IBM

Displaywriter System

Product Support Manual

IBM 6360 Diskette Unit
IBM 6580 Display Station

PREFACE

This manual is written for use by experienced US and World Trade service personnel. Refer to other product publications if additional information is needed.

The display formats shown in this manual are subject to minor changes due to software improvements. Future versions of this manual will reflect any changes.

Where applicable, component locator drawings, adjustments, and other service aids are given by module. This manual is in seven sections.

Where applicable, component locator drawings, adjustments, and other service aids are given by module. This manual is in nine sections.

The 25-Line Display, Large Display, Keyboard, and Diskette sections contain service information, adjustments, and removal/replacement procedures. In the diskette section, the type 2D head is shown only when it is necessary for adjustments or removal.

The Display, Keyboard, and Diskette sections contain service information, adjustments, and removal/replacement procedures.

The System Electronics/Power Supply section contains service information and removal/replacement procedures.

The Cables, Connectors, and Test Points section helps locate test points in the system. Point to point wiring is shown for tracing wires and voltages through the system.

The Diagnostics section gives a summary of the diagnostic package. Charts and flowcharts provide reference information for operating procedures and test results.

More detailed descriptions and operating instructions are provided for the diagnostic procedures that are not self-explanatory. The display formats that require interaction, and are not self-explanatory, are described.

The Intermittent Problem Diagnostic Approach section is a guide to help service personnel solve intermittent system problems. These procedures should be used only after MAPs have failed to isolate the problem.

The Operating Instructions section lists some of the basic menu sequences available to the operator. These menus permit the operator to perform tasks and functions that are available in the IBM Licensed Program Textpack 1. Since customer applications, menu sequences, and basic system operation are a result of software programs, the most current Operator Reference Guide should always be used as a reference source for system operation or function.

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The drawings and specifications contained herein shall not be reproduced in whole or in part without written permission.

IBM has prepared this maintenance manual for the use of IBM Customer Engineers in the installation, maintenance and repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

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SAFETY PRECAUTIONS

All IBM Customer Engineers are expected to take every safety precaution possible and observe the following safety practices when servicing IBM equipment.

Mechanical Safety:

1. *Safety glasses must be worn.*
2. *All safety devices, such as guards, shields, signs, ground wires, etc., must be restored after maintenance. When a guard or shield is removed to observe or make an adjustment, that shield must be replaced when work in the area is completed.*
3. *Watches, rings, necklaces, ID bracelets, etc., must be removed when servicing the machine.*
4. *Care must be used when working near moving parts. Keep hair away from moving parts. Avoid wearing loose clothing that might be caught in the machine. Shirt sleeves must be kept buttoned or rolled above the elbows. Ties must be tucked in the shirt or have a tie clasp approximately three inches from the end. Tie chains are not recommended.*

Electrical Safety:

1. *The equipment referenced in this manual may use high voltages. Check voltage labels!*
2. *Safety glasses must be worn when checking energized circuits.*
3. *If a circuit is disconnected for servicing or parts replacement, it must be reconnected and tested before allowing the use of the machine.*
4. *Power should be removed from the machine for servicing whenever possible. Remember, when checking voltages, avoid contacting ground potential, such as metal floor strips, machine frame, etc.*
5. *Meter continuity checks should be used instead of voltage checks whenever possible.*
6. *Do not apply power to any part, component, or subassembly when it is not physically mounted in the machine, or its approved service position.*

General Safety:

1. *Each Customer Engineer is responsible to be certain no action on his/her part makes the product unsafe or exposes customer personnel to hazards.*
2. *Store the removed machine covers in a safe, out of the way place where no one can trip over them.*
3. *If you must leave the machine in a down condition, always install the covers and disconnect the power before leaving the customer's office.*
4. *Always place CE tool kit away from walk areas where no one can trip over it.*
5. *Maintain safe conditions in the area of the machine while performing and after completing maintenance.*
6. *Before starting the equipment, make sure fellow CEs and customer personnel are not in a hazardous position.*
7. *All the machine covers must be in place before the machine is returned to the customer.*

Note: *Refer to the Safety CEMs relating to this product(s) for further safety precautions.*

DIAGNOSTICS (Continued)

CAUTION
Do not remove the display covers. Operating voltages up to 14,000 volts are present inside the display. No bleeder resistor is provided.

SERVICE AIDS

The display module is a field replaceable unit (FRU) which is not field serviceable.

The raster is a normal background image on the display screen which is visible when the brightness control is turned up (clockwise) all the way.

A blank screen or blank area of the screen may not be a problem in the display module. The problem may be a change in or a loss of the input signals.

NOTE: When a displayed character is changed an "after image" will remain for a short time.

Contrast

Brightness
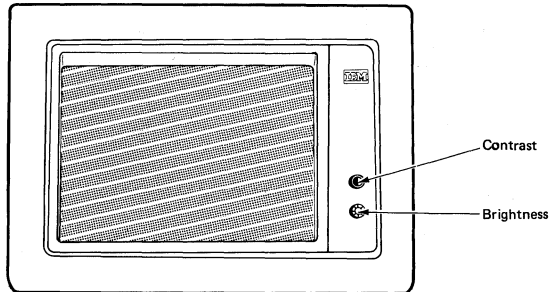
Display Raster

1

0 1 2 3 4 5 6 7 8 9 A B C D E F

2

0 1 2 3 4 5 6 7 8 9 A B C D E F

Display Fonts

DISPLAY

1. Turn the system power off.

2. Disconnect the system AC power cord.

3. Disconnect the display connector from the electronics module Panel 1.

4. Lift the display module up, releasing the interlock.

5. Pack the display in a display packing box.

CAUTION

Do not transport the display module unless it is suitably packed. The display may burst inward if broken.

Interlock
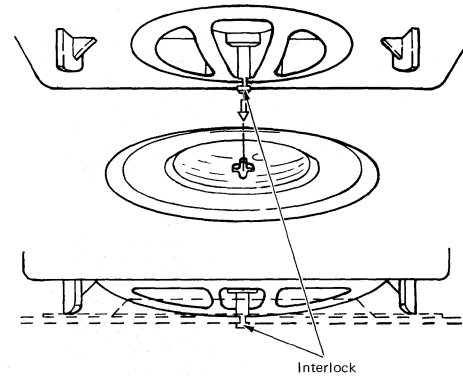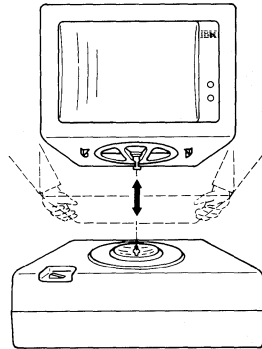
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LARGE DISPLAY

DANGER

Operating voltages of up to 17,000 volts are present inside the large display. A bleeder circuit is provided. However, you must wait at least 10 seconds after power is turned off for the voltages to reach a safe level (less than 60 volts). Follow all normal safety precautions.

SAFETY

Whenever the rear cover is removed from the large display, ALWAYS ensure that the CRT (Cathode Ray Tube) ground spring is in place, and that it is connected to the CRT socket ❶. Do this before any type of service is performed.

Use the CRT Anode Discharge Procedure whenever continuity checks are made, and during removal/replacement procedures. This will ensure that no high voltage is present.
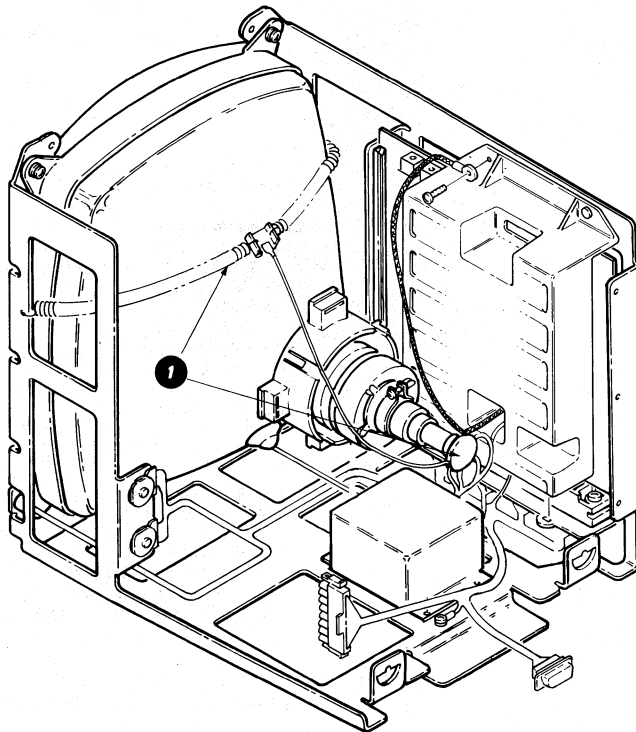
CRT ANODE DISCHARGE PROCEDURE

1. Turn the system power off, and disconnect the system AC line cord from the wall outlet.

2. Wait 15 seconds.

3. Perform the rear cover removal.

4. Perform the low voltage power supply removal.

5. Use an alligator clip to connect the plug end of a Fluke* meter lead to the display mainframe.

6. Push the probe end of the meter lead under the boot on the anode ❶. Visually ensure that the probe tip touches the metal prongs on the anode lead.

7. Remove the probe from the anode, and ensure that the boot is securely seated against the surface of the CRT ❷.

CAUTION
Even though this safety procedure is used, if the anode lead is disconnected from the CRT, the CRT may slowly recharge. Make sure you discharge the anode hole in the CRT:
.   Every 5 to 10 minutes
.   Before connecting the anode lead to the CRT
.   When installing a new mainframe assembly or high voltage power supply.

* Trademark of John Fluke Manufacturing, Inc.

Rear Cover

Front Cover

Bezel

Low Voltage Power Supply

LV1 Display Indicator Ø

LV2 (DC out)

LV3 (AC in)

CRT Ground Spring

CRT Socket

Display Indicators

0 1 2

Connector 8 AC Power Outlet

Connector 2 Display Signal Cable

High Voltage Power Supply

Brightness Control Knob

Display AC Cable

J301 and J302

Width Control R106

Height Control R203

Analog Card

J502

J501

J4

Connector Strip

J1

Display Mainframe

* Pot 2

* Pot 1

CRT Anode Lead

Yoke

* Sealed Pots (Do Not Adjust)

DANGER
Operating voltages of up to 17,000 volts are present inside the large display. A bleeder circuit is provided. However, you must wait at least 10 seconds after power is turned off for the voltages to reach a safe level (less than 60 volts).

SERVICE AIDS

The raster on the display screen is a normal display which is usually visible when the brightness control is turned up (clockwise) all the way.

A blank screen or blank area of the screen may not be a problem in the display module. The problem may be a change in or loss of the input signals.

NOTE: When a displayed character is changed, an "after image" remains for a short time.

Operator Control
(Brightness)
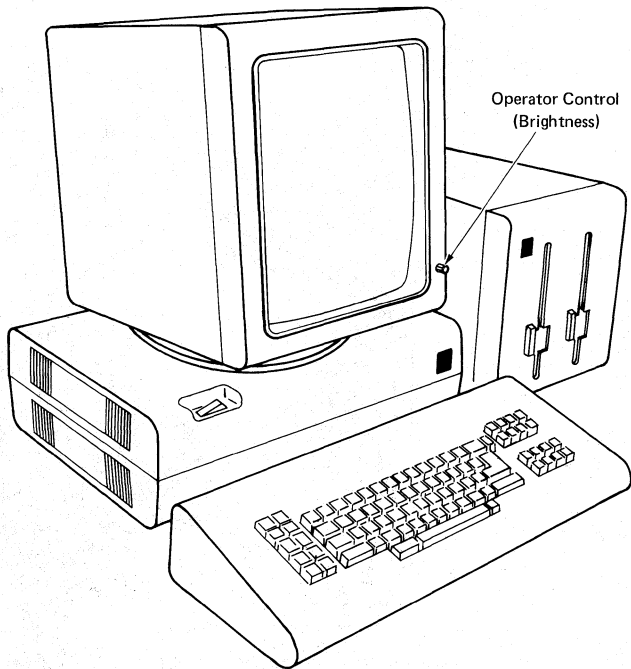
DISPLAY INDICATORS

There are three display indicators on the back of the display module. They are:

0 = Low Voltage Power Supply (LED)
1 = High Voltage Power Supply (Neon)
2 = Horizontal Beam Deflection Circuit (Neon)

These indicators show the operating condition of the two power supplies and the circuit.

If an indicator is ON (glowing), it indicates correct operation.

If an indicator is OFF, it indicates a problem.

The problem may be caused by one or more of the following:
.   Loose or defective indicator lamp
.   Loose or defective cable or plug
.   Defective Low Voltage or High Voltage Power Supply
.   Defective Analog Card

NOTE: Loss of horizontal   beam deflection causes both indicators 1 and 2 to be OFF.

Display Indicators

0 1 2

Electronics Module

Large Display

Microprocessor on the System Card moves data from the Memory Card

Display Adapter Card

Display Buffer (RAM)

(Controls logic and character generator)

Bright

Video

Vertical Sync

Horizontal Sync

Analog Card

CRT
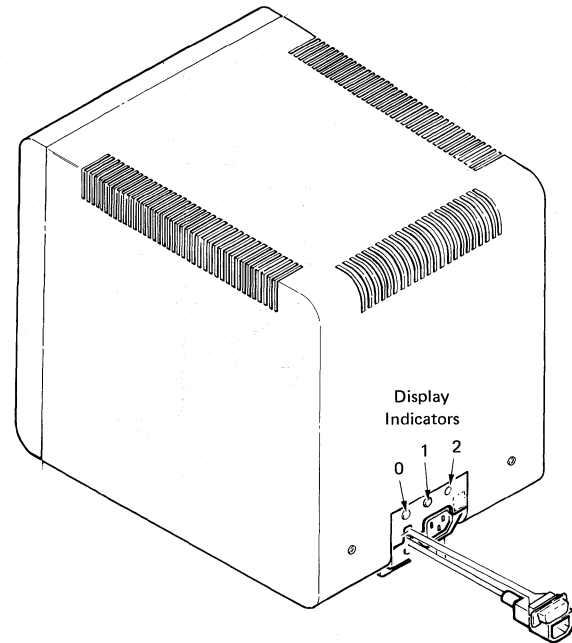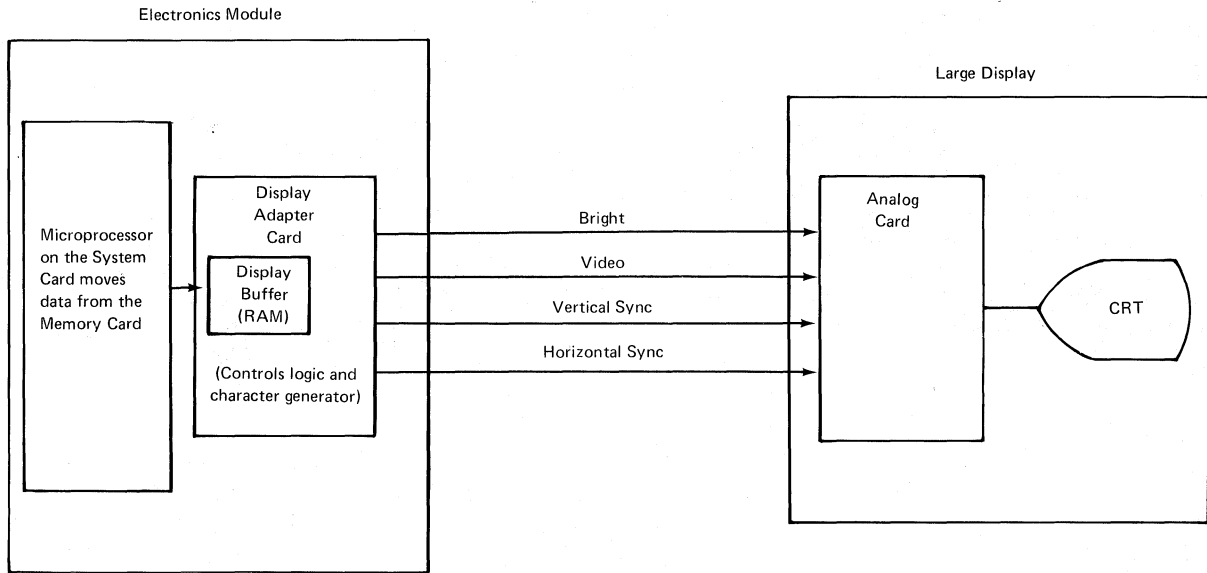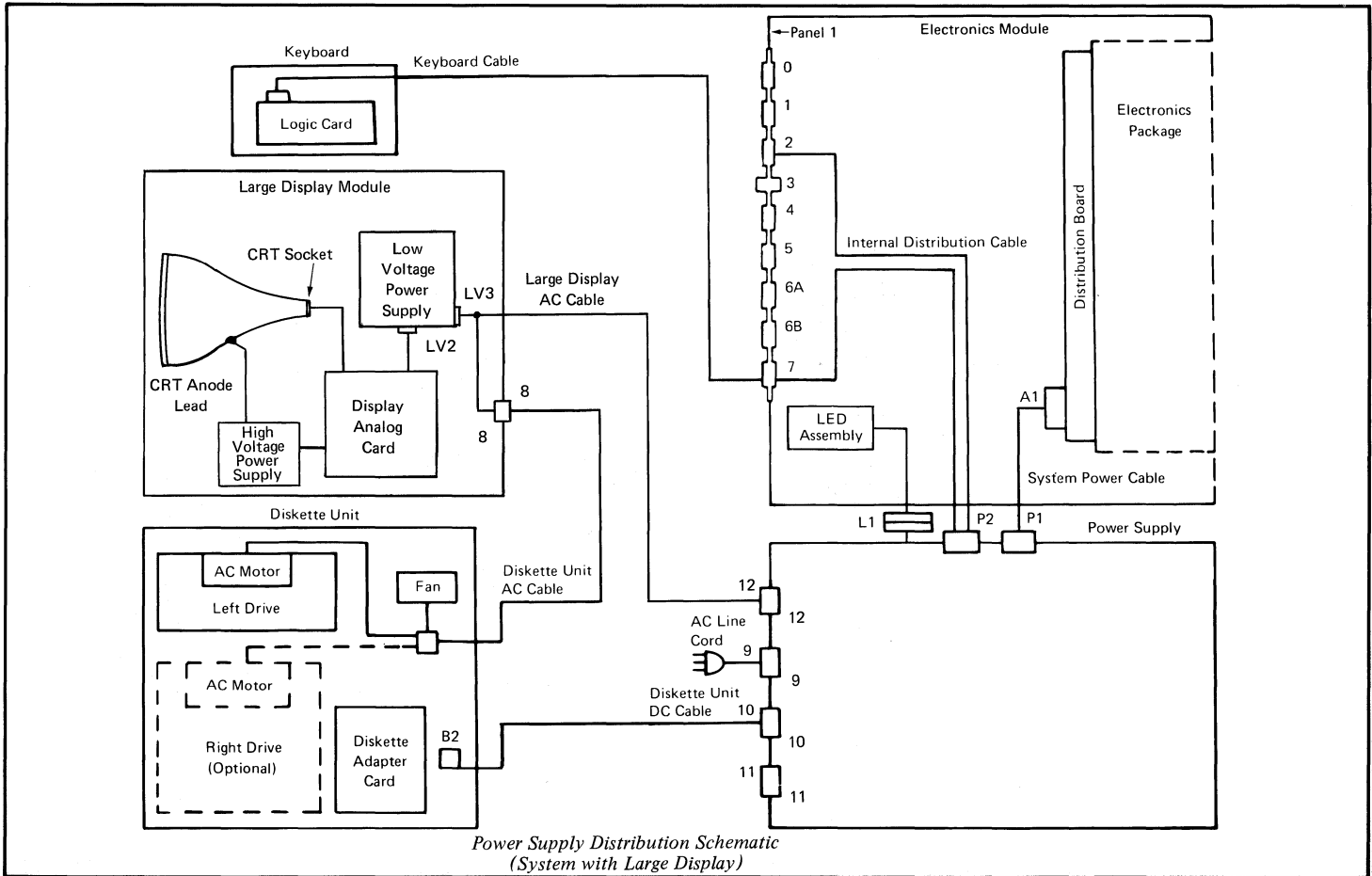
Power Supply Distribution Schematic
(System with Large Display)
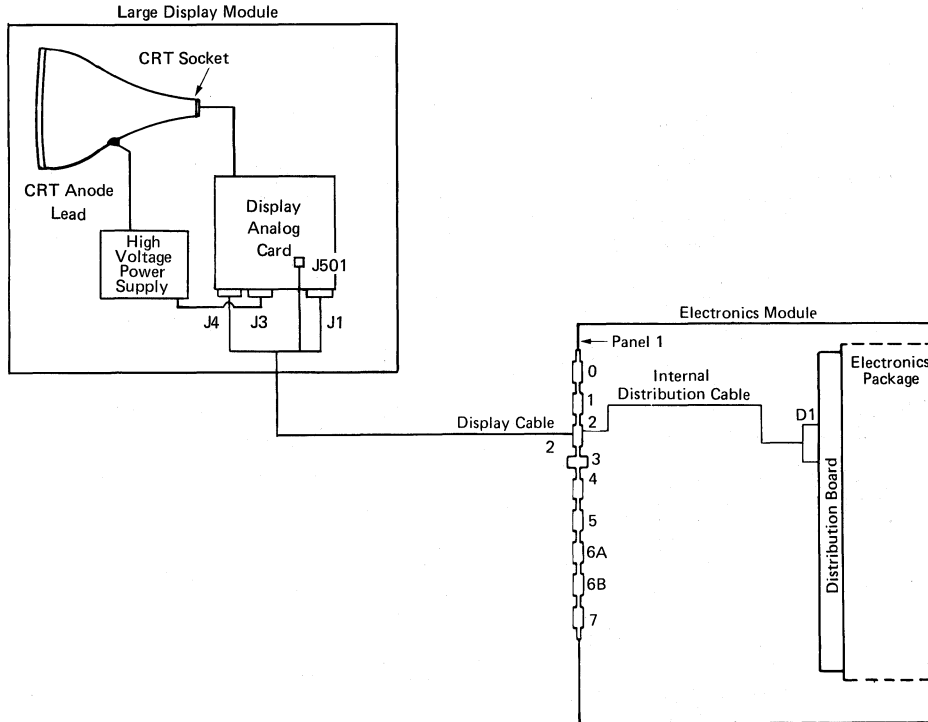
Signal Distribution Schematic

Grounding Points

①	Ground Spring on CRT to CRT Socket Pin 5
②	(AC) LV3-2 to Frame Ground
③	(AC) Connector 8 Ground to Frame Ground
④	(AC) Display Power Cable Ground to Frame Ground
⑤	Connector 2 Pin 8 to Frame Ground
⑥	Connector J1-17, 19, 21, and 23 to Frame Ground
⑦	Shield (for Video Output wires) to Frame Ground
⑧	(World Trade Only) Low Voltage Power Supply to Frame Ground

Connector 8
(AC out)

Display Power Cable
(AC in)
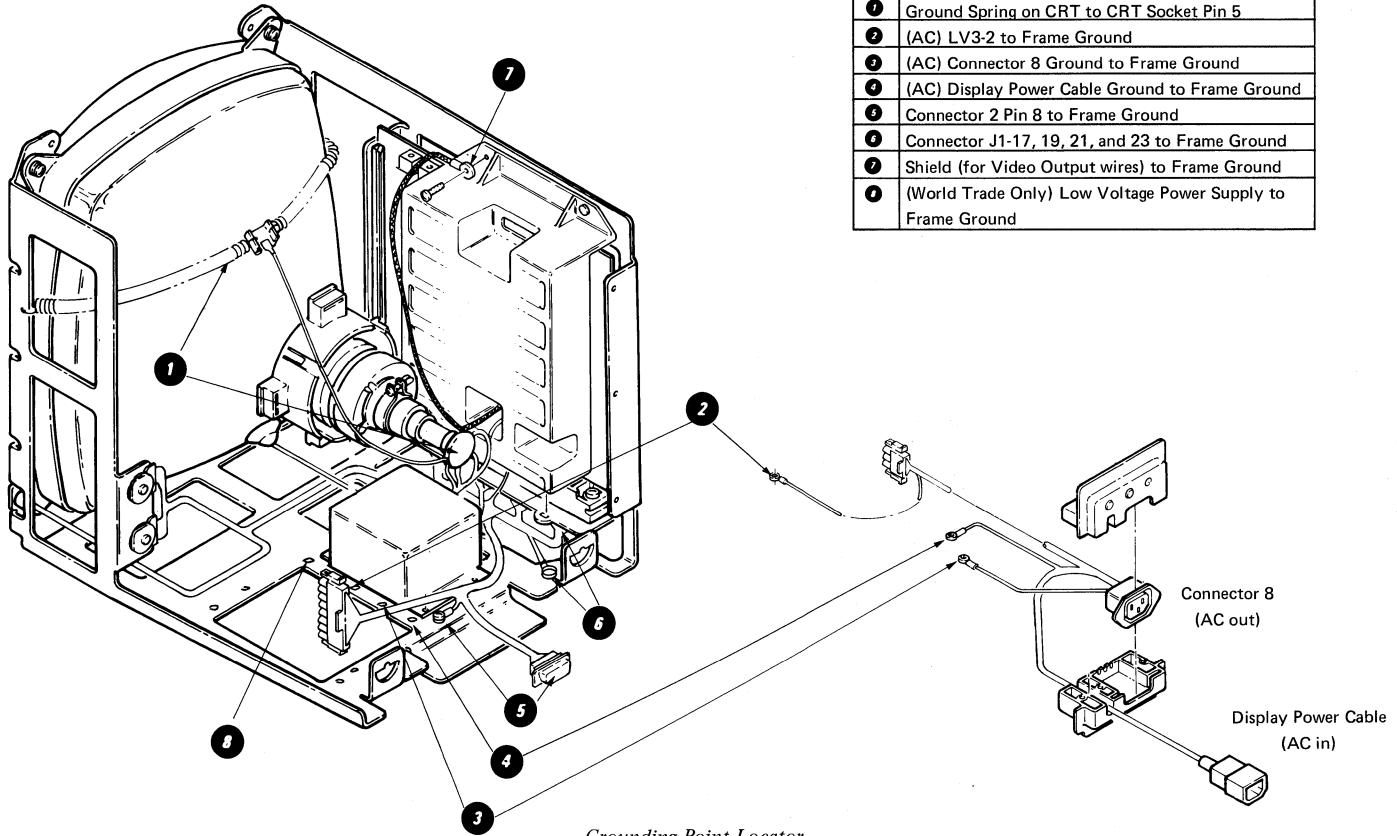
Grounding Point Locator

IMAGE SIZE ADJUSTMENT

1. Turn the system power off.

2. Perform the rear cover removal.

3. Turn system power on, load the CE Diagnostic Diskette, and select UTILITIES.   Press ENTER.

4. Select DISPLAY from the Group Selection Menu.

   Press ENTER.

5. Select TEST PATTERN. Press ENTER.   (The H test pattern should appear on the display screen.)

6. Turn the adjustment screws on R106 and R203 fully counterclockwise to make the image on the screen the minimum size.

WARNING: Use care in the following steps. Component damage may occur if the image size is increased to where the edges or corners of the image extend beyond the inside edge of the display screen bezel.

7. Adjust R203 to increase the image height until the sum of the dimensions V and V' is 20 to 25 mm (0.8 to 1.0 inches).

8. Adjust R106 to increase the image width until the sum of the dimensions H and H' is 20 to 25 mm (0.8 to 1.0 inches).

NOTE: If the image is noticeably off-center on the screen, use the Image Centering Adjustment to correct the problem.

R106 controls width
R203 controls height

Inside Edge of Bezel

V

Edge of Pattern after Size Adjustments

Edge of Pattern with Image Size Adjusted for Minimum

H

H'

V'
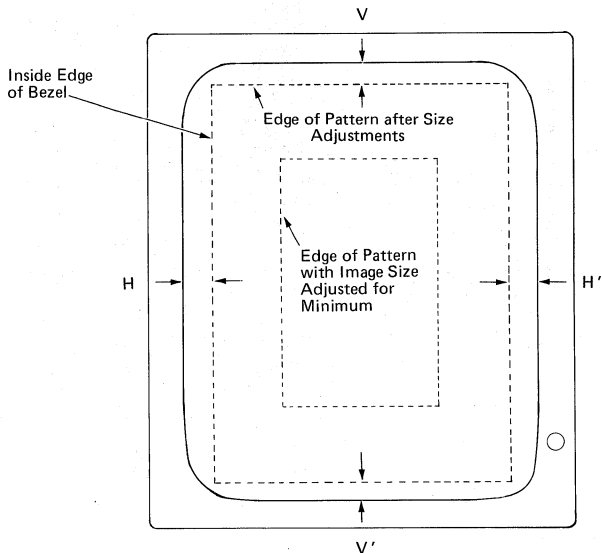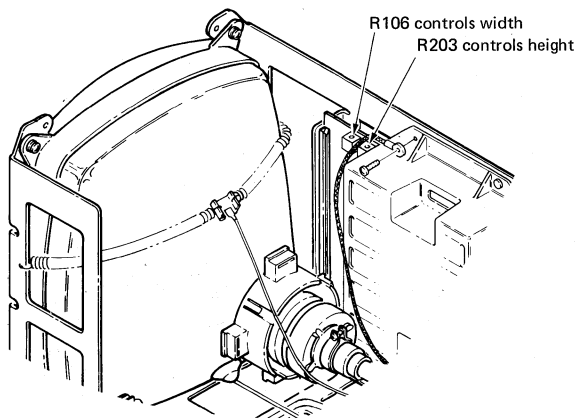
IMAGE CENTERING ADJUSTMENT

CAUTION
Be very careful when making this adjustment because power must be ON.

Make this adjustment only when absolutely necessary.

NOTE: The image is properly centered when the outline of the H pattern is at least 2.5 mm (0.1 inch) from the bezel all the way around the screen, including the corners.

1. Verify the image size is correct. (See Image Size Adjustment)

2. With the test pattern showing on the display screen, rotate one of the centering rings ❶ until the square tabs on the two rings are aligned.

3. With the square tabs aligned, rotate the rings together to center the image between the left and right edges of the bezel.

NOTE: The centering rings can be rotated 360 degrees.

4. Rotate the two rings in opposite directions, at the same time and in equal amounts, to center the image top to bottom on the screen.

Inside Edge of Bezel

Edge of Pattern after Size and Centering Adjustments
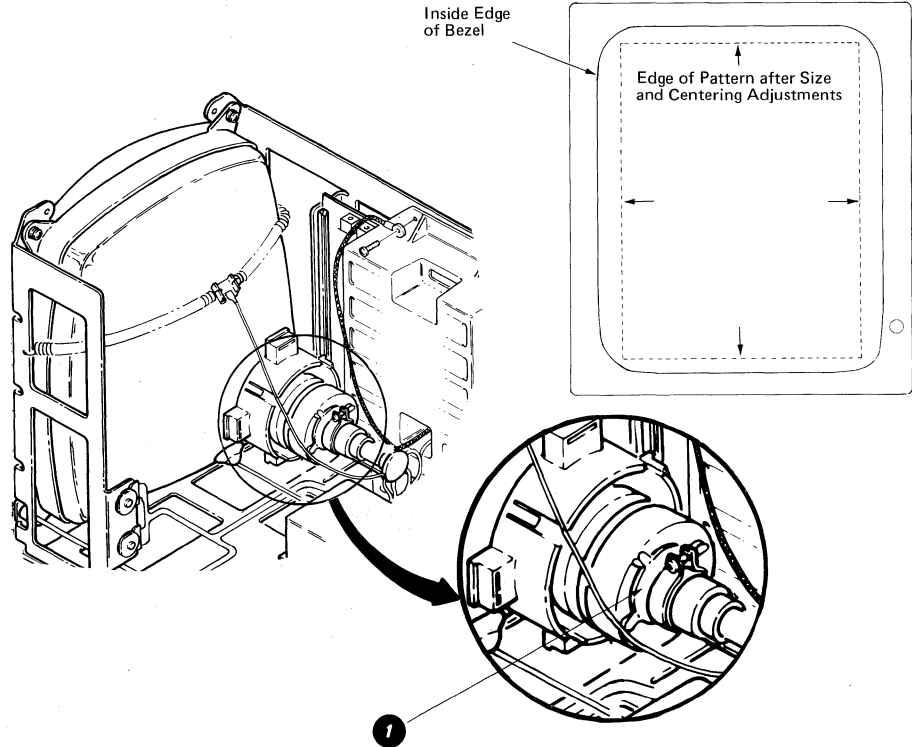
LARGE DISPLAY MODULE REMOVAL

1. Turn the system power off.

2. Disconnect the two AC power cords (Connectors 8 and 12).

3. Disconnect the display cable from the electronics module panel 1.

4. Be sure the display module is facing straight forward and is exactly level (not tilted).

5. Lift the display module straight up to release the interlock.

6. Pack the display module in a display packing carton if it is to be transported.

DANGER
Do not transport the display module unless it is suitably packed. The CRT may burst inward (implode) if broken.

Large
Display

Electronics
Module

(Front View)

Interlock
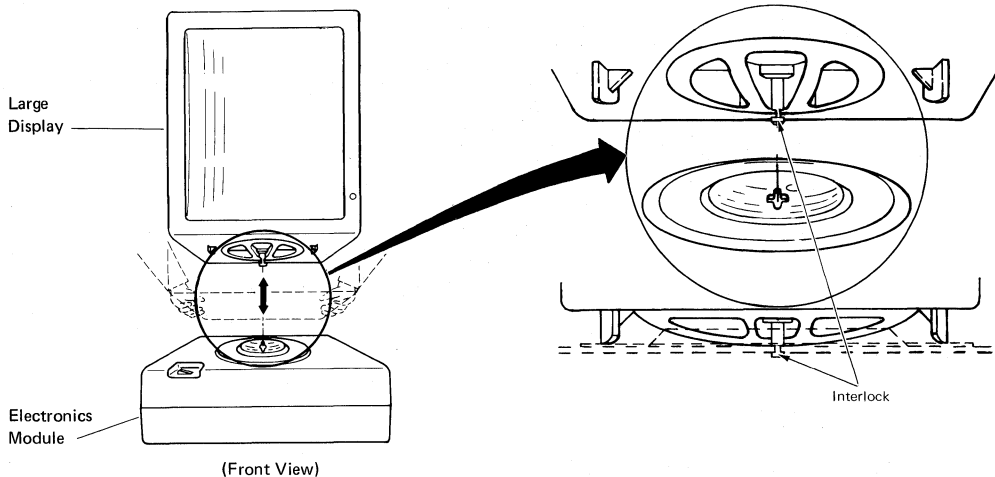
REAR COVER REMOVAL

1. Turn the system power off.

2. Release the quarter-turn cover fasteners in the back of the display module.

3. Slide the cover to the rear to remove.

4. ALWAYS check to ensure the ground spring around the CRT is in place, and that it is connected to the CRT socket before performing any type of service.

DANGER
Be extremely careful when working near the neck of the CRT. The CRT may burst inward (implode) if broken.
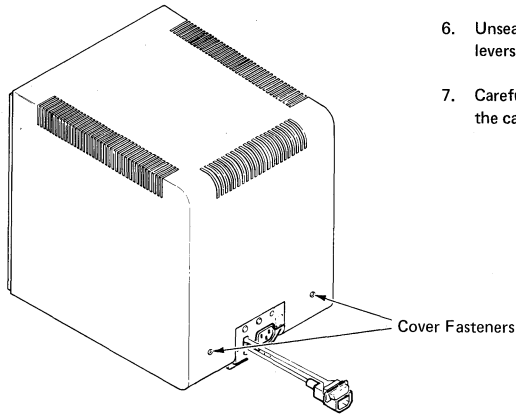
DISPLAY ANALOG CARD REMOVAL

1. Turn the system power off.

2. Perform the rear cover removal.

3. Disconnect the J301, J302, J501, and J502 connectors from the analog card ❶.

4. Cut the cable tie (if present) that holds the cable to the analog card cover. (Replacement of the shipping tie is unnecessary.)

5. Remove the two screws ❷ that hold the analog card and ground strap to the mainframe.

CAUTION
Do not touch the heat sink on the back of the analog card. It may be HOT.

6. Unseat the analog card by lifting the card removal levers ❸.

7. Carefully slide the analog card ❹ up and out of the card guides.
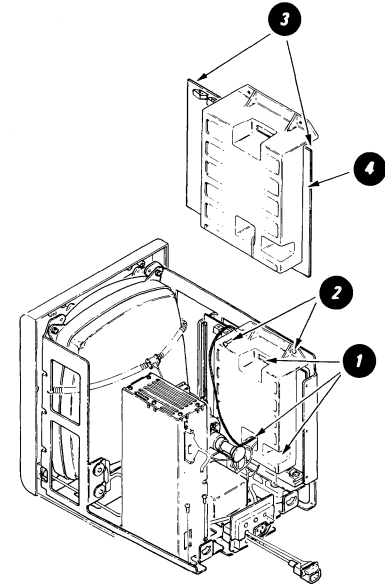
Cover Fasteners

LOW VOLTAGE POWER SUPPLY REMOVAL

1. Turn the system power off.

2. Perform the rear cover removal.

3. Disconnect the two AC power cords (Connectors 8 and 12).

4. Disconnect LV1 (LED 0), LV2 (DC), and LV3 (AC) connectors ❶ from the Low Voltage Power Supply.

5. Remove the four screws and the power supply ❷.
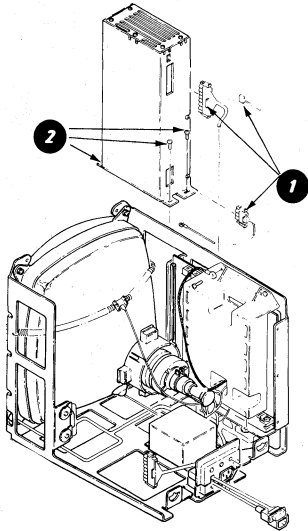
HIGH VOLTAGE POWER SUPPLY REMOVAL

1. Turn the system power off.

2. Perform the rear cover removal.

3. Perform the CRT Anode Discharge Procedure.

DANGER
Be extremely careful when working near the neck of the CRT. The CRT may burst inward (implode) if broken.

4. Disconnect the anode lead ❶ from the CRT.

5. Disconnect cable plug J3 from the connector strip ❷.

6. Remove the two screws ❸ and slide the power supply to the rear until free. (Save the two star washers that are between the power supply cover and the mainframe.)

CAUTION
The CRT may slowly recharge when the anode lead is disconnected. Be sure to perform the Anode Discharge Procedure in the anode hole in the CRT before replacing and reconnecting the High Voltage Power Supply.
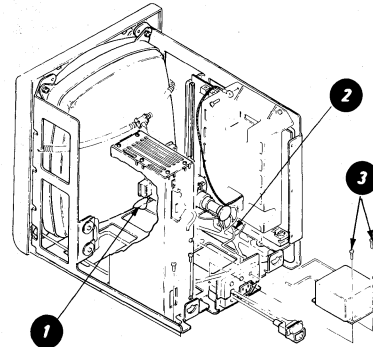
MAINFRAME ASSEMBLY AND FRONT COVER REMOVAL

1. Turn the system power off and disconnect the AC line cord from the wall outlet.

2. Remove the brightness control knob **1**.

3. Perform the rear cover removal.

4. Perform the Display Analog Card Removal.

5. Perform the Low Voltage Power Supply Removal.

NOTE: If only removing the front cover, skip to Step 8.

6. Remove the three screws, the Cable/Display Indicator Panel, and the AC Cable Assembly **3** from the Mainframe Assembly. (Cable has three ground wires.)

7. Perform the CRT Anode Discharge Procedure and the High Voltage Power Supply Removal.

8. Disconnect the display cable from the Electronics Module (Panel 1, Connector 2).

DANGER
Be extremely careful when working near the neck of the CRT. The CRT may burst inward (implode) if broken.

9. Remove the eight screws **2** that hold the Mainframe Assembly to the front cover.

10. Lift the mainframe assembly **4** from the cover, and place it in a shipping carton for safe handling during transport.

CAUTION
The CRT may slowly recharge when the anode lead is disconnected. Be sure to perform the Anode Discharge Procedure when replacing the mainframe assembly and before reconnecting the anode lead from the High Voltage Power Supply to the CRT. (This also applies to a new mainframe assembly being installed.)

Mainframe Assembly

Front Cover
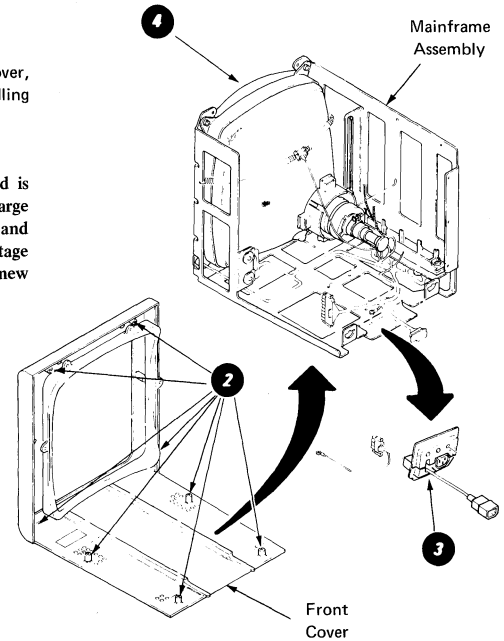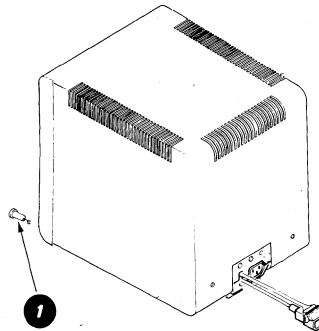
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KEYBOARD

Logic Card Connector

Keyboard Cable Connector

ID Jumper

Logic Card

Speaker

Key Module

Speaker Connector

30-Pin Edge Connector

Pad Card

Keyboard Connector

At Rest
Normal

Compression Spring

Flat Spring

Fly Plate Spring

Fly Plate

Clearance

Pad Card Capacitor Plate

Fully Pressed

Stem Assembly

Fly Plate

Pad Card Capacitor Plate

Clearance

Key Module Operation

Space Bar

Shift Reset Bail

Stabilizer

Key Module Assembly

Shift-Lock Restoring Mechanism

BASIC ASSURANCE TEST (BAT)

A Power on Reset (POR) of the system will automatically start the keyboard Basic Assurance Test (BAT) and perform wrap tests on the keyboard adapter circuits of the system card.

The keyboard BAT will verify the keyboard microprocessor, located on the keyboard logic card is operating correctly. The keyboard notifies the system processor of the keyboard status by transmitting a specified sequence of two bytes of data. Successful completion of the BAT is necessary for the keyboard to proceed with normal system operation.

A third byte containing the keyboard ID is also transmitted to provide configuration information.

⊗ System Power-On-Reset

⊗ BAT Signal to Keyboard Microprocessor

⊗ BAT Self-test of Keyboard Microprocessor

⊗ BAT Completion Codes Transmitted

⊗ System Electronics Accepts Data Byte Codes

⊗ Keyboard ID Transmitted

⊖ Keyboard Operational
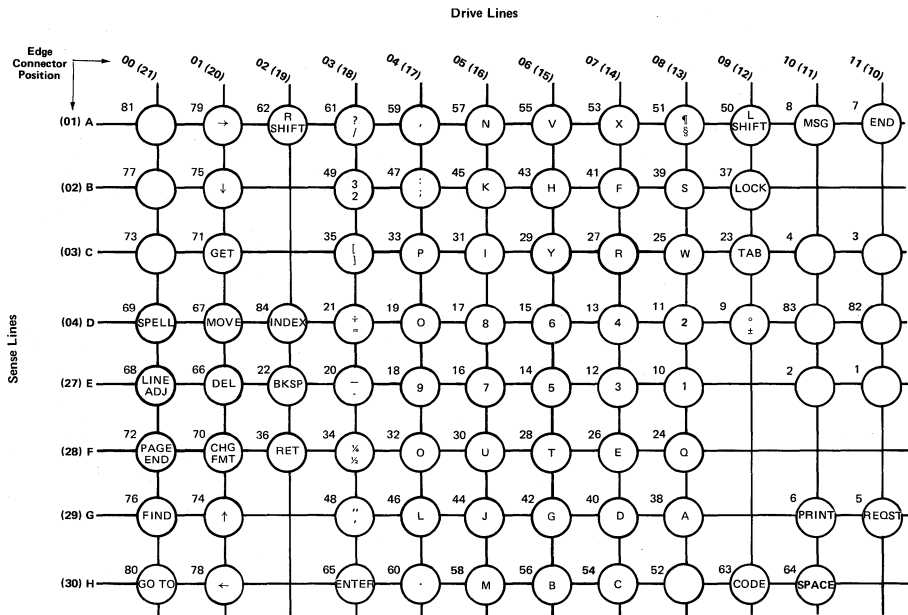
Keyboard Number 1 Matrix Chart

Key Pressed (First)

Pad Card Change

Key Pressed (Second) — Yes / No

Held Pressed — Yes / No

Make/Break — Yes / No

No Indication To System Electronics

Typamatic — No / Yes

Single Action — Yes / No

Held (350 msec) — No / Yes

Repeat (14 cps)

Character Or Function To System Electronics
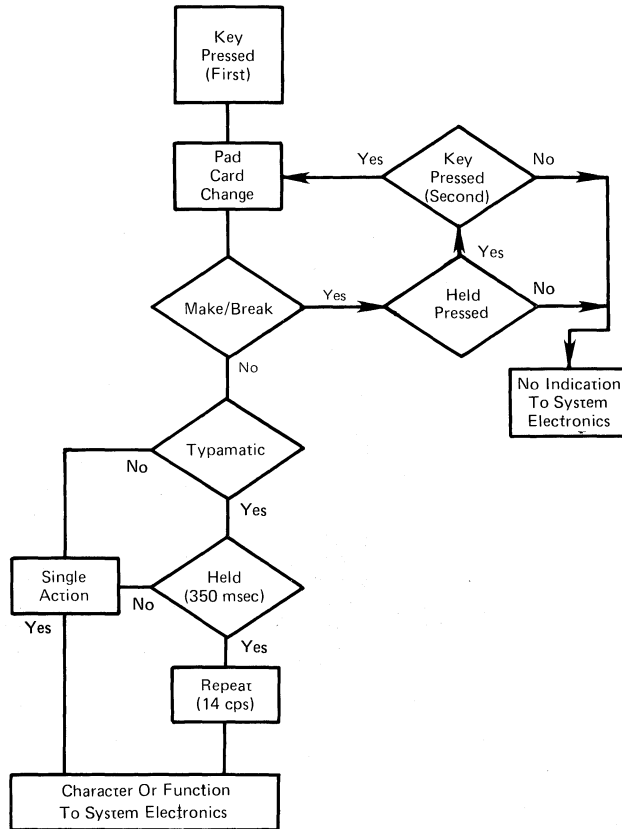
KEY POSITION

The key positions are shown in Figure 10. Key positions marked with a "T" are typamatic keys, positions marked "N-A" are non-active, and those marked "M" are make/break keys. The position of the typamatic keys are controlled by software and may be different for World Trade countries depending on the country layout.

Key Legend

Work Station
Control Keys

Function Keys
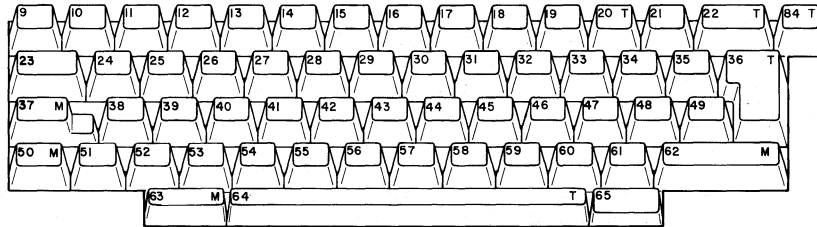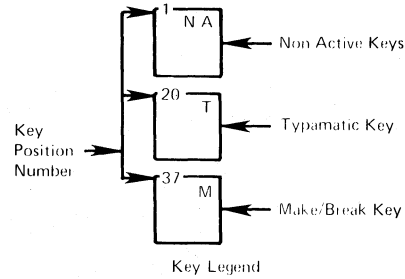
Cursor Control Keys
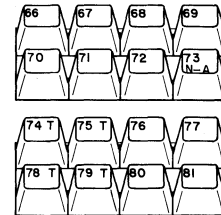
96-Character Keyboard

LANGUAGE SUPPORT	STRAP IDs 92	96	ID JUMPERS* 0	1	2	3	4	5	6	7
Australia/New Zealand		1	X	X	X	X	X	X	X	
Austria/Germany		29	X	X	X				X	
Belgium (Flemish)		247				X				
Canada-England		37	X	X		X	X		X	
Canada-France/Bilingual		39	X	X		X	X			
Czech-Czech		83	X		X		X	X		
Czech-Slovak		85	X		X		X		X	
Denmark		57	X	X				X	X	
Finland		248						X	X	X
France/Belgium (AZ)		251						X		
France (Qwerty)		252							X	X
Greece (Latin)		75	X		X	X		X		
Hong Kong (Latin)		119	X				X			
Hungary		91	X		X			X		
Italy (S.A.)		41	X	X		X		X	X	
Japan (English)		69	X		X	X	X		X	
Netherlands		43	X	X		X		X		
Norway		55	X	X			X			
Poland		93	X		X				X	
Portugal		63	X	X						
Rumania		87	X		X		X			
S. Africa		81	X		X		X	X	X	
Spain		45	X	X		X			X	
SP Speak/Puerto Rico		25	X	X	X			X	X	
Sweden		53	X	X			X		X	
Switzerland-Germany		51	X	X			X	X		
Switzerland-France		49	X	X			X	X	X	
Turkey		79	X		X	X				
U.K./Israel		67	X		X	X	X	X		
U.S.		1	X	X	X	X	X	X	X	
U.S.	249							X	X	
U.S. Dvorak		250						X		X
Yugoslavia (Latin)		95	X		X					

*X's Indicate Jumper Positions

The Keyboard Assembly requires no scheduled preventive maintenance.

TOOLS AND EQUIPMENT

The following equipment is required to service the keyboard:

- Keybutton Puller (P/N 9900373)
- Alcohol Pad (P/N 9900679)
- Lint-free Cloths (P/N 2108930 or P/N 2123106), or Disposable Cleaning Cloths (P/N 1650800)

CLEANING PROCEDURES

Plastic parts and painted covers can be cleaned with IBM cover cleaner, P/N 450891, or a mild non-abrasive hand soap. Other solvents or cleaners are not recommended as damage or discoloration of plastic or painted parts can result.

Cleanliness is important when working on the keyboard. Any particle between the key module fly plate and the pad card is a potential problem.

Before any keyboard disassembly, prepare a smooth, clean work area by wiping contamination away with an alcohol pad. Gently tap, brush, and shake the keyboard assembly to remove any loose particles which could get into the pad card and fly plate area during disassembly and reassembly.

The pad card and key module fly plates are cleaned by carefully wiping each with an alcohol pad followed by a lint-free cloth. Care should be taken not to dislodge or remove fly plates from key modules.

Some minor liquid spills, such as soft drinks or coffee with sugar, can be removed by first washing the pad card and affected fly plates with a lint-free cloth dampened with a mixture of water and a mild hand soap. Rinse with a water-dampened lint-free cloth, then clean with an alcohol pad and dry with a lint-free cloth.

NOTE: Sticky key modules must be replaced. A severe liquid spill may necessitate replacement of the entire keyboard assembly.

Shift Lock Brake Adjustment

1. Adjust the shift lock brake screw so the shift latches and and locks reliably (clockwise increases brake tension). ➊
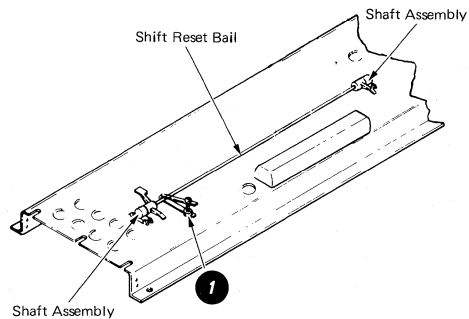
KEYBOARD COVER

1. Turn the system power off.

2. Remove the top cover by loosening the four captive screws on the bottom of the keyboard assembly **❶**.

Four Captive Screws
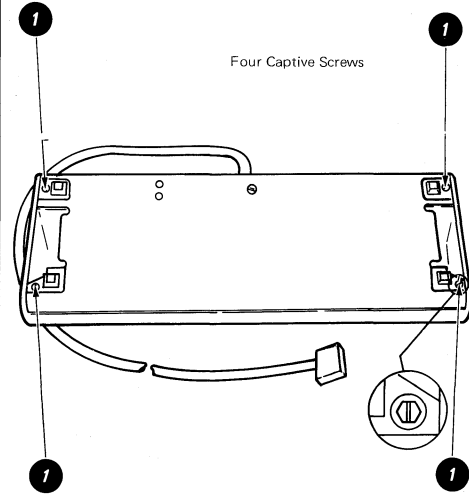
PAD CARD

1. Turn the system power off.

2. Remove the top cover by loosening the four captive screws on the bottom of the keyboard assembly (see Keyboard Cover Removal.)

3. Remove the two screws holding the keyboard logic card. Disconnect the speaker cable **❶** and the keyboard cable. **❷** Remove the logic card.
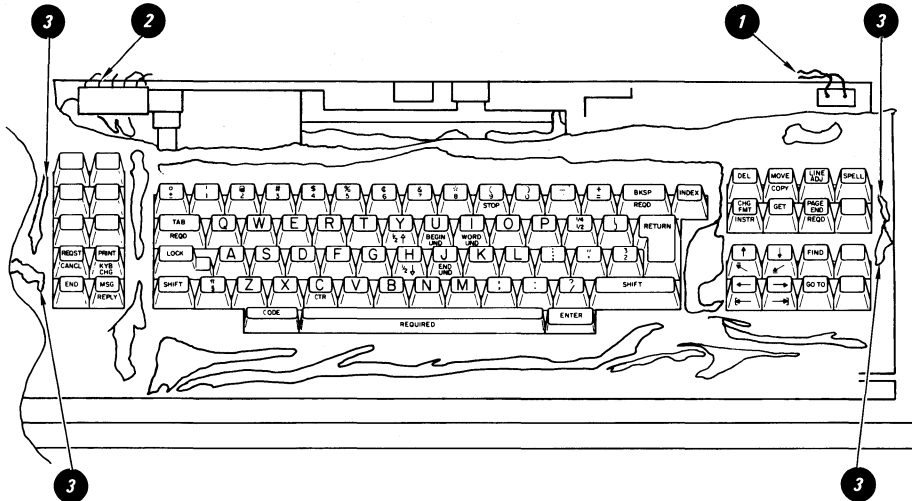
4. If a key module is to be removed, locate the position of the key before the keyboard is inverted and remove the keybutton.

5. Remove two mounting screws on each side of the keyboard under the contamination shield. **❷**

6. Lift the keyboard out of the keyboard frame.

7. Invert the keyboard and install it on the frame using a screw on each side to hold the assembly in place.

Warning: Removing the pad card with a key pressed may cause the fly plate to spring out of the key module.

8. Ensure there is no pressure on any keys.

9. Remove the screws from the pad card. ❹

10. Lift the pad card from the keyboard assembly.
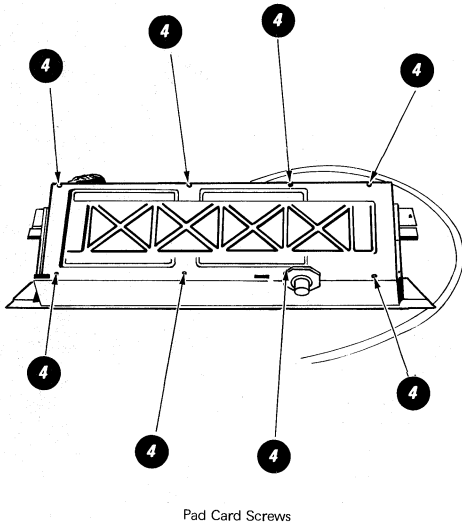
11. To assemble, reverse the above procedure. Before inserting the logic card, the pad card should be cleaned and lubricated as follows:

A. Carefully wipe the pad card with an alcohol pad followed by a lint-free cloth.

B. Use a light abrasive (P/N 9900089) or a pencil eraser to clean the top and bottom copper contacts of the 30-pin edge connector.

C. After cleaning the contacts, apply a thin layer of IBM No. 10 oil to the edge connector (top and bottom) of the pad card. Coverage of about 50% of the tab area (as measured from the edge of the tab) will ensure the desired protection of the contacts.

Warning: Do not over-lubricate the edge connector, as permanent damage to the key modules may occur if lubricant gets on the pad card.

Pad Card Copper Contacts

Pad Card Screws
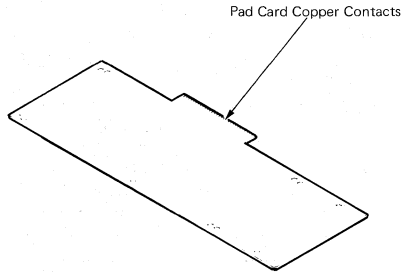
KEY MODULE

Removal

1. Use the keybutton removal tool (P/N 9900373) to lift the keybutton from the key module to be removed.

2. Disassemble the keyboard (see Pad Card Removal).

3. Reach under the key assembly and push the failing key module up until it is free. ❶

Warning: To prevent loosening a fly plate, ensure no keys are accidentally pressed while the pad card is removed.

Notch
Spacebar Edge ❶ Retaining Ear
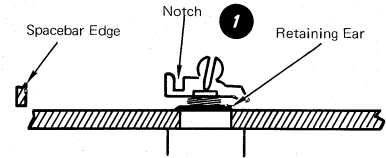
NOTE: The module retaining ears must clear the frame.

Installation

1. Insert the key module. Match the opening in the key module with the aligning lug in the mounting hole. The key stem notch must be positioned toward the spacebar edge of the keyboard. ❶

2. Reinstall the pad card.

3. Turn the key assembly over and, if necessary, reposition the contamination shield.

4. Put the keybutton on the key module.

5. Reinstall the logic card cables and covers.

FLY PLATE REPLACEMENT

Reinstalling a disconnected fly plate in a key module is not recommended.

If replacement is necessary because a new key module is not available, inspect the fly plate to ensure the connection is not loose between the spring and fly plate and the fly plate is not damaged.

1. Remove the keyboard top cover. (See Keyboard Cover Removal.)

2. Remove the keybutton.

3. Remove the stepped insert, spring, and o-ring from the key stem.

4. Disconnect the keyboard module cable from the keyboard logic card. ❶

5. Remove the two mounting screws on each side of the keyboard under the contamination shield. ❷
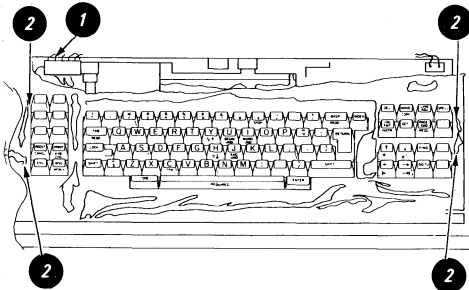
6. Lift the keyboard out of the keyboard frame.

7. Invert the keyboard and install it on the frame using a screw on each side to hold the assembly in place.

Warning: Removing the pad card with a key pressed may cause the fly plate to spring out of the key module.

8. Remove the pad card screws. ❸
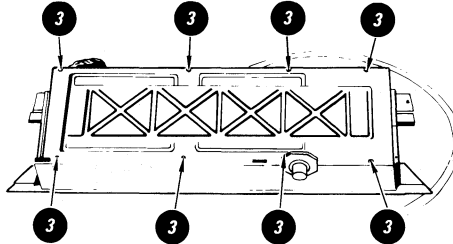
9. Lift the pad card/logic card from the keyboard assembly.

10. Remove the key stem from the key module housing.

11. Form the spring on the fly plate so there is 12.7mm (0.5 inch) between the ends of the spring. Reconnect the fly plate. ❹
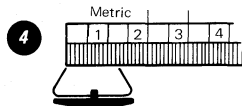
12. Place the key stem back into the key module housing.

13. Reinstall the pad card/logic card.

14. Remove the screws that mount the keyboard.

15. Place the keyboard assembly right side up and reinstall the keyboard mounting screws.

16. Reinstall the spring, o-ring, and stepped insert (notch toward the spacebar). ❺
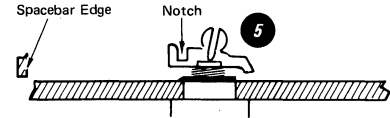
17. Reinstall the keybutton.

18. Reconnect the keyboard module cable to the keyboard logic card.

19. Reinstall the keyboard cover.
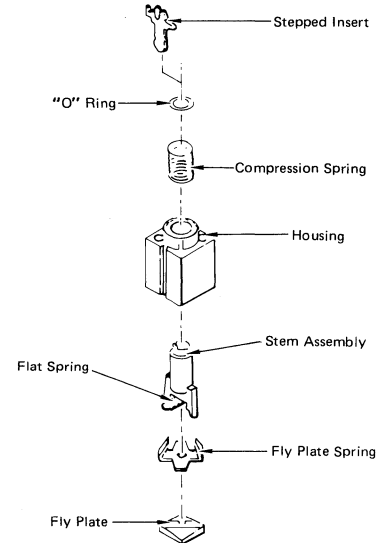
SHIFT-LOCK MECHANISM

1. Perform the keyboard cover removal procedures.

2. Remove both left and right shift keybuttons and the shift-lock keybutton.

3. Remove the screw and shift lock brake from the shaft assembly. ❶

4. Slide the shaft assembly out of the pivot housings. ❷

5. Remove the left and right pivot housings from the keyboard frame. Pivot housings are removed from the bottom of the keyboard assembly in the same procedure as removing a key module (see Key Module Removal).
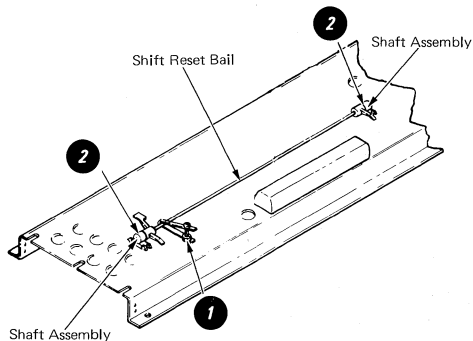
SPACEBAR MECHANISM

1. Perform the keyboard cover removal procedures.

2. Remove the ENTER keybutton. ❶

3. Hold the spacebar to keep it from being pressed.

4. Push the key module key stem ❷ down to disconnect it from the spacebar.

5. Slide the spacebar as far to the right as it will go.

6. Slide the stabilizer ❸ to the left and pull the spacebar upward and out of the keyboard — be careful not to tear the contamination shield.

7. Remove the stabilizer by pulling it forward.

Shift Reset Bail
Shaft Assembly
Shaft Assembly

Pad
Key/Stem
Shift Reset Bail
Guide/Pivot(s)
Stabilizer
Keyboard Module Assembly
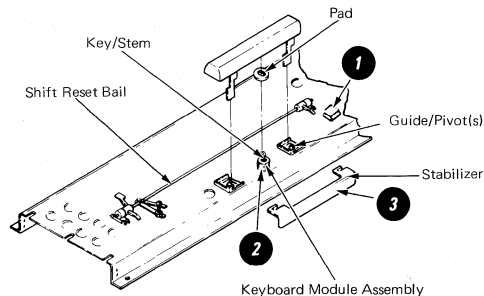
TABLE OF CONTENTS

SYSTEM ELECTRONICS/POWER SUPPLY

Memory Extender Card
Position F

Memory Card
Position E

Display Adapter Card
Position D

Printer Sharing Card
Position C

S1

S2

System Card
Position B

Distribution Board

A4

F1

E1

D1

C1

B1

A1

Communications
Adapter Card
Position A

Fuse

AC Input

AC Output

P1

P2

Power Supply

* Connector 8 will be labeled 12 if the
large display is installed on the system.

Memory Record
Button

Printer

Mag Card Unit

Display

AC (Output)

AC (Input)

Panel 1

Panel 2

LEDs

A
B
C
D
E
F
G
H

0

1

2

3

4

5

*8

9

FUSE

Fuse

6(A)

6(B)

7

10

11

Communications

Printer Sharing

Keyboard

Diskette Signal

Diskette DC Voltage

Communications DC Voltage
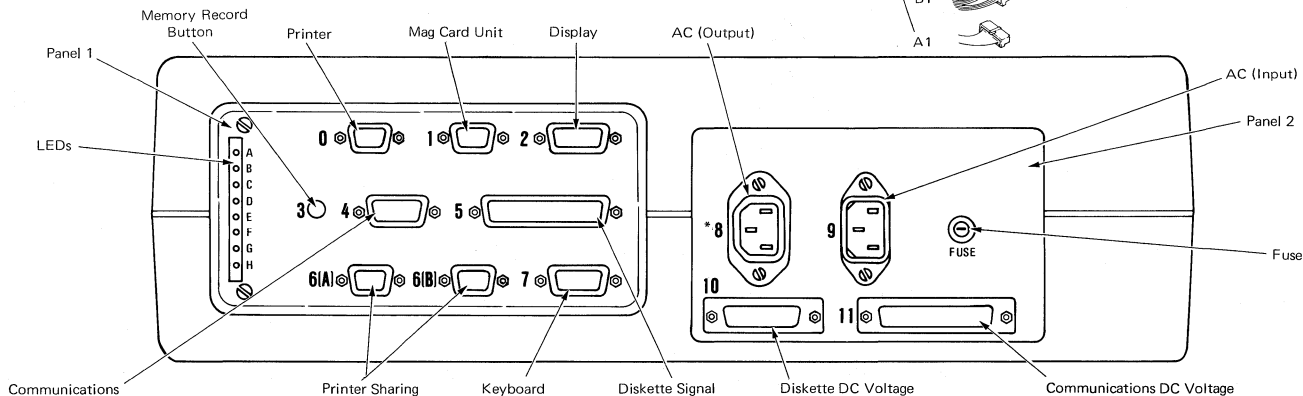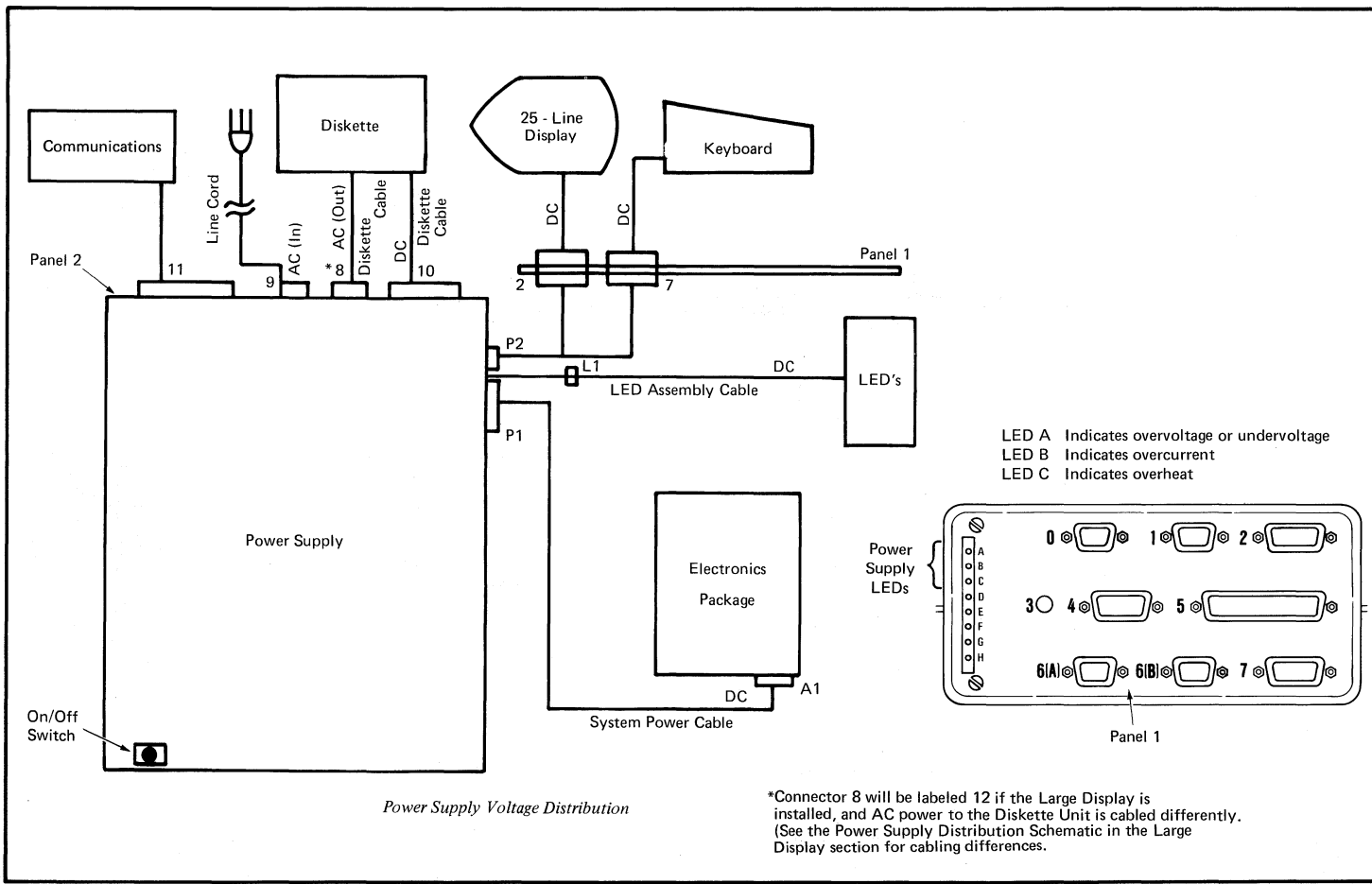
Power Supply Voltage Distribution

LED A   Indicates overvoltage or undervoltage
LED B   Indicates overcurrent
LED C   Indicates overheat

*Connector 8 will be labeled 12 if the Large Display is
installed, and AC power to the Diskette Unit is cabled differently.
(See the Power Supply Distribution Schematic in the Large
Display section for cabling differences.

Grounding Prong

Diskette AC Components

Display

Keyboard

Mag Card Unit

Printer

Line Cord

AC (In)

AC (Out)

Diskette Cable

Panel 2

9

*8

2

7

1

0

Panel 1

Ground Wires

Ground Wires

Ground Strap Between Panels

Power Supply

On/Off Switch

*Connector 8 will be labeled 12 on systems with the Large Display.

PANEL 1 — GROUND WIRE CONNECTIONS

Conn/Pin	Identification
0–5 0–6	Printer DC Cable to Frame Ground
1–5 1–6	Mag Card Unit DC Cable to Frame Ground
2–8	Display DC Cable to Frame Ground
7–10 7–12 7–13 7–14	Keyboard DC Cable to Frame Ground

PANEL 2 — GROUND WIRE CONNECTIONS

Conn/Pin	Identification
*8–1	Diskette AC Cable to Frame Ground
9–1	System AC Line Cord Ground

System Grounding Path Schematic

The power supply must have the ability to provide the following DC voltages and currents to the system:

OUTPUT VOLTAGES	TOTAL REGULATION (PERCENT)	OPERATING CURRENT * (AMPERES)
+24.0 VDC	+10, −8	1.3
+12.0 VDC	+10, −8	.9
+12.0 VDC	+ 5, −5	1.6
+ 8.5 VDC	+ 5, −5	2.5
+ 5.0 VDC	+10, −8	16.0
− 5.0 VDC	+10, −8	0.5
−12.0 VDC	+10, −8	0.25

*Actual performance may exceed the current listed.

DC VOLTAGE, LEVEL	UNDERVOLTAGE/OVERVOLTAGE LIMITS	
+24.0 VDC	16.8 —	31.2
+12.0 VDC	8.4 —	15.6
+12.0 VDC	8.4 —	15.6
+ 8.5 VDC	5.95 —	11.05
+ 5.0 VDC	3.5 —	6.5
− 5.0 VDC	(− 3.5) —	(− 6.5)
−12.0 VDC	(− 8.4) —	(−15.6)

DC Voltage Operating Limits

	VOLTAGE TOLERANCE	FUSE
US/Canada	104 — 127 VAC	7 Amp
WT (Except Canada)	90 — 137 VAC	6.3 Amp
WT (Except Canada)	180 — 254 VAC	5 Amp
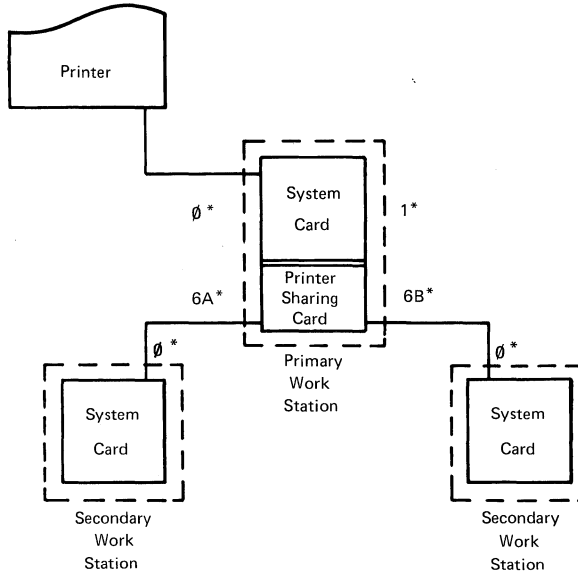
* Work Station Panel 1 Connector Positions
Printer Sharing Configuration

COVER REMOVAL

1. Turn the system power off.

2. Perform the display module removal.

3. Remove the top cover mounting screw.

4. Remove the top cover.

Mounting Screw

Top Cover
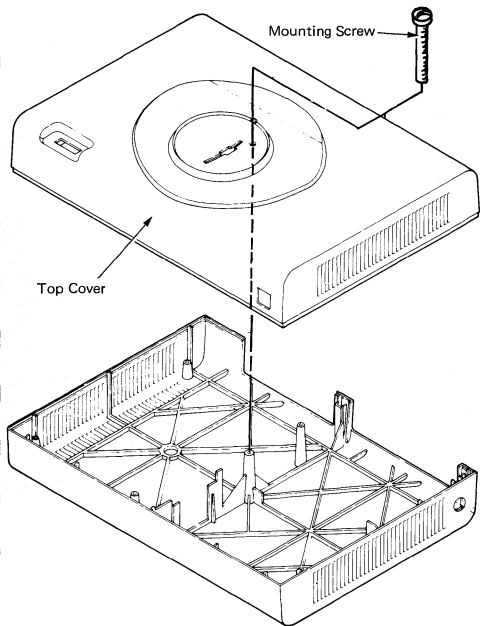
ELECTRONIC CARD(S) REMOVAL

1. Turn the system power off.

2. Perform the display module removal.

3. Perform the electronics module cover removal.

4. Lift the electronics package to the service position.

5. Disconnect the S1 and S2 connectors, if necessary. **❼**

6. Remove the card retainer(s). **❷**

7. Remove the card(s) by grasping on the side and gently rocking the card(s) back while pulling (out).

Warning: Card components can be easily damaged if the cards are not carefully removed.

Memory Extender Card
Memory Card
Display Adapter Card
Printer Sharing Card

Card Retainers

S1

S2

System Card

Communications Adapter Card

A4

A1
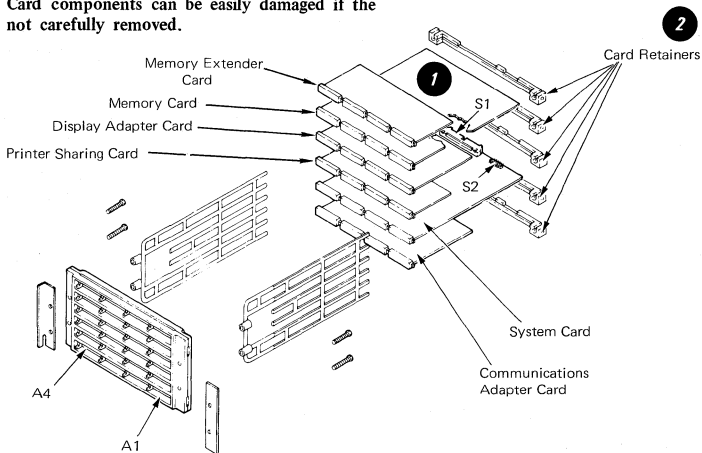
DISTRIBUTION BOARD REMOVAL

1. Turn the system power off.

2. Perform the display module removal.

3. Perform the top cover removal.

4. Disconnect the following connectors: S1, S2, A1, B1, C1, and D1.

5. Perform the electronics card(s) removal.

Warning: Card components can be easily damaged if the cards are not carefully removed.

6. Remove the four card guide mounting screws, ❶ two card guide mounting brackets, ❷ and two card guides. ❸

7. Separate the two stiffeners that enclose the distribution board. ❹

   NOTE: When reassembling the distribution board ❺ and stiffeners, use the following procedure to prevent multiple card damage.

8. Position the distribution board so connector A1 is in the lower right-hand corner, as observed from the front of the electronics module.

9. The cable connector guide lugs must be on the top surface of the horizontal rungs on both stiffeners.

10. The cable connector openings must face away from the distribution board on both surfaces.

Right Card Guide

Left Card Guide

Mounting Screws

Card Guide Mounting Bracket

Mounting Screws

Stiffener

Distribution Board

Card Guide Mounting Bracket

Cable Connector Guide Lugs

Horizontal Rungs

Stiffener

D1

C1

B1

A1

S1

S2

C1

B1

A3 A2 A1
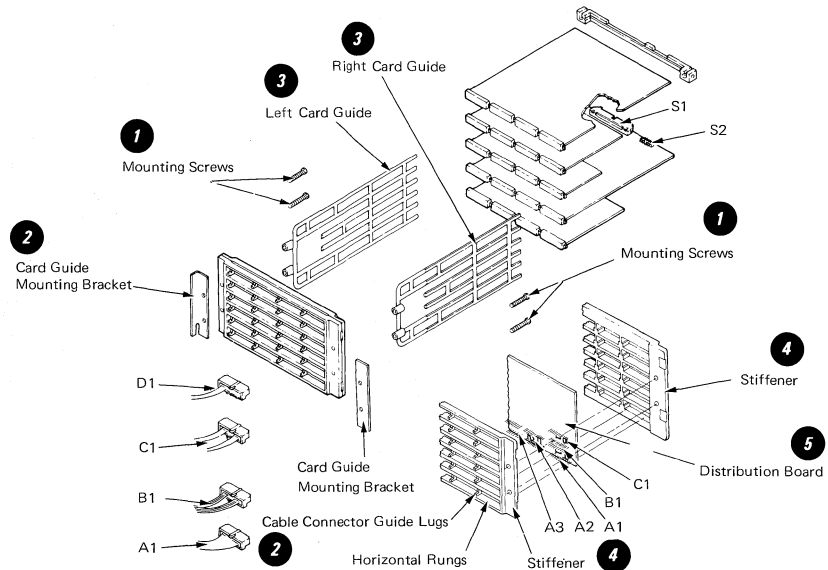
POWER SUPPLY REMOVAL

CAUTION
Do not remove the power supply covers. The power supply is a FRU and is replaced as a unit. The power supply may be hot.

1. Turn the system power off and disconnect the system line cord.

2. Perform the display module removal.

3. Perform the top cover removal.

4. Lift the electronics package out of the bottom cover.

5. Disconnect the following connectors P-1, P-2, L-1 8, 9, 10, 11. ●

6. Disconnect the ground strap from the power supply.

7. Reinstall the electronics package.

8. Remove the four power supply mounting screws. ②

9. Lift the power supply up and out of the bottom cover.

Power Supply

Ground Strap

L1

Rear View

FUSE

8   9

10   11

P1

P2

D1

S1

L1

S2

B1-A

B1-B

C1-B
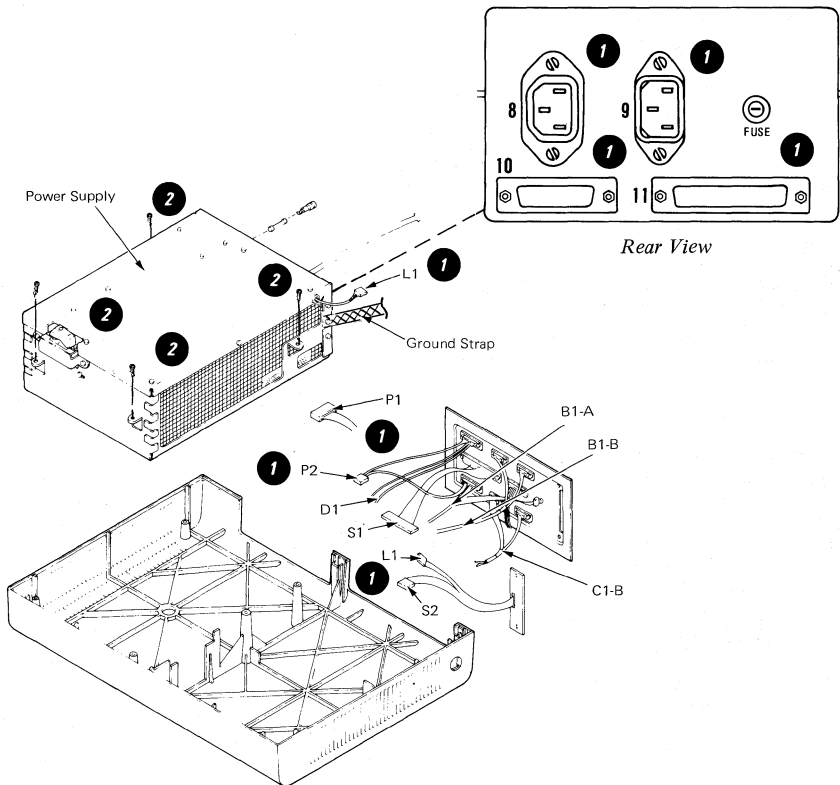
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DISKETTE UNIT

CAUTION

The system supplies AC and DC power to the
diskette unit. AC voltage is present at the drive
motor, fan and capacitor terminals anytime the
system is turned on.

The AC motor and solenoid housings become hot
after continuous use. Let surfaces cool before
servicing them.

Type 2D Drive
Head Carriage Assembly

AC Drive Motor

AC Capacitor

Head/Carriage
Assembly

Stepper Motor

Drive Motor
Pulley/Fan

Read/Write Head
Cable Guide

Read/Write
Head

Diskette Guide
Assembly

Mounting
Screws

AC Drive
Motor

Bail Lever

Head Load Bail

Motor
Drive Belt

Head Load Solenoid

Collet/Flat
Spring

Motor
Drive Hub

File Control
Card

LED

Operator
Handle
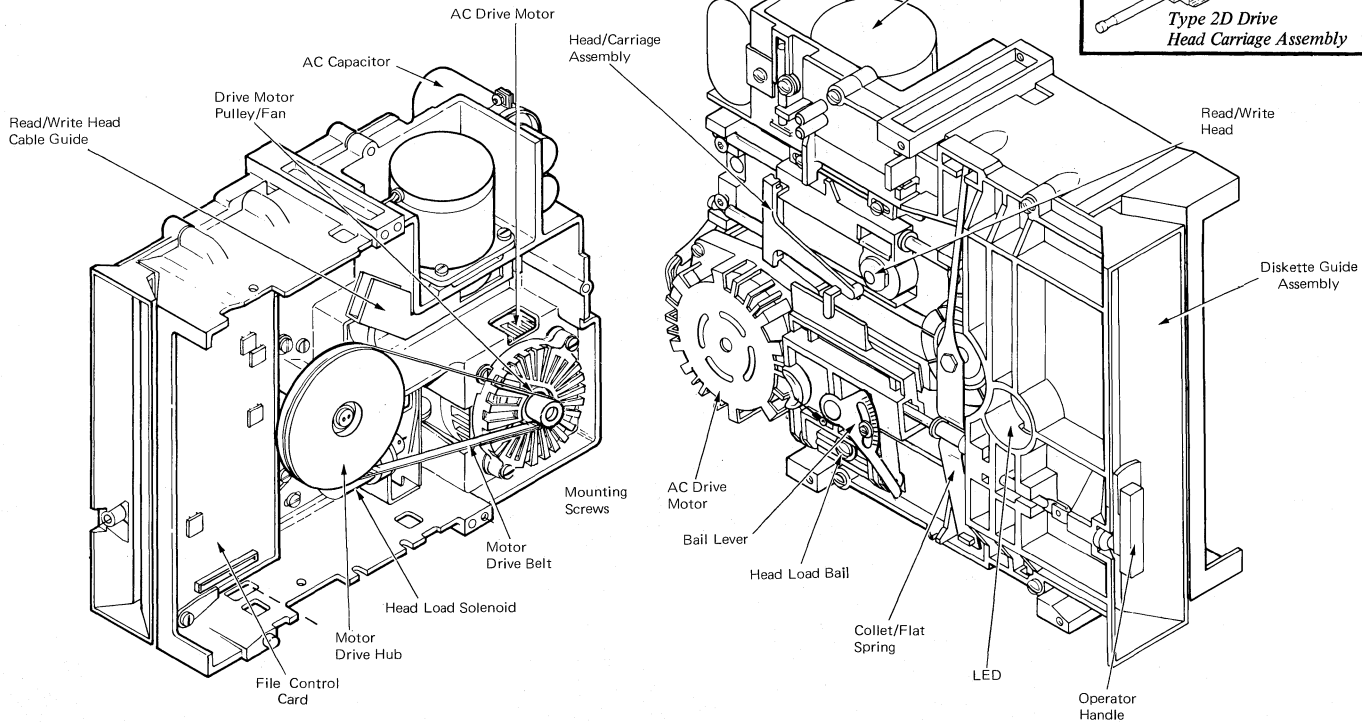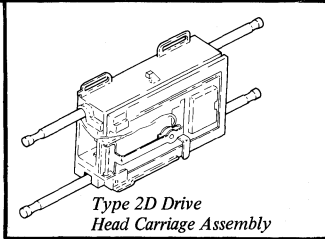
DISKETTE HANDLING

To prevent diskette damage, observe the following procedures and precautions:

- Do not use paper clips or rubber bands on the diskette.

- Do not place heavy items on the diskette.

- Place diskettes in their envelopes and store in the following conditions:

  Temperature: 10°C to 51.5°C (50°F to 125°F)
  Relative Humidity: 8% to 80%

- If the diskette remains outside of the machine's temperature environmental range (shown above), do not use it for at least five minutes. The diskette should be removed from its shipping or storage envelope during this time.

- Keep the diskette away from magnetic fields.

- Always return the diskette to its storage envelope after it is removed from the diskette drive.

- Contaminated diskettes (pencil marks, finger prints, cleaning fluid) can cause data errors, equipment errors, or head damage.

- Diskettes that are creased or bent can cause read/write head damage and should not be used.

- Damaged diskettes should not be inserted into the drive.

Return a diskette to its envelope when it is removed from the diskette drive.
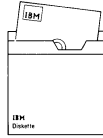
Do not lay diskettes near smoke or other things that can cause a diskette to be contaminated.

Do not use clips or rubber bands on a diskette.
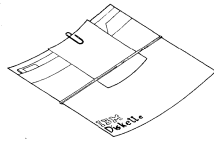
Do not place heavy books on diskettes.

Do not touch or attempt to clean diskette surfaces. Contaminated diskettes will not work correctly.

Do not place diskettes near magnetic materials. Data can be lost from a diskette exposed to a magnetic field.
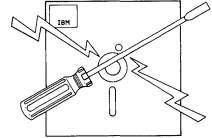
Do not expose diskettes to heat greater than 51.7°C (125°F) or direct sunlight.
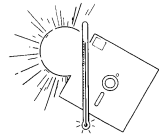
Do not write outside the label area on diskettes.

Diskette Handling

Read/Write
Head

Interrupt Request

Data Request

Diskette Drive Select

Ready

POR Signal

Data Acknowledge

System
Adapter
Logic
Interface

Stepping
Logic

LED

Select
Logic

PTX

Extended
System
Bus

Stepper
Motor

Formatting
Logic

Access
Degate
Logic

Head Load
Solenoid

+24 VDC

+12 VDC

+5 VDC

−5 VDC

Diskette Adapter Card

File Control Card

Diskette Unit Data Flow

System Electronics

Internal
Cables

System
Card

SI

5

Signal
Distribution

10

DC
Distribution

8

*AC
Distribution

Power Supply

DISKETTE DRIVE UNIT

B1

B2

B3

B4

Diskette
Adapter

File
Card

Right Drive
Assembly
(Optional)

AC Motor

'1'

FAN

File
Card

Left Drive
Assembly

AC Motor

* If Large Display is installed on the system, AC power is supplied to the
Diskette Unit at connector 8 on the back of the Large Display. The AC
connector on the Electronics Module is renumbered 12 instead of 8.

START

Read Operation

Error?
- No
- Yes

Add 1 To Counter

Counter = 10?
- Yes → 10th Failure
- No → Read Again

Counter = 0?
- Yes → Go On
- No

Flag Sector Or Replace Disk*

Soft Read/Write Error

Reset Counters To = 0

Go On

START

Write Operation

Read Back Check

Error
- No
- Yes

Add 1 To Counter

Counter = 4?
- Yes → 4th Failure
- No → Write Again

Flag Sector Or Replace Disk*

Counter = 0?
- No
- Yes → Go On

*Reset Counters To = 0
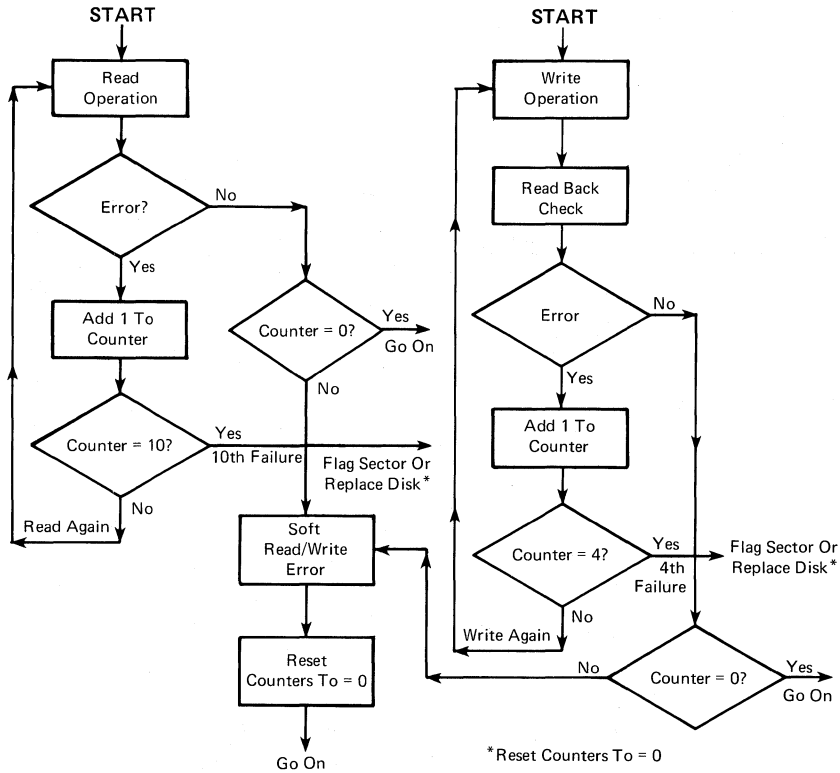
SERVICE AID

The diskette drive requires no scheduled maintenance.

Warning: The drive hub and pulley assembly are plant-adjusted and cannot be replaced in the field. The head carriage assembly can be replaced in the field; however, any attempt to repair or clean the head carriage assembly may cause damage to the read/write head. Voltage or resistance checks of the read/write head made with the CE meter may damage the head and should not be attempted.

NOTE: The type 2D head is shown only when it is necessary for adjustments or removal.

SPECIAL TOOLS

The three special tools needed to service the diskette drive are stored on the frame of each drive. Their use is described in the Adjustments section.

1. The timing pin is used to mechanically align the stepper motor shaft and pulley.

NOTE: The Timing Pin may be stored on the diskette drive frame or under the head cable guide. (Ref. Figure).

2. The track 40 feeler gauge clip is used to keep the gauge in contact with the track 40 adjustment surface.

3. The head carriage assembly spring is used to keep the head carriage against the feeler gauge during this adjustment. This spring angle must match the view as shown in detail A (below) with an acceptable deviation of ± 1.5 mm (0.060 inch).

Detail A
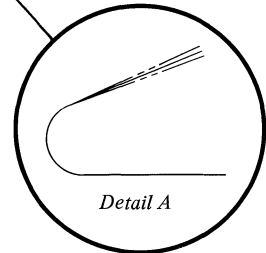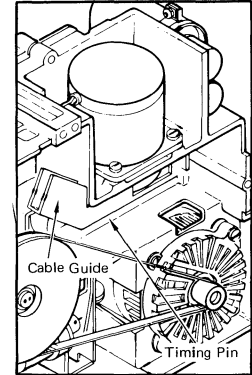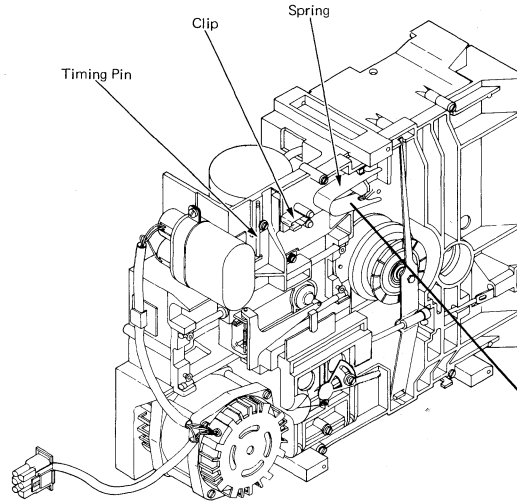
Operator Handle Adjustment, Collet/Flat Spring Adjustment Check

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Loosen the collet actuator rod screw and adjust the operator handle to obtain a maximum of 0.1 mm (0.004 inch) gap between the operator handle and the diskette guide. **❶**

2. Insert a diskette and with the operator handle open, check for a 2 mm (0.080 inch) gap between the collet and a diskette. The flat spring is not adjustable, and should be replaced to obtain this adjustment. **❷**

Screw

Flat Spring

Diskette

Collet

❶

Collet Actuator Rod

End Play
0.1 mm Maximum
(0.004 inch)

Operator Handle

❷

2.0 mm Gap
(0.080 inch)

Diskette Guide
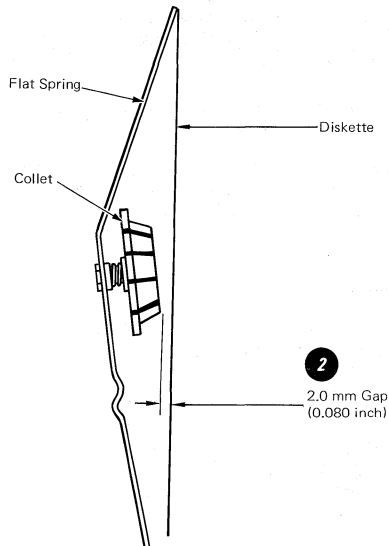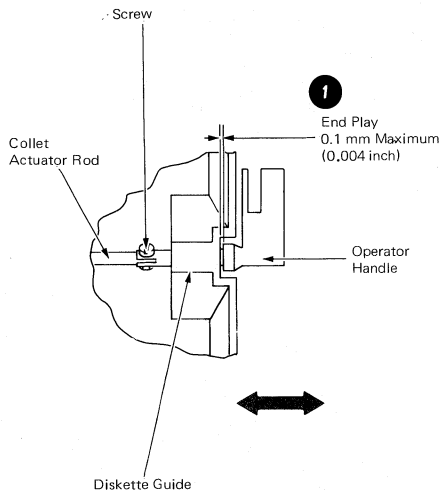
Solenoid and Bail Adjustment

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Disconnect the Diskette Unit AC cable from connector 8.

3. Close the diskette handle.

4. While looking into the diskette guide opening, loosen the bail lever screw. ❶

   For the type 1 drive, move the bail lever until the head load arm pad just touches the head.

   For the type 2D drive, insert a piece of paper between the heads and move the bail lever until the two heads just touch the paper.

5. Observe the marks on the bail lever relative to the bail alignment edge. ❷

6. For the type 1 drive, turn the bail lever one and one half spaces (marks) clockwise and tighten the bail lever screw.

   For the type 2D drive, turn the bail lever one space (mark) clockwise.

7. For the type 1 drive, the gap should now be 3 to 4 mm (0.118 to 0.159 inches) between the head and head load arm. Check visually only. ❸

   For the type 2D drive, the gap between the head surfaces should be 2 to 3 mm (0.079 to 0.118 inches) check visually only. ❸

8. Load the diskette and turn the system power on.

NOTE: DC voltage will be present at this time to activate the head load solenoid.

(Adjustment procedure continued on next page.)

❸
3.0 to 4.0 mm (Type 1 drive) (0.118 to 0.159 inch)

2.0 to 3.0 mm (Type 2D drive) (0.079 to 0.118 inch)

Carriage Assembly

Read/Write Head

Bail Assembly

Cable

Bail Alignment Edge

❷

Bail Lever

Bail Lever Screw

❶

Eyelet Crimp Facing Out
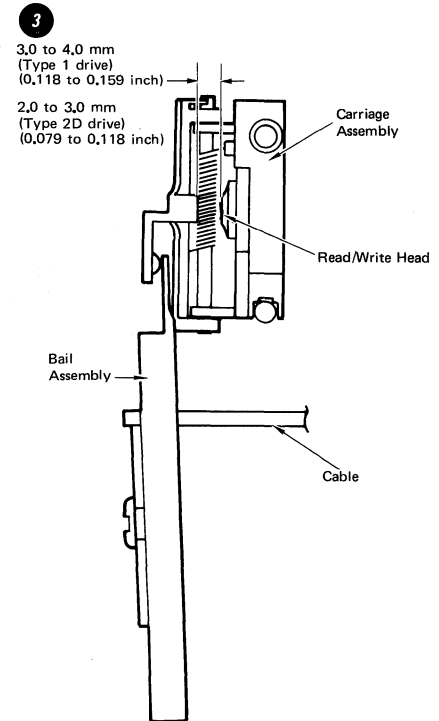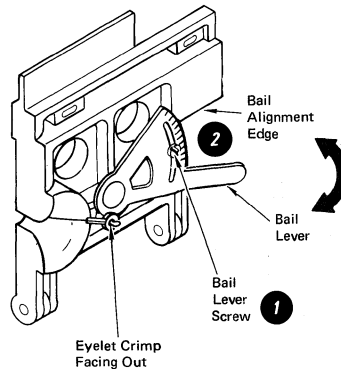
Head Load Solenoid De-activated

(Continued from preceding page.)

9. For the type 1 drive, activate the solenoid by jumper-ing from TPC04 (ground) to TPHLD (head load). ❸

For the type 2D drive, activate the solenoid by jumpering from TPA07 (ground) to TPA08 (head load). ❸

CAUTION
The solenoid may be hot. Let it cool before servicing.

10. Loosen the solenoid locking screw. ❹

Warning: Do not let the solenoid plunger and cable turn while making this adjustment.

11. Turn the solenoid in the mounting bracket to obtain 0.30 mm to 0.71 mm (0.012 to 0.028 inches) gap between the head load arm and the head load bail. Tighten the locking screw. Remove the jumper. ❺

12. Turn the system power off.

13. Reconnect Diskette Unit AC cable.

Control Card
Type 1 Drive

Control Card
Type 2D Drive

Head Load Solenoid Activated

Stepper Drive Band Adjustment

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Remove the read/write head cable connector and guide.

3. Place the head carriage at track 40 (timing holes in pulley and casting are aligned). Observe this condition visually.

4. Loosen the three screws that attach the band to the pulley and the carriage bracket. ❶

5. Tighten the right-hand carriage bracket screw ❷ and the band clamp screw ❸ keeping the band parallel to the edge of the pulley.

6. Block the head carriage approximately 25.40 mm (1.0 inch) from the casting.

7. Use a paper clip and the push/pull scale to pull the loose end of the band with 1135 grams ± 10% (2.5 pounds ± 10%) of force, and tighten the left-hand carriage bracket screw. This adjustment ensures the drive band tracks evenly and tightly over the stepper pulley. ❹

8. Carriage must move freely from track 00 to track 76.

9. Load the CE diskette and run the alignment verification test. The display will indicate correct or incorrect alignment.

NOTE: Check the Head Carriage Adjustment and adjust if necessary.

Drive band must be parallel to pulley edge.
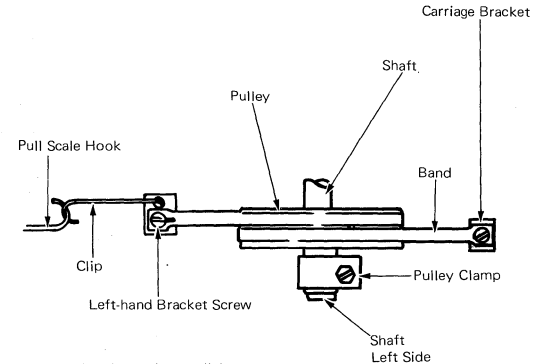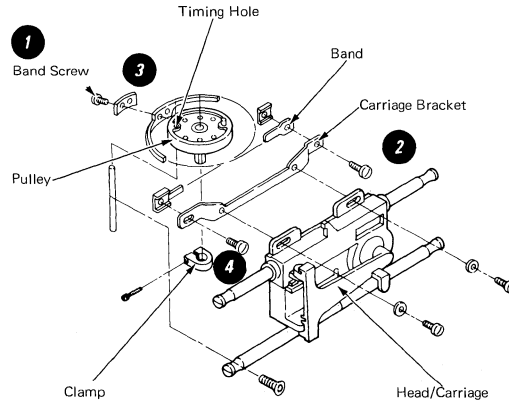
Head Carriage Adjustment

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Power on with the Memory Record Button pressed to place the system in resident non-automatic diagnostics. Select the diskette drive to be adjusted (Test D).

2. Load a diskette.

3. Execute Test L to place the stepper motor at Phase 0 (disregard the results of the test).

4. Remove the read/write cable head guide.

Warning: Do not allow the head cable to touch the drive belt.

5. Loosen the stepper motor pulley clamp screw ❶ and rotate the pulley to align the timing pin holes in the pulley and casting. ❷

6. Insert the timing pin into the timing pin holes and tighten the pulley, keeping the band parallel to the pulley 2.03 ± 0.25 mm (0.08 ± 0.01 inches) from the casting. ❸
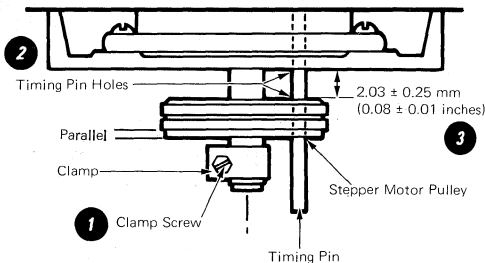
7. Remove the diskette and the timing pin. Select and execute Test N. This places the head carriage detent at track 40.

8. Verify timing pin hole alignment between the pulley and casting. Step the head carriage from track 40 to track 39 and back to track 40 by pressing the spacebar twice. The stepping action is necessary because of the torque characteristics of the stepper motor. It provides a positive detent for this adjustment.

9. Loosen the carriage bracket screws. ❹ Attach a 0.508 mm (0.02 inch) feeler gauge to the track 40 adjusting surface using the clip. ❺

10. Install the carriage pressure spring to hold the carriage against the feeler gauge. ❻ Tighten the carriage bracket screws. ❹
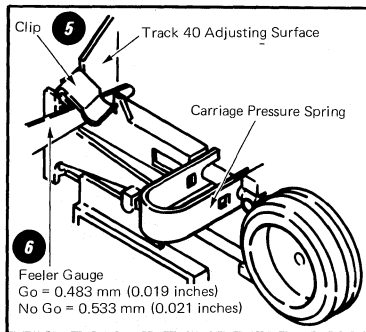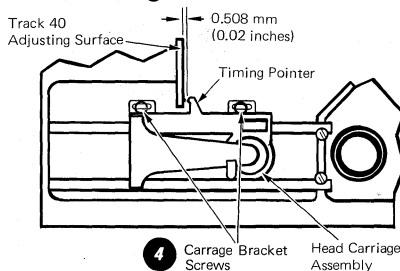
11. Remove the pressure spring and the feeler gauge. Press the spacebar twice to step the head from track 40 to track 39 and again to 40. Verify the adjustment by inserting the feeler gauge between the adjusting surface and pointer. Go = 0.483 mm (0.019 inches), No Go = 0.533 mm (0.021 inches).

12. Press the Memory Record Button, load the CE diskette, and run the diskette MDIs.

NOTE: To check the head carriage adjustment, perform steps 1, 7, 8, and 11.

The head carriage can be stepped by hand from track 40 to track 39 and back to track 40 by using the following alternate procedures. (Refer to cable and connector section for test point locations.)

● For the type 1 drive, install a jumper between TPC04 (ground) and TH05 (disable stepper). This prevents accidental stepping.

  For the type 2D drive, install a jumper between TPB02 (grnd) and TH05 (disable stepper). This prevents accidental stepping.

● For the type 1 drive, install a second jumper between TPF01 (ground) and TPH04 (motor control 0).

  For the type 2D drive, install a second jumper between TPA07 (ground) and TPA04 (motor control 0).

● For the type 1 drive, remove jumper end from TPH04 and install it on TPH01 (motor control 3). The carriage will move from track 40 to track 39.

  For the type 2D drive, remove the jumper end from TPA04 and install it on TPA01 (motor control 3). The carriage will move from track 40 to track 39.

● For the type 1 drive, remove jumper end from TPH01 and install it on TPH04. This will move the carriage back to track 40.

  For the type 2D drive, remove the jumper from TPA01 and install it on TPA04. This will move the carriage back to track 40.

COVER REMOVAL

1. Turn the system power off.

2. On early level machines, remove two screws in the back of the module. ❶ On later level machines, release the two quarter-turn fasteners.

3. Slide the top cover to the rear.

4. Remove four screws holding the front cover. ❷

5. Slide the front cover forward.
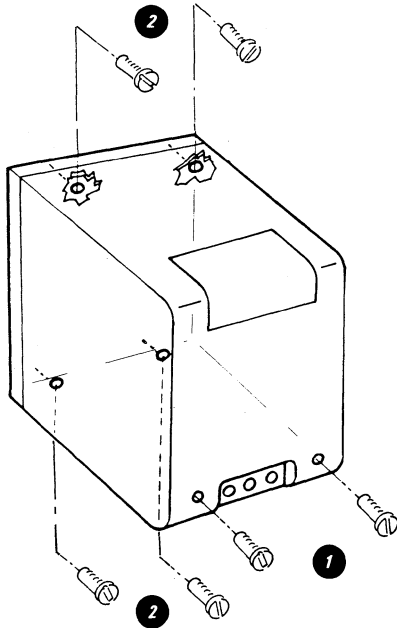
RIGHT DISKETTE DRIVE REMOVAL

CAUTION
When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Disconnect the Diskette Unit AC cable from connectors.

3. Perform Cover Removal.

4. Loosen the two screws on the fan mounting bracket and slide bracket. ❶

5. Loosen the two screws that hold the drive mounting bracket. ❷

6. Slide the drive mounting bracket, and lift the drive up and out of the Diskette Unit.
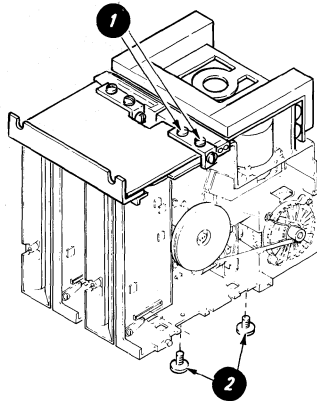
HEAD LOAD BAIL REMOVAL

CAUTION
When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Close the diskette handle.

3. Disconnect the bail actuator cable from the bail cable stud. ❶

4. Open the handle.

Warning: Damage to the head can occur if the pressure pad arm is permitted to hit the head.

5. Observe the position of the bail return spring ❷ and loosen the bail retainer screw ❸ and pivot the bail retainer down. ❹

6. Remove the bail, bail return spring, and pivot rod. ❺
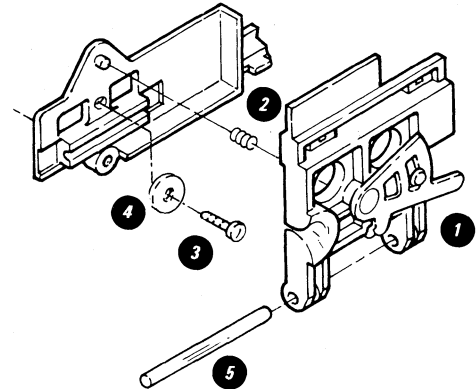
DISKETTE GUIDE ASSEMBLY REMOVAL

CAUTION
When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Close the diskette handle.

3. Push the bail in slightly, and disconnect the bail actuator cable from the bail cable stud. ❶

4. Open the diskette handle.

5. Remove the diskette handle. ❷

6. Remove the LED cable from the file card.

Warning: Damage to the head can occur if the pressure pad is permitted to hit it.

7. Remove the four guide screws and remove the guide. ❸

NOTE: After replacement, perform the following adjustments:

● Operator Handle Adjustment

● Solenoid and Bail Adjustment.
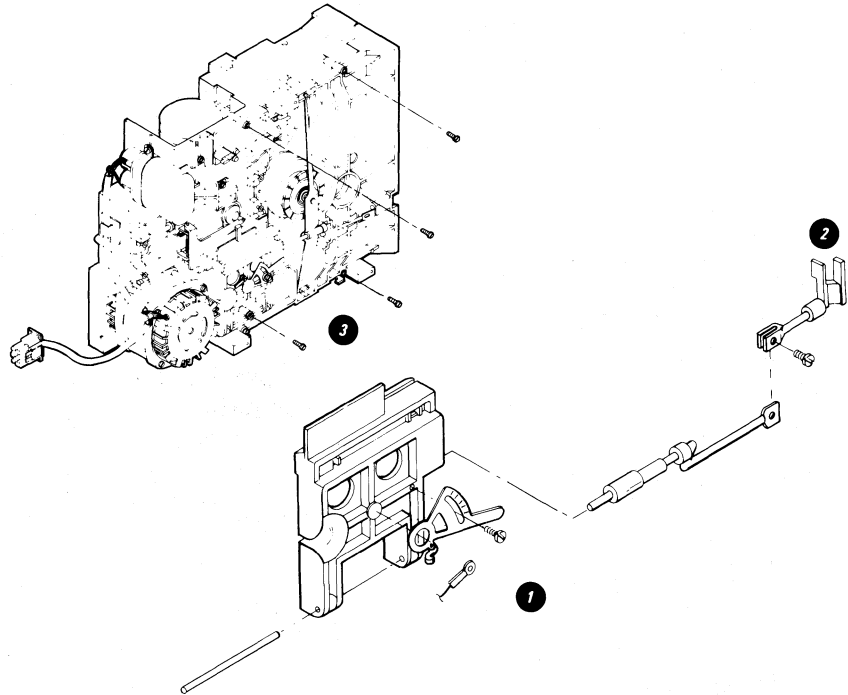
COLLET/FLAT SPRING REMOVAL

CAUTION:

- **Do not attempt to remove the collet/flat spring before removing the bail. Too much pressure or binding can damage the spring.**

- **Flex the collet spring only as needed for removal.**

- **Do not spread the dual heads (type 2D) beyond the normal position.**

- **Do not allow dual heads (type 2D) to contact each other.**

- **Do not allow the pressure pad (type 1) to hit the head.**

1. Turn the system power off.

2. Close the diskette handle.

3. Push the bail in slightly, and disconnect the bail actuator cable from the bail cable stud **❶**.

4. For the type 2D drive, place a clean piece of paper between the heads.

5. Observe the position of the bail return spring, and loosen the bail retainer screw. Pivot the retainer down **❷**.

6. Remove the bail, the bail return spring, and the pivot rod **❸**.

7. Open the diskette handle.

8. Remove the collet actuator roll and the pressure roll **❹**.

9. Turn the collet actuator rod up and out of the way.

10. Remove the collet/flat spring assembly **❺**.
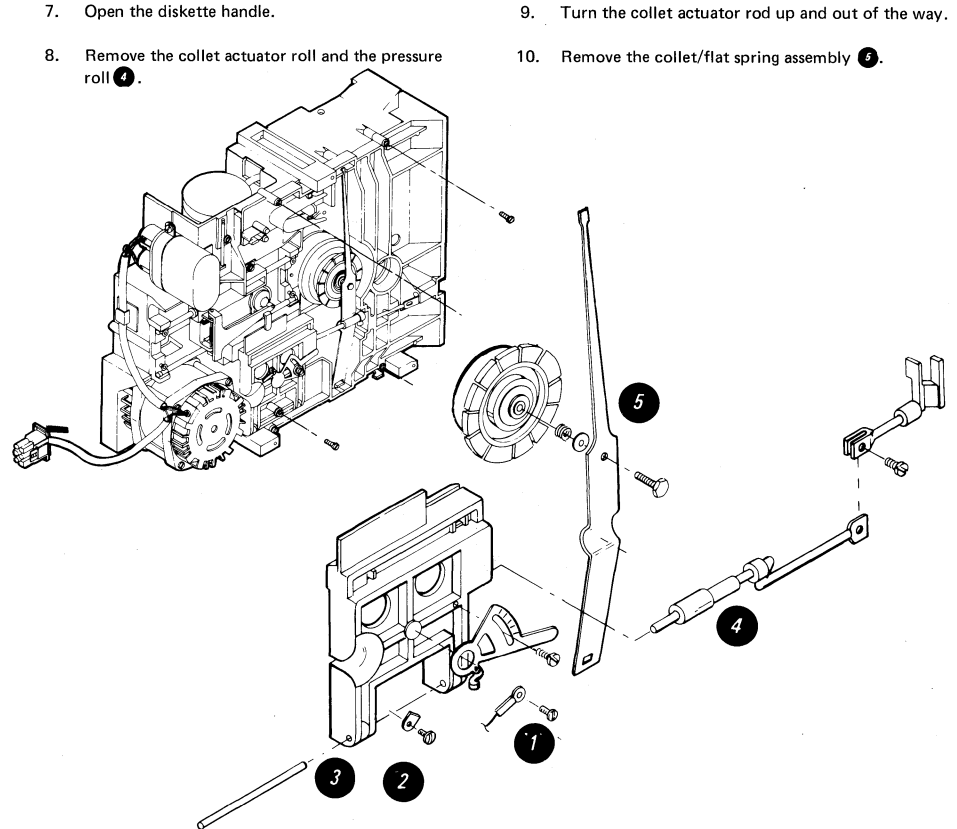
HEAD LOAD ARM PAD

SERVICE WARNING

The head area can be easily damaged or contaminated. When changing a pressure pad, observe the following precautions:

- Ensure all tools are clean. Use an alcohol pad (P/N 9900679) to clean the tools.

- Do not touch the new pressure pad with fingers (use the pressure pad tool included with new pressure pad).

- Be careful not to damage the new pressure pad or loosen any of the pad surface. The layer of adhesive on the new pad is very thin; do not damage the adhesive. Do not let the adhesive touch the surface of the pad that will touch the diskette. Do not use damaged pads.

- Do not make any scratches on the head load arm.

- Do not let the head load arm hit the read/write head.

- Move the head load arm as little as possible. The tension spring can become disconnected.

HEAD LOAD ARM PAD REMOVAL/REPLACEMENT

1. Move the head load arm away from the read/write head.

2. Pull the worn pad off the arm with tweezers. ❶

3. Carefully remove any adhesive that remains on the arm.

4. Use an alcohol pad to ensure that the pressure pad mounting surface is lint-free. If the surface is not completely clean, the new pad may not seat correctly.

5. Carefully remove the new pad from the other pads using scissor clamp.

6. Use a knife or similar thin blade to lift off the paper cover that protects the adhesive layer on the new pad.

7. Place the new pad on the head load arm.

8. Using the small end of the pressure pad tool, press at 90° to the head load arm while turning the tool at least one revolution. ❷ .

9. Carefully restore the head load arm to its operating position.

Tension Spring

Read/Write Head

Pressure Pad

❶

❷

Apply Steady Pressure

Rotate
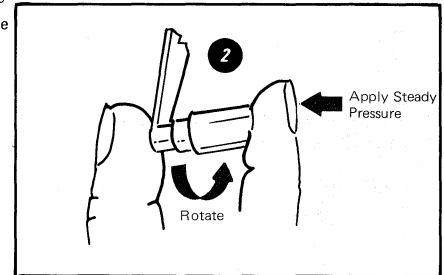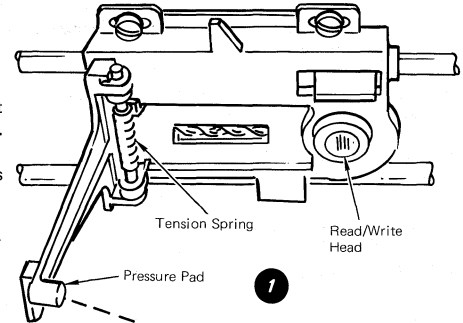
BAIL SOLENOID AND IDLER REMOVAL

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Disconnect the bail actuator cable from the bail cable stud.

3. Remove the solenoid cable connector from the file control card.

4. Remove the AC motor drive belt. ❶

5. Remove the solenoid, bracket and cable as a unit. ❷

6. Remove the idler. ❸

7. Loosen the solenoid locking setscrew and unscrew the solenoid from the bracket. ❹
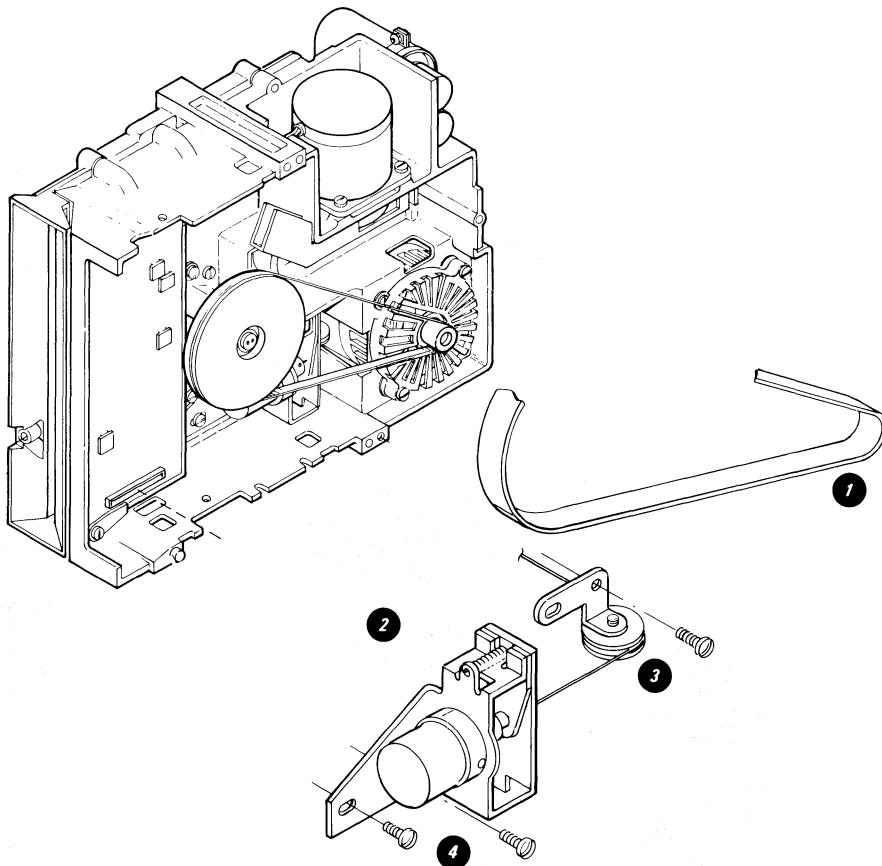
LED AND PTX/FILE CONTROL CARD REMOVAL

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Perform cover removal.

3. Remove the LED and PTX cable connectors. **1** Note the cable path for replacement.

4. Remove the one screw holding the LED in place and remove the LED. **2**

5. Remove the diskette drive unit from the brackets.

6. Disconnect the bail actuator cable from the bail cable stud. **3**

7. Remove the four screws holding the diskette guide and remove the guide. **4**

8. Remove the remaining cable connectors from the file control card.

9. Remove the file control card from the two retainer clamps. **5**

10. Remove one screw holding the PTX and remove the PTX. **6**
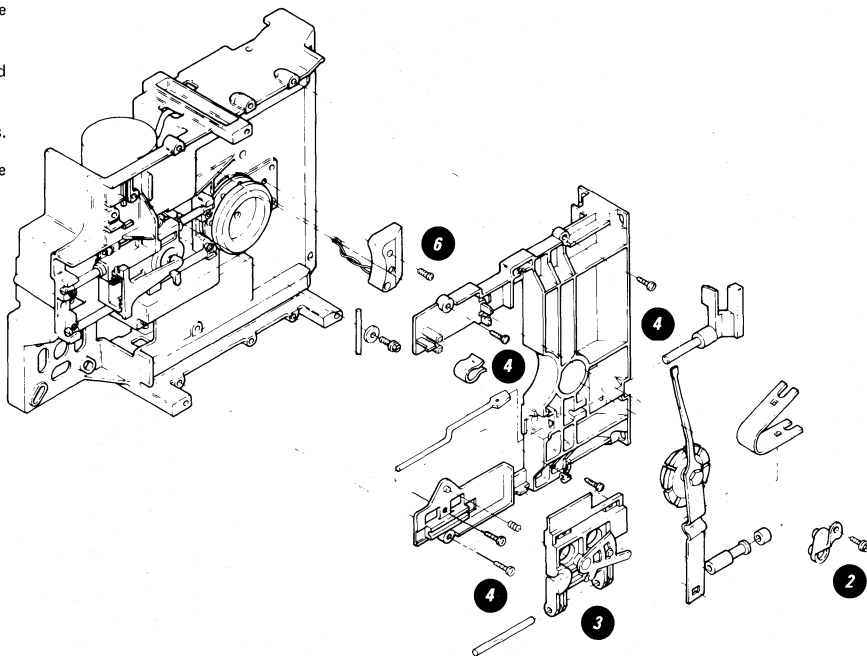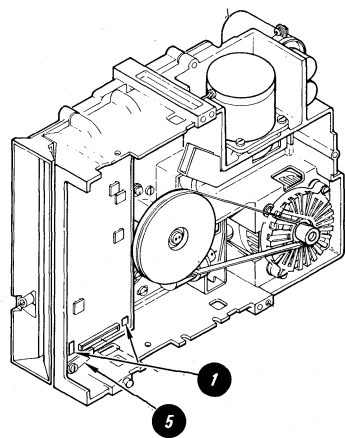
DISKETTE ADAPTER CARD REMOVAL

CAUTION
When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Remove the card retainer. ❶

3. Remove the card. ❷
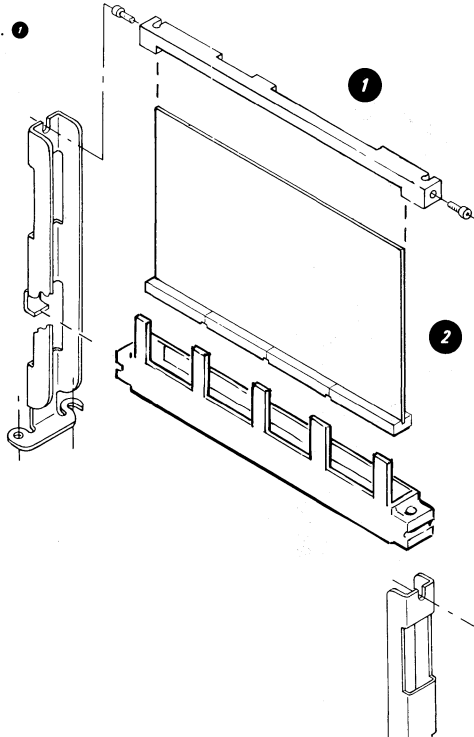
HEAD/CARRIAGE ASSEMBLY REMOVAL (Type 1 and Type 2D Drive)

CAUTION
When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Remove the read/write head cable from the file control card and cable guide.

3. Remove the cable guide.

Warning: The head carriage band must not be bent or damaged.

4. Remove the carriage bracket from the head carriage band. ❶

5. Remove the two top guide rod screws. ❷

6. Slide the top guide rod to the left and remove the head carriage assembly. ❸
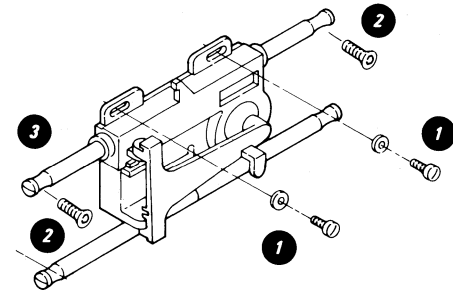
PULLEY AND DRIVE BAND REMOVAL

CAUTION

When a diskette drive is removed from its mounting, the ground through the AC connector must be verified. Verify the ground by checking for 0 ohms between the Diskette Unit base and the diskette drive.

1. Turn the system power off.

2. Remove the head cable connector and cable guide.

Warning: The drive band is easily damaged (do not bend, crease or scratch).

3. Remove the three mounting screws and clamps that attach the band to the pulley and carriage. ❶

4. Remove the stepper pulley and pulley clamp. ❷
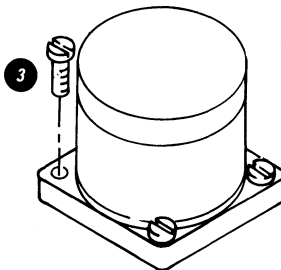
DRIVE BAND REPLACEMENT

1. Attach the end of the band with the welded adapter to the adjustable end of the carriage bracket. ❹ Leave the screw loose.

2. Attach the band to the drive pulley with the screw and clamp. Ensure that the band is parallel to the edge of the pulley (leave the screw loose). ❶

3. Attach the other end of the band to the carriage bracket. Ensure that the band is parallel to the carriage bracket. ❼

4. Perform stepper drive band adjustment.

STEPPER MOTOR REMOVAL

1. Turn the system power off.

2. Remove the head cable connector and cable guide.

3. Remove the stepper motor cable connector.

4. Move the read/write head to track 40 and insert the timing pin into the timing pin holes.

5. Loosen the stepper pulley clamp. ❶

6. While holding the pulley ❷ and the timing pin, remove the four screws that mount the stepper motor. ❸

7. Remove the stepper motor.
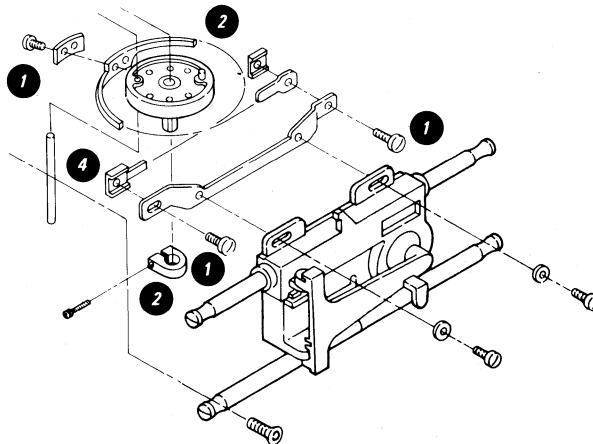
AC DRIVE MOTOR REMOVAL

1. Turn the system power off.

2. Disconnect the diskette AC power cable from connector 8.

3. Perform the cover removal.

4. If necessary, perform the Right Diskette Drive Removal.

5. Disconnect the AC drive motor power cable ❷.

6. Remove the AC drive motor belt ⓫ .

DANGER:
The motor case becomes HOT after continuous use.

7. On all domestic machines or World Trade machines (before EC 841505), remove the two fan enclosure mounting screws ❸ and remove the fan enclosure ❹. On World Trade machines with EC 841505 and later, remove the two mounting screws ❷ and remove the AC drive motor ❶ .

8. Loosen the setscrew ❻ then remove the AC drive motor pulley/fan assembly ❼ .

DANGER:
High voltage may be present at capacitor terminals.

9. Remove the two insulator caps ❹ from the capacitor terminals.

10. Discharge the capacitor by jumpering its terminals with the large-bladed screwdriver.

11. Remove the AC drive motor leads ❸ from the capacitor terminals.

12. Remove the AC drive motor capacitor leads from the from the cable guide ❺ on the casting.

13. Remove the two insulator caps from the AC drive motor capacitor leads.

14. On all domestic machines or World Trade machines (before EC 841505), remove the two remaining motor mount screws ❿ and remove the AC drive motor ❶. On World Trade machines with EC 841505 and later, skip this step.

AC DRIVE MOTOR REPLACEMENT

To reinstall the AC drive motor, observe the following exceptions and reverse the steps in the removal procedure.

1. When installing the AC drive motor leads on the capacitor, note the cable numbers to determine which lead goes on which terminal.

2. When installing the pulley/fan assembly on the AC drive motor, ensure that the setscrew is centered on the flat surface of the motor shaft.

3. Place the pulley/fan assembly on the AC drive motor shaft with a gap ⓬ of 0.5 mm ± 0.1 mm (0.020 inch ± 0.004 inch) between the motor face and the fan hub.

Note: Motor capacitor leads go through holes in insulator caps.

Note: Fan enclosure is not removable.

(World Trade with EC 841505 and later)
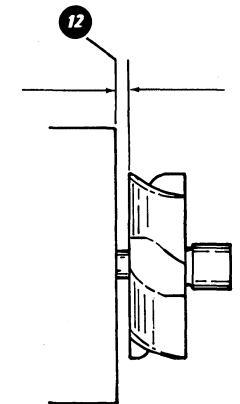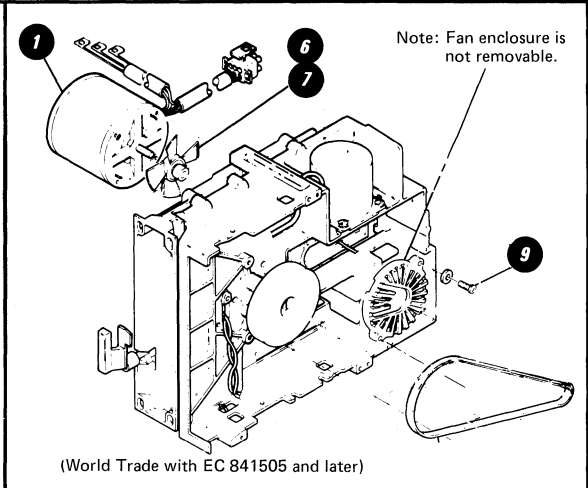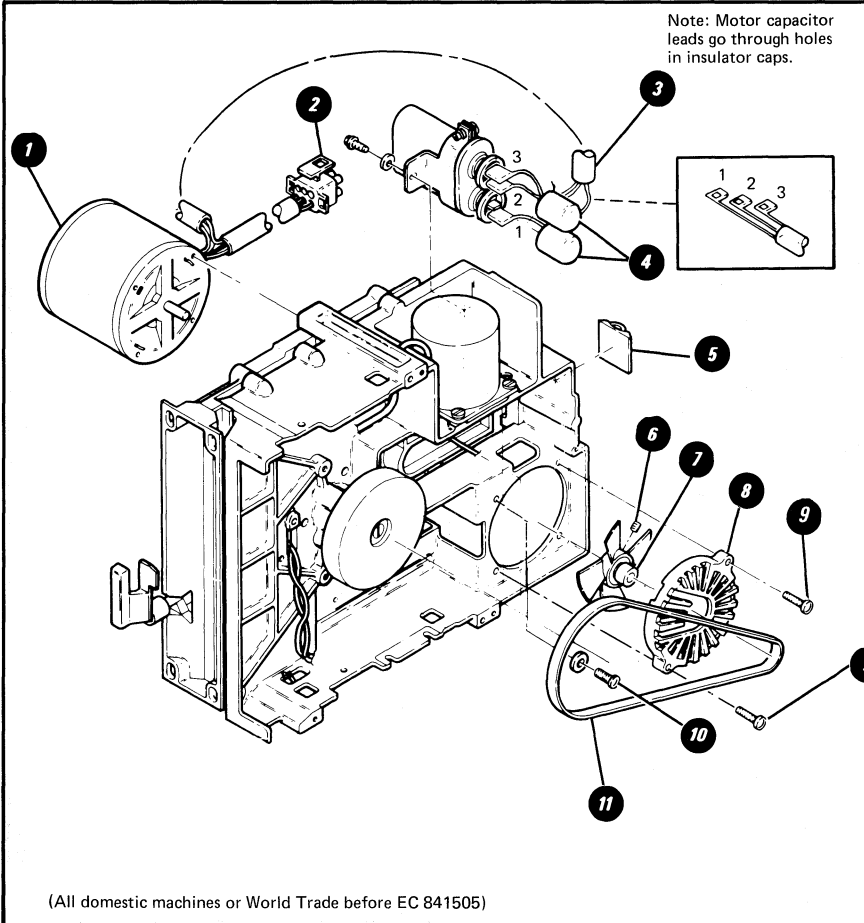
(All domestic machines or World Trade before EC 841505)

CAPACITOR REMOVAL

1. Turn the system power off.

2. Disconnect the diskette AC power cable from connector 8.

3. Perform the Cover Removal.

4. If necessary, perform the Right Diskette Drive Removal.

5. Disconnect the AC drive motor power cable **1**.

DANGER:
High voltage may be present at the capacitor terminals.

6. Remove the two insulator caps **6** from the capacitor terminals.

7. Discharge the capacitor **3** by jumpering its terminals with the large-bladed screwdriver.

8. Remove the three motor capacitor leads **5** from the capacitor terminals.

9. Remove the screw **2** and remove the capacitor bracket assembly **4**.
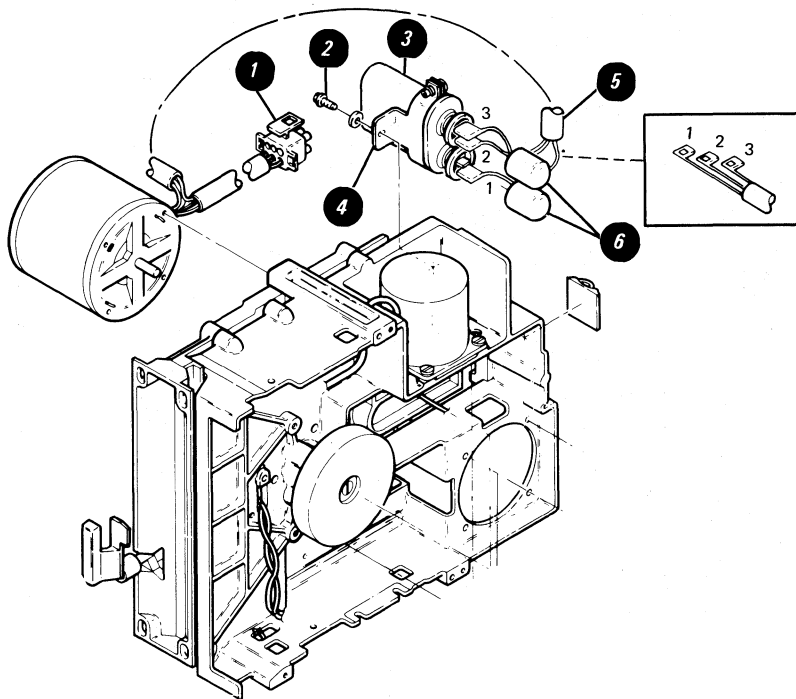
TABLE OF CONTENTS

CABLES, CONNECTORS & TEST POINTS

This section will aid in locating cables, connectors, and test points in the IBM Displaywriter work station. Wire termination points are also given for doing continuity checks.

Use the Point To Point Wiring Locator Chart (Figure 11) for tracing wires and voltages through the Displaywriter System.

When instructed by MAPs to measure a voltage:

- Refer to the Locator Chart (Figure 1) to find the name of the card or connector to be measured. The cards and connectors are listed by module.

- Refer to the figure number in the "Go To Figure" column for the location of the connector or card test point to be measured.

Signal Ground is to be used when measuring voltages.

Frame Ground is earth ground and is used only for electrostatic discharge grounding. The use of frame ground when measuring voltages should only be used when instructed by MAPs.

Warning: Only use a Fluke* digital multimeter or it's equivalent for all voltage readings while servicing the IBM Displaywriter System. The use of any other multimeter to check voltages may cause circuit damage.

*Trademark of John Fluke Manufacturing, Inc.

Note: Figures 9, 9A, and 9B are the AC voltage grounding path schematics. These figures also show the physical locations of the AC grounds.

ELECTRONICS MODULE	
Connector/Card	Go To Figure
0 (Panel 1 — Printer)	2
1 (Panel 1 — Mag Card Unit)	2
2 (Panel 1 — 25-Line Display Module)	2
3 (Panel 1 — Memory Record Switch)	2
4 (Panel 1 — Communications)	2
5 (Panel 1 — Diskette Signal)	2
6A (Panel 1 — Printer Sharing 1)	2
6B (Panel 1 — Printer Sharing 2)	2
7 (Panel 1 — Keyboard)	2
8 (Panel 2 — AC Output)	3
9 (Panel 2 — AC Input)	3
10 (Diskette DC)	3
11 (Communications)	3
12 (Large Display)	3
A1 (To Distribution Board)	4
B1 (To Distribution Board)	4
C1 (To Distribution Board)	4
D1 (To Distribution Board)	4
L1 (LED Board to Power Supply)	4
P1 (To Power Supply)	3
P2 (To Power Supply)	3
S1 (To System Board)	4
S2 (To System Board)	4
Distribution Board	4

KEYBOARD MODULE	
Connector/Card	Go To Figure
30 Pin Connector For Pad Card	10
Keyboard Logic Card	10
Keyboard Cable Connector (at Logic Card)	10
Speaker Connector	10

DISKETTE UNIT	
Connector/Card	Go To Figure
B1	5
B2	5
B3	5
B4	5
AC Fan Connector	8, 8A, 8B
AC Cable and Connectors	8, 8A, 8B
Diskette Adapter Card	5
File Control Card (Type 1 Drive)	6
File Control Card (Type 2D Drive)	7
File Control Card Connector	6, 7
Head Connector (Type 1 Drive)	6
Head Connector (Type 2D Drive)	7
LED Connector (Type 1 Drive)	6
LED Connector (Type 2D Drive)	7
PTX Connector (Type 1 Drive)	6
PTX Connector (Type 2D Drive)	7
Solenoid Connector (Type 1 Drive)	6
Solenoid Connector (Type 2D Drive)	7
Stepper Motor Connector (Type 1 Drive)	6
Stepper Motor Connector (Type 2D Drive)	7

LARGE DISPLAY	
Connector/Card	Go To Figure
2 (Panel 2 — Large Display)	40,41
Analog Card Connector Strip	37
CRT Socket Pins	37
J1 (Display Cable Connector)	37
J2 (Display Cable Connector)	37
J3 (Display Cable Connector)	37
J4 (Display Cable Connector)	37

LARGE DISPLAY	
Connector/Card	Go To Figure
J301 (Deflection Output Cable)	38
J302 (Deflection Indicator Cable)	38
J501 (Video Input Cable)	38
J502 (Video Output Cable)	38
LV1 (Low Voltage Power Supply Cable)	39
LV2 (Low Voltage Power Supply Cable)	39
LV3 (Low Voltage Power Supply Cable)	39

Locator Chart (For Use With MAPs)

0—Printer
5 1
9 6
Female

1 — Mag Card Unit
5 1
9 6
Female

2—Display Module
1
9 15
Male

3 — Memory Record Switch
N/O
N/C   Common
(inside panel 1 view)

4 — Communications
8 1
15 9
Female

5 — Diskette Signal
1 19
20 37
Male

6 A — Printer Sharing 1
5 1
9 6
Female

6 B — Printer Sharing 2
5 1
9 6
Female

7 — Keyboard Module
8 1
15 9
Female
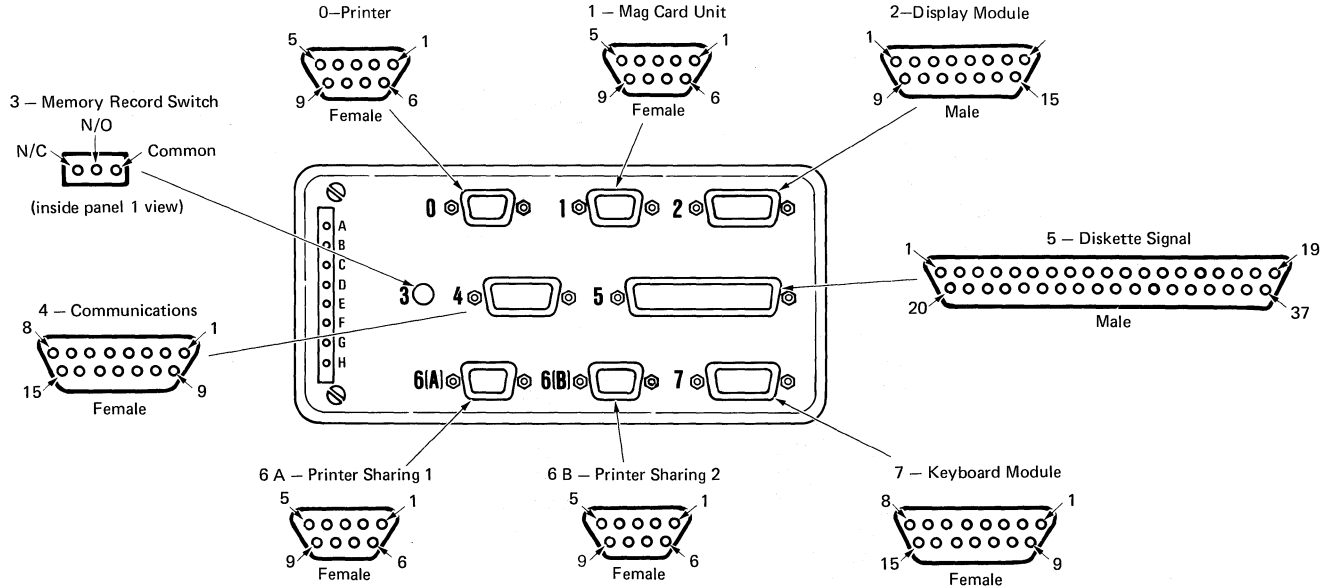
Electronics Module Panel 1 Pin Locator

* 8 — AC (Output)

1
2
3

Female

I — Ground
2 — Line
3 — Neutral

9 — AC (Input)

1
2
3

Male

1 — Ground
2 — Neutral
3 — Line

Fuse

* Connector 8 will be
labeled 12 if the
Large Display is
installed on the
system.

* 8   9

10   11

P2

1 5
6 10

Wiring Side of
Internal Distribution Cable
Connector P2

P1

1 12
13 24

Wiring side of System Power Cable
Connector P1

10

13   1
25   14
Female

11

19   1
37   20
Female
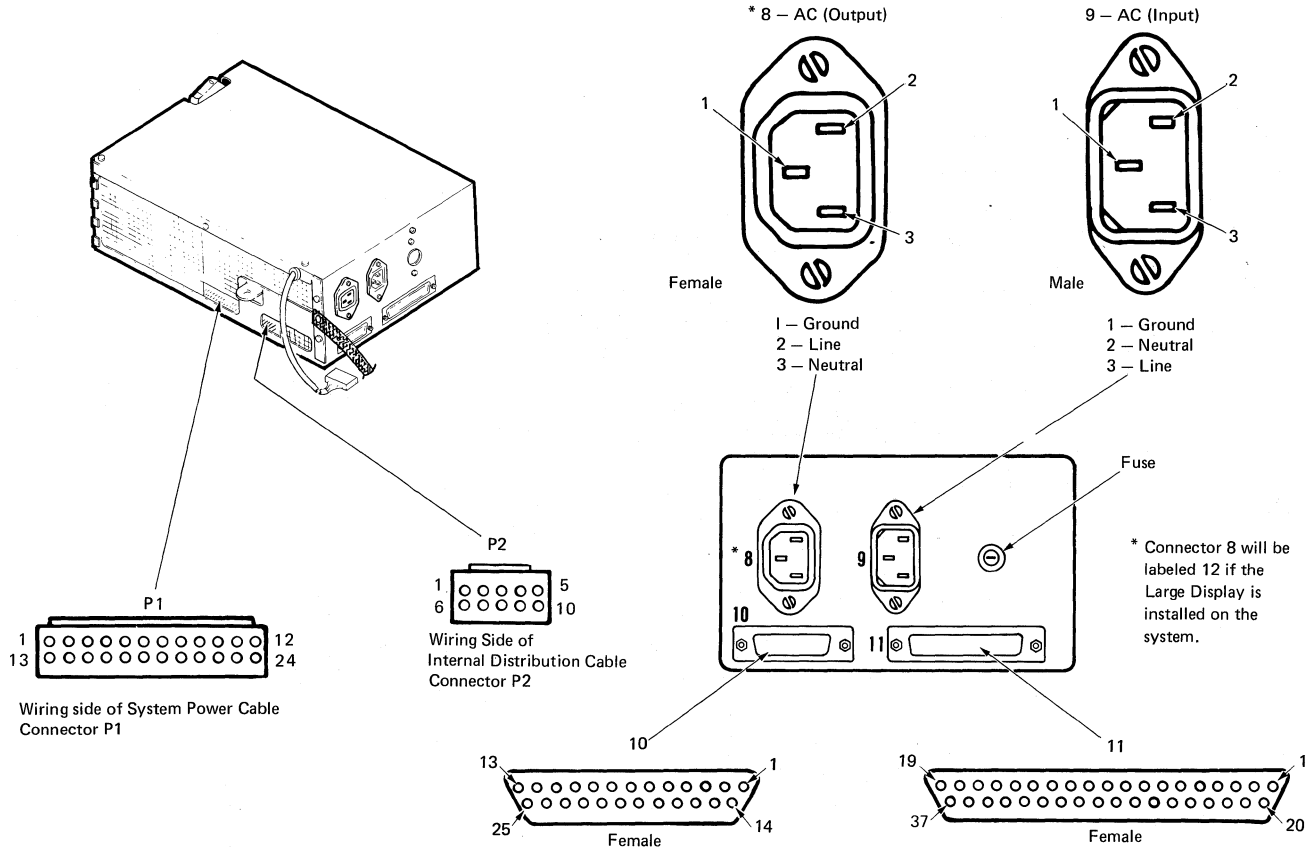
Power Supply and Panel 2 Connector Pin Locators

L1

Wiring Side

L1

S2

S1

S1   Wiring Side

S1

S2

System Card

S2

1 O O O ● O O O O 8

Wiring Side

			F	Memory Extender Card
			E	Memory Card
O				
			D	Display Adapter Card
			C	Printer Sharing Card
O				
			B	System Card
			A	Telecommunications Card

Distribution Board

Pin 1   Pin 12

Wiring Side

Pin 13   Pin 24

Distribution Board Connector
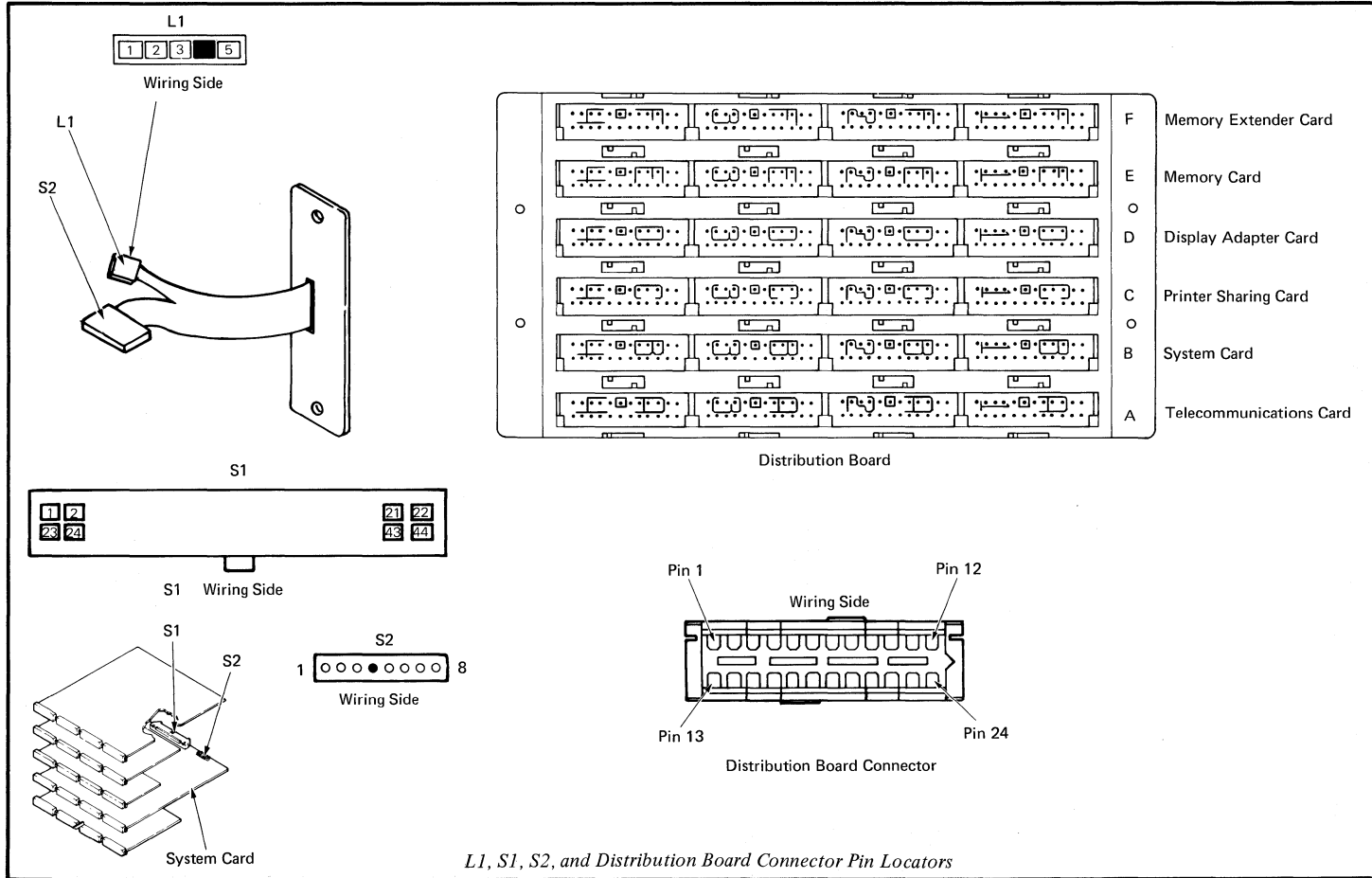
L1, S1, S2, and Distribution Board Connector Pin Locators

Pin 1

Pin 12

Pin 13   Wiring Side   Pin 24

B1   B2   B3   B4
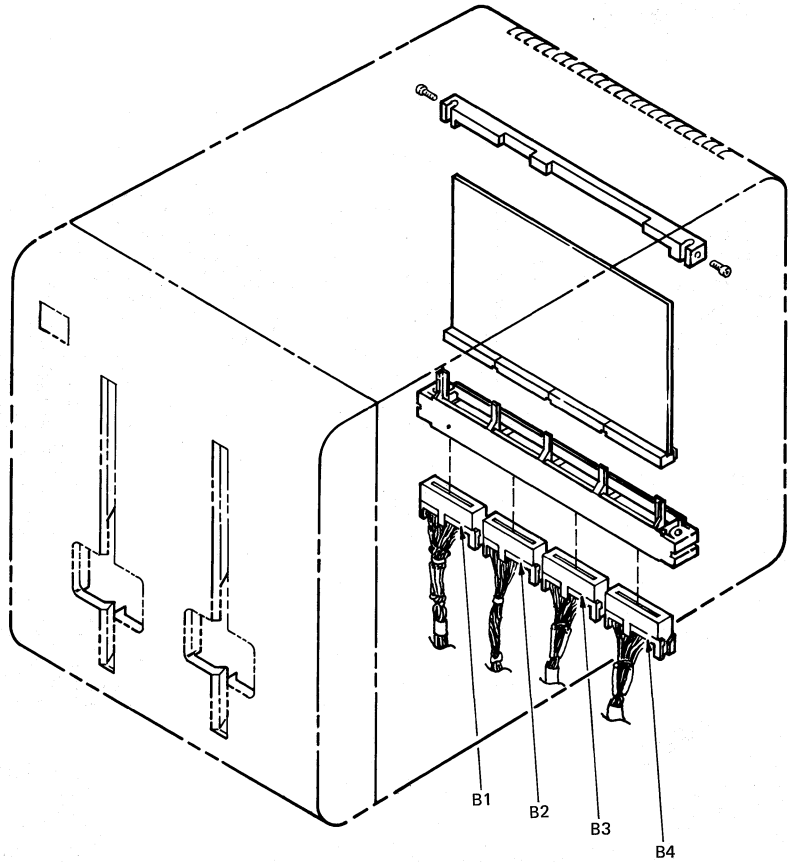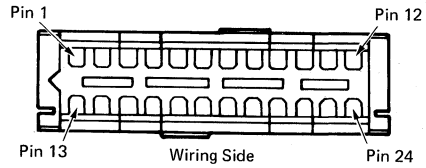
Diskette Adapter Card Connector Pin Locators
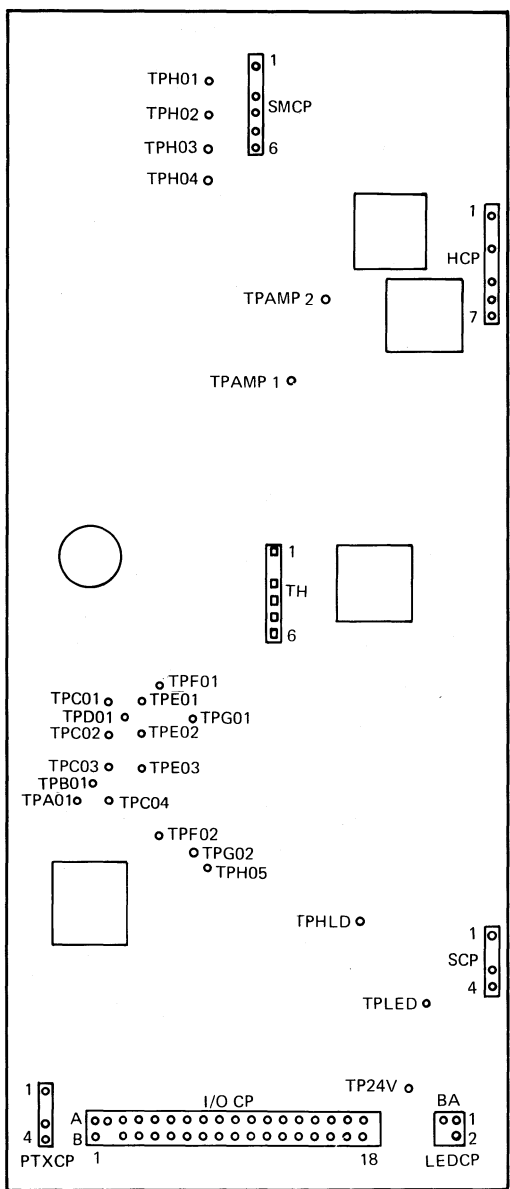
PTXCP — PTX Connector Pins
I/O CP — File Control Card Connector Pins
LEDCP — LED Connector Pins
SCP — Solenoid Connector Pins
HCP — Head Connector Pins
SMCP — Stepper Motor Connector Pins

Type 1 Drive
File Control Card Test Points and Connector Pin Locators
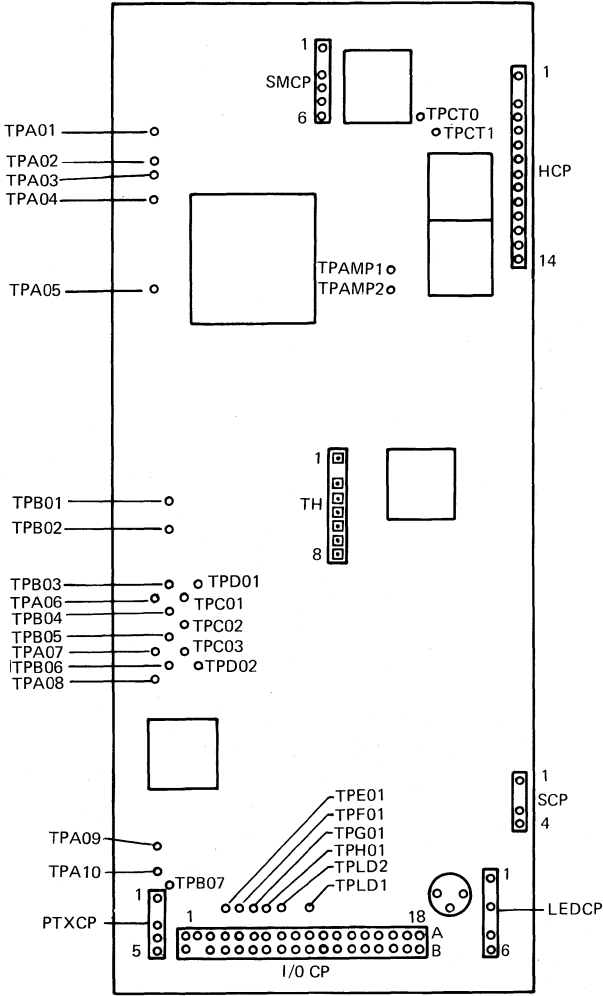
PTXCP — PTX Connector Pins
I/O CP — File Control Card Connector Pins
LEDCP — LED Connector Pins
SCP — Solenoid Connector Pins
HCP — Head Connector Pins
SMCP — Stepper Motor Connector Pins

Type 2D Drive
File Control Card Test Points and Connector Pin Locators
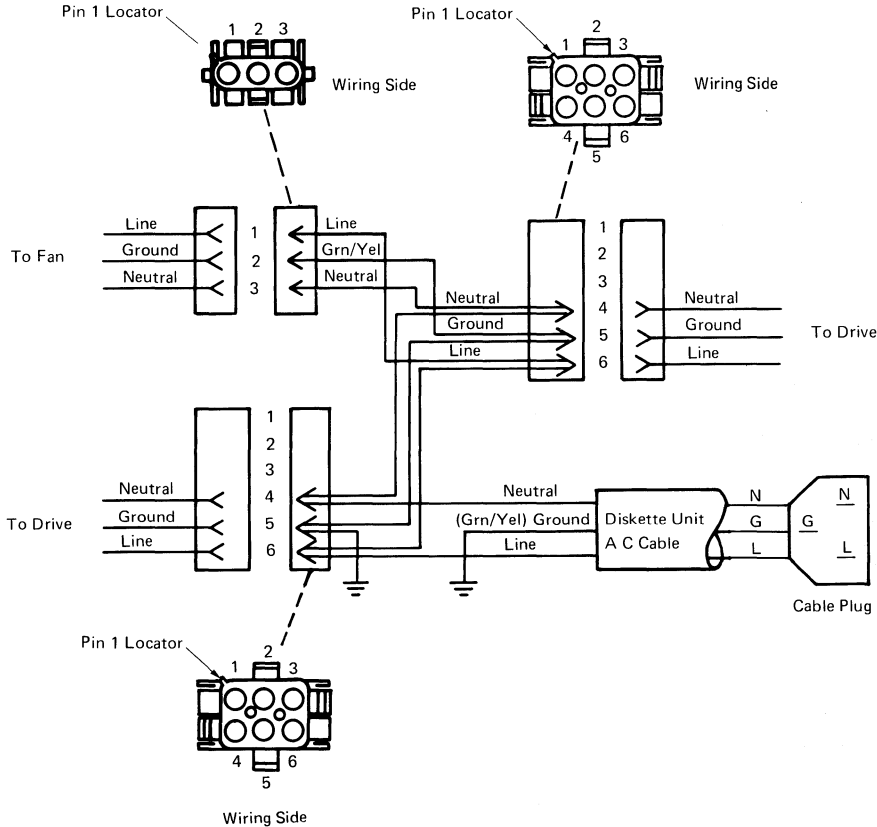
AC VOLTAGE CHECK

Line To Gound	Read AC Voltage
Line To Neutral	Read AC Voltage
Ground To Neutral	0 Volts

Left or Right Drive Conn.	Fan Conn.	Description
Pin 4	Pin 3	Neutral
Pin 5	Pin 2	Ground
Pin 6	Pin 1	Line

Diskette Drive AC Connectors — AC Wiring Diagram

AC VOLTAGE CHECK	
Line To Ground	Read AC Voltage
Line To Neutral	Read AC Voltage
Ground To Neutral	0 Volts

Terminal Block Positions	Left or Right Drive Conn.	Fan Conn.	Description
Pin 6, 7, 8, 9	Pin 6	Pin 1	Line
Pin 1, 2, 3, 4	Pin 5	Pin 2	Ground
Pin 11, 12, 13, 14	Pin 4	Pin 3	Neutral
Pin 5, 10			Separator
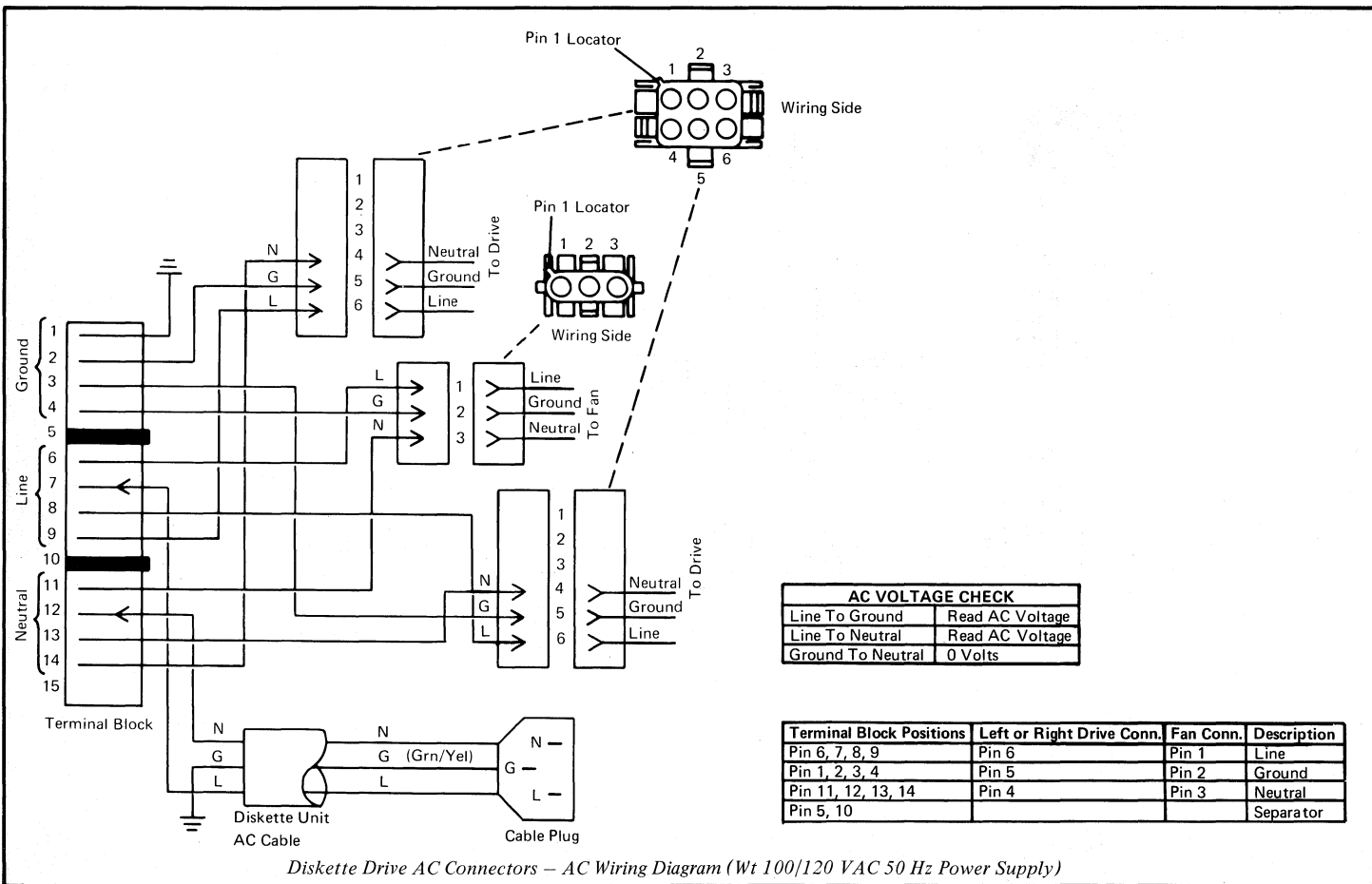
Diskette Drive AC Connectors — AC Wiring Diagram (Wt 100/120 VAC 50 Hz Power Supply)
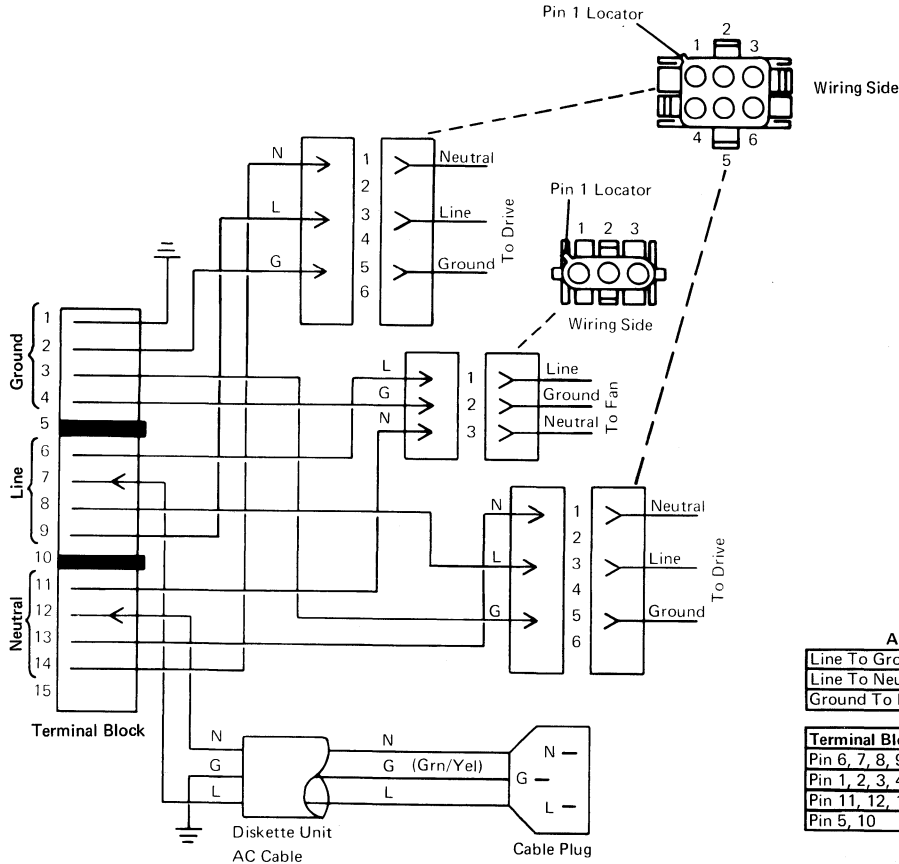
Diskette Drive AC Connectors — AC Wiring Diagram (Wt 200/240 VAC 50/60 Hz Power Supply)

AC VOLTAGE CHECK

Line To Ground	Read AC Voltage
Line To Neutral	Read AC Voltage
Ground To Neutral	0 Volts

Terminal Block Positions	Left or Right Drive Conn.	Fan Conn.	Description
Pin 6, 7, 8, 9	Pin 3	Pin 1	Line
Pin 1, 2, 3, 4	Pin 5	Pin 2	Ground
Pin 11, 12, 13,114	Pin 1	Pin 3	Neutral
Pin 5, 10			Separator

Diskette Drive AC Voltage Grounding Path Schematic
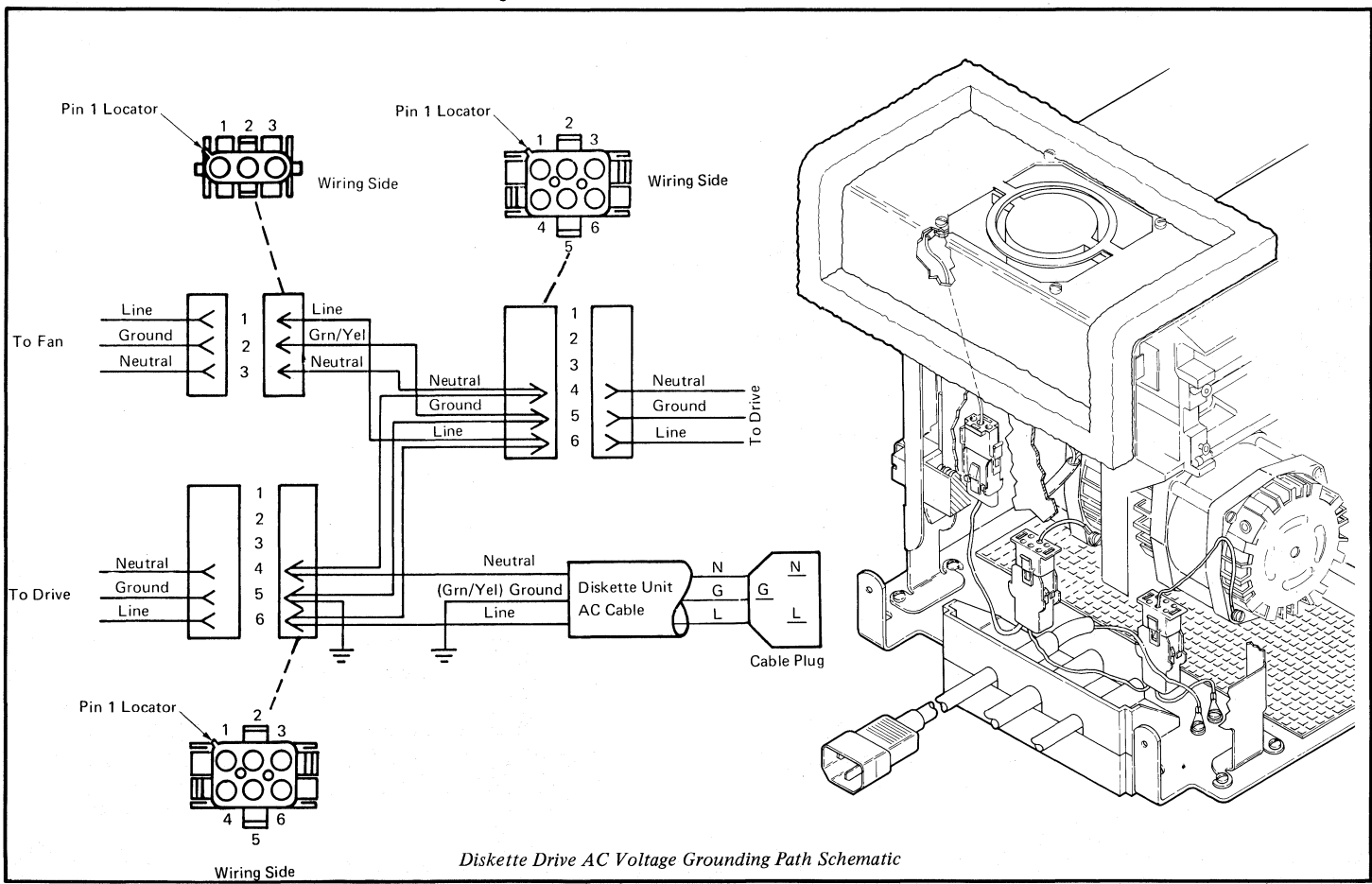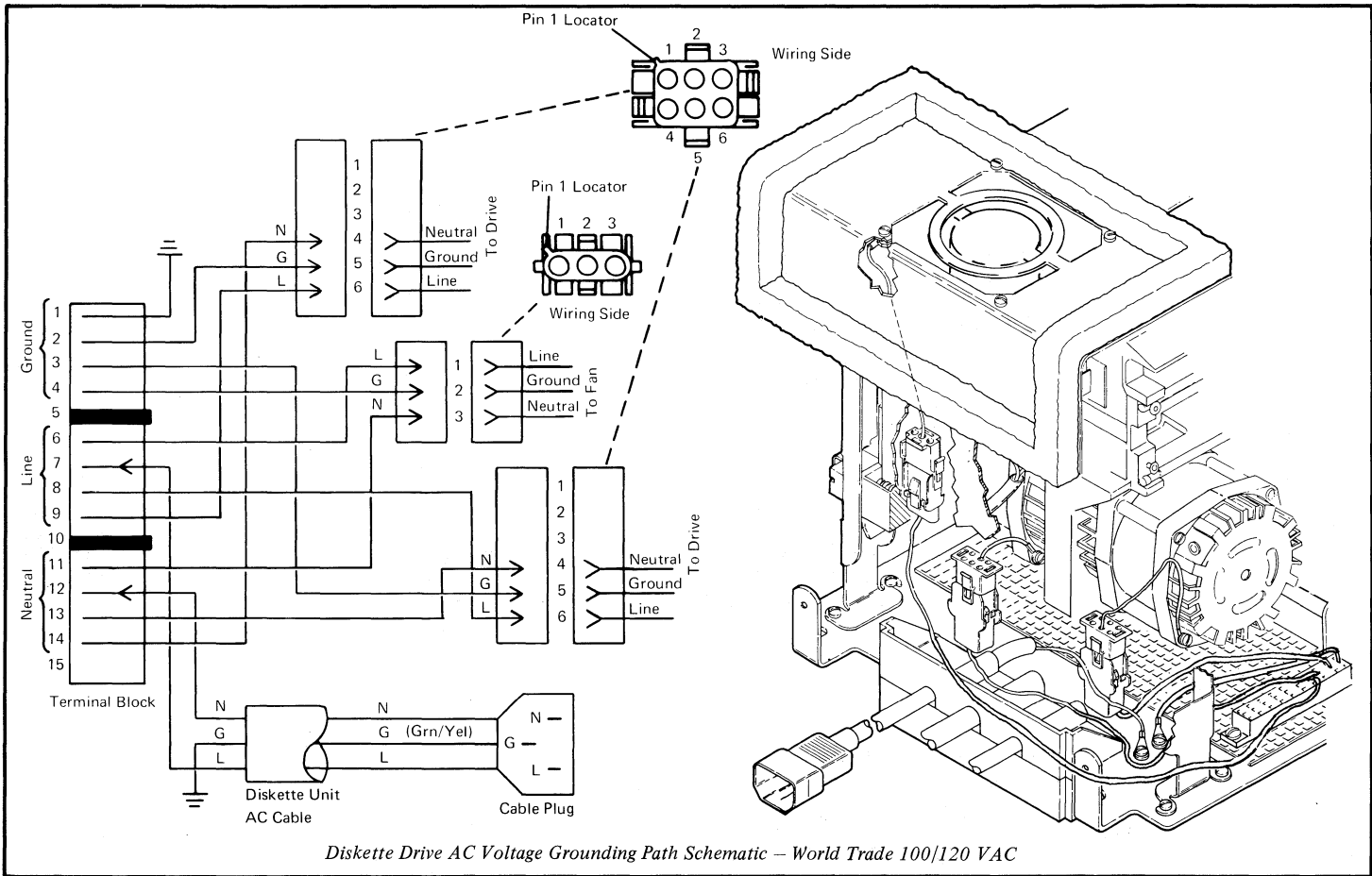
Diskette Drive AC Voltage Grounding Path Schematic — World Trade 100/120 VAC
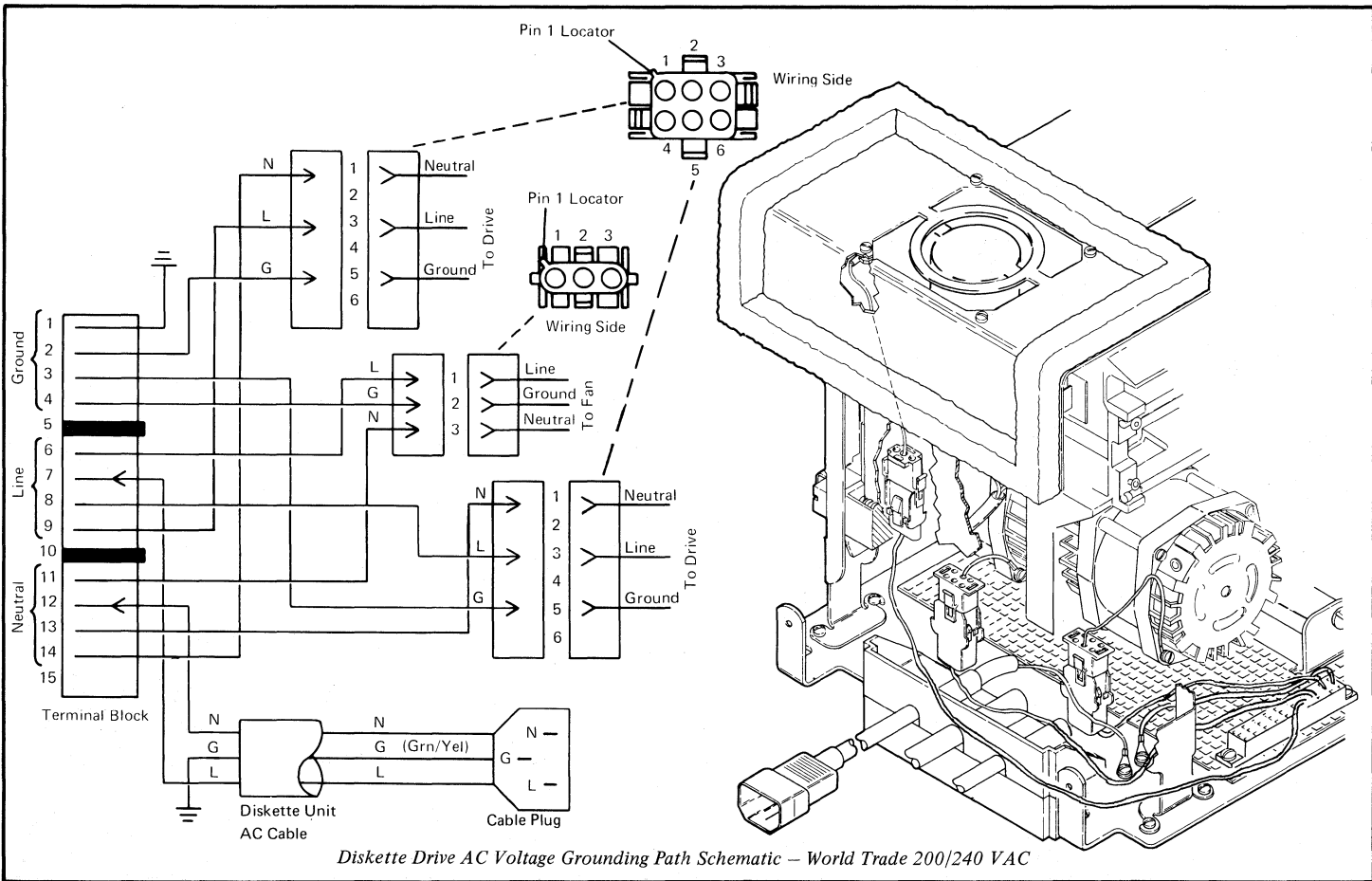
Diskette Drive AC Voltage Grounding Path Schematic — World Trade 200/240 VAC

Pin 14 — Key

Keyboard Cable Connector (at Logic Card)

A02

SPEAKER CONNECTOR

14

Keyboard Cable Connector (at Logic Card)

Keyboard Logic Card

1

0   7

ID Jumpers (See Keyboard Section)

30 Pin Edge Connector

Sense Lines — 1-4 and 27-30
Drive Lines — 10 - 21
Ground — 5 - 9 and 22 - 26
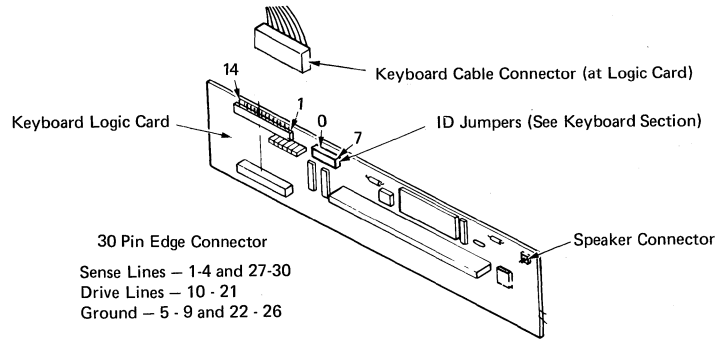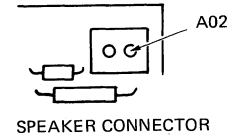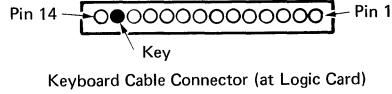
Speaker Connector

Keyboard Logic Card and Speaker Connector Pin Locators

The Point to Point Wiring Locator Chart (Figure 11) will aid service personnel locate connector wires when doing continuity checks, tracing wires in cables, and checking voltages.

The connectors and cards are listed by module. Printer Sharing cables and connectors are listed separately.

Signal Ground is to be used when measuring voltages.

Frame Ground is earth ground and is used only for electrostatic discharge grounding. The use of frame ground when measuring voltages should only be used when instructed by MAPs.

Warning: Only use a Fluke* digital multimeter or it's equivalent for all voltage readings while servicing the IBM Displaywriter System. The use of any other multimeter to check voltages may cause circuit damage.

*Trademark of John Fluke Manufacturing, Inc.

ELECTRONICS MODULE	
Connector/Card	Go To Figure
0 (Panel 1 — Printer)	23
1 (Panel 1 — Mag Card Unit)	23
2 (Panel 1 — 25-Line Display Module)	24
3 (Panel 1 — Memory Record Switch)	22
4 (Panel 1 — Communications)	24
5 (Panel 1 — Diskette Signal)	25
6A (Panel 1 — Printer Sharing 1)	36
6B (Panel 1 — Printer Sharing 2)	36
7 (Panel 1 — Keyboard)	26
8 (Panel 2 — AC Output)	3
10 (Panel 2 — Diskette DC)	16
11 (Panel 2 — Communications)	16
12 (Panel 2 — Large Display)	3
A1	18
B1	19
C1	20
D1	20
L1	15
P1	14
P2	15
S1	21
S2	22
Distribution Board	17

KEYBOARD MODULE	
Connector/Card	Go To Figure
Keyboard Cable Connector (at Logic Card)	35

DISKETTE UNIT	
Connector/Card	Go To Figure
B1	27
B2	28
B3/B4	29
AC Fan Connector	8, 8A, 8B
AC Cable and Connectors	8, 8A, 8B
File Control Card (Type 1 Drive)	31
File Control Card (Type 2D Drive)	33
File Control Card Connector	30
Head Connector (Type 1 Drive)	31, 32
Head Connector (Type 2D Drive)	33, 34
LED Connector (Type 1 Drive)	31, 32
LED Connector (Type 2D Drive)	33, 34
PTX Connector (Type 1 Drive)	31, 32
PTX Connector (Type 2D Drive)	33, 34
Solenoid Connector (Type 1 Drive)	31, 32
Solenoid Connector (Type 2D Drive)	33, 34
Stepper Motor Connector (Type 1 Drive)	31, 32
Stepper Motor Connector (Type 2D Drive)	33, 34

LARGE DISPLAY	
Connector/Card	Go To Figure
2 (Panel 1 — Large Display)	40, 41
Analog Card Connector Strip	37
CRT Socket Pins	37
J1	37, 41
J2	37
J3	37
J4	37, 41

LARGE DISPLAY	
Connector/Card	Go To Figure
J301	38
J302	38
J501	38, 41
J502	38
LV1	39
LV2	39
LV3	39

Point to Point Wiring Locator Chart

Power Supply Distribution Schematic (for system with 25-Line display)
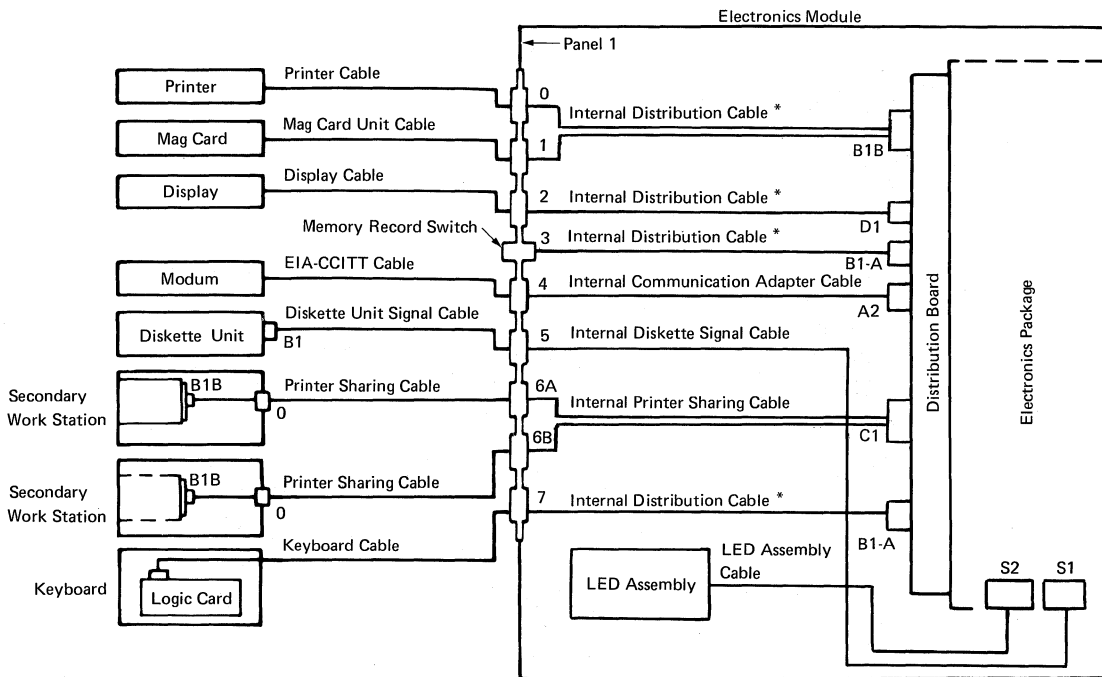
* The internal distribution cable has several connectors.
  Each connector plugs into a different position.

Signal Distribution Schematic

Power Supply Connector P1

Note: All connectors are shown from the wiring side.

P1

1 ○○○○○○○○○○○ 12
13 ○○○○○○○○○○○ 24

A1

1   12

13   24

Electronics Module

← Panel 1

0
1
2
3
4
5
6A
6B
7

A1

Distribution Board

Electronics Package

L1 ☐

P2 P1   Power Supply
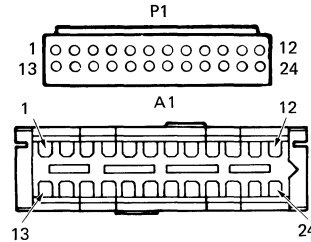
P1	Conn/Pin	Identification
1	A1–8	–12.0 VDC
2	A1–13	–5.0 VDC
3	—	—
4	A1–16	Signal Ground
5	A1–18	Signal Ground
6	A1–17	Signal Ground
7	—	—
8	—	—
9	—	—
10	A1–22	+5.0 VDC
11	A1–23	+5.0 VDC
12	A1–24	+5.0 VDC
13	A1–21	+5.0 VDC (POR)
14	A1–15	+8.5 VDC
15	A1–20	+12.0 VDC
16	—	—
17	A1–4	Signal Ground
18	A1–5	Signal Ground
19	A1–6	Signal Ground
20	A1–3	Signal Ground
21	A1–9	+5.0 VDC
22	A1–10	+5.0 VDC
23	A1–11	+5.0 VDC
24	A1–12	+5.0 VDC
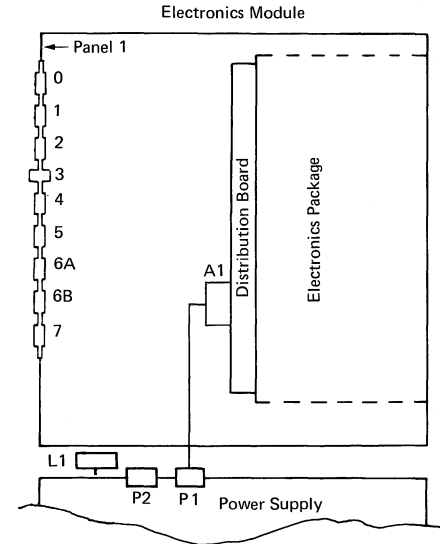
Power Supply Connectors P2, and L1.

Note: All Panel 1 Connectors are shown form the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
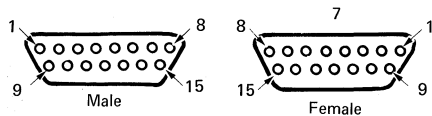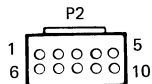
P2	Conn/Pin	Conn/Pin	Identification
1	—	—	—
2	—	—	—
3	7–11	Lgc Cd–2	+5.0 VDC
4	7–9	Lgc Cd–1	+8.5 VDC
5	—	—	—
6	2–4	—	Signal Ground
7	2–2	—	Signal Ground
8	2–7	—	+5.0 VDC
9	—	—	—
10	2–3	—	+12.0 VDC

L1	Identification
1	LED C (Thermal)
2	LED B (Over Current)
3	LED A (Over/Under Voltage)
4	Key
5	+16 VDC

Power Supply Connectors 11 and 10.

Note: All Panel 2 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
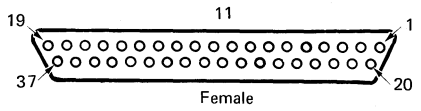
11	Identification
1	Signal Ground
2	Signal Ground
3	Signal Ground
4	Signal Ground
5	Signal Ground
6	Signal Ground
7	Signal Ground
8	Signal Ground
9	+12 VDC
10	+5.0 VDC
11	+5.0 VDC
12	+5.0 VDC
13	+5.0 VDC
14	+5.0 VDC
15	+5.0 VDC
16	+8.5 VDC
17	+8.5 VDC
18	-5.0 VDC

11	Identification
19	-12 VDC
20	Signal Ground
21	Signal Ground
22	Signal Ground
23	Signal Ground
24	Signal Ground
25	Signal Ground
26	Signal Ground
27	+12.0 VDC
28	+5.0 VDC
29	+5.0 VDC
30	+5.0 VDC
31	+5.0 VDC
32	+5.0 VDC
33	+5.0 VDC
34	+8.5 VDC
35	+8.5 VDC
36	-5.0 VDC
37	-12.0 VDC

10	Conn/Pin	Identification
1	B2-13	+5.0 VDC
2	B2-14	+5.0 VDC
3	B2-1	+5.0 VDC
4	B2-2	+5.0 VDC
5	B2-10	+12.0 VDC
6	B2-6	+18.0 VDC (POR DIS)
7	B2-15	Signal Ground
8	B2-16	Signal Ground
9	B2-17	Signal Ground
10	B2-18	Signal Ground
11	B2-19	Signal Ground
12	B2-5	-5.0 VDC

10	Conn/Pin	Identification
13	B2-12	+24.0 VDC
14	B2-3	+5.0 VDC
15	—	—
16	—	—
17	—	—
18	—	—
19	—	—
20	B2-20	Signal Ground
21	B2-21	Signal Ground
22	—	—
23	—	—
24	—	—
25	—	—

Distribution Board

F4	F3	F2	F1	Memory Extender Card (Position F)
E4	E3	E2	E1	Memory Card (Position E)
D4	D3	D2	D1	Display Adapter Card (Position D)
C4	C3	C2	C1	Printer Sharing Card (Position C)
B4	B3	B2	B1	System Card (Position B)
A4	A3	A2	A1	Communications Card (Position A)

Pin 1
Wiring Side
Pin 12
Pin 13   Distribution Board Connector   Pin 24
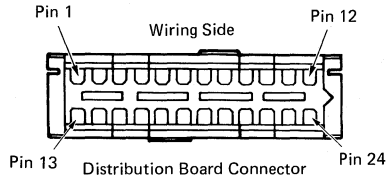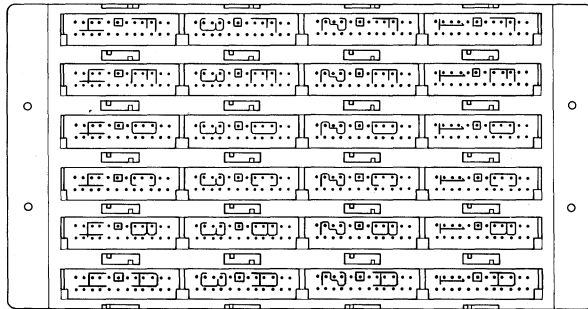
Pin	Voltage	Pin	Voltage	Pin	Voltage	Pin	Voltage
	F4		**F3**		**F2**		**F1**
6	Ground	6	Ground	6	Ground	6	Ground
11	+5 VDC	11	+5 VDC	11	+5 VDC	11	+5 VDC
				13	-5 VDC	13	-5 VDC
				15	+8.5 VDC	15	+8.5 VDC
				20	+12 VDC	20	+12 VDC
	E4		**E3**		**E2**		**E1**
6	Ground	6	Ground	6	Ground	6	Ground
11	+5 VDC	11	+5 VDC	11	+5 VDC	11	+5 VDC
				13	-5 VDC	13	-5 VDC
				15	+8.5 VDC	15	+8.5 VDC
				20	+12 VDC	20	+12 VDC
	D4		**D3**		**D2**		**D1**
6	Ground	6	Ground	6	Ground	6	Ground
11	+5 VDC	11	+5 VDC	11	+5 VDC	11	+5 VDC
						13	-5 VDC
						15	+8.5 VDC
						20	+12 VDC
	C4		**C3**		**C2**		**C1**
6	Ground	6	Ground	6	Ground	6	Ground
11	+5 VDC	11	+5 VDC	11	+5 VDC	11	+5 VDC
						13	-5 VDC
						15	+8.5 VDC
	B4		**B3**		**B2**		**B1**
6	Ground	6	Ground	6	Ground	6	Ground
11	+5 VDC	11	+5 VDC	11	+5 VDC	11	+5 VDC
	A4		**A3**		**A2**		**A1**

Pin	Voltage	Pin	Voltage
6 Ground (A4)		6 Ground (A3)	
3	Ground	13	-5 VDC
4	Ground	15	+8.5 VDC
5	Ground	16	Ground
6	Ground	17	Ground
8	-12 VDC	18	Ground
9	+5 VDC	20	+12 VDC
10	+5 VDC	22	+5 VDC
11	+5 VDC	23	+5 VDC
12	+5 VDC	24	+5 VDC

Note: All ground pins on the Distribution Board are signal ground.

Distribution Board and Distribution Board Connectors

Distribution Board Connector A1

Note: All connectors are shown from the wiring side.
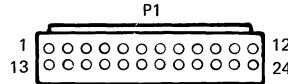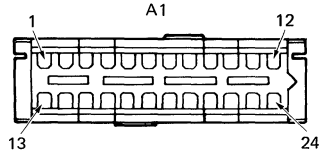
A1	Conn/Pin	Identification
1	—	—
2	—	—
3	P1–20	Signal Ground
4	P1–17	Signal Ground
5	P1–18	Signal Ground
6	P1–19	Signal Ground
7	—	—
8	P1–1	–12.0 VDC
9	P1–21	+5.0 VDC
10	P1–22	+5.0 VDC
11	P1–23	+5.0 VDC
12	P1–24	+5.0 VDC
13	P1–2	–5.0 VDC
14	—	—
15	P1–14	+8.5 VDC
16	P1–4	Signal Ground
17	P1–6	Signal Ground
18	P1–5	Signal Ground
19	—	—
20	P1–15	+12.0 VDC
21	P1–13	POR
22	P1–10	+5.0 VDC
23	P1–11	+5.0 VDC
24	P1–12	+5.0 VDC
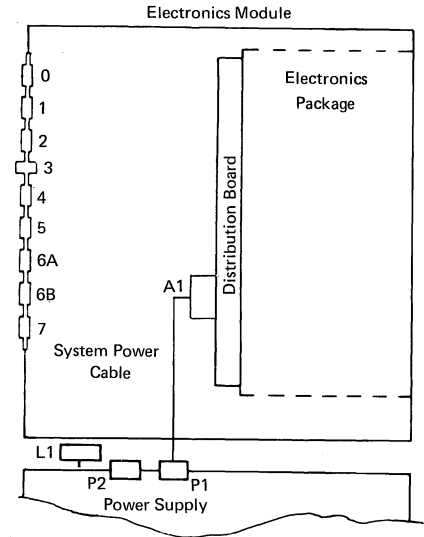
Distribution Board Connector B1.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

The Memory Record Switch is shown from the inside of Panel 1.

Memory Record Switch

N/C — N/O — Common

Keyboard Cable Connector (at Logic Card)

Pin 14 — Key — Pin 1
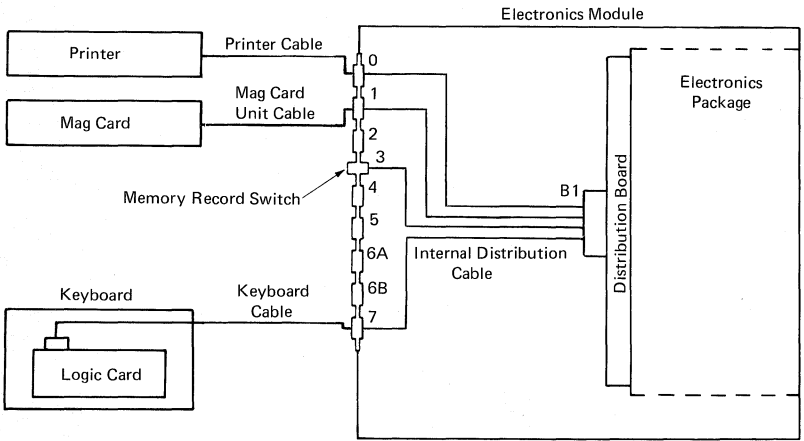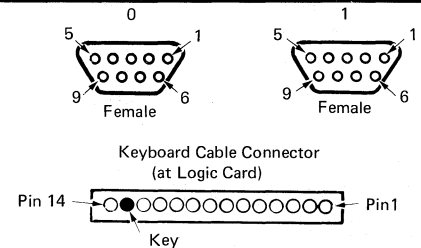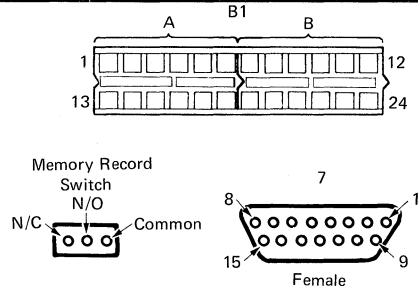
B1	Conn/Pin	Conn/Pin	Identification
1	7-8	Lgc Cd-9	Data Strobe
2	7-6	Lgc Cd-10	Tone (Speaker)
3	7-5	Lgc Cd-3	Click (Speaker)
4	7-3	Lgc Cd-7	Serial Data Clock
5	7-1	Lgc Cd-8	Serial Data
6	MRS* N/O	—	Signal Ground
7	0-9	—	Data Set Ready
8	0-3	—	Receive High
9	0-4	—	Receive Low
10	0-1	—	Transmit High
11	—	—	—
12	0-2	—	Transmit Low
13	—	—	—
14	7-7	Lgc Cd-5	Keyboard Acknowledge
15	MRS* Common	—	System Dump
16	7-4	Lgc Cd-12	Power-On-Reset
17	—	—	—
18	—	—	—
19	1-9	—	Data Set Ready
20	—	—	—
21	1-3	—	Receive High
22	1-4	—	Receive Low
23	1-1	—	Transmit High
24	1-2	—	Transmit Low

* Memory Record Switch

Electronics Module

Printer — Printer Cable — 0

Mag Card — Mag Card Unit Cable — 1

2

3

Memory Record Switch — 4

5

6A

Internal Distribution Cable — 6B

Keyboard — Keyboard Cable — 7

Logic Card

Electronics Package

B1 — Distribution Board

Distribution Board Connectors C1 and D1.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

C1	Conn/Pin	Identification	Conn/Pin	Conn/Pin	Identification
7	6A-9*	Data Set Ready			
8	6A-3	Receive High	0-1	B1-10	Transmit High
9	6A-4	Receive Low	0-2	B1-12	Transmit Low
10	6A-1	Transmit High	0-3	B1-8	Receive High
12	6A-2	Transmit Low	0-4	B1-9	Receive Low
19	6B-9*	Data Set Ready			
21	6B-3	Receive High	0-1	B1-10	Transmit High
22	6B-4	Receive Low	0-2	B1-12	Transmit Low
23	6B-1	Transmit High	0-3	B1-8	Receive High
24	6B-2	Transmit Low	0-4	B1-9	Receive Low

* On Connector 6A and 6B, Pins 7, 8, and 9 are strapped together.
  On Connector 6A and 6B, Pins 5 and 6 are Frame Ground.

Note: The Receive and Transmit Signals change names at Panel 1, Connector 0.

D1	Conn/Pin	Identification
1	2-10	Video
2	2-11	Brightness
3	2-12	Vertical
4	2-13	Horizontal Drive
5	—	—
6	2-15	Signal Ground

System Card Connector S1.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
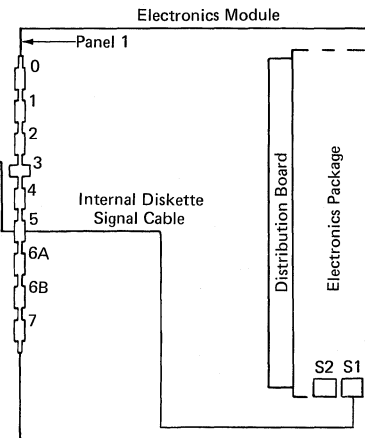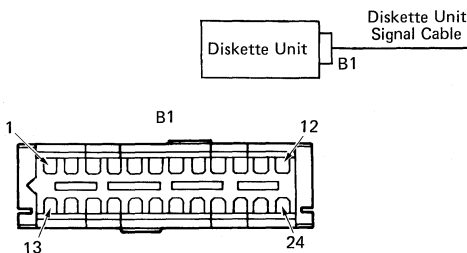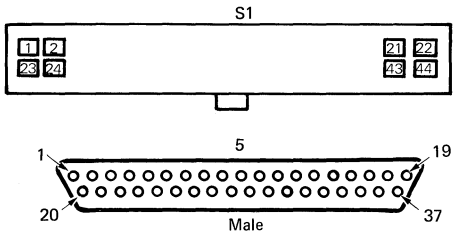
S1	Conn/Pin	Conn/Pin	Identification
1	–	–	–
2	–	–	–
3	–	–	–
4	–	–	–
5	5-5	–	Address Bit 8
6	5-20	–	DMA Request Receive
7	–	–	–
8	5-22	–	DMA Request Transmit
9	5-36	B1-11	Data Bus Bit 2
10	5-37	B1-12	Data Bus Bit 0
11	5-27	B1-2	Interrupt 4
12	5-26	–	Interrupt 1
13	5-29	B1-4	DMA Request
14	5-30	–	Reset
15	5-31	B1-6	I/O Read
16	5-32	B1-7	Address Bit 4
17	–	–	–
18	–	–	–
19	–	–	–
20	5-8	–	Select
21	5-33	B1-8	Address Bit 2
22	–	–	–

S1	Conn/Pin	Conn/Pin	Identification
23	–	–	–
24	–	–	–
25	–	–	–
26	–	–	–
27	5-34	B1-9	Data Bus Bit 6
28	5-1	–	DMA Acknowledge Receive
29	5-4, 5-13	–	Twisted Pair Ground
30	5-19	B1-24	Data Bus Bit 1
31	5-35	B1-10	Data Bus Bit 4
32	5-18	B1-23	Data Bus Bit 3
33	5-7	–	Interrupt 7
34	5-10	B1-15	Diskette Ready
35	5-11	B1-16	DMA Acknowledge
36	5-12	B1-17	Diskette Select
37	5-9	B1-14	I/O Write
38	5-14	B1-18	Address Bit 3
39	5-15	B1-20	Address Bit 1
40	5-16	B1-21	Data Bus Bit 7
41	5-17	B1-22	Data Bus Bit 5
42	5-28	B1-3	Terminal Count
43	5-21	–	DMA Acknowledge Transmit
44	–	–	–

System Card Connector S2 and Panel 2 Connector 3.

Note: All connectors are shown from the wiring side.

The Memory Record Switch is shown from the inside of Panel 1.

LED Board

S2
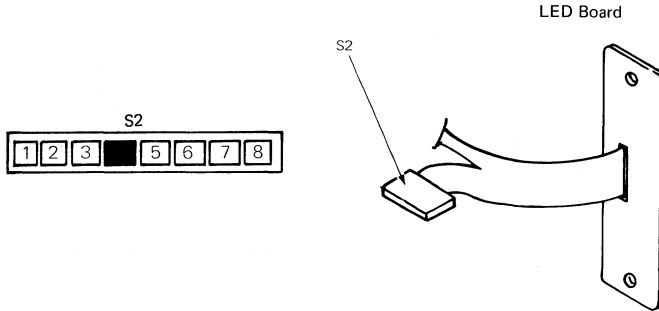
S2	Identification
1	—
2	LED D (Error)
3	LED E (Error)
4	Key
5	LED F (Error)
6	LED G (Error)
7	LED H (Error)
8	+5.0 VDC

Memory Record Switch

N/O

N/C — Common

3	Conn/Pin	Identification
N/C	—	—
N/O	B1-6	Signal Ground
Common	B1-15	System Dump

Electronics Module

Panel 1

0
1
2
3
4
5
6A
6B
7

Memory Record Switch

Internal Distribution Cable

B1

Electronics Package

Distribution Board

LED Assembly Cable

LED Assembly

S2 S1

A B1 B

1 ┌─────────────┐ 12
13 └─────────────┘ 24
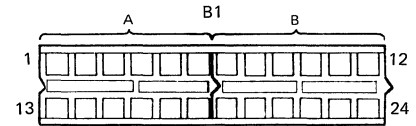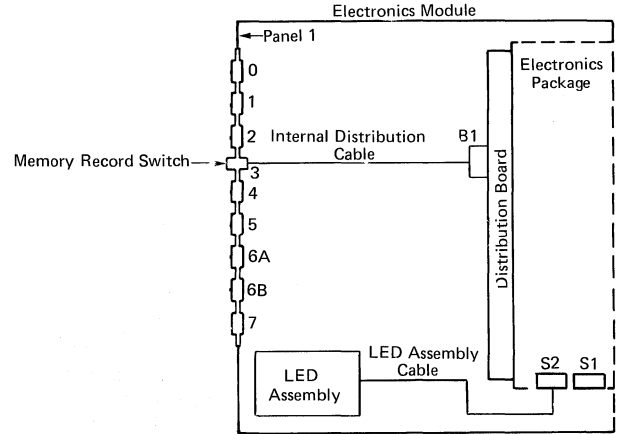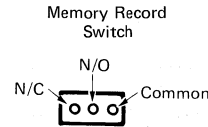
Panel 1 Connectors 0 and 1.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
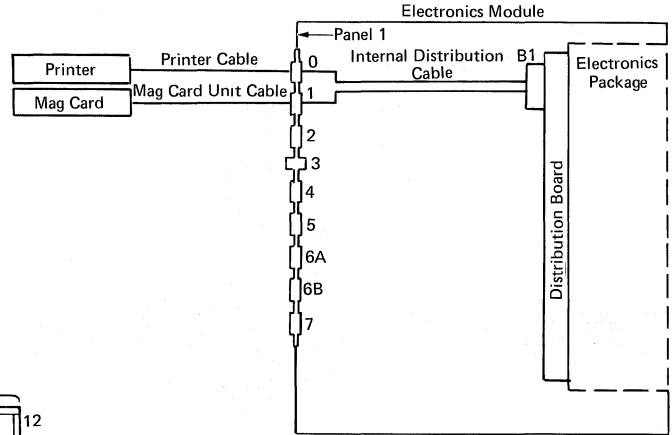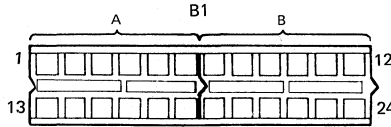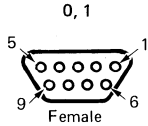
0	Conn/Pin	Identification
1	B1-10	Transmit High
2	B1-12	Transmit Low
3	B1-8	Receive High
4	B1-9	Receive Low
5	1-5	Frame Ground
6	1-6	Frame Ground
7*	—	Data Set Ready
8*	—	Data Set Ready
9*	B1-7	Data Set Ready

* Strap

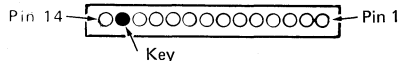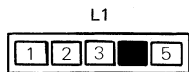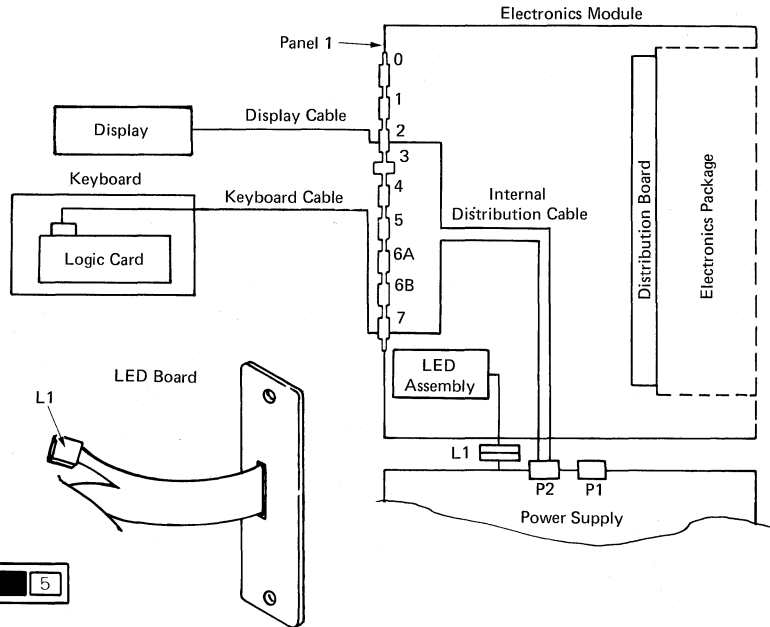| 1	Conn/Pin	Identification
1	B1-23	Transmit High
2	B1-24	Transmit Low
3	B1-21	Receive High
4	B1-22	Receive Low
5*	0-5	Frame Ground
6*	0-6	Frame Ground
7**	—	Data Set Ready
8**	—	Data Set Ready
9**	B1-19	Data Set Ready

* Ring Terminal
** Strap

Panel 1 Connectors 2 and 4.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
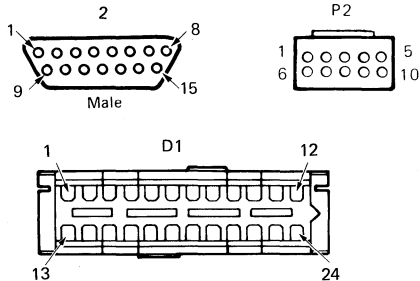
2	Conn/Pin	Identification
1	–	–
2	P2-7	Signal Ground
3	P2-10	+12.0 VDC
4	P2-6	Signal Ground
5	–	–
6	–	–
7	P2-8	+5.0 VDC
8*	–	Frame Ground
9	–	–
10	D1-1	Video
11	D1-2	Brightness
12	D1-3	Vertical
13	D1-4	Horizontal Drive
14	–	–
15	D1-6	Signal Ground

* Ring Terminal
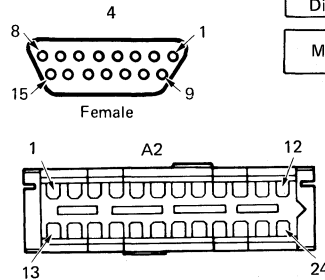
4	Conn/Pin	Identification
1	A2-19	Transmit Data
2	A2-22	Receive Data
3	A2-23	Request To Send
4	A2-16	Clear To Send
5	A2-5	Data Set Ready
6*	–	Shield Ground
7	A2-2	Carrier Detect
8	A2-21	Select Standby
9	A2-6	Signal Ground
10	A2-10	Transmit Clock
11	A2-4	Receive Clock
12	A2-7	Test
13	A2-12	Data Terminal Ready
14	A2-13	Ring Indicate
15	A2-8	Data Rate Select

* Ring Terminal
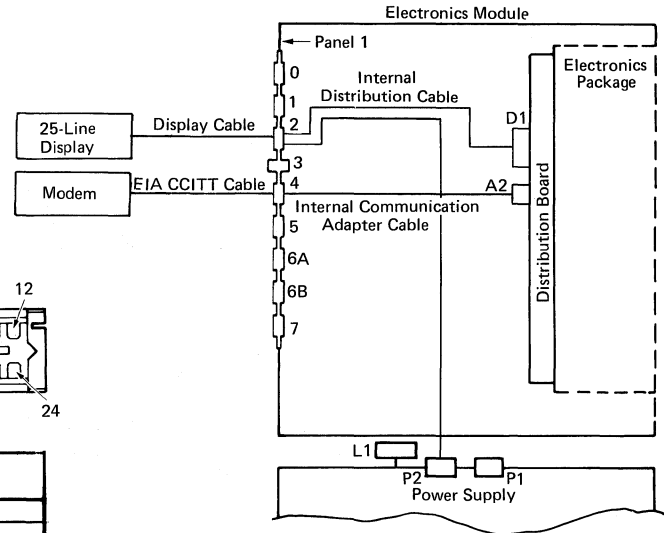
Panel 1 Connector 5.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.
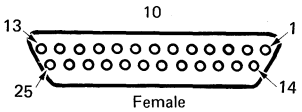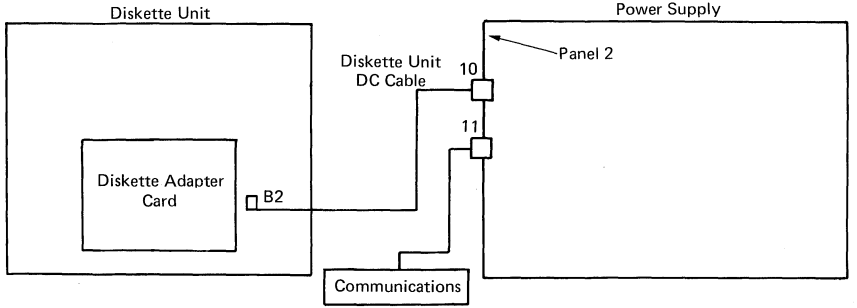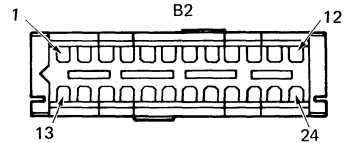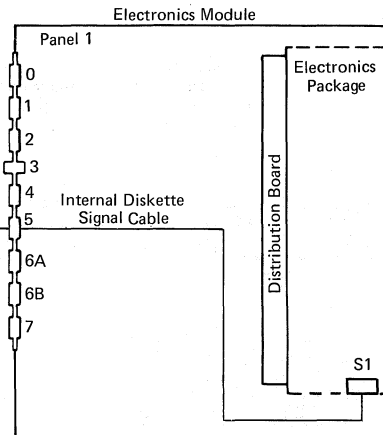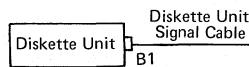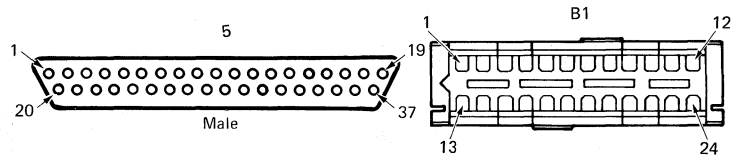

Conn/Pin	5	Conn/Pin	Identification
—	1	S1-28	DMA Acknowledge Rec.
—	2*	—	Shield Ground
—	3*	—	Shield Ground
—	4**	S1-29	Twisted Pair Ground
—	5	S1-5	Address Bit 8
—	6	—	
—	7	S1-33	Interrupt 7
—	8	S1-20	Select
B1-14	9	S1-37	I/O Write
B1-15	10	S1-34	Diskette Ready
B1-16	11	S1-35	DMA Acknowledge
B1-17	12	S1-36	Diskette Select
—	13**	S1-29	Twisted Pair Ground
B1-18	14	S1-38	Address Bit 3
B1-20	15	S1-39	Address Bit 1
B1-21	16	S1-40	Data Bus Bit 7
B1-22	17	S1-41	Data Bus Bit 5
B1-23	18	S1-32	Data Bus Bit 3
B1-24	19	S1-30	Data Bus Bit 1

* Ring Terminal
** 5-4 and 5-13 are jumpered together

Conn/Pin	5	Conn/Pin	Identification
—	20	S1-6	DMA Request Receive
—	21	S1-43	DMA Acknowledge Trans.
—	22	S1-8	DMA Request Transmit
—	23*	—	Shield Ground
—	24	—	—
—	25*	—	Shield Ground
—	26	S1-12	Interrupt 1
B1-2	27	S1-11	Interrupt 4
B1-3	28	S1-42	Terminal Count
B1-4	29	S1-13	DMA Request
—	30	S1-14	Reset
B1-6	31	S1-15	I/O Read
B1-7	32	S1-16	Address Bit 4
B1-8	33	S1-21	Address Bit 2
B1-9	34	S1-27	Data Bus Bit 6
B1-10	35	S1-31	Data Bus Bit 4
B1-11	36	S1-9	Data Bus Bit 2
B1-12	37	S1-10	Data Bus Bit 0

Panel 1 Connector 7.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

Keyboard Cable Connector (at Logic Card)

Electronics Module

Keyboard

Logic Card

Keyboard Cable

6B Internal Distribution Cable

Power Supply
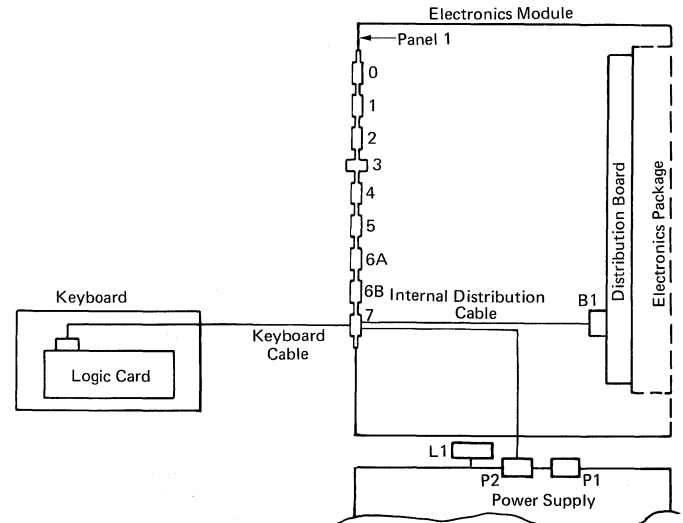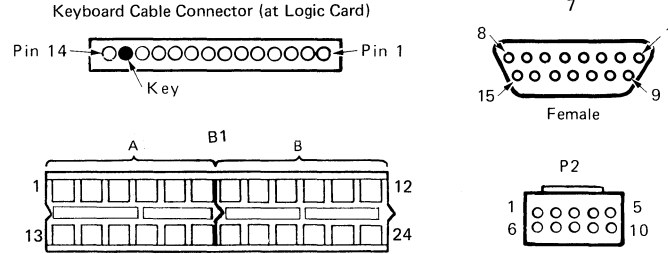
Conn/Pin	7	Conn/Pin	Identification
Lgc Cd-8	1	B1-5	Serial Data
–	2	–	
Lgc Cd-7	3	B1-4	Serial Data Clock
Lgc Cd-12	4	B1-16	Power-On-Reset
Lgc Cd-3	5	B1-3	Click (Speaker)
Lgc Cd-10	6	B1-2	Tone (Speaker)
Lgc Cd-5	7	B1-14	Kybd Acknowledge
Lgc Cd-9	8	B1-1	Data Strobe
Lgc Cd-1	9	P2-4	+8.5 VDC
Lgc Cd-4	10*	–	Signal/Frame Ground
Lgc Cd-2	11	P2-3	+5.0 VDC
Lgc Cd-6	12*	–	Signal/Frame Ground
–	13*	–	Shield/Frame Ground
–	14*	–	Shield/Frame Ground
–	15	–	–

* Ring Terminal

Diskette Unit Connector B1.

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

B1	Conn/Pin	Conn/Pin	Identification
1	—	—	—
2	5-27	S1-11	Interrupt 4
3	5-28	S1-42	Terminal Count
4	5-29	S1-13	DMA Request
5	—	—	—
6	5-31	S1-15	I/O Read
7	5-32	S1-16	Address Bit 4
8	5-33	S1-21	Address Bit 2
9	5-34	S1-27	Data Bus Bit 6
10	5-35	S1-31	Data Bus Bit 4
11	5-36	S1-9	Data Bus Bit 2
12	5-37	S1-10	Data Bus Bit 0
13	—	—	—
14	5-9	S1-37	I/O Write
15	5-10	S1-34	Diskette Ready
16	5-11	S1-35	DMA Acknowledge
17	5-12	S1-36	Diskette Select
18	5-14	S1-38	Address Bit 3
19	—	—	Twisted Pair Ground
20	5-15	S1-39	Address Bit 1
21	5-16	S1-40	Data Bus Bit 7
22	5-17	S1-41	Data Bus Bit 5
23	5-18	S1-32	Data Bus Bit 3
24	5-19	S1-30	Data Bus Bit 1
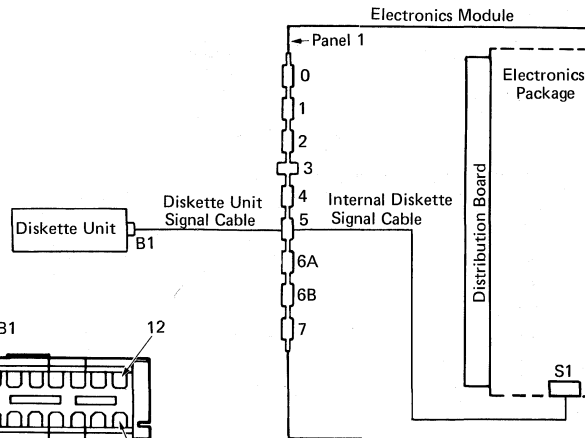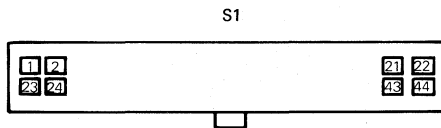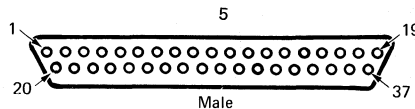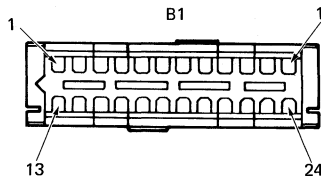
Diskette Unit Connector B2.

Note: All Panel 2 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

B2	Conn/Pin	Identification
1	10-3	+5.0 VDC
2	10-4	+5.0 VDC
3	10-14	+5.0 VDC
4	—	—
5	10-12	-5.0 VDC
6	10-6	POR DIS
7	10-11	Signal Ground
8	—	—
9	—	—
10	10-5	+12.0 VDC
11	—	—
12	10-13	+24.0 VDC
13	10-1	+5.0 VDC
14	10-2	+5.0 VDC
15	10-7	Signal Ground
16	10-8	Signal Ground
17	10-9	Signal Ground
18	10-10	Signal Ground
19	10-11	Signal Ground
20	10-20	Signal Ground
21	10-21	Signal Ground
22	—	—
23	—	—
24	—	—
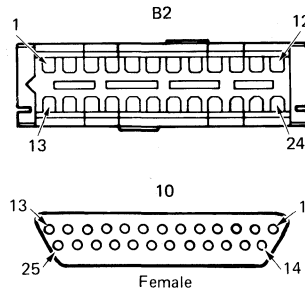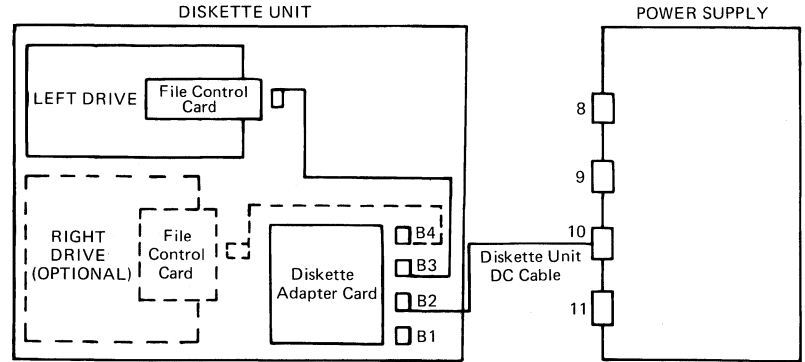
Diskette Unit Connectors B3 and B4.

Note: All connectors are shown from the wiring side.

DISKETTE UNIT

POWER SUPPLY

B3/B4	File Card Pin	Identification
1	B04	Index Pulse
2	B05	Diskette Sense
3	B06	Write Erase Enable
4	B07	File Data
5	A01	–5.0 VDC
6	A18	Drive Present
7	A12	Signal Ground
8	B16	Inner Tracks
9	B09	Erase Gate
10	—	
11	B14	Write Gate
12	B03	+24.0VDC
13	B10	Access 0
14	B01	+5.0 VDC
15	B13	Access 1
16	B11	Switch Filter
17	B15	Head Engage
18	B08	Inner Tracks
19	A02	Signal Ground
20	A03	Signal Ground
21	B17	Write Data
22	—	—
23	—	—
24	A16	Twisted Pair Ground

LEFT DRIVE — File Control Card

RIGHT DRIVE (OPTIONAL) — File Control Card

Diskette Adapter Card

B4
B3
B2
B1

Diskette Unit DC Cable

8
9
10
11

B3, B4

1   12
13   24

File Control Card Connector

A01 .... A18
B01 .... B18
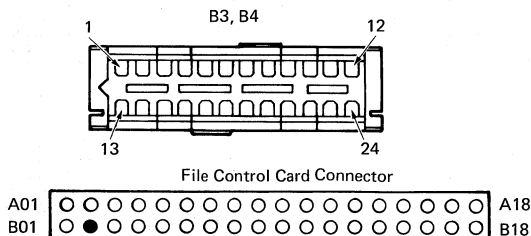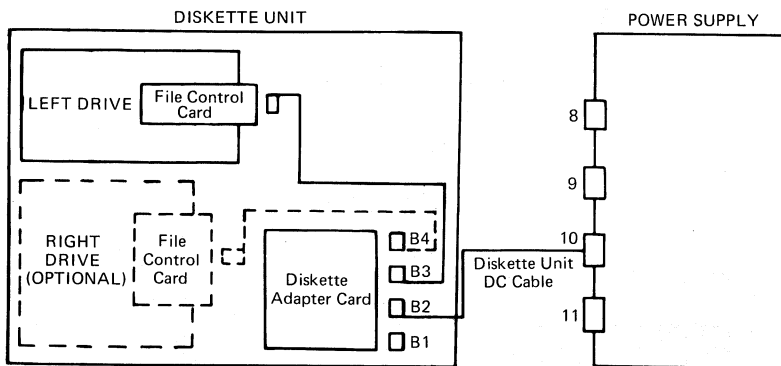
File Control Card Connector.

Note: All connectors are shown from the wiring side.

DISKETTE UNIT

LEFT DRIVE — File Control Card

RIGHT DRIVE (OPTIONAL) — File Control Card — Diskette Adapter Card — B4 B3 B2 B1

Diskette Unit DC Cable

POWER SUPPLY — 8 9 10 11
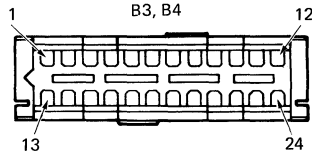
File Control Card Connector
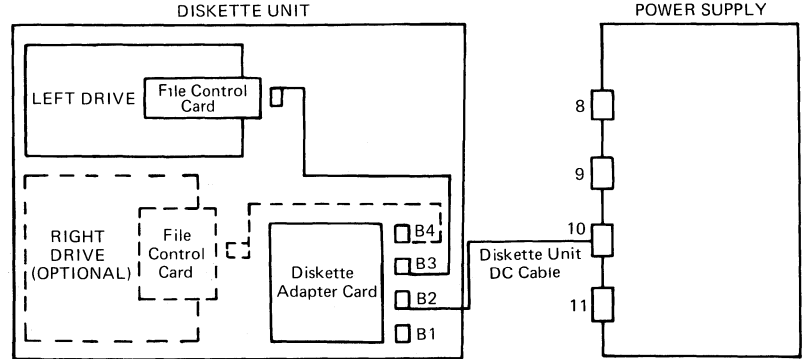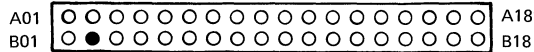
File Control Card	Conn/Pin	Identification
A01	B3,B4–5	-5.0 VDC
A02	B3,B4–19	Signal Ground
A03	B3,B4–20	Signal Ground
A04	–	–
A05	–	–
A06	–	–
A07	–	–
A08	–	–
A09	–	–
A10	–	–
A11	–	–
A12	B3,B4–7	Signal Ground
A13	–	–
A14	–	–
A15	–	–
A16	B3,B4–24	Twisted Pair Ground
A17	–	–
A18	B3,B4–6	Drive Present

File Control Card	Conn/Pin	Identification
B01	B3,B4–14	+5.0 VDC
B02	–	Key
B03	B3,B4–12	+24.0 VDC
B04	B3,B4–1	Index Pulse
B05	B3,B4–2	Diskette Sense
B06	B3,B4–3	Write Erase Enable
B07	B3,B4–4	File Data
B08	B3,B4–18	Inner Tracks
B09	B3,B4–9	Erase Gate
B10	B3,B4–13	Access 0
B11	B3,B4–16	Switch Filter
B12	–	–
B13	B3,B4–15	Access 1
B14	B3,B4–11	Write Gate
B15	B3,B4–17	Head Engage
B16	B3,B4–8	Inner Tracks
B17	B3,B4–21	Write Data
B18	–	–
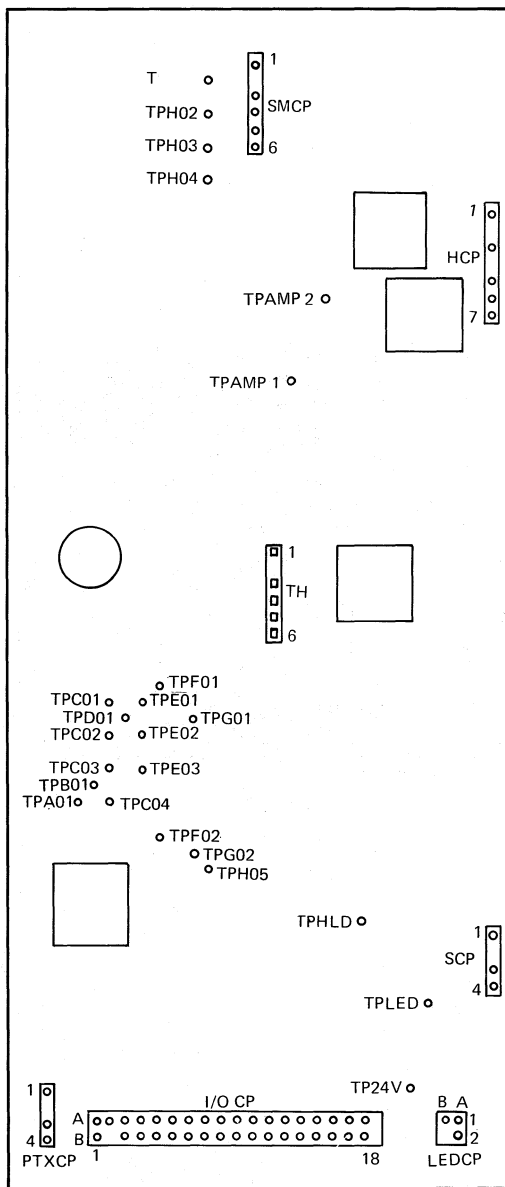
Test Points	Line Names
TPA01	+5 VDC
TPB01	-5VDC
TPC01	+Access 1
TPC02	D1 PTX
TPC03	Write Data
TPC04	Ground
TPD01	+Inner Tracks
TPE01	+Access 0
TPE02	+Head Engage
TPE03	+Index
TPF01	Ground
TPF02	+Write/Erase Enabled
TPG01	+File Data
TPG02	+Erase Gate
TPH01	MC-3
TPH02	MC-2
TPH03	MC-1
TPH04	MC-0
TPH05	+Write Gate
TPAMP1	Preamp TP1
TPAMP2	Preamp TP2
TPHLD	-Head Load
TP24V	+24 VDC
TPLED	LED Voltage

Test Points	Line Names
TH01	Diff Read B
TH02	No Pin
TH03	Diff Read A
TH04	Not Assigned
TH05	-Disable Stepper Motor
TH06	+18V

PTXCP — PTX Connector Pins
I/O CP — File Control Card Connector Pins
LEDCP — LED Connector Pins
SCP — Solenoid Connector Pins
HCP — Head Connector Pins
SMCP — Stepper Motor Connector Pins

LED (Light Emitting Diode)
PTX (Photo Transistor)

Type 1 Drive
Diskette Unit File Control Card Connectors and Test Points –
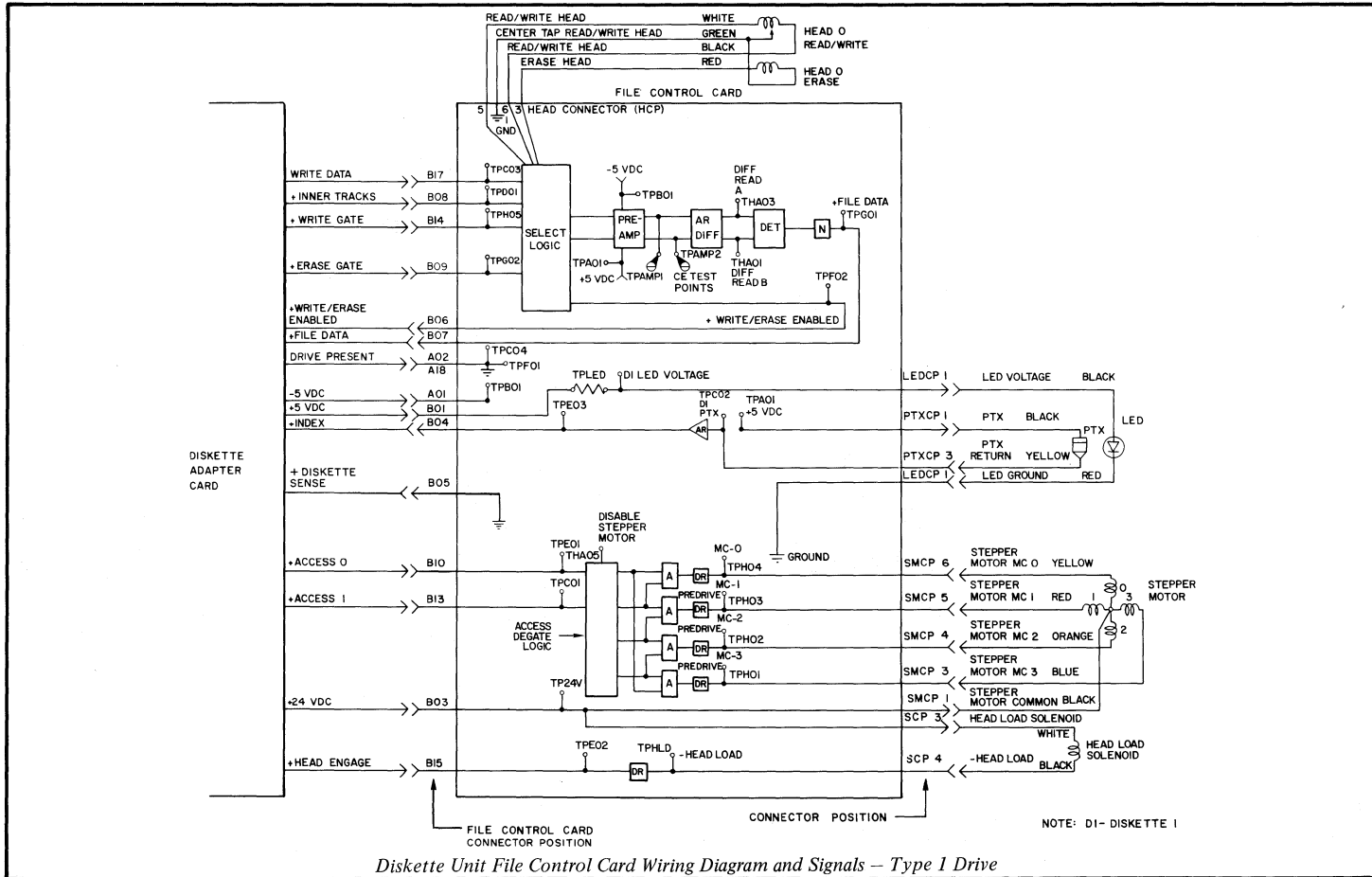
Diskette Unit File Control Card Wiring Diagram and Signals — Type 1 Drive
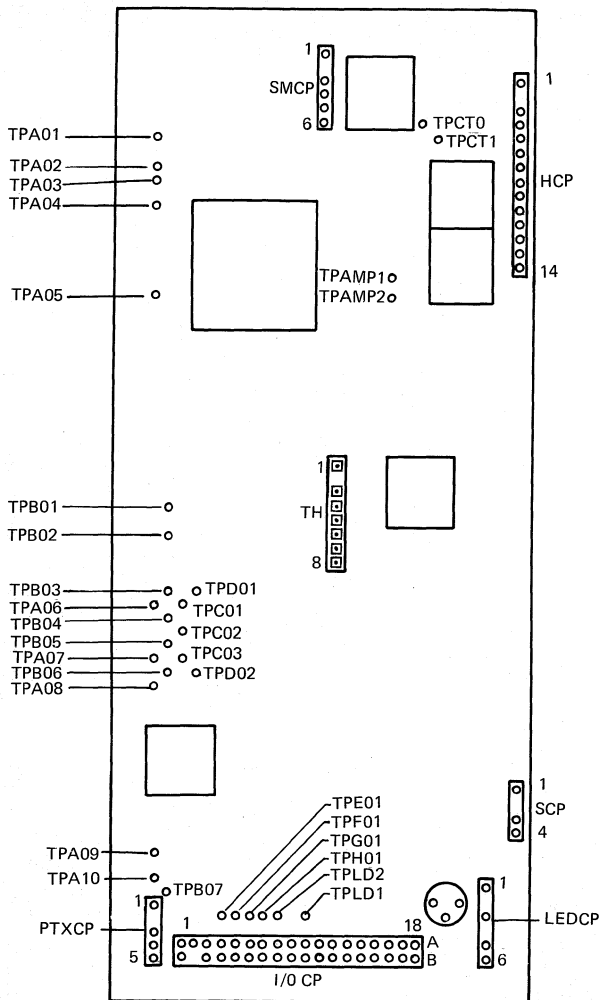
Test Points	Line Names
TPA01	MC−3
TPA02	MC−1
TPA03	MC−2
TPA04	MC−0
TPA05	Ground
TPA06	+Erase Gate
TPA07	Ground
TPA08	−Head Load
TPA09	+5 VDC
TPA10	D2 PTX
TPB01	+24 VDC
TPB02	Ground
TPB03	+Select Head 1
TPB04	+Write Gate
TPB05	+Head Engage
TPB06	Write Data
TPB07	D1 PTX
TPC01	+Access 0
TPC02	+Inner Tracks
TPC03	−5 VDC
TPD01	+Access 1
TPD02	+Switch Filter
TPE01	+Index
TPF01	+Diskette Sense
TPG01	+Write/Erase Enabled
TPH01	+File Data
TPLD2	D2 LED Voltage
TPLD1	D1 LED Voltage
TPAMP2	Preamp TP2
TPAMP1	Preamp TP1
TPCTO	Center Tap Head 0
TPCT1	Center Tap Head 1

Test Points	Line Names
TH01	Diff Read B
TH02	No Pin
TH03	Diff Read A
TH04	Not Assigned
TH05	-Disable Stepper Motor
TH06	+18V

PTXCP — PTX Connector Pins
I/O CP — File Control Card Connector Pins
LEDCP — LED Connector Pins
SCP — Solenoid Connector Pins
HCP — Head Connector Pins
SMCP — Stepper Motor Connector Pins

LED (Light Emitting Diode)

PTX (Photo Transistor)

Diskette Unit File Control Card Connectors and Test Points — Type 2D Drive
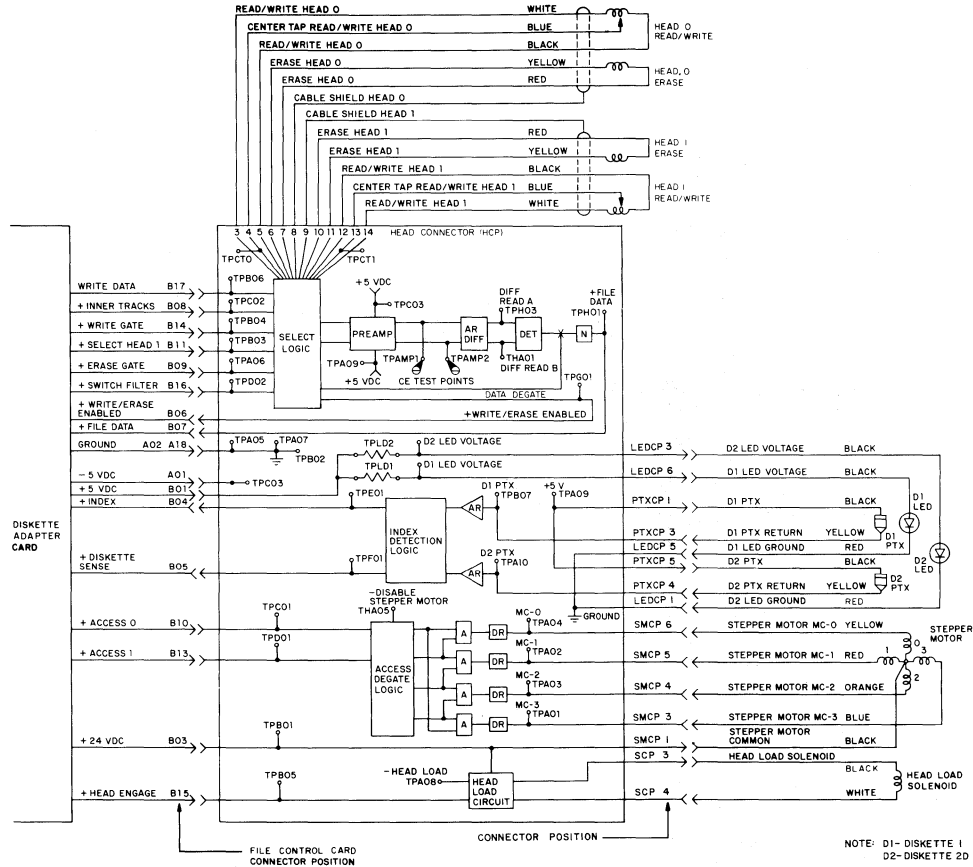
Diskette Unit File Control Card Connectors and Test Points — Type 2D Drive

Keyboard Cable Connector (at Logic Card)

Note: All Panel 1 Connectors are shown from the outside
rear view of the Electronics Module. All other connectors
are shown from the wiring side.

Keyboard Cable Connector (at Logic Card)
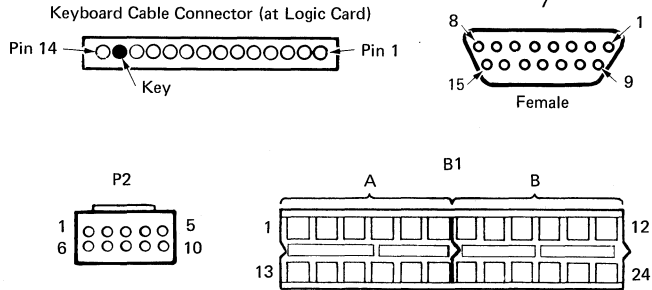
Logic Card Conn	Conn/Pin	Conn/Pin	Identification
1	7-9	P2-4	+8.5 VDC
2	7-11	P2-3	+5.0 VDC
3	7-5	B1-3	Click Speaker
4	7-10*	—	Signal/Frame Ground
5	7-7	B1-14	Kybd Acknowledge
6	7-12*	—	Signal/Frame Ground
7	7-3	B1-4	Serial Data Clock
8	7-1	B1-5	Serial Data
9	7-8	B1-1	Data Strobe
10	7-6	B1-2	Tone (Speaker)
11	—	—	—
12	7-4	B1-16	Power-On-Reset
13	—	—	Key
14	—	—	—

* Ring Terminal
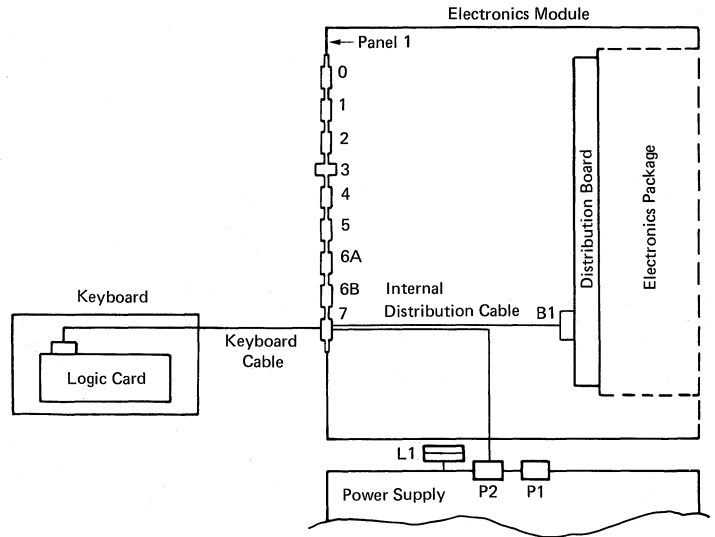
Printer Sharing Connectors

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

C1	Conn/Pin	Identification	Conn/Pin	Conn/Pin	Identification
7	6A-9*	Data Set Ready			
8	6A-3	Receive High	0-1	B1-10	Transmit High
9	6A-4	Receive Low	0-2	B1-12	Transmit Low
10	6A-1	Transmit High	0-3	B1-8	Receive High
12	6A-2	Transmit Low	0-4	B1-9	Receive Low
19	6B-9*	Data Set Ready			
21	6B-3	Receive High	0-1	B1-10	Transmit High
22	6B-4	Receive Low	0-2	B1-12	Transmit Low
23	6B-1	Transmit High	0-3	B1-8	Receive High
24	6B-2	Transmit Low	0-4	B1-9	Receive Low

* On Connector 6A and 6B, Pins 7, 8, and 9 are strapped together.
On Connector 6A and 6B, Pins 5 and 6 are Frame Ground.
Note: The Receive and Transmit Signals change names at Panel 1, Connector 0.

Large Display Analog Card Connectors J1 through J4, and CRT Socket

(SERVICE POSITION)

(Ground Spring on CRT)

J502-4) ⑥
(J502-I) ⑦
(J2-13) ⑧
⑤
④ (J2-19)
③ (Pot 1 pin 2)
② (None)
① (J2-1)

CRT SOCKET
Pin Side

J1 J2 J3 J4
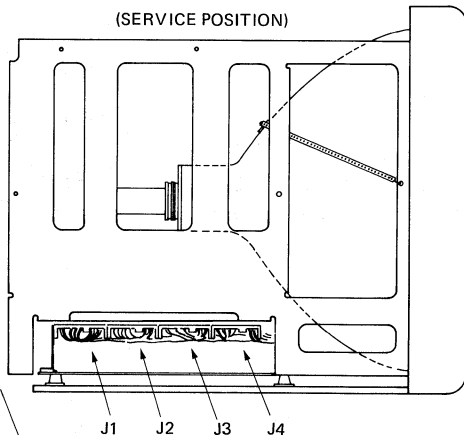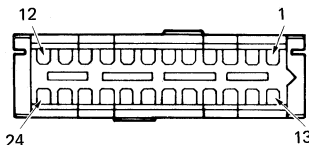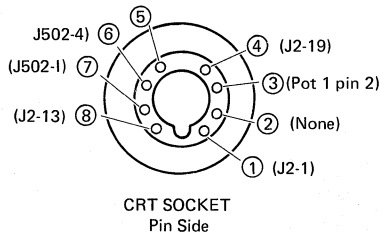
NOTE: Voltage and continuity checks on the Connector Strip pins
are taken from the top (card side) with the Analog Card removed.

12   1

24   13

J CONNECTORS
Wiring Side

Pin 1   Pin 12

Pin 13   J1   Pin 24   J2   J3   J4
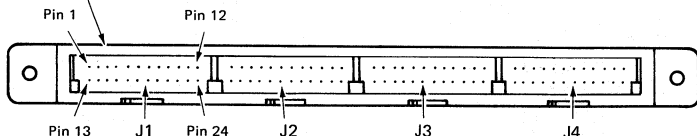
CONNECTOR STRIP
Card Side (Top)

J1	Conn/Pin	Conn/Pin	Identification
1	2-11		Bright (Info. Only)
2		LV2-6	+5VDC
5	Bright Ctrl	Pins 2&3	Intensity
7		LV2-1	+32VDC
9			+18VDC
11		LV2-8	-5VDC
15		LV2-3	Signal Ground
17			Frame Gd. (Ring Term.)
19			Frame Gd. (Ring Term.)
21			Frame Gd. (Ring Term.)
23			Frame Gd. (Ring Term.)

J2	Conn/Pin	Identification
1	CRT Socket Pin 1	Heater Ground
2	HVPS Neon	Ground
3	HVPS Neon	-135 VDC
13	CRT Socket Pin 8	Heater Power (6.3 VAC)
15	Bright Ctrl Pin 1	-135 VDC
17	Pot 2 Pin 3	(Info. Only)
19	CRT Socket Pin 4	Focus Grid G4
21	Pot 2 Pin 2	(Info Only)
24	Pot 1 Pin 3	+1200VDC

J3	Identification
12	HVPS (High Voltage Power Supply) Ground
13	+1200 V to card (Dynamic Focus Circuit)
16	-135 V to card
22	Inhibit line to HVPS (Info. Only)
24	+32 V to HVPS

J4	Conn/Pin	Conn/Pin	Identification
1		LV2-4	Signal Ground
3		LV2-5	Signal Ground
5	Pot 1 Pin 1	Pot 2 Pin 1	Signal Ground
11	2-15		Signal Ground
12	2-15		Signal Ground
13		LV2-2	+32 VDC
15			+18 VDC
17		LV2-7	+5 VDC
23	2-13		Horiz. Sync
24	2-12		Vert. Sync
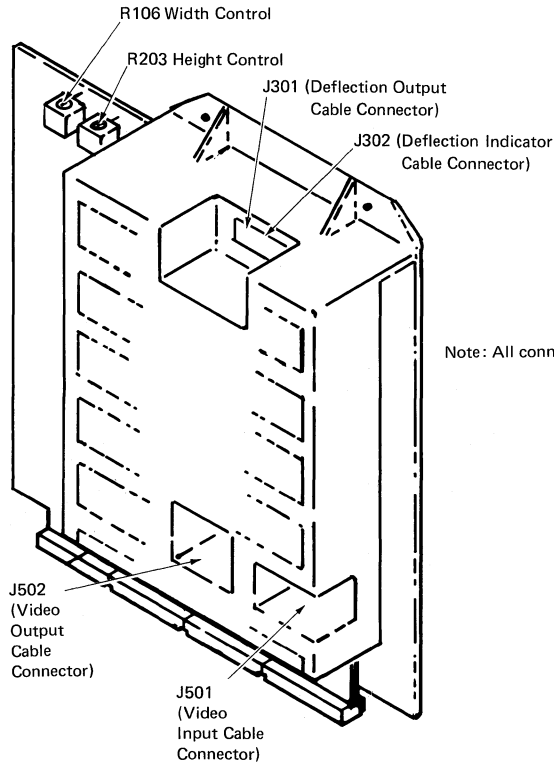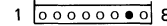
1 □o o o o o o • o□ 8   **J301 (DEFLECTION OUTPUT CABLE)**

Pin	Identification
1	To Vertical Yoke
2	To Vertical Yoke
3	To Vertical Yoke Center Tap
4	32V (Jumper to pin 5)
5	32V (Jumper to pin 4)
6	To Horizontal Yoke
7	(Key)
8	To Horizontal Yoke

1 □o • o o□ 4   **J302 (DEFLECTION INDICATOR CABLE)**

Pin	Identification
1	To Sweep Indicator (Neon 2)
2	(Key)
3	(Not Used)
4	To Sweep Indicator (Ground)

1 □oo□ 2   **J501 (VIDEO INPUT CABLE)**

Pin	Con/Pin	Identification
1	2-10	Video Input Signal
2	2-9	Signal Ground

1 □o o • o□ 4   **J502 (VIDEO OUTPUT CABLE)**

Pin	Identification
1	To CRT Socket Pin 7 (Cathode)
2	(Not Used)
3	(Key)
4	To CRT Socket Pin 6 (G1)

Note: All connectors are shown from the wiring side

Large Display Analog Card Test Point and Connector Pin Locator

Large Display Low Voltage Power Supply Cable Connectors.

Note: All connectors are shown from the wiring side.
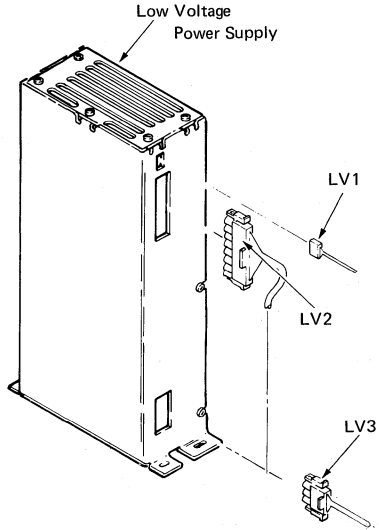
LV1	LV1	Identification
4 ○	4	(Not Used)
3 ○	3	Indicator 0
2 ●	2	(Key)
1 ○	1	Indicator 0

LV2	LV2	Conn/Pin	Conn/Pin	Identification
8	8	J1-11		-5VDC
7	7		J4-17	+5VDC
6	6	J1-2		+5VDC
5	5		J4-3	Signal Ground
4	4		J4-1	Signal Ground
3	3	J1-15		Signal Ground
2	2		J4-13	+32VDC
1	1	J1-7		+32VDC

LV3	LV3	Identification
3 ○	3	AC (in)
2 ○	2	Frame Ground
1	1	AC (in)

Analog Card
(Component side)

Connector Strip

J4 J1

J CONNECTORS

12 ____ 1

24 ____ 13
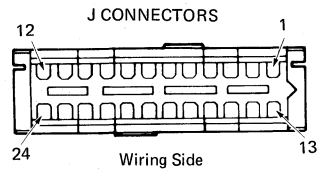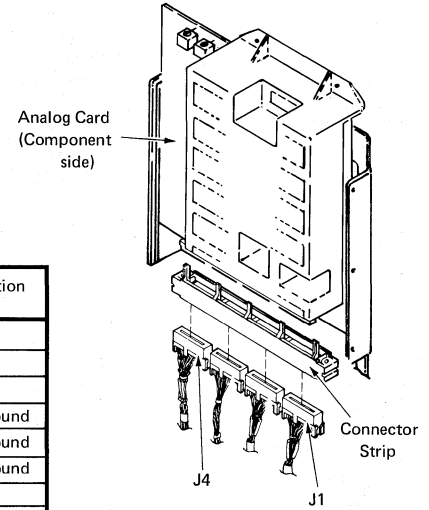
Wiring Side

Panel 1 Connector 2 (Large Display)

Note: All Panel 1 Connectors are shown from the outside rear view of the Electronics Module. All other connectors are shown from the wiring side.

Connector

Connector D1

Male
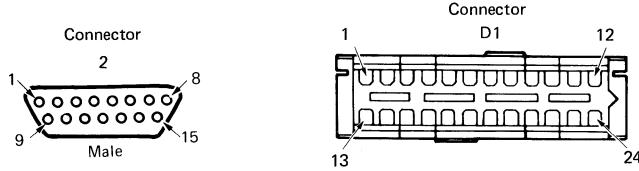
2	Conn/Pin	Identification
1	—	—
2**	P2-7	Signal Ground
3**	P2-10	+12.0 VDC
4**	P2-6	Signal Ground
5	—	—
6	—	—
7**	P2-8	+5.0 VDC
8*	—	Frame Ground
9	D1-6	Signal Ground
10	D1-1	Video
11	D1-2	Bright
12	D1-3	Vertical Sync
13	D1-4	Horizontal Sync
14	—	—
15	D1-6	Signal Ground

* Ring Terminal
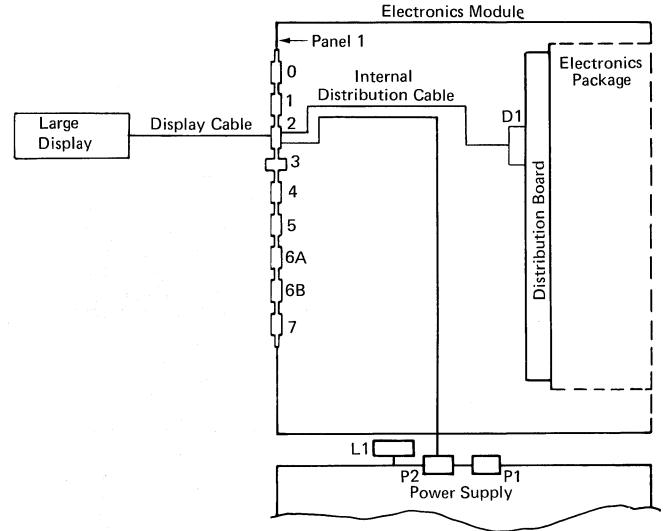
** Note: The two signal grounds and the two DC voltages shown between Connector P2 and Connector 2 are present, but are not used by the large display.

Large Display Cable Connectors 2, J1, J4, and J501.

Note: Connectors J1, J4, and J501 are shown from the wiring side. Connector 2 is shown from the pin side.
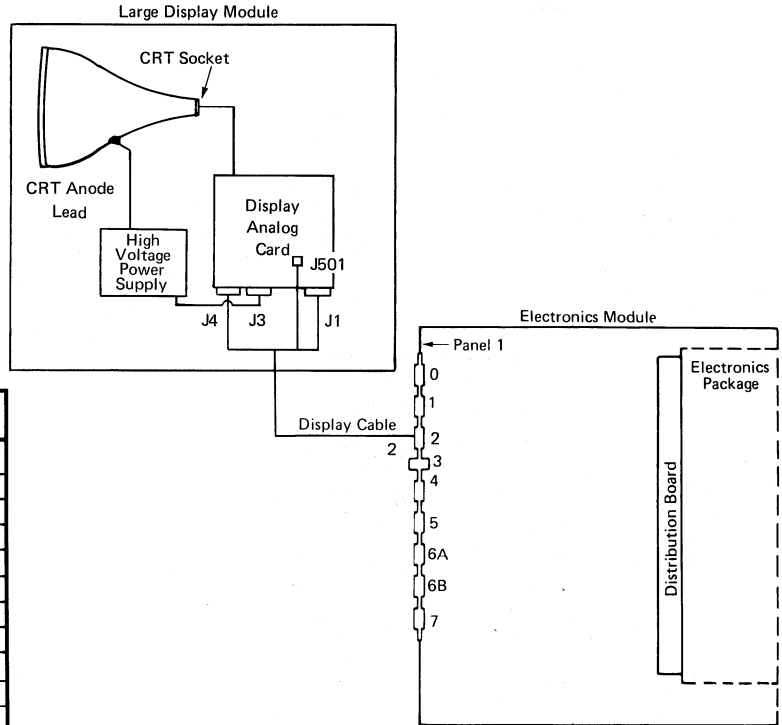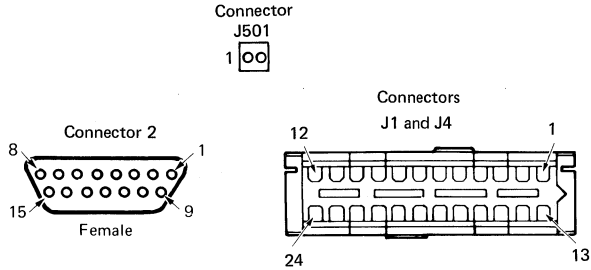
2	Conn/Pin	Conn/Pin	Conn/Pin	Identification
1	—	—	—	—
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	Frame Ground
9	J501-2	—	—	Signal Ground
10	J501-1	—	—	Video
11	—	J1-1	—	Bright
12	—	—	J4-24	Vertical Sync
13	—	—	J4-23	Horizontal Sync
14	—	—	—	—
15	—	—	—	—

*Ring Terminal

TABLE OF CONTENTS

DIAGNOSTICS

DIAGNOSTICS OVERVIEW

The diagnostic support package for the CE consists of:

- MAPs

- Resident Diagnostics
  - Basic Assurance Tests (BAT)
  - Resident Non-Automatic (RNA) Tests

- Loadable (Non-Resident) Diagnostics
  - MAPs Diagnostics Integration (MDI)
  - Utilities
  - System Exerciser
  - Load Program

NOTE: This section contains display formats and printed outputs that should be considered as samples only.

BASIC ASSURANCE TEST (BAT)

The Basic Assurance Test (BAT) is a series of tests executed in sequence as part of ROS. It is automatically started when the system is powered on, and performs a quick status check on the system.

There are two methods of indicating BAT progress. The first is the LEDs, located on Panel 1, which are used at the start of BAT. The second is the display which is used to show BAT progress after the display adapter is tested and operational (initialized).

```
A  —  Over Voltage/Under Voltage ⎫
B  —  Over Current                ⎬ Power Supply LEDs
C  —  Over Temperature            ⎭

D  —  Error LEDs                  ⎫
E  —                             ⎪
F  —                             ⎬ BAT Progress LEDs
G  —                             ⎪
H  —                             ⎭
```
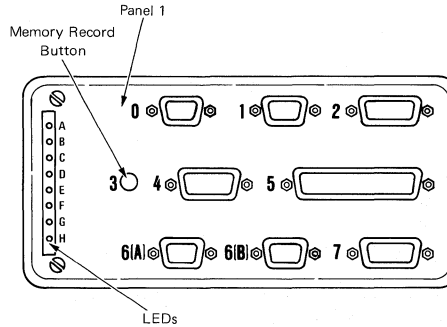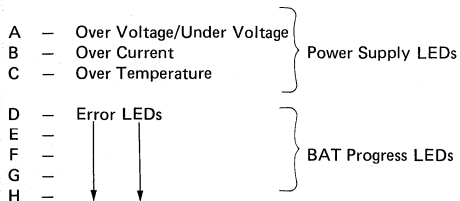

Electronics Module (LEDs)

If the BAT could not complete because of an error after display initialization, further diagnosis is performed as follows:

- Press the ENTER key to re-try the test which failed.

- Press the MOVE key or MEMORY RECORD button to skip the failing test and continue with the next test. Control is passed to the RNA controller when BAT completes.

- Press the END key. Exit BAT, go to the RNA controller.

The MEMORY RECORD button can be used if there is a keyboard failure.

BAT PROGRESS/ERROR CODES

This table lists the tests in the order they occur. The LED pattern and the display failure codes indicate the test which failed.

The LEDs are read in binary. That is, 0 is off and 1 is on. Where an LED (E-H) pattern is shown (for example, 0101 for the Display Adapter Timing Test), it is read as follows: the "E" LED is off, "F" is on, "G" is off, and "H" is on.

Description Of Test	Error LED D	LEDs EFGH	Display Failure Codes
Power On Reset (POR)	1	XXXX*	N/A
Processor & ROS CRC Tests	1	XXXX	N/A
Local I/O Bus Wrap Test	1	XXXX	N/A
Timer Test	0	1111	N/A
Interrupt Controller Test	0	1111	N/A
Memory Record Switch Latch Test	0	1111	N/A
Keyboard Adapter Test	0	1111	N/A
Mini-RAM	0	0010**	N/A
	0	0011**	N/A
Parity Generator/Checker	0	0001	N/A
Base RAM Test	0	1110	N/A
Processor Extension Test	0	0011	N/A
Display RAM Test	0	0100	N/A
Display Adapter Timing	0	0101	N/A
Display Adapter Video Test	0	0101	N/A
Keyboard Cable Test	0	0110	01
Physical Keyboard Test	0	0110	02
DMA Controller Test	0	0111***	03
Diskette Module Wrap Test	0	1000	04
Diskette Adapter Test	0	1000	05
Extra RAM Test	0	1001****	N/A
Bus Time-Out Test	0	1010	08
RAM Addressability Test	0	1100	09

BAT Progress/Error Codes

* The XXXX pattern means an unknown status of the LEDs.

** The test will fail with 0010 if there is a bad Memory Card or 0011 if there is a bad System Card.

*** A short tone (less than one second) is generated at the start of the Direct Memory Access (DMA) Test. During this test, a failure could cause the processor to lose control of the system, and a continuous tone is generated. When this occurs, the information displayed by the LEDs and/or the display may not be correct.

**** An Extra RAM Test will not display a failing code, but this will allow a degraded mode of operation. It is Test Number 06.

Message Number

Current Test Number

Error Code

(May be more than one error code)

801   XX   XX   XX   XX   XX   .....
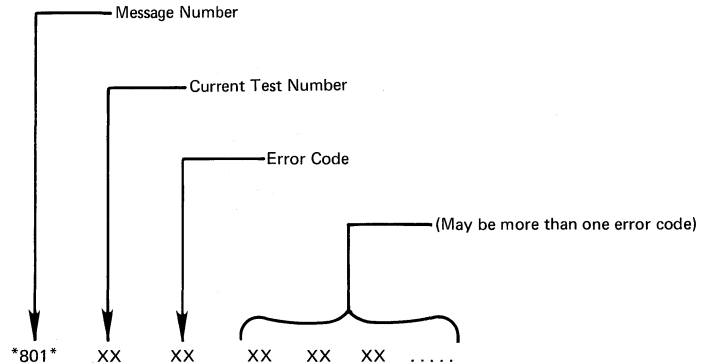
BAT Display Format

RESIDENT NON-AUTOMATIC (RNA) DIAGNOSTICS

These RNA diagnostics are contained in the system electronics but do not run during BAT.

They aid in isolating problems in the diskette drive and intermittent system bus failures. These tests are selected through the keyboard using the Resident Non-Automatic Diagnostic Flowchart.
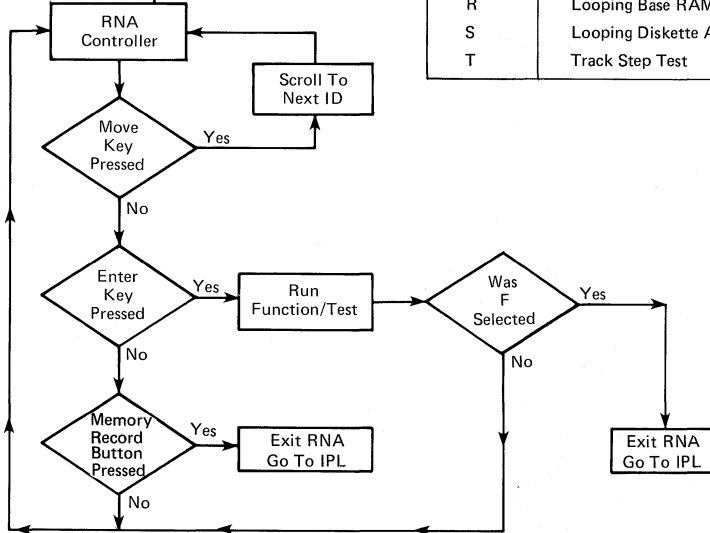
Function/ Test ID	Description	Test Exit	Conditions
D	Switch To Opposite Diskette Drive	N/A	
F	Run BAT Once	N/A	
G	Run BAT In Loop Mode	MEMORY RECORD Button	
L	Diskette Drive Set Ready Test	N/A	Diskette Must Be Inserted
M	Diskette Stepper Motor Phase Test	N/A	Diskette Must Be Inserted
N	Diskette Drive Alignment Aid	END Key	Diskette Must Be Removed
P	Looping ROS CRC Test	END Key	
Q	Looping Display Path Test	END Key	
R	Looping Base RAM Test	END Key	Screen Blank During Test
S	Looping Diskette Adapter Wrap Test	END Key	Screen Blank During Test
T	Track Step Test	END Key	Diskette Must Be Removed

Resident Non-Automatic Diagnostic Flowchart

A Resident Non-Automatic Diagnostic Controller is in the system electronics. When the RNA controller is entered, the first test ID appears on the display. Press the MOVE key to select the next test ID. The ID list will loop from the last to the first entry in the list. Press the ENTER key to execute the test.

By pressing the MEMORY RECORD button, the Force IPL Function will cause an Initial Program Load (IPL) to occur without first passing the Basic Assurance Test (BAT), so the CE diagnostic diskette may be loaded. This is not possible if the BAT error occurs in the processor. If the RNA Diagnostic Controller was entered with the MEMORY RECORD button, the MEMORY RECORD button must be pressed a second time to perform a Force IPL.

RESIDENT NON-AUTOMATIC DIAGNOSTIC DISPLAY FORMAT
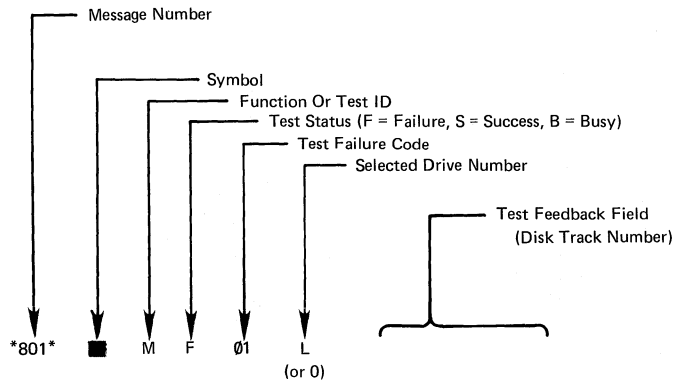
Message Number

Symbol

Function Or Test ID

Test Status (F = Failure, S = Success, B = Busy)

Test Failure Code

Selected Drive Number

Test Feedback Field
(Disk Track Number)

801   ■   M   F   Ø1   L

(or 0)

RNA Diagnostic Display Format

RESIDENT NON-AUTOMATIC DIAGNOSTIC TESTS

The following is a description of Resident Non-Automatic Diagnostic Tests.

D   Switch To Opposite Diskette Drive: The system will switch from one diskette drive to the other to execute tests on a Dual Diskette Drive system. The selected drive will default to the left drive L (or 0) when RNA is first entered. Each time the ENTER key is pressed while this function ID is displayed, the opposite drive will be selected. Any drive test selected after this function is run will be executed from the last selected drive.

F   Execute BAT Once: The BAT will run once from the start of the test. At the end of this test, the processor will pass system control to IPL if the test is acceptable.

G   Execute BAT In Loop Mode: The BAT will run continuously in the loop mode until an error is found or the MEMORY RECORD button is pressed. It is only possible to get out of this mode at a specific time during the test. This period of time is known as the exit window. The exit window occurs during the RAM part of the BAT and lasts four or five seconds. The LEDs will display 1110 continuously during the exit window. During this time, the MEMORY RECORD button must be pressed and released. When the test is ended this way, the processor will return system control to the RNA controller. The test will not stop immediately, because it must complete the BAT sequence.

When BAT is run from the RNA controller, the system control goes to the BAT controller. The RNA display will disappear, and the interface with BAT will be through the normal BAT display formats.

L   Run Diskette Drive Set Ready Test: The CE diagnostic diskette must be loaded in the selected drive before starting this test. This test performs in the following sequence:

1. PORs the Diskette Adapter Cards
2. Samples the Diskette Index Pulse
3. Checks the Drive Set Ready Signal
4. Engages the Read/Write Head
5. Checks the Write/Erase Enable Line (This ensures the system will not write on the customer's diskette.)
6. Reads the Track ID
7. Disengages the Head

The system will return to RNA controller at the end of this test.

M   Diskette Stepper Motor Phase Test: The CE diagnostic diskette must be loaded in the selected drive before starting this test. This test determines if the diskette stepper motor is operating correctly in each phase. When an error occurs during this test, the last correct track ID that was read will be displayed in the test feedback field. The sequence and the track IDs read are: 0, 1, 2, 3, 36, 44, 45, 46, 47, 73, 74, 75, 76, 47, 46, 45, 44, 3, 2, 1, and 0. The write/erase enable line is checked to ensure a "write unsafe" condition is not present, and the system will not write on the customer's diskette. The system will return to RNA controller at the end of this test.

N   Diskette Drive Alignment Aid: The diskette must be removed from the diskette drive before starting this test. This test is used with an adjustment procedure to ensure the read/write head is correctly aligned. The adjustment procedure is described in the Diskette Drive section of this manual. When the ENTER key is pressed, the head is positioned to track 40, and pressing the spacebar will cause the read/write head to step between tracks 39 and 40. Pressing the END key will end this test, and the system will return to RNA controller.

T   Track Step Test: The diskette must be removed from the diskette drive before starting this test which is used to track step the diskette drive from track 0 to track 76. When this test is running, pressing the spacebar will cause a track step up. If the head is in track 76, it will not move. Pressing the END key will end the test and return control to RNA controller.

P   Looping ROS CRC Test: Checks the ROS on the Processor Card.

Q   Looping Display Path Test: Checks the Display Adapter RAM.

R   Looping Base RAM Test: Checks the system RAM contained on the Memory Card. The display is blank while this test is running.

S   Looping Diskette Path Test: Checks the diskette path with a wrap test. The display is blank while this test is running.

Customer Engineering (CE) Loadable Diagnostics are on the CE Diagnostic Diskette. They include:

- MAP Diagnostic Integration (MDI)
- CE Utilities
- System Exerciser
- Load Program

To cause a soft IPL when the Task Selection Menu is displayed:

- Remove all diskettes from the Diskette Unit.
- Hold the CONTROL KEY (Position 3) down and press the RETURN KEY.
- Press ENTER.

When the CE diagnostic diskette is loaded, the program loads, and the Function Selection Menu is displayed.

CE Loadable Diagnostic Flowchart

```
                    ┌───┐
                    │ 1 │
                    └─┬─┘
          ┌───────────────────────┐
          │ MDI DEVICE SELECTION  │
          │         MENU          │
          └───────────┬───────────┘
                      │
                  ╱   Did   ╲
                 ╱ you open  ╲         ┌──────────┐
                ╱ and close   ╲  YES   │ Keyboard │
                ╲ drive        ╱───────│   MDIs   │
                 ╲ handle?    ╱        │ Execute  │
                  ╲         ╱          └──────────┘
                      │ NO
              ┌───────────────┐
              │    Type ID    │
              │    Letter     │
              └───────┬───────┘
                      │
                  ╱   Did   ╲
                 ╱the machine╲
                ╱ prompt: Insert╲   NO
                ╲ Optional CE    ╱──────┐
                 ╲ Diskette?    ╱       │
                  ╲          ╱          │
                      │ YES            │
              ┌───────────────┐        │
              │    Insert     │        │
              │   Optional    │        │
              │   Diskette    │        │
              └───────┬───────┘        │
                      │                │
          ┌───────────────────────┐    │
          │   MDI RUN TIME        │    │
          │   OPTIONS MENU        │    │
          └───────────┬───────────┘    │
              ┌───────────────┐
              │ Follow Screen │
              │  Prompts to   │
              │ completion or │
              │ follow repair │
              │    action     │
              └───────────────┘
```

```
                                    ┌──2──┐
                                    └─────┘
                                       │
              GROUP SELECTION
                  MENU
          a   Error Log/Maintenance Statistics
          b   6360 Head Alignment
              Compatibility Check
          c   FESN/RVM
          d   Communications
          e   Display

                              Type ID
                              Letter

                            a  b  c  d  e
```

GROUP SELECTION MENU

a   Error Log/Maintenance Statistics
b   6360 Head Alignment Compatibility Check
c   FESN/RVM
d   Communications
e   Display

Type ID Letter

a b c d e

3

Follow Prompts to completion or perform repair action

DISPLAY

Type ID Letter

FESN/RVM

Communications Link Analysis

a   ASYNC
b   BSC
c   3270

Refer to Communications Service Manual

```
                          ┌─────┐
                          │  3  │
                          └──┬──┘
                             │
              ┌──────────────┴──────────────┐
             /         ERROR LOGS            \
            <   a   Memory Record             >
             \  b   5218 Maintenance Statistics/
              └──────────────┬──────────────┘
                             │
                       ┌─────┴─────┐
                        \ Type ID  /
                         \ Letter /
                          \ a  b /
                           └──┬──┘
                             │
              ┌──────────────┴──────────────┐        ┌──────────────┐
             <    DEVICE SELECTION MENU      >──────<     5218       >
              └──────────────┬──────────────┘        \ Maintenance  /
                             │                        \ Statistics /
                       ┌─────┴─────┐                   └───────────┘
                        \ Insert  /
                         \ Memory/
                          \Diskette/
                           └──┬──┘
                             │
                       ┌─────┴─────┐
                        \ Type ID  /
                         \ Letter /
                           └──┬──┘
                             │
                       ┌─────┴─────┐
                        \ Refer to /
                         \ Product/
                          \ Support/
                           \ Manual/
                            └──────┘
```

CE LOADABLE DIAGNOSTIC DISPLAY FORMAT

The CE diagnostic display shows the following line information:

Line one:

- Foreground Mode — Displays CE diagnostics.

- Function Name — Operation being performed in the Foreground Mode. The contents will include either the MDI, the Utilities, the System Exerciser or the Program Diskette.

- Memory Size Field — Displays the size of good memory and memory card information. The first three characters show the size of good memory, and the last character (an A, B, C, or D) shows the card(s) configuration and position.

  A — Type A card in position E.
  B — Type B card in position E.
  C — 160A card in position E, Type B extender card in position F.
  D — 192A card in position E, Type B extender card in position F.

NOTE: The error code *900* 00D0 will display if an operator trys to load a program diskette into a system that does not have enough memory to hold the program. This error can be caused by a memory failure.

Line two:

- Left Diskette Name — The name of the diskette in the left L (or 0) diskette drive of a dual drive system.

- Right Diskette Name — The name of the diskette in the right R (or 1) diskette drive of a dual drive system.

- Communications Status — The status of communications.

Keyboard ID — The keyboard identification code. This ID number indicates the placement of the ID jumpers. Refer to Keyboard Arrangements in the Keyboard section for jumper placement and language support.

Lines three through 23: Typing or Menu Area — A menu or this area may be used as a window into the current function.

Line 24: Prompt Line — Prompts for keyboard action.

Line 25: Message Line — Messages to the operator.

```
Foreground mode      Function Name                    Memory xxxx
L disk R disk Communication status reserve                KybXXX




```

```
 'prompt line'
 'message line'
```

CE Loadable Diagnostic Display Format

CE LOADABLE DIAGNOSTICS KEYBOARD FUNCTIONS

NOTE: When diagnostics are loaded or selected from the CE Diagnostic Diskette, the cables to the feature attachments (for example, the printer or Mag Card Unit) are wrapped. A *time delay* of up to one minute can occur during this wrap test. Typing or opening the diskette handle during the test will cause the diagnostics to work incorrectly.

The END key is used to stop the function selected from the menu and return to the Function Selection Menu.

The CANCL key is used to cancel functions and clear prompts. The exact function of CANCL is determined by the status of the system when the key is pressed. For example, if the system is displaying a prompt and a response is keyed, pressing the CANCL key clears the response and displays the reply symbol ⊔ to the immediate right of the prompt. System control remains in the menu displayed at the time the CANCL key was pressed. If the system is displaying a prompt and a response is not yet keyed, pressing the CANCL key stops the displayed function and returns control to the preceding menu.

The ENTER key instructs the system to continue to the next step of the function being performed.

The PRINT key will cause lines three through 23 on the display screen to print exactly as they are displayed. The PRINT key is only active when the message: "Press PRINT to print screen" appears in the typing area or menu area.

In a printer sharing configuration, the PRINT key works only if the diagnostics are performed at the primary work station.

The printer must be turned on and ready to print before the PRINT key is pressed. Pressing the CANCEL key on the printer while printing will cause the printer to stop. Any printer problems during printing will cause the printer to stop and the message "Printer Error" to appear on the message line.

MDI RUN TIME OPTIONS

Run time options are entered through the MDI Run Time Options Menu.

If these options are to be the normal default options, the CE may press the ENTER key while displaying this menu and the MDI will run automatically.

Run time mode options are:

1 = RUN: Advance automatically through the steps. Perform the tests, display the results and stop only when a question must be answered or when a repair is displayed. This is the default option.

2 = STEP: Perform a step, display test results and wait for a keyboard response before continuing to the next step.

3 = LOOP: Repeat (loop) the step or steps specified until a keyboard response or a device failure stops the loop. If the loop mode is selected, the MDI SUBSECTIONS, START ON STEP and END ON STEP values must be selected or the loop mode will use the default options. An MDI SUBSECTION is a specific part of a device (section) MDI. (For example, the stepper motor subsection of the diskette MDI.) To stop the loop, the REQST key must be pressed.

The choice may be selected (entered) at the same time the ID letter is selected; for example, instead of just selecting "a" to choose the mode, the choice may be selected by entering "a 2". This will select the step mode. When this is selected, the ID, Item and Choice will be video reversed.

MDI RUN TIME OPTIONS MENU — "STOP ON" OPTIONS

The "STOP ON" option is valid for all modes of operation and is selected from the MDI Run Time Options Menu. If no "STOP ON" option is selected, the MDI supervisor will default to the 0 or "DON'T STOP" option. In this option, the following values are assigned to one and two.

1 — Stop if the answer is YES
2 — Stop if the answer is NO

MDI TEST UNIT NUMBERING

Each device is assigned a two-digit section number from the possible MDI section numbers from 10 through 90. Each section is divided into subsections which are given a two-digit number from possible subsection numbers from 70 through 89. A subsection is made up of steps which have the same numbering method as steps in the MAPs. The step numbers in a subsection are given a three-digit number from 001 through 999.

Section	Subsection	Test Group
10	XX	Keyboard
20	XX	Electronics
30	XX	Mag Card
40	XX	Shared Resource
50	XX	Printer
60	XX	Power Supply
70	XX	Communications
80	XX	Diskette
90	XX	Display

MDI Test Unit Numbering

MDI PROMPT RESPONSES

The following is a description of the responses which can be used during MDI.

o = Option: Return to the MDI options menu to enter new options. From the options menu, press the ENTER key to return to the last step.

t = Trace: Display a trace of the steps performed and the decisions made in each step. Decisions may be:
YES (y)
NO (n)
GO TO STEP (g)
GO TO MAP (m)
FIX (f)
When a "GO TO MAP" step occurs, the trace table will contain the MDI number as the entry following the "GO TO MAP" step.

While displaying the trace table, pressing ENTER will return to the last step.

y = Yes: The answer to this question is yes. Continue on the yes column of the MDI.

n = No: The answer to this question is no. Continue on the no column of the MDI.

b = BACK UP: Return to the last step which was performed. This response is not valid if entered at the start of a subsection. When it is necessary to back up more than one or two steps, return to the options menu and enter a "start on" step number.

r = RESUME: Return to the same step in the MDIs after the system is turned off. There are two modes of resume, automatic and manual. Automatic resume occurs when the MDI step instructs you to turn the system off to perform a service check. When the CE Diagnostic Diskette is reloaded and MDIs are selected, the system will instruct to press ENTER to resume MDI processing. To resume on an MDI step that is not automatic, it is necessary to type an "r" and press ENTER before turning the system off.

```
C. E. Diagnostics        MDIs Keyboard           Memory xxxx
CED201                                               Kyb 001
                                             MAP Description:
Good Test Unit results?                      This MAP isolates Keyboard problems.

                                             Overrun test for the keyboard.




                                             Test     - YES NO    Section    - 10
                                             Received - YES       Subsection - 70
CANCEL to return to Device Selection:                            Step       - 001
END to return to Function Selection.                             Mode       - Step
Type y,n,(b,o,t,r), press ENTER:  y
```

Test Unit Prompt Responses Display

MDI PROMPTS

The following is a description of the prompts displayed during MDI.

Question Prompt — The answer may be "y" (Yes), "n" (No), or select one of the specified options "b" (Back up), "o" (Return to the options menu), "t" (Display the trace table), "r" (Resume at the last MDI step performed).

Command Test Prompt — These are instructions which must be performed before continuing with MDI. If one of the options (b, o, t, r) is entered, that option is taken. If no option is entered, the MDI will continue with the next step.

Test Unit Prompt — One of the following is displayed when a step is run in the STEP mode. The results of the test unit are checked, and a decision is made by the MDI controller. This may be overridden by entering another value or one of the other options (b, o, t, r).

```
C. E. Diagnostics        MDIs System              Memory xxxx
CED201                                                  Kyb 001

Good Test Unit results?




                                              Test     - EQ      Section    - 20
                                              Received - 0000    Subsection - 70
CANCEL to return to Device Selection:         Expected - 0000    Step       - 001
END to return to Function Selection.                             Mode       - Step
Type y,n,(b,o,t,r), press ENTER:    y
```

Test Unit Prompt Display

Fix/Stop Prompt — The following is displayed when a FIX or STOP step is indicated. No response before pressing ENTER causes the MDI controller to return to the Device Selection Menu. When ENTER is pressed, the MDI controller looks at the response and takes the needed action.

```
C. E. Diagnostics        MDIs Keyboard              Memory xxxx
CED201                                                   Kyb 001
Exchange Key Modules.

Select the Keyboard ID to execute the
CE Diagnostic MAP 1070 which is
located on the CE Diagnostic Diskette.




                                                    Section     - 10
                                                    Subsection - 70
          CANCEL to return to Device Selection;     Step        - 007
          END to return to Function Selection.      Mode        - Step
          Type (b,o,t,r),   press ENTER: ⊔
```

Fix/Stop Display

MDI DISPLAY TYPING AREA OR MENU AREA

This area displays the following information:

- Command Text
- Question Text
- Fix/Stop Text
- Supplementary Text (Additional information about the step)
- Prompts and Instructions
- Application Status (Mode or Step Number)
- Decision Data or Test Condition (Symbol for each condition)
  - EQ (Equal To)
  - GR (Greater Than)
  - LT (Less Than)
  - NE (Not Equal To)
  - ON or OFF as in bit arrangement in the status byte
  - In Range (HILOW) — Results should be inside range
  - Selected bits on (ON) — Bits that are on in the mask must be on in the result
  - Selected bits off (OFF) — Bits that are on in the mask must be off in the result
  - Yes — Result is Yes or No
  - Expected (What the test results should be)
  - Received (What the test results are)
  - Next Step (Number of the next step in MDI)
- Test Unit Information (Information about the test which is running)
  - Adapter Status
  - Information common to the test being run
  - Special Instructions

```
C.E. Diagnostics    MDIs                        Memory xxxx
L Disk R Disk                                        Kyb xxx
...........................................  ................................
.                                          .  .                             .
.         COMMAND TEXT, FIX TEXT,          .  .       SUPPLEMENTARY TEXT     .
.         and QUESTION TEXT                .  .                             .
.                                          .  .                             .
.                                          .  .                             .
.                                          .  .                             .
.                                          .  .                             .
.                                          .  .                             .
.                                          .  ................................
.                                          .  ................................
.                                          .  .                             .
.                                          .  .       TEST UNIT UNIQUE       .
.                                          .  ................................
.                                          .  ..............  ...............
.                                          .  . DECISION   .  . STATUS       .
.....DIRECTIVE TEXT     ..............     .  . DATA       .  .              .
...........................................  ................................
'Prompt Line'
'Message Line'
```

Typing Area Or Menu Area

MDI TRACE DISPLAY

The MDI trace table may contain a maximum of 100 steps. This information is always available during MDI.

The display permits the MDI step entries to be seen at once and permits a review of the steps taken in MDI when a wrong step is suspected. The format of each entry is:

nnn	=	Step Number (from 001 through 999)
d	=	Decision (y, n, g, f, or m)
y	=	Step result was Yes
n	=	Step result was No
g	=	Step result was to go to another step
f	=	Step result was a fix
m	=	Step result was to go to another MAP
mmss	=	The MDI ID number for a GO TO MAP step
		mm = Section Number (10 − 99)
		ss = Subsection Number (70 − 89)

The trace table may be printed as it is displayed by pressing the PRINT key.

C. E. Diagnostics   MDIs Diskette   Memory xxxx
CED201   Kyb 001

START   001-y   003-y   005-y   007-y   009-y   011-y   013-y   015-y   -END-

Press ENTER to continue:

MDI Trace Display

CE UTILITIES

The CE Loadable Diagnostics include utilities normally used with MAPS' When thes utilities are selected from the Function Selection Menu , the Utility Group Selection Menu will be displayed . Once the utility group has been selected , a specific group utility selection menu will be displayed. The specific group utility selection menu will differ with the utility group selected.

ERROR LOG UTILITY GROUP

A group of Error Log Utilities permits a review of the error log information stored in Random Access Memory and then written (dumped) to a diskette(s) called the Memory Record Diskette(s). This error log information aids in finding intermittent failures by showing where the failures have occurred. The Error Log Utilities format and display the contents of the Memory Record Diskette(s).

SYSTEM ERROR LOG

The system logs (records) errors in the system memory. This information can be stored on a diskette by either the operator or the CE. The CE can display the error log to determine what errors have occurred in the system. Because the error log is contained in Random Access Memory, it will be lost when system power is turned off or when a program diskette is loaded if it is not first dumped to a diskette(s).

```
C.E. Diagnostics                                      Memory xxxx
CED201                                                   Kyb xxx
                      DISKETTE DRIVE ERROR LOG

Duration of Logging    2 hrs  17 min  41 sec    Program Disk   xxxxxx


Read Operations      Write Operations      Seek Operations      Data Field Errors
xxxxxxxxxx           xxxxxxxxxx            xxxxxxxxxx           xxxxxxxxxx



Read Data Errors     Write Fault Errors    Seek Errors          No Data Errors
xxxxxxxxxx           xxxxxxxxxx            xxxxxxxxxx           xxxxxxxxxx



Status Reg 1         Status Reg 2          Status Reg 3         Last Diskette
10110100             11110111              10111011             xxxxxx



Press CANCL to return to Device Selection Menu.
Press END to return to Function Selection Menu.
Press PRINT to print screen.
To continue to next DEVICE, press ENTER:
```

Device Error Log

ERROR LOG DUMP PROCEDURE

The error log in RAM and system memory is dumped to diskette(s) by using the following procedure:

- Leave the system in the normal operating mode.
- Remove all diskettes from the diskette unit. (The Error Log Dump Procedure will write over the information on the diskette.)
- Press the Memory Record Button once. Error codes will be displayed. (Refer to Figure)
- Press the Memory Record Button a second time.
- Load the Memory Record Diskette in the left drive (drive 0).

When the Memory Record Diskette is loaded, the error log is automatically dumped to the diskette from RAM.

```
                                  |                                    |Memory xxxx|
       |        |                 |                     |               Kyb xxx
                                       TASK SELECTION

           ID    ITEM

           a     Typing Tasks:
                   Create, Revise or Paginate Documents
           b     Work Diskette Tasks:
                   Delete or Duplicate Documents,
                   Duplicate, Condense or
                   Erase/Initialize (Name) Diskette,
                   Print Index of Diskette Contents, Change
                   Document or Dikette Name, Recover Documents
           c     Program Diskette Tasks:
                   Default Formats, Duplicate Setups,
                   Printer and Work Station Description,
                   Duplicate and Erase Program Diskette
           d     Spelling Tasks
```

```
*900*  FFF2  0111  1000  00  003C  0034  0170  1A9AIA
```

Error Log Dump Error Codes

900 – A software error has been detected.	90A – Indicator that the left drive has become ready.
901 – 256K bytes recorded; insert another memory record diskette.	90B – Left drive is not ready.
	90C – Left drive had a read error.
902 – Dump complete.	90D – Left drive is ready.
903 – Read/write error on dump diskette.	90E – Left drive had a seek error.
904 – Dump diskette improperly formatted.	90F – Left drive is not present.

SYSTEM EXERCISER

When the system exerciser is selected from the Function Selection Menu, it starts to test the system. The system centers the printer carrier on the writing line so the operator may prepare the printer. The operator then presses the ENTER key, and the display will show information about the system's active devices and their status while the system exerciser is operating. This display will vary depending on which devices are attached to the system.

An optional keyboard test is available to the operator or CE, and the keyboard may be tested anytime during the test.

While the test is operating, the timer count is continuously updated to show testing is in process. If the system exerciser fails to complete normally, the status column will show which device or combination of devices are suspected. The printed output should also be checked for errors.

The system exerciser takes approximately 2 to 3 minutes to complete. When the system exerciser is completed, the END key may be pressed to return to the Function Selection Menu, or the ENTER key may be pressed to place the system exerciser in a loop mode.

In a loop mode, the exerciser will repeat until an error is sensed or the CANCL key is pressed.

```
C.E. Diagnostics    System Exerciser           Memory xxxx
CED201                                          Kyb xxx

                       System Configuration

                       Display Module
                       Keyboard Module
                       Electronics Module
                       Diskette Unit
                       Printer
```

System Exerciser Display


```
abc̄de              _____      a  b  c  d  e    Zz
```

LOAD PROGRAM FUNCTION

The Load Program Function is selected from the CE Diagnostic Function Selection Menu to perform a soft IPL of the customer program diskette. A soft IPL is an Initial Program Load performed without turning the system off and going through the normal POR and BAT sequence.

This function may also be used to execute diskette MDIs from the opposite diskette drive.

DISKETTE UNIT (6360) HEAD ALIGNMENT COMPATABILITY CHECK

This utility checks the compatability of the read/write head alignment of two or more diskette drives by using one CE diskette. One of three results will be displayed; return codes, diskette drive problem, or unexpected diskette failure.

• The return codes of the diskette drives checked are compared to determine which diskette drive(s), if any, need to be mechanically checked and/or adjusted with the head alignment procedure in this manual.

  The return codes +1, 0, or -1 are displayed, and indicate the result of the check.

  A variation in return codes between drives indicates the head alignments are not identical. A variation of not more than one, for example +1 and 0 or 0 and -1, is generally acceptable.

  If the variation between drives is more than one, for example +1 and -1, the head alignment is not acceptable and must be adjusted to reduce the variation to one or less. Adjustments should be performed on the smallest group of like return codes.

• The diskette drive problems identified are head alignment, head sensitivity and stepper mechanism problems. If the head alignment is beyond the +1 or -1 range, a prompt will reference the head alignment adjustment in the Product Support Manual. When head sensitivity or stepper mechanism problems are found, the prompt will reference a MAP.

• Unexpected diskette failures can occur during this test. If this occurs, a prompt is displayed to re-run the test. If problems continue, the MAPs should be used.

FIELD ENGINEERING SERVICE NUMBER/RELEASE VERSION MODIFICATION (FESN/RVM)

The FESN/RVM utility is selected from the Group Selection Menu to identify and check the level of the customer program diskette. When the utility is selected and the program diskette is loaded, the program diskette name, spelling support, the FESN, and the RVM is displayed.

The FESN and RVM are used to call report software problems and are recorded on the I/PAR when a software problem is found.

LICENSED PROGRAM GUIDELINES AND MEMORY CARD CONFIGURATION

Listed are guidelines for IBM Licensed Program memory requirements. This list is only a guide since system configurations and World Trade requirements may change the memory requirement. The proper sales literature has the latest requirements.

Textpack I	192K
Textpack II	192K
ASYNC Communications	192K
BSC Communications	256K
Textpack III	256K
Textpack IV	256K

There are two types of memory card, Type A and Type B. When replacing memory cards, care must be taken to replace like card with like card. For example, a 128A card must be replaced with 128A card, and a 128B card must be replaced with a 128B card. This is necessary to ensure proper operation of the system and to maintain machine level control (MLC).

Memory sizes can be configured as follows:

Bytes of Storage	Card Configuration	Displayed in Memory Size Field
128K	128A 128B	128A 128B
192K	192A 192B	192A 192B
256K	256B 192A (base card) + 64B (extender	256B 256D
320K	256B (base card) + 64B (extender)	320E

TABLE OF CONTENTS

INTERMITTENT PROBLEM DIAGNOSTIC APPROACH

Page

INTERMITTENT PROBLEM DIAGNOSTIC APPROACH

INTRODUCTION

The Intermittent Problem Diagnostic Approach is a guide to aid service personnel in solving system problems that appear to be intermittent. The purpose of this diagnostic approach is to collect data and use the Displaywriter diagnostic aids to lead to a repair action. These procedures are only guidelines to aid in solving intermittent problems. Service personnel can develop and use other diagnostic approaches as knowledge of the Displaywriter system increases.

NOTE: These procedures should be used only after MAPs have failed to isolate the problem. At all times, follow the Required Action Guidelines.
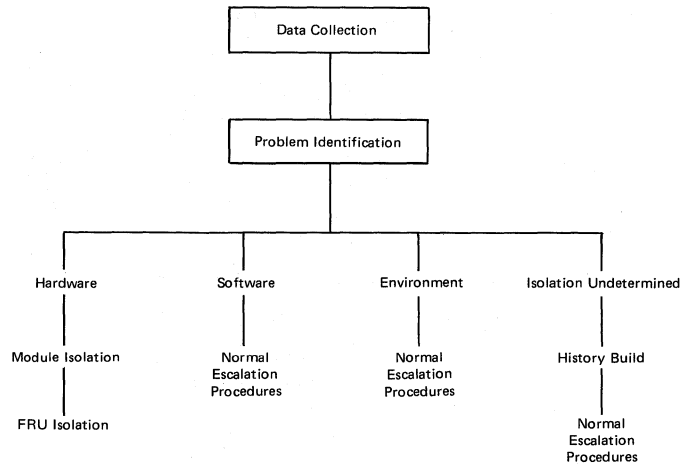
Figure 1 — Intermittent Problem Diagnostic Approach Flow Chart

DATA COLLECTION

The purpose of this section is to inform service personnel of ways to collect general data that could lead to intermittent problem identification.

INSTRUCTIONS

Collect all the available customer information, including: the application or job being performed at the time of failure; the regularity of the failure; the time of day the failure occurs; any unusual module sounds; a hard copy of the job; the Memory Record Diskette; any error indicators, and similar information.

Check the system history records for installed Engineering Changes, CEMs, and earlier service calls that might have caused the problem.

Review all CEMs for existing information that may supply a solution to the problem.

If possible, have the customer repeat the problem.

- Look for a module or function failure while the customer is operating the system.

- See if the job fails in the same place, exactly the same way.

- Listen for any unusual system sounds.

- Observe what areas (modules) of the system were operating at the time of the failure.

Learn the sequence leading up to the failure.

- Observe which keys are pressed.

- Look for unusual operator actions that may cause intermittent failures.

- Observe which drive unit had the work diskette and which drive unit has the licensed program diskette.

- Observe, if possible, where in the job(s) the failure occurs.

Collect as many failure symptoms as possible.

- Make a note of BAT error codes and/or the Problem Determination Diskette (PDD) service request numbers.

- If possible, run the customer's job(s) on another Displaywriter, located in the same environment with the same EC/CEM level.

Look at the error log(s) if a Memory Record Diskette is available. If any errors are indicated, print the error log.

PROBLEM ISOLATION

The following questions are designed to lead the CE in problem isolation.

1. Does the problem only occur when a specific licensed program is loaded?

2. Does the problem occur only when a specific job or application is performed?

3. Does the problem occur if the job is run on another Displaywriter with the same features and EC/CEM level?

4. Does the problem occur only when typing?

5. What areas (modules) of the system are operating at the time of failure?

6. Does the failure only occur when other equipment is turned on or operated?

7. On a dual diskette unit, does the problem occur on both the left and right side?

8. Does the problem occur at a specific time of day?

9. Do other Displaywriters in the account have the same problem?

10. Does the same operator have the problem on different machines?

11. Are there any errors in any of the device error logs? Section 16, "Guidelines for Error Log Interpretation," will aid in error log interpretation.

12. Does the customer have any service request numbers? If so, check Figure 2.

SERVICE REQUEST NUMBERS	SUSPECTED AREA
x1xxxx	Keyboard
x2xxxx	System Electronics
x4xxxx	Printer Sharing
x5xxxx	Printer
x6xxxx	Power Supply
x8xxxx	Diskette Unit

Figure 2. Service Request Number Chart

Using the information from Data Collection and the decisions made in Problem Isolation, see one or more of the following sections for further isolation.

Hardware

- Keyboard — See Section 1

- Display — See Section 2

- Electronics Module — See Section 3

- Diskette Unit — See Section 4

- 5215 Printer — See Section 5

- 5218 Printer — See Section 6

- 6361 Mag Card Unit — See the Mag Card Unit Product Support Manual.

- Printer Sharing — See Section 7

- Communications — See the Communications Service Manual.

- Power Supply — See Section 8

- Isolation Undetermined — See Section 9

- Software or Operator Procedure — See Section 10

- Environment — See Section 11

SECTION 1 KEYBOARD ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the keyboard MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on BAT (RNA Test G)

   - Failure — Use the BAT error code with MAPs to determine the cause, and see Section 14, "BAT Failures."

   - No Failure — Continue with this procedure.

2. Loop on BAT (RNA Test G) while flexing (moving) the following:

   - The keyboard cable and keyboard cable connectors
   - The internal distribution cable and connectors 7, B1-A, and P2

   - Failure — Check the cable and connector.

   - No Failure — Continue with this procedure.

3. Loop on keyboard MDIs

   - Failure — Print the trace table, and perform the fix as instructed.

   - No Failure — Continue with this procedure.

4. Loop on keyboard MDIs while flexing (moving) the cables referenced in Step 2.

   - Failure — Print the trace table, and check the cable and connector.

   - No Failure — Check all ground wires for a good ground.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 2 DISPLAY ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the display MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on BAT (RNA Test G)

   - Failure — Use the BAT error code with MAPs to determine the cause, and see Section 14, "BAT Failures."

   - No Failure — Continue with this procedure.

2. Loop on BAT (RNA Test G) while flexing (moving) the following:

   - The display cable and display cable connector 2
   - The internal distribution cable and internal distribution cable connectors 2, D1, and P2

   - Failure — Check the cable and connector.

   - No Failure — Continue with this procedure.

3. Loop on Display Path Test (RNA Test Q)

   - Failure — A failure to read or write to the display buffer memory is indicated. Reseat the system and display adapter cards.

   - No Failure — Continue with this procedure.

4. Loop on display MDIs

   - Failure — Print the trace table, and perform the fix as instructed.

   - No Failure — Continue with this procedure.

5. Loop on keyboard MDIs while flexing (moving) the cables referenced in Step 2.

   - Failure — Print the trace table, and check the cable and connector.

   - No Failure — Check all ground wires for a good ground.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 3 ELECTRONIC MODULE ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the system MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on BAT (RNA Test G)

   - Failure — Use the BAT error code with MAPs to determine the cause, and see Section 14, "BAT Failures."

   - No Failure — Continue with this procedure.

2. Loop on BAT (RNA Test G) while flexing (moving) all Electronics Module cables and connectors.

   - Failure — Check the cable and connector.

   - No Failure — Continue with this procedure.

3. Loop on Base RAM TEST (RNA Test R)

   - Failure — A failure to read or write to main memory is indicated. Reseat the system and memory cards.

   - No Failure — Continue with this procedure.

4. Loop on ROS CRC Test (RNA Test P)

   - Failure — A CRC error is sensed. Reseat the system card.

   - No Failure — Continue with this procedure.

5. Loop on system MDIs

- Failure — Print the trace table, and perform the fix as instructed.

- No Failure — Continue with this procedure.

6. Loop on keyboard MDIs while flexing (moving) the cables referenced in Step 2.

- Failure — Print the trace table, and check the cable and connector.

- No Failure — Check all ground wires for a good ground.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 4 DISKETTE UNIT ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the diskette MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on BAT (RNA Test G)

- Failure — Use the BAT error code with MAPs to determine the cause, and see Section 14, "BAT Failures."

- No Failure — Continue with this procedure.

2. Loop on BAT (RNA Test G) while flexing (moving) the following:

- The diskette DC cable and diskette DC cable connectors 10 and B2
- The Diskette Unit signal cable and Diskette Unit signal cable connectors 5 and B1
- The internal diskette signal cable and internal diskette signal cable connectors 5 and S1

- Failure — Check the cable and connector.

- No Failure — Continue with this procedure.

3. Loop on diskette MDIs

- Failure — Print the trace table, and perform the fix as instructed.

- No Failure — Continue with this procedure.

4. Loop on diskette MDIs while flexing (moving) the following:

- The cables referenced in Step 2.
- The diskette drive cable, diskette drive cable connectors B3 and B4, and the file control card
- All file control card connectors

- Failure — Print the trace table, and check the cable and connector.

- No Failure — Continue with this procedure.

5. Perform the Diskette Unit (6360) Head Alignment Compatibility check and use the Diagnostic section in this manual for data interpretation.

- Failure — Align the head to be compatible with other diskette units in the account.

No Failure — Continue with this procedure.

6. Check the solenoid and bail adjustment.

- Not Correct — Adjust as specified.

- Correct — Continue with this procedure.

7. Loop on diskette path test (RNA Test S)

- Failure — Reset the system and diskette adapter cards. Check the cables and connectors referenced in Step 2.

- No Failure — Continue with this procedure.

8. Run the Track Step Test (RNA Test T)

- Failure — Check the track stepping mechanisms. If an error is found, see Section 15 for error codes.

- No Failure — Continue with this procedure.

9. Run the Track Step Test (RNA Test T) while flexing (moving) the following:

   - The cables referenced in Step 2
   - The diskette drive cable, diskette drive cable connectors B3, B4, and the file control card
   - The stepper motor cable and connector.

   • Failure — Check the cable and connector.

   • No Failure — Continue with this procedure.

10. Run the Diskette Stepper Motor Phase Test (RNA Test M)

    • Failure — See Section 15 for failure codes. Reseat the system and diskette adapter cards. Check the cables and connectors referenced in Steps 2 and 9, and check the track stepping mechanisms.

    • No Failure — Continue with this procedure.

11. Run the Diskette Stepper Motor Phase Test (RNA Test M) while flexing (moving) the cables and connectors referenced in Steps 2 and 9.

    • Failure — Check the cable and connector.

    • No Failure — Continue with this procedure.

12. Run the Diskette Drive Set Ready Test (RNA Test L)

    Failure — See Section 15 for failure codes. Reseat the system and diskette adapter cards. Check the cables and connectors referenced in Steps 2 and 9, and check the track stepping mechanisms.

    • No Failure — Continue with this procedure.

13. Run the Diskette Drive Set Ready Test (RNA Test L) while flexing (moving) the cables and connectors referenced in Steps 2 and 9.

    • Failure — Check the cable and connector.

    • No Failure — Check all ground wires for a good ground.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 5 5215 PRINTER ISOLATION

Did the customer have a service request number leading to this area?

   YES, loop on the printer MDIs and see Section 13, "Service Request Numbers."

   NO, follow the procedure below:

1. Loop on printer MDIs

   • Failure — Print the trace table, and perform the fix as instructed.

   • No Failure — Continue with this procedure.

2. Loop on printer MDIs while flexing (moving) the following:

   - The internal distribution cable and internal distribution cable connectors 0 and B1-B
   - The printer cable and printer cable connector 0
   - The I/O connector in the printer

   • Failure — Print the trace table, and check the cable and connector.

   • No Failure — Continue with this procedure.

3. Thoroughly exercise the printer using the Printer Tests Diagnostic/Adjustment.

   • Failure — Perform any adjustments or repairs needed.

   • No Failure — Check all ground wires for a good ground; perform a static voltage check; and check all adjustments that affect the feedback circuits and timing.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 6 5218 PRINTER ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the printer MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on printer MDIs

   • Failure — Print the trace table, and perform the fix as instructed.

   • No Failure — Continue with this procedure.

2. Loop on printer MDIs while flexing (moving) the following:

   — The internal distribution cable and internal distribution cable connectors 0 and B1-B
   — The printer cable and printer cable connector 0
   — The printer connector on the printer attachment panel.

   • Failure — Print the trace table, and check the cable and connector.

   • No Failure — Continue with this procedure.

3. See the 5218 Intermittent MAP.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 7 PRINTER SHARING ISOLATION

Did the customer have a service request number leading to this area?

YES, loop on the printer sharing MDIs and see Section 13, "Service Request Numbers."

NO, follow the procedure below:

1. Loop on printer sharing MDIs at the primary work station.

   • Failure — Print the trace table, and perform the fix as instructed.

   • No Failure — Continue with this procedure.

2. Loop on printer sharing MDIs at the primary work station while flexing (moving) the following:

   — The primary work station internal printer sharing cable and internal printer sharing cable connectors 6A, 6B, and C1
   — The external printer sharing cable and external printer sharing cable connectors 6A, 6B, and 0

   • Failure — Print the trace table, and check the cable and connector.

   • No Failure — Continue with this procedure.

3. Loop on printer sharing MDIs at the secondary work station.

   • Failure — Print the trace table, and perform the fix as instructed.

   • No Failure — Continue with this procedure.

4. Loop on printer sharing MDIs at the secondary work station while flexing (moving) the following:

   — Secondary work station internal distribution cable and the internal distribution cable connectors 0 and B1-B

   • Failure — Print the trace table, and check the cable and connector.

   • No Failure — Check all ground wires for a good ground.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 8 POWER SUPPLY ISOLATION

1. Using a ground indicator or CE multimeter, verify that the AC outlet is wired correctly.

2. Verify the AC input voltage at the wall outlet is in the following specifications:

US/Canada	104 — 127 VAC
WT	90 — 137 VAC
WT	180 — 254 VAC

3. Verify the AC output voltage to the diskette unit at connector 8 of panel 2 is in the above specification.

4. Verify all power supply voltages at P1, P2, and 10 are in the following specifications (see the Cables, Connectors, and Test Points section of this manual for pin locations):

+24.0 VDC	+22.08 to +26.4 VDC
+12.0 VDC	+11.04 to +13.20 VDC
+12.0 VDC	+11.40 to +12.60 VDC
	(only connector P2, Pin 10)
+ 8.5 VDC	+ 8.245 to + 8.925 VDC
+ 5.0 VDC	+ 4.6 to + 5.5 VDC
− 5.0 VDC	− 4.6 to − 5.5 VDC
−12.0 VDC	−11.04 to −13.20 VDC

5. Verify there are no DC or AC voltages on any ground loop. Measure between frame ground and signal ground with the multimeter.

   Turn the system power off and measure for continuity (less than 2 Ohms) between frame ground and all ground wires.

6. Run the BAT in a loop mode (RNA Test G) while flexing (moving) all cables going from the power supply.

7. Run the system exerciser in a loop mode while flexing (moving) all cables going from the power supply.

NOTE: If you suspect another area, see that section. If not, see Section 9.

SECTION 9 ISOLATION UNDETERMINED

1. Loop on BAT (RNA Test G)

   - Failure — Use the BAT error code with MAPs to determine the cause, and see Section 14, "BAT Failures."

   - No Failure — Continue with this procedure.

2. Loop on System Exerciser

   - Failure — See the isolation section for that device.

   - No Failure — Continue with this procedure.

3. Run the Problem Determination Diskette (PDD)

   - Failure — See the Problem Isolation section, Service Request Number Chart in Figure 2.

   - No Failure — Continue with this procedure.

4. Run all MDIs

   - Failure — Print the trace table, and perform the fix as instructed.

   - No Failure — Continue with this procedure.

5. Analyze the error logs. If errors are indicated, print the error logs and see the Section 16, "Guidelines for Error Log Interpretation." If no errors are indicated, see Section 12, "History Build."

SECTION 10 SOFTWARE/OPERATOR PROCEDURES

This section assumes that the problem is suspected to be the licensed program or operator procedures.

- Carefully observe the procedures being followed when the operator repeats the problem. Determine if correct operator procedures are used.

- If you suspect a software failure, follow your normal escalation procedures for aid. The RETAIN data base may have a solution to the problem.

SECTION 11 ENVIRONMENT

The purpose of this section is to aid service personnel in identifing external causes of machine failures.

1. Ensure the system environment meets printed specifications for the Displaywriter and its supplies. The physical environmental limits are:

   - 15.6°C to 32.2°C (60°F to 90°F)

   - 15.6°C to 29.4°C (60°F to 85°F) (with the sheet-feed attachment)

   - 8% to 80% relative humidity

   - 30% to 65% relative humidity (with the sheet-feed attachment)

2. Using a ground indicator or CE multimeter, verify the AC outlet is wired correctly. This does not verify a good earth ground.

3. Verify the AC input voltage at the wall outlet is in the following specifications:

US/Canada	104 — 127 VAC
WT	90 — 137 VAC
WT	180 — 254 VAC

   NOTE: A dedicated line is recommended if the communication feature is attached.

4. If Radio Frequency Interference (RFI) is suspected, follow this procedure:

   - Use the IBM triplett VOM P/N 9900167.

   - Select the lowest AC voltage setting.

   - With both test leads plugged into the multimeter, extend the two probe ends into the air near the system.

   - Spread both leads as far apart as possible.

   - Move the leads around to simulate a receiving antenna. A strong RFI signal will cause a meter needle deflection.

   - Floor covering and/or humidity may cause Electrostatic Discharge (ESD) problems. Floor covering material can contribute to the buildup of high static electrical charges. This problem is more severe as room humidity decreases.

QUESTIONS

1. Are the system vents clear, and is there enough space around the system modules to permit cooling?

2. Is the system near one of the following:

   - Radio/television station transmission antenna.

   - Airport.

   - Microwave station.

   - Radar installation.

   - X-ray equipment.

3. Does any other equipment at the customer location have intermittent problems?

4. When other equipment is turned on or operated, does the intermittent failure occur?

Copiers	Refrigerator	Elevator
Air Conditioners	Portable Heater	Water Fountains
DP/WP Systems	Coffee Pot	(Hot or Cold)

RECOMMENDATION

If you suspect environment, follow your normal escalation procedures and inform local management.

SECTION 12 HISTORY BUILD

This section outlines a series of procedures that may be useful when a problem is either difficult to repeat or cannot be repeated in a customer's office.

If (a) the preceding procedures fail to find the cause of the intermittent problem or (b) the problem could not be repeated at the time of the call, the following is recommended:

1. Keep a history of all data obtained to this point, and store it with the system for future use.

2. Obtain error logs, if possible, by requesting the customer to dump the Displaywriter's memory each time the failure occurs, one per diskette. This could aid in future analysis.

3. Request the customer to keep any samples or hard copy of the job and to record the time of failure.

4. Request the customer to list all steps and operations performed that led to the failure.

Inform management of any continuing unresolved problems, and follow your normal escalation procedures.

SECTION 13 SERVICE REQUEST NUMBERS

1. x1xxxx numbers indicate keyboard function failures. For all x1xxxx series numbers:

   - Clean the pad card.

   - Reseat the system card and the keyboard logic card.

   - Check the logic card connector.

   - Check the internal distribution cable connectors 7 and B1-A.

2. x2xxxx numbers indicate electronics function failures. For all x2xxxx series numbers:

   - Reseat the memory, system, and display adapter cards.

   - Check the system power cable connectors P1 and A1.

3. x4xxxx numbers indicate printer sharing function failures. For all x4xxxx series numbers:

   - Reseat the printer sharing card.

   - Reseat the system card in the primary and/or secondary station.

   - Check the secondary work station Panel 1, connector 0.

   - Check the secondary work station internal distribution cable connector B1-B.

   - Check the primary work station Panel 1, connectors 6A and/or 6B.

   - Check the primary work station internal distribution cable connector C1.

4. x5xxxx numbers indicate printer function failures.

   x50xxx numbers indicate a printer link problem.

   - Reseat the system card.
   - Check the printer cable connectors.
   - Check the printer electronics and cables.

   x51xxx numbers indicate a 5215 Printer problem.

   - Thoroughly test the printer using the printer test Diagnostic/Adjustment.

   x52xxx numbers indicate a 5218 Printer problem.

   - Go to the 5218 Intermittent MAP.

   x53xxx numbers indicate a 5218 sheet feed problem.

   - Go to the 5218 Intermittent MAP.

   x54xxx numbers indicate a 5218 tractor feed problem.

   - Go to the 5218 Intermittent MAP.

5. x6xxxx numbers indicate power supply function failures. For all x6xxxx series numbers:

   - Check the AC input voltage.

   - Check all DC supply voltages.

6. x8xxxx numbers indicate diskette function failures.

   480016

   - The drive belt may be slipping.
   - The diskette may be slipping on collet.
   - Check the AC input voltage to the Diskette Unit.

580010

- Test all diskette connectors (B1, B2, B3, B4, and File Control Card).
- Reseat diskette adapter card.
- Check the stepper drive band adjustment.
- The head carriage assembly may be binding on guide rods.

680011

- Check the head alignment.
- Check the solenoid and bail adjustment.
- Check all diskette connectors (B1, B2, B3, B4, and File Control Card).

780018

- Same as 680011

880013

- Same as 480016

For all other x8xxxx numbers:

- Reseat the diskette adapter and system cards.
- Check all diskette connectors (B1, B2, B3, B4, and the File Control Card).
- Check Panel 2, connectors 8, and 10.
- Check internal diskette signal cable connectors 5 and S1.

7. x9xxxx numbers indicate display function failures. For all x9xxxx series numbers:

- Reseat the display adapter and system cards.

- Check the display module connector (2) and the internal distribution cable connectors (D1 and P2).

SECTION 14 BAT FAILURES

PRE-CRT INITIALIZATION BAT FAILURES

Check the following:

- DC supply voltages.

- AC input voltage.

- Reseat all electronic cards and check all connectors inside the Electronics Module.

- Reseat the Display Module connector 2.

POST-CRT INITIALIZATION BAT FAILURES

Check the following:

- DC supply voltages.

- AC input voltage.

- Reseat all electronic cards and check all connectors inside the Electronics Module.

- Reseat the Display Module connector 2.

- Reseat the keyboard logic card and the diskette adapter card.

- Check the keyboard logic card connector and the keyboard cable connector 7.

- Check all connectors on the Diskette Unit.

- Check Panel 1, connectors 5, 8.

- Check Panel 2, connector 10.

SECTION 15 DISKETTE RNA TEST FAILURE CODES

DRIVE SET READY TEST (L)

- L F 01 — Read ID Error (head is not being engaged)

- L F 02 — Drive Not Ready (slow diskette speed)

- L F 03 — Recalibrate Not Successful

- L F 04 — Write Fault Error

- L F 07 — Head Engage Signal Set Incorrectly

- L F 09 — Head Cannot Be Engaged

- L F 10 — Drive Not Present

- L F 14 — Unexpected Transition (change in diskette speed)

- L F 17 — Read ID Shows Incorrect Track Location (seek/track step problem).

- L F 19 — No Index Pulse Detected

- L F 20 — Index Pulse Will Not Reset

STEPPER MOTOR PHASE TEST (M)

- M F 01 — Read ID Error* (head is not being engaged)

- M F 02 — Drive Not Ready (slow diskette speed)

- M F 03 — Recalibrate Not Successful

- M F 05 — Write/Erase Enabled Incorrectly

- M F 07 — Head Engage Signal Set Incorrectly

- M F 08 — Seek Error* (seek/track step problem)

- M F 09 — Head Cannot Be Engaged

- M F 10 – Drive Not Present

- M F 14 – Unexpected Transition (change in diskette speed)

- M F 15 – Inner Track Signal Set Incorrectly*

- M F 16 – Inner Track Signal Not Set*

- M F 17 – Read ID Shows Incorrect Track Location* (seek/track step problem)

*Current Track Location Display in Test Feedback Field

TRACK STEP TEST (T)

- T F 02 – Drive Not Ready (slow diskette speed)

- T F 03 – Recalibrate Not Successful

- T F 08 – Seek Error (seek/track step problem)

- T F 10 – Drive Not Present

- T F 14 – Unexpected Transition (change in diskette speed)

SECTION 16 GUIDELINES FOR ERROR LOG INTERPRETATION

1. Diskette Error Log

   - Write Fault Error

     A write fault causes that drive to be made unavailable to the user.

     The number of write faults will never be more than one, because no operations are permitted on the drive after a write fault occurs.

     A write fault may be caused by either a bad file card, a bad diskette adapter card, or cables.

   - No Data Error

     A no data error indicates that a sector to be read could not be located.

     The probable cause of a no data error is a bad diskette.

   - Seek Error

     A seek error is caused by a failure to track step to the correct track.

     Most seek errors will be corrected by an automatic retry. Frequent seek errors indicate a problem in the head track step area.

   - Data Field Error*

     Data field errors indicate an error in reading customer data. Many will be corrected by an automatic retry.

     Data field errors may indicate a bad diskette, a file card problem, a diskette adapter card problem, or a head alignment problem.

   - Data Error*

     Data errors indicate an error in reading sector identification data or customer data. Many will be corrected by an automatic retry.

     If the number of data errors is much larger than the number of data field errors, this may indicate poor diskette initialization or poor head alignment.

*If read operations equal seek operations, then all data errors and data field errors were corrected by automatic retrys without informing the operator.

2. Keyboard Error Log

   - Queue Overruns

     Queue overruns are possible during normal operation.

     A large number of queue overruns indicates a keyboard electronics failure.

     Queue overruns may appear to the operator as missing key strokes.

   - Code MAP Errors

     Code MAP errors may be caused by bad keyboard electronics or electrical noise picked up by the keyboard cable.

3. Printer Error Logs

   - Parity/Frame and Print Parity/Frame Errors

     If both parity/frame errors and print parity/frame errors occur, there may be electrical transients (AC Line) in the environment.

     If only parity/frame errors or only print parity/frame errors occur, the system card or the printer electronics is probably failing.

- Print Overrun Errors

Print overrun errors may be caused by slow printer responses. Slow printer responses can be caused by a sluggish printer or maladjusted print feedback circuitry.

SECTION 17 TRACE TABLE USAGE

The trace table can be used to analyze the path of the steps taken in the MDI. When in the loop mode, comparison of the steps in each loop will show any differences in the path taken. For example:

Diskette MDI trace.

    001-y 003-y   005-y   009-y   013-y   015-f

    001-y 003-y   005-y   009-n   010-y   012-n etc.

This trace shows step 009 was answered differently. The supplementary information at MDI step 009 might supply a clue to the cause of the intermittent problem. The supplementary information displayed at MDI step 009 reads: "The purpose of this test is to check the diskette drive's speed." Because this step had failed, the diskette unit should be checked for any problems that might cause slow diskette rotation (slipping drive belt, etc.).

TABLE OF CONTENTS

OPERATING INSTRUCTIONS

The Typing Tasks Menu Sequence shows a basic sequence
of menus, beginning with the IPL, that occurs when the
program diskette is loaded and ending with the printing
of a document using the Print key or the Request Tasks
menu.

IPL The System
(Load Program Diskette)

Task Selection

Typing Tasks

Work Diskette Tasks

Program Diskette Tasks

Spelling Tasks

Create Or Revise Document

Paginate Document

Go To Task Selection

(Text)

END

PRINT / KYB CHG

REQST / CANCL

Task Selection

END

Request Tasks

Print Document
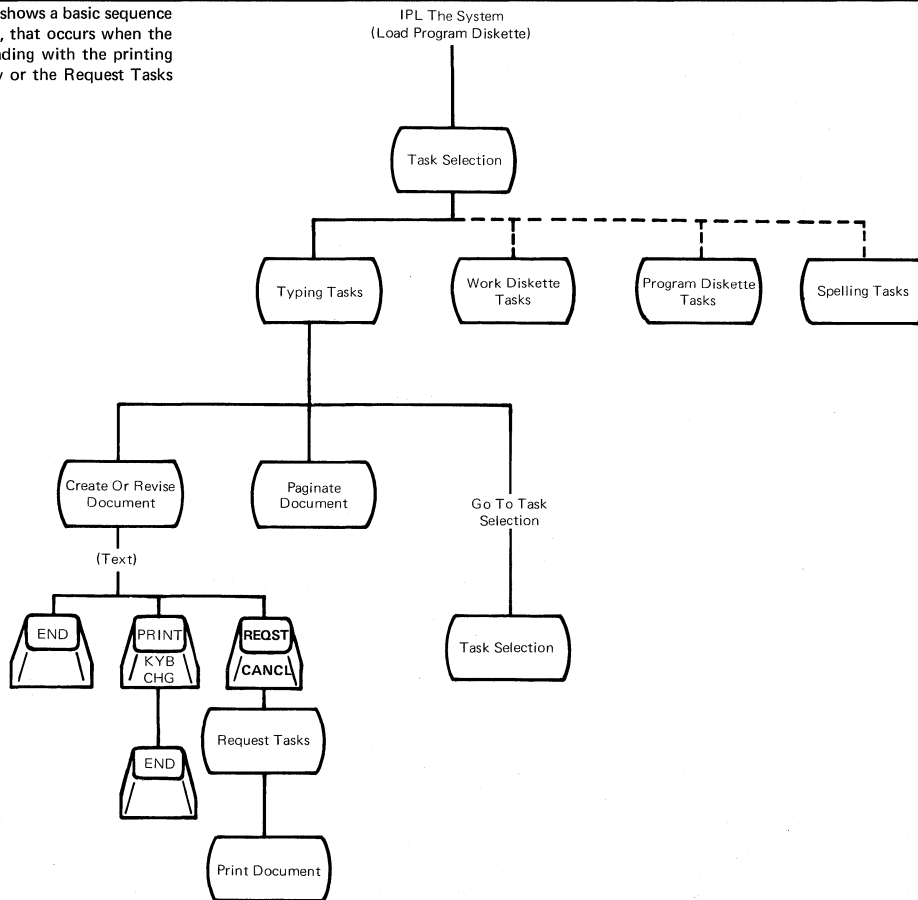
The Work Diskette Tasks Menu Sequence shows the menus available when Work Diskette Tasks is selected from the Task Selection Menu.

IPL The System
(Load Program Diskette)

Task Selection

Typing Tasks

Work Diskette Tasks

Program Diskette Tasks

Spelling Tasks

Delete Document

Duplicate Document

Change Document Name

Duplicate Diskette

Go To Task Selection

Condense Diskette

Change Diskette Name — Single Diskette

Change Diskette Name — Dual Diskette

Erase Or Initialize (Name) Diskette — Single Diskette

Erase Or Initialize (Name) Diskette — Dual Diskette

Recover Documents — Single Diskette

Recover Documents — Dual Diskette
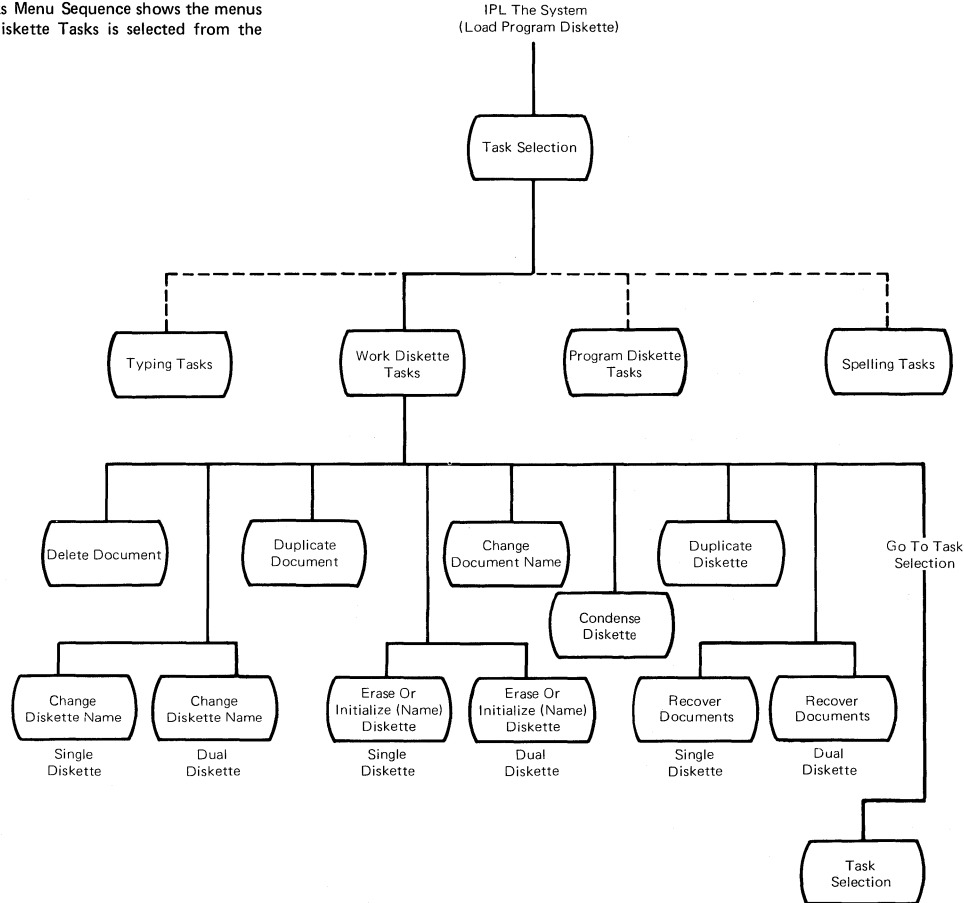
Task Selection

The Program Diskette Tasks Menu Sequence shows the menus available when Program Diskette Tasks is selected from the Task Selection Menu.

IPL The System
(Load Program Diskette)

Task Selection

Typing Tasks

Work Diskette Tasks

Program Diskette Tasks

Spelling Tasks

Change Document Format Defaults

Change Alternate Format Defaults

Printer Description

Work Station Description

Duplicate Program Diskette

Erase Program Diskette

Go To Task Selection

Format Selection

Task Selection

Line Format

Margins And Tabs

Page Format

Header And Footer

The Spelling Tasks Menu Sequence shows the menus available when Spelling Tasks is selected from the Task Selection Menu.

IPL The System
(Load Program Diskette)

Task Selection

Typing Tasks

Work Diskette Tasks

Program Diskette Tasks

Spelling Tasks

Check Document

Load Supplement

Clear Supplement

Store Supplement On Program Diskette

Go To Task Selection

Task Selection
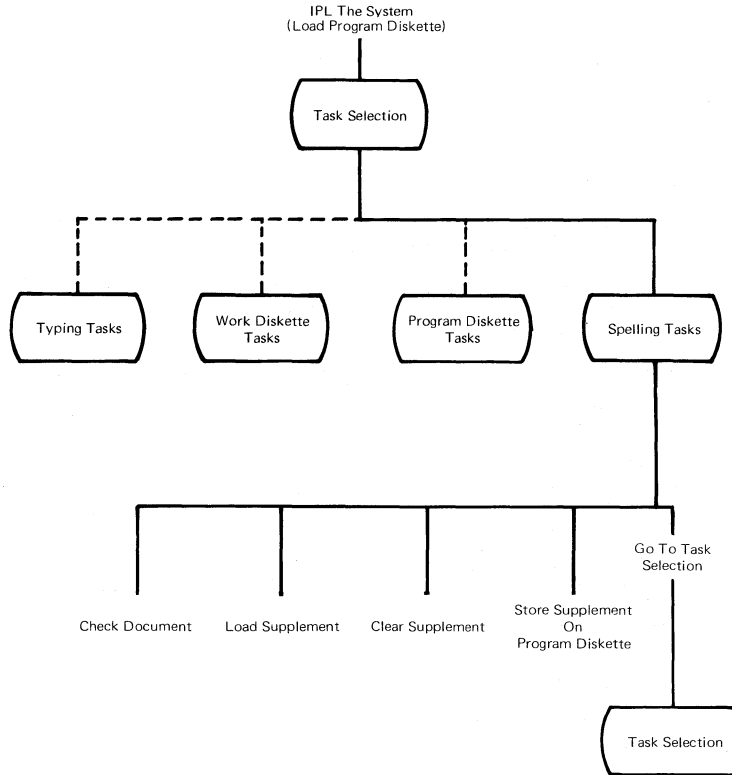
The Change Format Key Menu Sequence shows the menus available when the Change Format (CHG FMT) key is pressed when creating or revising text.

In Create Document Task
Or
Revise Document Task

Cursor

Cursor

Cursor

CHG FMT /INSTR\

CHG FMT /INSTR\

CHG FMT /INSTR\

Format Selection

Format Selection

Format Selection

Line Format

Margins And Tabs

Page Format

Header And Footer

Line Format

Margins And Tabs

Header Text

Footer Text
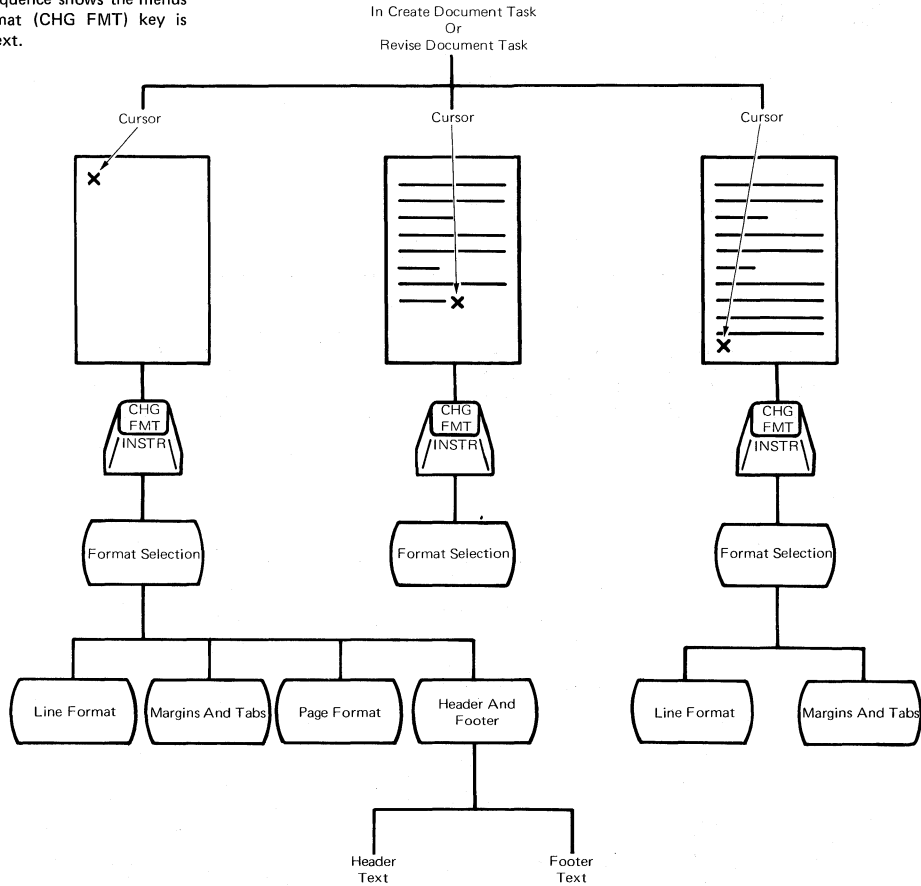
The Request Key Sequence shows the menus available when the Request (REQST) key is pressed. This menu sequence not available in Program Diskette Tasks.

```
                    ┌─────────┐
                    │ REQST   │
                    │/CANCL\  │
                    └─────────┘
                         │
                   ┌───────────┐
                   │Request Tasks│
                   └───────────┘
                         │
   ┌──────────┬──────────┼──────────┬──────────┐
┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐  Print With
│ Print  │ │Display │ │ Change │ │Diskette│  Element Now
│Document│ │ Print  │ │Printing│ │Contents│  On Printer
└────────┘ │Queue Or│ │ Order  │ └────────┘
           │ Cancel │ └────────┘
           │Print Job│
           └────────┘
```
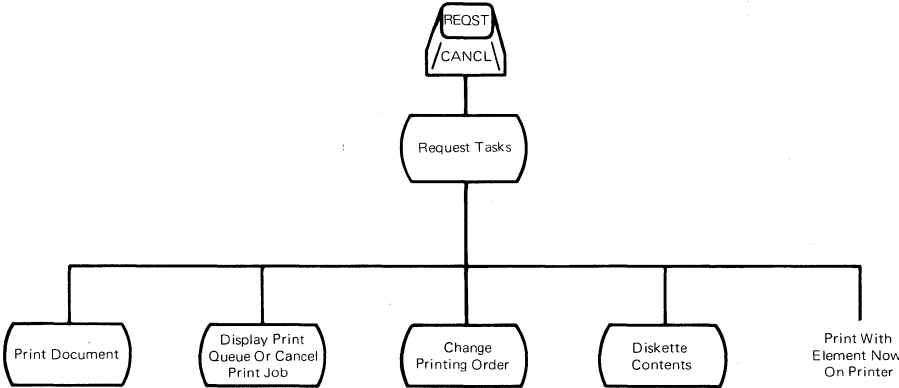
The Instructions Menu Sequence shows the menus available
when the CODE key and the Change Format (CHG FMT)
key are pressed when creating or revising text.

In Create Document Task
Or
Revise Document Task

Cursor:
At Beginning Of
Section Of Text
To Be Kept
Together

Cursor:
At Beginning
Of Page

Code +

CHG
FMT
/INSTR\

CHG
FMT
/INSTR\

Instructions

Format
Selection

Cursor:
At End Of Section
Of Text To Be Kept
Together

Header And
Footer

Header Text

Footer Text

Code +

CHG
FMT
/INSTR\

Code +

CHG
FMT
/INSTR\

Instructions

Instructions

IBM.