go to page 400-41.

YES 



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

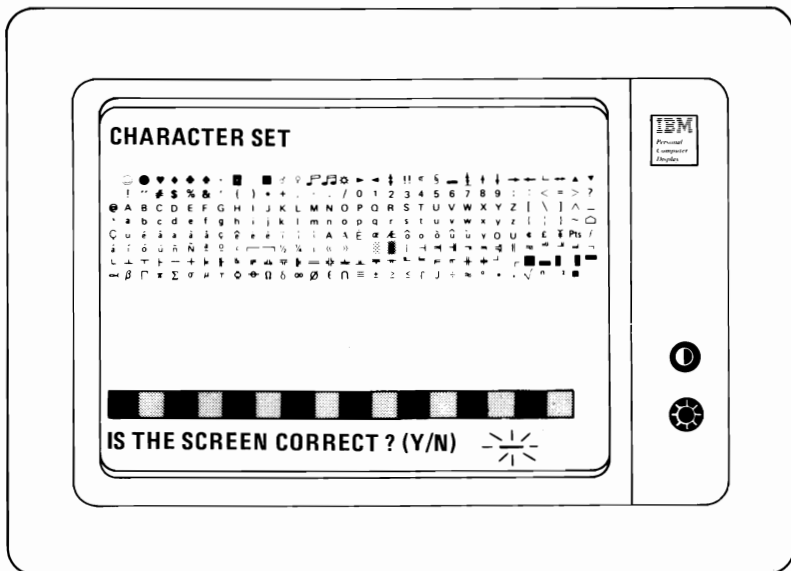


IS YOUR DISPLAY SCREEN CORRECT?

NO Replace *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 



To continue, press  and  (Enter). The following will appear on your Display:

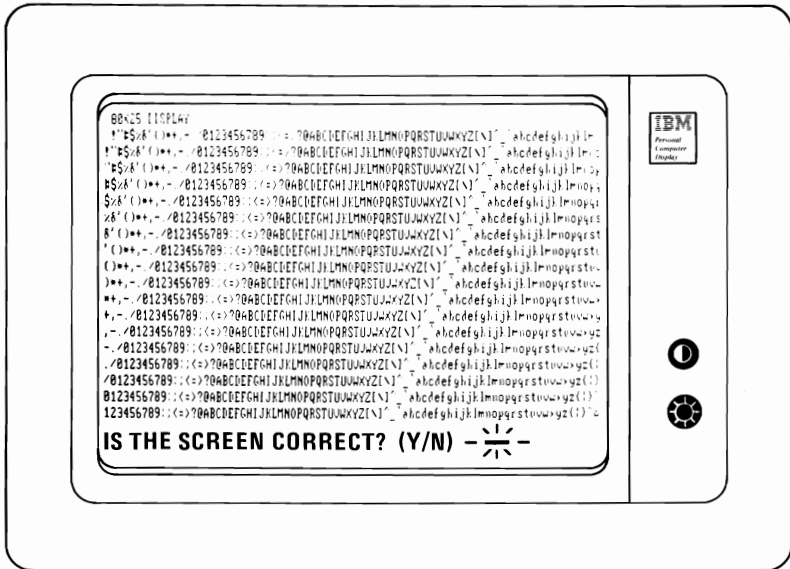


IS YOUR DISPLAY SCREEN CORRECT?

NO Replace your *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 



To continue, press  and  (Enter). The following will appear on your Display:

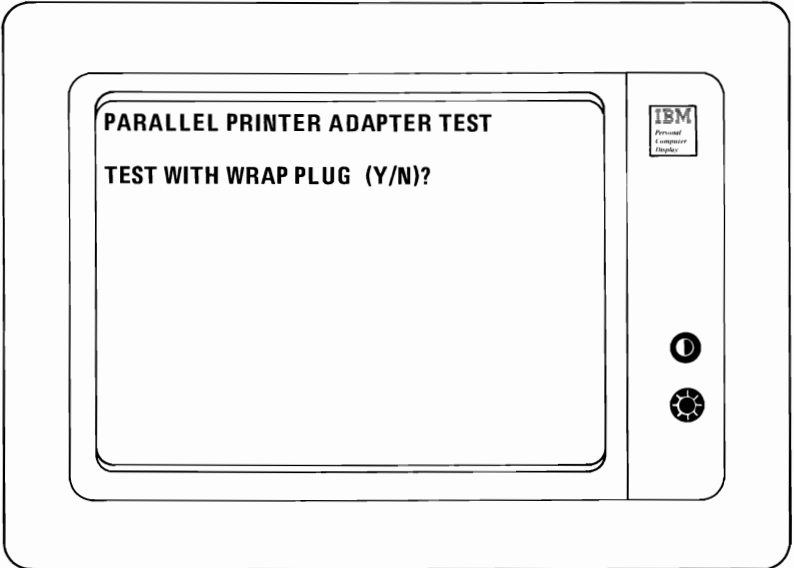


IS THE SCREEN ON YOUR DISPLAY CORRECT?

NO Replace *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 

Remove the Parallel Printer Adapter cable. To continue, press  and  (Enter). The following will appear on your Display:



400

DID YOU COMPLETE THE TEST WITHOUT AN ERROR?

NO Replace your *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 

400-9

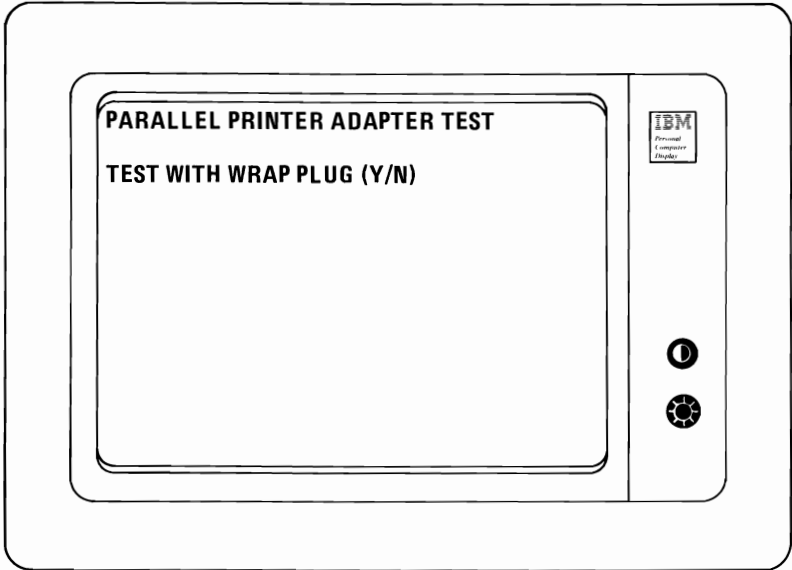
If you did not receive an error message, you should have received a message similar to the one below. DO NOT PRESS



YES OR



(ENTER) AT THIS POINT!



DO YOU WANT TO INSTALL THE PARALLEL PRINTER ADAPTER WRAP PLUG?

NO

Press



and



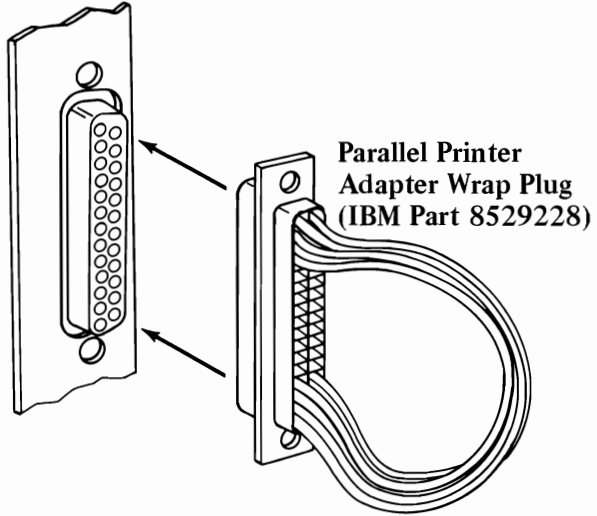
(Enter). This action will

return you to the test menu.

YES

Before answering YES, install the Parallel Printer Adapter Wrap Plug as shown in the diagram or you will receive an invalid error message.

IBM Monochrome Display and Parallel Printer Adapter



400

HAVE YOU INSTALLED THE WRAP PLUG?

NO Install your Wrap Plug, then continue with the diagnostics.

YES 

Press

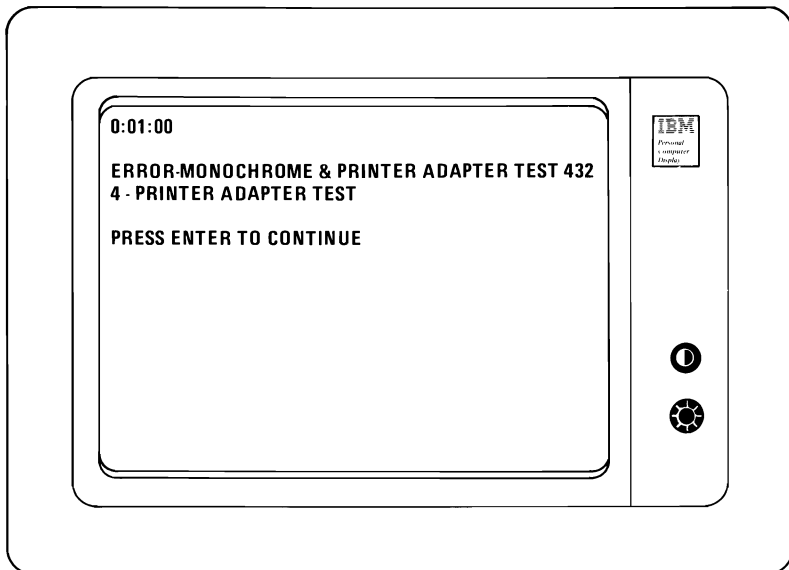


and



Enter. This will cause the System Unit

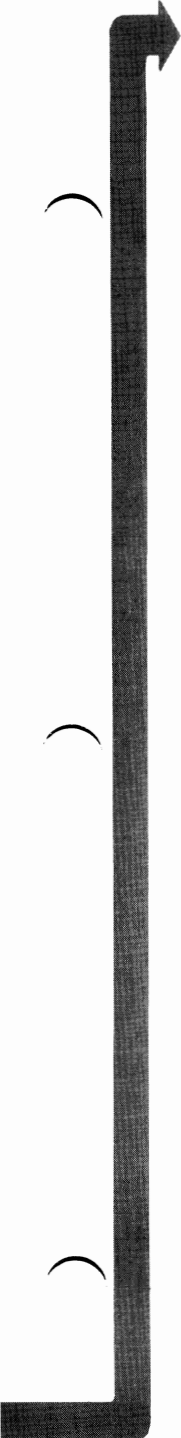
to check the *IBM Monochrome Display and Parallel Printer Adapter*. An error message similar to one below may appear.



DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO Replace your *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 




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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, “Start.”
3. Select “Utilities” in the diagnostic menu, start an error log, and select “Run tests multiple times.” This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 “Start” or the appropriate PIC for that symptom.









400

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

You reached this page because you do not have a properly functioning Display. You can use an audio response to guide you. Press the following keys in the sequence listed below.

Listen for the beep each time you press the  (Enter) key.

Use the numbers on the top row of the keyboard for this test; do not use the numeric keypad. If you are using cassette diagnostics, go to page 010-9, complete the instructions on that page, then return to this page and continue with step 2.

-
1.  Run Diagnostics
 2.  Enter (Beep)
 3.  Are the installed devices correct? Yes.
 4.  Enter (Beep)
 5.  Run Test
 6.  Enter (Beep)
Enter the number of devices to test.
 7.  Monochrome Display and Printer Adapter
 8.  Enter (Beep) (Beep)

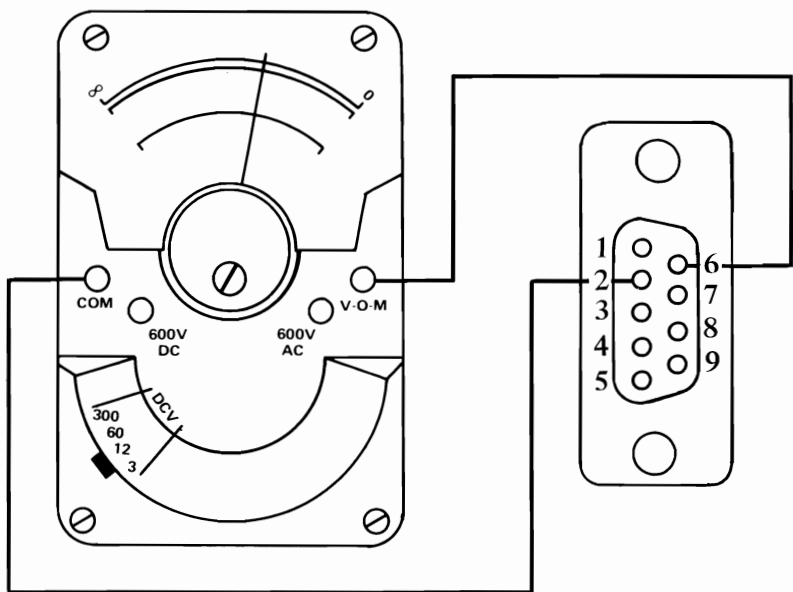
WERE YOU ABLE TO COMPLETE THE AUDIO RESPONSE DIAGNOSTICS BY PRESSING THE ABOVE SEQUENCE OF KEYS?

NO You may have a power supply or connector problem. Check your connector or see PIC 020, "Power."

YES 

Press   and  (Enter). Selecting the video


test should place a signal on pin 6 and 7 of the 9 pin connector of between 2.4 and 3.8 Vdc. Remove the display cable. Measure the voltage present between pins 2 and 7 and pins 2 and 6.



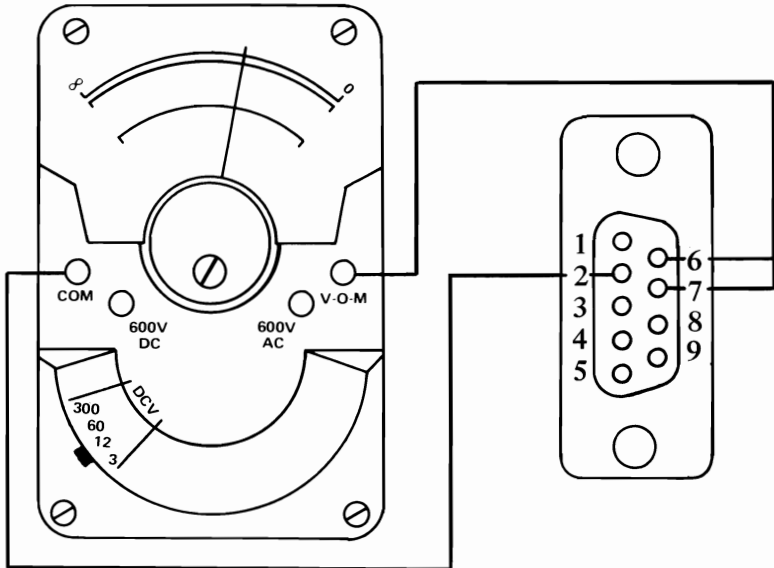
WERE YOU ABLE TO READ BETWEEN 2.4 AND 3.8 Vdc?

NO Replace *IBM Monochrome Display and Parallel Printer Adapter*. See Section 3, "Removal/Replacement."

YES 

Press  (Enter). This will select an all black screen and


place a signal on pins 6 and 7 of the 9 pin connector of between 0 and 0.5 Vdc. Set your meter on the 12 volt DC scale and measure the voltage present between pins 2 and 7 and pins 2 and 6.



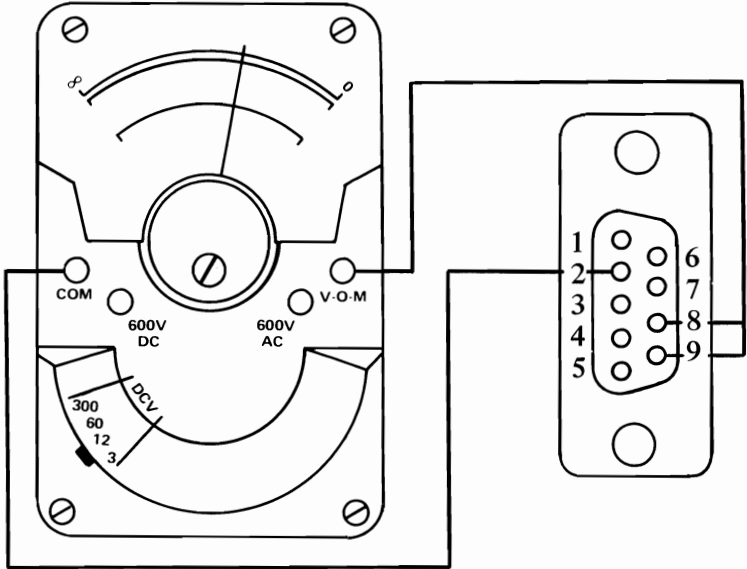
WERE YOU ABLE TO READ BETWEEN 0 AND 0.5 Vdc AT PINS 6 AND 7?

NO Replace IBM Monochrome Display and Parallel Printer Adapter. See Section 3, "Removal/Replacement."

YES 

Press  (Enter) and wait for two beeps.

The signal on pin 8 (horizontal sync) should be between 0.4 and 1.1 Vdc, and on pin 9 should be between 3.0 and 4.2 Vdc. Refer to the diagram below. Set your meter on the 12 volt DC scale and measure the voltage present at pin 8 and pin 9.



400

WERE YOU ABLE TO READ BETWEEN 0.4 AND 1.1 Vdc ON PIN 8 AND BETWEEN 3.0 AND 4.2 Vdc ON PIN 9?

NO Replace IBM Monochrome Display and Parallel Printer Adapter. See Section 3, "Removal/Replacement."

YES

Press the following keys

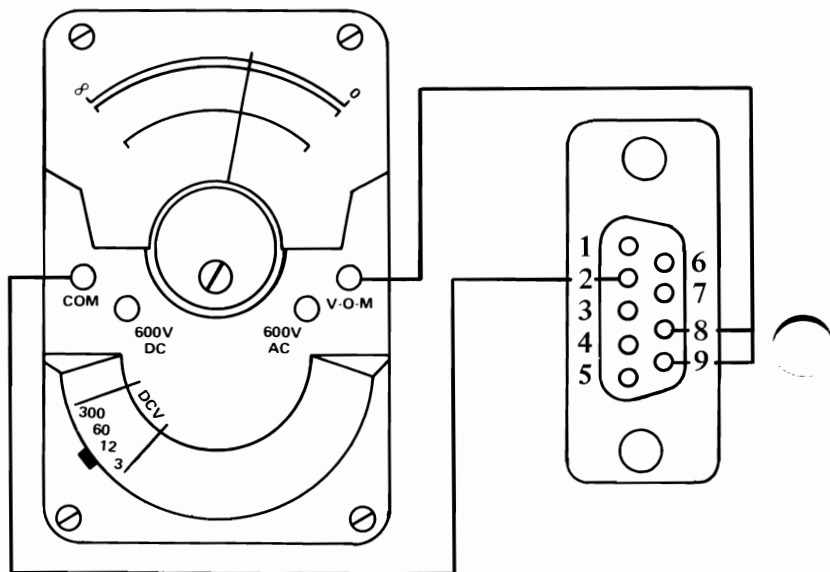


(sync test) and



(Enter). You have placed the following signals on pin 8

(horizontal sync) and 9 (vertical sync) of the 9 pin connector. Pin 8 should measure between 1.5 and 2.5 Vdc. Pin 9 should measure between 1.8 and 2.6 Vdc. Set your meter on the 12 volt DC scale and measure the voltage present at pin 8 and pin 9.



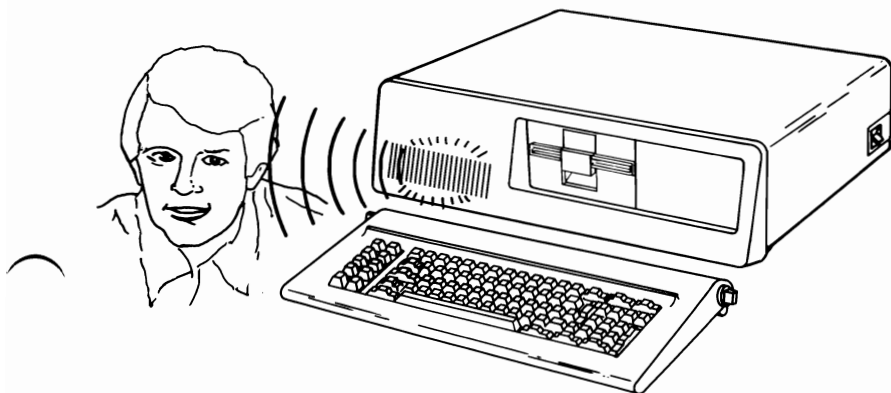
WERE YOU ABLE TO READ BETWEEN 1.5 AND 2.5 Vdc ON PIN 8 AND BETWEEN 1.8 AND 2.6 Vdc ON PIN 9?

NO Replace your IBM Monochrome Display and Parallel Printer Adapter. See Section 3, "Removal/Replacement."

YES Replace your display. See Section 3, "Removal/Replacement."

Display (Color/Graphics)

You have entered this PIC because you were unable to complete the POST, you visually detected a Color/Graphics problem or you have an error message indicating a color/graphics problem. Set the System Unit Power switch to Off, insert your Advanced Diagnostic diskette or cassette, and position the System Unit Power switch to On. (Note any audio messages during the POST.)





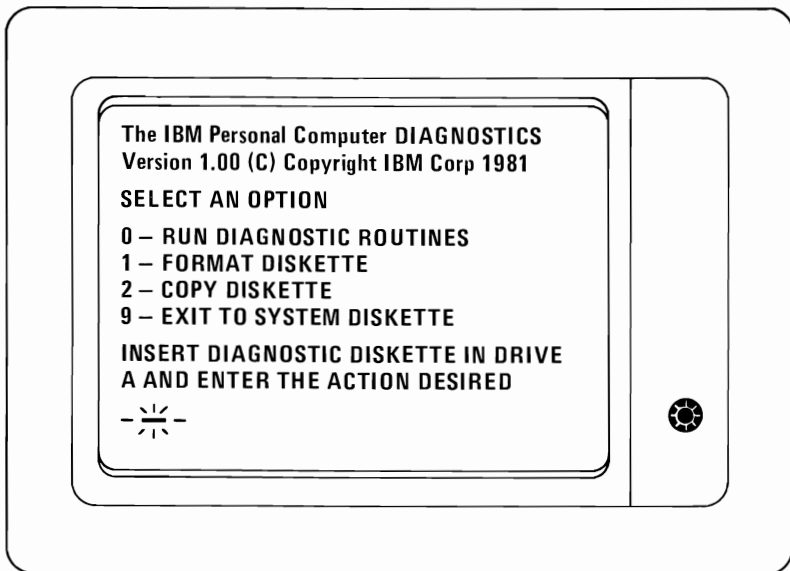
500

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

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

The display messages shown on the following pages were reproduced from a Direct Drive-Color Monitor. If you are using a Direct Drive-Color Monitor, your messages will compare favorably with those shown in the manual. If you are using a composite monitor or television, your message will not appear as sharp as those shown in this manual. (**Note:** If the message on your display is too far to the left or right to read the entire message, press  to move the message to the right or  to move it to the left.) The following message should appear on your display:

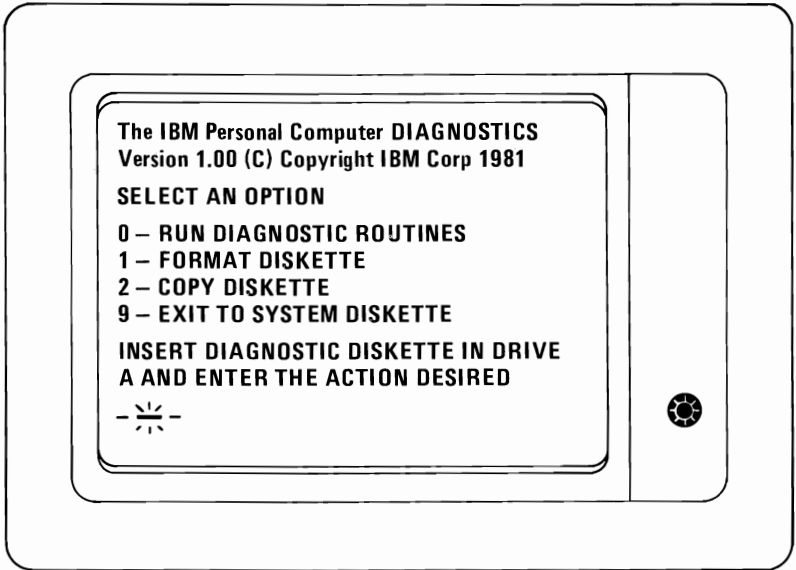


**WAS THE ABOVE MESSAGE STABLE AND READABLE
ON YOUR DISPLAY?**

NO Go to page 500-19.

YES 

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

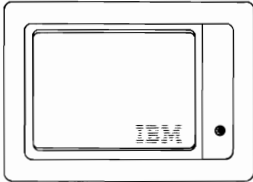


IS THE CURSOR VISIBLE AND IS IT IN THE CORRECT POSITION ON YOUR DISPLAY?

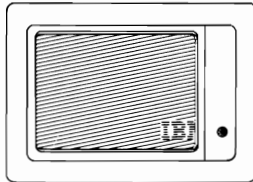
NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

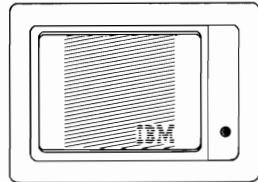
Your Display may be distorted or the characters may be the wrong size as shown in the examples:



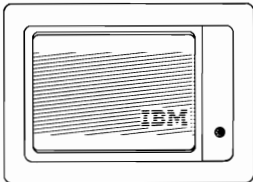
Too Dim



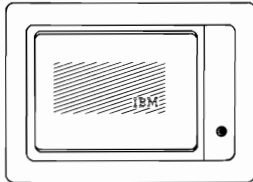
Too Wide



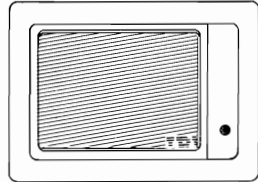
Too Narrow



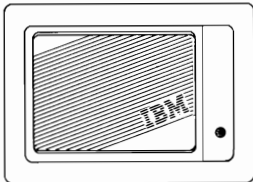
Too Short



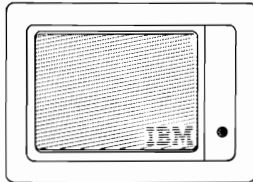
Shrunk



*Changes Size When
Brightness Control
Turned*



Tilted



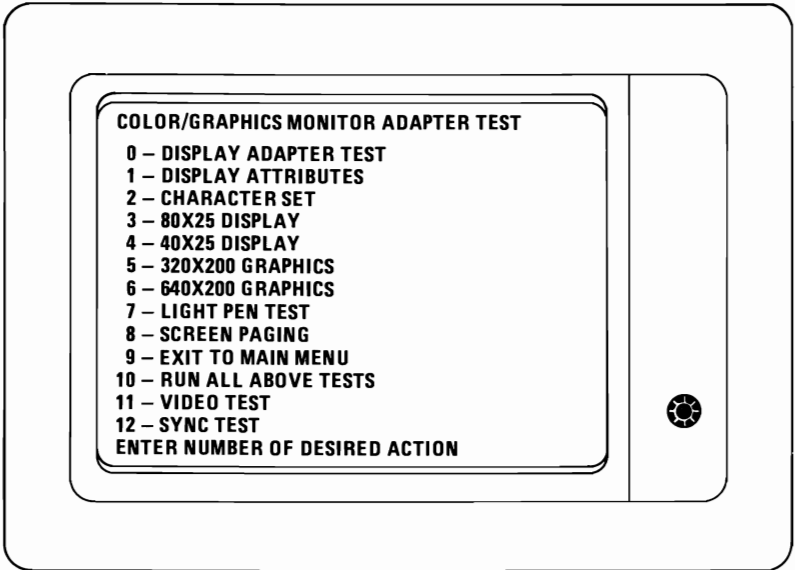
Out of Focus

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

NO Replace your Display. See Section 3, "Removal/Replacement."

YES 

Continue running diagnostic routines. Verify the installed devices, select the Color/Graphics Test (5). The following menu should appear on your Display:



500

DID THE ABOVE DISPLAY APPEAR?

NO Go to page 500-19.

YES 

Press

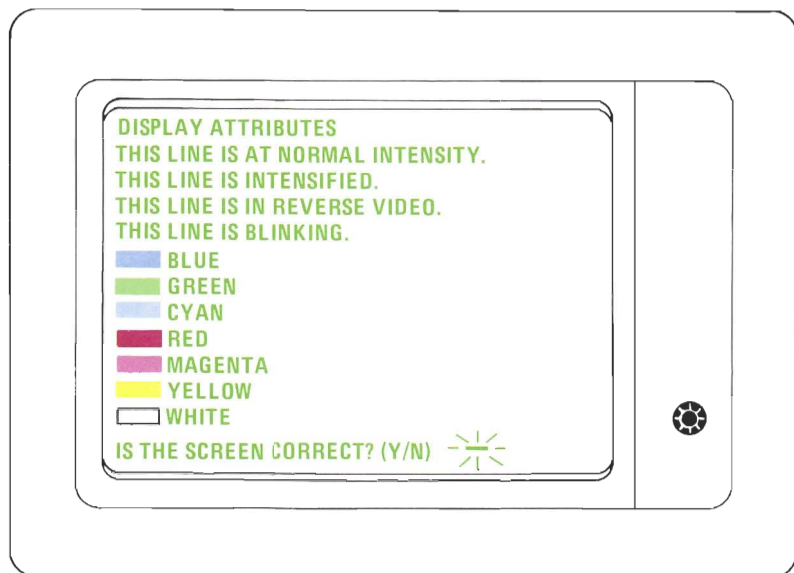


(Run all above tests) and



(Enter);

the following message will appear on your display. If error 501 message appears, replace your Color/Graphics Monitor Adapter. If you have a composite color display, the colors will appear in two shades with the darker shade on top. If you are using a direct drive display, it will probably not support the intensity bit; the intensified line will be displayed with normal intensity and only one shade will be displayed for each other.

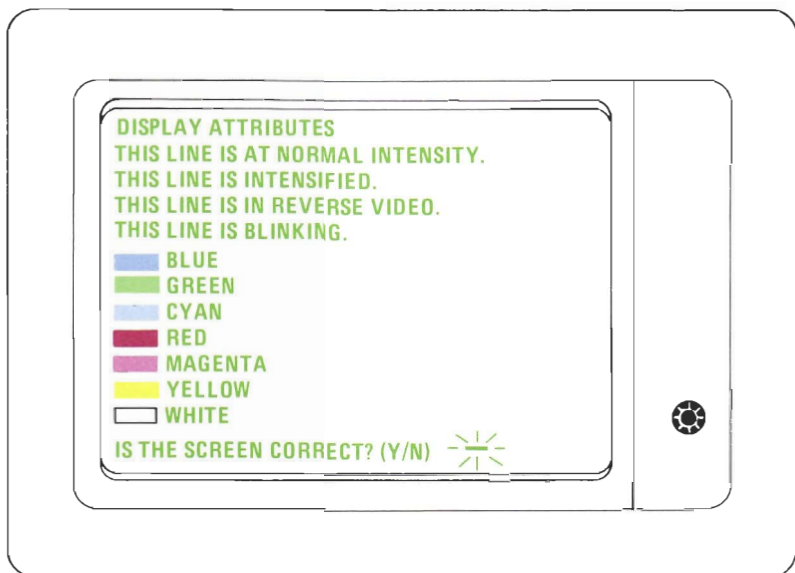


ARE ALL OF THE COLORS PRESENT AND OF CORRECT HUE ON THE DISPLAY?

NO For composite color display, go to page 500-18.
For direct drive display, go to page 500-19.

YES

If you have a composite color display, the colors will appear in two shades with the darker shade on top. The appearance of each line on your display should match the description on that same line.



IS THE SCREEN ON YOUR DISPLAY CORRECT?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

Press

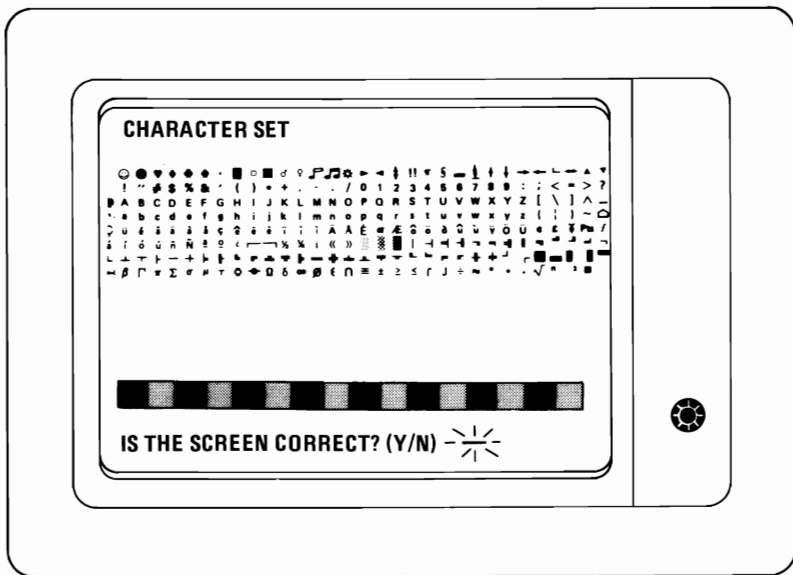


and



(Enter). The following should appear

on your Display:

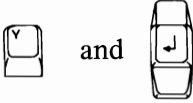


ARE ALL THE CHARACTERS PRESENT AND CORRECT (NO EXTRA DOTS IN CHARACTER BOXES OR MISSING DOTS FROM CHARACTER FIGURE)?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

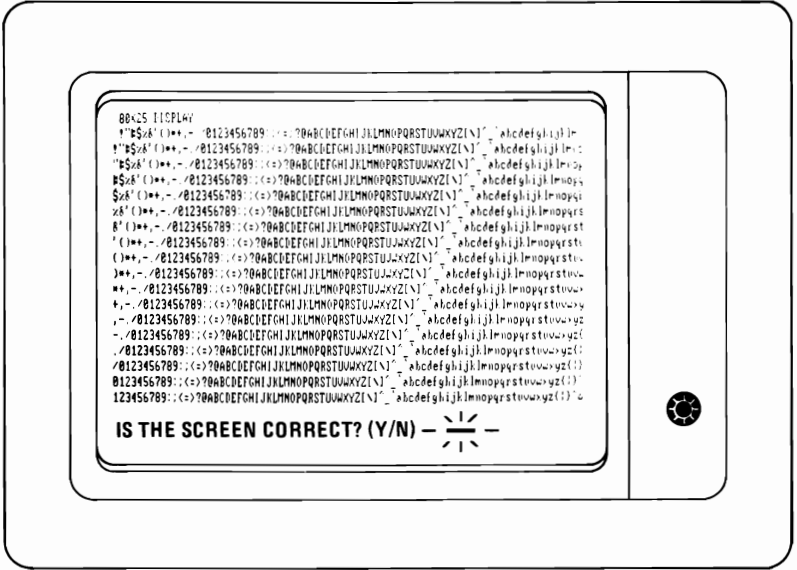
YES 

This test is used to verify that the 80 x 25 Alpha mode logic is functioning on the Color/Graphics Monitor Adapter. The border for the 80 x 25 character test should be black. Press



and (Enter). The following should appear on

your Display:



500

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

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES

This test is used to verify the 40 x 25 Alpha mode logic is functioning on the Color/Graphics Monitor Adapter. The border for the 40 x 25 character test should be white. Press

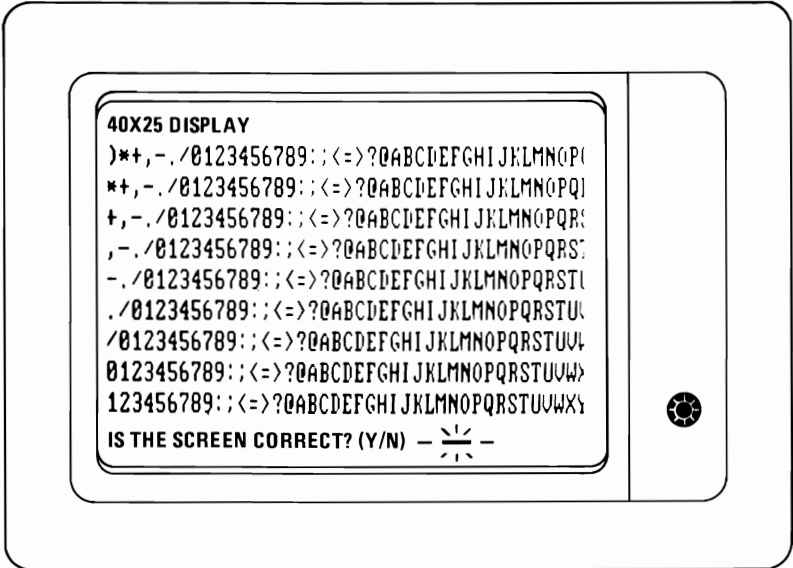


and



(Enter). The following should appear on

your Display:





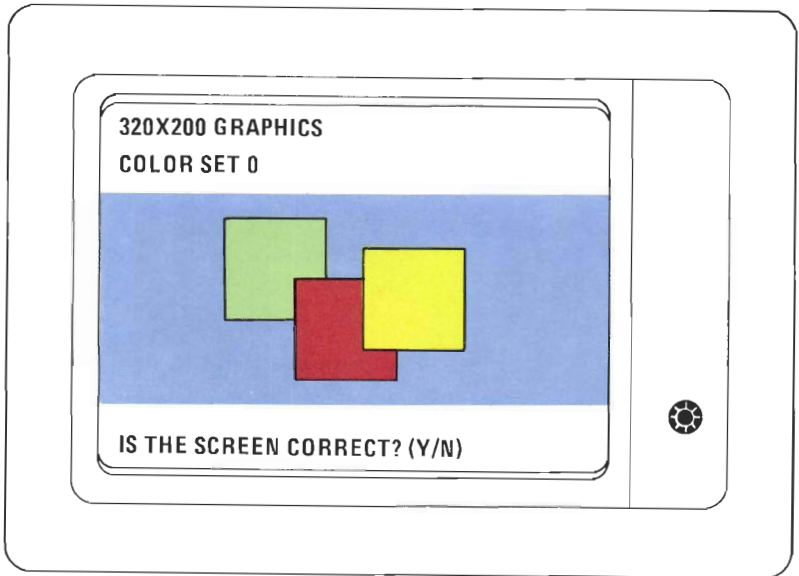
IS THE BORDER WHITE AND ARE ALL THE CHARACTERS PRESENT AND COMPLETE?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES

This test is used to verify the 320 x 200 color graphics color set 0. The background is dark cyan. The left box is intensified green, the center box is intensified red, the right box is intensified yellow, and the characters are printed in intensified yellow.

Press  and  (Enter). The following should appear on your Display:





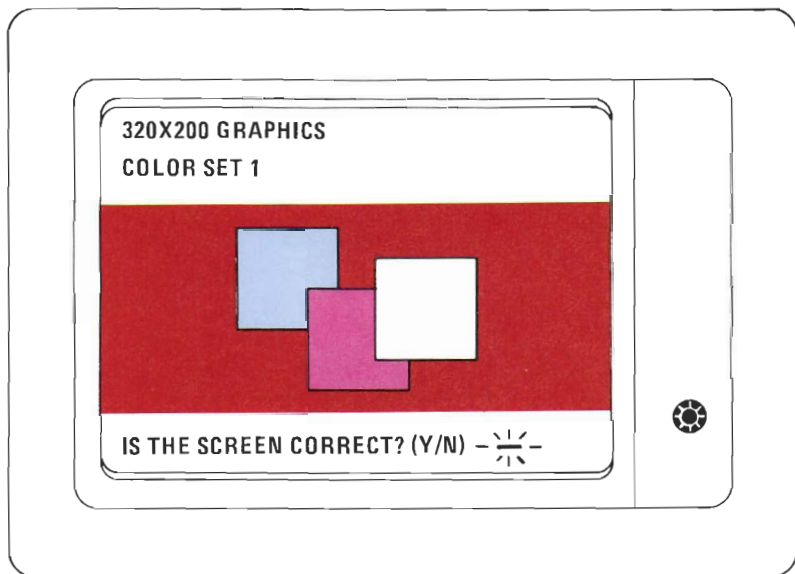
IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

This test is used to verify the 320 x 200 color graphics color set 1. The background is intensified red. The left box is dark cyan, the center box is dark magenta, the right box is non-intensified white (light gray) and the characters are printed in dark magenta.

Press  and  (Enter). The following should appear on your Display:





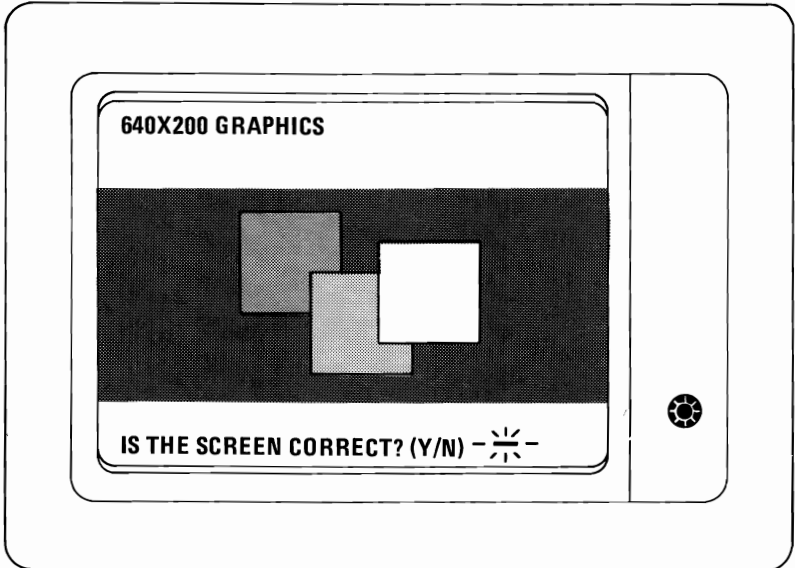
IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

This test is used to verify the 640 x 200 color graphics. The background is black, the left box is gray, the middle box is gray, the right box is white. The background is black, the left box is gray, the middle box is gray, the right box is white.



Press  and  (Enter). The following should appear on your Display:

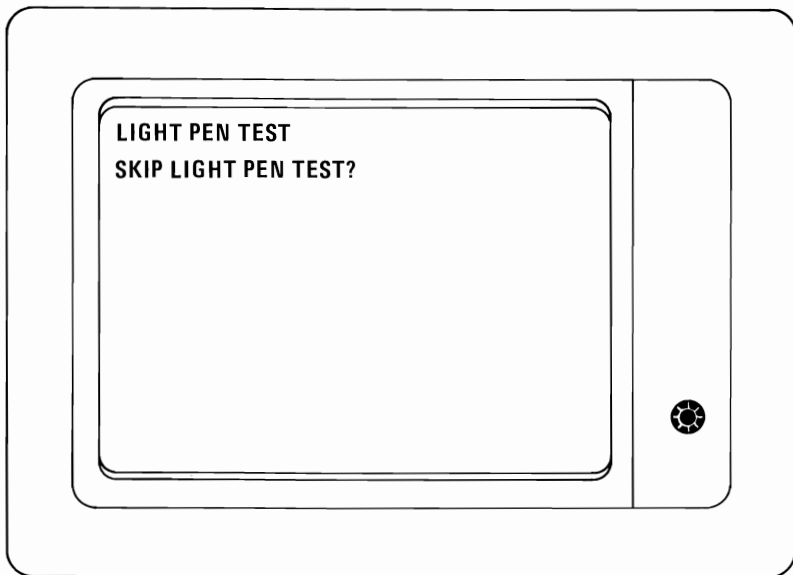


IS THE GRAPHIC DISPLAY THE SAME AS YOU SEE HERE?



NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

Press  and  (Enter). The following should appear on your Display:





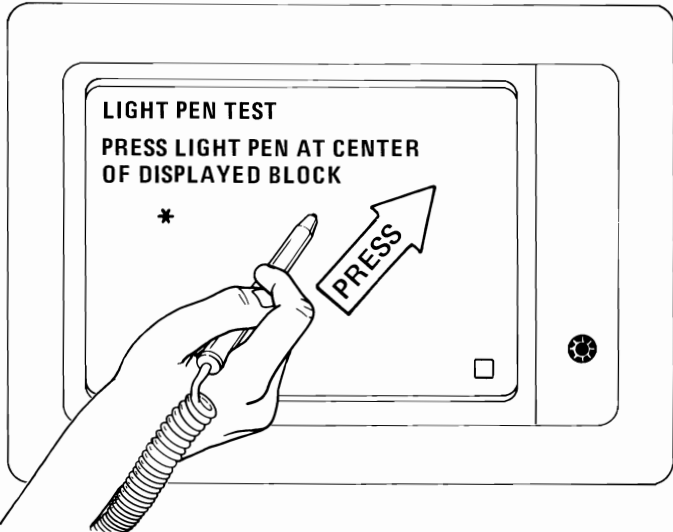
DO YOU HAVE A LIGHT PEN INSTALLED?

NO Press  and  (Enter). Go to page 500-16.

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. 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.

Press  and  (Enter). The following should appear on your Display:

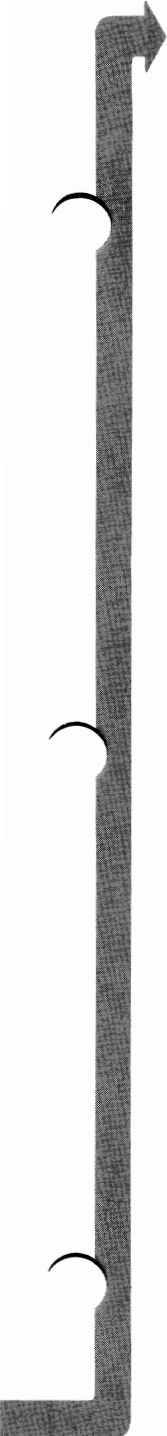


500

WERE YOU ABLE TO COMPLETE THE LIGHT PEN TEST?

NO Replace the light pen.

YES 



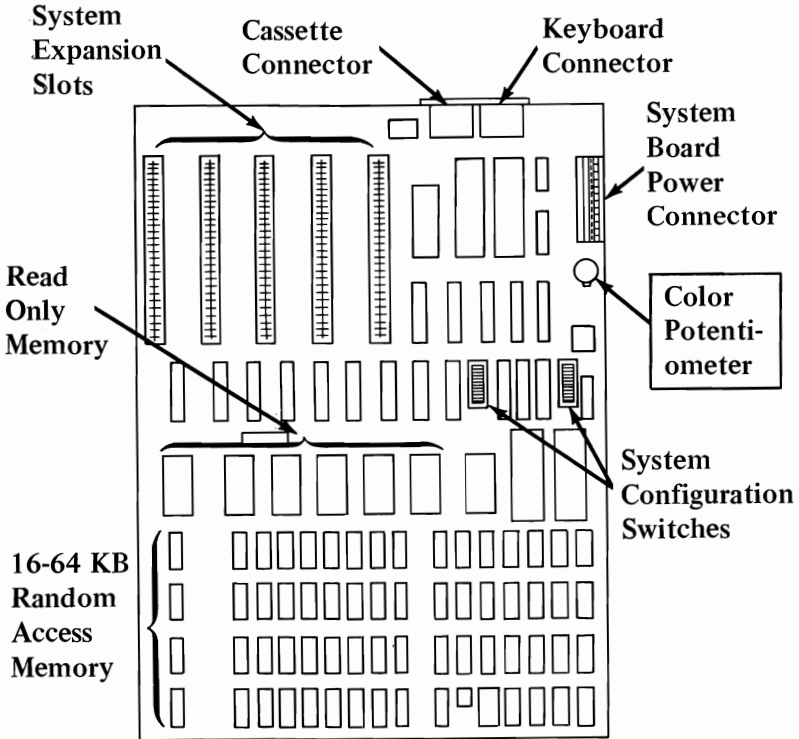
You have gone through the PICs without resolving your problem. The following steps should help you to find additional *audio* or *visual* symptoms.

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, “Start.”
3. Select “Utilities” in the diagnostic menu, start an error log, and select “Run tests multiple times.” This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 “Start” or the appropriate PIC for that symptom.

500

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

If your Display works properly except for an incorrect color hue or the absence of color, adjust the potentiometer on the System Board next to the power supply connectors in small increments until the color appears. (Use only a nonmetallic screwdriver or aligning tool.) The hue and color controls on the color monitor must also be set correctly at this point.




WERE YOU UNABLE TO ADJUST FOR ACCEPTABLE COLOR?

NO Go to page 500-7.









YES 

Set the System Unit Power switch to Off and connect your display cable to the System Unit connector. Insert your Advanced Diagnostic diskette or cassette. Set the System Unit Power switch to On. You will use an audio response to guide you through the diagnostics. Press the following keys in the sequence listed and listen for the "beep" each time you

press  (Enter). If you are using cassette diagnostics, go to page 010-9, complete the instructions on that page; return to this page and continue with step 2.

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

STEPS

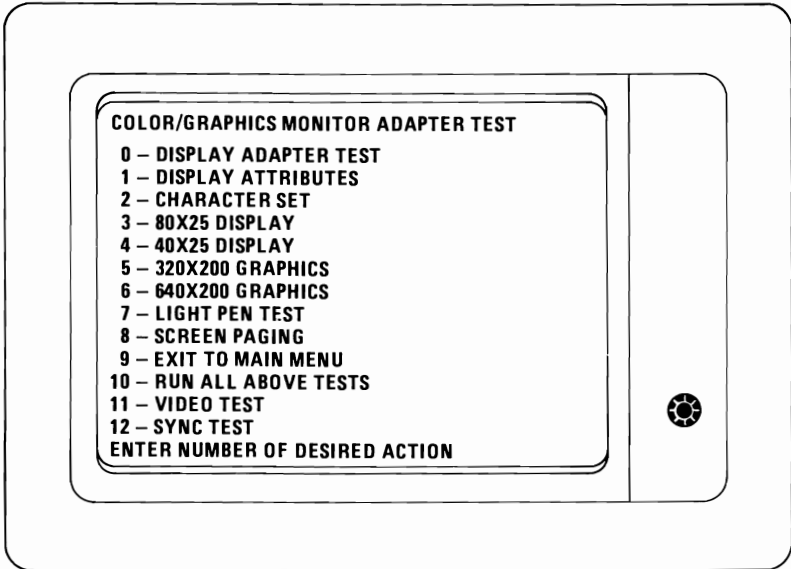
1.  Run Diagnostics
2.  Enter (Beep)
3.  Are the options correct? (YES).
4.  Enter (Beep)
5.  Run Test
6.  Enter (Beep)
Enter the number of option to test.
7.  Color/Graphics Adapter
8.  Enter (Beep)(Beep)

WERE YOU ABLE TO COMPLETE THIS 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 020, "Power."

YES 

The menu shown here should appear on your Display. You may have recognizable but incorrect characters present on the Display, producing an unintelligible message.






**ARE RECOGNIZABLE BUT INCORRECT CHARACTERS
PRESENT ON THE DISPLAY?**

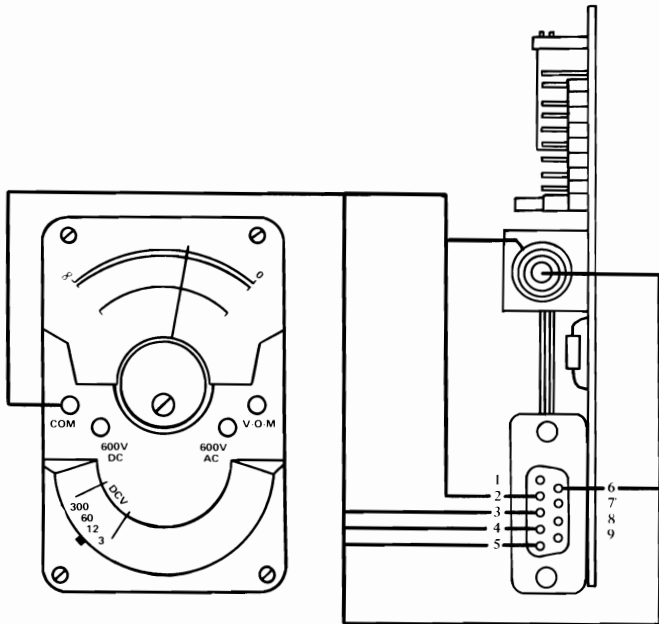
YES Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

NO 

Disconnect the Display signal cable at the rear of the System

Unit. Press   (Video Test), and  (Enter).


Selecting the Video Test will place a signal on pins 3, 4, 5, and 6 of the 9 pin connector of between 2.4 and 5.5 Vdc. At the phono-jack connector, the voltage between the two test points should be 1.2 and 2.5 Vdc. Measure the voltages present on pins 3, 4, 5, and 6 of the 9 pin connector and the voltage between the center and outer edge of the phono-jack.



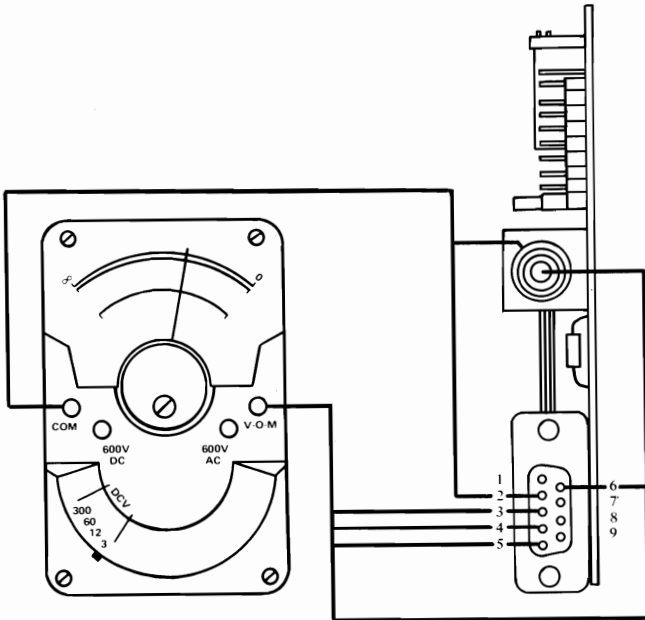
WERE YOU ABLE TO READ THE PROPER VOLTAGES?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES

Press  (Enter). This will return you to an all black


screen. Selecting the all black screen will place a signal on pins 3, 4, 5, and 6 of the 9 pin connector of between 0.0 and 0.5 Vdc. At the phono-jack connector, the voltage between the two test points should be 0.0 and 0.9 Vdc. Measure the voltage present at pins 3, 4, 5, and 6 of the 9 pin connector and the voltage between the center and outer edge of the phono-jack.



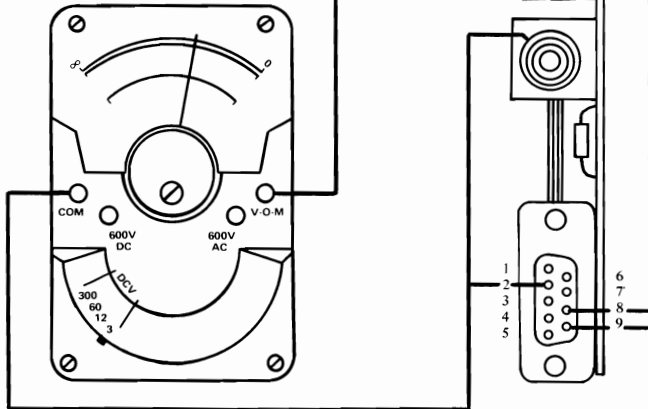
WERE YOU ABLE TO READ THE PROPER VOLTAGE?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES 

Press the  key and listen for two “beeps.” The voltages listed in the table below should be present on pins 8 and 9 of the 9 pin connector; at the phono-jack connector, the voltage should be between 1.0 and 1.5 volts DC. Measure the voltages present at pins 8 and 9 of the 9 pin connector and the voltage between the center and outer edge of the phono-jack.

Pin	Volts, DC
8	0.0-0.7
9	0.0-0.4
Phono	1.0-1.5



500

WERE YOU ABLE TO READ THE PROPER VOLTAGES ON PINS 8 AND 9 AND AT THE PHONO-JACK CONNECTOR?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, “Removal/Replacement.”

YES 

Press



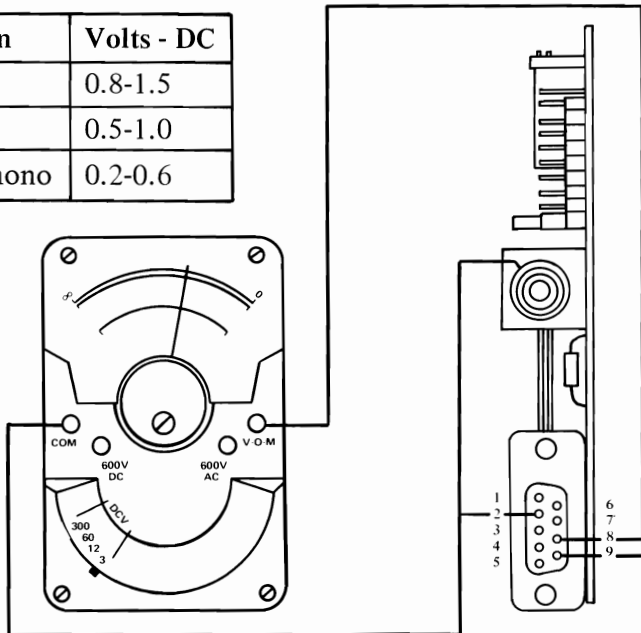
(Sync Test) and



(Enter). The

voltages listed in the table below should be present on pins 8 and 9 of the 9 pin connector and at the phono-jack connector. Measure the voltage present at pins 8 and 9 or the 9 pin connector and the voltage between the center and outer edge of the phono-jack.

Pin	Volts - DC
8	0.8-1.5
9	0.5-1.0
Phono	0.2-0.6



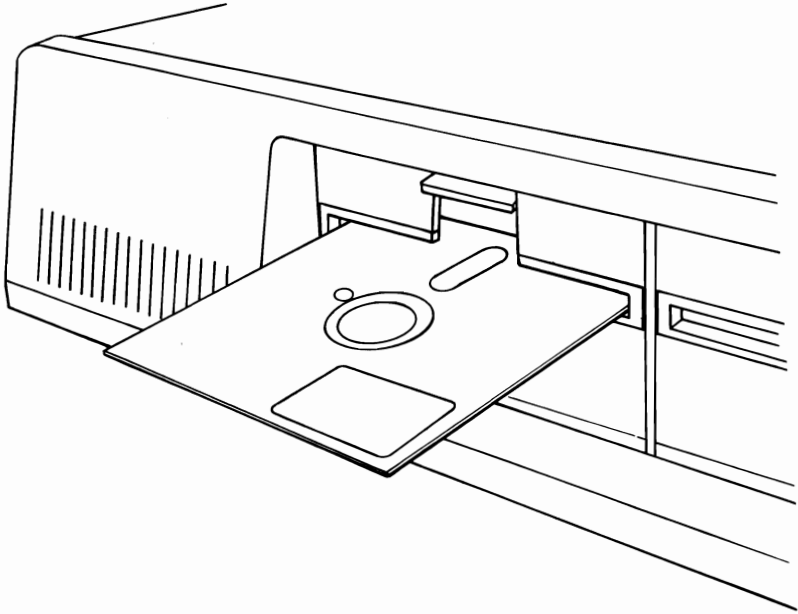
WERE YOU ABLE TO READ THE PROPER VOLTAGES ON PINS 8 AND 9 AND AT THE PHONO-JACK CONNECTOR?

NO Replace your Color/Graphics Monitor Adapter. See Section 3, "Removal/Replacement."

YES Replace your Monitor. See Section 3, "Removal/Replacement."

5¼" 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 the obstruction or replace the appropriate FRU. Check your diskette for damage.



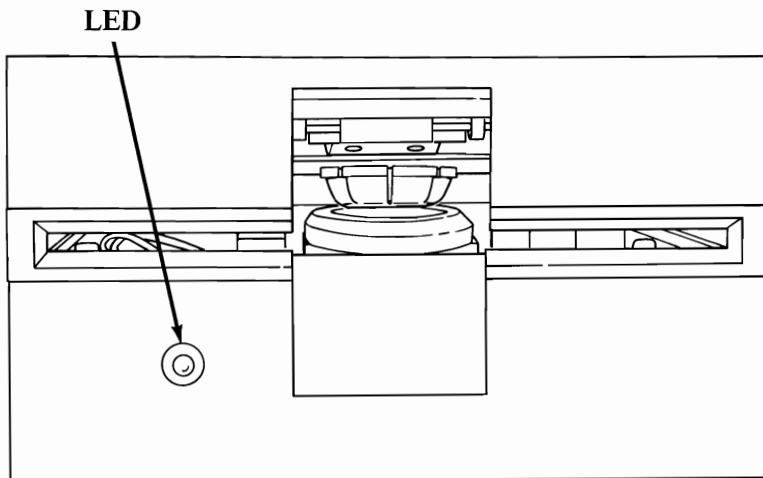
600

IS YOUR DISKETTE FREE OF DAMAGE, FORMATTED, AND INSERTED PROPERLY?

NO Use another diskette or insert the diskette properly, then repeat the operation which failed to verify the repair.

YES 

Position the System Unit Power switch to Off. Check the Diskette Drive connectors for damage or improper connection. Be sure the diskette assembly mounting screws are tight. Insert your Advanced Diagnostic diskette in drive "A" and position the System Unit Power switch to On.



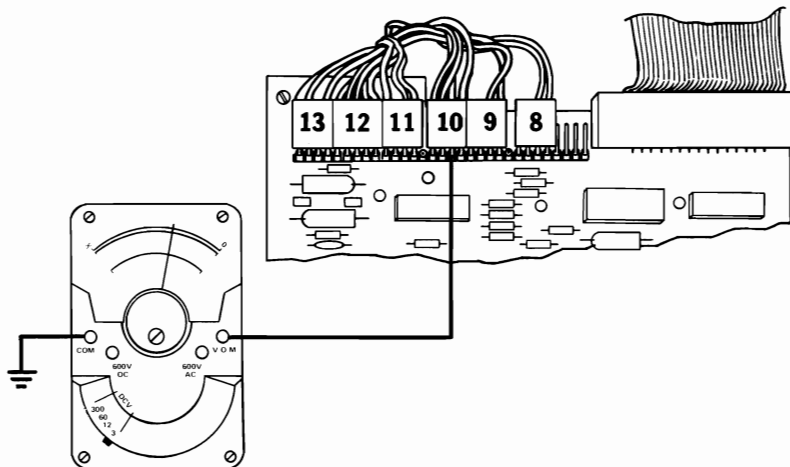
Front View Diskette Drive

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

NO Go to page 600-9.

YES 

Remove your diskette. Check the voltage from P10-2 to ground while inserting a diskette in Diskette Drive "A." The voltage should drop from 0.5-1.0 Vdc to 0-0.4 Vdc as the diskette is inserted.



600

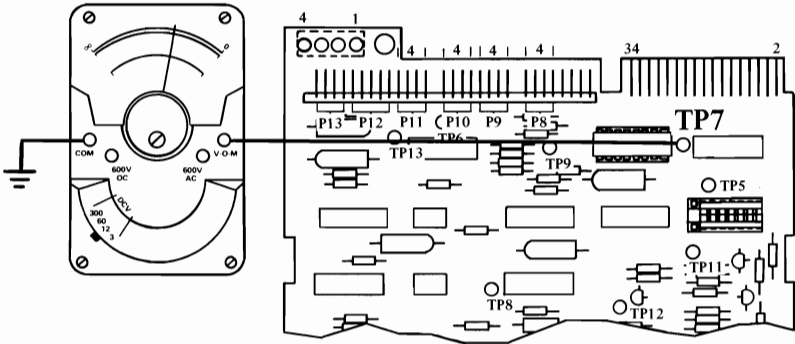
DID THE VOLTAGE AT P10-2 DROP FROM 0.5-1.0 Vdc TO 0-0.4 Vdc WHILE INSERTING THE DISKETTE?

NO Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

YES 

600-3

Remove your diskette. Check the voltage from TP-7 to ground while inserting a diskette. The voltage should decrease from 2.0-5.5 Vdc to 0-0.8 Vdc as the diskette is inserted.

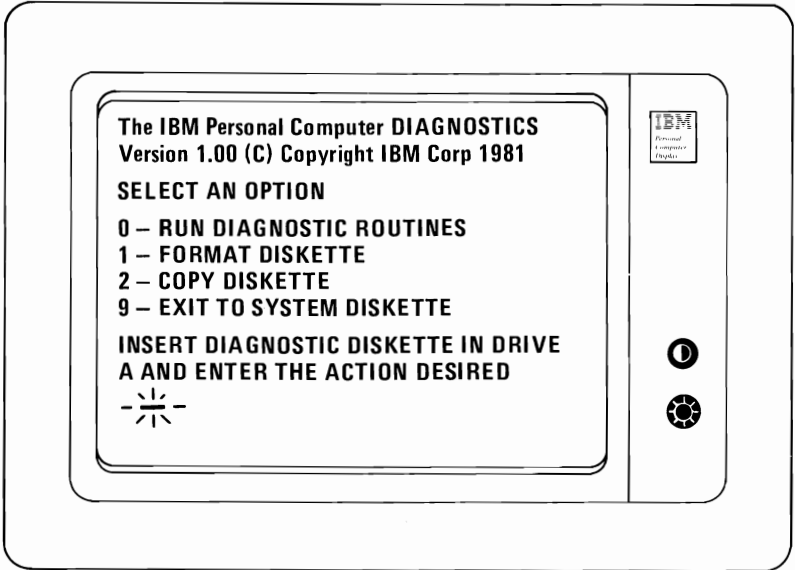


DID THE VOLTAGE AT TP-7 DECREASE FROM 2.0-5.5 Vdc TO 0-0.8 Vdc WHILE INSERTING THE DISKETTE?

NO Replace the Diskette Logic Printed Circuit Board.
See Section 3, "Removal/Replacement."

YES 

The Advanced Diagnostic diskette should have loaded and the first diagnostic menu should appear on your display.



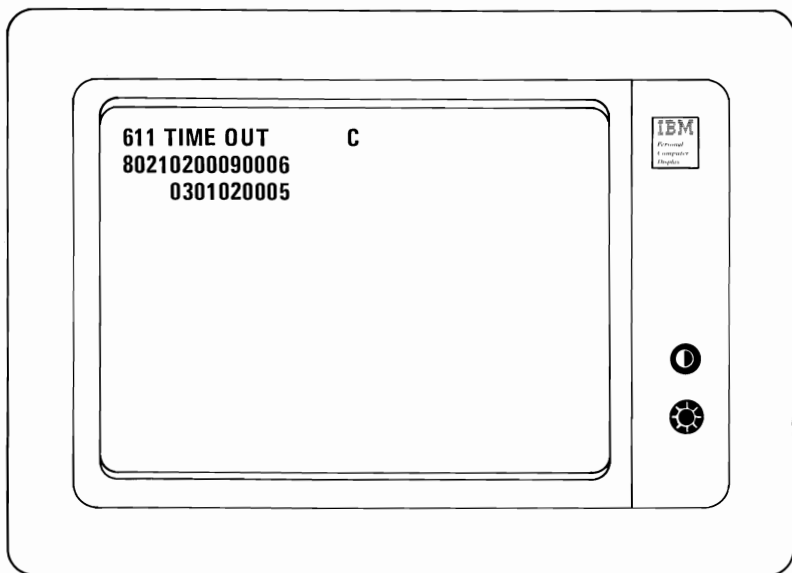
DID THIS MESSAGE APPEAR ON YOUR DISPLAY?

NO Go to page 600-13.

YES 

Select diagnostic routines (0), verify that your device list is correct, and "run tests multiple times" (1) for the Diskette Drive Assembly (6).

Run the test one time (1), do not wait each time an error occurs (N).



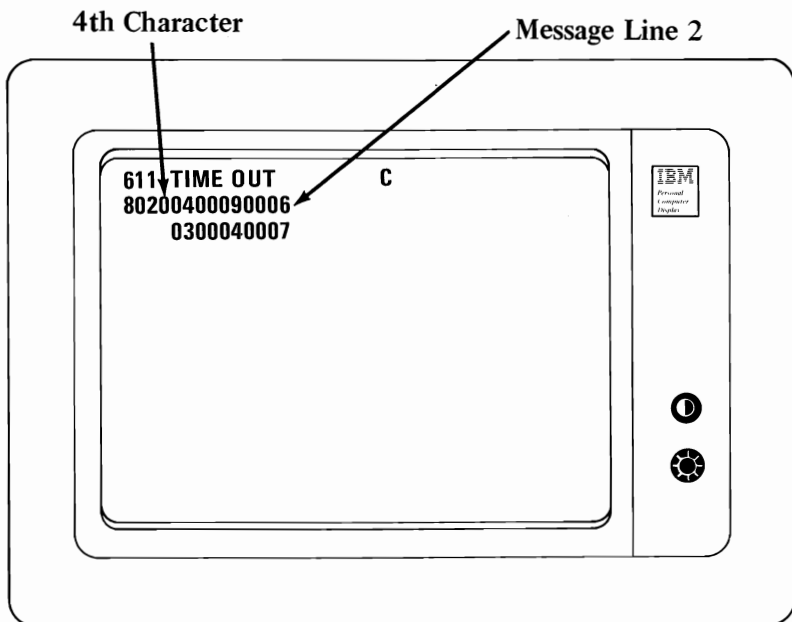
DID YOU HAVE AN ERROR CODE SIMILAR TO THIS ONE?

NO Go to page 600-29.

YES 

The fourth character of message line 2 indicates which Diskette Drive is failing. If the fourth character is a 0, the failure is with Diskette Drive "A." If the fourth character is a 1, the failure is with Diskette Drive "B."

Note: If you have the same failure on both diskette drives, check the signal cable and replace your diskette adapter. See Section 3, "Removal/Replacement."



IS THE FOURTH CHARACTER OF MESSAGE LINE 2 A 0?

NO Exchange the signal cables for Diskette Drives "A" and "B." Then go to page 600-2 for the test.

YES →

Repeat the test on page 600-6 using another formatted diskette.

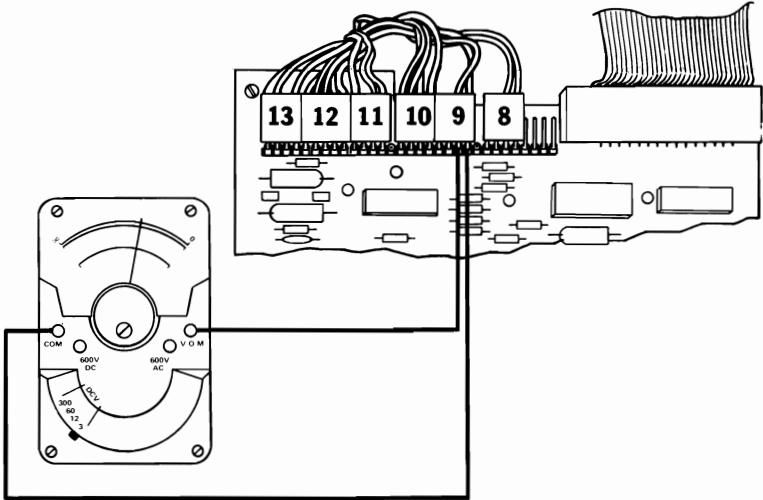
Error Code	Page
605	600-26
607	600-26
608	600-26
611	600-26
612	600-27
613	600-27
621	600-27
622	600-27
623	600-27
624	600-27
625	600-27
626	600-27

**DO YOU STILL HAVE AN ERROR CODE AFTER
RUNNING THE TEST WITH ANOTHER DISKETTE?**

NO Replace the diskette you used for the first test.

YES Go to the page listed in the table above for your error code.

You may have a LED that has failed. If the diagnostic routines run correctly but the LED is not lit, check for a minimum of 1.5 Vdc between P9-1 and P9-2 on the Logic Printed Circuit Board when the spindle is turning.



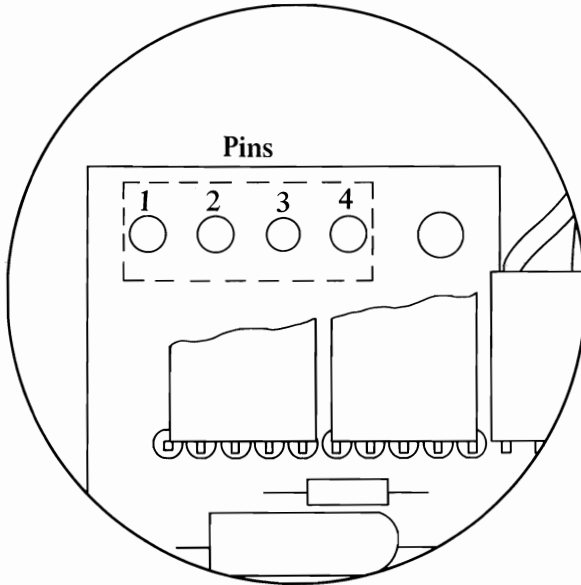
600

DO YOU HAVE FUNCTIONING DIAGNOSTICS, AT LEAST 1.5 Vdc AT P9 AND A LED THAT DOES NOT LIGHT?

YES Replace the LED assembly. See Section 3, "Removal/Replacement."

NO 

Check the Diskette Drive Power connector on Diskette Drive "A" for the voltages listed in the chart below.



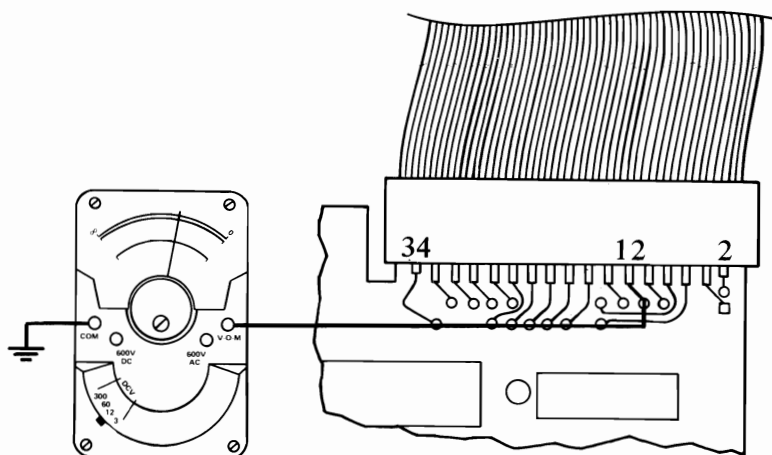
Diskette Drive Power Connector			
Min VDC	Max VDC	-Lead	+Lead
+ 4.8	+ 5.25	2	4
+11.52	+12.60	3	1

ARE THE VOLTAGES WITHIN THE TOLERANCES SHOWN IN THE TABLE?

NO Go to PIC 020, "Power."

YES

Turn the System Unit power OFF for five seconds, then turn the System Unit power ON. Check for the voltage at Pin 12 on the signal cable connector to drop from 2.0-5.5 Vdc to 0-0.8 Vdc during the POST.



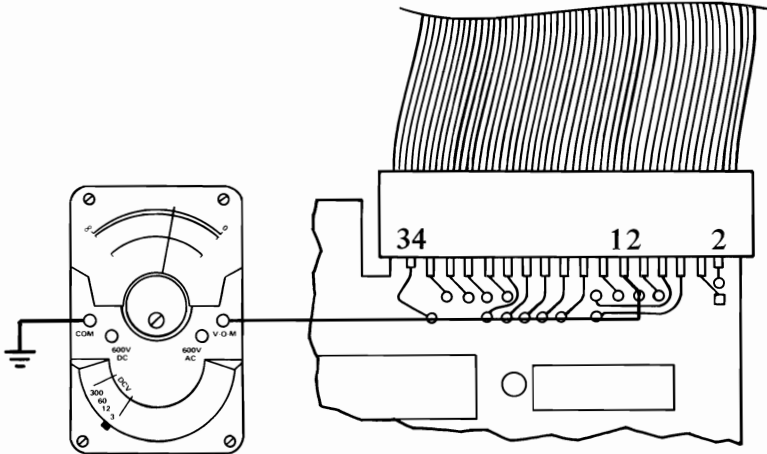
600

DID YOU HAVE 2.0-5.5 Vdc AT PIN 12 ON THE SIGNAL CABLE CONNECTOR WHEN THE POWER WAS FIRST TURNED ON?

NO Replace the Logic Printed Circuit Board. See Section 3, "Removal/Replacement."

YES 

Check for the voltage at Pin 12 on the Signal Cable connector to drop from 2.0-5.5 Vdc to 0-0.8 Vdc during the POST.

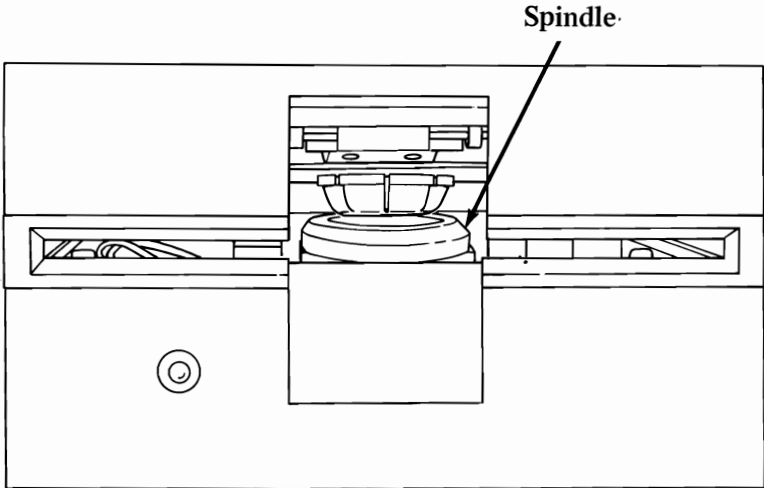


DID THE VOLTAGE AT PIN 12 ON THE SIGNAL CABLE CONNECTOR DROP TO 0-0.8 Vdc BEFORE THE BEEP AT THE END OF THE POWER ON SELF TEST (POST)?

NO Replace the Diskette Drive Adapter. See Section 3, "Removal/Replacement."

YES Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

Remove your diskette. Position the System Unit Power switch to Off, wait five seconds, then power on. Observe the spindle during the POST.



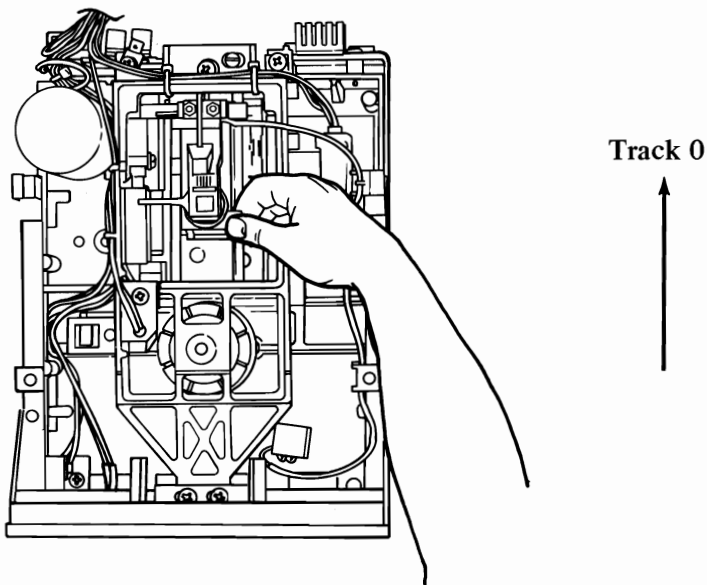
Front View Diskette Drive

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

NO Go to page 600-20.

YES 

Position the System Unit Power switch to Off. Remove the Diskette Logic Printed Circuit Board. (See Section 3, "Removal/Replacement.") Move the Read/Write head assembly to the rear of the Diskette Drive assembly until it reaches track 0.

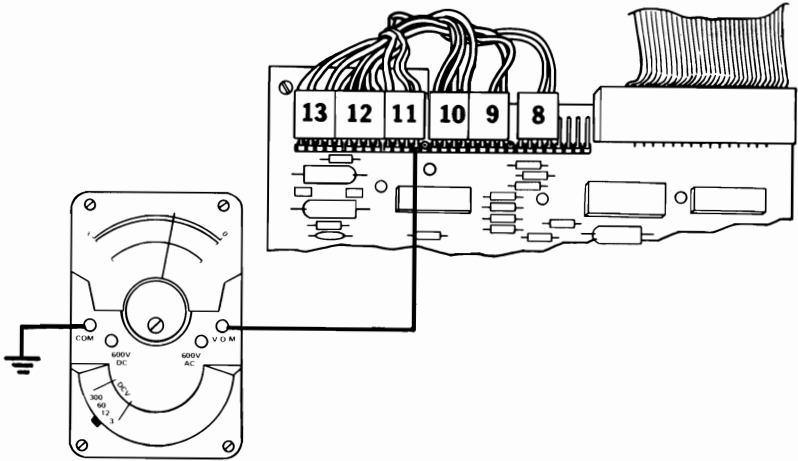


DID THE HEAD MOVE TO TRACK 0 WITH NO BINDS?

NO Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

YES 

Reinstall the Diskette Logic Printed Circuit Board. (See Section 3, "Removal/Replacement.") Position the System Unit Power switch to On. Check the voltage at P11-1 for 0-0.8 Vdc before the LED is lit - at the end of the POST.



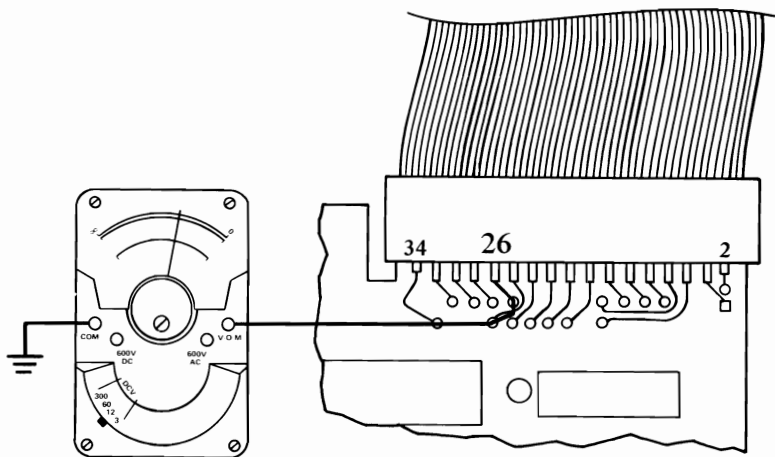
600

DID YOU HAVE 0-0.8 Vdc AT P11-1?

NO Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

YES 

Position the System Unit Power switch to Off. Remove the Diskette Logic Printed Circuit Board. (See Section 3, "Removal/Replacement.") Move the head to track 0 again. Reinstall the Logic Printed Circuit Board. Position the System Unit Power switch to On, and check for the voltage 0-0.8 Vdc to drop to at pin 26 on the diskette signal cable connector before the LED is lit at the end of the POST.

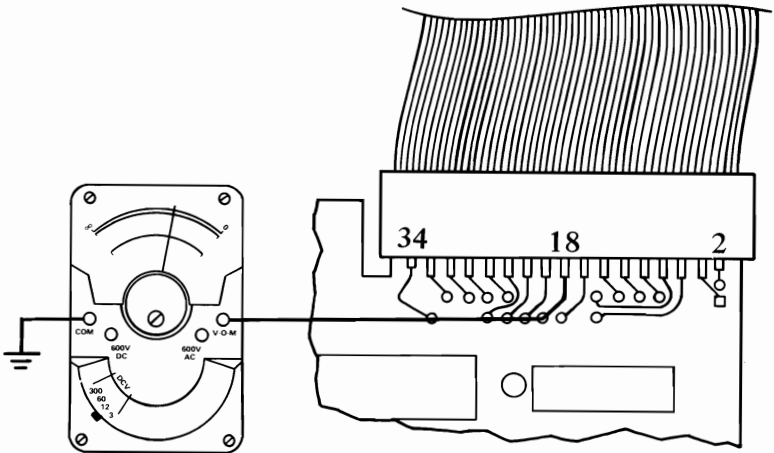


DID YOU HAVE 0-0.8 Vdc AT PIN 26?

NO Replace the Diskette Logic Printed Circuit Board. See Section 3, "Removal/Replacement."

YES 

Position the System Unit Power switch to Off for five seconds. Then position the System Unit Power switch to On. Check the voltage at Pin 18 on the diskette signal connector for a decrease from 2.0-5.5 Vdc to 0-0.8 Vdc at some time before the beep at the end of the POST.

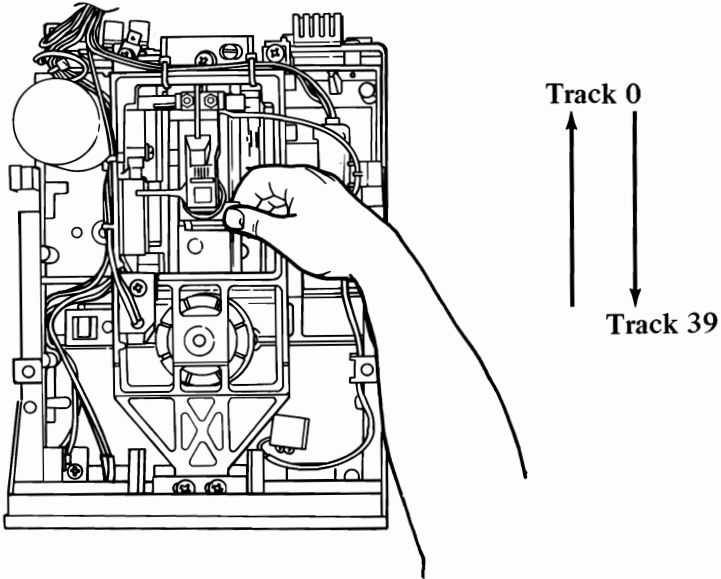


DID THE VOLTAGES AT PIN 18 ON THE DISKETTE SIGNAL CABLE CONNECTOR DECREASE FROM 2.0-5.5 Vdc TO 0-0.8 Vdc?

NO Replace the Diskette Drive Adapter. See Section 3, "Removal/Replacement."

YES 

Position the System Unit Power switch to OFF. Partially remove the Logic Printed Circuit Board, leaving all the connectors on except P-6 (See Section 3, "Removal/Replacement.") Lift the Logic Printed Circuit Board just enough to observe the Head assembly. Move the head away from track 0. Power the System Unit on, and observe the head assembly motion.

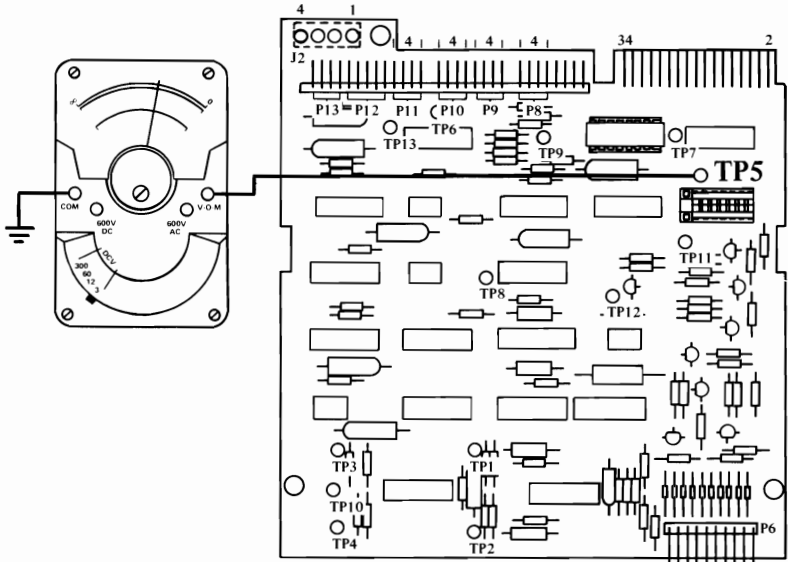


DOES THE HEAD ASSEMBLY MOVE TO TRACK 0 AND THEN AWAY FROM IT BEFORE THE END OF THE POWER ON SELF TEST (POST)?

NO Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

YES 

Reinstall the Logic Printed Circuit Board. Position the System Unit Power switch to Off for five seconds, insert your Advanced Diagnostic diskette, then power the System Unit on. Test for an increase (approximately 0.2 Vdc) at TP-5 on the Logic Printed Circuit Board during the POST while the LED is lit.

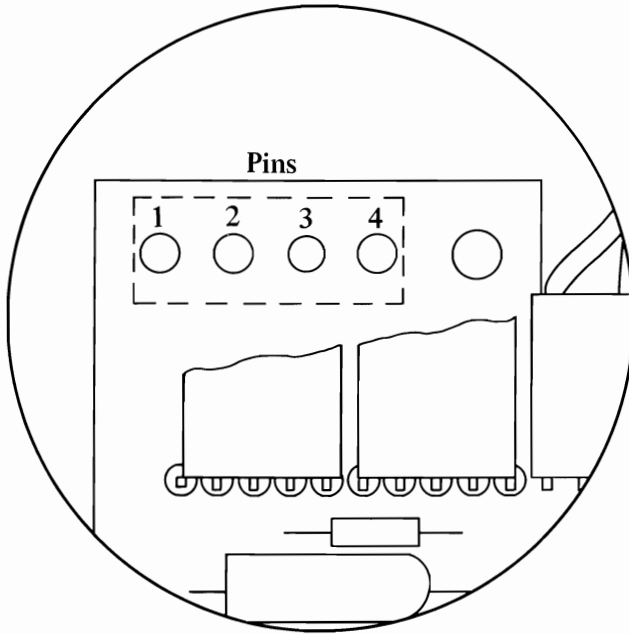


**DOES THE VOLTAGE AT TP-5 INCREASE
(APPROXIMATELY 0.2 Vdc) WHEN THE "LED" IS LIT?**

NO Replace the Diskette Drive assembly. See Section 3, "Removal/Replacement."

YES Replace Diskette Drive Adapter. See Section 3, "Removal/Replacement."

Check the Diskette Drive Power connector for the voltages listed in the table below.



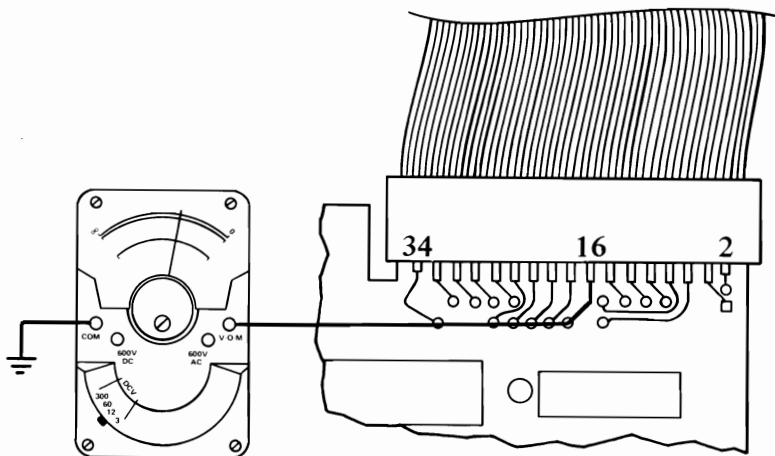
Diskette Drive Power Connector			
Min Vdc	Max Vdc	-Lead	+Lead
+4.8	+5.25	2	4
+11.52	+12.60	3	1

ARE THE VOLTAGES WITHIN THE TOLERANCES SHOWN IN THE TABLE?

NO Go to PIC 020, "Power."

YES 

Position the System Unit Power switch to Off for five seconds, then power the System Unit on. Check for the voltage at Pin 16 on the Diskette Drive Signal Cable connector to decrease from 2.0-5.5 Vdc to 0-0.8 Vdc before the “beep” at the end of the POST.

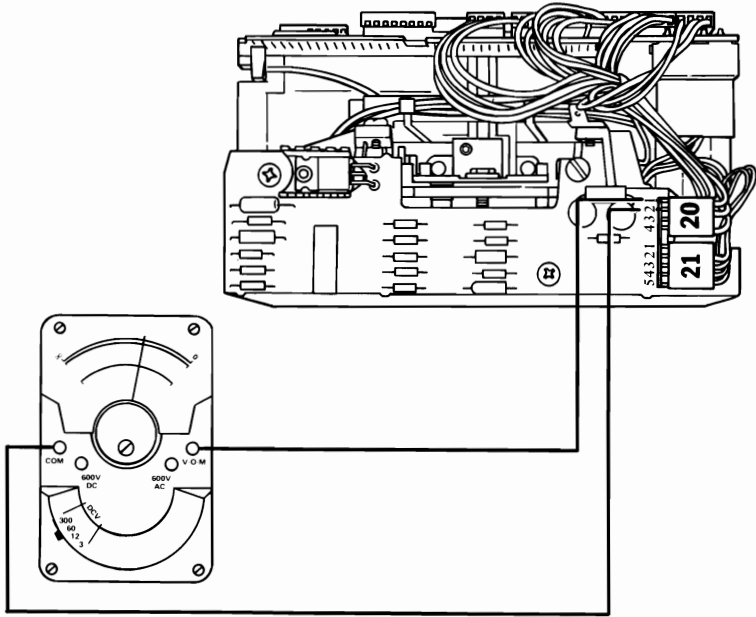


DID THE VOLTAGE AT PIN 16 DECREASE FROM 2.0-5.5 Vdc TO 0-0.8 Vdc?

NO Replace the Diskette Drive Adapter. See Section 3, “Removal/Replacement.”

YES 

Check the voltage between P20-1 and P20-2 at the servo-board for 11.25-12.6 Vdc.

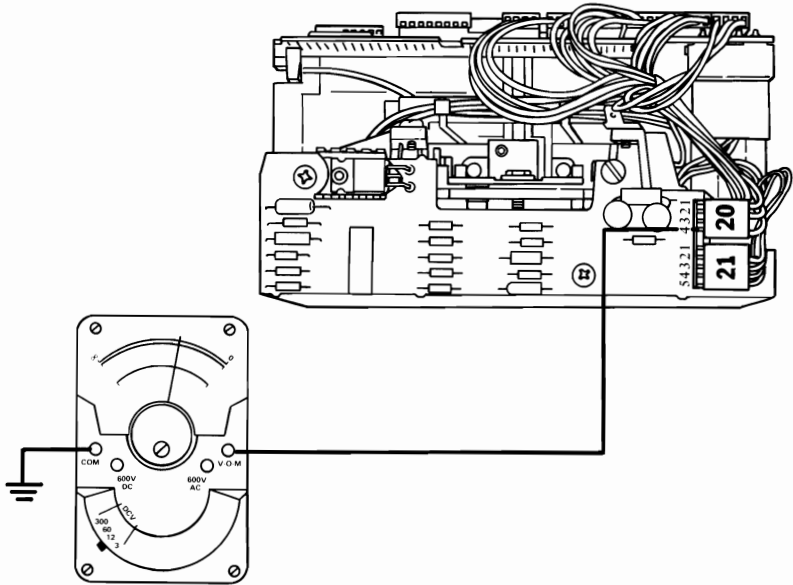


DO YOU HAVE 11.25-12.6 Vdc FROM P20-2 TO P20-1?

NO Replace the Logic Printed Circuit Board. See Section 3, "Removal/Replacement."

YES 

Position the System Unit Power switch to Off for five seconds, then power the System Unit on. Check for the voltage at P20-4 to decrease from 2.0-5.5 Vdc to 0-0.8 Vdc when the LED is on.



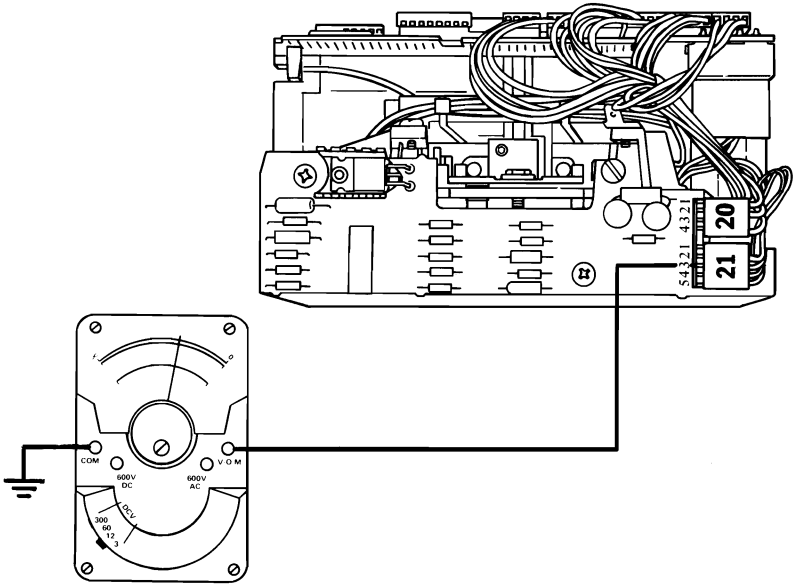
600

DID THE VOLTAGE AT P20-4 DECREASE FROM 2.0-5.5 Vdc TO 0-0.8 Vdc?

NO Replace the Logic Printed Circuit Board. See Section 3, "Removal/Replacement."

YES 

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

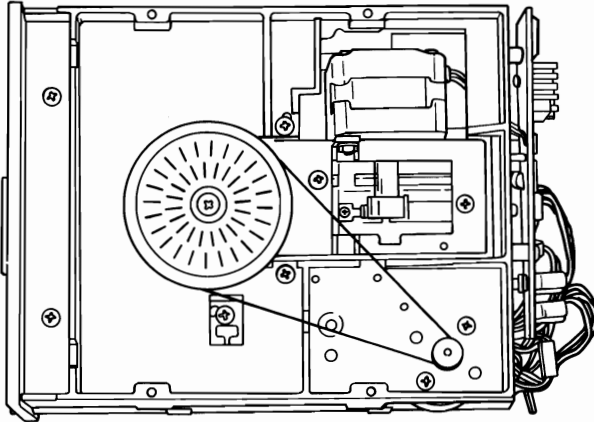


IS THERE 3 TO 9 Vdc AT P21-3 WHEN THE LED IS ON?

NO Replace the Servo-Board. See Section 3,
“Removal/Replacement.”

YES 

Check the Diskette Drive Belt to be sure that it is in good condition and on the pulleys properly.



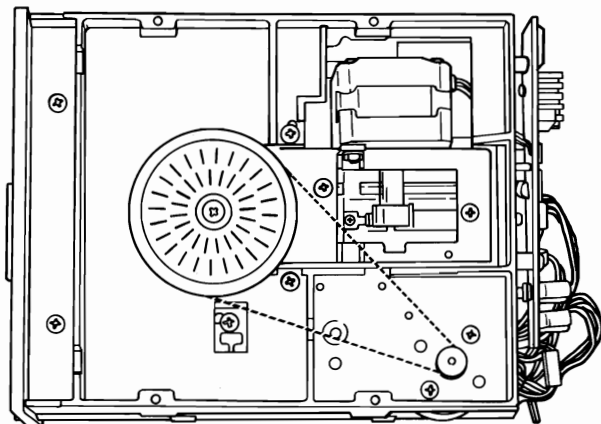
Bottom View

IS THE DRIVE BELT ON THE PULLEYS AND FREE OF DAMAGE?

NO Replace the Diskette Drive Belt. See Section 3, "Removal/Replacement."

YES 

Remove the Diskette Drive Belt and turn the spindle to be sure that it turns freely and without binds.



Bottom View

DOES THE SPINDLE TURN FREELY?

NO Replace the Spindle assembly. See Section 3, "Removal/Replacement."

YES Replace the Diskette Drive Motor. See Section 3, "Removal/Replacement."

DISKETTE DRIVE ERRORS

Error Code		Repair Action
606	Your Diskette Drive assembly or Diskette Drive Adapter has failed.	Replace: 1. Diskette Drive assembly. 2. Diskette Adapter (See Section 3, "Removal/Replacement").
607	1. Are you using a diskette that is write protected? . . . YES: 2. Is the diskette inserted properly? NO: 3. Is there 0 Vdc between TP-9 and TP-10? . NO: 4. Is there 0-0.8 Vdc at Pin 28 when the LED is on? YES:	Use a diskette that is <i>not</i> write protected. Insert diskette properly. Replace Write Protect switch. (See Section 3, "Removal/Replacement.") Replace Logic Printed Circuit Board. (See Section 3, "Removal/Replacement.")
608	There is a problem with your Advanced Diagnostic Diskette.	Use your backup diagnostic diskette.
611	Your signal cable or Diskette Drive Adapter has failed.	Check the signal cable and replace Diskette Drive Adapter. (See Section 3, "Removal/Replacement.")

DISKETTE DRIVE ERRORS

Error Code		Repair Action
612	Your signal cable or Diskette Drive Adapter board has failed.	Check signal cable, replace Diskette Drive Adapter. (See Section 3, "Removal/Replacement.")
613	Your signal cable or Diskette Drive Adapter failed.	Check signal cable, replace Diskette Drive Adapter. (See Section 3, "Removal/Replacement.")
621 622 623 624 625 626	Your Diskette Drive assembly has failed.	Replace Diskette Drive assembly. (See Section 3, "Removal/Replacement.")

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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, "Start."
3. Select "Utilities" in the diagnostic menu, start an error log, and select "Run tests multiple times." This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 "Start" or the appropriate PIC for that symptom.



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

Notes:

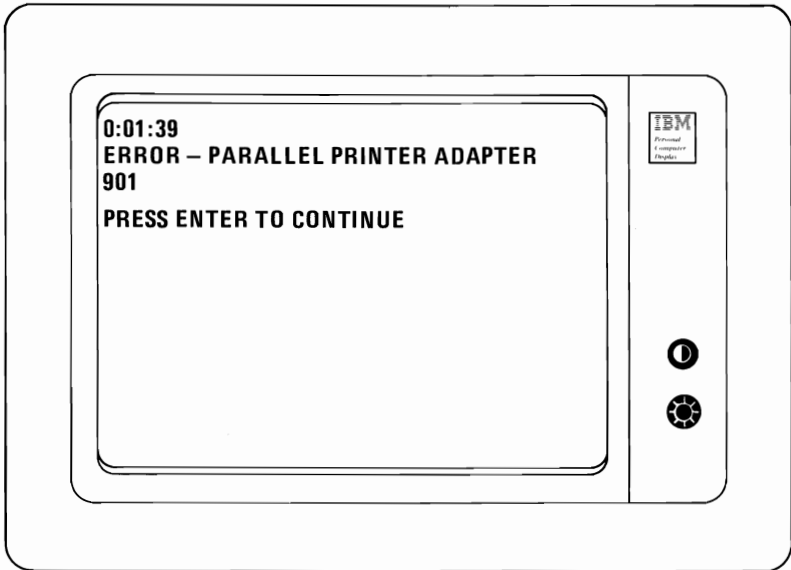


Parallel Printer Adapter

You have entered this PIC because you were unable to complete the Power On Self Test (POST) or you have an error message indicating a (90X) Parallel Printer Adapter. Before running this test, REMOVE THE OPTION CABLE connected to this adapter. If you have not already done so, insert your Advanced Diagnostic diskette or cassette and proceed with running diagnostic routines. Verify your installed devices, choose the system checkout action you desire and select the

device to be tested. (See display.) Press  and  (Enter).

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



DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO Replace the Parallel Printer Adapter. See Section 3, "Removal/Replacement."

YES 

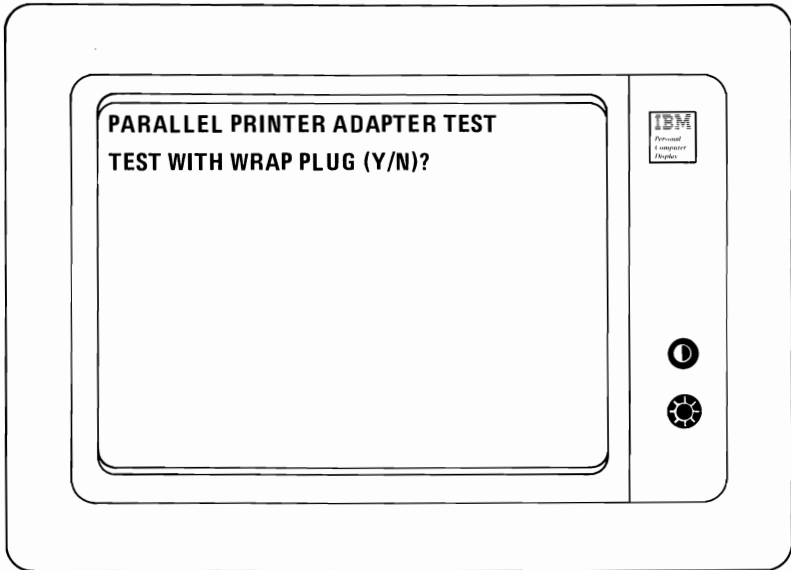
If you didn't receive an error message, you would have received a message similar to the one below. *DO NOT PRESS*





(YES) OR



(ENTER) AT THIS POINT!



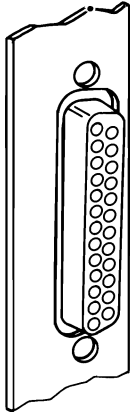
DO YOU WANT TO INSTALL THE WRAP PLUG?

NO Press  and  (Enter). This action will return you to the diagnostic menu.

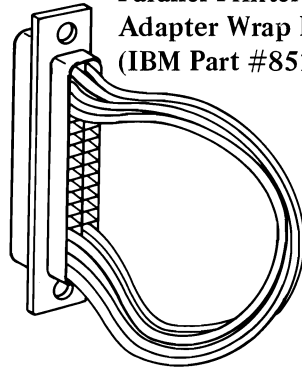
YES 

Before answering YES, install the Parallel Printer Adapter Wrap Plug or you will receive an invalid error message.

Parallel
Printer
Adapter



Parallel Printer
Adapter Wrap Plug
(IBM Part #8529228)



INSTALL THE WRAP PLUG AS SHOWN HERE.

CONTINUE

Press

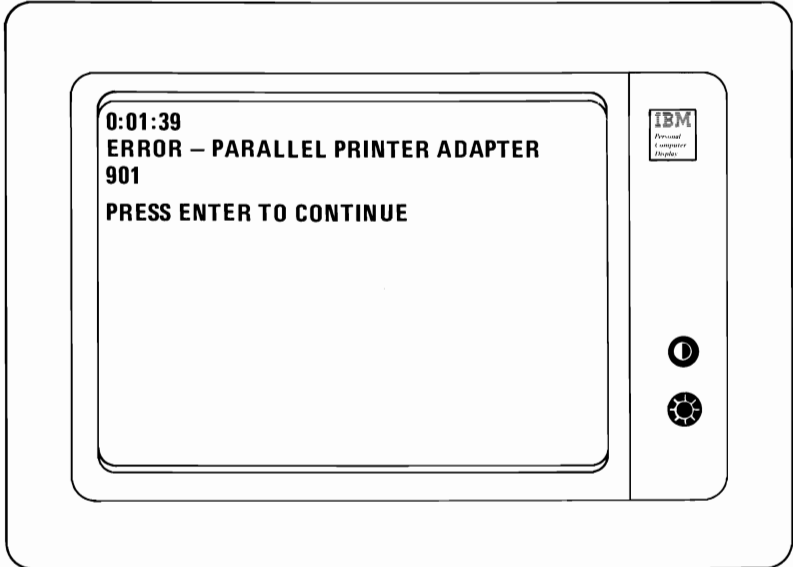


and



Enter. This will cause the System

Unit to check the Parallel Printer Adapter. An error message similar to the one in the diagram below may appear.



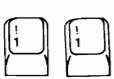
DID YOU RECEIVE AN ERROR MESSAGE?

NO Remove the Parallel Printer Adapter Wrap Plug. You may want to run additional tests on the printer attached to this adapter. See PIC 1400, "Printer."

YES Replace the Parallel Printer Adapter. See Section 3, "Removal/Replacement."

Asynchronous Communications Adapter

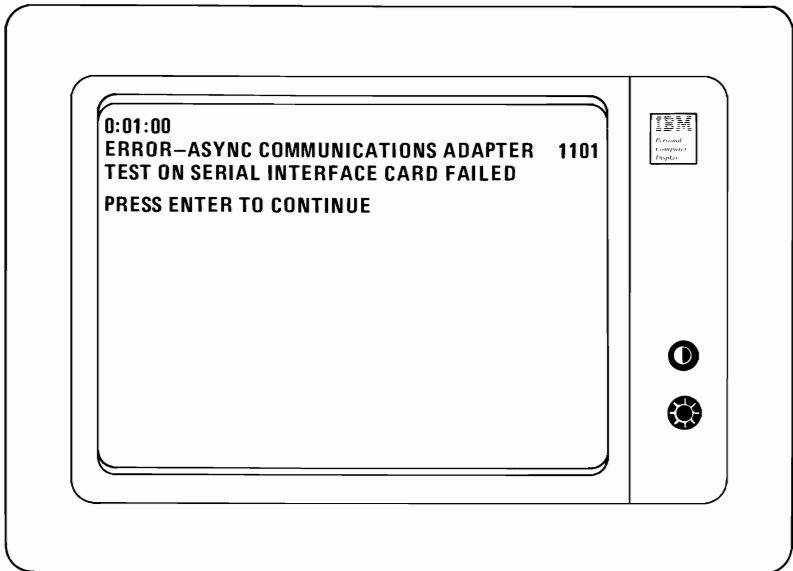
You have entered this PIC because you were unable to complete the Power On Self Test (POST) or you have an error message indicating a (110X) Asynchronous Communications Adapter failure. Before running the test, REMOVE THE OPTION CABLE connected to this adapter. If you have not already done so, insert your Advanced Diagnostics diskette or cassette and proceed with running diagnostics routines. Verify your installed devices, choose the system checkout action you desire and option to test. (See display.) Press



, and



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



1100

DID YOU COMPLETE THE TEST WITHOUT AN ERROR MESSAGE?

NO See Section 3, "Removal/Replacement."

YES 

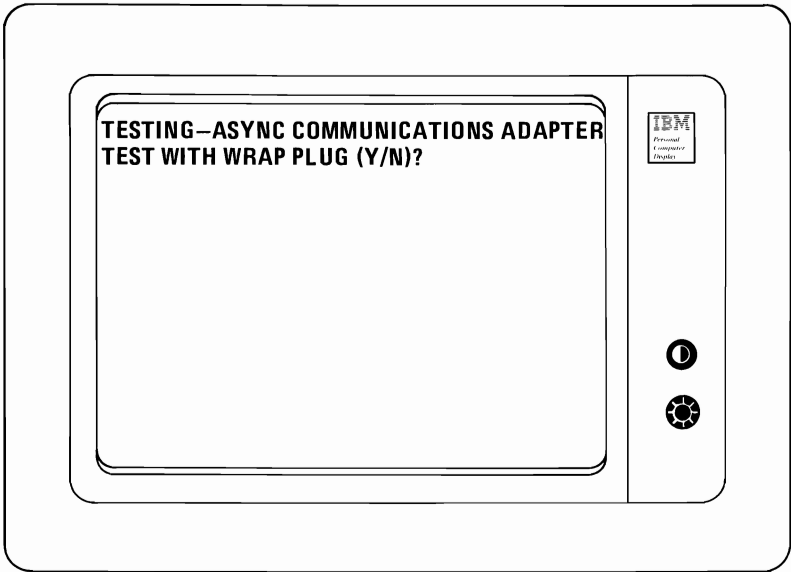
If you didn't receive an error message, you would have received a message similar to the one below. **DO NOT PRESS**



(YES) AND



(ENTER) AT THIS POINT!

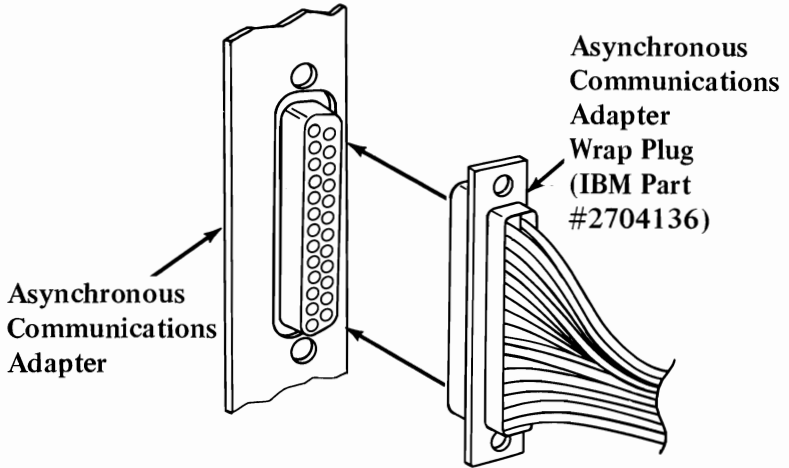


DO YOU WANT TO INSTALL THE ASYNCHRONOUS COMMUNICATIONS ADAPTER WRAP PLUG?

NO Press  and  (Enter). This action will return you to the diagnostic menu.

YES 

Before answering YES, install the Asynchronous Communications Adapter Wrap Plug or you will receive an invalid error message.





INSTALL THE WRAP PLUG AS SHOWN HERE.

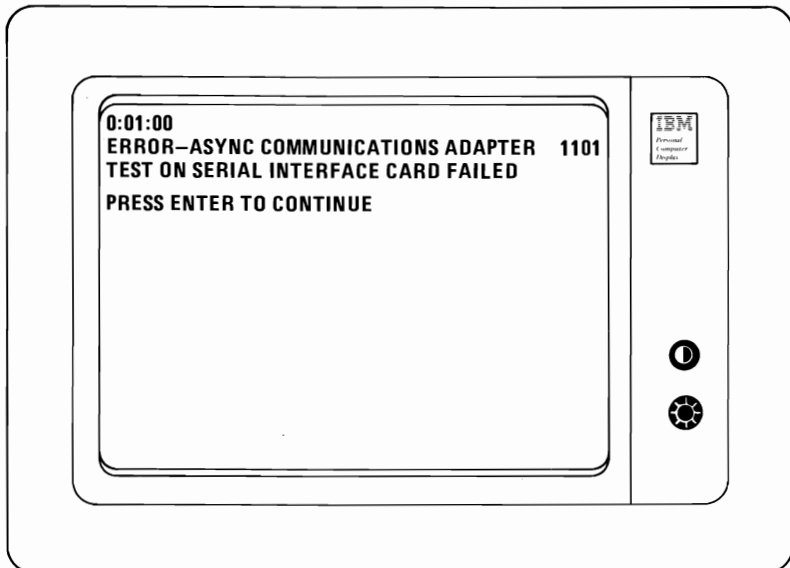
1100

CONTINUE

1100-3

Press  and  (Enter). This will cause the System

Unit to check the Asynchronous Communications Adapter. An error message similar to the one in the diagram below may appear.



DID YOU RECEIVE AN ERROR MESSAGE?

NO Remove the Asynchronous Communications Adapter Wrap Plug and go to page 1100-5.

YES Replace the Asynchronous Communications Adapter. See Section 3, "Removal/Replacement."

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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, “Start.”
3. Select “Utilities” in the diagnostic menu, start an error log, and select “Run tests multiple times.” This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010 “Start,” or the appropriate PIC for that symptom.



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

Notes:



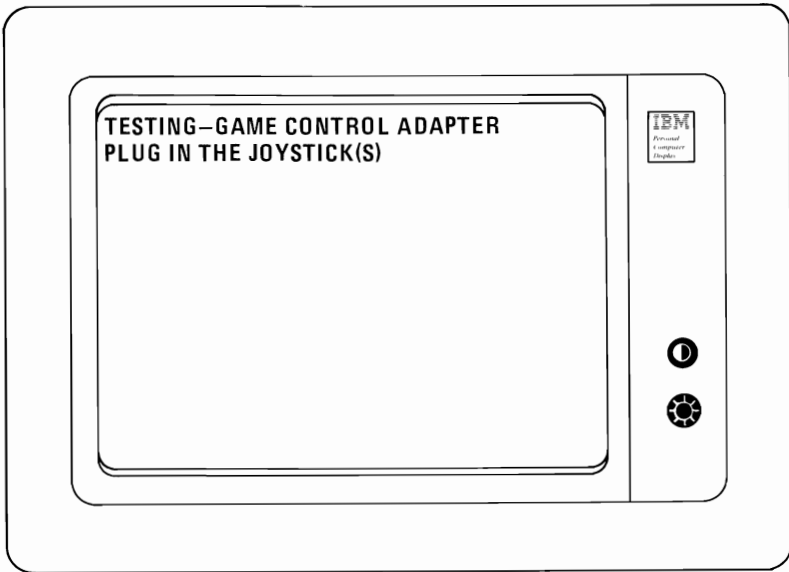
Game Control Adapter

You have entered this PIC because you suspect a Game Control Adapter problem or you have an error message indicating a Game Control Adapter problem.

This Test assumes the joy sticks function properly. If you have not already done so, insert your Advanced Diagnostic diskette or cassette and proceed with running diagnostic routines. Verify your installed devices, choose the system, check out action you desire and option to test (see display). Press   Game Control Adapter and



(Enter). The following message will appear on your display.



ARE THE JOY STICK(S) INSTALLED?

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

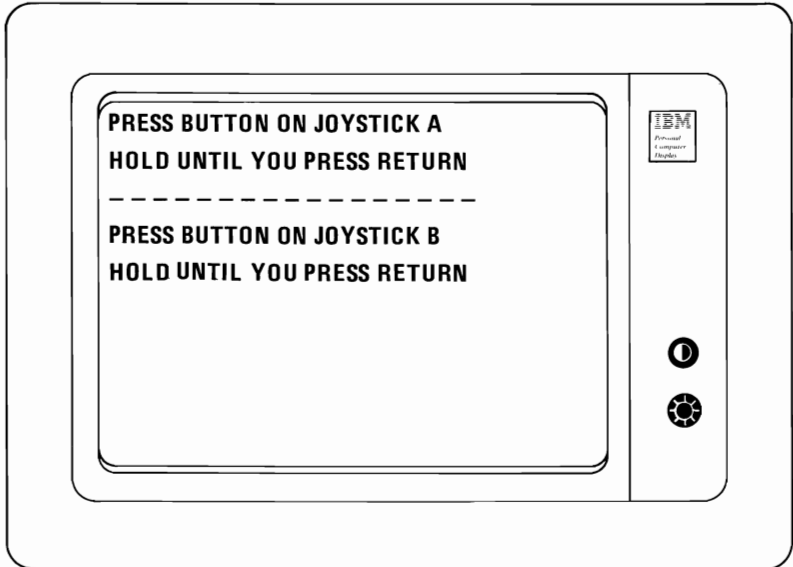
1300

YES 

1300-1

Pressing  (YES) and  (Enter) will bring up the


following message on your display which applies to joy sticks "A" and "B." Follow the instructions on your display for both joy sticks.

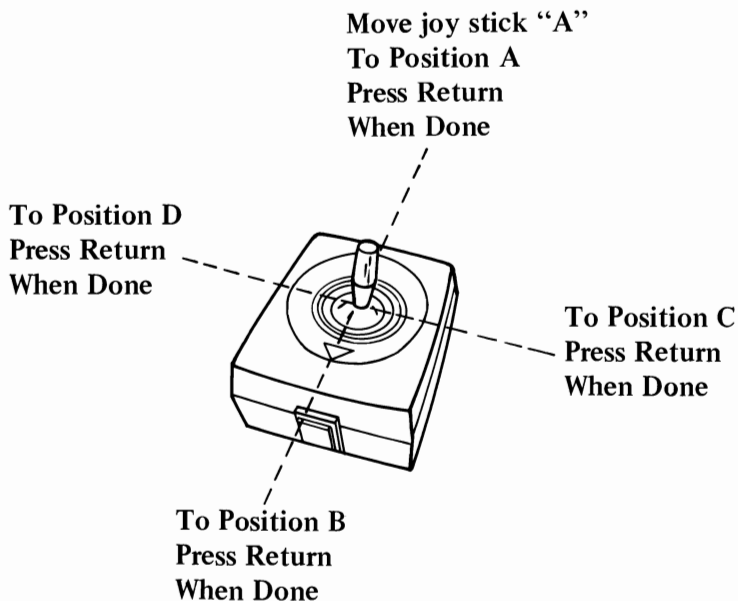


**WERE YOU ABLE TO COMPLETE THE JOY STICK
BUTTON PORTION OF THE GAME CONTROL ADAPTER?**

NO Replace your Game Control Adapter. See Section 3, "Removal/Replacement."

YES 

Pressing  (YES) will bring up the following display for testing the joy stick portion of the Game Control Adapter. Follow the instructions on your display to test all four positions of JOY STICK "A." (Note: Position A is indicated by the arrow on the joy stick housing, see the diagram below:)




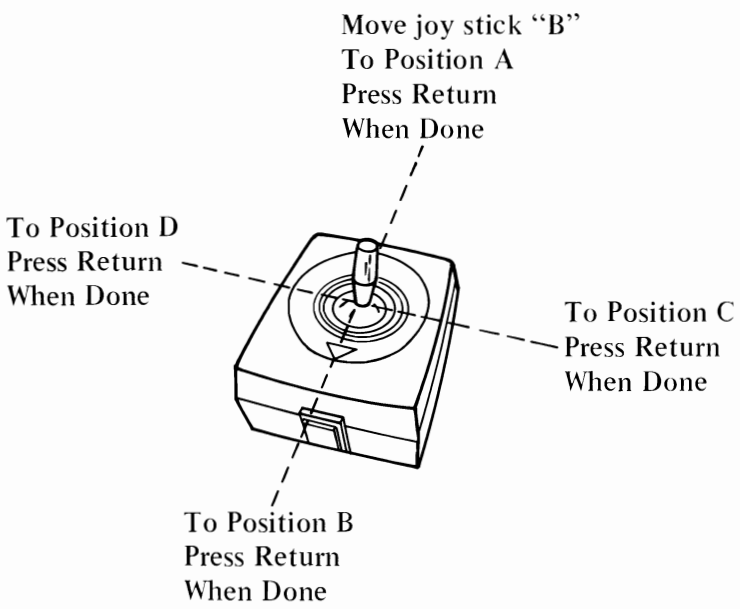
WERE YOU ABLE TO COMPLETE THE TEST SATISFACTORILY?

NO Replace your Game Control Adapter. See Section 3, "Removal/Replacement."

1300

YES 

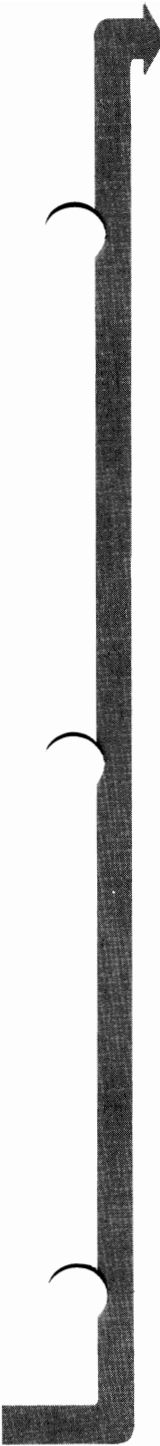
Pressing  (YES) will bring up the following display for testing the joy stick portion of the Game Control Adapter. Follow the instructions on your display to test all four positions of JOY STICK "B." (Note: Position A is indicated by the arrow on the joy stick housing, see the diagram below:)



WERE YOU ABLE TO COMPLETE THE TEST SATISFACTORILY?

NO Replace your Game Control Adapter. See Section 3, "Removal/Replacement."

YES 



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

1. Check the entire system for loose or damaged connectors.
2. Review PIC 010, “Start.”
3. Select “Utilities” in the diagnostic menu, start an error log, and select “Run tests multiple times.” This will allow you to exercise the machine thoroughly and identify the failing symptom. When you have identified the symptom, go to PIC 010, “Start” or the appropriate PIC for that symptom.

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

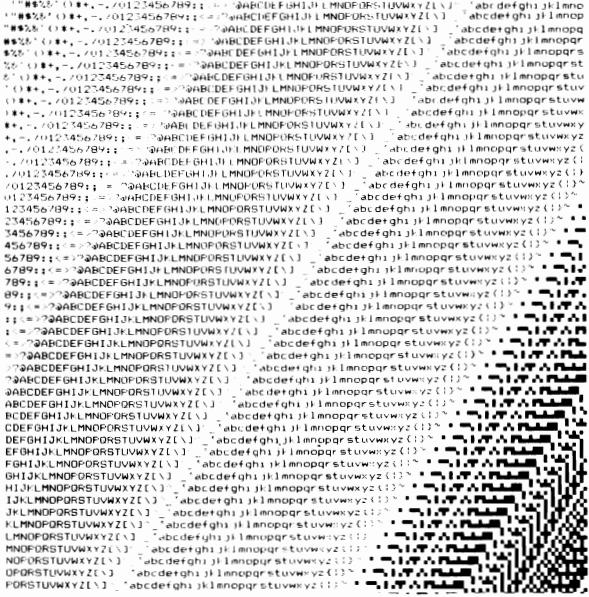
Notes:



Printer

Error Description	Diagnostic Action
1400 Printer Entry	<ol style="list-style-type: none"><li data-bbox="338 240 949 508">1. Position Printer Power switch to OFF. Verify forms are properly inserted. Move print head to left-most position. Position Printer Power switch to ON. Are the Power, Ready, and Online lights on? YES: Go to step 2. NO: Go to page 1400-26, "Control Panel."<li data-bbox="338 548 949 719">2. Press Online Switch Does Online light go out? YES: Go to step 3. NO: Go to page 1400-26, "Control Panel."<li data-bbox="338 751 949 1109">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 <i>either</i> the Line Feed <i>or</i> the Forms Feed is pressed? YES: Go to page 1400-26 "Control Panel." NO: Go to page 1400-15, "Forms Do Not Advance."<li data-bbox="338 1149 949 1344">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 1400-26, "Control Panel."

Error Description	Diagnostic Action
<p>1400 Printer Entry</p>	<p>5. Load Advanced Diagnostic diskette (or cassette) if not already loaded.</p> <p>Is option 14 missing from menu?</p> <p><i>YES:</i> Go to step 6.</p> <p><i>NO:</i> Run option 14.</p> <p>Does the printer fail to print?</p> <p><i>YES:</i> Go to step 6.</p> <p><i>NO:</i> Compare printout with this one.</p> <pre> ! "#\$%&'()*+,-. 0123456789: ; <=> @ABCDEFGHIJKLMN PQRSTUVWXYZ[\]^ `abcdefghijklmnop qrstuvwxyz{ } ~ ! "#\$%&'()*+,-. 0123456789ij(<=> @ABCDEFGHIJKLMN PQRSTUVWXYZ[\]^ `abcdefghijklmnop qrstuvwxyz{ } ~ ! "#\$%&'()*+,-. `~!@#%&'()*+,-. </pre> <p>Any errors?</p> <p><i>YES:</i> Go to step 6.</p> <p><i>NO:</i> Go to page 1400-5, "Failure Symptom" chart. If a failure symptom still exists, proceed to the corresponding PIC and follow each step until FRU is isolated.</p>

Error Description	Diagnostic Action
<p>1400 Printer Entry</p>	<p>6. Power off the Printer and the System Unit. Disconnect the signal cable at the Printer and System Unit. Run the Offline Diagnostic Test (see page 1400-33).</p> <p>Does the printer fail to print?</p> <p>YES: Go to page 1400-11, "No Printing." NO: Compare printout with one below.</p>  <p>Any errors?</p> <p>YES: Go to page 1400-5, "Failure Symptom" chart. Proceed to the corresponding page and follow each step in PIC procedure until failing FRU is isolated.</p> <p>NO: Go to step 7.</p>

Error Description	Diagnostic Action
<p>1400 Printer Entry</p>	<p>7. Position the System Unit Power switch to On. Load Advanced Diagnostic diskette.</p> <p>Note: If the signal cable was connected to a Monochrome Display and Parallel Printer Adapter, Option 4 should be displayed. If the cable was connected to a Parallel Printer Adapter, Option 9 should be displayed.</p> <p>Is the correct Option (4 or 9) missing?</p> <p>YES: Replace the Adapter. (See Section 3, "Removal/Replacement.")</p> <p>NO: Run the Advanced Diagnostics for the optional adapter installed.</p> <p>Did the diagnostics run error free?</p> <p>YES: Go to step 8.</p> <p>NO: Replace the Adapter. (See Section 3, "Removal/Replacement.")</p> <p>8. Check Parallel Printer Cable. (See Section 5, "Locations.") Check all pins, pin to pin, on Parallel Printer cable for shorts or opens.</p> <p>Any shorts or opens?</p> <p>YES: Replace Parallel Printer cable.</p> <p>NO: Replace control cards in printer (see Section 3, "Removal/Replacement").</p>

Failure Symptom	Page
<i>Power Supply</i>	1400-6
<i>Print Head</i>	
No Printing	1400-11
Print head carriage not moving	1400-14
<i>Forms</i>	
Forms not advancing; overprinting	1400-15
Forms jamming or tearing	1400-15
<i>Ribbon</i>	
Ribbon jammed	1400-17
<i>Print Quality</i>	
Printing too light; poor print quality	1400-18
Smudged printing	1400-19
Uneven printing (characters or lines)	1400-19
Row(s) of print dots missing	1400-20
Random print dots missing	1400-21
Extra print dots	1400-22
<i>Printing continues beyond end-of-forms</i>	1400-23
<i>Doublespacing – abnormal characters</i>	1400-23
<i>False end-of-forms alarm</i>	1400-24
<i>Uneven horizontal spacing</i>	1400-25
<i>Control Panel</i>	1400-26

Error Description	Diagnostic Action
<p>Power Supply Check</p>	<p>1. Position Printer Power switch to OFF. Unplug Printer power cord. Position Printer Power switch to ON. Measure 2-12 ohms between voltage terminals on power cord.</p> <p>Resistance = 2-12 ohms?</p> <p>YES: Go to step 3.</p> <p>NO: Check for open fuse (see Section 5, "Locations").</p> <p>Fuse open?</p> <p>YES: Replace fuse (see Section 3, "Removal/Replacement"). Power off. Plug in Printer power cord. Power on for 1 minute.</p> <p>Does fuse open?</p> <p>YES: Go to step 2.</p> <p>NO: Problem resolved.</p> <p>NO: Check for approximately 22 ohms on primary side of power transformer (see Section 5, "Locations").</p> <p>Resistance = 22 ohms?</p> <p><u>DANGER:</u> STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE EXTREME CAUTION IN THIS AREA.</p> <p>YES: Replace Fuse-Filter card (see Section 3, "Removal/Replacement").</p> <p>NO: Replace power transformer (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
<p>Power Supply Check</p>	<p>2. Position Printer Power switch to OFF. Unplug Printer power cord. Replace fuse (see Section 3, "Removal/Replacement"). Disconnect power transformer connector from Fuse-Filter card (see Section 5, "Locations"). Plug in Printer power cord. Power on for 1 minute. Power off. Unplug Printer power cord. Check for open fuse.</p> <p>Fuse open?</p> <p><u>DANGER</u>: STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE EXTREME CAUTION.</p> <p>YES: Replace Fuse-Filter card (see Section 3, "Removal/Replacement").</p> <p>NO: Replace power transformer (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action																									
Power Supply Check	<p>3. Disconnect CN2 (see Section 5, “Locations”). Plug in Printer power cord. Position Printer Power switch to ON. Measure voltages on the plug side of CN2 according to the chart below.</p> <p><u>DANGER:</u> LINE VOLTAGE IS PRESENT ON THE AC FILTER, CIRCUIT BOARD, AND TRANSFORMER. CAUTION SHOULD BE EXERCISED WHEN MEASURING SECONDARY VOLTAGES.</p> <table border="1" data-bbox="317 678 937 943"> <thead> <tr> <th>Color</th> <th>+ Lead</th> <th>- Lead</th> <th>Min voltage</th> <th>Max voltage</th> </tr> </thead> <tbody> <tr> <td>Gray</td> <td>CN2-1</td> <td>CN2-2</td> <td>7.6 Vac</td> <td>10.4 Vac</td> </tr> <tr> <td>Orange</td> <td>CN2-3</td> <td>CN2-4</td> <td>19.5 Vac</td> <td>26.5 Vac</td> </tr> <tr> <td>Red</td> <td>CN2-5</td> <td>CN2-6</td> <td>8.1 Vac</td> <td>10.9 Vac</td> </tr> <tr> <td>Blue</td> <td>CN2-7</td> <td>CN2-8</td> <td>13.0 Vac</td> <td>17.6 Vac</td> </tr> </tbody> </table> <p>Voltages in range? YES: Go to step 4. NO: Replace power transformer (see Section 3, “Removal/Replacement”).</p>	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
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																						

Error Description	Diagnostic Action									
<p>Power Supply Check</p>	<p>4. Position the Printer Power switch to OFF. Connect CN2 (see Section 5, "Locations"). Power on. Measure voltages at CN3 (see Section 5, "Locations") as shown in chart below. Use the ground pin on Drive Circuit card.</p> <p><u>DANGER:</u> LINE VOLTAGE IS PRESENT ON THE AC FILTER, CIRCUIT BOARD, AND TRANSFORMER. CAUTION SHOULD BE EXERCISED WHEN MEASURING DC VOLTAGES.</p> <table border="1" data-bbox="399 721 850 894"> <thead> <tr> <th data-bbox="399 721 525 800">Pin no.</th> <th data-bbox="525 721 686 800">Min. voltage</th> <th data-bbox="686 721 850 800">Max voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="399 800 525 846">CN3-16</td> <td data-bbox="525 800 686 846">+4.5 Vdc</td> <td data-bbox="686 800 850 846">+5.5 Vdc</td> </tr> <tr> <td data-bbox="399 846 525 894">CN3-20</td> <td data-bbox="525 846 686 894">+12.6 Vdc</td> <td data-bbox="686 846 850 894">+15.4 Vdc</td> </tr> </tbody> </table> <p>Are +5 and +14 Vdc within range?</p> <p>YES: Go to step 5.</p> <p>NO: Replace both Control cards (see Section 3, "Removal/Replacement").</p>	Pin no.	Min. voltage	Max voltage	CN3-16	+4.5 Vdc	+5.5 Vdc	CN3-20	+12.6 Vdc	+15.4 Vdc
Pin no.	Min. voltage	Max voltage								
CN3-16	+4.5 Vdc	+5.5 Vdc								
CN3-20	+12.6 Vdc	+15.4 Vdc								

Error Description	Diagnostic Action						
Power Supply Check	<p data-bbox="302 204 862 264">5. Measure the +24 Vdc (use ground pin on the Driver Circuit card).</p> <table border="1" data-bbox="348 293 806 418"> <thead> <tr> <th data-bbox="352 298 481 375">Pin no.</th> <th data-bbox="481 298 643 375">Min. voltage</th> <th data-bbox="643 298 803 375">Max voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="352 375 481 414">CN3-18</td> <td data-bbox="481 375 643 414">+21.6 Vdc</td> <td data-bbox="643 375 803 414">+26.4 Vdc</td> </tr> </tbody> </table> <p data-bbox="348 453 663 483">Is +24 Vdc within range?</p> <p data-bbox="348 496 770 527">YES: Power supply checks good.</p> <p data-bbox="348 542 594 573">NO: Go to step 6.</p> <p data-bbox="302 612 884 781">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.</p> <p data-bbox="348 799 758 829">Is the difference 0.5 to 0.9 Vdc?</p> <p data-bbox="348 844 903 904">YES: Replace both control cards (see Section 3, "Removal/Replacement").</p> <p data-bbox="348 922 862 1019">NO: Replace the heat sink/power transistor assembly (see Section 3, "Removal/Replacement").</p>	Pin no.	Min. voltage	Max voltage	CN3-18	+21.6 Vdc	+26.4 Vdc
Pin no.	Min. voltage	Max voltage					
CN3-18	+21.6 Vdc	+26.4 Vdc					

Error Description	Diagnostic Action
<p>No Printing</p>	<ol style="list-style-type: none"> 1. Does print head carriage move back and forth normally when attempting to print? YES: Go to page 1400-20, "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 3, "Removal/Replacement.") 3. Remove ribbon cartridge. Turn knob on cartridge to check for jamming. Replace if jammed. (See Section 3, "Removal/Replacement.") 4. Check print head for broken wires. Replace print head if wires are damaged. (See Section 3, "Removal/Replacement.") 5. Position Printer Power switch to OFF. Move print head assembly. Check for smooth mechanical operation. Smooth operation? YES: Go to step 6. NO: Check for worn or broken gears in Carriage Drive assembly. Gears worn or broken? YES: Replace Carriage Drive assembly. (See Section 3, "Removal/Replacement.") NO: Replace Print Mechanism assembly. (See Section 3, "Removal/Replacement.")

Error Description	Diagnostic Action
<p>No Printing</p>	<p>6. Position Printer Power switch to ON. Move print head to the left-most position. Check for a Down level (approximately 0 Vdc) to an Up level (approximately +5 Vdc) meter deflection at CN6-20 on the Driver Circuit card (see Section 5, "Locations") while moving the print head to the center of the print line. Use the ground pin on the Driver Circuit card for common.</p> <p>Is there a Down level to an Up level deflection?</p> <p>YES: Go to step 7.</p> <p>NO: Is there a constant Down level?</p> <p>YES: Go to page 1400-6, "Power Supply Check." Replace the Left Margin Sensor if the power supply checks good. (See Section 3, "Removal/Replacement.")</p> <p>NO: Position Printer Power switch to 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 5, "Locations.")</p> <p>Either line open?</p> <p>YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Left Margin Sensor (See Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
<p>No Printing</p>	<p>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 5, "Locations") while applying slight pressure to print head - do not advance the print head to the next detented position. Use the Driver Circuit card ground pin for common.</p> <p>Is there an Up level to a Down level deflection?</p> <p>YES: Go to step 8.</p> <p>NO: Is there a constant Up level?</p> <p>YES: Replace Print Mechanism assembly. (See Section 3, "Removal/Replacement.")</p> <p>NO: Check for +5 Vdc at CN5-18 (see Section 5, "Locations").</p> <p>+5 Vdc?</p> <p>YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement").</p> <p>NO: Go to page 1400-6, "Power Supply Check."</p>

Error Description	Diagnostic Action
<p>No Printing</p>	<p>8. Measure resistance between pin CN6-13, (Driver Circuit card) (see Section 5, "Locations") and pins CN6-21, 22, 23, and 24 (Stepper Motor Coils) on cable end for a reading of approximately 45 ohms.</p> <p>Resistance = 45 ohms?</p> <p>YES: Replace Control cards. (See Section 3, "Removal/Replacement.")</p> <p>NO: Replace Print Mechanism assembly. (See Section 3, "Removal/Replacement.")</p>
<p>Print Head Carriage Not Moving</p>	<p>1. Go to page 1400-11, "No Printing."</p>

Error Description	Diagnostic Action
<p data-bbox="128 212 295 272">Forms Do Not Advance</p> <p data-bbox="128 315 291 345">Overprinting</p> <p data-bbox="128 386 279 483">Forms Jamming or Tearing</p>	<ol style="list-style-type: none"> <li data-bbox="357 212 937 345">1. Check position of forms feeding into printer. Forms path must be parallel to printer sides. Reposition forms for parallel feeding. <li data-bbox="357 386 951 516">2. Check forms path for any obstructions (for example, jagged edges on forms box, torn paper in Print Mechanism). Remove any obstructions. <li data-bbox="357 557 862 873">3. Inspect left and right forms tractors. <ul style="list-style-type: none"> <li data-bbox="405 589 650 620">– Poor positioning <li data-bbox="405 626 604 657">– Loose covers <li data-bbox="405 664 657 695">– Loose lock levers <li data-bbox="405 701 604 732">– Worn springs <li data-bbox="405 738 655 769">– Broken feed pins <p data-bbox="405 776 873 873">Replace left or right forms tractors if damaged. (See Section 3, “Removal/Replacement.”)</p> <li data-bbox="357 914 969 1011">4. Inspect print head for broken wires. Replace if wires damaged. (See Section 3, “Removal/Replacement.”) <li data-bbox="357 1052 921 1149">5. Check print head gap adjustment. Adjust if out of tolerance. (See Section 3, “Removal/Replacement.”) <li data-bbox="357 1190 937 1287">6. Check for bent or pitted ribbon shield. Replace shield if damaged. (See Section 3, “Removal/Replacement.”) <li data-bbox="357 1328 937 1425">7. Check for damaged platen. Replace Print Mechanism assembly if platen is damaged. (See Section 3, “Removal/Replacement.”)

Error Description	Diagnostic Action
<p>Forms Do Not Advance</p> <p>Overprinting</p> <p>Forms Jamming or Tearing</p>	<p>8. Position Printer Power switch to OFF. Advance forms by turning forms advance knob. Check intermediate gear for worn or broken teeth. Replace gears if damaged. Check left and right tractors for broken feedpins. Replace if broken. (See Section 3, "Removal/Replacement.")</p> <p>9. 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 5, "Locations").</p> <p>Resistance = 45 ohms?</p> <p>YES: Check for +24 Vdc at CN3-18. (See Section 5, "Locations.")</p> <p>+24 Vdc?</p> <p>YES: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: See page 1400-6, "Power Supply Check."</p> <p>NO: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
<p>Ribbon Jammed</p>	<ol style="list-style-type: none"> 1. Remove ribbon cartridge. Try a print operation to verify that print head carriage functions normally. If carriage fails, see page 1400-11, “No Printing.” 2. Check ribbon cartridge for binding by manually advancing ribbon. Replace if binding. 3. Visually check for worn or broken ribbon drive gears. Replace Carriage Drive assembly if damaged. (See Section 3, “Removal/Replacement.”) 4. Check for bent ribbon shield. Replace if necessary. (See Section 3, “Removal/Replacement.”) 5. Check print head for broken or binding wires. Replace print head if wires are broken or bound. (See Section 3, “Removal/Replacement.”)

Error Description	Diagnostic Action
<p data-bbox="89 212 189 310">Printing Too Light</p> <p data-bbox="89 350 181 448">Poor Print Quality</p>	<ol style="list-style-type: none"> <li data-bbox="317 212 830 310">1. Check for adequate ink on ribbon or damaged ribbon. Replace cartridge if needed. <li data-bbox="317 350 849 448">2. Check ribbon cartridge for binding by manually advancing ribbon. Replace if binding. <li data-bbox="317 488 919 618">3. Visually check for worn or broken ribbon drive gears. Replace Carriage Drive assembly if damaged. (See Section 3, "Removal/Replacement.") <li data-bbox="317 659 870 756">4. Check for bent ribbon shield. Replace if necessary. (See Section 3, "Removal/Replacement.") <li data-bbox="317 797 859 927">5. Check print head for broken or binding wires. Replace print head if wires are broken or bound. (See Section 3, "Removal/Replacement.") <li data-bbox="317 967 919 1097">6. Verify that print head gap is 0.6 to 0.65 mm (0.024 to 0.026 in.) with the lever in the center position. (See Section 3, "Removal/Replacement.") <li data-bbox="317 1138 834 1235">7. Check print head for loose mounting. Reseat. (See Section 3, "Removal/Replacement.") <li data-bbox="317 1276 902 1406">8. Check for loose or damaged platen, print head carriage shafts, or print mechanism frame. Replace Print Mechanism if needed. (See Section 3, "Removal/Replacement.")

Error Description	Diagnostic Action
<p>Smudged Printing</p>	<ol style="list-style-type: none"> 1. Check ribbon cartridge. <ul style="list-style-type: none"> – Jammed – Seated improperly – Excessive ink – Oily or dirty Replace cartridge if damaged. 2. Check for dirty, oily, or damaged platen. Replace Print Mechanism if platen is damaged. (See Section 3, “Removal/Replacement.”) 3. Check for dirty print head and print wires. Clean if dirty. 4. Check for dirty or bent ribbon shield. Replace shield if damaged. (See Section 3, “Removal/Replacement.”) 5. Visually check for worn or broken ribbon drive gears. Replace Carriage Drive assembly if damaged. (See Section 3, “Removal/Replacement.”)
<p>Uneven Printing</p> <p>Top/bottom of character</p> <p>Left/right of print line</p>	<ol style="list-style-type: none"> 1. No adjustment can be made. Replace Print Mechanism assembly. (See Section 3, “Removal/Replacement.”)

Error Description	Diagnostic Action
<p>Row(s) of Print Dots Missing</p>	<ol style="list-style-type: none"> 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 (0.024 to 0.026 in.) at center position of adjusting lever. (See Section 3, "Removal/Replacement.") 3. Check for damaged platen. Replace print mechanism if platen is damaged. (See Section 3, "Removal/Replacement.") 4. Check print head for broken wires. If wires are broken, replace print head. (See Section 3, "Removal/Replacement.") 5. Remove CN6 on Driver Circuit card. (See Section 5, "Locations.") Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 [male side]). <ul style="list-style-type: none"> Resistance = 22 ohms? YES: Replace both Control cards (see Section 3, "Removal/Replacement"). 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 5, "Locations.") Resistance = 22 ohms? YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement"). NO: Replace print head (see Section 3, "Removal/Replacement").

Error Description	Diagnostic Action
<p>Random Print Dots Missing</p>	<ol style="list-style-type: none"> 1. Check ribbon for damage (folds, holes, tears). Replace ribbon if damaged. 2. Verify print head gap adjustment is between 0.6 to 0.65 mm (0.024 to 0.026 in.) at center position of adjusting lever. (See Section 3, "Removal/Replacement.") 3. Check for damaged platen. Replace Print Mechanism if platen is damaged. (See Section 3, "Removal/Replacement.") 4. Check print head for broken wires. If wires are broken, replace print head. (See Section 3, "Removal/Replacement.") 5. Remove CN6 on Driver Circuit card. (See Section 5, "Locations.") Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 - male side). Resistance = 22 ohms? YES: Replace both Control cards (see Section 3, "Removal/Replacement"). 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 5, "Locations.") Resistance = 22 ohms? YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement"). NO: Replace print head (see Section 3, "Removal/Replacement").

Error Description	Diagnostic Action
<p>Extra Print Dots</p>	<ol style="list-style-type: none"> 1. Run Offline Diagnostic Test (see page 1400-33). Examine the / and Y-characters for extra dots. 2. Remove CN6 on Driver Circuit card (see Section 5, "Locations"). Measure approximately 22 ohms between pin CN6-10 (male side) and each head coil pin (CN6-1 to 9 - male side). Resistance = 22 ohms? YES: Replace both Control cards (see Section 3, "Removal/Replacement"). NO: Disconnect print head cable and check pins 1 through 9 (see Section 5, "Locations") for approximately 22 ohms. Resistance = 22 ohms? YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement"). NO: Replace print head (see Section 3, "Removal/Replacement").

Error Description	Diagnostic Action
<p>Extra Print Dots</p>	<p>3. Measure resistance between pins CN6-1 to 9 (see Section 5, "Locations") with respect to every other pin.</p> <p>Any pin shorted together?</p> <p>NO: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>YES: Disconnect print head cable and recheck pins CN6-1 to 9 with respect to every other pin.</p> <p>Any pins shorted together?</p> <p>YES: Replace Print Mechanism assembly (see Section 3, "Removal/Replacement").</p> <p>NO: Replace print head (see Section 3, "Removal/Replacement").</p>
<p>Printing Continues Beyond End-of-Forms</p>	<p>1. Position Printer Power switch to OFF. Check continuity of End-of-Forms switch from pin CN6-18 on Driver Circuit card (see Section 5, "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 3, "Removal/Replacement").</p> <p>2. Check for +5 Vdc at CN6-18 on Driver Circuit card (see Section 5, "Locations") with forms inserted. Check power supply if 0 Vdc. Use ground pin on the driver card.</p>
<p>Doublespacing or Abnormal Characters</p>	<p>1. Replace both Control cards (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
<p>False End-of-Forms Alarm</p>	<ol style="list-style-type: none"> 1. Is No Paper light off? <ul style="list-style-type: none"> <i>YES:</i> Go to step 2. <i>NO:</i> Are forms inserted properly? <ul style="list-style-type: none"> <i>YES:</i> Go to page 1400-23, "Printing Continues Beyond End-of-Forms." <i>NO:</i> Insert forms properly. 2. Power printer off. Power on. <ul style="list-style-type: none"> Is alarm still sounding? <ul style="list-style-type: none"> <i>YES:</i> Measure for +10.5 to 12.5 Vdc on pin 1 of control panel (see Section 5, "Locations"). 12 Vdc? <ul style="list-style-type: none"> <i>YES:</i> Replace both Control cards (see Section 3, "Removal/Replacement"). <i>NO:</i> Replace Control Panel (see Section 3, "Removal/Replacement"). <i>NO:</i> Run Offline Diagnostic Test (see page 1400-33). <ul style="list-style-type: none"> Does alarm sound? <ul style="list-style-type: none"> <i>YES:</i> Replace Print Mechanism assembly (see Section 3, "Removal/Replacement"). <i>NO:</i> Go to page 1400-1, "Printer Entry," if printer failure still suspected.

Error Description	Diagnostic Action
Uneven Horizontal Spacing	<ol style="list-style-type: none">1. Check for loose print head carriage belt. Adjust belt tension if needed. (See Section 3, "Removal/Replacement.")2. Check for loosely mounted print head. Reseat. (See Section 3, "Removal/Replacement.")3. Check for worn gears in Carriage Drive assembly. Replace assembly if needed. (See Section 3, "Removal/Replacement.")4. Check for bent or binding carriage shafts. Replace Print Mechanism assembly if needed. (See Section 3, "Removal/Replacement.")

Error Description	Diagnostic Action												
Control Panel	<p>1. Position Printer Power switch to ON. Measure voltages at CN3 (see Section 5, "Locations") as shown in chart below. Use ground on Driver Circuit card.</p> <table border="1" data-bbox="373 440 820 659"> <thead> <tr> <th>Pin no.</th> <th>Min voltage</th> <th>Max voltage</th> </tr> </thead> <tbody> <tr> <td>CN3-16</td> <td>+4.5 Vdc</td> <td>+5.5 Vdc</td> </tr> <tr> <td>CN3-20</td> <td>+12.6 Vdc</td> <td>+15.4 Vdc</td> </tr> <tr> <td>CN3-18</td> <td>+21.6 Vdc</td> <td>+26.4 Vdc</td> </tr> </tbody> </table> <p>Are all voltages correct? YES: Go to step 2. NO: Go to page 1400-6, "Power Supply Check."</p> <p>2. Power off the Printer. Disconnect the parallel printer cable at the printer. Insert forms. Power on.</p> <p>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 1400-24, "False End-of-Forms Alarm." NO: Go to step 3.</p>	Pin no.	Min voltage	Max voltage	CN3-16	+4.5 Vdc	+5.5 Vdc	CN3-20	+12.6 Vdc	+15.4 Vdc	CN3-18	+21.6 Vdc	+26.4 Vdc
Pin no.	Min voltage	Max voltage											
CN3-16	+4.5 Vdc	+5.5 Vdc											
CN3-20	+12.6 Vdc	+15.4 Vdc											
CN3-18	+21.6 Vdc	+26.4 Vdc											

Error Description	Diagnostic Action
Control Panel	<p>3. Is the Power light on? YES: Go to step 4. NO: Measure for approximately +10 to 12 Vdc at pin 9 on the Control Panel. Use pin 8 for ground (see Section 5, "Locations"). 12 Vdc? YES: Replace Control Panel (see Section 3, "Removal/Replacement"). NO: Go to page 1400-6, "Power Supply Check."</p> <p>4. Is 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 5, "Locations.") 12 Vdc? YES: Replace both Control cards (see Section 3, "Removal/Replacement"). NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
Control Panel	<p>5. Is Ready light on?</p> <p>YES: Go to step 6.</p> <p>NO: Measure for approximately +10 to +12 Vdc at pin 4 on Control Panel. Use ground pin on the Driver Circuit card (see Section 5, "Locations").</p> <p>12 Vdc?</p> <p>YES: Replace Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
Control Panel	<p>6. Position the Printer Power switch to OFF. Insert forms under End-of-Forms switch. Position the Printer Power switch to ON. Press Online switch.</p> <p>Online light off?</p> <p>YES: Go to step 7.</p> <p>NO: Measure for approximately +4 to 5.5 Vdc on pin 5 of Control Panel. Use pin 8 for ground (see Section 5, "Locations").</p> <p>5 Vdc?</p> <p>NO: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>YES: Press and hold Online switch. Measure 0 to +1.5 Vdc on pin 5 of Control Panel.</p> <p>1.5 Vdc?</p> <p>YES: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
Control Panel	<p>7. Press the Line Feed switch.</p> <p>Do forms step?</p> <p>YES: Go to step 8.</p> <p>NO: Measure for approximately +4 to 5.5 Vdc on pin 7 of Control Panel. Use pin 8 for ground (see Section 5, "Locations").</p> <p>5 Vdc?</p> <p>NO: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>YES: Press and hold Line Feed switch. Measure for 0 to +1.5 Vdc on pin 7 of Control Panel.</p> <p>1.5 Vdc?</p> <p>YES: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
Control Panel	<p>8. Press Forms Feed switch.</p> <p>Do forms advance?</p> <p>YES: Go to step 9.</p> <p>NO: Measure for approximately +4 to 5.5 Vdc on pin 6 of Control Panel. Use pin 8 for ground (see Section 5, "Locations").</p> <p>5 Vdc?</p> <p>NO: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>YES: Press and hold Forms Feed switch. Measure 0 to +1.5 Vdc on pin 6 of Control Panel.</p> <p>1.5 Vdc?</p> <p>YES: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Error Description	Diagnostic Action
<p>Control Panel</p>	<p>9. Remove forms from printer. Press the Online switch.</p> <p>Does alarm sound?</p> <p>YES: Go to step 10.</p> <p>NO: Measure for approximately +10 to +12 Vdc at pin 10 of Control Panel. Use pin 8 for ground (see Section 5, "Locations").</p> <p>+12 Vdc?</p> <p>YES: Replace Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p> <p>10. Does No Paper light go on?</p> <p>YES: Control Panel checks good. Return to "Printer Entry", page 1400-1.</p> <p>NO: Measure for approximately +10 to +12 Vdc at pin 3 of Control Panel.</p> <p>12 Vdc?</p> <p>YES: Replace both Control cards (see Section 3, "Removal/Replacement").</p> <p>NO: Replace Control Panel (see Section 3, "Removal/Replacement").</p>

Notes:



SECTION 3. REMOVAL/REPLACEMENT

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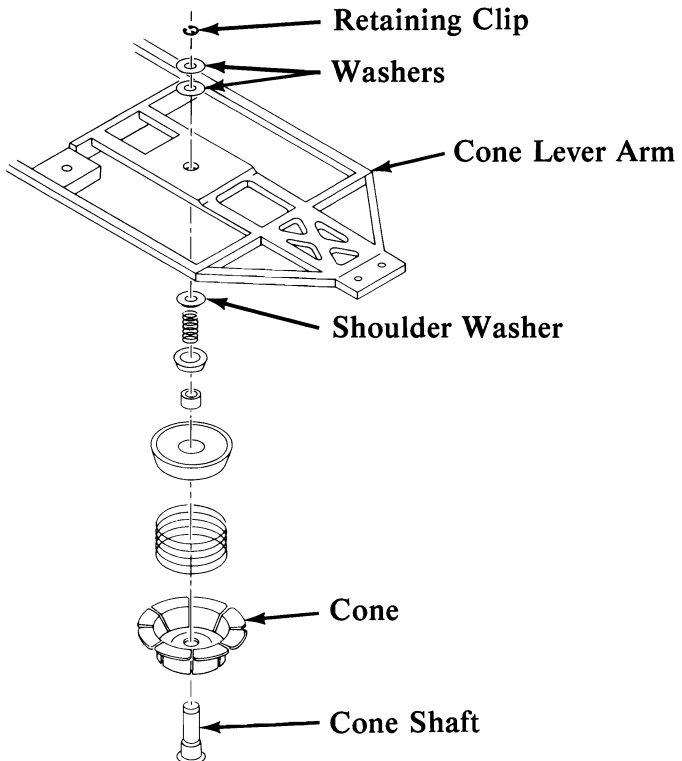
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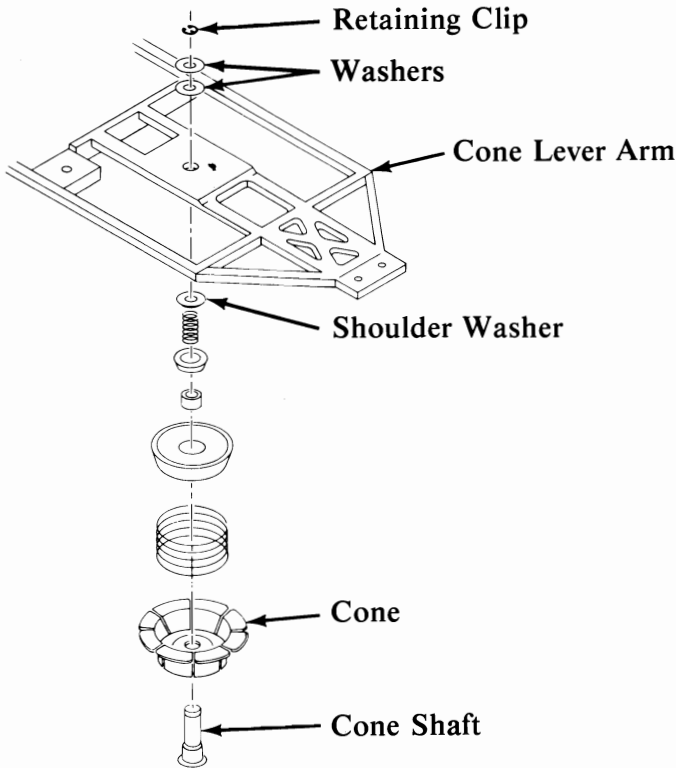
Cone Assembly Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printer Circuit Board (See page 3-24).
5. Remove cone lever arm (See page 3-5).
6. While compressing cone assembly to relieve spring tension, remove retaining clip from top of shaft.
7. Release spring tension and allow cone assembly to separate from cone lever arm.



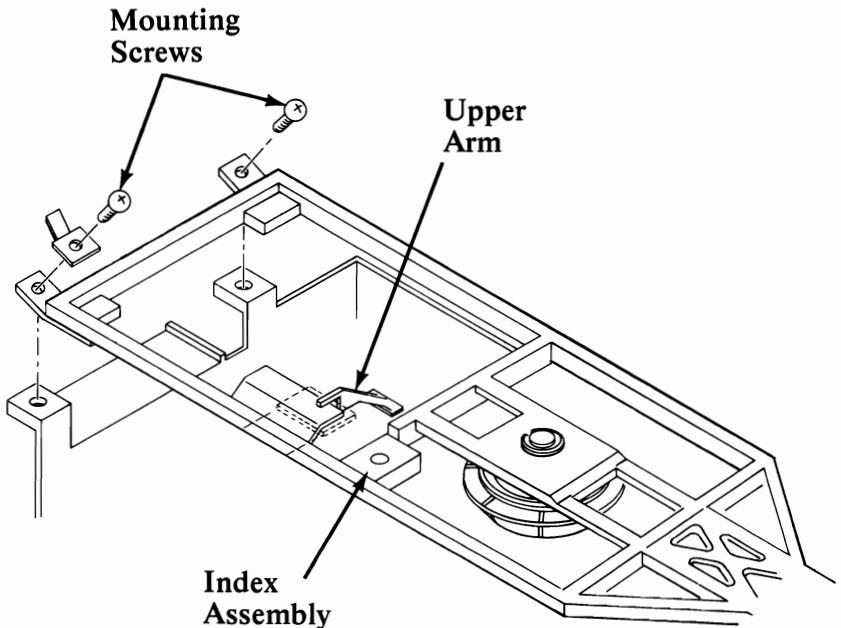
Cone Assembly Replacement

1. Place cone assembly parts in sequence shown in illustration with shaft through cone lever arm and spring compressed.
2. Replace retaining clip on shaft.
3. Replace cone lever arm (See page 3-6).
4. Replace Diskette Drive Printed Circuit Board (See page 3-26).
5. Replace System Unit cover (See page 3-98).
6. Reconnect cables to System Unit.



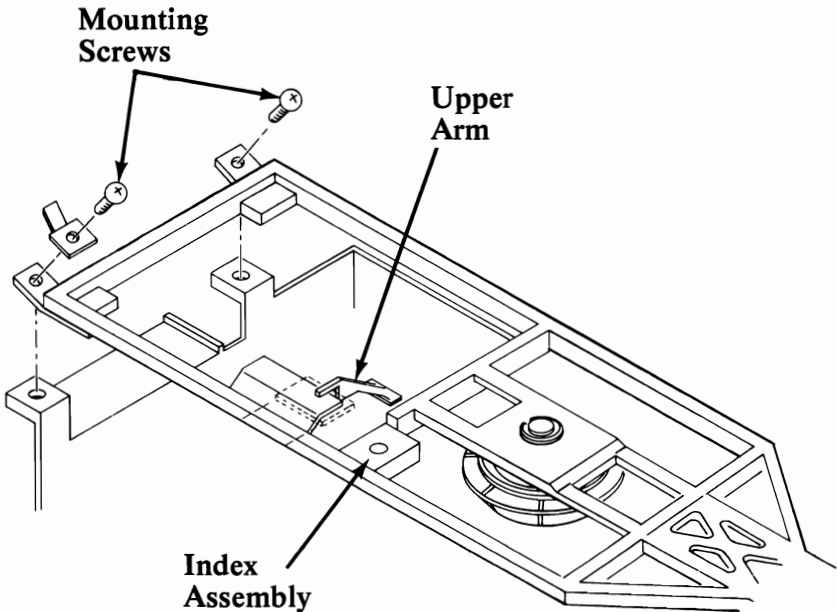
Cone Lever Arm Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Remove wire tie attaching index cable to cone lever assembly. Remove index assembly.
6. Remove two mounting screws for cone lever arm and remove wire ties at rear of cone lever arm.
7. Slide head carriage to front of machine (track 39 position).
8. Slide cone lever arm to rear of machine, releasing upper arm. Lift cone lever arm out of Diskette Drive.



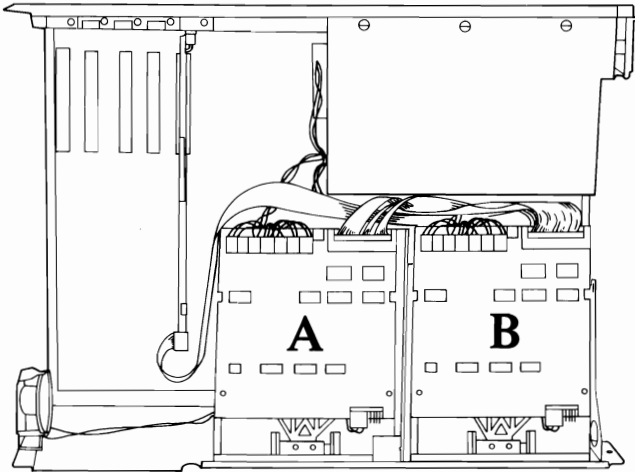
Cone Lever Arm Replacement

1. Insert latch assembly in its tracks; move latch assembly to the front of the Diskette Drive.
2. Carefully lower the cone lever arm and lift the upper arm over the cone lever arm.
3. Replace mounting screws; do not tighten.
4. Replace index assembly with mounting screw.
5. Tie emitter harness to cone lever arm.
6. Close latch assembly to engage the cone and hub.
7. Position cone lever arm so that cone assembly is centered over drive hub; tighten mounting screws.
8. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
9. Replace System Unit cover (See page 3-98).
10. Reconnect cables to System Unit.

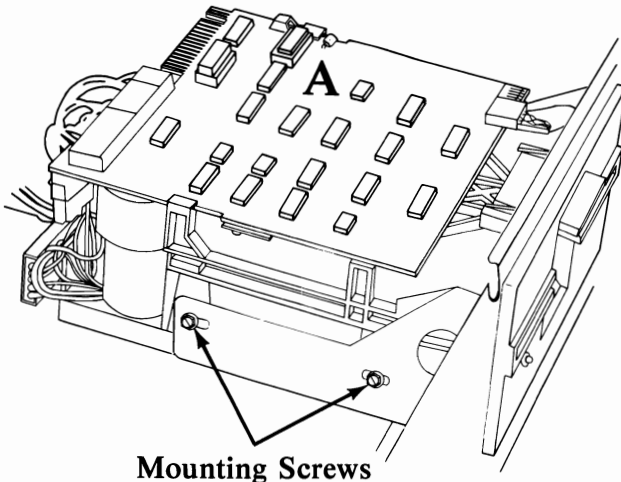


Diskette Drive "A" Removal

1. Position System Unit Power switch to Off; unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set the Display, Keyboard, and Printer away from System Unit work area.
3. Remove System Unit cover (See page 3-98).
4. Disconnect signal cable from Diskette Drive Printed Circuit Board.

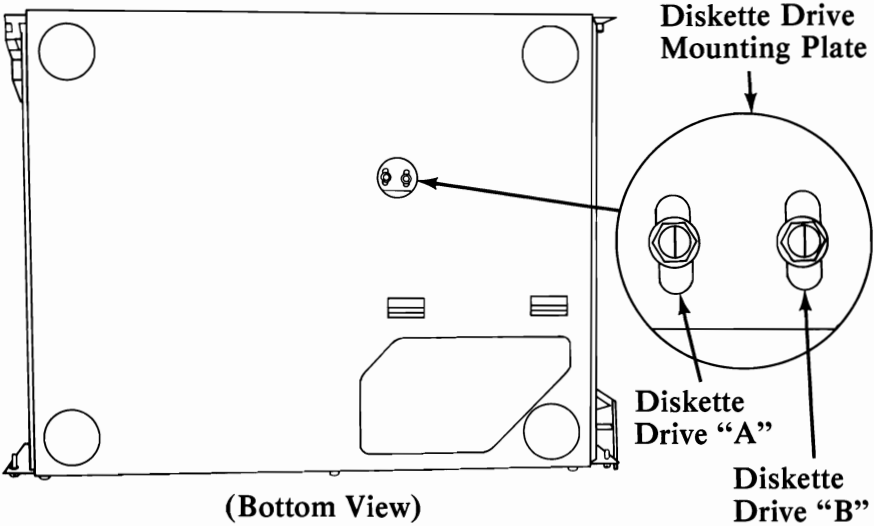


5. Remove the two mounting screws on left side of Diskette Drive "A".

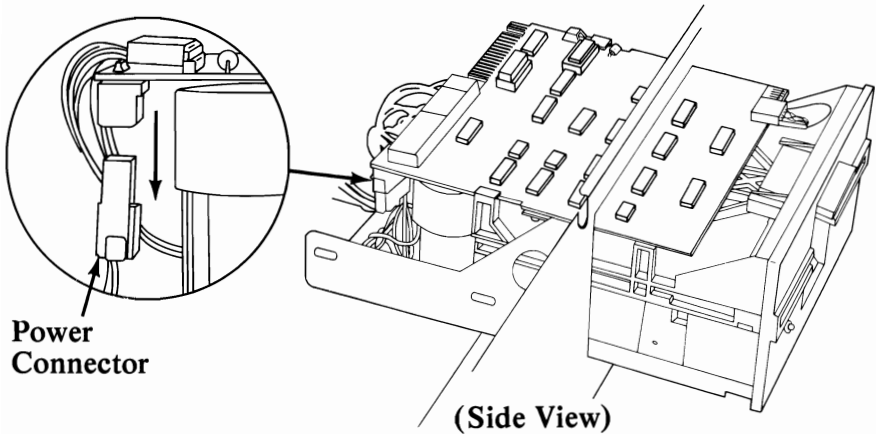


Diskette Drive "A" Removal (continued)

6. Remove mounting screw from bottom of Diskette Drive.



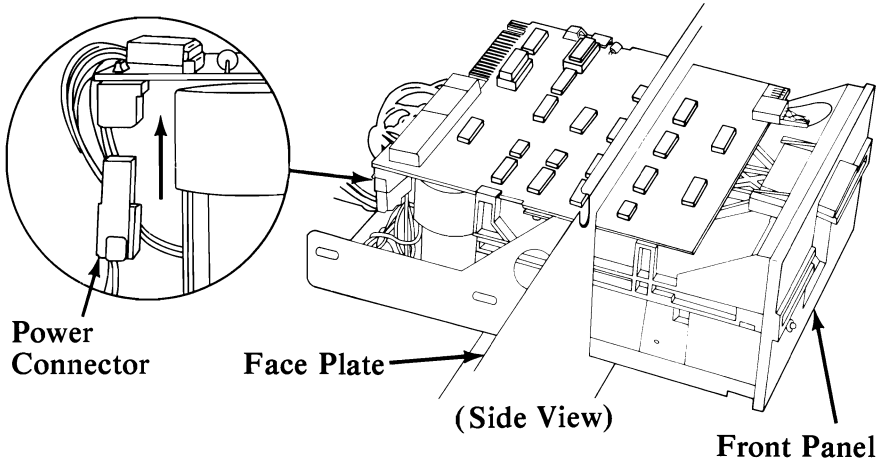
7. Slide Diskette Drive out of System Unit approximately 2 inches and remove power connector from Diskette Drive Logic Circuit Board.



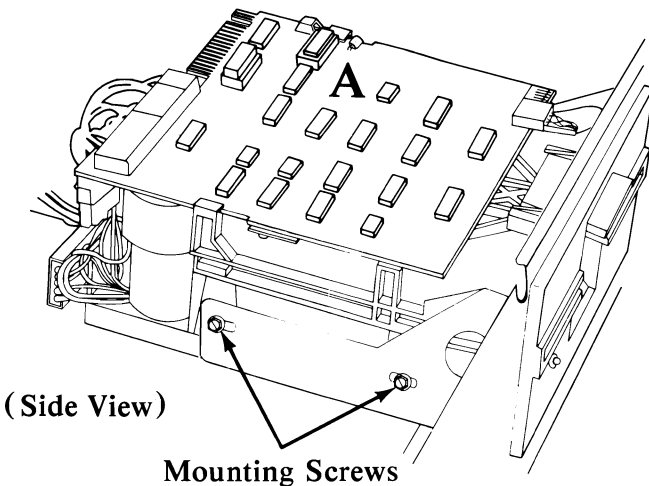
8. Remove Diskette Drive from System Unit.

Diskette Drive "A" Replacement

1. Slide Diskette Drive "A" in until front panel is approximately 2 inches from frame and connect power cable to Diskette Drive Logic Circuit Board.

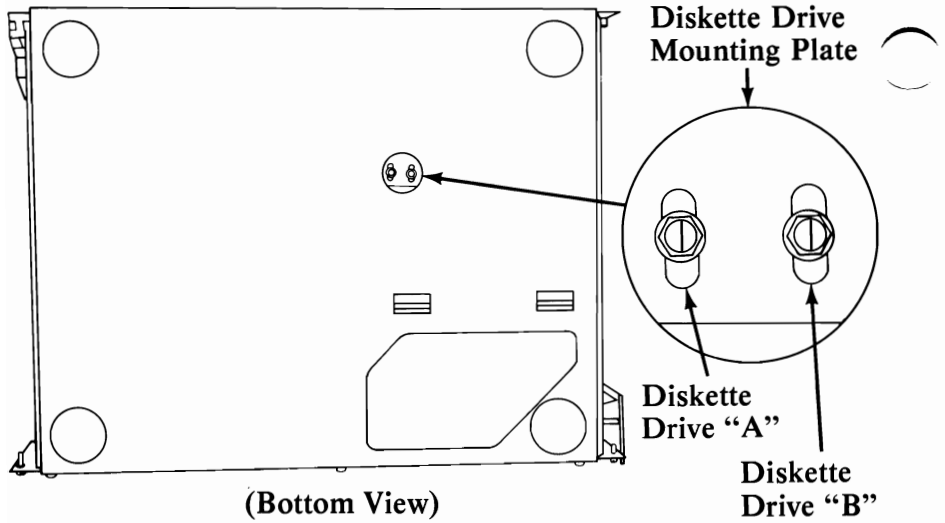


2. Slide Diskette Drive "A" in until faceplate is even with front panel.
3. Route signal cable between Diskette Drive and power supply. Connect end of signal cable to Diskette Drive.
4. Install the two side mounting screws.



Diskette Drive "A" Replacement (continued)

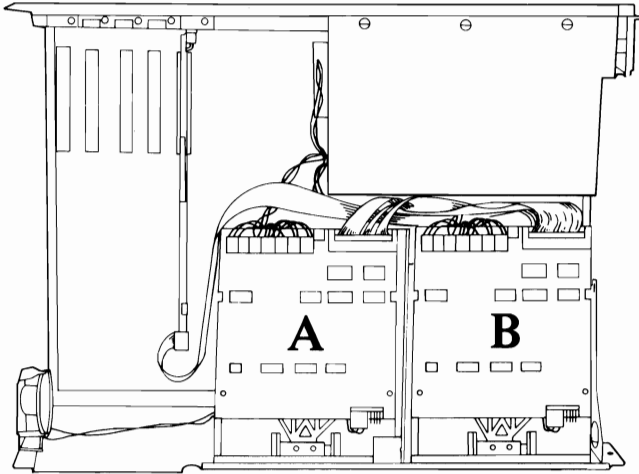
5. Install bottom mounting screw.



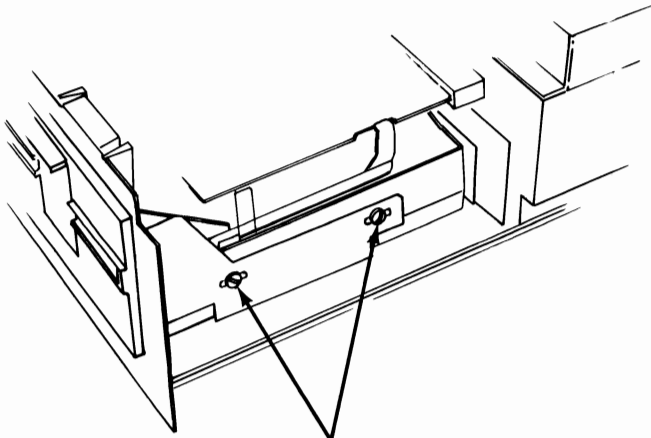
6. Install System Unit cover (See page 3-98).
7. Reconnect cables to System Unit.

Diskette Drive “B” Removal

1. Position System Unit Power Switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit work area.
3. Remove System Unit cover (See page 3-98).
4. Disconnect signal cable from Diskette Drive Logic Printed Circuit Board.



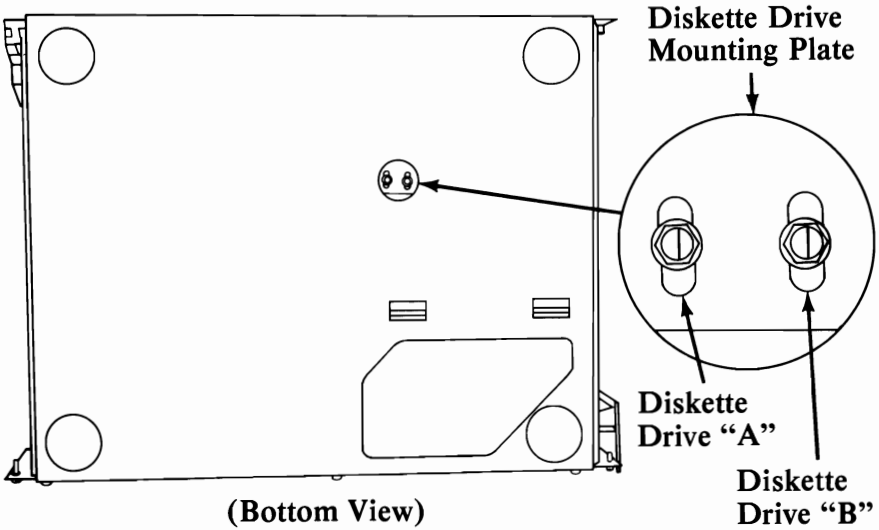
5. Remove the two mounting screws on right side of Diskette Drive.



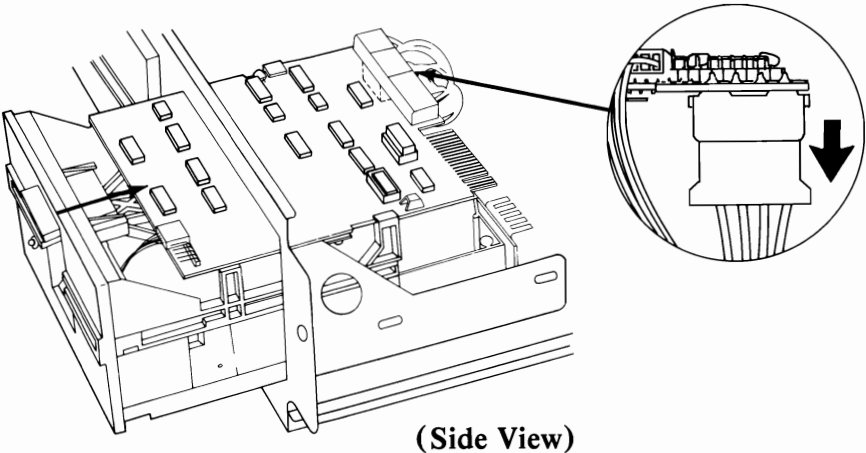
Mounting Screws

Diskette Drive "B" Removal (continued)

6. Remove mounting screw from bottom of Diskette Drive.



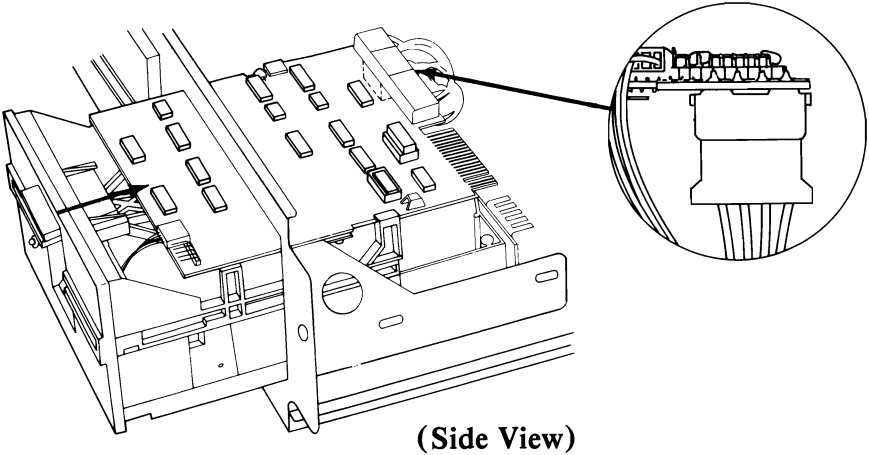
7. Slide Diskette Drive out of System Unit approximately 2 inches, and remove power connector from Diskette Drive Logic Printed Circuit Board.



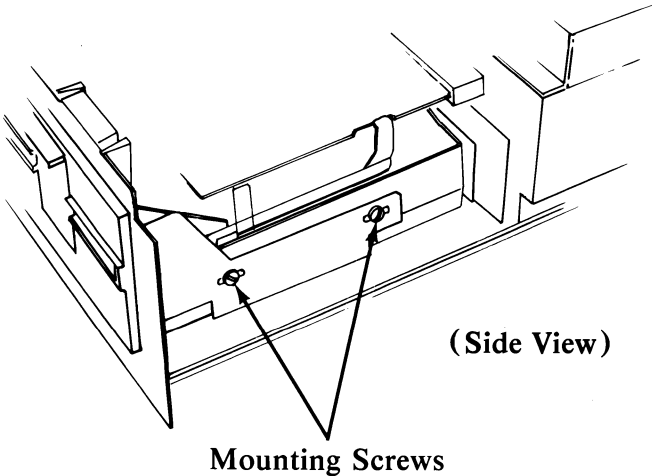
8. Remove Diskette Drive from System Unit.

Diskette Drive "B" Replacement

1. Slide Diskette Drive in until front panel is approximately 2 inches from frame and connect power cable to Diskette Drive Logic Printed Circuit Board.

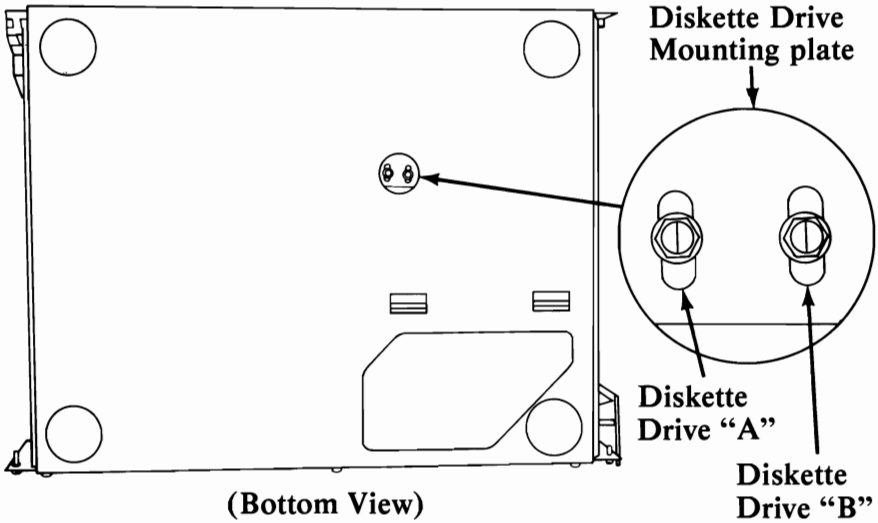


2. Slide Diskette Drive in until faceplate is even with front panel.
3. Route signal cable between Diskette Drive and power supply. Connect end of signal cable to Diskette Drive.
4. Install two side mounting screws.



Diskette Drive "B" Replacement (continued)

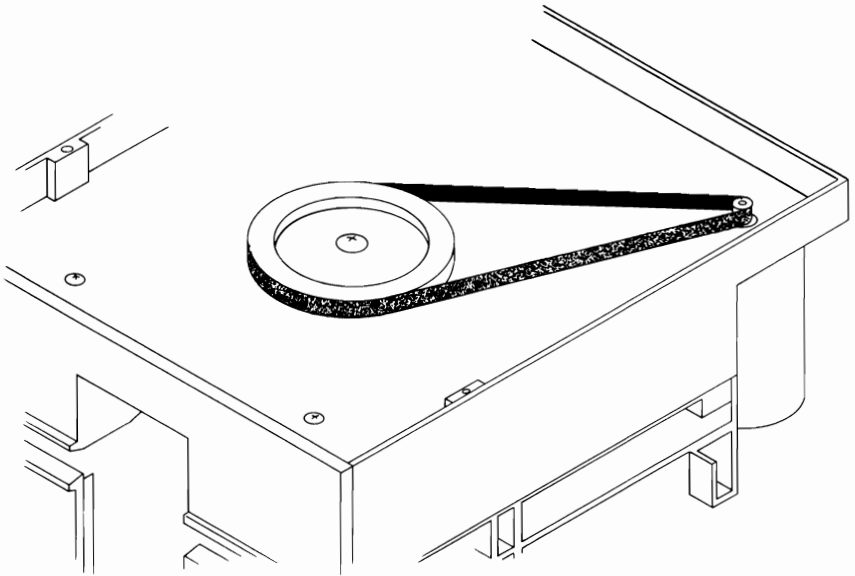
5. Install bottom mounting screw.



6. Install System Unit cover (See page 3-98)
7. Reconnect cables to System Unit.

Drive Belt Removal

1. Position System Unit power switch to Off, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set the Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (see page 3-98).
4. Remove Diskette Drive (See page 3-7).
5. Carefully place Diskette Drive on work surface with drive belt and pulleys facing up.
6. Lift belt off large pulley; then lift belt off small pulley.



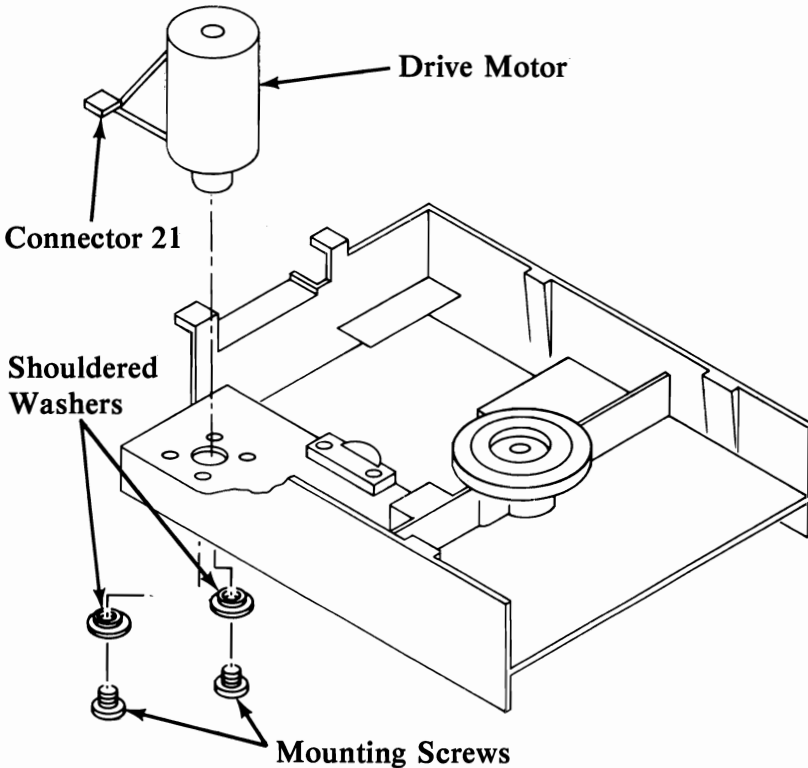
(Bottom View)

Drive Belt Replacement

1. Place drive belt around small pulley (dark shiny side facing pulleys), then place belt around large pulley.
2. Replace Diskette Drive (See page 3-9).
3. Replace System Unit cover (See page 3-98).
4. Reconnect cables to System Unit.

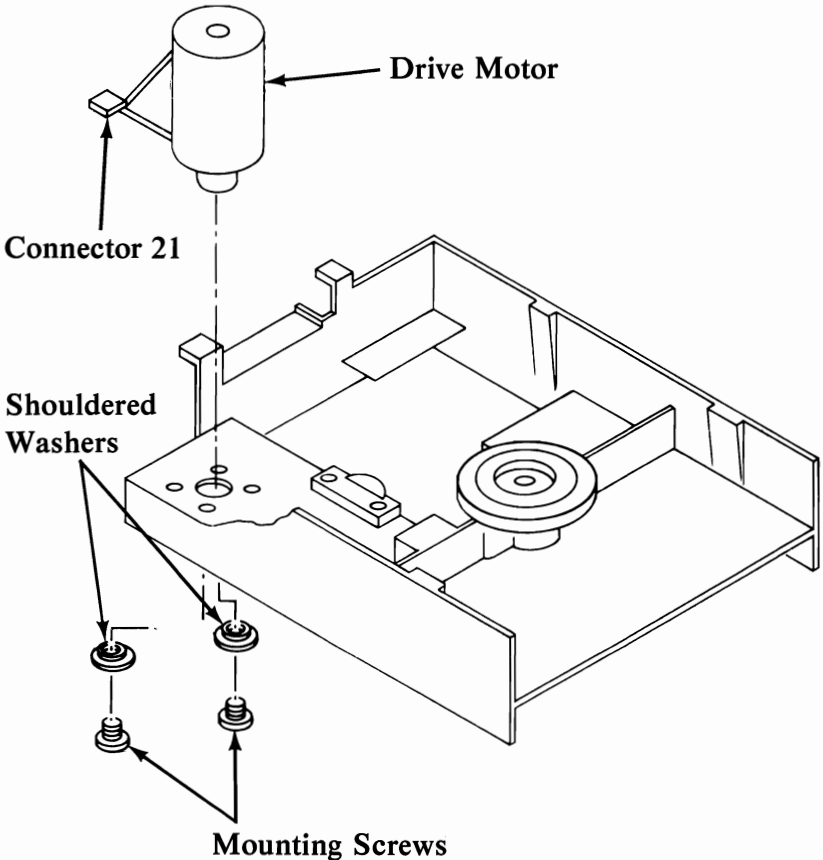
Drive Motor Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Carefully place Diskette Drive on work surface with drive belt and pulleys facing up.
6. Disconnect Connector 21 from servo board.
7. Remove drive belt (See page 3-15).
8. Remove drive motor mounting screws and shouldered washers.
9. Carefully pull drive motor out of Diskette Drive.



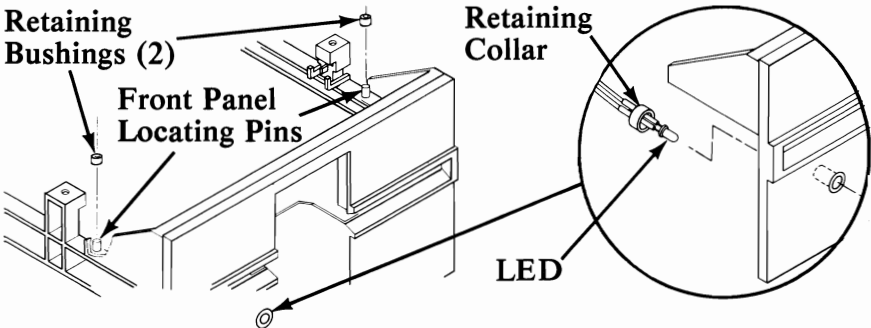
Drive Motor Replacement

1. Place drive motor in position, aligning threaded holes in motor with holes in frame (motor wiring harness should face rear of machine).
2. Replace mounting screws and shouldered washers.
3. Replace drive belt (See page 3-15).
4. Connect drive motor cable to servo board at Connector 21.
5. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
6. Replace System Unit cover (See page 3-98).
7. Reconnect cables to System Unit.

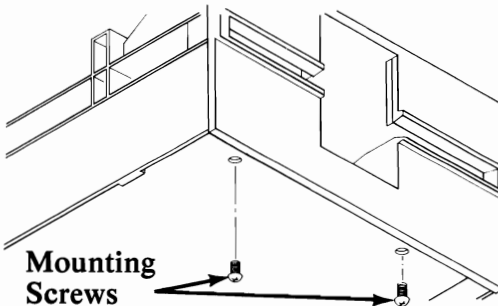


Front Panel Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive (See page 3-7).
5. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
6. Remove retaining collar that holds LED assembly to front panel.
7. Remove LED assembly from front panel.
8. Remove retaining bushings.

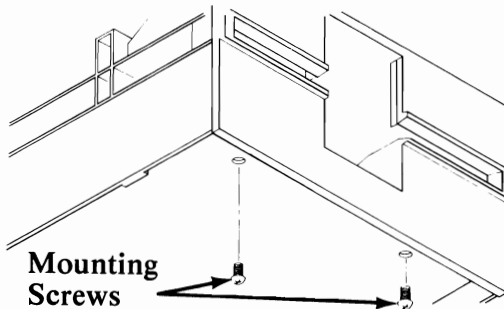
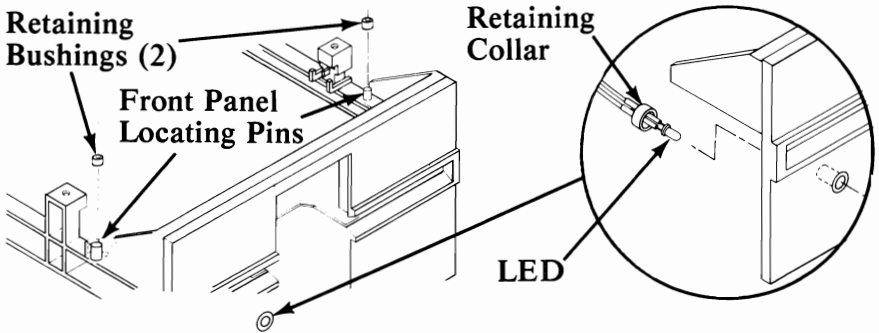


9. Carefully place Diskette Drive on its side and remove front panel mounting screws.
10. Remove front panel from Diskette Drive.



Front Panel Replacement

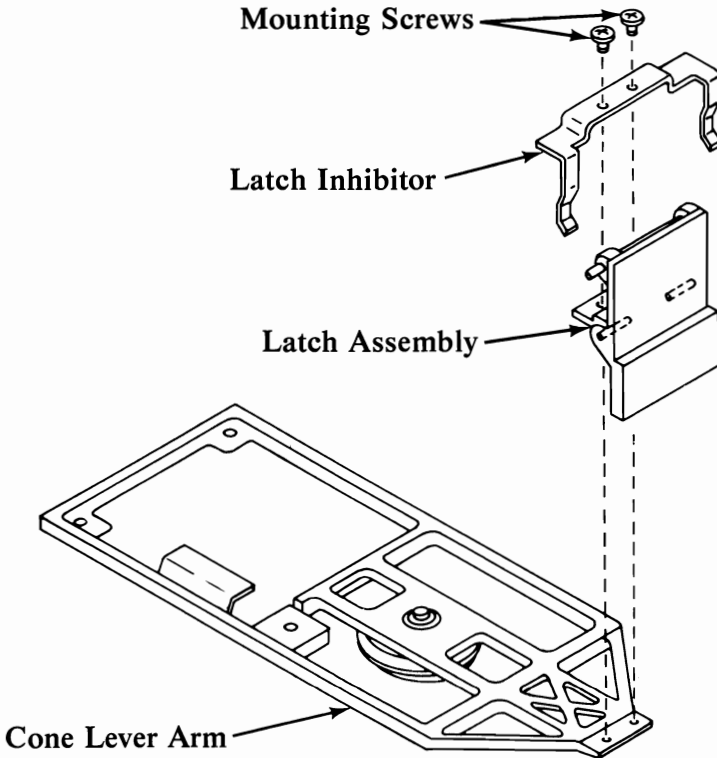
1. Install front panel by inserting the latch in its tracks and positioning the panel in place on the locating pins.
2. Install the two mounting screws that attach front panel to Diskette Drive.
3. Push the LED assembly into grommet.
4. Push the retaining collar over the back of the LED grommet.
5. Replace retaining bushings.



6. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
7. Replace System Unit cover (See page 3-98).
8. Reconnect cables to System Unit.

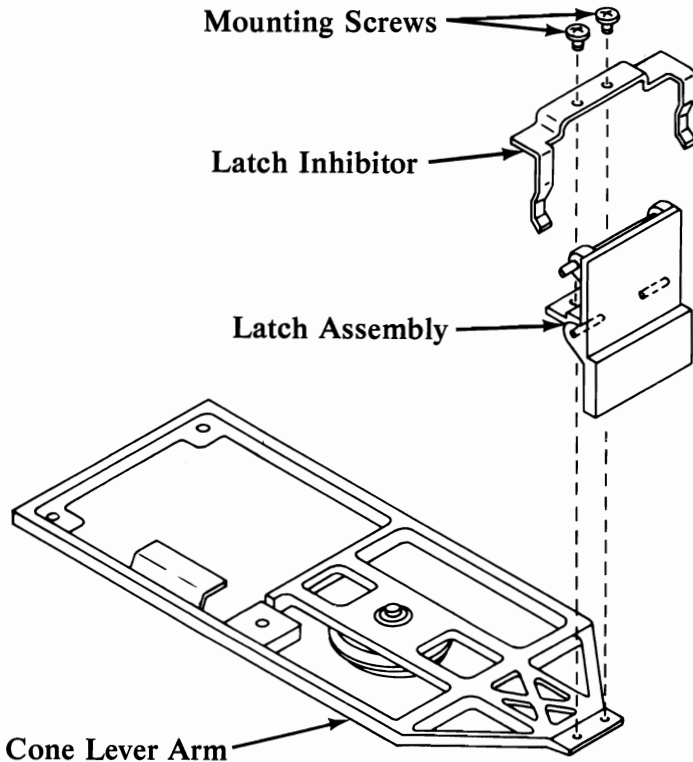
Latch Assembly Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Close latch and lightly hold cone lever arm down while removing latch mounting screws.
6. Lift latch inhibitor out of Diskette Drive.
7. Slide latch assembly out through slots in rear of front panel.



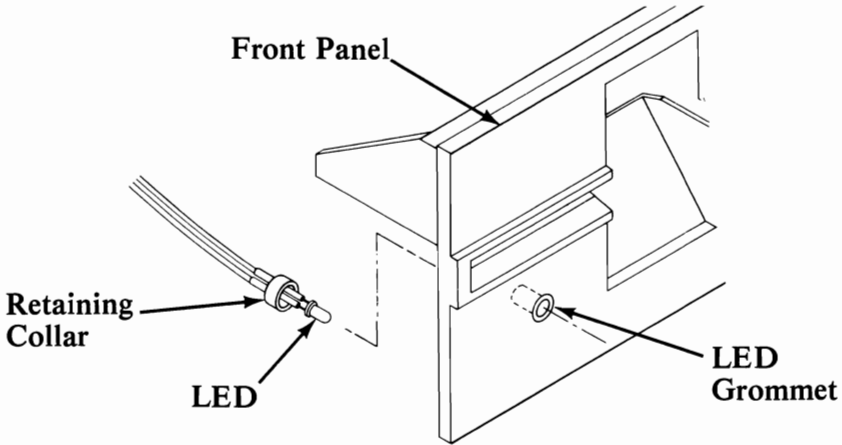
Latch Assembly Replacement

1. Slide latch assembly into slots at rear of front panel.
2. While lightly holding cone lever arm down, align two mounting holes in latch assembly with holes in front of cone lever arm.
3. Align latch inhibitor with two holes in latch assembly and replace screws; do not tighten screws.
4. Align latch with front panel and align latch inhibitor to just touch fully inserted diskette; then tighten screws.
5. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
6. Replace System Unit cover (See page 3-98).
7. Reconnect cables to System Unit.



LED Assembly Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Remove retaining collar that holds LED assembly to front panel.
6. Remove LED assembly from front panel.

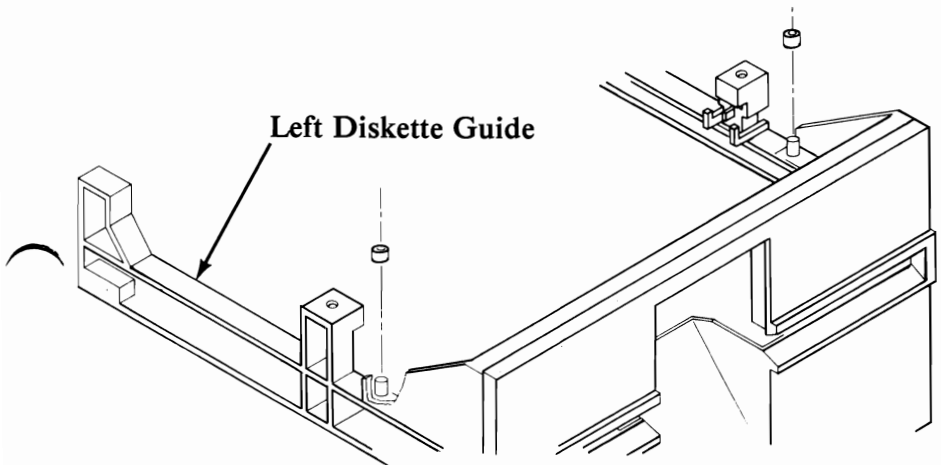


LED Assembly Replacement

1. Push LED assembly into grommet.
2. Push retaining collar over back of LED grommet.
3. Position cable along left side of frame and right side of motor. Tie wires as necessary.
4. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
5. Replace System Unit cover (See page 3-98).
6. Reconnect cables to System Unit.

Left Diskette Guide Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Remove Front Panel (See page 3-18).
6. Carefully lift left guide from frame.

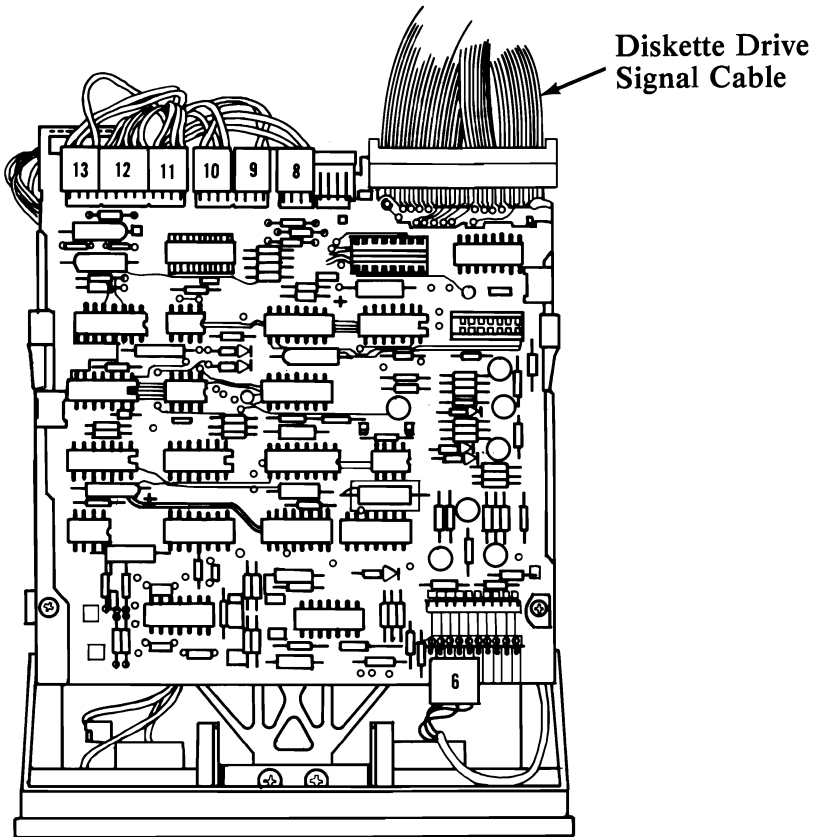


Left Diskette Guide Replacement

1. Align pins on left guide with mounting holes on top of left side frame, then lower guide onto frame.
2. Replace Front Panel (See page 3-19).
3. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
4. Replace System Unit cover (See page 3-98).
5. Reconnect cables to System Unit.

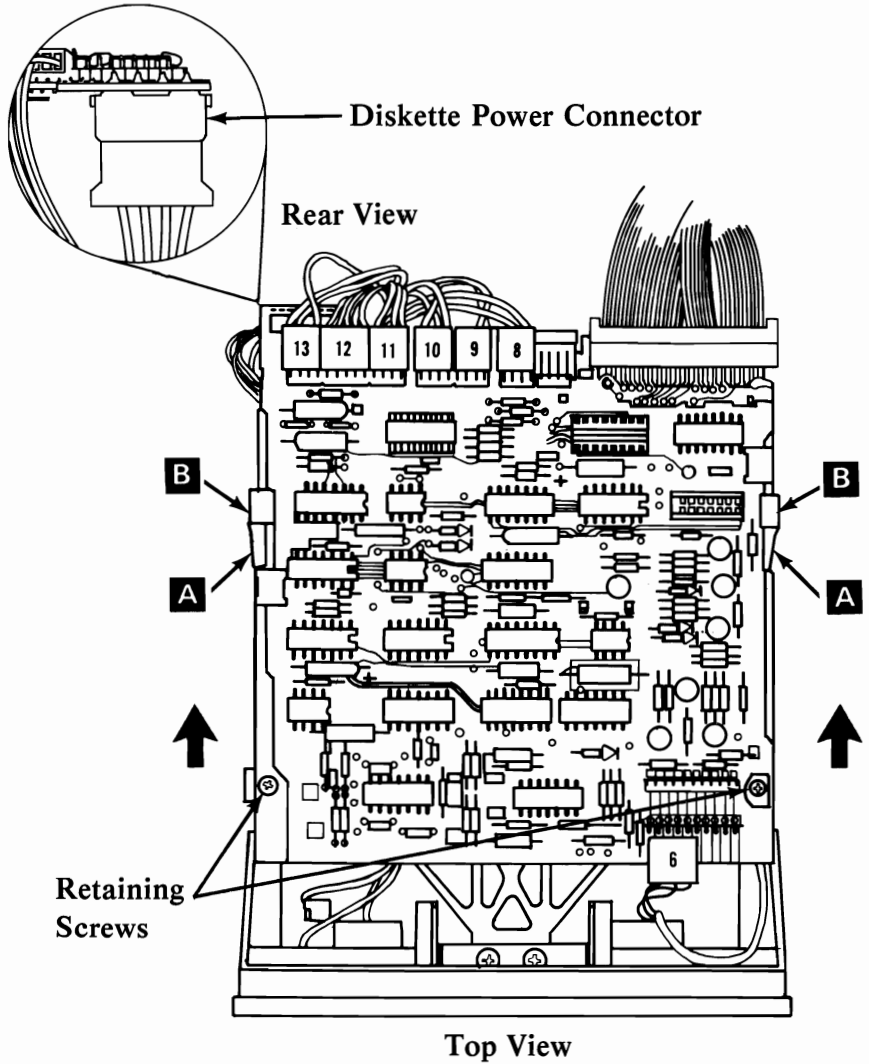
Diskette Drive Logic Printed Circuit Board Removal

1. Position System Unit Power switch to OFF, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit.
3. Remove System Unit cover (See page 3-98).
4. Disconnect connectors 8 through 13 from left rear of Diskette Drive Logic Printed Circuit Board, connector 6 from right front of Diskette Drive Logic Printed Circuit Board, and Diskette Drive signal cable from right rear of Diskette Drive Logic Printed Circuit Board.



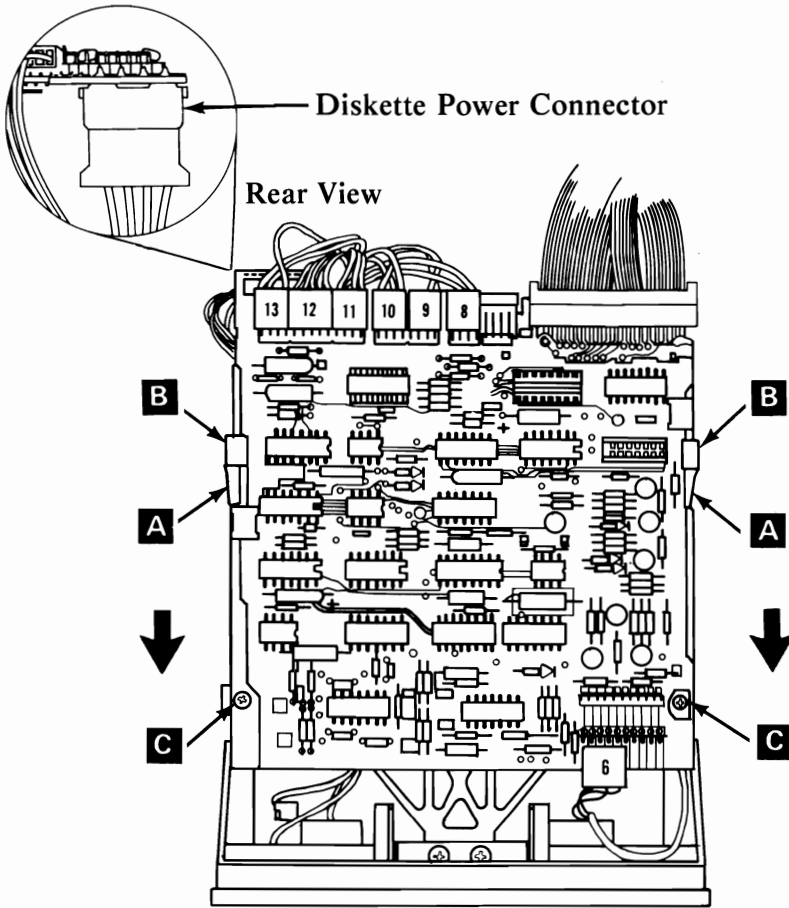
Top View

5. Remove two retaining screws from top of Diskette logic printed circuit board.
6. Slide Diskette Drive logic printed circuit board to rear until notches **A** line up with guide brackets **B**; then lift Diskette Drive logic printed circuit board from Diskette Drive.
7. Disconnect the Diskette Drive power connector from left rear of Diskette Drive Logic Printed Circuit Board.

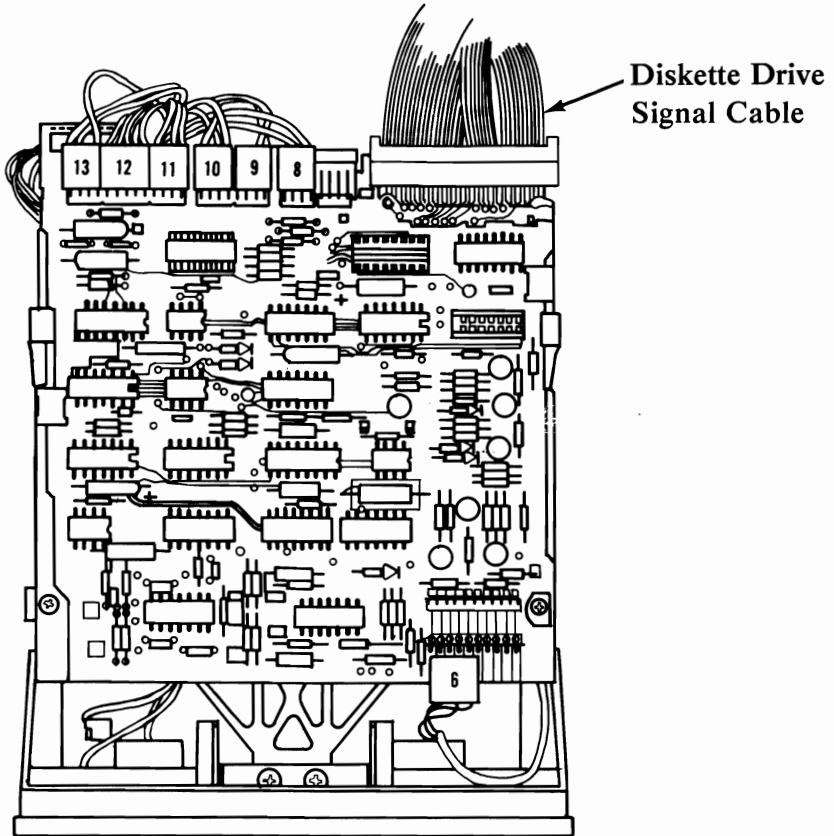


Diskette Drive Logic Printed Circuit Board Replacement

1. Connect Diskette Drive power connector at left rear of Diskette Drive Logic Printed Circuit Board.
2. Align notches **A** on sides of Logic Printed Circuit Board with guide brackets **B**; and lower Logic Printed Circuit Board onto brackets.
3. Slide Logic Printed Circuit Board toward front of machine until holes in Logic Printed Circuit Board line up with threaded holes for retaining screws **C**.



4. Replace Logic Printed Circuit Board retaining screws.
5. Connect connectors 8 through 13 at left rear of Logic Printed Circuit Board, connector 6 at right front of Logic Printed Circuit Board, and Diskette Drive signal cable at right rear of Logic Printed Circuit Board.

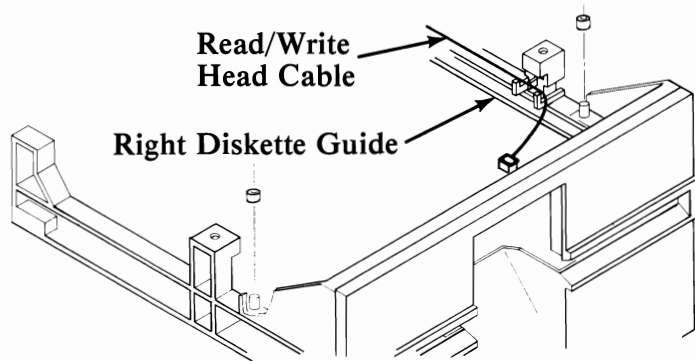


Top View

6. Replace System Unit cover (See page 3-98).
7. Reconnect cables to System Unit.

Right Diskette Guide Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit working area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Remove Front Panel (See page 3-18).
6. Remove read/write head cable from brackets on right diskette guide.
7. Carefully lift guide from frame.

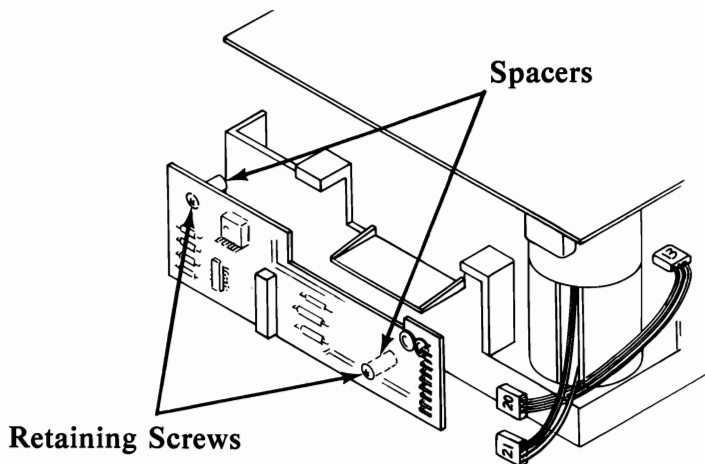


Right Diskette Guide Replacement

1. Align pins on right guide with mounting holes on top of right side frame, then lower guide onto frame.
2. Position read/write head cable through brackets on right guide.
3. Replace Front Panel (See page 3-19).
4. Replace Diskette Drive Logic Printed Circuit Board (See page 3-26).
5. Replace System Unit cover (See page 3-98).
6. Reconnect cables to System Unit.

Servo Board Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord, and disconnect all cables from rear of System Unit.
2. Set the Display, Keyboard, and Printer away from System Unit work area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive (See page 3-7).
5. Disconnect connectors 20 and 21 from servo board.
6. Remove servo board retaining screws and lift board from Diskette Drive.
(Note: Do not lose spacers between servo board and frame when removing board).

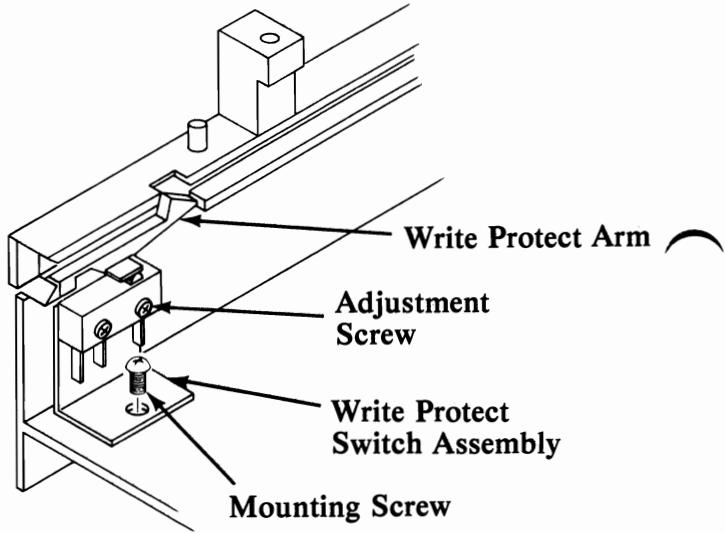


Servo Board Replacement

1. Place servo board in position at rear of Diskette Drive.
2. Replace retaining screws while holding spacers in place between servo board and frame.
3. Connect connectors 20 and 21 to servo board.
4. Replace Diskette Drive (See page 3-9).
5. Replace System Unit cover (See page 3-98).
6. Reconnect cables to System Unit.

Write Protect Switch Assembly Removal

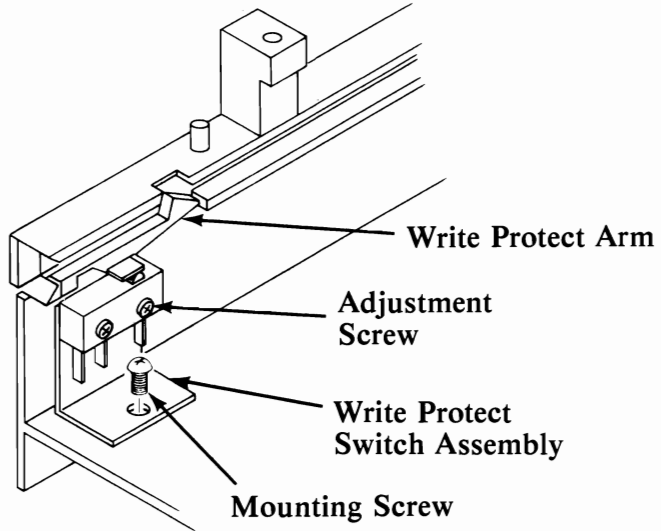
1. Position System Unit Power switch to Off, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set Display, Keyboard, and Printer away from System Unit work area.
3. Remove System Unit cover (See page 3-98).
4. Remove Diskette Drive Logic Printed Circuit Board (See page 3-24).
5. Remove write protect switch assembly.



Front View

Write Protect Switch Assembly Replacement

1. Place write protect switch assembly in position at the front of the Diskette Drive.
2. Replace mounting screw for the switch assembly.



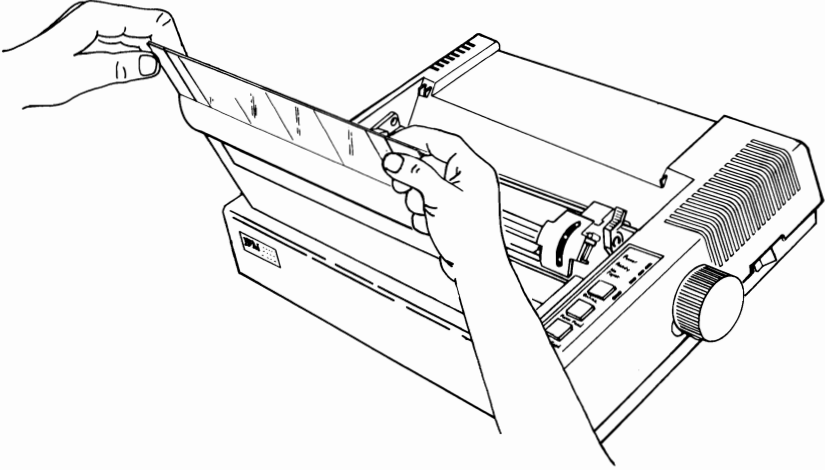
Front View

3. Position cable along left side of frame and right side of motor. Tie wires as necessary.
4. Adjust switch position so that when a diskette is inserted in the guides, it transfers without binding the diskette guide and write protect assembly.
5. Install Diskette Drive Logic Printed Circuit Board (See page 3-26).
6. Install System Unit cover (See page 3-98).
7. Reconnect cables to System Unit.

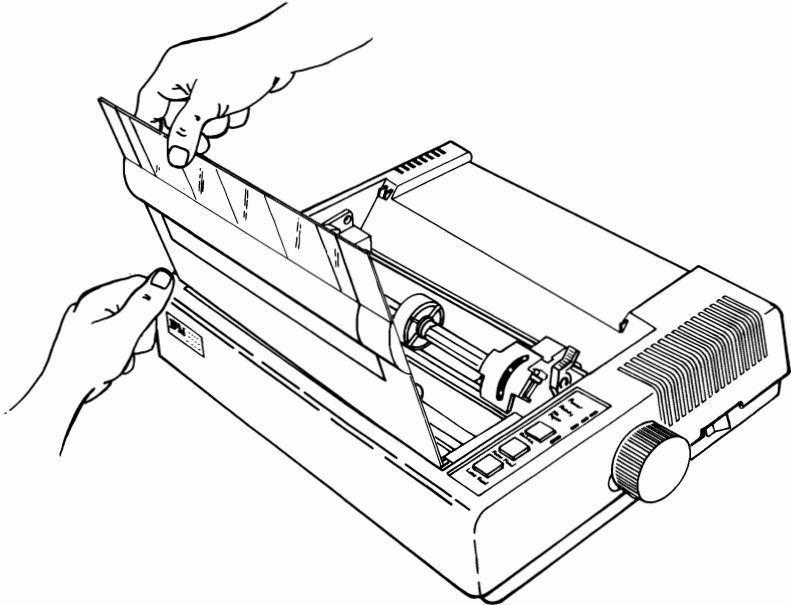
Printer

Access Cover Removal

1. Raise access cover.

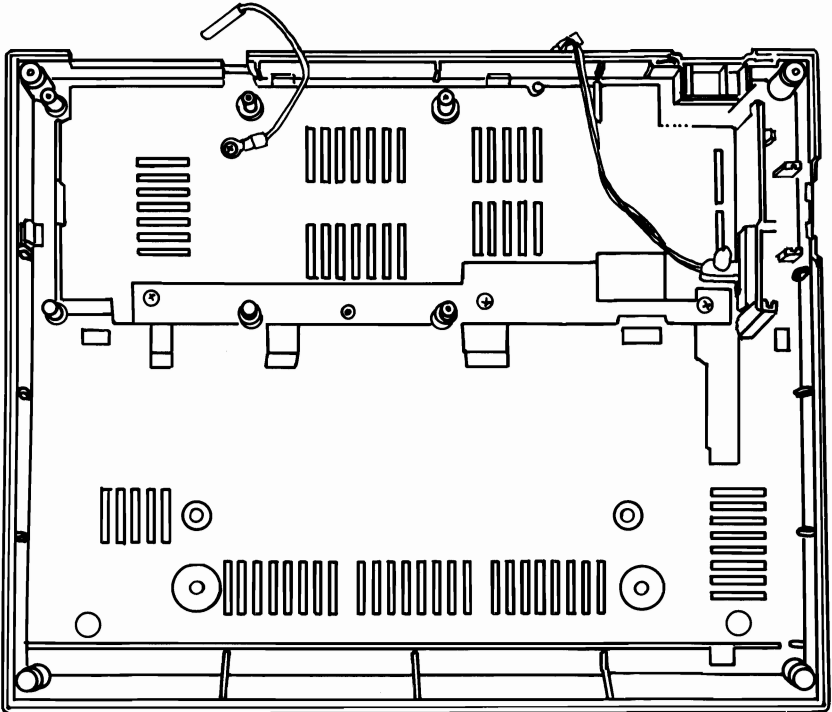


2. Lift cover from base as shown.



Base Cover Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Remove power transformer (See page 3-74).
7. Remove fuse-filter card/power cord (See page 3-60).
8. Remove driver circuit card (See page 3-51).
9. Remove control circuit card (See page 3-45).
10. Remove print mechanism assembly (See page 3-80).
11. Remove heat sink/power transistor assembly (See page 3-62).
12. Base cover is now completely detached from other FRUs.

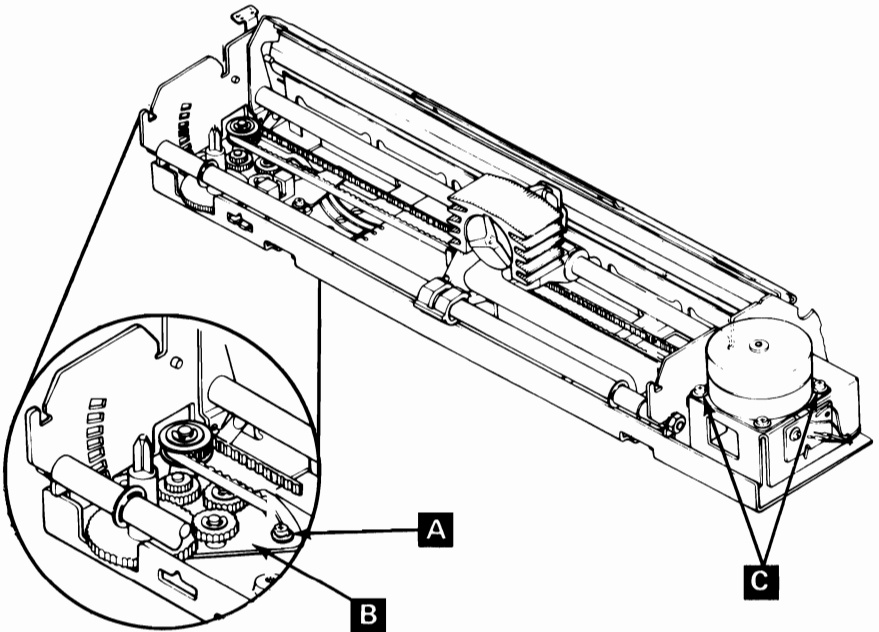


Base Cover Replacement

1. Set base cover on work surface.
2. Replace heat sink/power transistor assembly (See page 3-63).
3. Replace print mechanism assembly (See page 3-81).
4. Replace control circuit card (See page 3-48).
5. Replace driver circuit card (See page 3-53).
6. Replace fuse-filter card/power cord (See page 3-61).
7. Replace power transformer (See page 3-75).
8. Replace top cover (See page 3-90).
9. Replace access cover.
10. Replace forms rack.

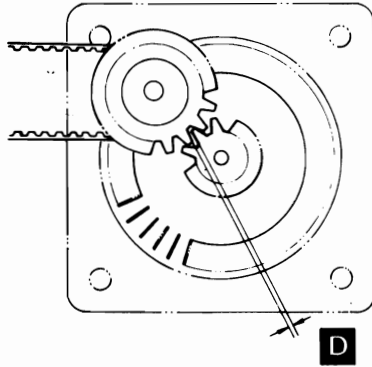
Carriage Belt Adjustment

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove ribbon cartridge.
6. Remove top cover (See page 3-88).
7. Loosen holddown screw **A** in carriage drive assembly.
8. Pivot carriage drive assembly **B** to the left to tighten belt.
9. Tighten holddown screw.
10. Loosen screws **C** in carriage motor mounts.



Carriage Belt Adjustment (continued)

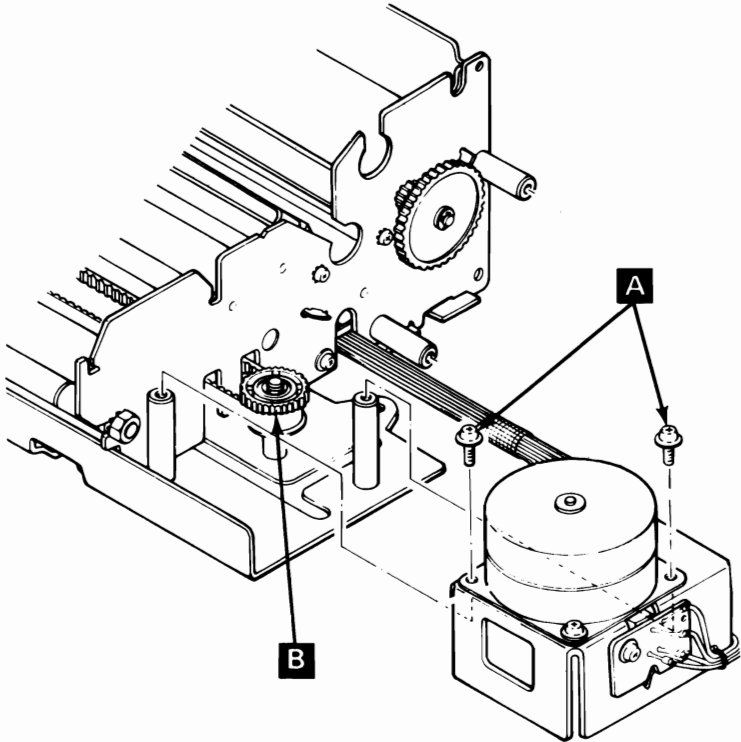
- 11. Position carriage motor so that motor and drive gears mesh.
- 12. Adjust gear backlash **D** for minimum.



- 13. Tighten motor mounts screws.
- 14. Move print head back and forth to check for smooth gear operation with no binding.

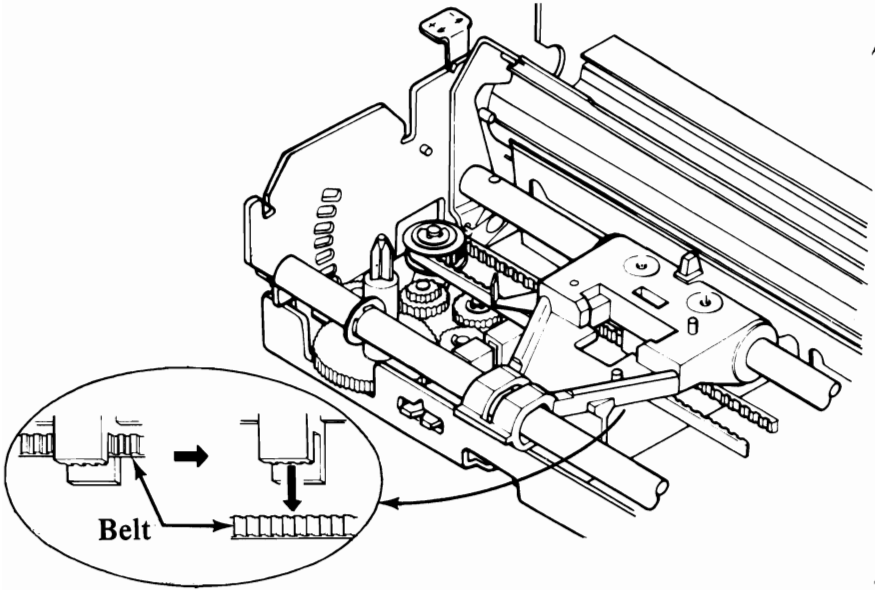
Carriage Belt Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove ribbon cartridge.
6. Remove top cover (See page 3-88).
7. Remove left front and right rear screws from carriage motor mounts **A**.
8. Lift motor away from mounts to expose belt pulley **B**.

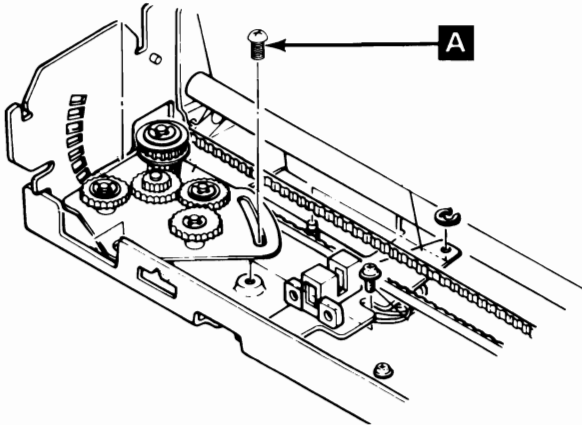


Carriage Belt Removal (continued)

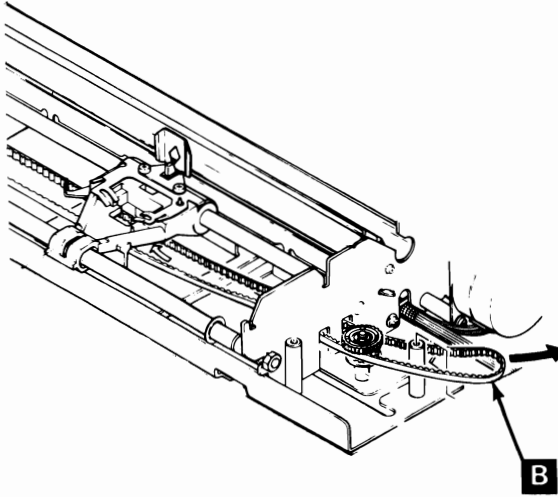
9. Pull belt from clip underneath print head carriage by pulling down on belt.



10. Loosen screw in slot in carriage drive assembly **A**.
11. Pivot carriage drive assembly to right.

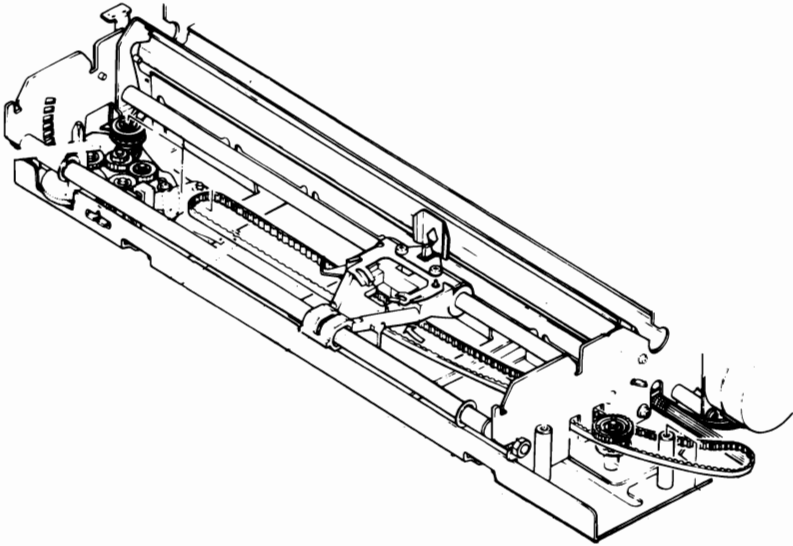


12. Lift belt off pulley at each end.
13. Guide belt **B** through opening in right side of print mechanism assembly frame.

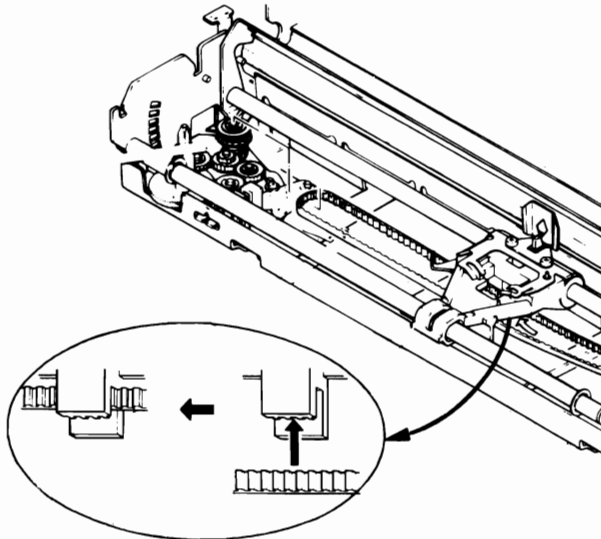


Carriage Belt Replacement

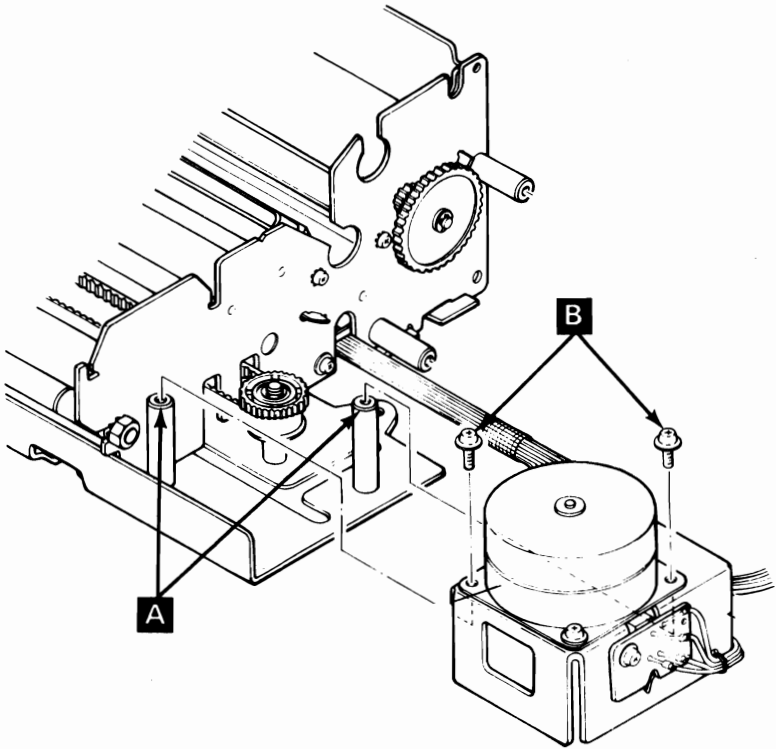
1. Insert belt through opening in right side of frame of print mechanism assembly.
2. Guide belt along base toward carriage drive assembly.



3. Place belt onto pulleys at both ends.
4. Insert belt into retaining clip under the print head carriage.



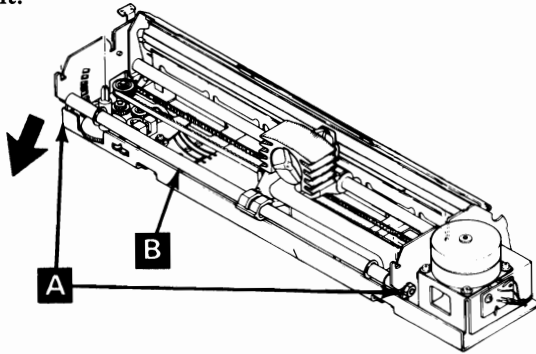
5. Place carriage motor onto motor mounts **A**.
6. Install screws into motor base (do not tighten) **B**.



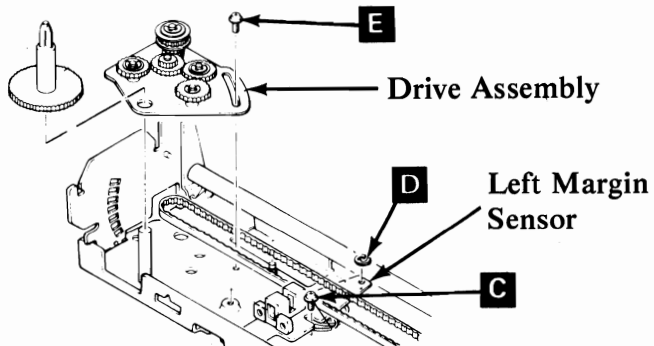
7. Perform carriage belt adjustment (See page 3-35).
8. Replace top cover (See page 3-91).
9. Replace ribbon cartridge.
10. Replace access cover.
11. Replace forms rack.

Carriage Drive Assembly Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove ribbon cartridge.
6. Remove top cover (See page 3-88).
7. Move carriage to right side of frame.
8. Loosen nuts **A** on carriage shaft **B** and pivot left end of shaft to front.

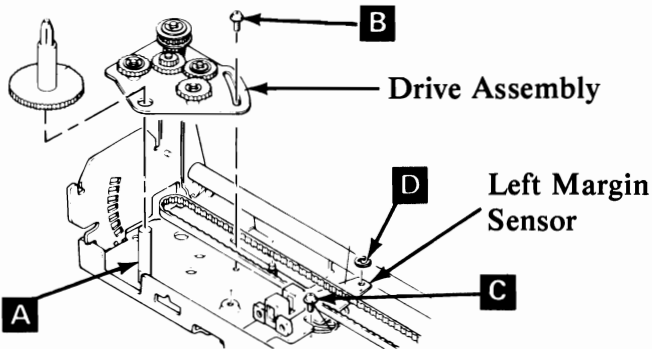


9. Remove screw **C** and clamp **D** from left margin sensor.
10. Remove carriage drive assembly retaining screw **E**.
11. Pivot carriage drive assembly clockwise, lift belt off drive pulley, lift left margin sensor off post, and lift carriage drive assembly from machine.

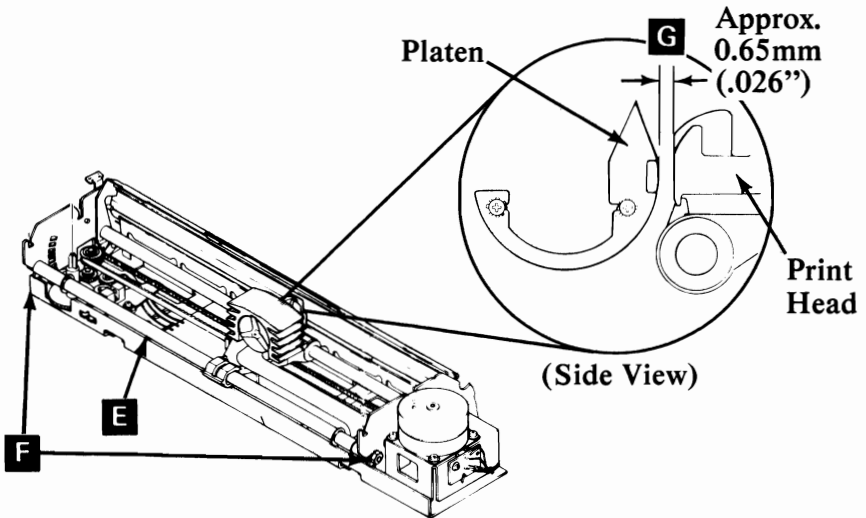


Carriage Drive Assembly Replacement

1. Position carriage drive assembly by inserting post **A** through pivot hole.
2. Replace carriage drive assembly retaining screw **B**.
3. Replace left margin sensor, screw **C**, and clip **D**.
4. Place belt over drive pulley and perform carriage belt adjustment (See page 3-35).



5. Pivot carriage shaft **E** into the slots on frame. Tighten nuts **F**.
6. Check print head gap **G**. Adjust if necessary (See page 3-76).



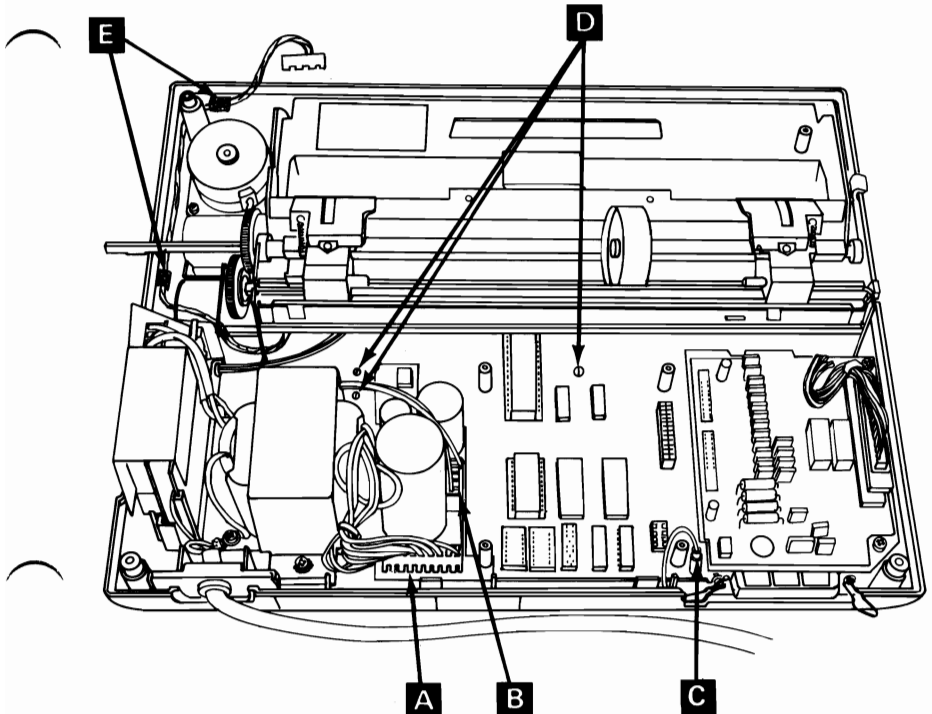
Carriage Drive Assembly Replacement (continued)

7. Perform left margin sensor adjustment.
8. Replace top cover (See page 3-90).
9. Replace ribbon cartridge.
10. Replace access cover.
11. Replace forms rack.



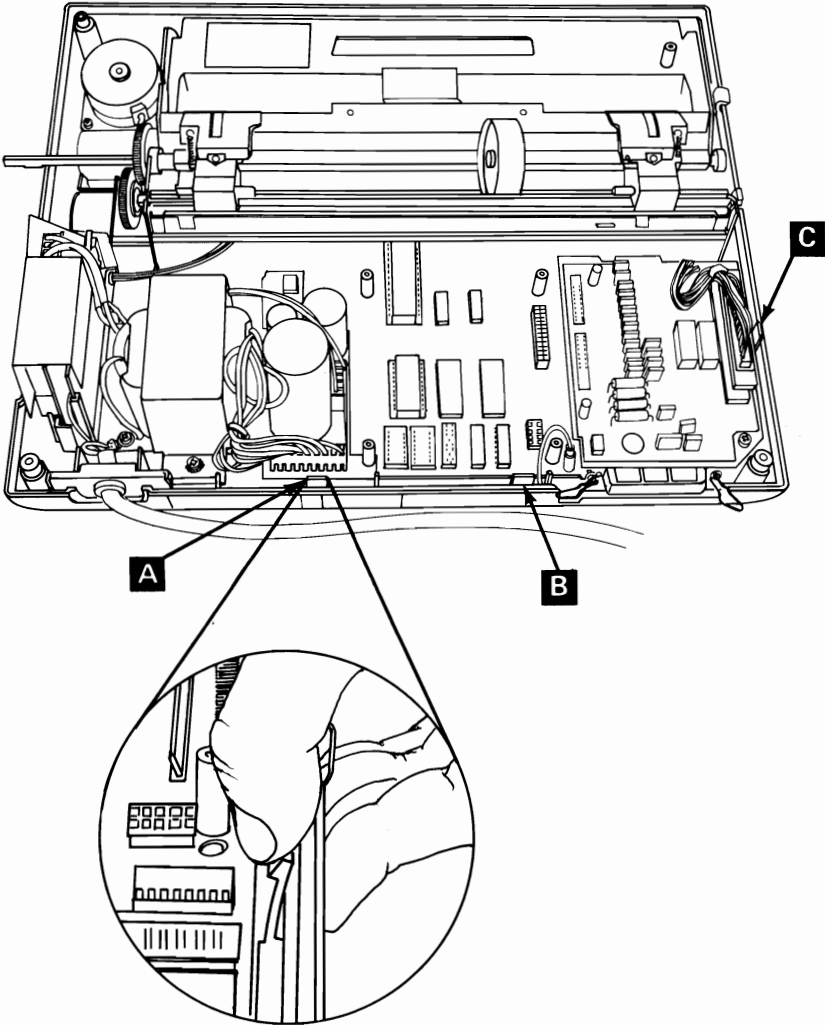
Control Circuit Card Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Remove driver circuit card (See page 3-51).
7. Unplug connector CN2. **A**
8. Unplug connector CN6. **B**
9. Unplug ground wire. **C**
10. Remove three screws. **D**
11. Pull control panel cable from under retaining clips. **E**

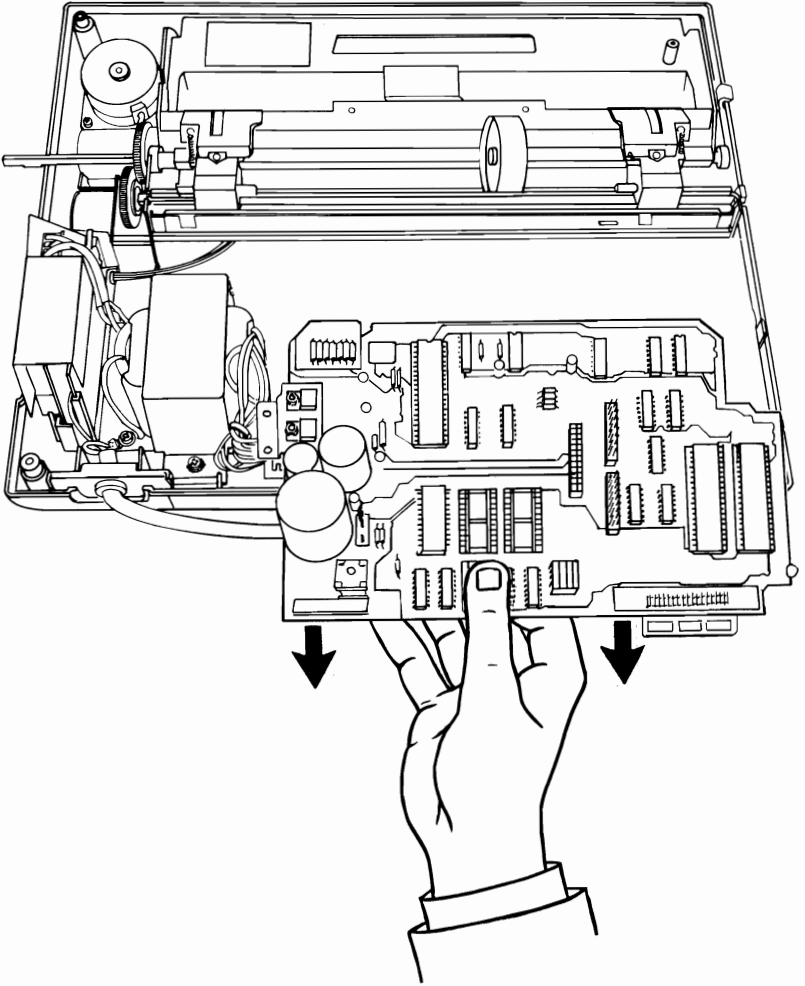


Control Circuit Card Removal (continued)

12. Press three tabs **A**, **B**, and **C**. Lift card clear of tabs.

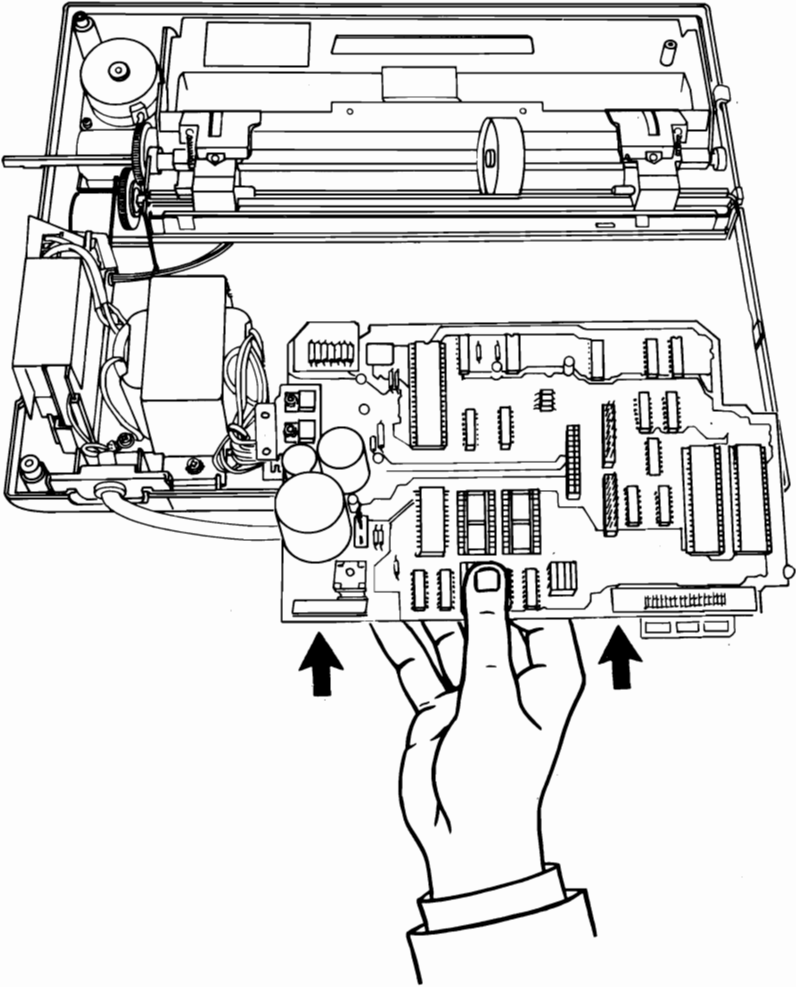


13. Lift control circuit card to clear the six posts. Carefully pull control circuit card away from print mechanism assembly.

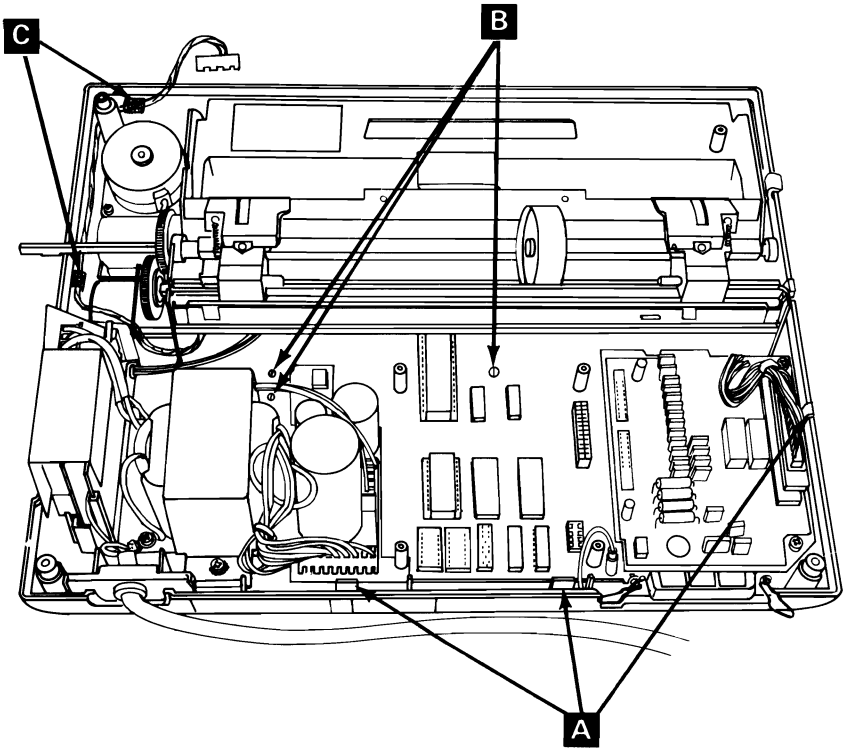


Control Circuit Card Replacement

1. Guide control circuit card into open area behind print mechanism assembly.

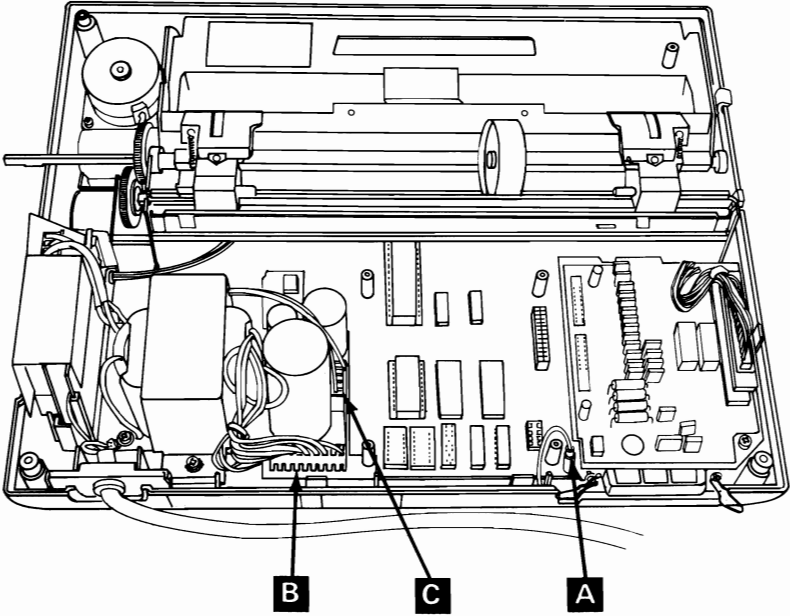


2. Align six holes in control circuit card with six posts in base cover.
3. Lower control circuit card onto base cover and snap the three retaining tabs **A** into place.
4. Install 3 hold down screws **B**.
5. Guide control panel cable along right side of base cover and around to front.
6. Place control panel cable under two retaining clips **C**.



Control Circuit Card Replacement (continued)

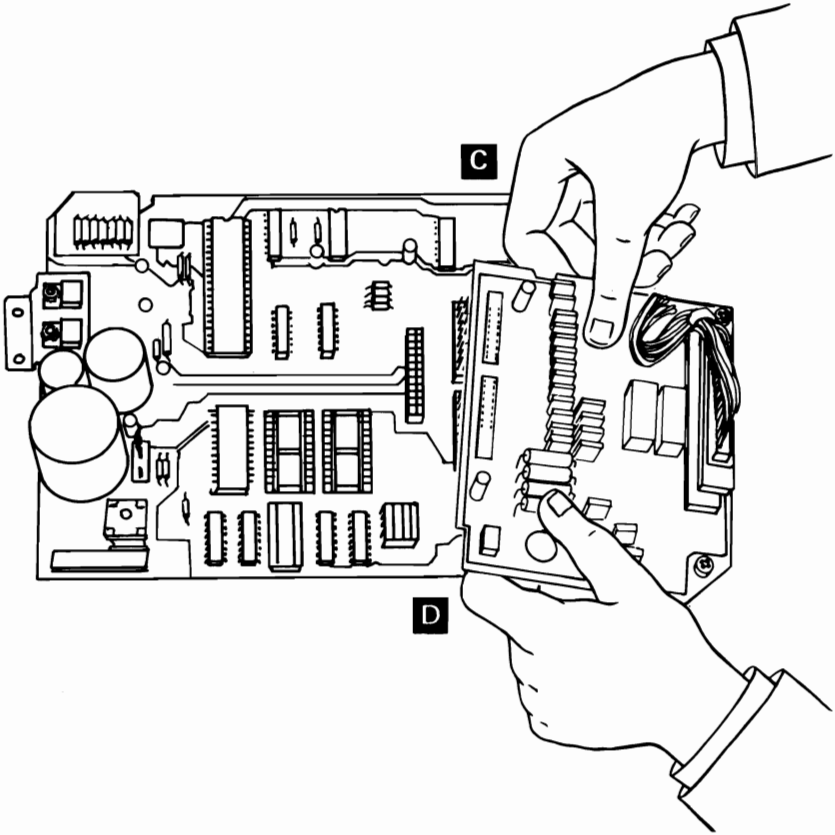
7. Connect ground wire. **A**
8. Install connector CN2. **B**
9. Install connector CN6. **C**



10. Replace driver circuit card (See page 3-53).
11. Replace top cover (See page 3-90).
12. Replace access cover.
13. Replace forms rack.

Driver Circuit Card Removal (continued)

8. Disconnect driver circuit card from control circuit card at CN4 and CN5. Lift at **C**, then at **D**.

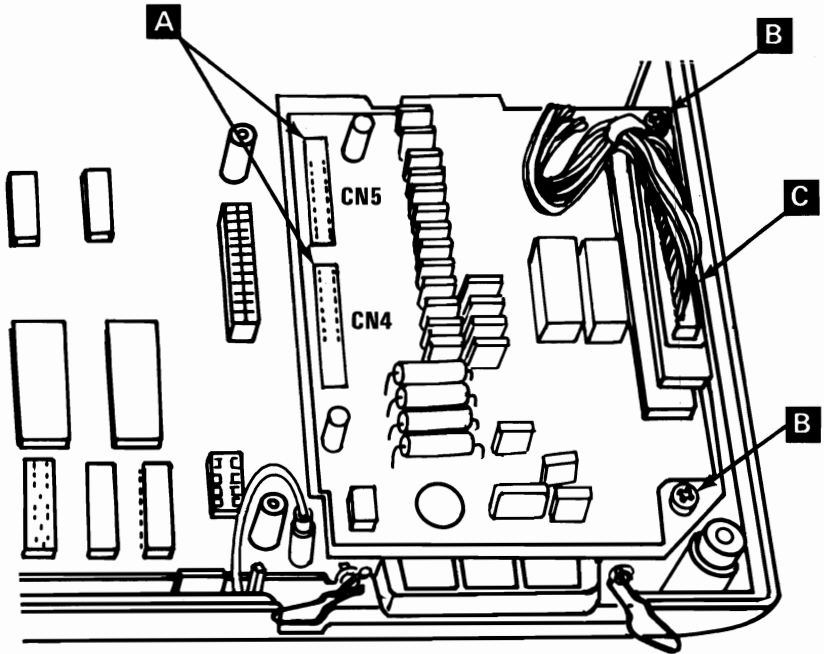


Driver Circuit Card Replacement

1. Align two connectors CN4 and CN5 **A** on bottom of driver circuit card with connectors CN4 and CN5 on control circuit card.

CAUTION: CN4 and CN5 are not keyed. Verify proper alignment before powering on to prevent circuit card damage.

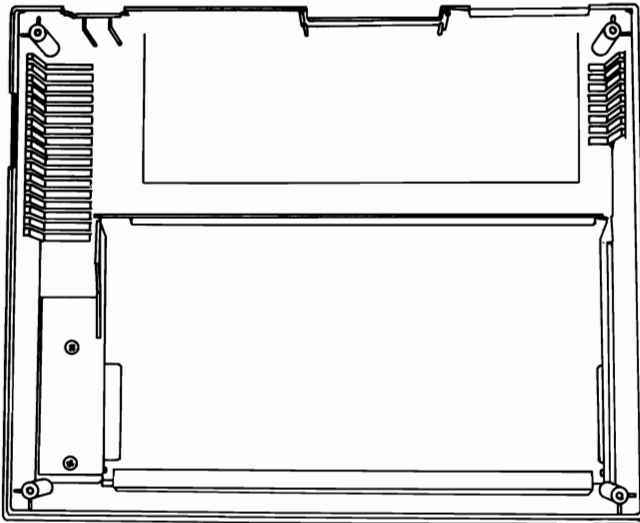
2. Connect driver circuit card to control circuit card by pressing down firmly on connectors. Be sure to guide connector CN6 cable into slot on left front edge of driver circuit.
3. Install two screws **B**.
4. Install connector CN6 **C**.



5. Replace top cover (See page 3-90).
6. Replace access cover.
7. Replace forms rack.

Control Panel Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Invert top cover.
7. Remove 2 screws **A** from underside of top cover.



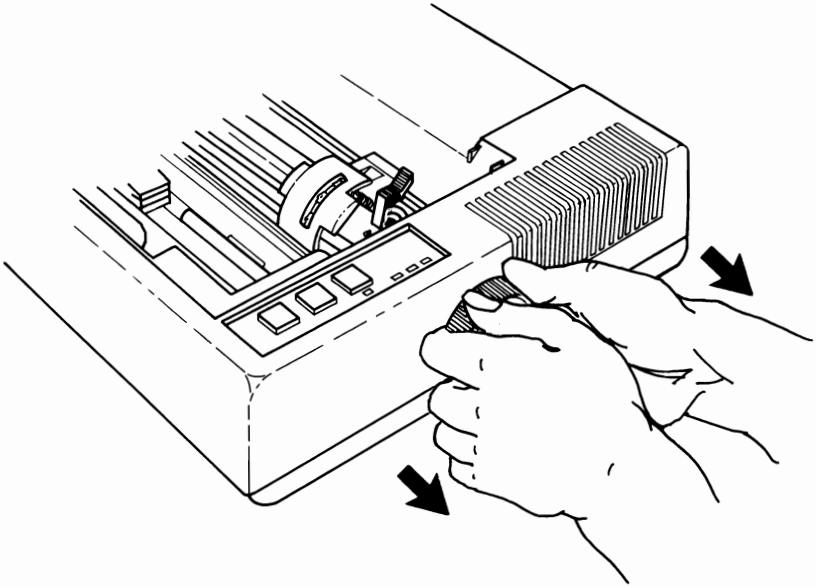
8. Lift control panel from top cover.

Control Panel Replacement

1. Insert control panel into top cover.
2. Install two screws.
3. Replace top cover (See page 3-90).
4. Replace access cover.
5. Replace forms rack.

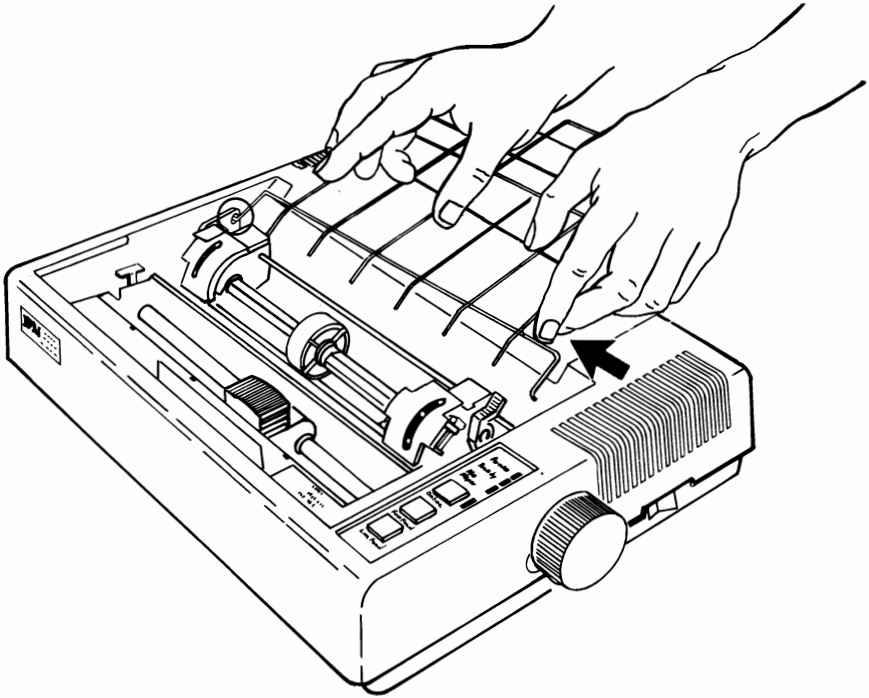
Forms Feed Knob Removal

1. Pull forms feed knob from shaft using steady, firm pull.



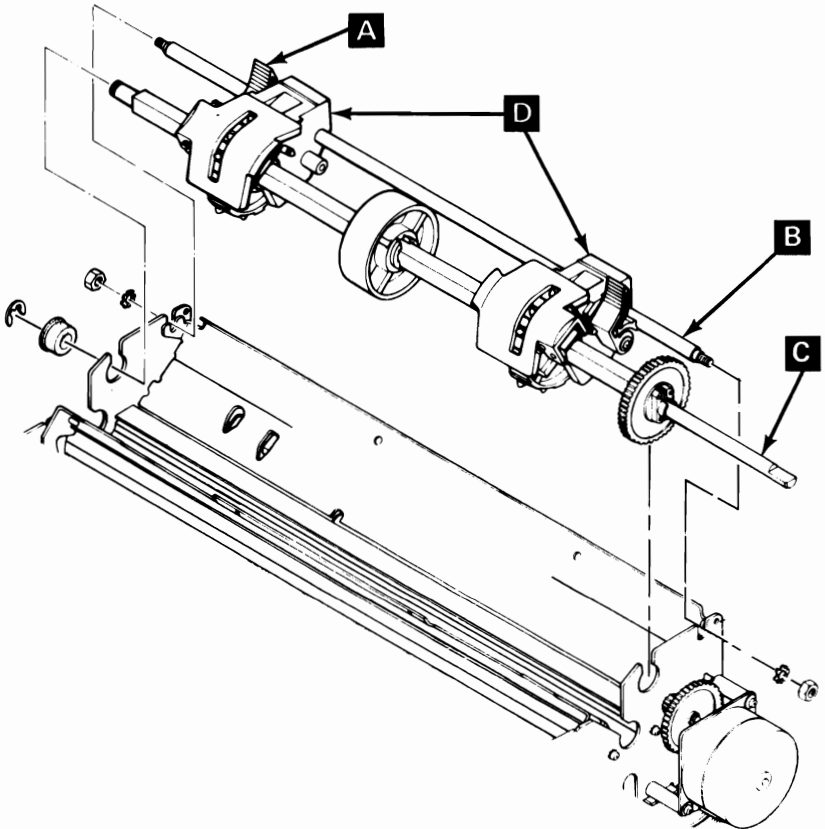
Forms Rack Removal

1. Remove forms.
2. Compress rack on one side to unhook rack from printer frame.
3. Lift rack away from frame.



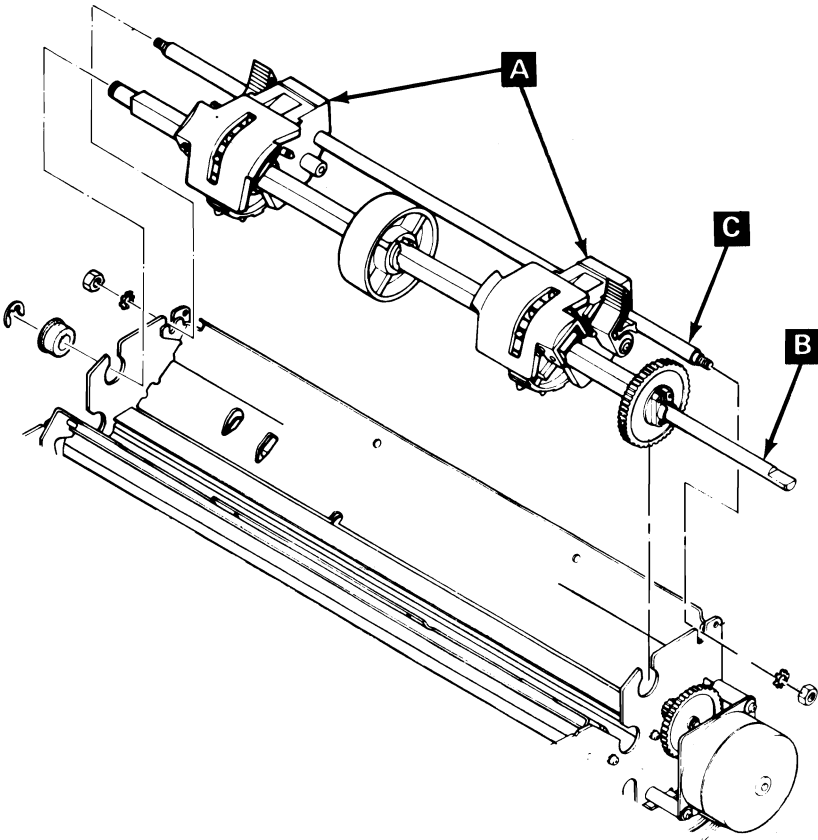
Forms Tractors Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Reotate lock levers **A** to forward (released) position.
7. Loosen nuts on ends of tractor support shaft **B**.
8. Remove retaining clip on left end of guide shaft **C** and slide bushings to outside of frame.
9. Lift guide shaft, support shaft and forms tractors from machine.
10. Slide forms tractors **D** off shafts.



Forms Tractors Replacement

1. Slide forms tractors **A** onto guide shaft **B** and support shaft **C**.
2. Place guide shaft and support shaft into slots on frame.
3. Slide bushings on guide shaft into frame and replace retaining clip on left end of shaft.
4. Tighten retaining nuts on ends on support shaft.
5. Replace top cover (See page 3-90).
6. Replace access cover.
7. Replace forms rack.

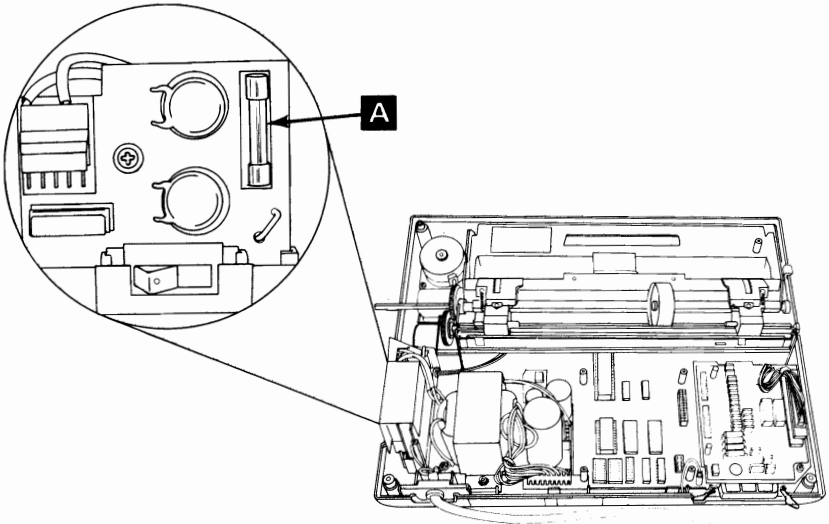


Fuse Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).

DANGER: STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE CAUTION IN THIS AREA.

6. Remove safety shield on fuse-filter card (See page 3-87).
7. Pull fuse **A** from holder.

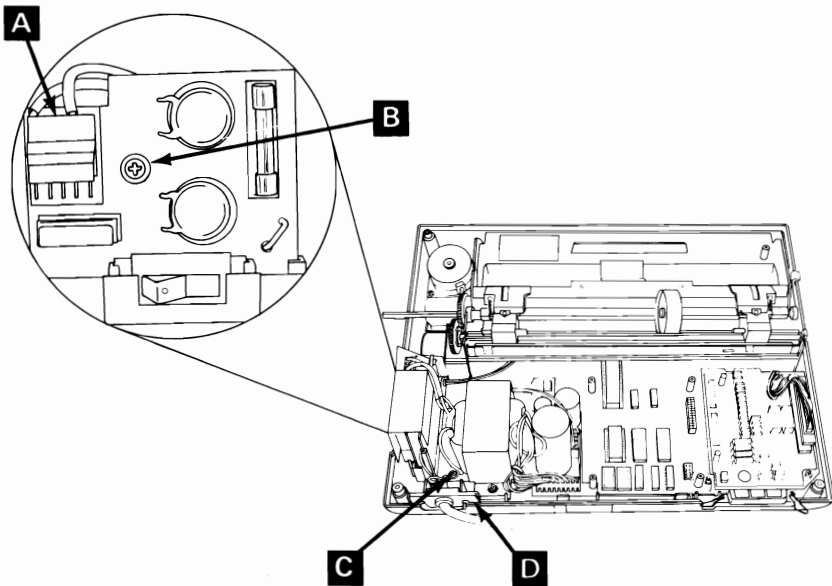


Fuse-Filter Card/Power Cord Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).

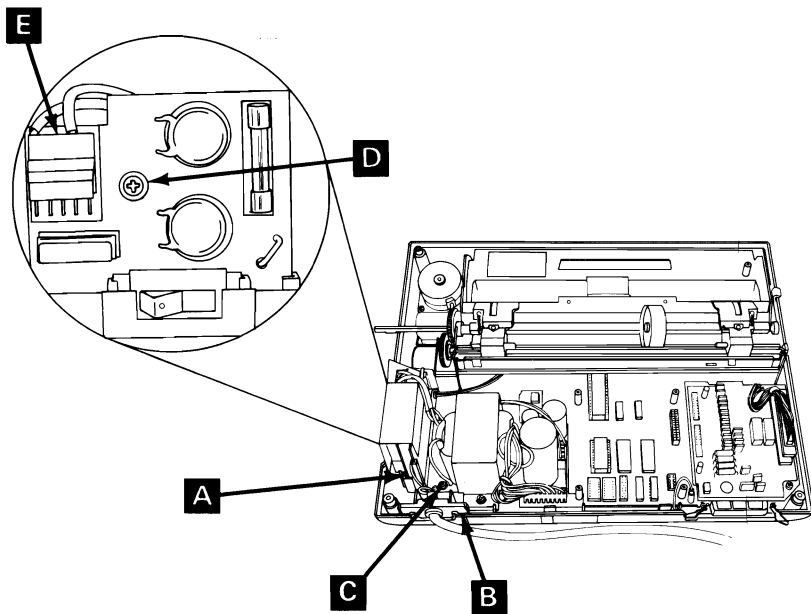
DANGER: STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE CAUTION IN THIS AREA.

6. Remove safety shield from filter-fuse card assembly (See page 3-87).
7. Remove transformer primary connector **A** from fuse-filter card.
8. Remove screw **B** from center of fuse-filter card.
9. Remove screw **C** from ground terminal of printer power cord.
10. Lift strain relief **D** from slot in base cover.
11. Lift fuse-filter card from slot in base cover.



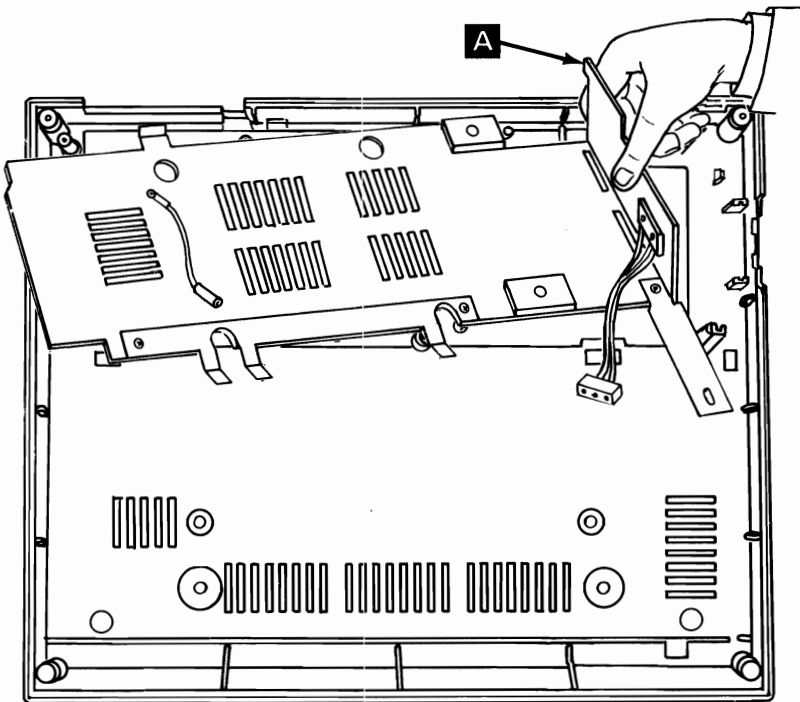
Fuse-Filter Card/Power Cord Replacement

1. Insert fuse-filter card into slot **A** in base cover.
2. Insert strain relief into slot **B** in base cover.
3. Install screw **C** into ground terminal of power cord.
4. Install screw **D** in center of fuse-filter card.
5. Connect transformer primary **E** to fuse-filter card.
6. Replace safety shield onto fuse-filter card.
7. Replace top cover (See page 3-90).
8. Replace access cover.
9. Replace forms rack.



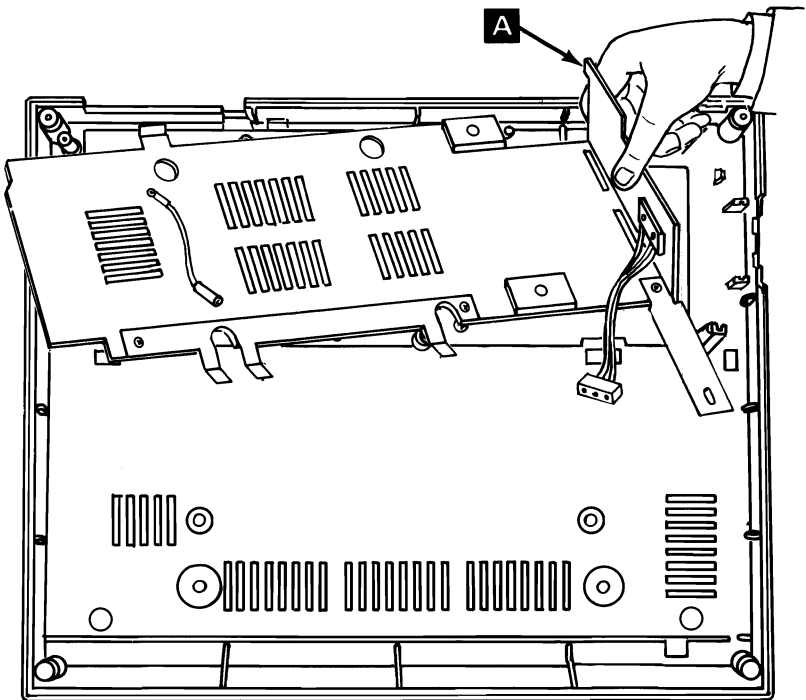
Heat Sink/Power Transistor Assembly Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Remove power transformer (See page 3-74).
7. Remove fuse-filter card/power cord (See page 3-60).
8. Remove driver circuit card (see page 3-51).
9. Remove control circuit card (See page 3-45).
10. Remove print mechanism assembly (See page 3-80).
11. Lift heat sink assembly **A** from base cover.



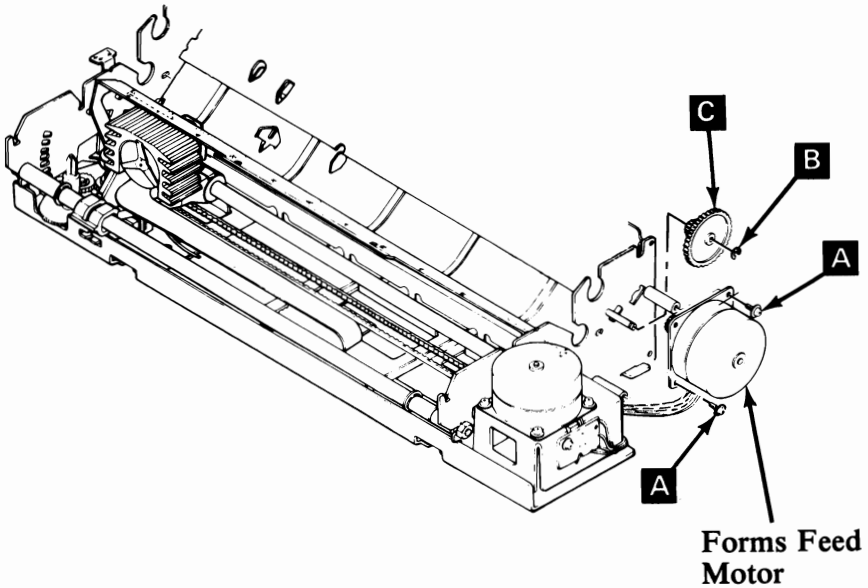
Heat Sink/Power Transistor Assembly Replacement

1. Position heat sink/power transistor assembly **A** onto base cover.
2. Replace print mechanism assembly (See page 3-81).
3. Replace control circuit card (See page 3-48).
4. Replace driver circuit card (See page 3-53).
5. Replace fuse-filter card/power cord (See page 3-61).
6. Replace power transformer (See page 3-75).
7. Replace top cover (See page 3-90).
8. Replace access cover.
9. Replace forms rack.



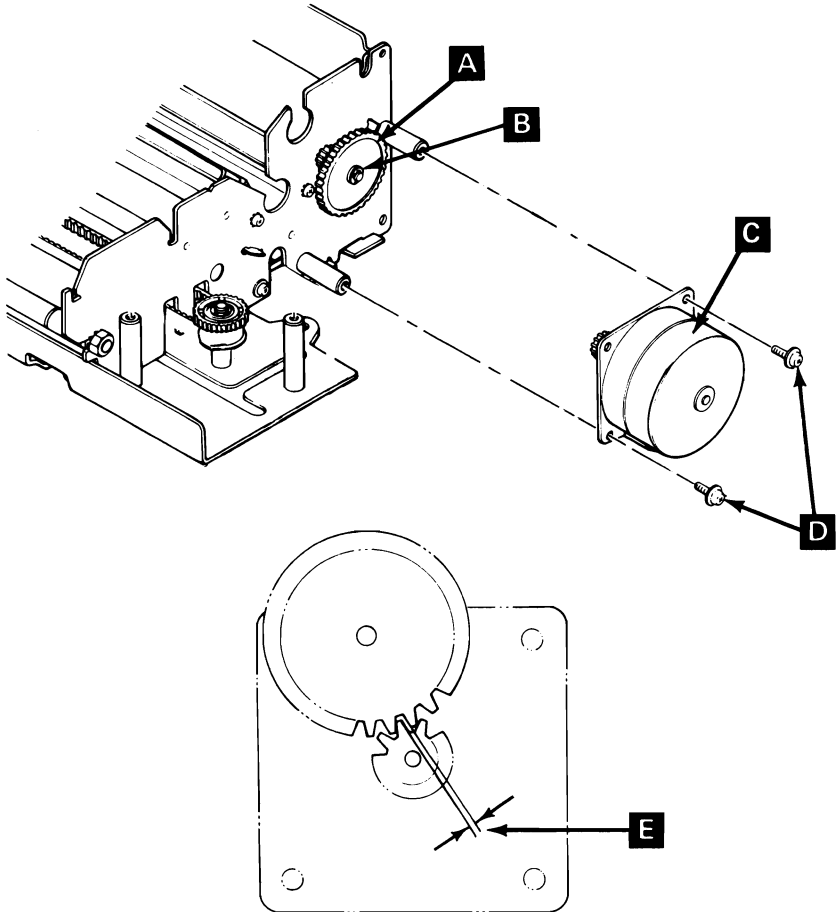
Intermediate Gear Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Remove two screws **A** from forms feed motor mounts.
7. Remove intermediate gear retaining clip **B**.
8. Slide intermediate gear **C** off shaft.



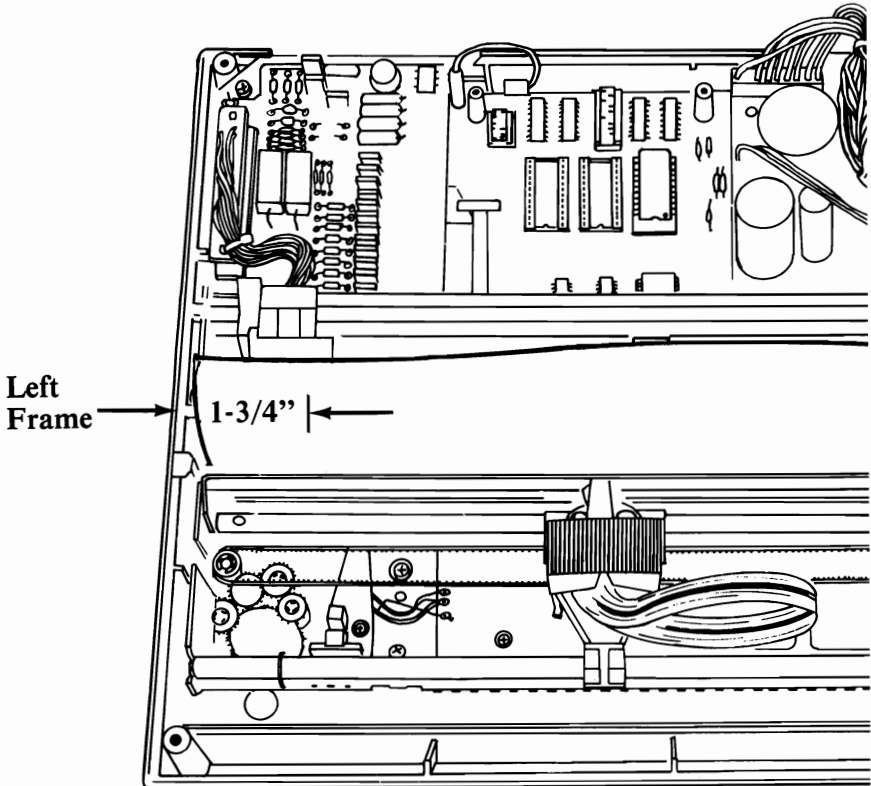
Intermediate Gear Replacement

1. Slide intermediate gear **A** onto shaft.
2. Replace retaining clip **B**.
3. Place forms feed motor **C** onto mounts.
4. Install two screws **D** but do not tighten.
5. Position motor to mesh gears with minimum backlash **E** and no binding.
6. Tighten two screws.
7. Replace top cover (See page 3-90).
8. Replace access cover.
9. Replace forms rack.

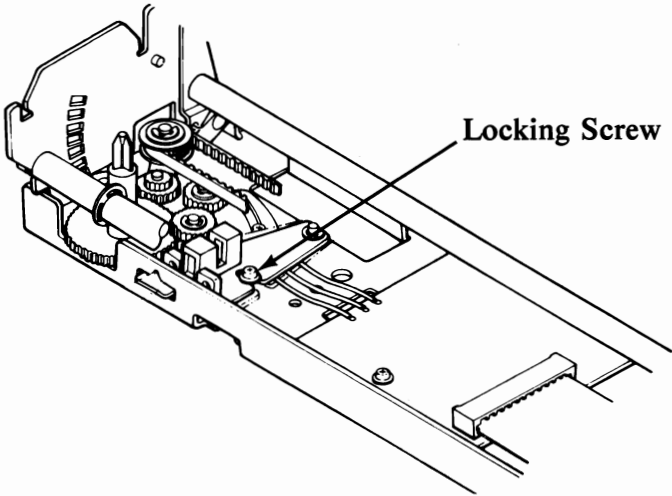


Left Margin Sensor Adjustment

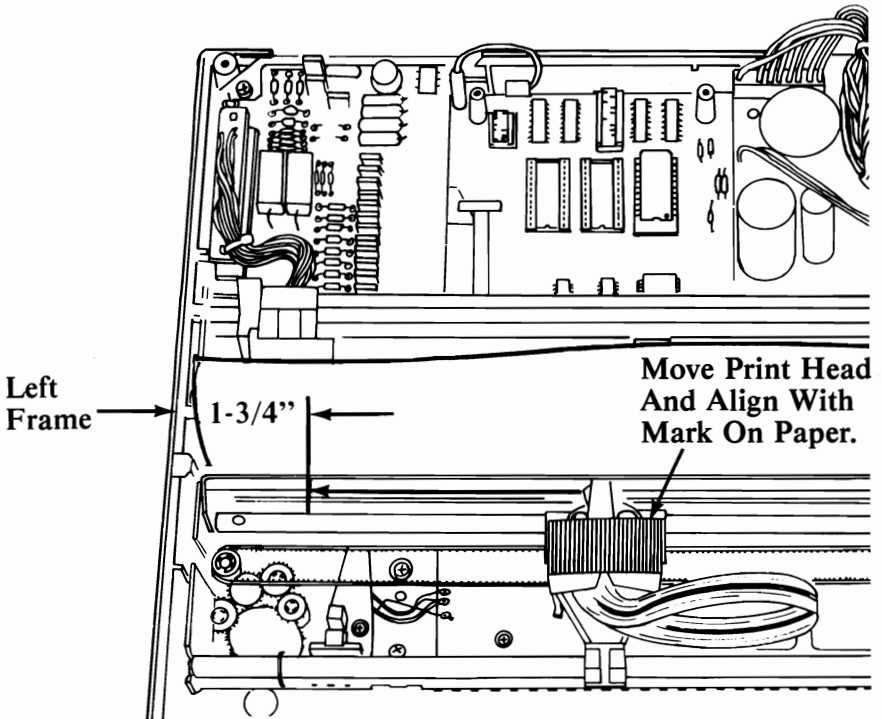
1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).
6. Remove ribbon cartridge.
7. Insert a sheet of paper into the printer. Position paper to the left frame.
8. Measure 1-3/4 inches from the left frame and mark the position on the paper.



9. Loosen the left margin sensor locking screw.



10. Plug in the Printer power cord. Position the Printer Power switch to ON.
11. Move the print head manually and align it with the 1-3/4 inch mark on the paper.



Left Margin Adjustment (continued)

12. Set your multimeter to the 12 Vdc scale.
13. Place the negative (-) lead of the meter on the ground pin of the driver circuit card.
14. Place the positive (+) lead of the meter on the yellow wire solder connection on the left margin sensor.

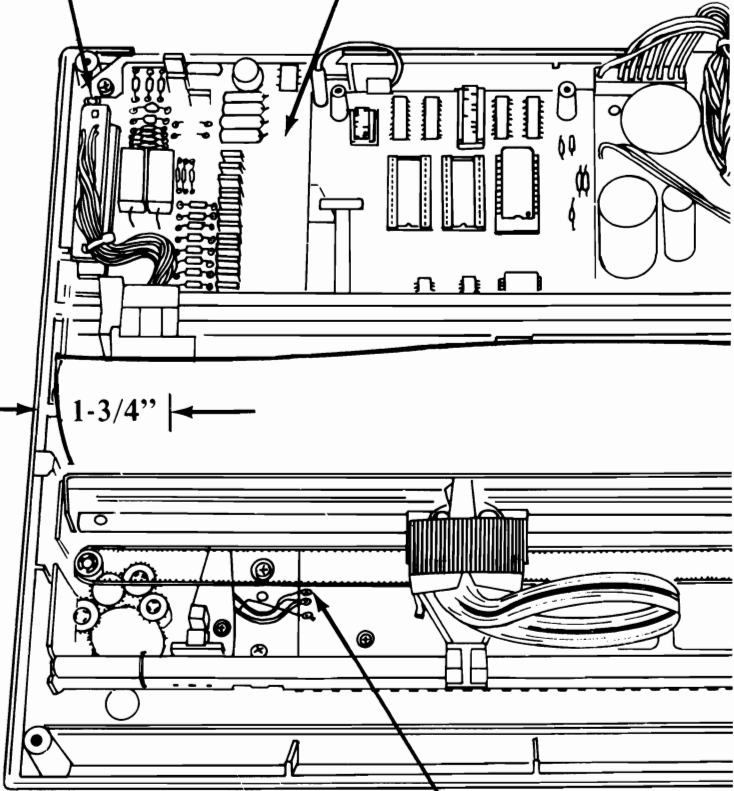
Negative (-) Lead to Ground Pin on Driver Circuit Card

Driver Circuit Card

Left Frame

1-3/4"

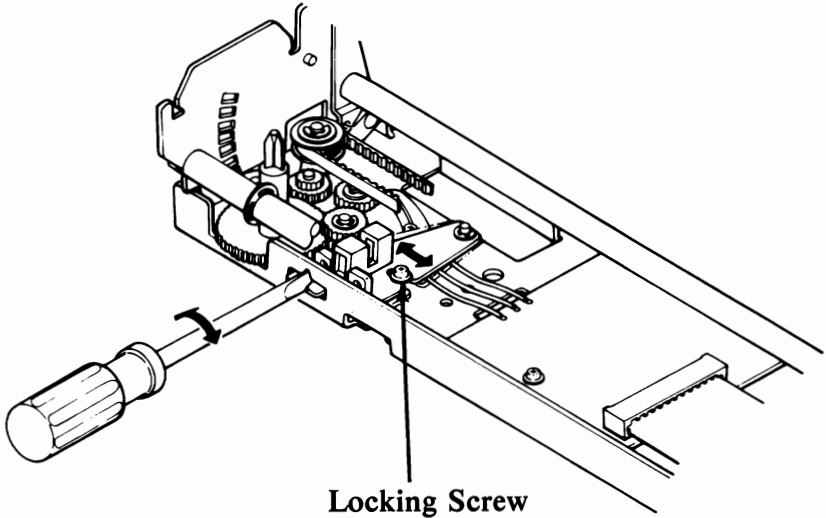
Positive (+) Lead to Yellow Wire Connection



15. Move the left margin sensor to the left until the voltage reading on the meter is a Down level (approximately 0 Vdc).
16. Move the left margin sensor to the right until the voltage on the meter is an Up level (approximately 5 Vdc).

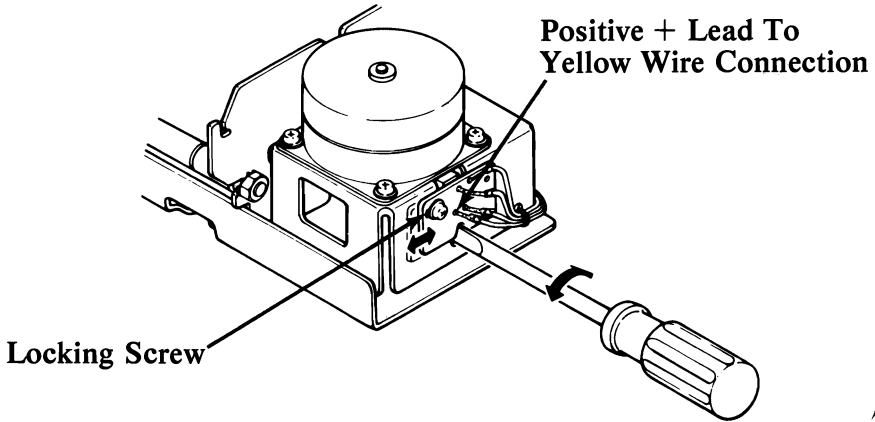
Note: If the voltage reading on the meter stays at a Down level, move the print head one position to the left and repeat steps 15 and 16.

17. Tighten the left margin locking screw.



Left Margin Adjustment (continued)

18. Place the positive (+) lead of the meter on the yellow wire solder connection on the Printer Timing Sensor (PTS) board.
19. Loosen the printer timing sensor board locking screw.
20. Move the printer timing sensor board either way until the voltage reading is an "Up" level (approximately 5 Vdc).

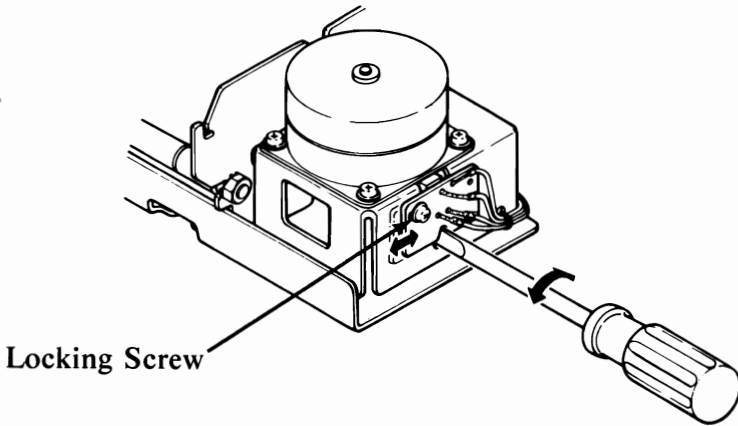


Adjustment of PTS Sensor Board

- 21a. Move the print head slightly to the left. The voltage reading should drop to a Down level (approximately 0 Vdc). Do not allow the print head to step to the next detented position.
- b. Move the print head slightly to the right. The voltage reading should drop to a Down level (approximately 0 Vdc).

Note: It is very important that the amount of pressure exerted on the print head be equal in either direction when the meter reading drops to the Down level, without causing the print head to jump to the next detented position.

22. Tighten the Printer Timing Sensor locking screw and recheck step 21. Realign if necessary.

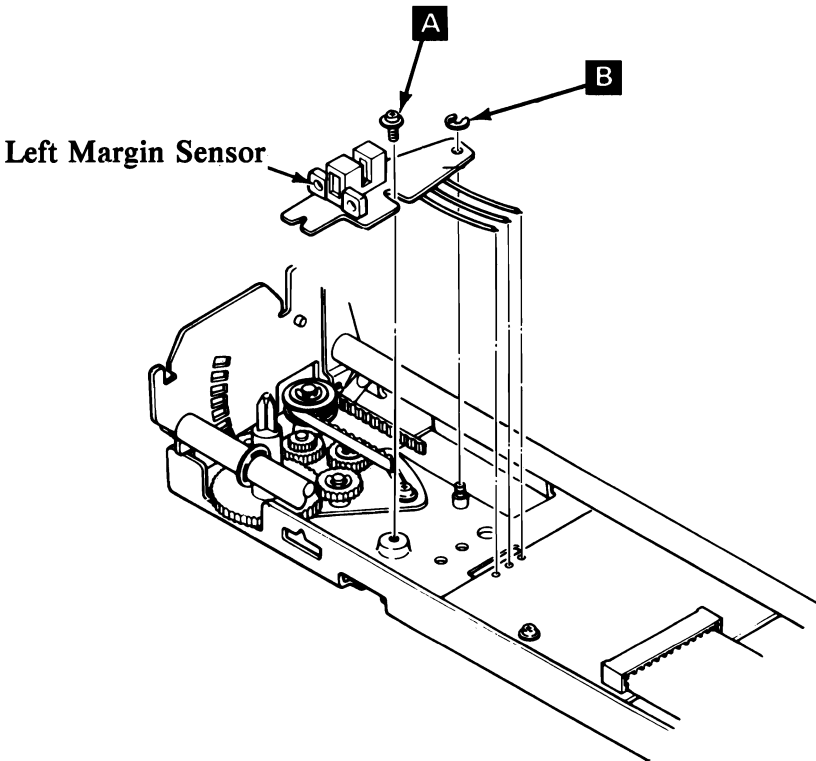


Adjustment of PTS Sensor Board

23. Run the Printer Offline Diagnostic Test and observe the speed in both directions.
24. If the buzzer sounds the Printer Timing Sensor board is set incorrectly. Repeat the procedure starting at step 18.
25. If the speed is different between forward and reverse printing, perform the following steps.
- Place the positive (+) lead of the voltage meter on the yellow wire solder connection on the Printer Timing Sensor board.
 - Loosen the printer timing sensor board locking screw.
 - Move the Printer Timing Sensor board until another Up level location is observed and repeat the procedure from step 21.
26. If it is the same speed in both directions, the adjustment is complete.

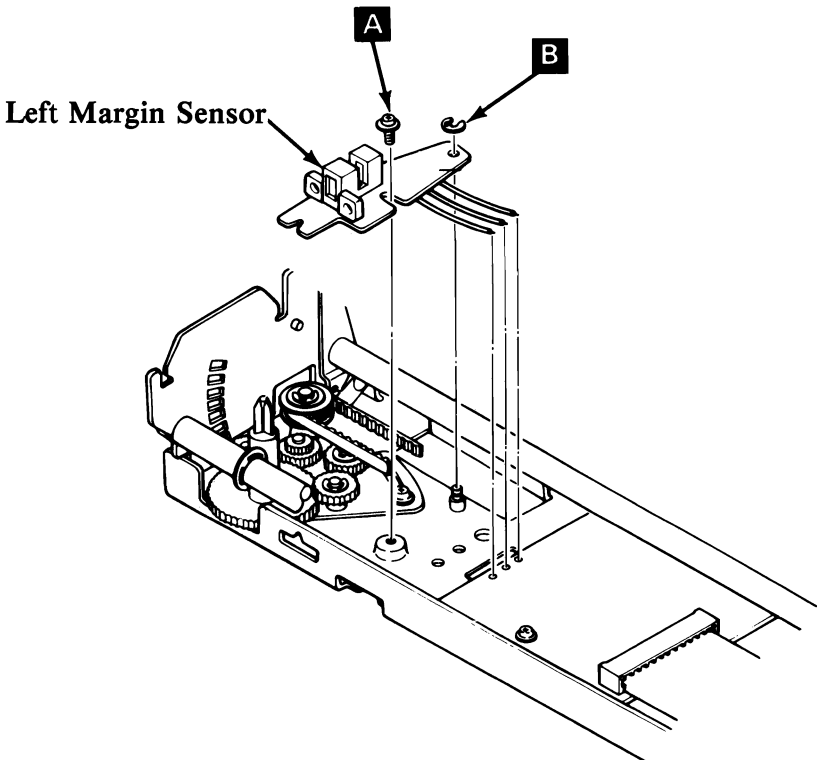
Left Margin Sensor Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove ribbon cartridge.
6. Remove top cover (See page 3-88).
7. Move carriage to right frame.
8. Remove retaining screw **A** and retaining clip **B**.
9. Unsolder three wires from left margin sensor.
10. Lift left margin sensor from printer.



Left Margin Sensor Replacement

1. Solder three wires from terminal board to left margin sensor.
2. Position left margin sensor pivot hole over post.
3. Replace retaining screw **A** and retaining clip **B**.
4. Readjust left margin sensor (See page 3-66).
5. Replace top cover (See page 3-90).
6. Replace ribbon cartridge.
7. Replace access cover.
8. Replace forms rack.

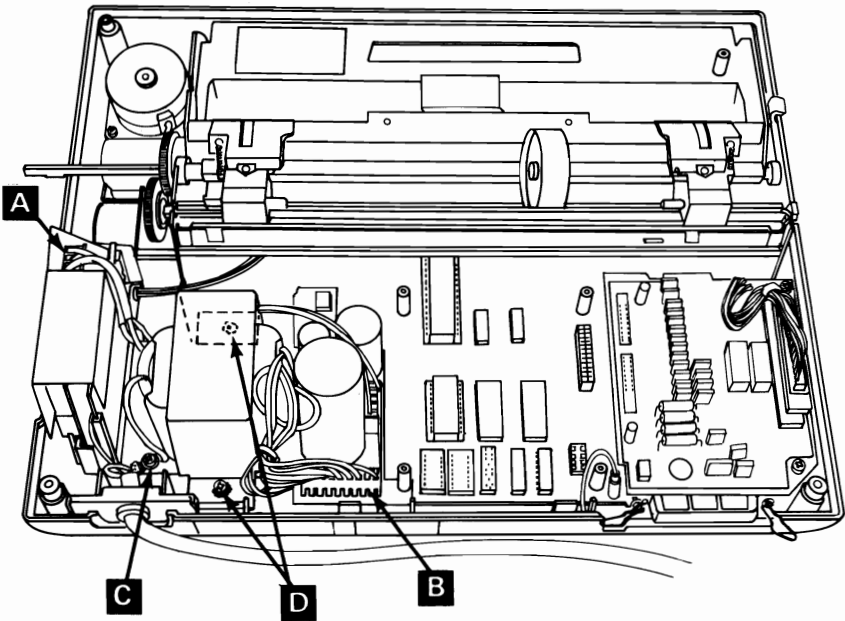


Power Transformer Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).

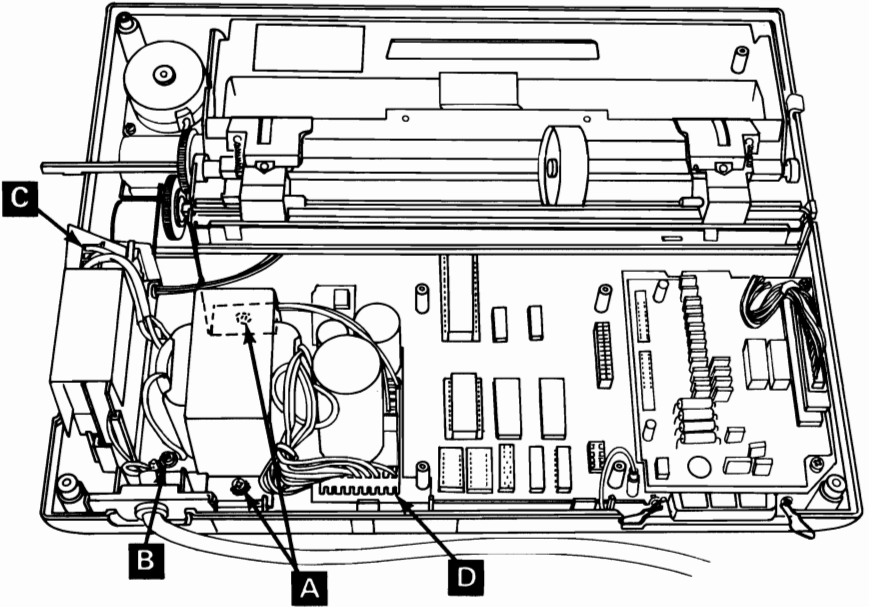
DANGER: STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE CAUTION IN THIS AREA.

6. Unplug connector **A** from fuse-filter card.
7. Unplug connector **B** from control circuit card.
8. Remove screw **C** from transformer ground wire.
9. Remove two screws **D** from base of transformer.
10. Lift transformer from base.



Power Transformer Replacement

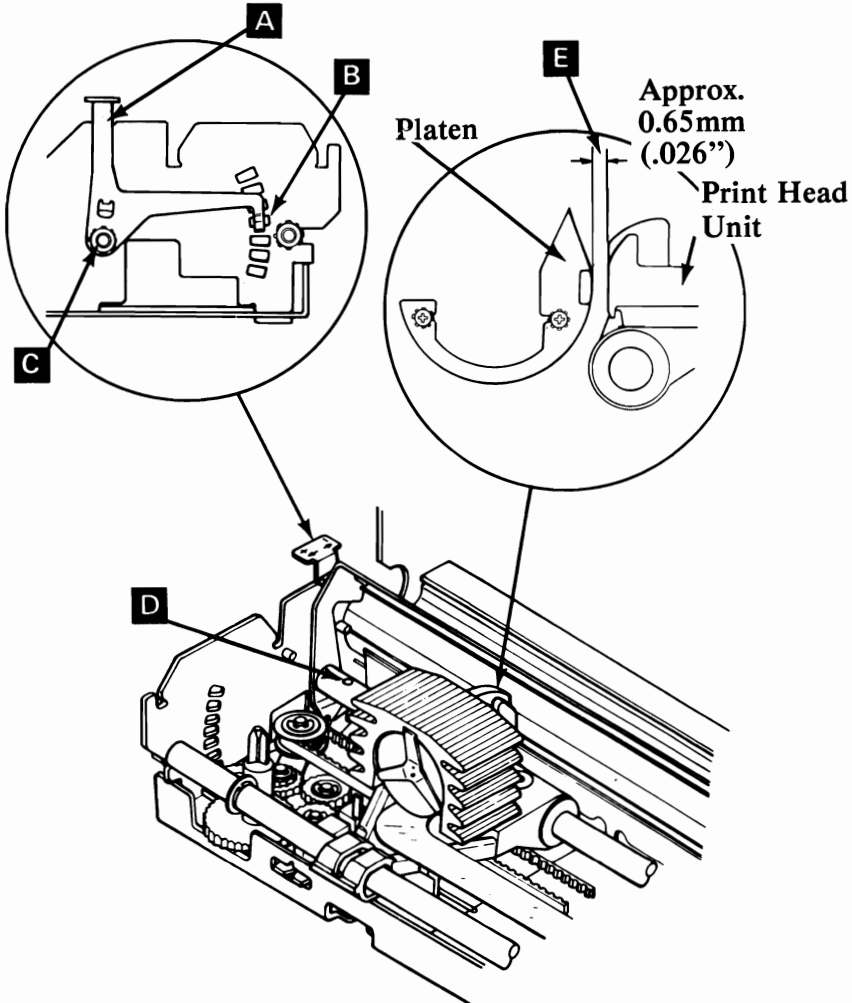
1. Place transformer on base in area next to fuse-filter card (note positioning of two connectors).
2. Install two base mounting screws **A**
3. Install screw in ground wire **B**.
4. Plug connector **C** into fuse-filter card.
5. Plug connector **D** into control circuit card.



6. Replace top cover (See page 3-90).
7. Replace access cover.
8. Replace forms rack.

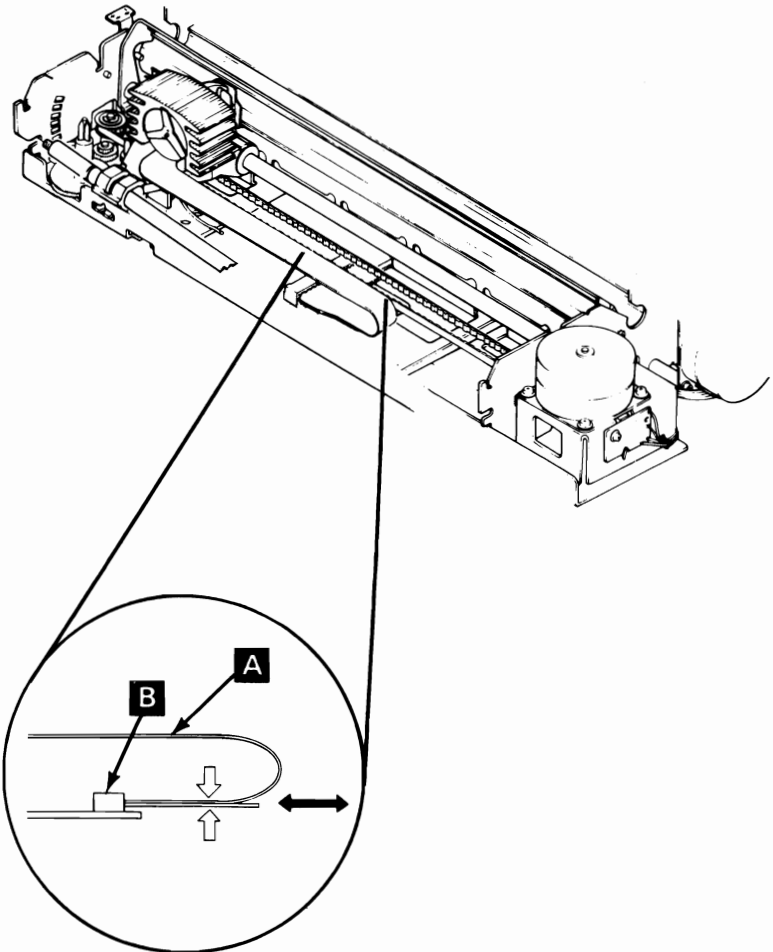
Print Head Gap Adjustment

1. Remove print mechanism assembly (See page 3-80).
2. Set print head gap adjusting lever **A** to the fourth position **B**.
3. Loosen nut **C**.
4. Rotate carriage shaft **D** to obtain .65mm gap (.026") between print head and platen **E**.
5. Righten nut **C**.
6. Replace print mechanism assembly (See page 3-81).



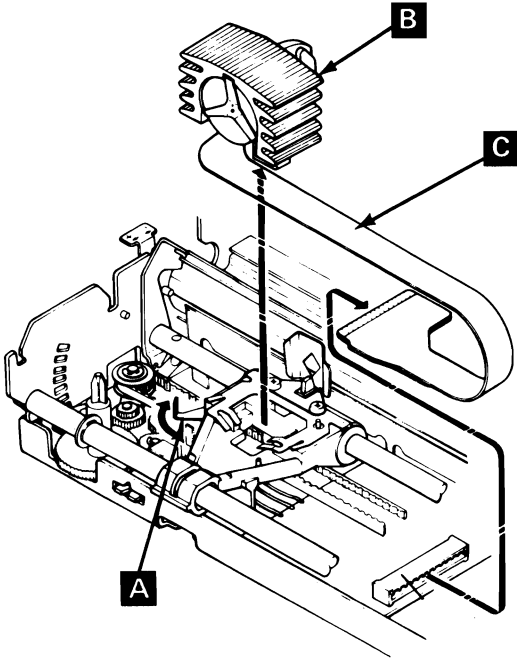
Print Head Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms rack (See page 3-56).
3. Remove access cover (See page 3-32).
4. Remove ribbon cartridge.
5. Remove top cover (See page 3-88).
6. Pull print head cable **A** from connector **B**.



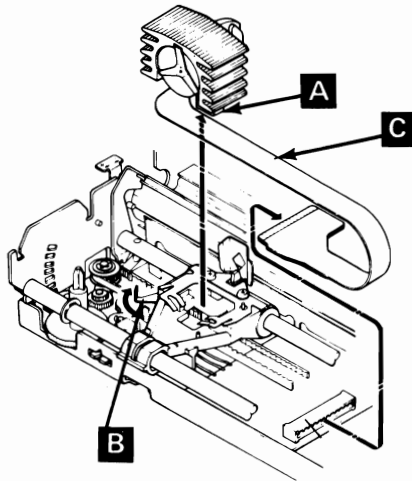
Print Head Removal (continued)

7. Pivot print head lock lever **A** clockwise.
8. Lift print head **B** and cable **C** from carriage.



Print Head Replacement

1. Insert feet **A** on print head into opening on carriage.
2. Pivot lock lever **B** counterclockwise while pressing down on print head.
3. Connect print head cable **C** at connector.
4. Replace top cover (See page 3-90).
5. Replace ribbon cartridge.
6. Replace access cover.
7. Replace forms rack.

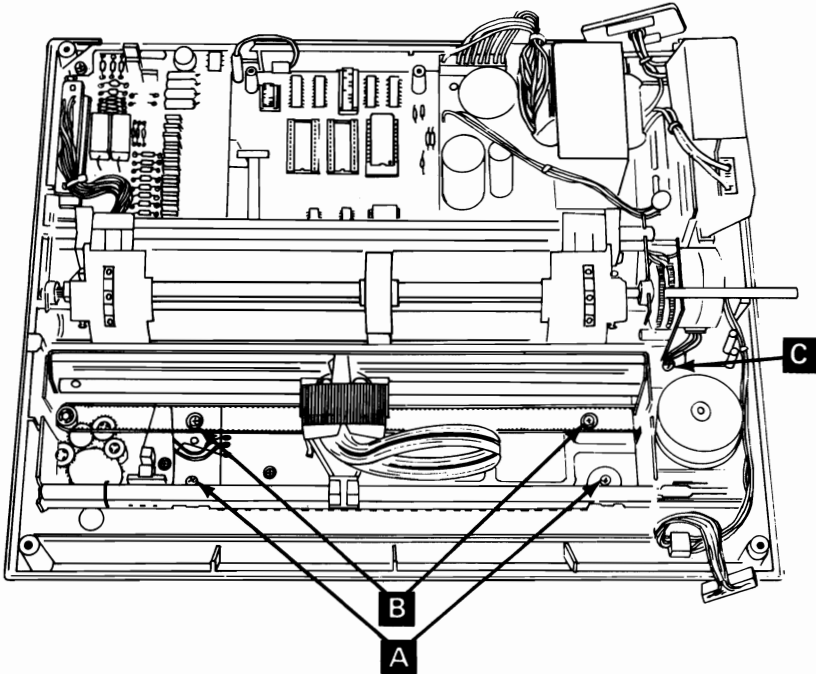


Note: Broken wires may be the result of other problems. If a print head has been replaced because of a broken wire, perform the following steps to prevent damaging the newly installed print head.

1. Remove the top cover. Disconnect CN6 on the driver control card. Check for 22 ohms resistance between pin CN6-10 (male end) and pins CN6-1 through 9. Replace the print mechanism assembly if there are any shorts or opens.
2. Power on. Check for +24 Vdc at pins CN6-1 through 9 on driver card (use ground pin for common lead). If any pin has +24 Vdc, replace the control cards. If all pins read 0 Vdc, power off and reconnect CN6. Print head circuitry is functional.

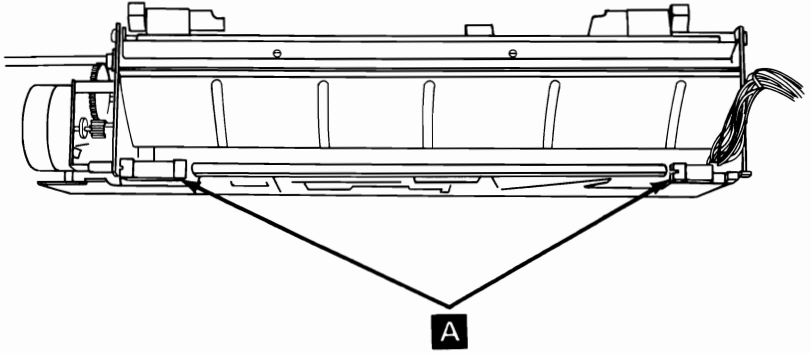
Print Mechanism Assembly Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove ribbon cartridge.
6. Remove top cover (See page 3-88).
7. Remove driver circuit card (See page 3-51).
8. Remove control circuit card (See page 3-45).
9. Remove two screws **A** from base of Print Mechanism assembly.
10. Remove shipping screws **B** if still installed.
11. Remove screw **C** from ground strap.
12. Lift print mechanism assembly from base cover.



Print Mechanism Assembly Replacement

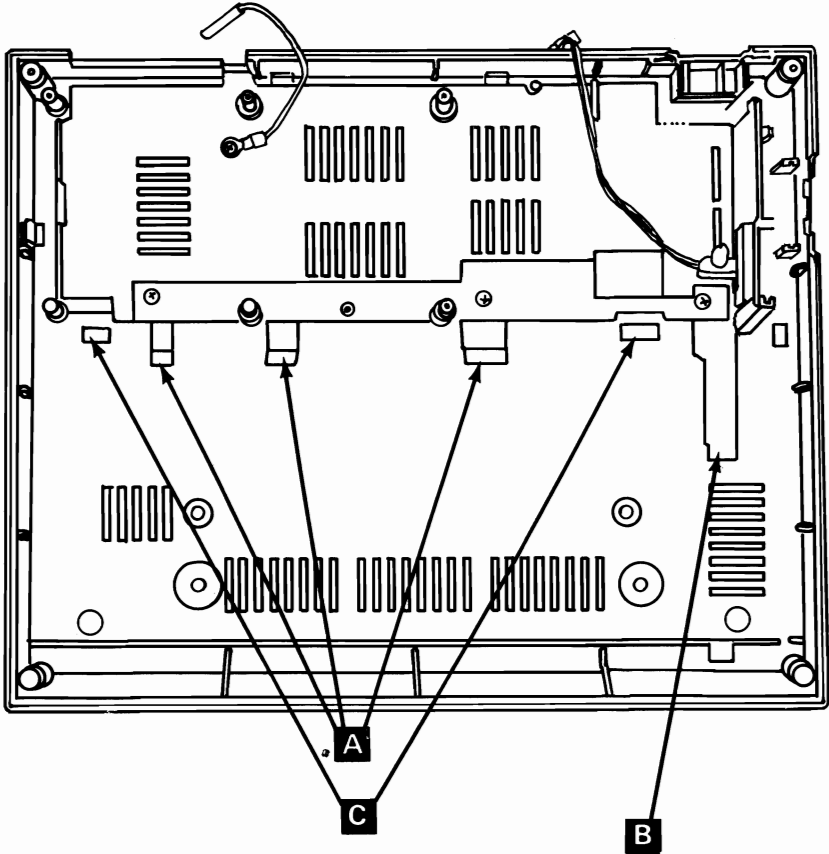
1. Verify that the rubber grommets **A** are in position shown.



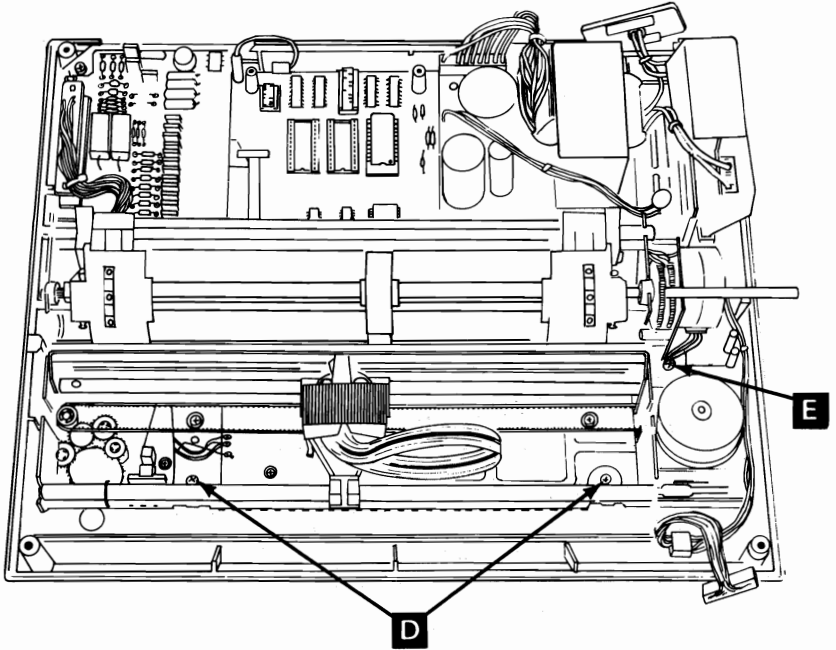
(Rear View)

Print Mechanism Assembly Replacement (continued)

2. Place print mechanism assembly on base cover.
3. Slide print mechanism assembly toward the rear over three grounding tabs **A** and under ground strap **B**.
4. Position rubber grommets around plastic stops **C**.



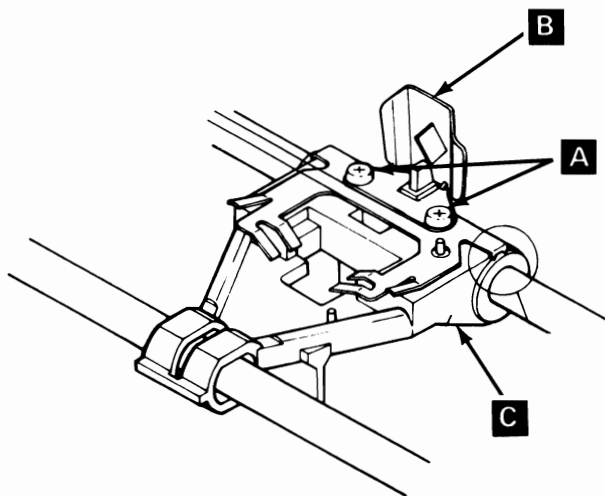
5. Install two screws **D**.



6. Install screw **E** in ground strap.
7. Replace control circuit card (See page 3-48).
8. Replace driver circuit card (See page 3-53).
9. Replace top cover (See page 3-90).
10. Replace ribbon cartridge.
11. Replace access cover.
12. Replace forms rack.

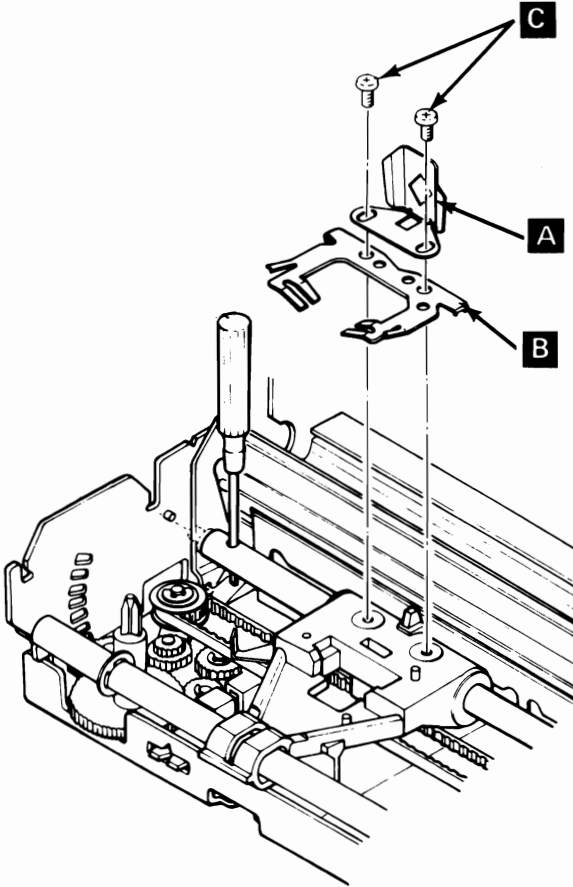
Ribbon Shield Removal

1. Position Printer Power switch to OFF; unplug printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove ribbon cartridge.
5. Remove access cover (See page 3-32).
6. Remove top cover (See page 3-88).
7. Remove print head (See page 3-77).
8. Remove two screws **A** at base of ribbon shield **B**.
9. Lift shield straight up from carriage **C**.



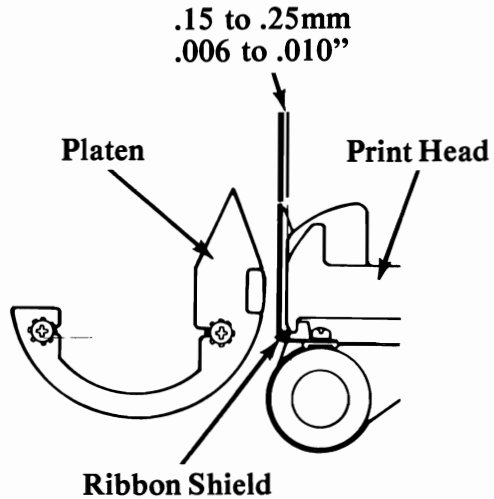
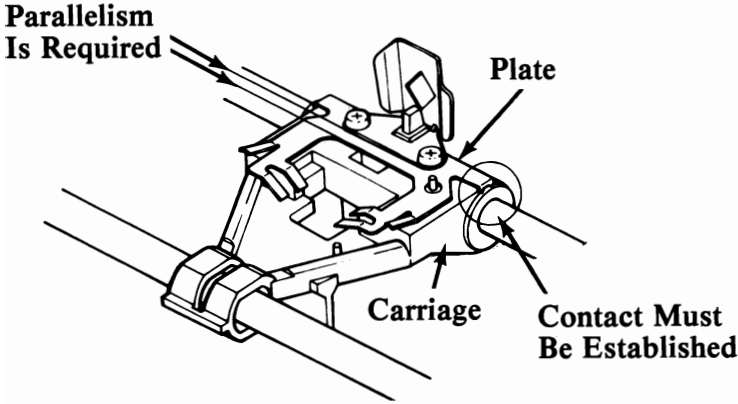
Ribbon Shield Replacement

1. Position shield **A** and plate **B** on print head carriage.
2. Insert screws **C**. (Do not tighten.)



Ribbon Shield Replacement (continued)

3. Position shield and plate as shown. Tighten screws.



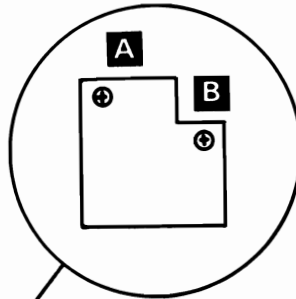
4. Replace print head (See page 3-79).
5. Replace top cover (See page 3-90).
6. Replace ribbon cartridge.
7. Replace access cover.
8. Replace forms rack.

Safety Shield Removal

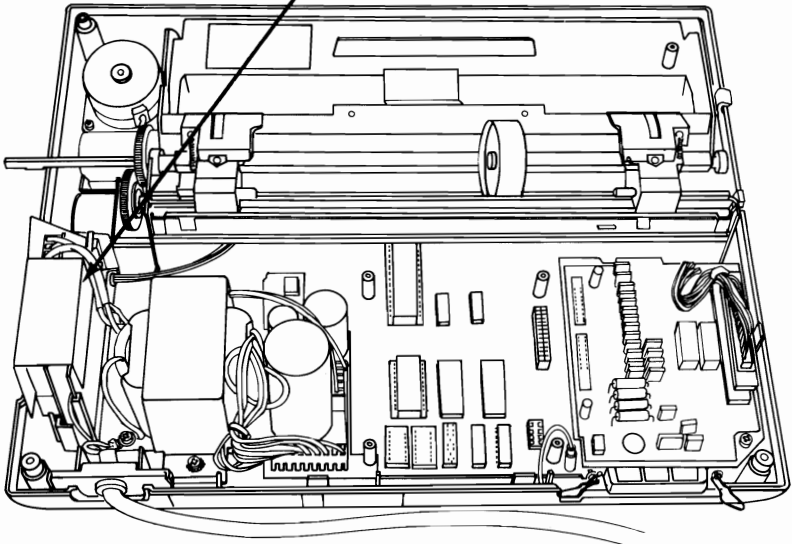
1. Position Printer Power switch to OFF; unplug Printer power cord from wall outlet and disconnect Parallel Printer Cable.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Remove top cover (See page 3-88).

DANGER: STATIC VOLTAGE MAY BE PRESENT ON THE FUSE-FILTER CARD. USE CAUTION IN THIS AREA.

6. Loosen screw **A** and screw **B**.
7. Lift safety shield from fuse-filter card.

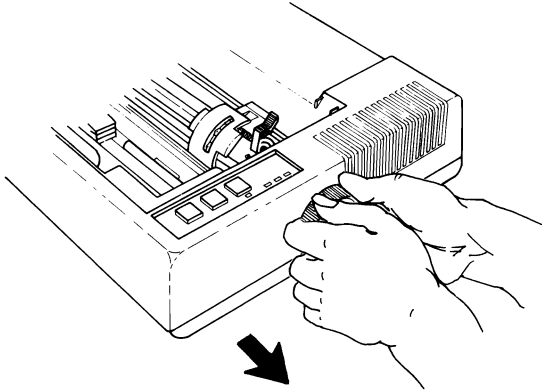


(Side View)

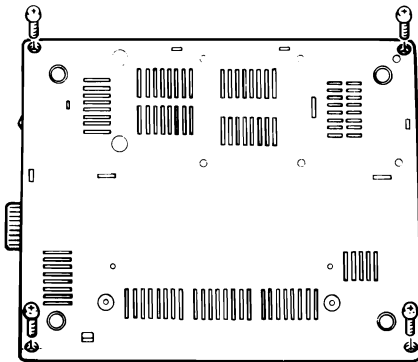


Top Cover Removal

1. Position Printer Power switch to OFF; unplug Printer power cord from wall outlet.
2. Remove forms.
3. Remove forms rack (See page 3-56).
4. Remove access cover (See page 3-32).
5. Pull forms feed knob from shaft using a steady, firm pull.

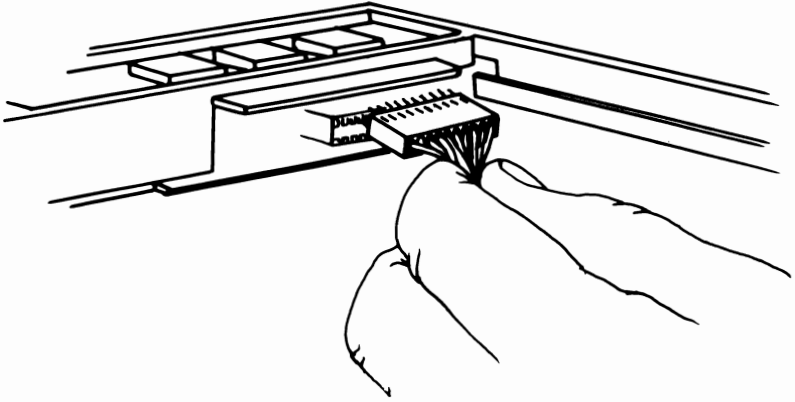


6. Turn printer upside down and place on smooth surface.
7. Loosen completely (using a Phillips screwdriver) the four corner screws in the base.

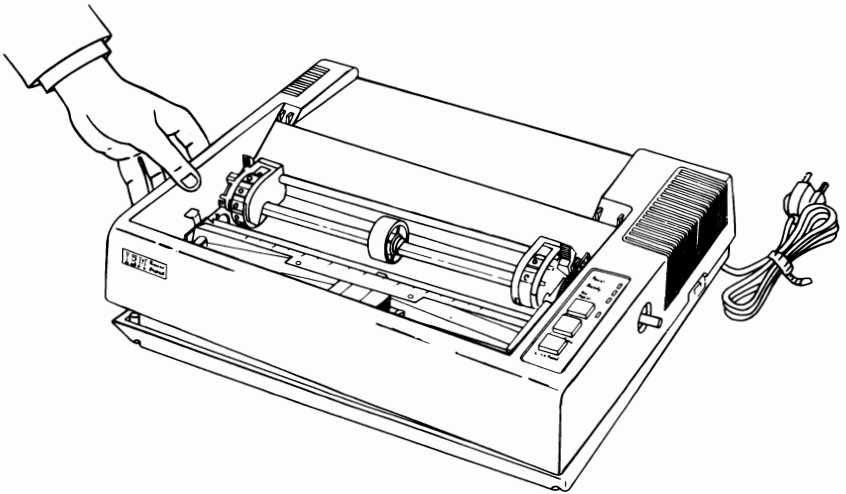


8. Turn printer rightside up.
CAUTION: Be sure to grasp both printer and base cover.

9. Pull Control Panel cable connector from control panel in top cover.

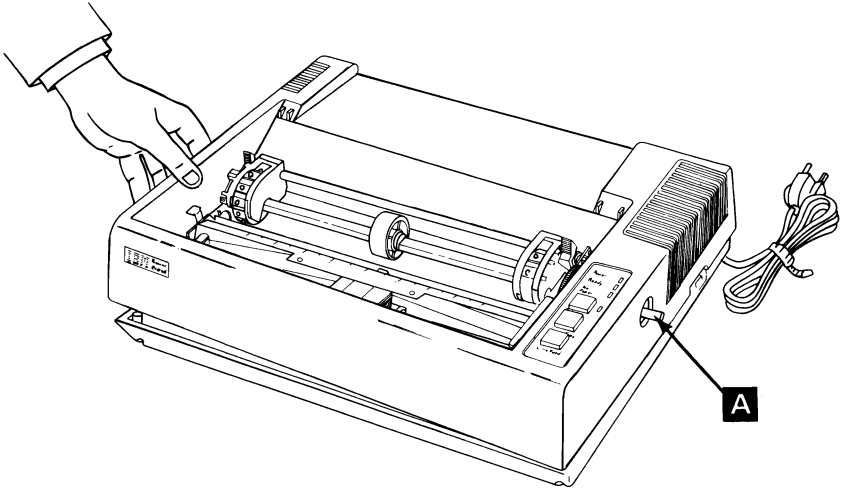


10. Lift top cover away from base cover. Lift left side first. Then, slide top cover to right to clear forms feed shaft.

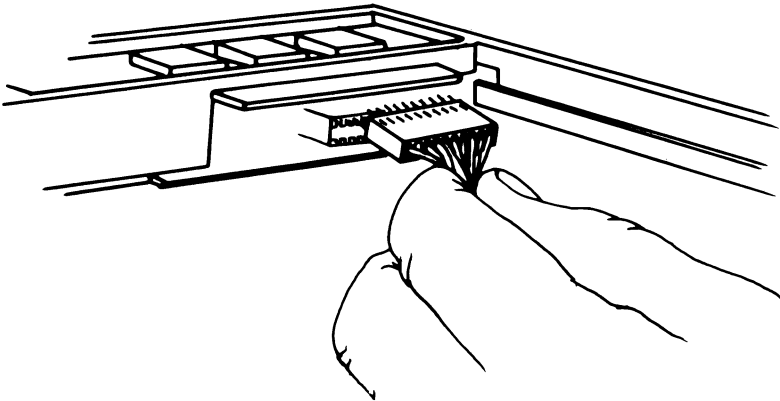


Top Cover Replacement

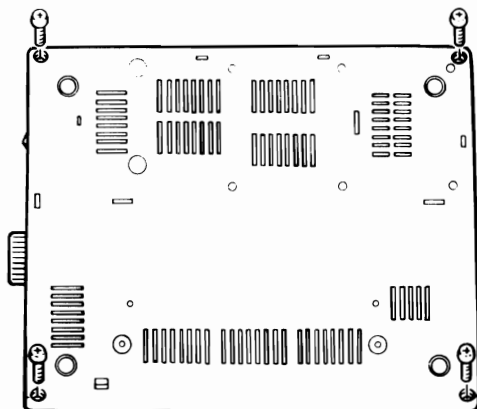
1. Position forms feed shaft through opening **A** in top cover and lower top cover onto base cover.



2. Connect Control Panel cable to Control Panel.



3. Turn printer upside down.
4. Install four screws.

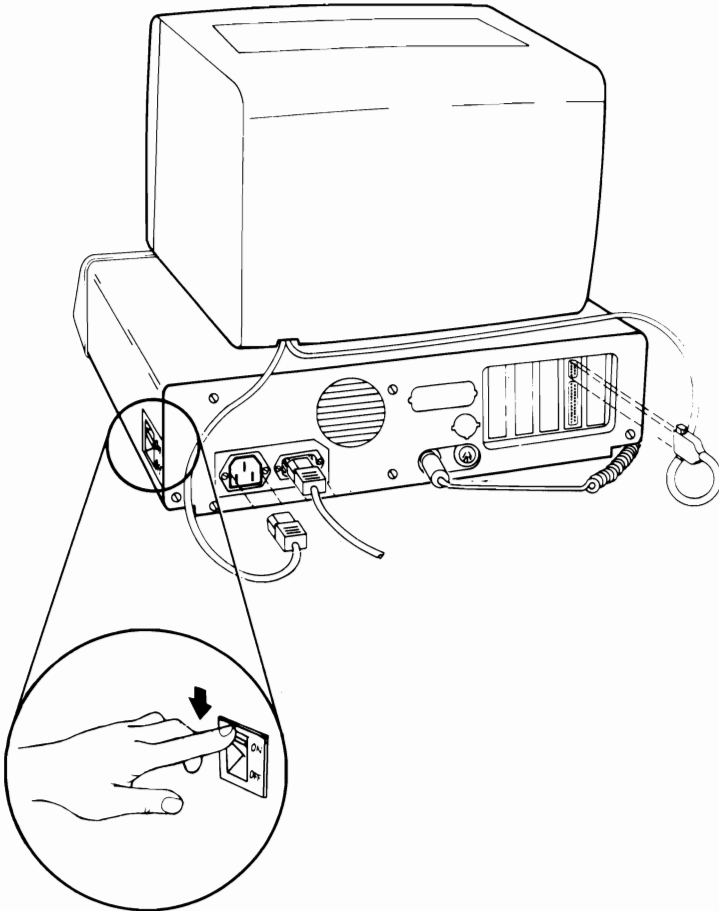


5. Turn printer rightside up.
6. Replace forms feed knob.
7. Replace access cover.
8. Replace forms rack.

IBM Monochrome Display

Display Removal

1. Position the System Unit Power switch to OFF, and remove the display power cord from the rear of the System Unit.
2. Disconnect the signal cable from the IBM Monochrome Display and Parallel Printer Adapter.



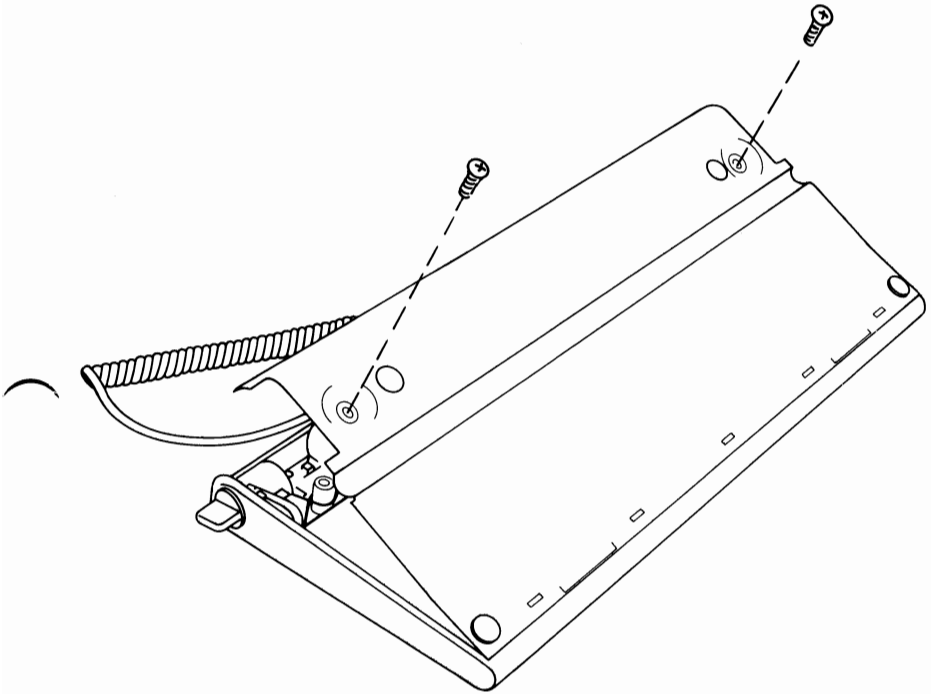
Display Replacement

1. Connect the signal cable from your display to the IBM Monochrome Display and Parallel Printer Adapter.
2. Connect the Display power cord to the connector at the rear of the System Unit.

Keyboard

Keyboard Base Removal

1. Position System Unit Power switch to OFF, and disconnect Keyboard cable from rear of System Unit.
2. Position the Keyboard with the bottom facing up and remove the two mounting screws.
3. Rotate the Base up and out of the front retaining slots.

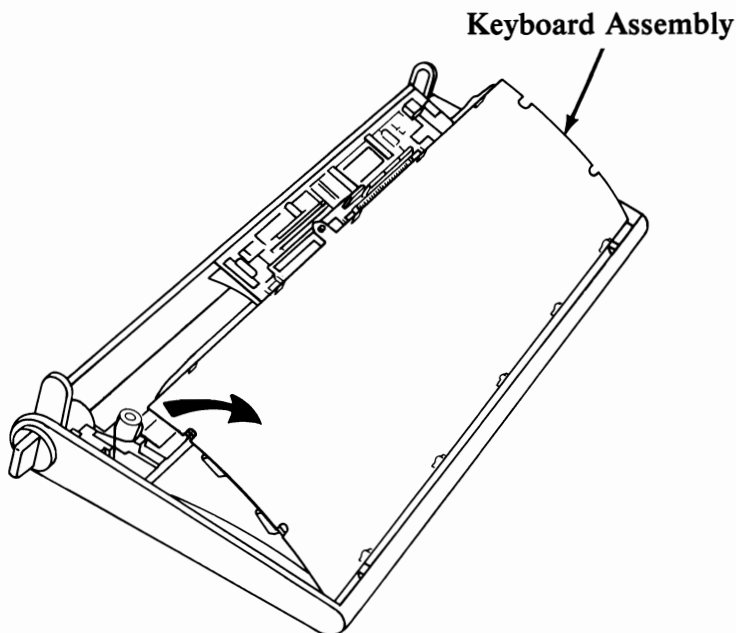


Keyboard Base Replacement

1. Place tabs on front of base into retaining slots on cover and rotate base to closed position.
2. Replace mounting screws.
3. Reconnect Keyboard cable at rear of System Unit.

Keyboard Assembly Removal

1. Position System Unit Power switch to Off, and disconnect keyboard cable from rear of System Unit.
2. Remove Keyboard Base (See page 3-93).
3. Disconnect cable from Keyboard assembly.
4. Lift rear of Keyboard assembly up and then out of the cover.



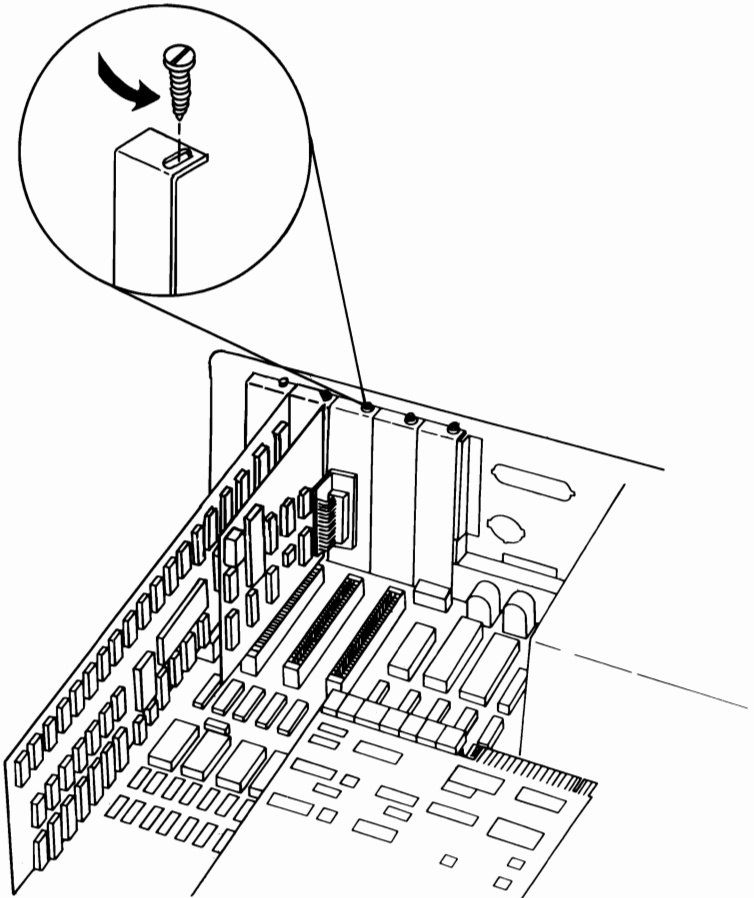
Keyboard Assembly Replacement

1. Place front of Keyboard assembly into cover.
2. Lower rear of Keyboard assembly into position in cover.
3. Replace Keyboard Base (See page 3-93).
4. Reconnect Keyboard cable at rear of System Unit.

Option Adapter

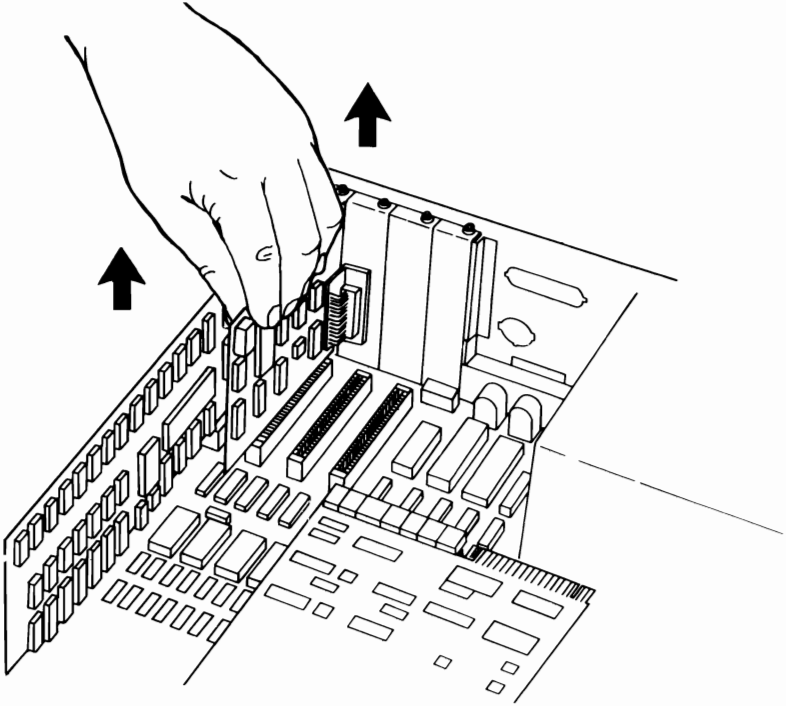
Option Adapter Removal

1. Position System Unit Power switch to Off; unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Remove System Unit cover (See page 3-98).
3. Remove the Option Adapter mounting screw.



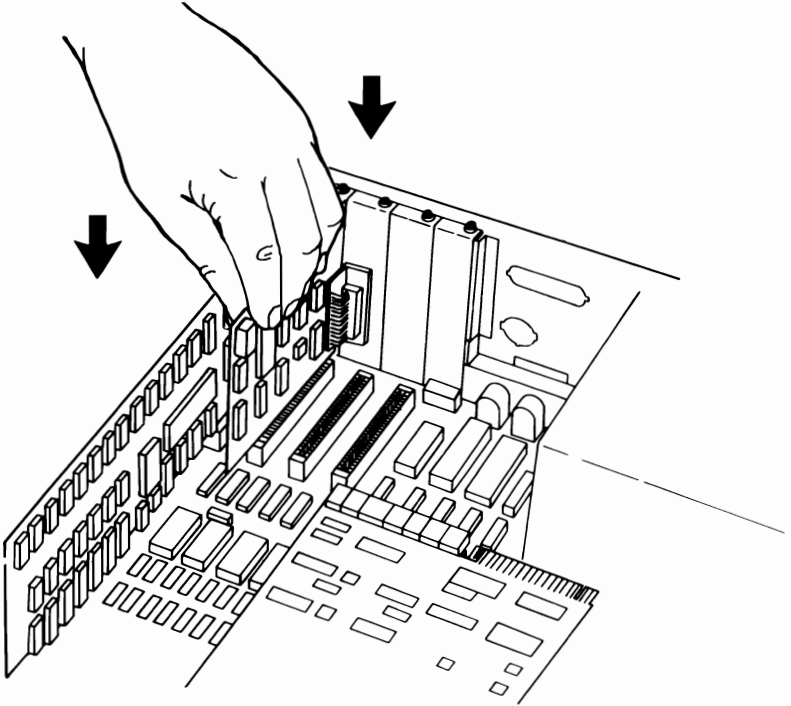
Option Adapter Removal (continued)

4. Grasp the Option Adapter by the top corners and lift straight up.



Option Adapter Replacement

1. Insert Option Adapter into Option Expansion Slot. Press down firmly on Option Adapter to seat connector.

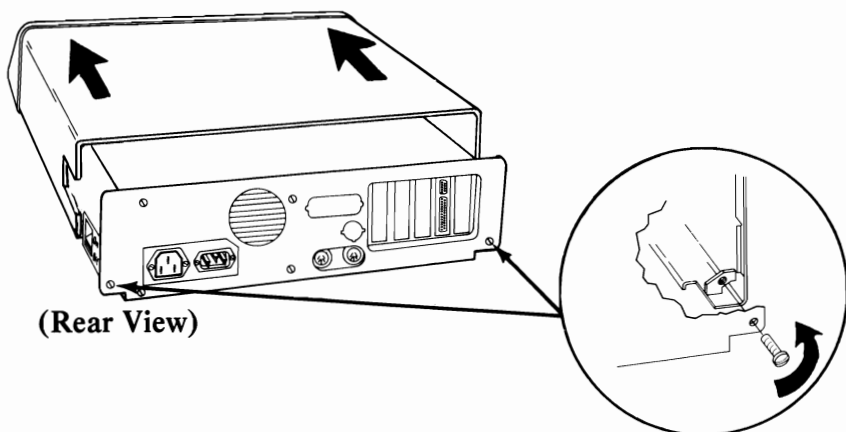


2. Install Option Adapter mounting screw.
3. Replace System Unit Cover (See page 3-98).

System Unit

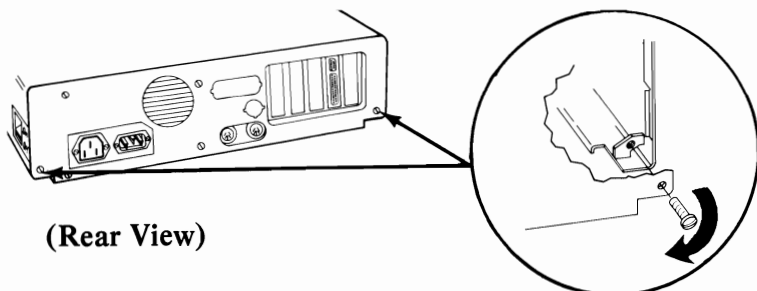
Cover Removal

1. Position System Unit Power switch to Off, unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Set the Display, Keyboard, and Printer away from System Unit work area.
3. Loosen two cover retaining screws and slide cover toward front of machine until it clears System Unit.



Cover Replacement

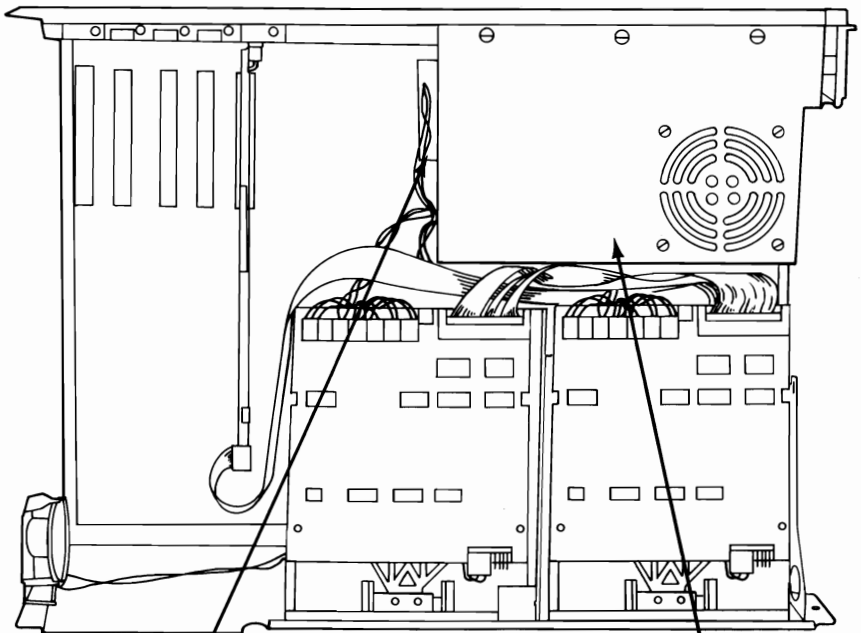
1. Slide cover toward rear of machine.
2. Align both cover retaining screws with threaded tabs on cover; tighten screws.
3. Reconnect cables to System Unit.



Power Supply Removal

1. Position the System Unit Power switch to Off.
2. Unplug the System Unit power cord from the wall outlet; then unplug the power cord from the back of the System Unit.
3. Remove the System Unit cover (See page 3-98).
4. Disconnect the System Board power connectors by grasping the connectors and pulling straight up.

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

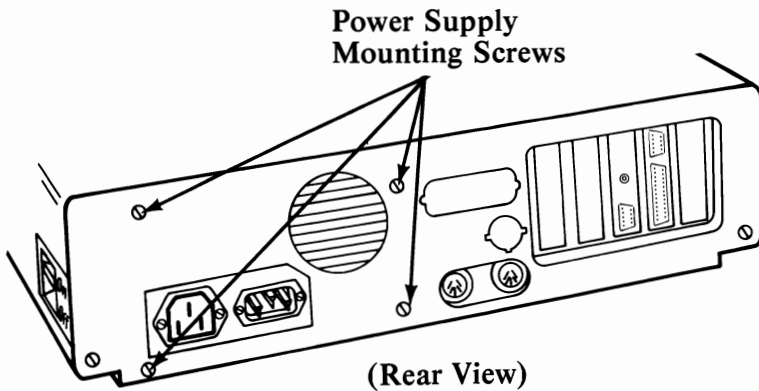


(Top View)
System Board Power Connectors

Power Supply

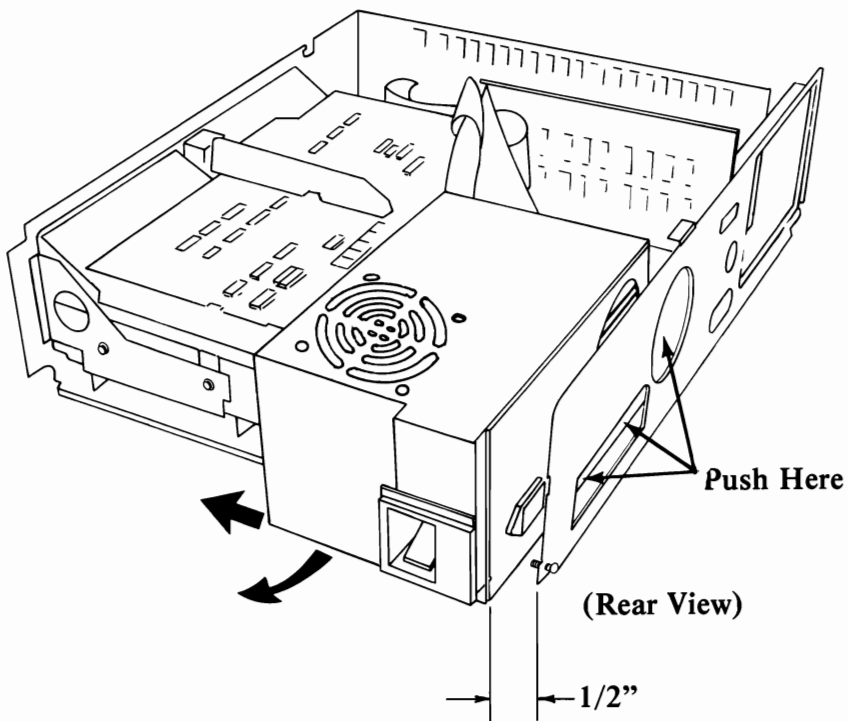
Power Supply Removal (continued)

5. If your System Unit contains a Diskette Drive, disconnect the Diskette Drive power connectors and signal connector(s) (See Section 5, "Locations"). Reposition the signal cable to allow the power supply to slide toward the front of the machine.
6. Remove the four power supply mounting screws.



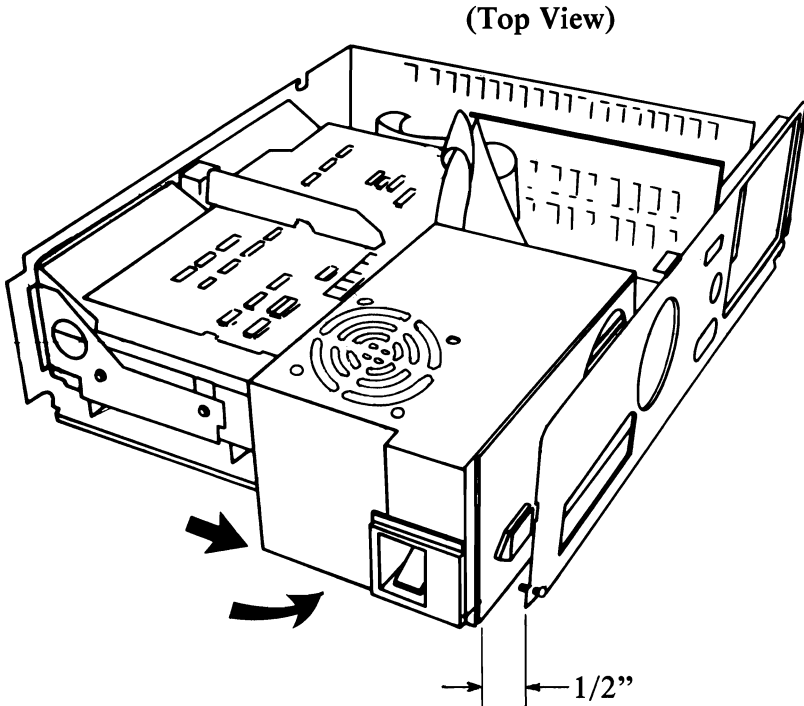
7. Push the power supply forward about 1/2 inch, lift up and slide left to remove.

(Top View)



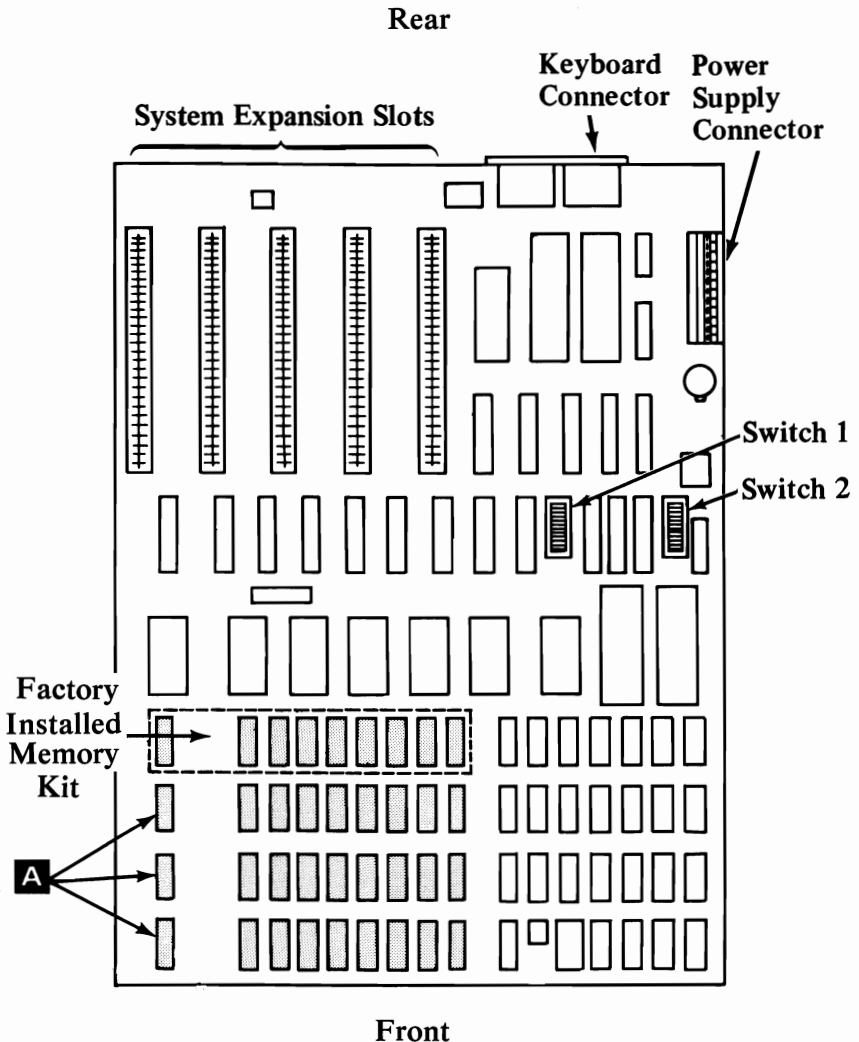
Power Supply Replacement

1. Position the power supply about 1/2 inch from the rear of the System Unit back plate and slide into position.
2. Align the screw holes.
3. Replace and tighten four power supply mounting screws.
4. If your System Unit contains a Diskette Drive, reconnect the Diskette Drive power and signal connectors.
5. Reinstall the System Board power connectors.



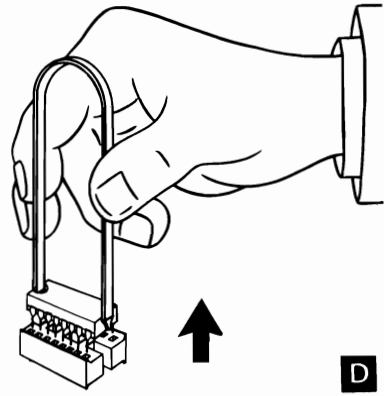
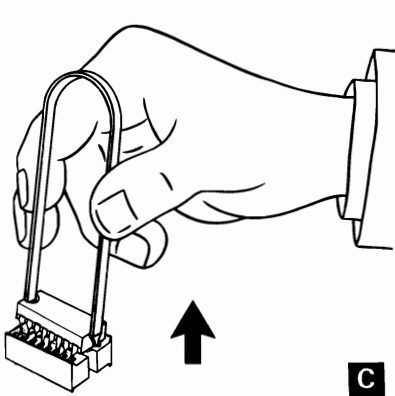
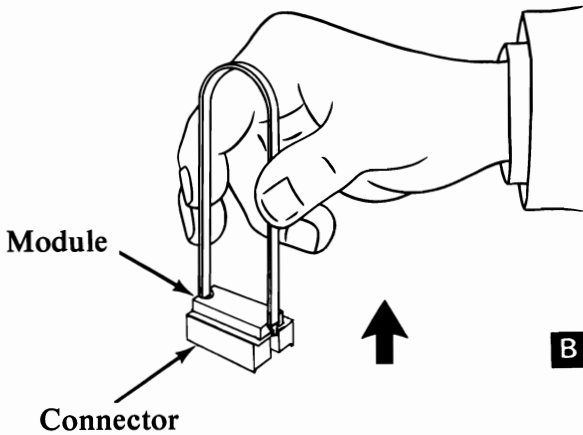
16 KB Memory Expansion Kit Removal

1. Position System Unit Power switch to Off; unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Remove System Unit cover (See page 3-98).
3. Remove all Option Adapters (See page 3-95).
4. Locate the module **A** to be removed from the System Board.



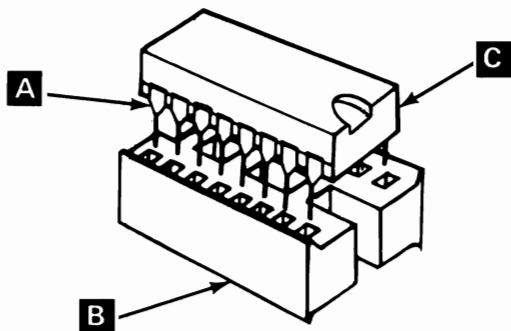
16 KB Memory Expansion Kit Removal

5. To separate module from connector, grasp module as shown **B**. Lift in a 2 step motion as shown **C** and **D** to avoid bending pins.



16 KB Memory Expansion Kit Replacement

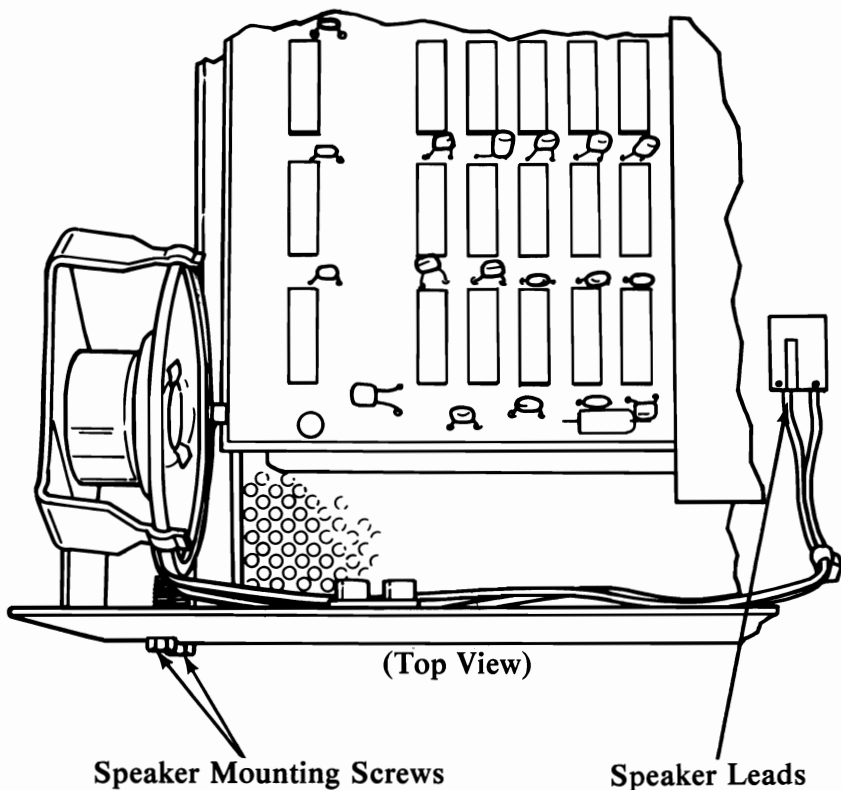
1. Align the module pins **A** with the connector **B** and firmly press the module into place. Notch **C** on module faces rear.
2. Replace Option Adapters (See page 3-97).
3. Replace System Unit cover (See page 3-98).



(Rear View)

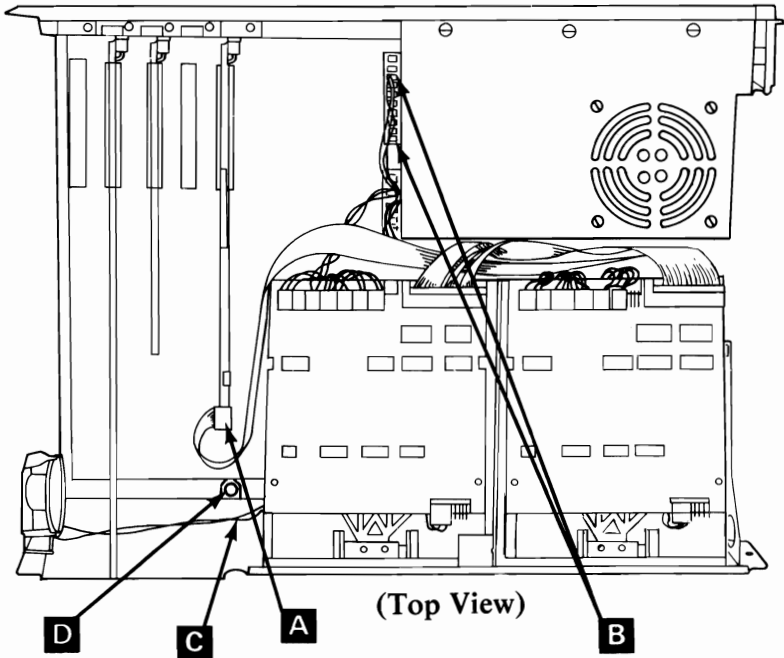
Speaker Removal

1. Position System Unit Power switch to OFF.
2. Remove System Unit power cord from the wall outlet.
3. Remove the System Unit cover (See page 3-98).
4. Disconnect the speaker leads.
5. Remove the two speaker mounting screws.
6. Remove the speaker.



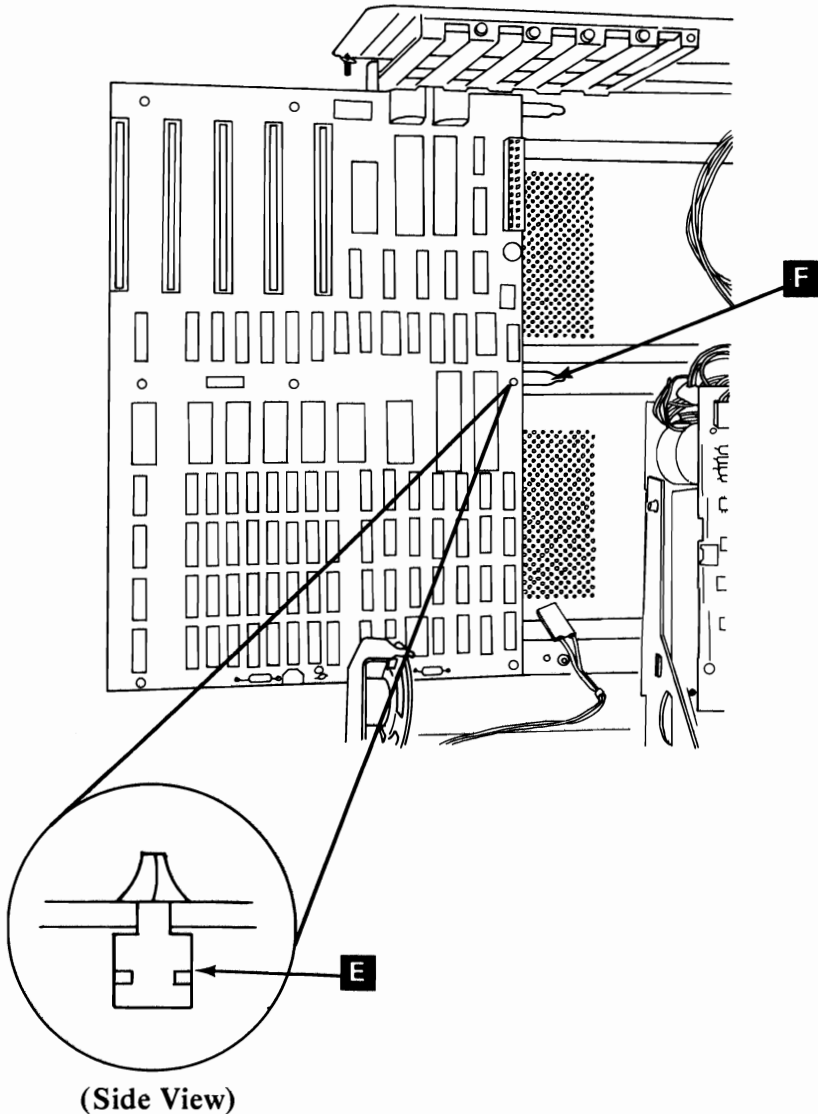
System Board Removal

1. Position the System Unit Power switch to Off; unplug System Unit power cord and disconnect all cables from rear of System Unit.
2. Remove System Unit cover (See page 3-98).
3. Remove all Option Adapters (See page 3-95).
4. Disconnect Diskette Drive signal cable **A** and System Board power connector **B**.
5. Remove the speaker connector **C**.
6. Remove System Board mounting screw **D**.



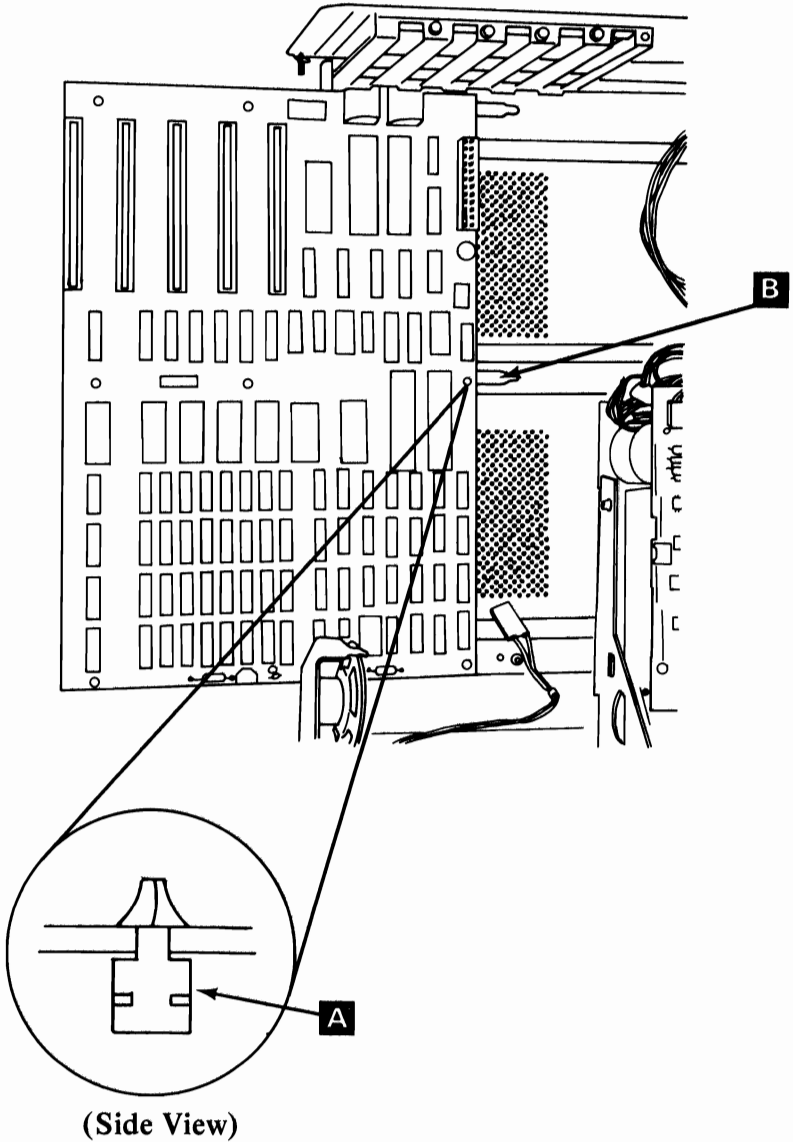
System Board Removal (continued)

- Slide System Board away from power supply (approximately 1/2 inch) until stand-offs **E** can be lifted from mounting slots **F**.
- Lift System Board up and out of System Unit.



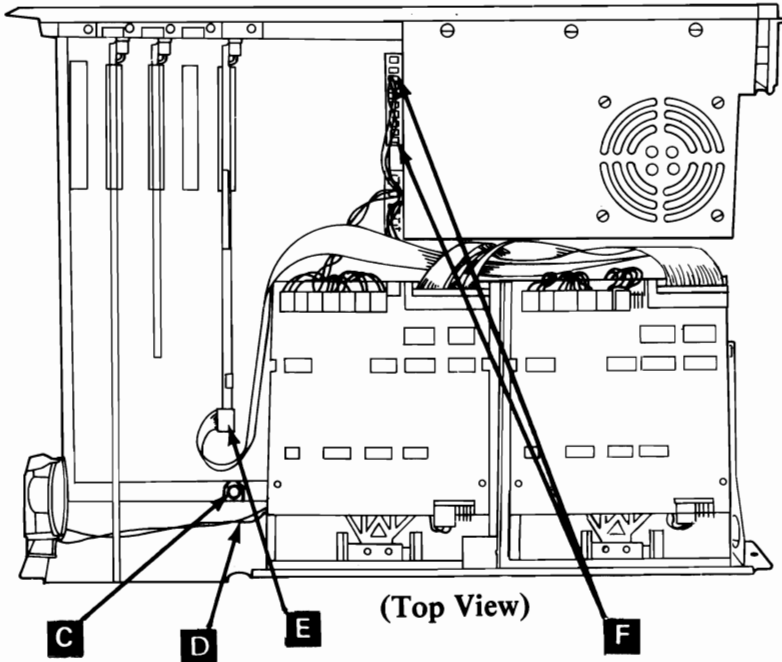
System Board Replacement

1. Position the stand-offs **A** on the System Board into the mounting slots **B**.



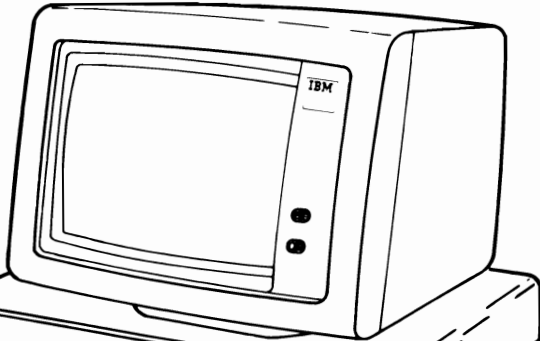
System Board Replacement (continued)

2. Slide System Board toward power supply until hole for mounting screw is aligned.
3. Install System Board mounting screw **C**.
4. Install speaker connector **D**.
5. Install Option Adapters (See page 3-97).
6. Install Diskette Drive signal cable **E** and System Board power connector **F**.
7. Install System Unit cover (See page 3-98).

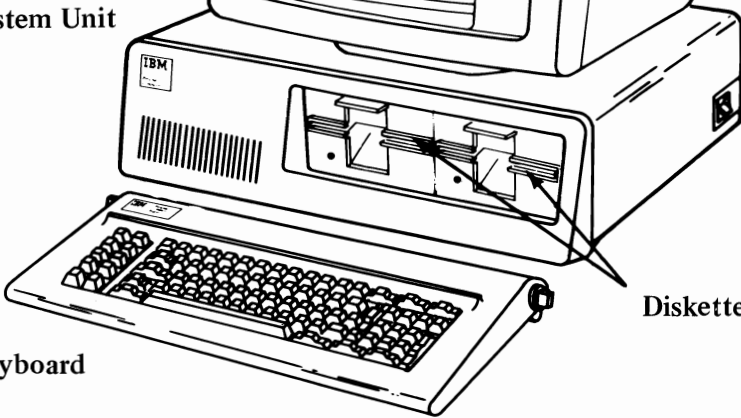


SECTION 4. PARTS CATALOG

IBM Monochrome Display

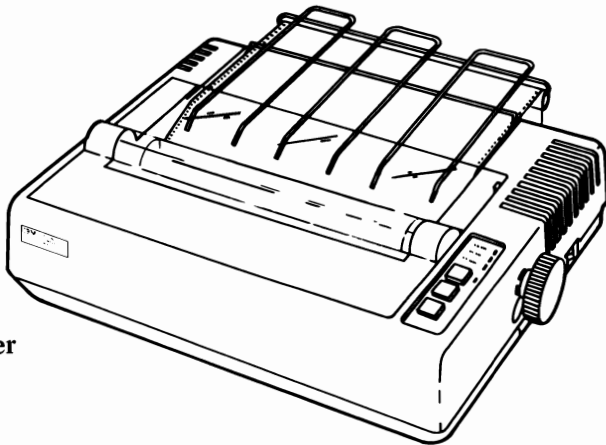


System Unit



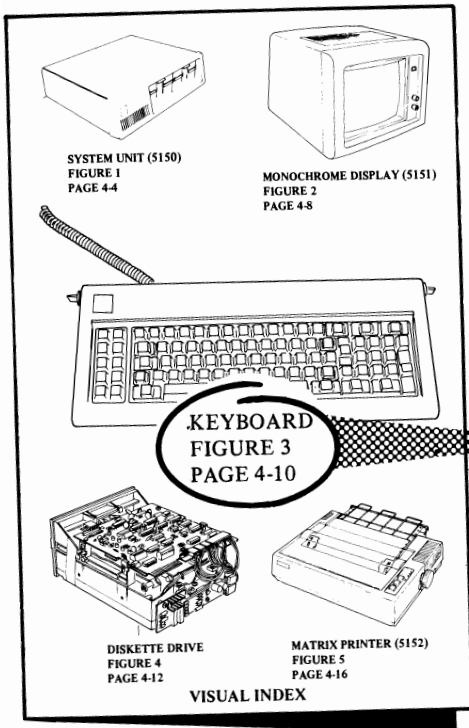
Diskette Drives

Keyboard

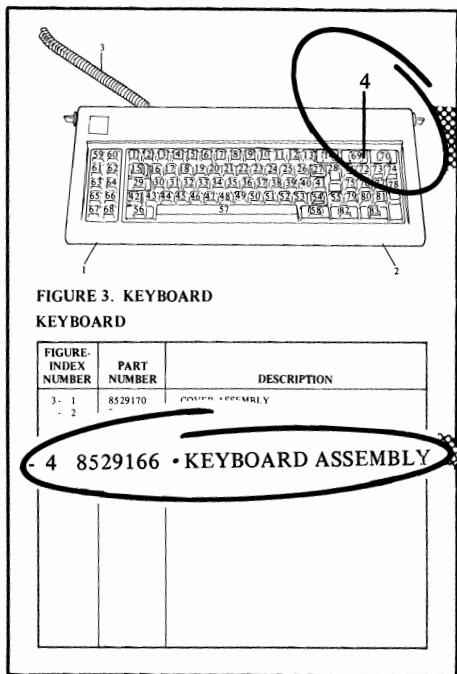


IBM 80 CPS
Matrix Printer

HOW TO USE THIS PARTS CATALOG

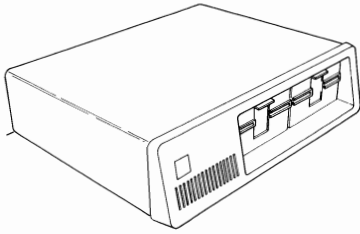


1
TURN TO THE VISUAL INDEX—THEN LOCATE, BY ILLUSTRATION, THE ASSEMBLY CONTAINING THE PART.

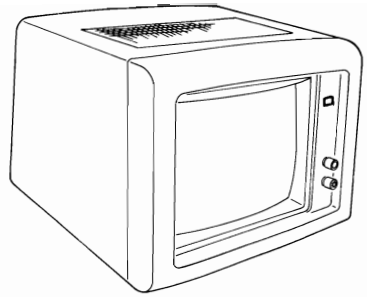


2
TURN TO THE PAGE FOR THAT ASSEMBLY— THEN LOCATE THE PART VISUALLY

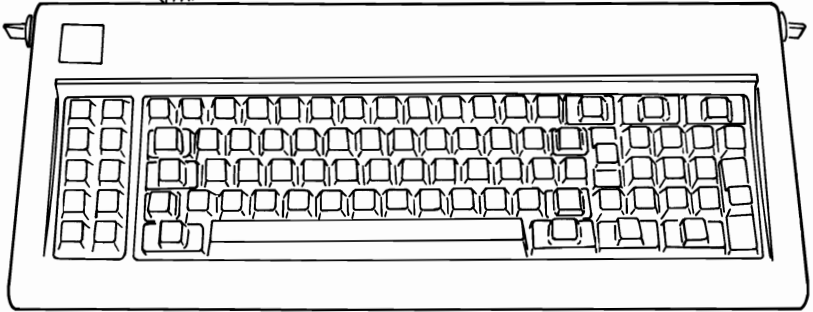
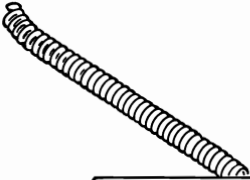
3
USING THE INDEX NUMBER SHOWN WITH THE PART. REFER TO THE ACCOMPANYING LISTING TO OBTAIN THE PART NUMBER, DESCRIPTION AND QUANTITY.



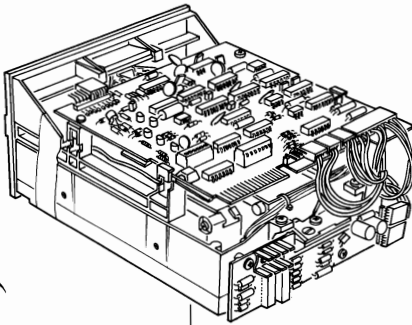
SYSTEM UNIT (5150)
FIGURE 1
PAGE 4-4



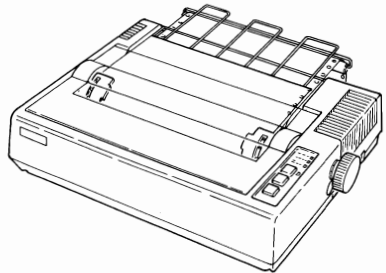
MONOCHROME DISPLAY (5151)
FIGURE 2
PAGE 4-8



KEYBOARD
FIGURE 3
PAGE 4-10



DISKETTE DRIVE
FIGURE 4
PAGE 4-12



MATRIX PRINTER (5152)
FIGURE 5
PAGE 4-16

VISUAL INDEX

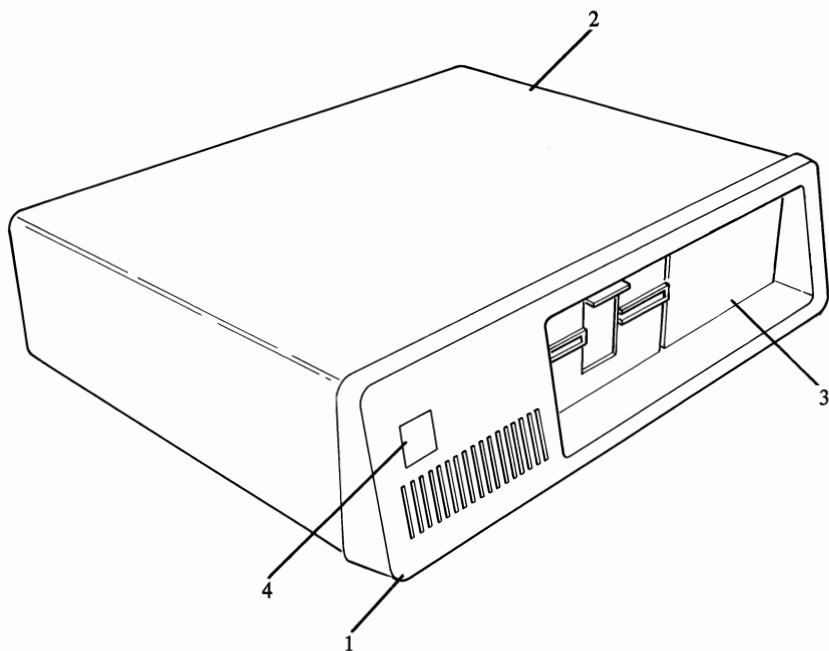


FIGURE 1. SYSTEM UNIT. (5150) SHEET 1 OF 2.

SYSTEM UNIT (5150)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
1- 1 - 2 - 3 - 4	8529163 8529162 8529204 8529164	BEZEL ASSEMBLY COVER ASSEMBLY DISK COVER PLATE LABEL

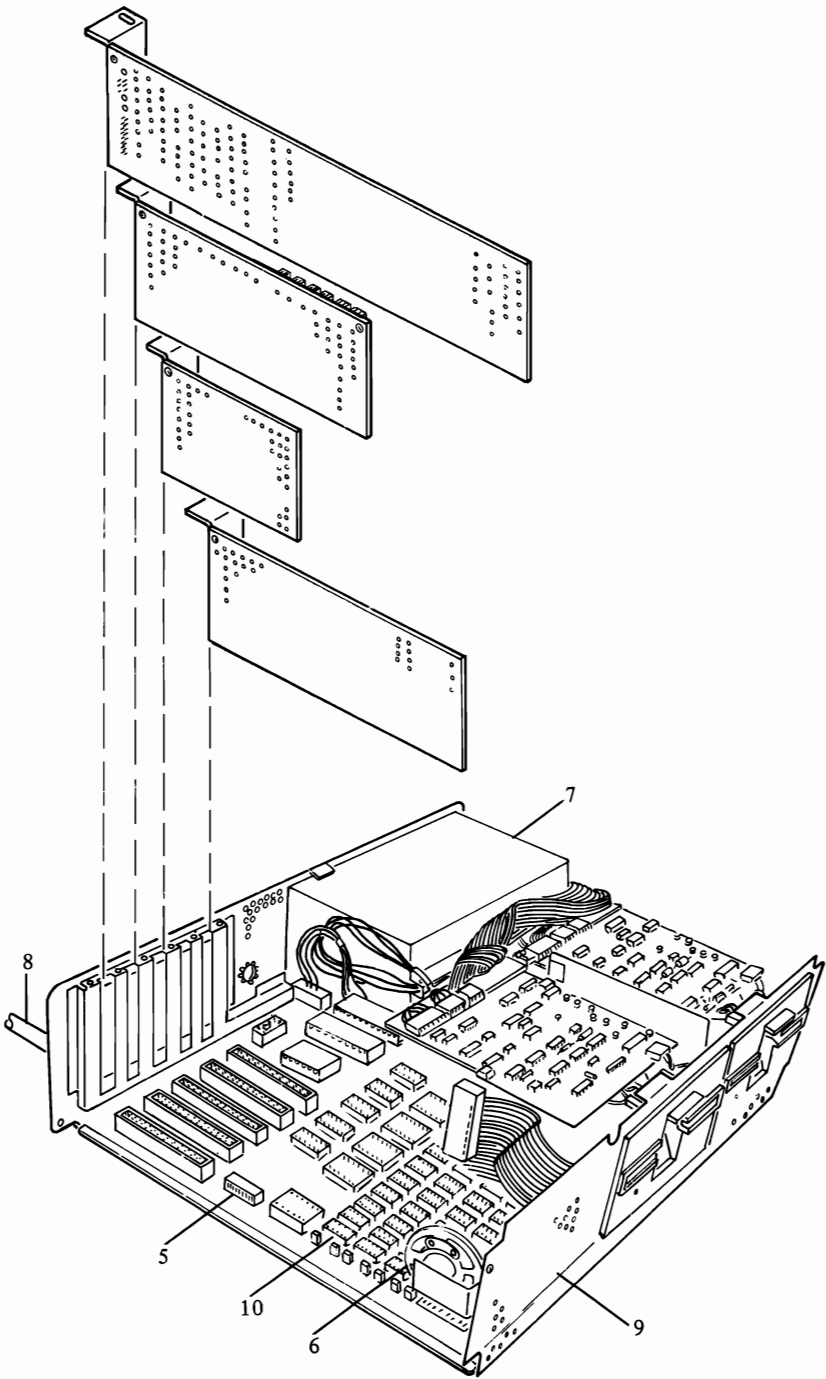


FIGURE 1. SYSTEM UNIT. (5150) SHEET 2 OF 2.

SYSTEM UNIT (5150)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
1 - 5	8529205	SYSTEM BOARD
- 6	8529143	SPEAKER AND CABLE
- 7	8529155	POWER SUPPLY
- 8	8529158	LINE CORD
- 9	8529161	BASE ASSEMBLY
- 10	8529142	16KB MEMORY MODULE
---OPTIONAL PARTS---		
	8529144	32KB MEMORY EXPANSION OPTION
	8529145	64KB MEMORY EXPANSION OPTION
	8529146	COLOR/GRAPHICS MONITOR ADAPTER
	8529148	IBM MONOCROME DISPLAY & PARALLEL PRINTER ADAPTER
	8529149	PARALLEL PRINTER ADAPTER
	8529150	ASYNCHRONOUS COMMUNICATIONS ADAPTER
	8529151	GAME CONTROL ADAPTER
	8529152	5¼" DISKETTE DRIVE ADAPTER

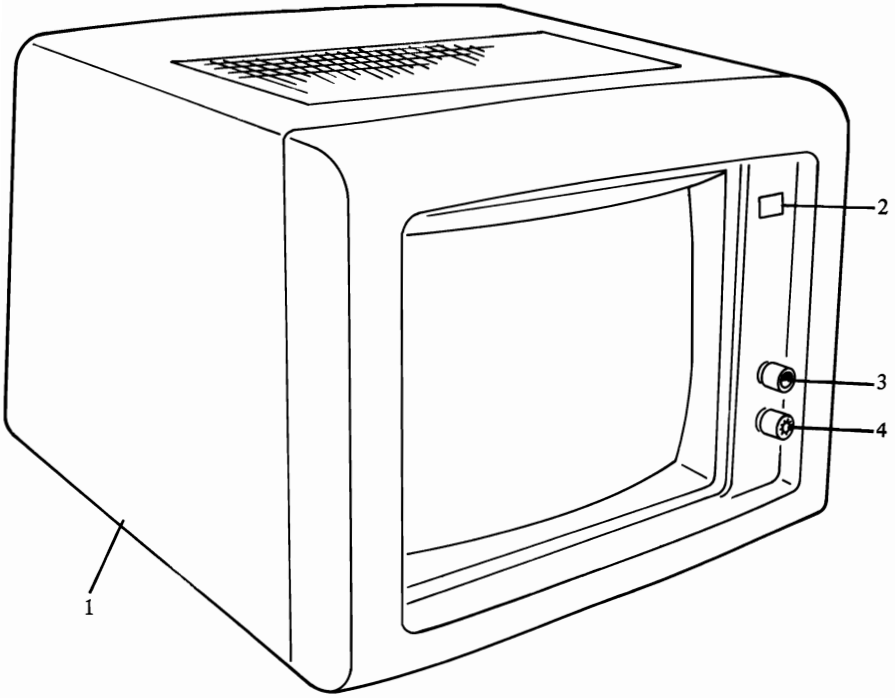


FIGURE 2. MONOCHROME DISPLAY. (5151)

MONOCHROME DISPLAY (5151)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
2- 1	8529171	DISPLAY ASSEMBLY
- 2	8529179	LABEL
- 3	8529177	BRIGHTNESS KNOB
- 4	8529178	CONTRAST KNOB
	8529229*	FRONT PANEL
	8529230*	BACK COVER
	8529231*	UPPER COVER
	8529232*	BUSHING
	8529176*	POWER CORD HOLDER
	8529173*	SIGNAL CABLE
	8529235*	TRANSFORMER
	8529237*	CONTROL SUPPORT
	8529236*	TRANSFORMER SUPPORT
	8529175*	FUSE
	8529233*	ANALOG CARD
	8529234*	PC CARD
	8529174*	POWER CORD
	8529180*	DISPLAY MISC HARDWARE KIT
		--CONSISTING OF--
		DISPLAY CRT MOUNTING SCREW
		DISPLAY TRANSFORMER MOUNTING SCREW
		DISPLAY CRT MOUNTING SUPPORT
		DISPLAY CRT BRACKET TO FRONT PANEL
		DISPLAY TRANSFORMER SUPPORT FRONT PANEL
		DISPLAY RUBBER BUSHING SCREW
		DISPLAY RUBBER BUSHING NUT
		DISPLAY CABLE RESTRAINT SCREW
		DISPLAY STAR WASHER
		--***--
		*Restricted availability.

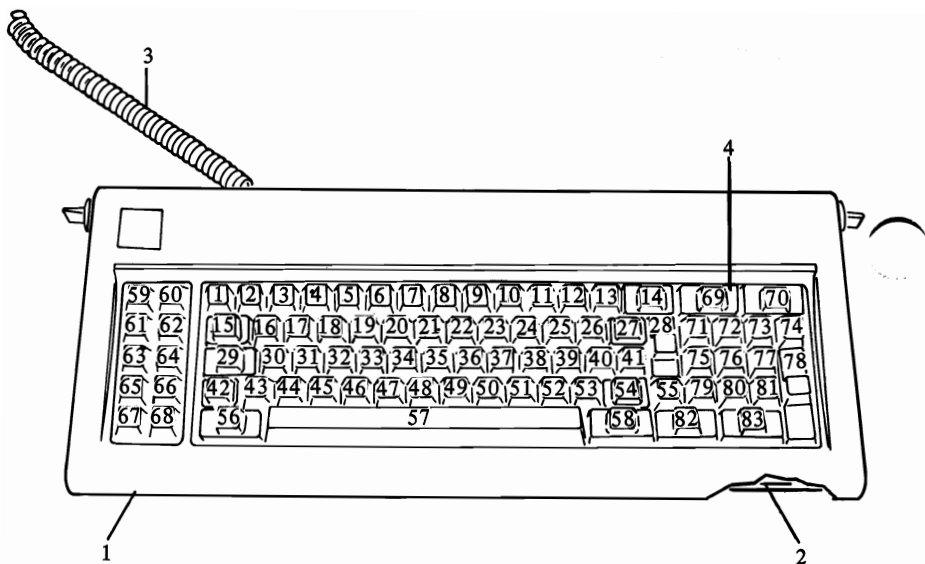


FIGURE 3. KEYBOARD
KEYBOARD

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
3- 1	8529170	COVER ASSEMBLY
- 2	8529169	BASE ASSEMBLY
- 3	8529168	CABLE ASSEMBLY
- 4	8529166	KEYBOARD ASSEMBLY

KEYBUTTON PART NUMBERS

KEY LOCATION	PART NUMBER	DESCRIP-TION	KEY LOCATION	PART NUMBER	DESCRIP-TION
1	4584714	ESC	43	5997221	!/\
2	1761460	!/1	44	2658860	Z
3	1642308	@/2	45	2658861	X
4	1642309	#/3	46	2658862	C
5	1642342	\$/4	47	2658863	V
6	1642343	%/5	48	2658864	B
7	4496183	^/6	49	2658865	N
8	2658824	~/7	50	2658866	M
9	2658825	*/8	51	1864026	</,
10	2658826	(/9	52	1864027	>/.
11	2658827)/10	53	2658869	?//
12	1761515	-/-	54	2658870	SHIFT
13	2658829	+/=	55	4584718	PRT SC
14	1643315	BACKSPACE	56	1643330	ALT
15	1643316	←/→	57	N/A	SPACE BAR
16	2658832	Q	58	4584719	CAPS LOCK
17	2658833	W	59	4584720	F1
18	2658834	E	60	4584721	F2
19	2658835	R	61	4584722	F3
20	2658836	T	62	4584723	F4
21	2658837	Y	63	4584724	F5
22	2658838	U	64	4584725	F6
23	2658839	I	65	4584726	F7
24	2658840	O	66	4584727	F8
25	2658841	P	67	4584728	F9
26	4585286	{/[68	4584729	F10
27	4585288	}]/	69	4584730	NUM LOCK
28	5184235	RETURN	70	4584731	SCROLL LOCK
29	4584717	CTRL	71	4584732	7/HOME
30	2658846	Δ	72	4584733	8/↑
31	2658847	S	73	4584734	9/PG UP
32	2658848	D	74	1761511	-
33	2658849	F	75	4584735	4/←
34	2658850	G	76	2658892	5
35	2658851	W	77	4584736	6/→
36	2658852	J	78	1761513	+
37	2658853	K	79	4584737	1/END
38	2658854	L	80	4584739	2/↓
39	2658846	:/;	81	4584739	3/PG ON
40	4584779	"/'	82	4584740	0/INS
41	1642306	~/~	83	4584741	./DEL
42	2658858	SHIFT			

FOR A COMPLETE SET OF KEYBUTTONS ORDER PART NO. 4584657

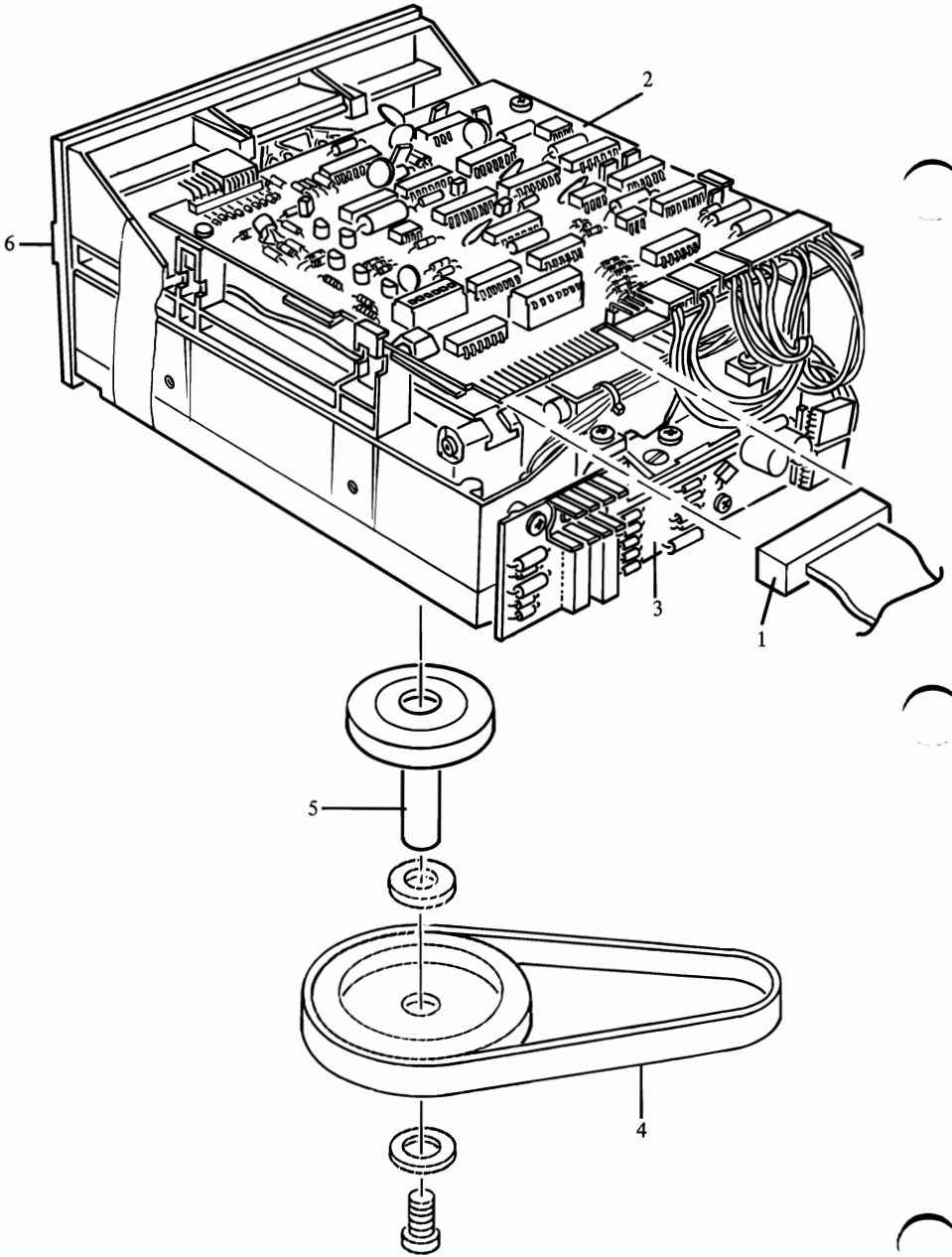


FIGURE 4. DISKETTE DRIVE. SHEET 1 OF 2.

DISKETTE DRIVE

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
4 -	8529153	DISK DRIVE
		---CONSISTING OF---
- 1	8529159	SIGNAL CABLE
- 2	8529226	LOGIC BOARD
- 3	8529256	SERVO BOARD
- 4	8629154	DISK DRIVE BELT
- 5	8529263	SPINDLE ASSEMBLY
		---CONSISTING OF---
		DRIVE PULLEY
		SCREW
		WASHER
		SPACER
		SPINDLE
		---****---
- 6	8529293	FRONT PANEL

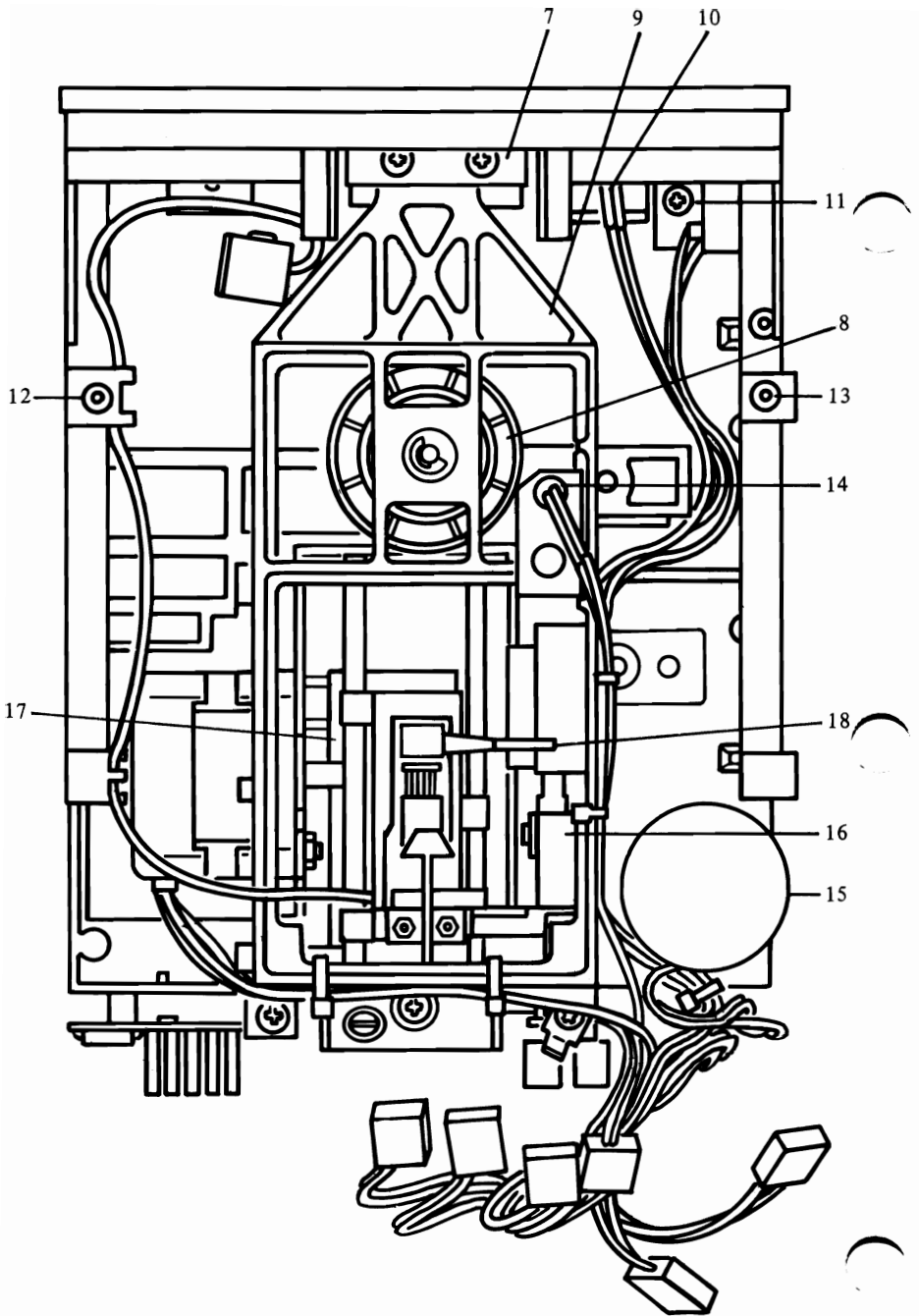


FIGURE 4. DISKETTE DRIVE, SHEET 2 OF 2.

DISKETTE DRIVE

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
4 - 7	8529260	LATCH ASSEMBLY
- 8	8529259	CONE ASSEMBLY
- 9	8529267	CONE LEVER ASSEMBLY
- 10	8529258	L.E.D. ASSEMBLY
- 11	8529225	WRITE PROTECT SWITCH
- 12	8529261	GUIDE,RIGHT
- 13	8529262	GUIDE,LEFT
- 14	8529257	INDEX ASSEMBLY
- 15	8529223	DRIVE MOTOR
- 16	8529224	TRACK 0 SWITCH
- 17	8529264	MODULE SSR
- 18	8529265	SSR UPPER ARM
	8529266	TRACK 0 STOP

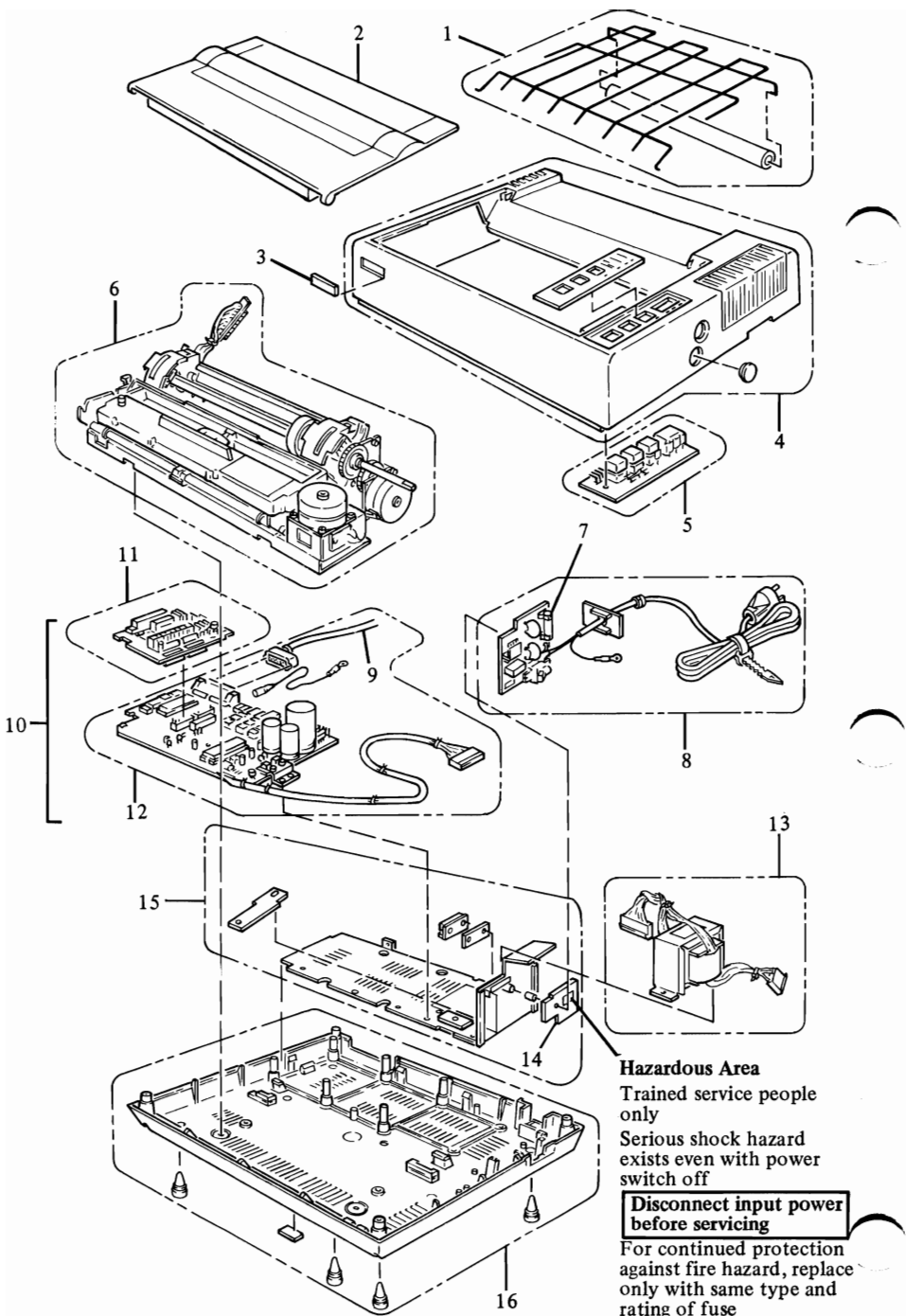


FIGURE 5. MATRIX PRINTER. (5152) SHEET 1 OF 2.

MATRIX PRINTER (5152)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
5 - 1	8529191	FORMS RACK
- 2	8529185	COVER DOOR
- 3	8521986	LABEL
- 4	8529182	TOP COVER
- 5	8529184	CONTROL PANEL
- 6	8529198	PRINTER MECHANICAL ASSEMBLY
- 7	8529220	FUSE
- 8	8529187	LINE CORD AND CARD ASSEMBLY
- 9	8529214	PRINTER CABLE
- 10	8529197	CONTROL CARDS
		--CONSISTING OF--
- 11	8529221*	DRIVER CARD
- 12	8529222*	LOGIC CARD
		--****--
- 13	8529196	POWER TRANSFORMER
- 14	8529215	SAFETY SHIELD
- 15	8529217	HEATSINK/POWER TRANSISTOR
- 16	8529181	BASE ASSEMBLY
		*Restricted availability.

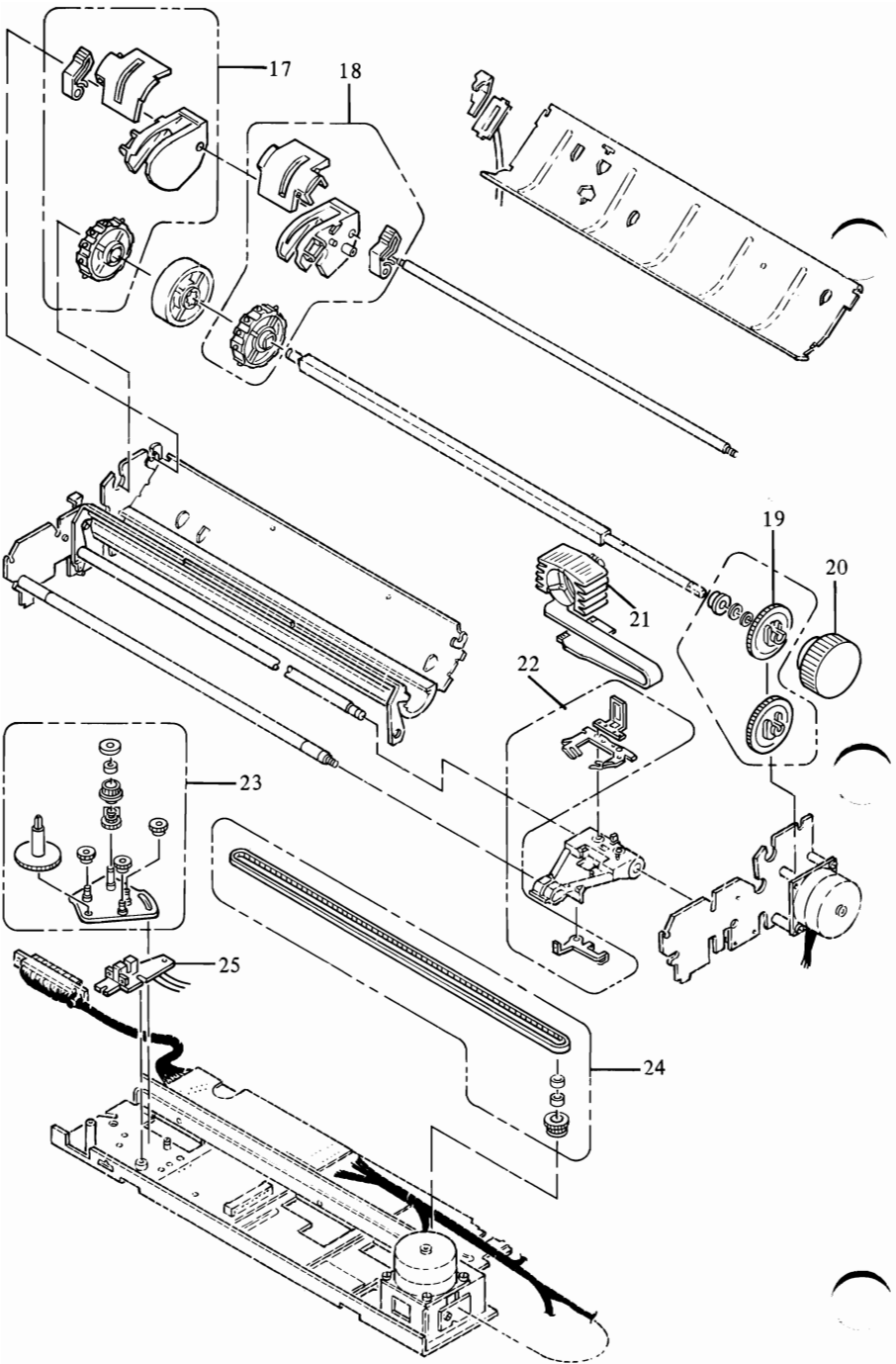


FIGURE 5. MATRIX PRINTER. (5152) SHEET 2 OF 2.

MATRIX PRINTER (5152)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
5 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25	8529188 8529216 8529194 8529193 8529183 8529192 8529195 8529190 8529189 8529200	TRACK ROLLER ASSEMBLY,LEFT TRACK ROLLER ASSEMBLY,RIGHT INTERMEDIATE GEAR ROLLER KNOB PRINT HEAD RIBBON SHIELD CARRIER DRIVE ASSEMBLY DRIVE GEAR BELT LEFT MARGIN ASSEMBLY PRINTER MISC HARDWARE --CONSISTING OF-- PLANE WASHER C.T.P. SCREW PLANE WASHER RETAINING RING,TYPE E RETAINING RING,TYPE E PLANE WASHER CP SCREW WITH OW CP SCREW WITH OW CUP SCREW SPACER CUP SCREW OUTSIDE TOOTHED LOCK WASHER CP SCREW WITH SW CP SCREW WITH OW PLANE WASHER CUP SCREW CT SCREW (BINDING HEAD) CUP SCREW PLANE WASHER RETAINING RING,TYPE E C.T.P. SCREW RETAINING RING,TYPE E OUTSIDE TOOTHED LOCK WASHER HEXAGON NUT CB SCREW PLANE WASHER OUTSIDE TOOTHED LOCK WASHER CUP SCREW

MATRIX PRINTER (5152)

FIGURE- INDEX NUMBER	PART NUMBER	DESCRIPTION
5 -	8529218	PRINTER MISC SPRINGS ---CONSISTING OF--- SPRING PIN LEAF SPRING LEAF SPRING PE LEVER SPRING HEADLOCK LEVER SPRING SCALE SPRING,LEFT SCALE SPRING,RIGHT PAPER HOLDING COVER SPRING ---****---
	8529219	PRINTER MISC PARTS ---CONSISTING OF--- BOARD SPACING PAPER GUIDE ROLLER GROMMET RUBBER DUMPER A RUBBER DUMPER B CORD BAND WIRE BAND ---***---

SECTION 5. LOCATIONS

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IBM 80 CPS MATRIX PRINTER

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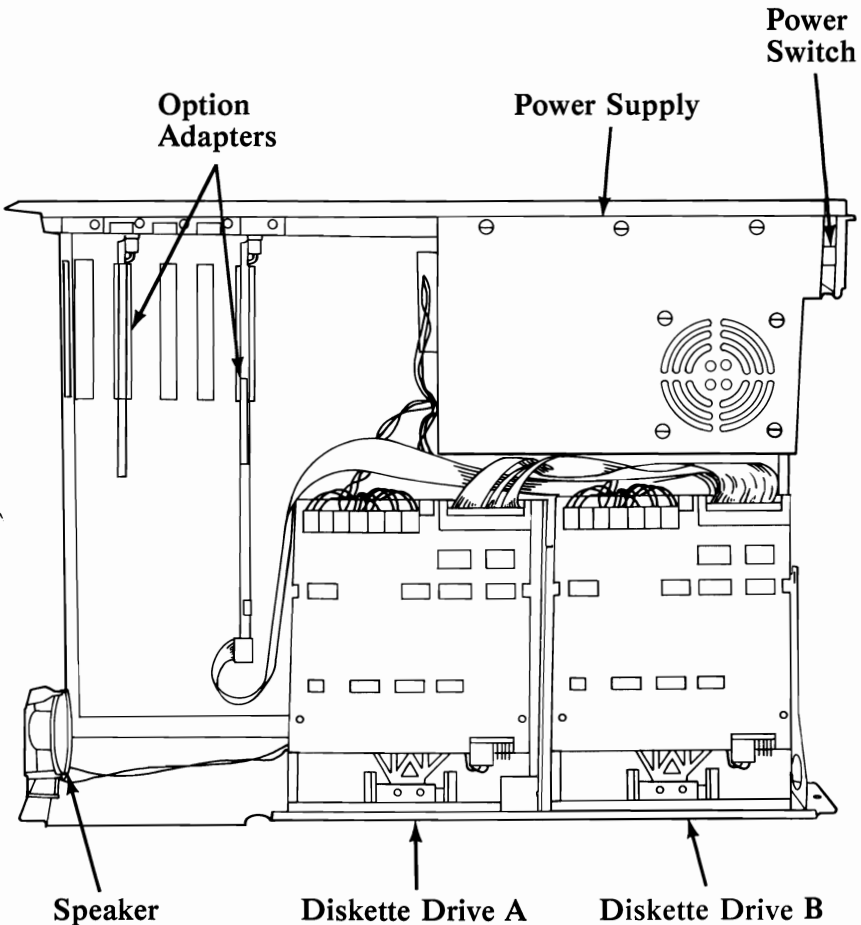
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SYSTEM UNIT

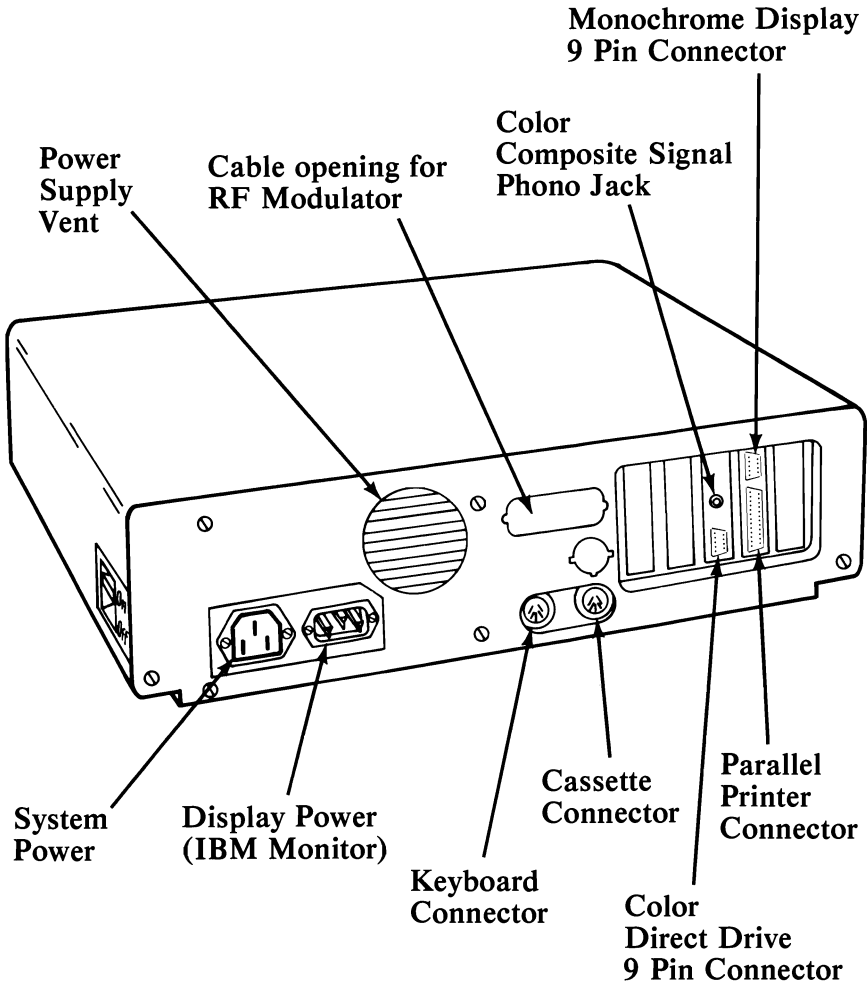
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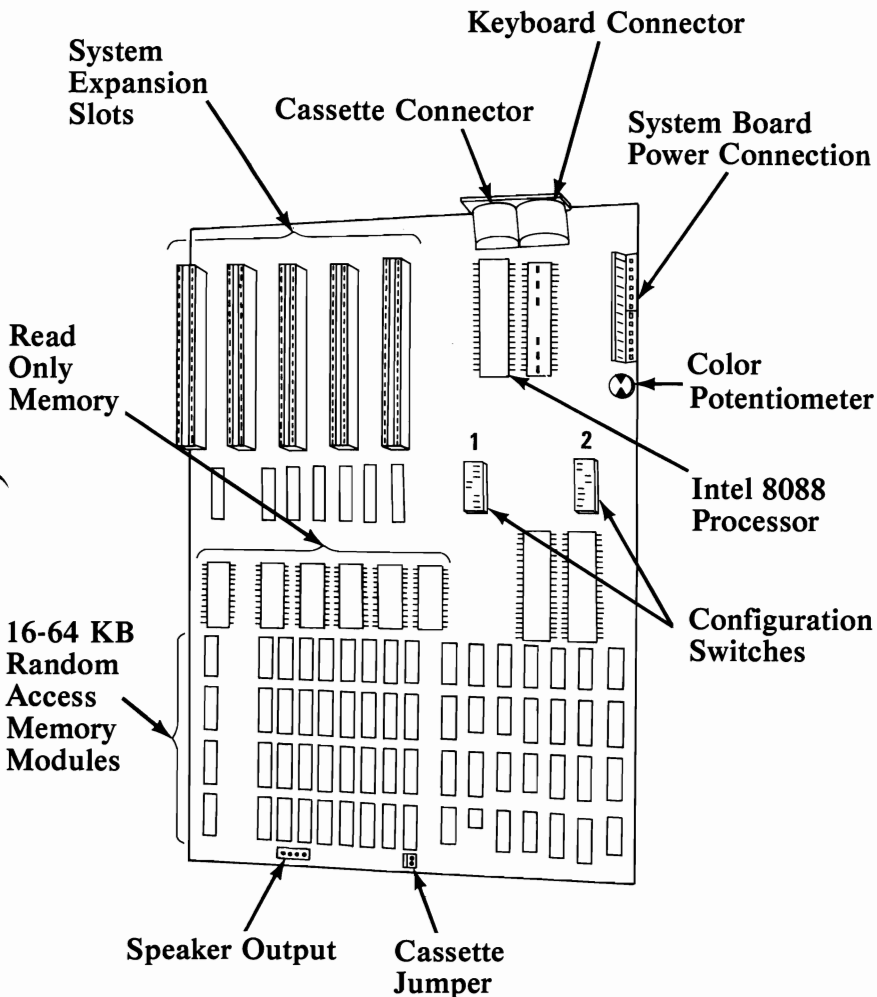


**SYSTEM UNIT
(TOP VIEW)**

System Unit (continued)



**SYSTEM UNIT
(REAR VIEW)**

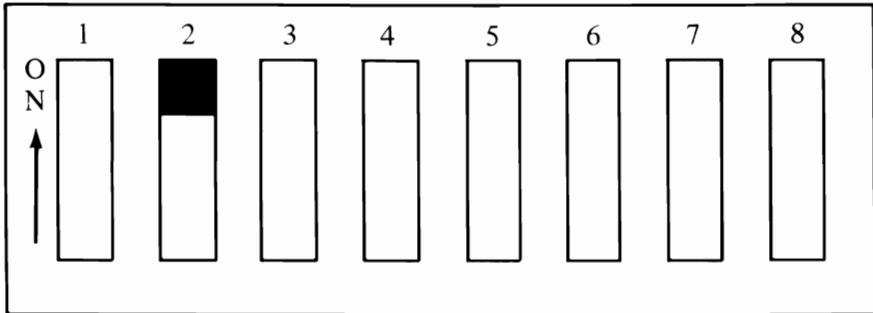


**SYSTEM BOARD
(TOP VIEW)**

Configuration Switch Settings

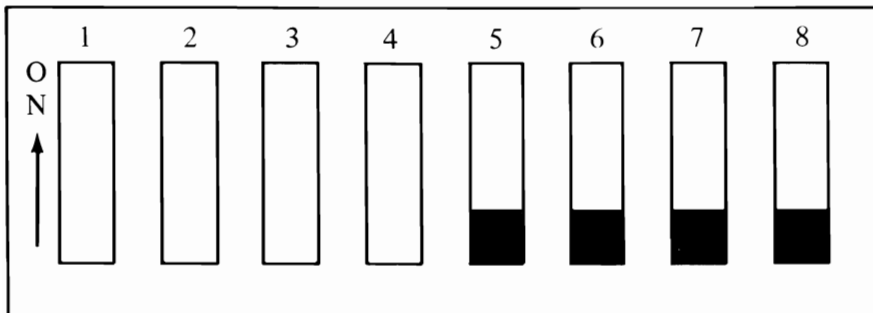
The illustrations on the following pages show the proper switch settings to reflect each system configuration. For the location of the configuration switches, see page 5-5.

SWITCH 1



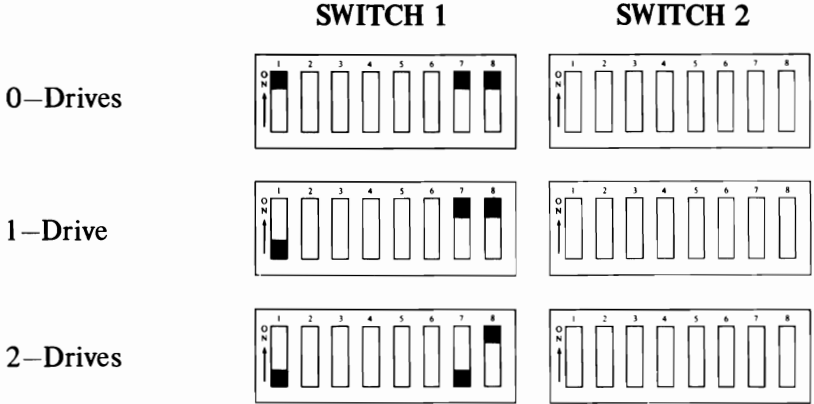
Position	Function
1-7-8	Number of 5¼" Diskette Drives Installed
2	Unused—must be on
3-4	Amount of memory on System Board
5-6	Type of monitor you are using

SWITCH 2

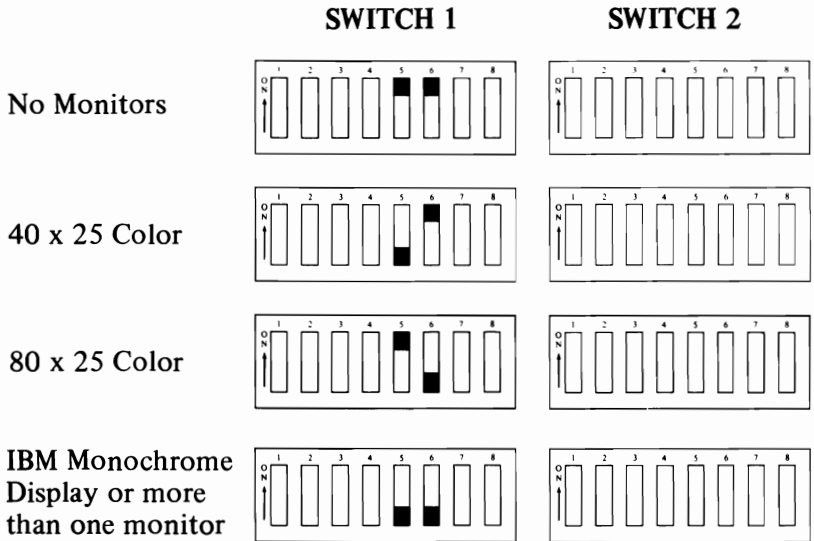


Position	Function
1-2-3-4	Amount of memory options installed
5-6-7-8	Always in the OFF position

Number of 5-1/4" Diskette Drives Installed



Monitor Type



Configuration Switch Settings (continued)

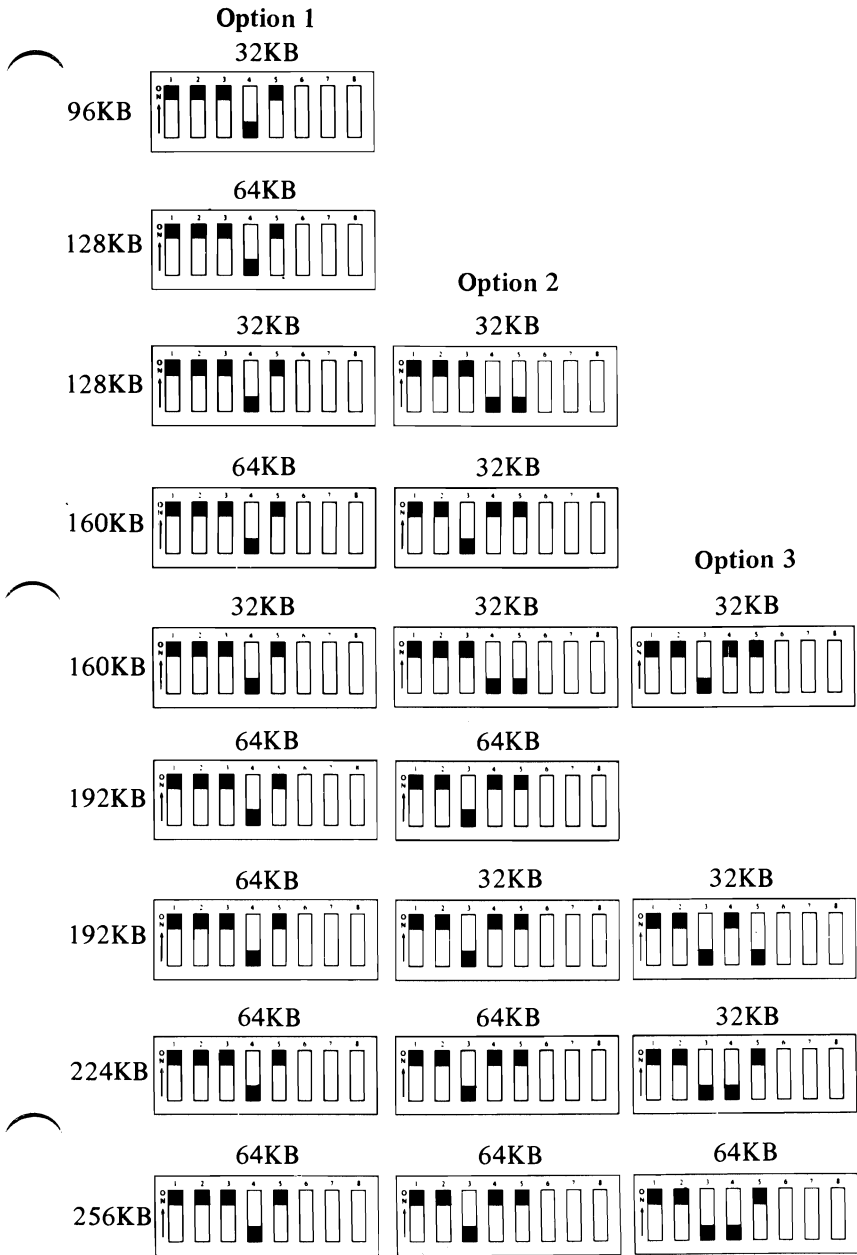
System Board Memory Switch Settings

	Switch 1	Switch 2
SYSTEM BOARD		
16KB		
32KB		
48KB		
64KB		
MEMORY OPTIONS		
96KB		
128KB		
160KB		
192KB		
228KB		
256KB		

Memory Expansion Options

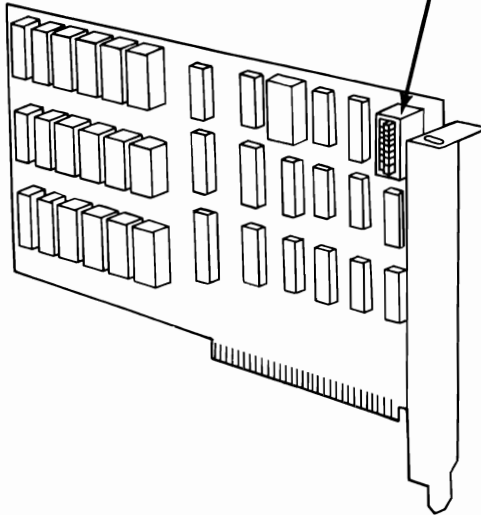
The following are switch settings on each Memory Expansion Option.

Note: Positions 6-7-8 always ON.



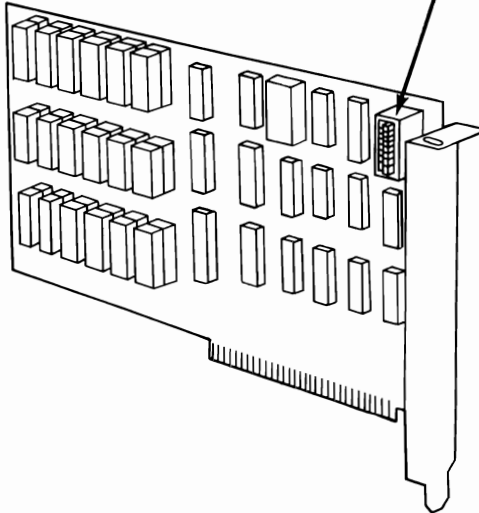
Option Adapters

Memory Configuration Switches

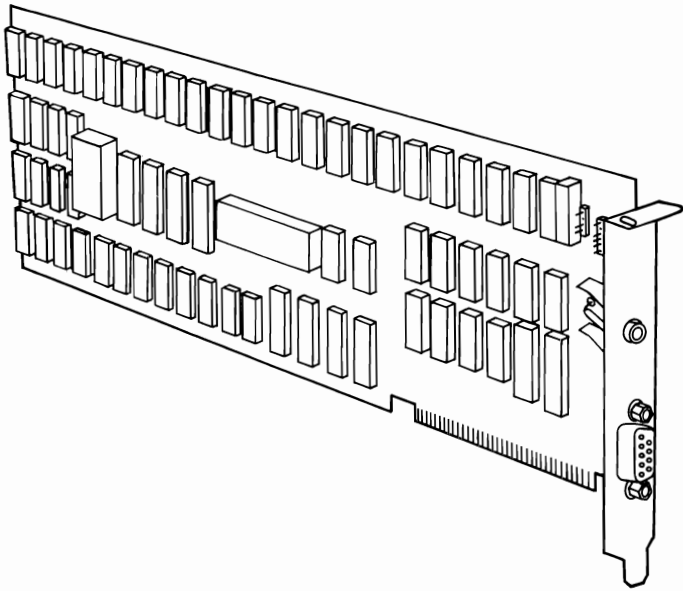


**32 KB MEMORY EXPANSION OPTION
(RIGHT VIEW)**

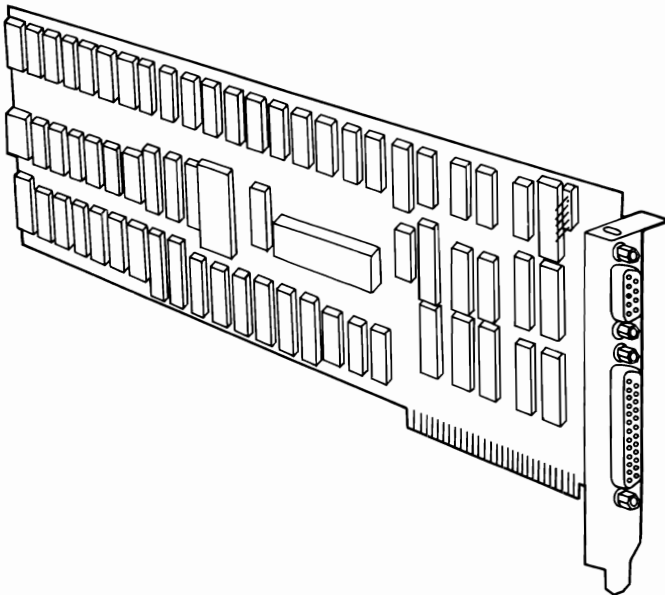
Memory Configuration Switches



**64 KB MEMORY EXPANSION OPTION
(RIGHT VIEW)**

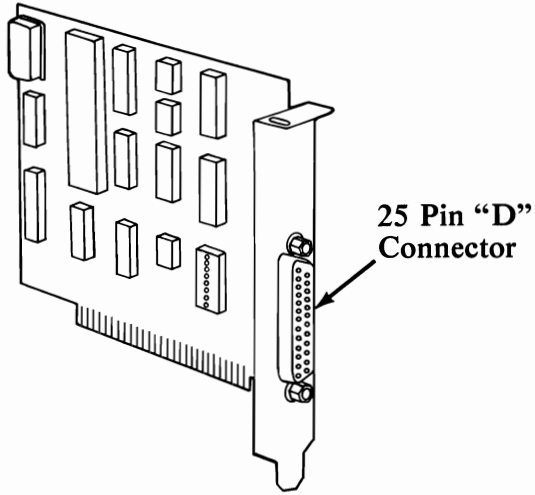


**COLOR/GRAPHICS MONITOR ADAPTER
(RIGHT VIEW)**

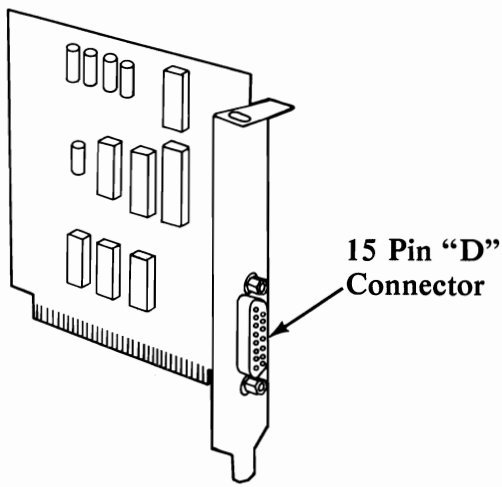


**IBM MONOCHROME DISPLAY AND
PARALLEL PRINTER ADAPTER
(RIGHT VIEW)**

Option Adapters (continued)

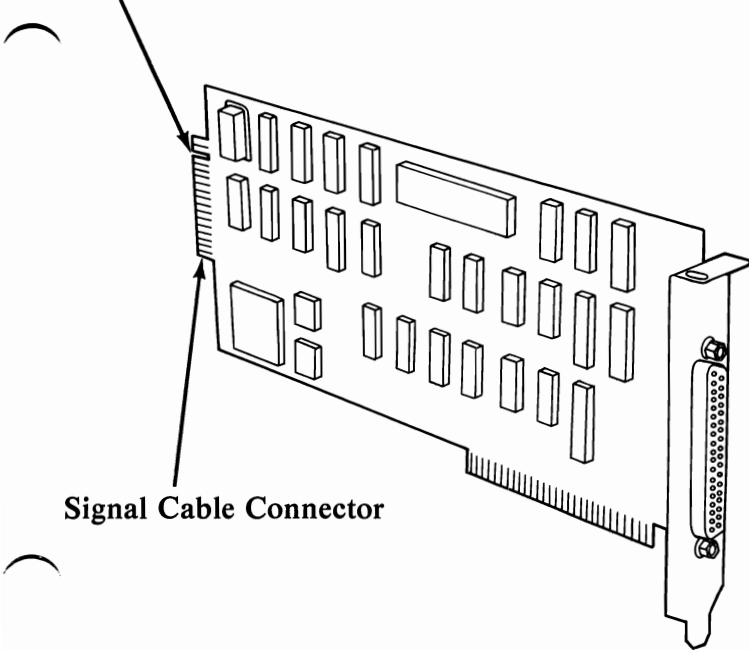


**ASYNCHRONOUS COMMUNICATIONS ADAPTER
(RIGHT VIEW)**



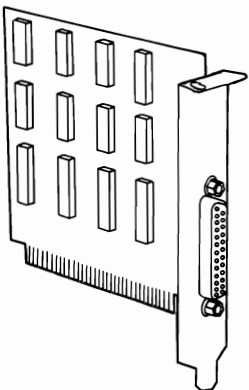
**GAME CONTROL ADAPTER
(RIGHT VIEW)**

Locating Key



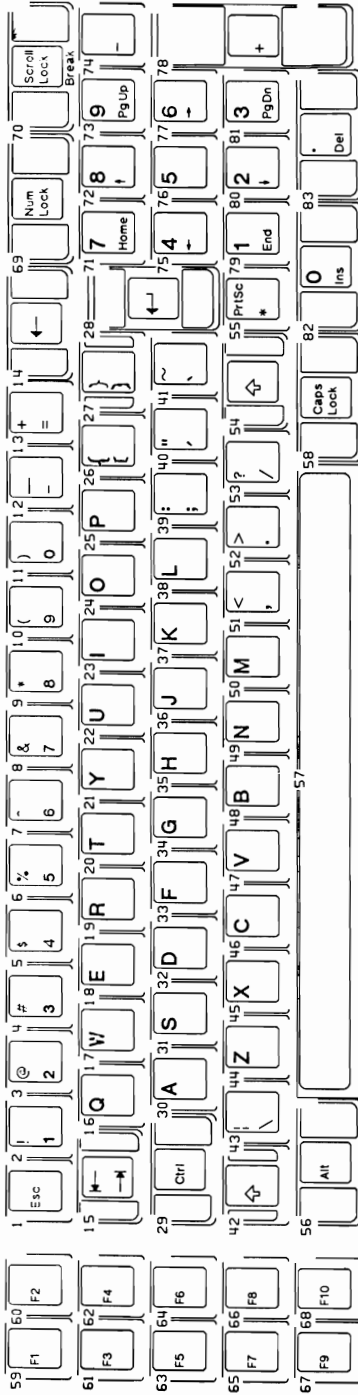
Signal Cable Connector

**DISKETTE ADAPTER
(RIGHT VIEW)**

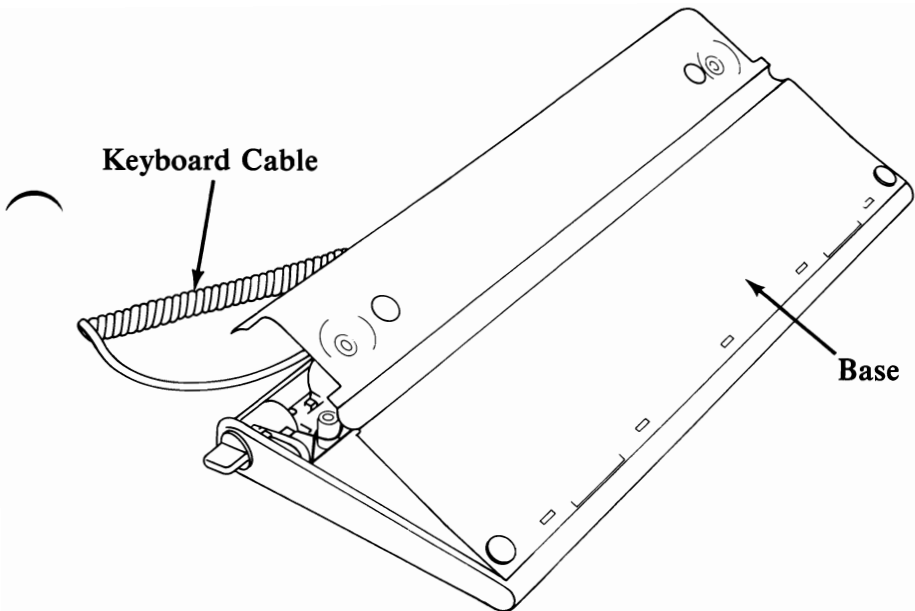


**PARALLEL PRINTER ADAPTER
(RIGHT VIEW)**

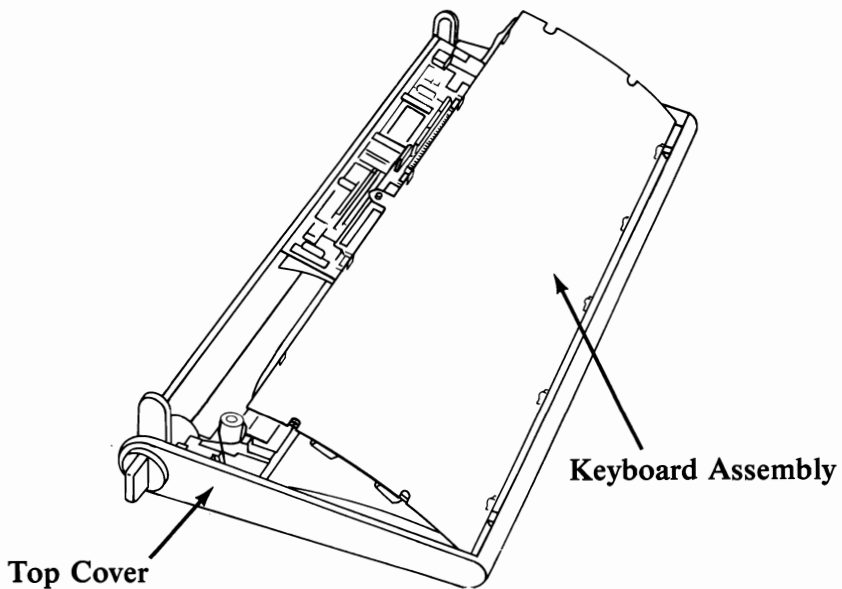
Keyboard



THE NUMBER TO THE UPPER LEFT DESIGNATES THE KEY POSITION IN THE PARTS CATALOG (SEE SECTION 4)

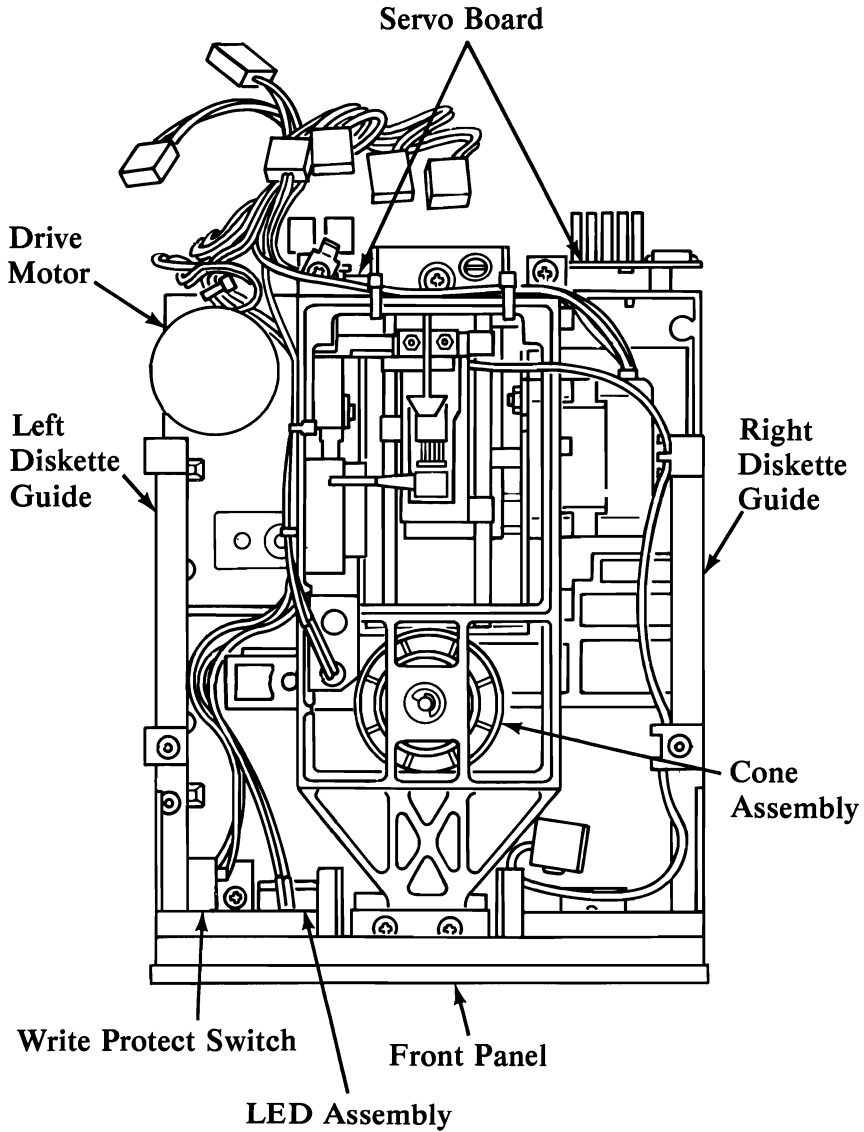


**KEYBOARD
(BOTTOM VIEW)**

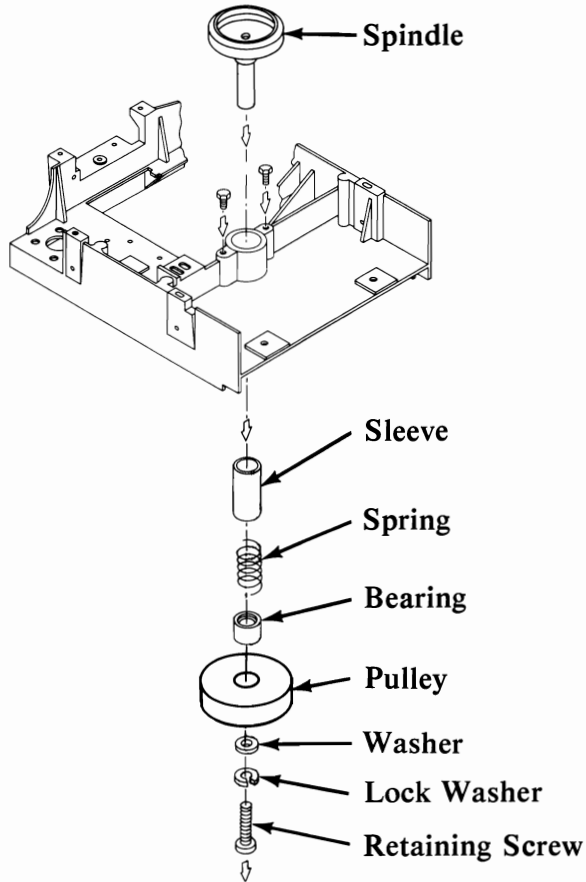
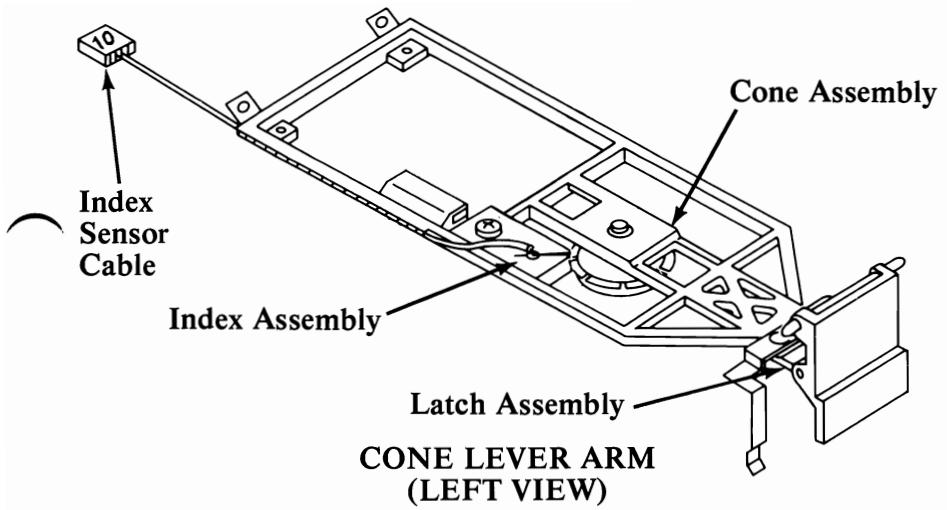


**KEYBOARD
(BOTTOM VIEW)**

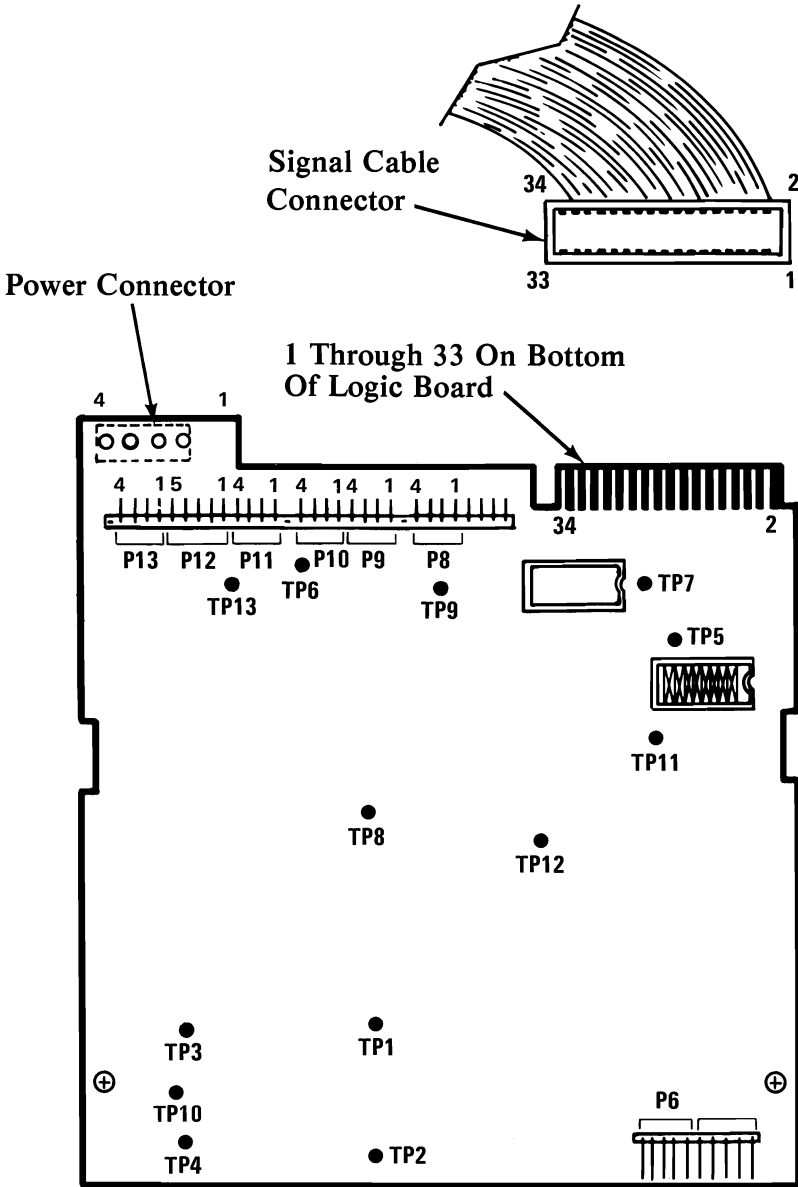
Diskette Drive



**DISKETTE DRIVE ASSEMBLY
(TOP VIEW)**



Diskette Drive (continued)



**LOGIC PRINTED CIRCUIT BOARD
(TOP VIEW)**

IBM 80 CPS Matrix Printer

Power Transformer
Primary Cable

Fuse

**FUSE-FILTER CARD
(RIGHT VIEW)**

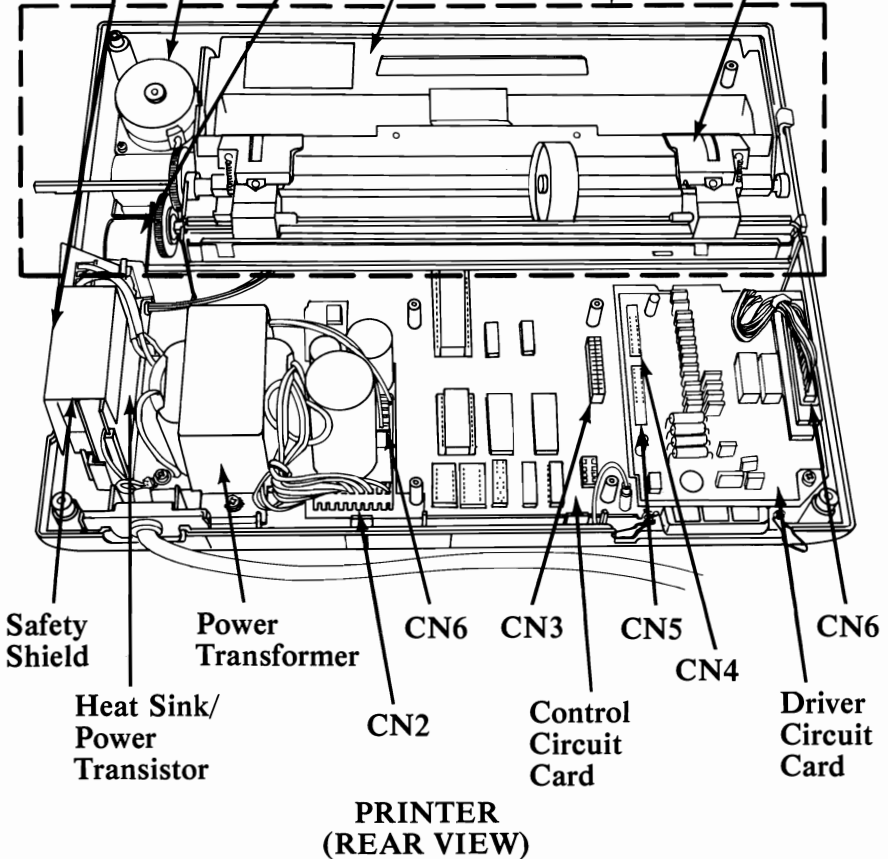
Carriage
Motor

Forms
Feed
Motor

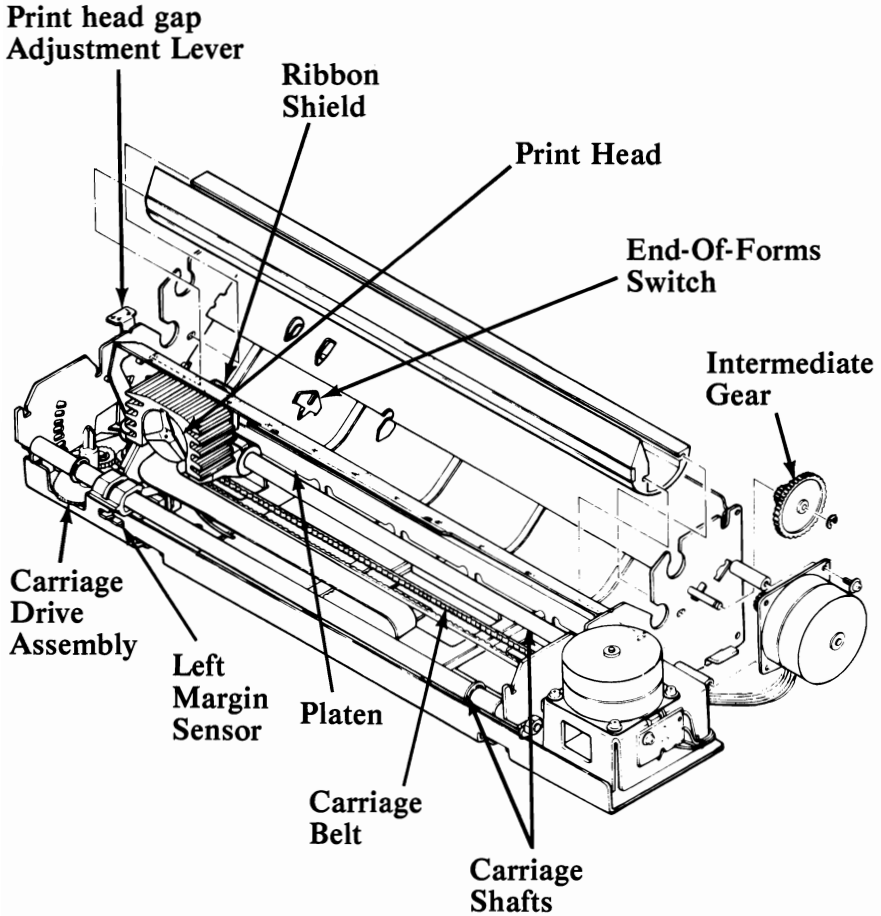
Ribbon
Cartridge

Print
Mechanism
Assembly

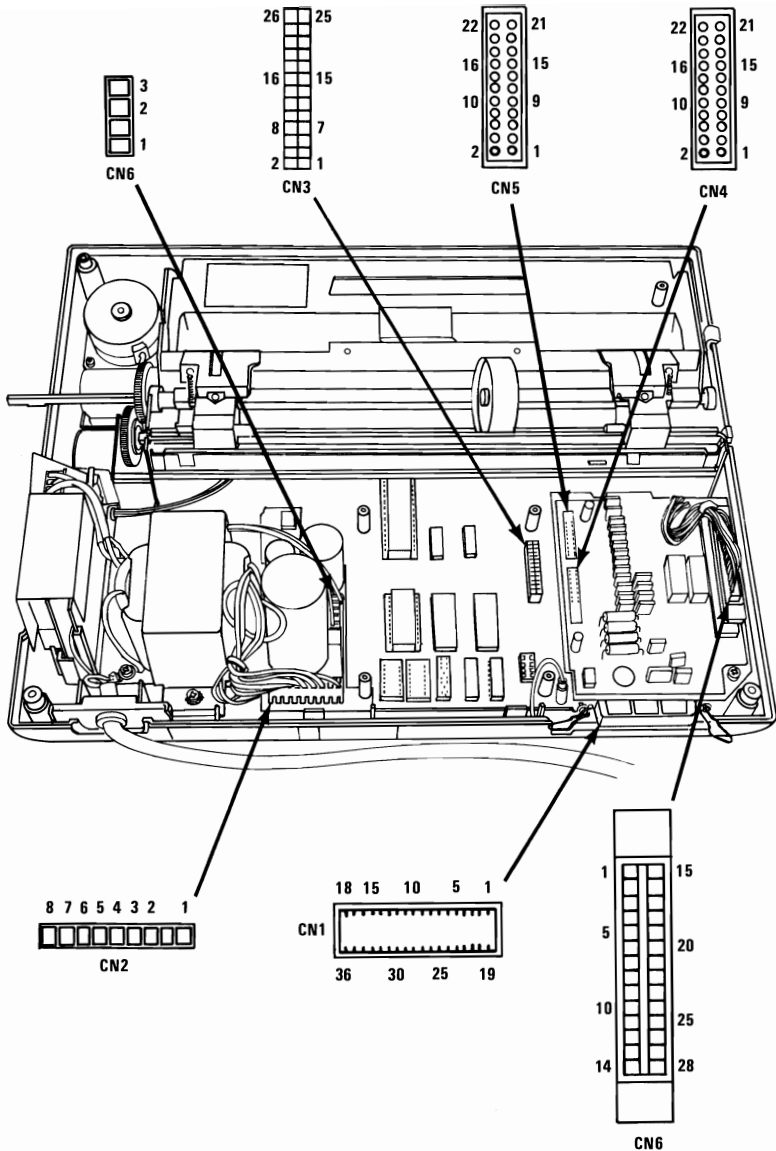
Forms
Tractor



Printer (continued)

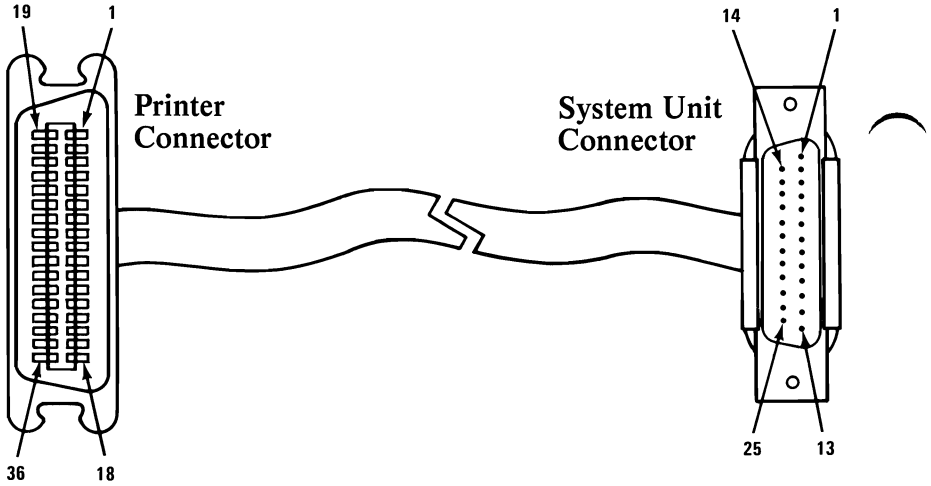


**PRINT MECHANISM ASSEMBLY
(FRONT VIEW)**



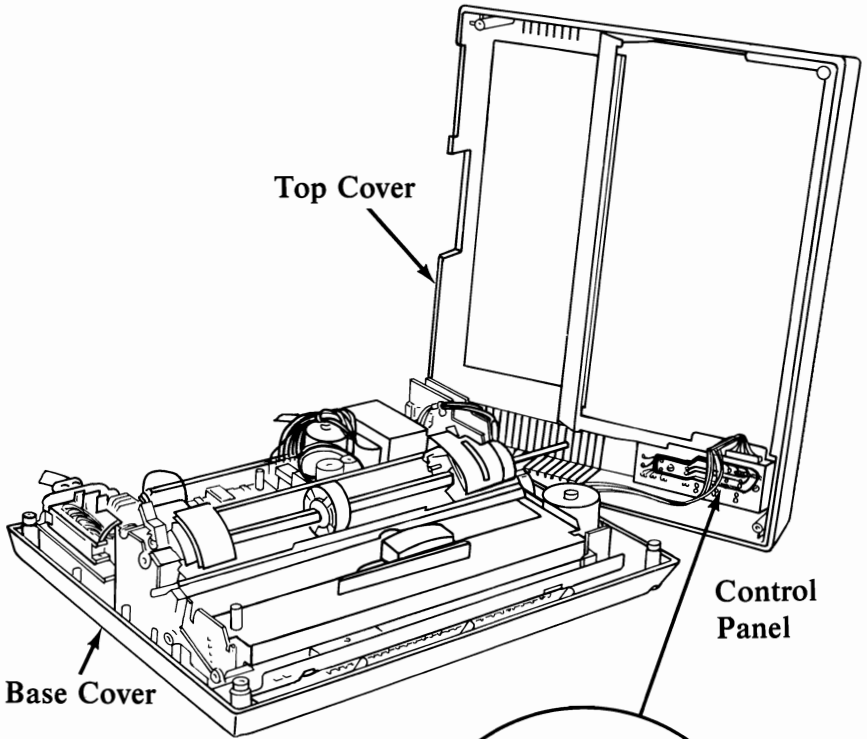
**PRINTER
(REAR VIEW)**

Printer (continued)

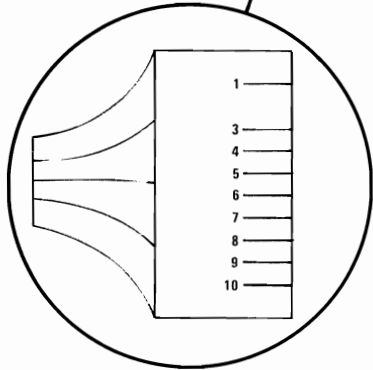


PRINTER SIGNAL CABLE

PRINTER CONNECTOR PIN NUMBER	SYSTEM UNIT CONNECTOR PIN NUMBER
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
32	15
31	16
36	17
33	18
19	19
21	20
23	21
25	22
27	23
29	24
30	25



**PRINTER
(TOP VIEW)**



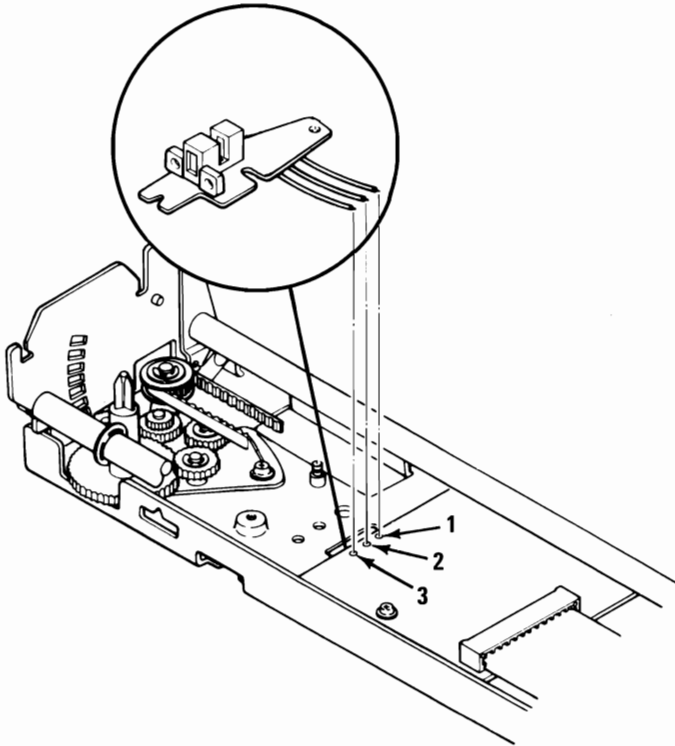
CONTROL PANEL CONNECTOR

PIN	NAME
1	Online Light
2	Key
3	No Paper Light
4	Ready Light
5	Online Switch
6	Forms Feed
7	Line Feed
8	Ground
9	+12 Vdc
10	Alarm

Printer (continued)



**PRINT HEAD AND CABLE
(REAR VIEW)**

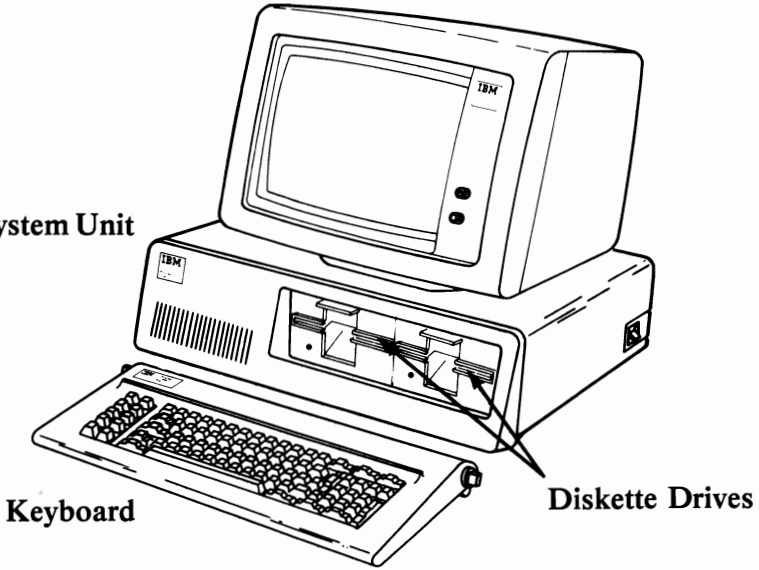


**LEFT MARGIN SENSOR
(FRONT VIEW)**

SECTION 6. PREVENTIVE MAINTENANCE (PM)

IBM Monochrome Display

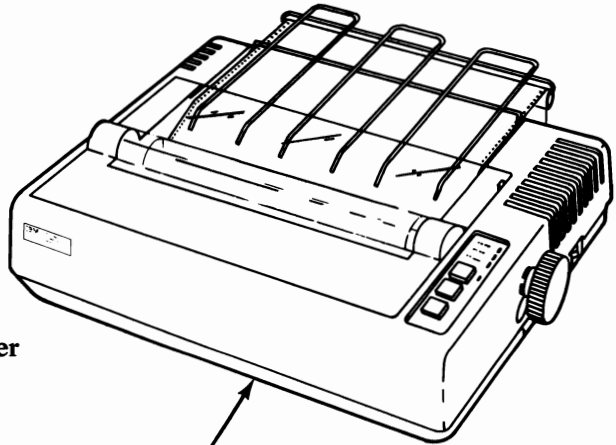
System Unit



Keyboard

Diskette Drives

IBM 80 CPS
Matrix Printer

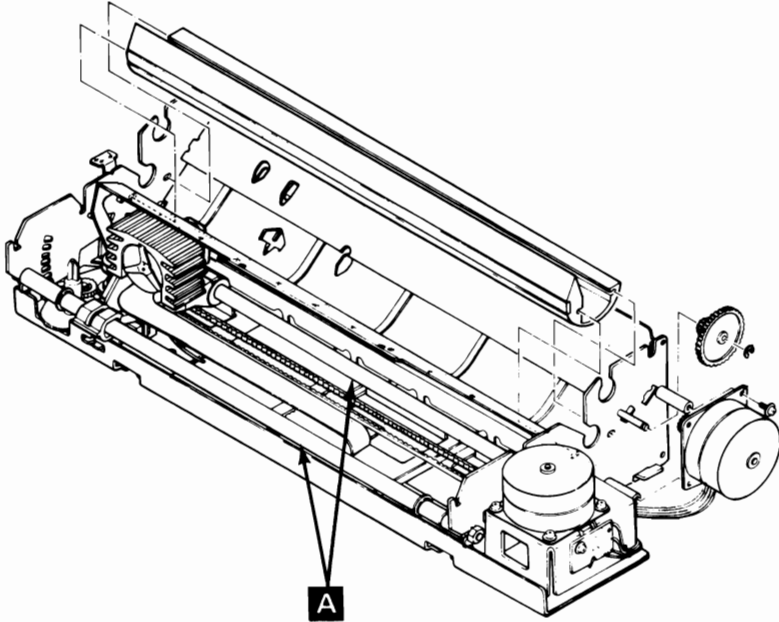


**THE ONLY AREA OF THE
SYSTEM THAT REQUIRES PM.**

IBM 80 CPS Matrix Printer

Apply a coat of oil to the print head carriage shafts **A** during every service activity.

Lubricant -- IBM #10 Oil - PN 1280554 -- 4 oz. (or equivalent)
PN 1280444 -- pint.



SECTION 7. RESERVED



Notes:



SECTION 8. GLOSSARY

Terms

ADVANCED DIAGNOSTICS (Cassette/Diskette): A cassette or diskette used by service personnel to diagnose hardware problems.

ASYNCHRONOUS COMMUNICATION: A communication mode in which each single byte of data is synchronized, usually by the addition of start/stop bits.

BASIC (Beginner's All-purpose Symbolic Instruction Code) (SC1) A programming language with a small repertoire of commands and a simple syntax, primarily designed for numerical applications.

JOY STICK: In computer graphics, a lever that provides coordinate data of a display surface. The coordinate data may be used to control operations such as the movement of one or more display elements.

LIGHT PEN: In computer graphics, a photosensitive stylus used to identify display elements or to detect the light generated within an aiming symbol.

WRAP PLUG: A connector which directly connects the input and output lines of an adapter for testing purposes.

Abbreviations

- AC:*** alternating current
- CPS:*** characters per second
- CRU:*** customer replaceable unit
- FRU:*** field replaceable unit
- KB:*** kilo-byte
- MIN:*** minimum
- MAX.*** maximum
- PM:*** preventive maintenance
- PIC:*** problem isolation chart
- Vac:*** volts alternating current
- Vdc:*** volts direct current

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Parts 4-18

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Parts 4-19

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Replacement 3-97

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