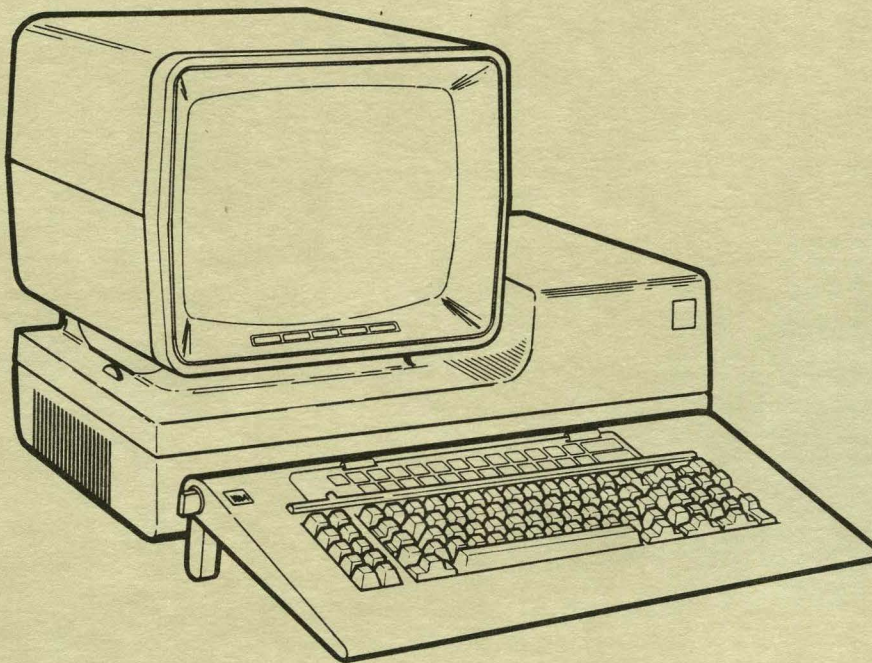


SY31-0641-1

**IBM 5291 Display Station  
Maintenance Information and  
Maintenance Analysis Procedures Manual**





SY31-0641-1

# **IBM 5291 Display Station Maintenance Information and Maintenance Analysis Procedures Manual**

**Glossary  
Legend  
Using Manual**

**MAP  
Charts**

**Keyboard  
Unit**

**Display  
Unit**

**Lower Unit  
Power Supply**

**Switches**

**Diagnostics  
CE Switch  
Free Key**

**Online Tests  
(600)**

**Index**

## Preface

This manual is used by customer engineers for servicing the 5291 Display Station. Customer engineers using this manual are assumed to have completed the 5291 Display Station education course.

This manual has two major sections: maintenance analysis procedures (MAPs) and maintenance information. The *MAPs* section contains map charts to help you isolate a problem to a failing part. The *maintenance information* section contains service information. This section is divided into six subsections: using the maintenance information, keyboard unit, display unit, lower unit, display station operation, and online tests.

Definitions of terms and abbreviations that are not common, but are used in this manual, are in the *Glossary of Terms and Abbreviations*.

There are several *DANGER* and *CAUTION* notices in this manual. You can use the blank lines below each notice to translate it into your own words. The locations of these notices are listed in the *Safety* section.

## Related Publications

Related information can be found in the following manuals:

- *IBM Synchronous Data Link Control General Information*, GA27-3093
- *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337
- *IBM 5250 Information Display System Reference Card*, GX21-9249
- *IBM 5291 Display Station Setup Procedure*, GA21-9408
- *IBM 5291 Display Station I/PAR Code Guide and CE Log*, ZY31-0642

## Second Edition (December 1981)

This is a major revision of, and makes obsolete, SY31-0641-0. Changes are periodically made to the information herein; these changes will be reported in new editions of this publication.

Use this publication only for the purposes stated in the *Preface*.

Publications are not stocked at the address below. Requests for copies of IBM publications and for technical information about the system should be made to your IBM representative or to the branch office serving your locality.

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**DANGER AND CAUTION NOTICES**

Throughout this manual, the word DANGER is used to inform the CE of an action that could cause a personal injury. The word CAUTION is used to inform the CE of an action that could damage the machine or affect the running of a customer program.

**DANGER Notices**

DANGER notices appear in the following maintenance procedures:

- 230 Display Adjustments
- 242 Display Unit Top Cover
- 343 AC Capacitor
- 344 Power Supply Transformer
- 450 Station Protector

The IBM 5291 Display Station has the following specific dangers:

**DANGER**

- Line voltage is present at the power supply and the display assembly.  
  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- High voltage is present at the cathode-ray tube.  
  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- The cathode-ray tube could implode if it is hit or if it falls.  
  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CAUTION Notices**

CAUTION notices appear in the following maintenance procedures:

- 347 Planar
- 450 Station Protector

## CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you **MUST** work alone.
2. Remove all power, ac and dc, when removing or assembling major components, working in immediate areas of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. After turning off wall box power switch, lock it in the Off position or tag it with a "Do Not Operate" tag, Form 229-1266. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, observe the following precautions:
  - a. Another person familiar with power off controls must be in immediate vicinity.
  - b. Do not wear rings, wrist watches, chains, bracelets, or metal cuff links.
  - c. Use only insulated pliers and screwdrivers.
  - d. Keep one hand in pocket.
  - e. When using test instruments, be certain that controls are set correctly and that insulated probes of proper capacity are used.
  - f. Avoid contacting ground potential (metal floor strips, machine frames, etc.). Use suitable rubber mats, purchased locally if necessary.
5. Wear safety glasses when:
  - a. Using a hammer to drive pins, riveting, staking, etc.
  - b. Power or hand drilling, reaming, grinding, etc.
  - c. Using spring hooks, attaching springs.
  - d. Soldering, wire cutting, removing steel bands.
  - e. Cleaning parts with solvents, sprays, cleaners, chemicals, etc.
  - f. Performing any other work that may be hazardous to your eyes. **REMEMBER—THEY ARE YOUR EYES.**
6. Follow special safety instructions when performing specialized tasks, such as handling cathode ray tubes and extremely high voltages. These instructions are outlined in CEMs and the safety portion of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles—this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. After maintenance, restore all safety devices, such as guards, shields, signs, and grounding wires.
12. Each Customer Engineer is responsible to be certain that no action on his part renders products unsafe or exposes customer personnel to hazards.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. Ensure that all machine covers are in place before returning machine to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it; for example, under desk or table.
16. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
17. When using stroboscope, do not touch **ANYTHING**—it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

**Knowing safety rules is not enough.  
An unsafe act will inevitably lead to an accident.  
Use good judgment—eliminate unsafe acts.**

## ARTIFICIAL RESPIRATION

### General Considerations

1. **Start Immediately—Seconds Count**  
Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim, or apply stimulants.
2. **Check Mouth for Obstructions**  
Remove foreign objects. Pull tongue forward.
3. **Loosen Clothing—Keep Victim Warm**  
Take care of these items after victim is breathing by himself or when help is available.
4. **Remain in Position**  
After victim revives, be ready to resume respiration if necessary.
5. **Call a Doctor**  
Have someone summon medical aid.
6. **Don't Give Up**  
Continue without interruption until victim is breathing without help or is certainly dead.

### Rescue Breathing for Adults

1. Place victim on his back immediately.
2. Clear throat of water, food, or foreign matter.
3. Tilt head back to open air passage.
4. Lift jaw up to keep tongue out of air passage.
5. Pinch nostrils to prevent air leakage when you blow.
6. Blow until you see chest rise.
7. Remove your lips and allow lungs to empty.
8. Listen for snoring and gurglings—signs of throat obstruction.
9. Repeat mouth to mouth breathing 10-20 times a minute. Continue rescue breathing until victim breathes for himself.



Thumb and  
finger positions



Final mouth-to-  
mouth position

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## Glossary of Terms and Abbreviations

**address switches:** Switches that permit the setting of a discrete address for each device on a system cable (line). These switches are 1, 2, and 3 on the switch block at the rear of the display station. See reference 420.

**anode:** The high voltage connector on the cathode-ray tube.

**attribute:** A characteristic that controls how data is displayed on the display screen. For example, the attributes of a display field include blinking, high intensity, and reverse image.

**bezel:** The mounting frame for the cathode-ray tube in the display unit.

**blink attribute:** An attribute of a display field that causes the characters to flash.

**blink or blinking:** Flashing.

**brightness control:** A potentiometer on the CRT PC board that controls raster brightness. This control is not accessible to the operator. See reference 230.

**Brightness control (operator):** A potentiometer on the underside of the Display Unit for adjusting the brightness of the data on the display screen. This control is accessible to the operator. See reference 230.

**Cable Thru:** A function that permits multiple display stations or printers to be attached serially to a system cable.

**callout:** A character, number, or name used to identify a particular part of a figure.

**character set:** A group of characters contained in a character generator. See reference 620.

**Cmd key:** The command key on the keyboard that is used to select command functions.

**column separator:** A dot that separates all the characters in a field of data.

**command function keys:** The 14 keys in the top row of the display station keyboard that are used with the Cmd (command) key to request functions.

**controller:** A device that controls the operation of one or more input or output devices.

**CRT:** Cathode-ray tube.

**field attribute:** The control characters that describe a displayed field. For example, a displayed field can be intensified, reversed, underscored, or made to blink.

**FRU:** Field-replaceable unit.

**hex:** Hexadecimal.

**I/O:** Input/output.

**ID:** Identification.

**implode:** To break inward suddenly.

**Ins key:** The key on the keyboard that is used to select insert mode.

**IPL:** Initial program load. The first machine program operation after power on.

**Keylock RPQ:** A lock and key that prevents the use of the display station.

**keystroke:** The action of pressing a key on the keyboard.

**KU:** Keyboard unit.

**LC:** Line check.

**line check:** A check for errors that occur during the transmission of data from the system controller to the display station.

**LU:** Logic unit (planar).

**mandatory:** Something that must be done or must be present.

**menu:** A list of options that can be selected.



**metric:** A decimal system of measurement based on the meter as a standard of measurement.

**mm:** Millimeter. One thousandth of a meter.

**N/C:** Pertains to a switch setting; normally open.

**N/O:** Pertains to a switch setting; normally open.

**network:** All of the work stations and associated cabling attached to a controller.

**online tests:** A series of tests that can be requested from the system after power on and before sign on. See reference 600.

**option:** One of the items listed on a display screen menu.

**overview:** A short description which is general in scope.

**PC:** Printed circuit.

**planar:** The basic printed circuit electronic board used in the display station.

**poll:** A method the controller uses to determine if a display station is ready to send or receive data.

**POR:** Power on reset.

**port:** The place where a cable is connected to a controller.

**protector:** A device that aids in preventing injuries to persons or damage to machines.

**raster:** The image on the cathode-ray tube (CRT) that is made by the action of the CRT electron beam as it scans across the area where data is displayed. Normally, the intensity of the raster is not high enough to be visible. However, the raster can be displayed by adjusting the brightness control on the CRT circuit board. See reference 230.

**replace:** To exchange something; for example, replace a failed part with a new one.

**required:** See *mandatory*.

**retrace lines:** The lines that appear on the display screen when the display adapter returns the trace to the upper left corner of the display screen. Retrace lines are normally not displayed. See reference 230.

**ripple:** Small waves present on DC voltages.

**rolling:** Pertains to movement on a display screen; the movement can be horizontal, vertical, or a combination of both.

**SA:** System available.

**shorting:** Making an electrical short circuit.

**sign on:** A log-on procedure performed at a display station; the procedure can include entering the sign-on command, a password, or other user-specified security information.

**slot:** A narrow opening or groove.

**socket:** The connectors on the display station to which cables are connected.

**Sys Req key:** The key that is used to send a request directly to the system. See reference 600.

**TB:** Terminal block.

**terminator switch:** The switch used to terminate the customer system cable at the last display station or printer in a series. See reference 423.

**twinaxial cable:** A shielded, twisted-pair cable that connects a display station or printer to a controller

**typamatic key:** A repeat action key on the keyboard.

**U.S.:** United States.

**undefined:** The meaning is not known or described.

**underscore:** A line under all positions of a field. Underscore is controlled by an attribute.

**undisplayable character:** A valid hexadecimal character code, but the character cannot be displayed on the CRT. See reference 620, step A2.

**Vac:** Volts alternating current.

**Vdc:** Volts direct current.

**verification:** Testing an operation or machine.

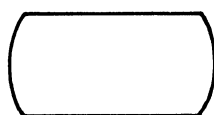
**video:** Pertains to the data displayed on the screen.

**yoke assembly:** The assembly on the back of the CRT, that contains the horizontal and vertical deflection coils and the centering rings. See reference 230.

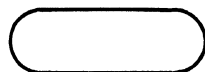
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## Legend

The following symbols are used in flowcharts and figures throughout this manual.



Display Screen



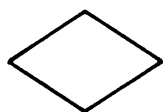
Start and End  
of Flowchart



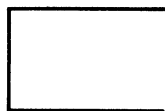
Off-Page  
Connector



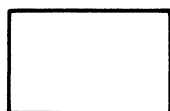
On-Page  
Connector



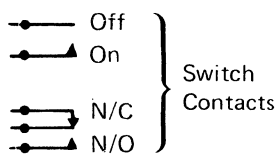
Decision  
Block



Comment  
Block



Information  
Block



Switch  
Contacts



Resistor



Ground



Transformer



This manual has been designed to aid you in isolating a problem to a field replaceable unit (FRU) and then to remove and replace that unit.

The *MAPs* section aids you in isolating the problem to a failing FRU and the *Maintenance Information* section contains adjustment procedures, removal and replacement procedures, and diagnostic and online test information.

You should first use the *MAPs* section to identify the failing FRU and then go to the referenced maintenance information for the suitable repair action.

No scheduled preventive maintenance or special tools and test equipment are required to service this display station.

The format for page numbering is X-YYY. X is the section number and YYY is the page number within that section. For example, 1-22 is page 22 in Section 1.

Three digit reference numbers are used in the *MAPs* and text to index the maintenance information. In the *MAPs* and text, these numbers are in parentheses. For example, 110 refers to *Description and Parts Location* under *100 Keyboard Unit*.

### MAPs SECTION

The *MAPs* section contains MAP charts that help you isolate a problem to a failing FRU. Three-digit reference numbers refer you to the suitable maintenance information to adjust or replace it.

### MAINTENANCE INFORMATION SECTION

The *Maintenance Information* section is indexed by three-digit numbers for referencing. The major divisions that are indexed are the keyboard unit (100), display unit (200), lower unit (300), power-on diagnostics (520), and online tests (600).

### INDEX

The index is a detailed keyword reference to all the material contained in this manual.

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## MAPs Section

### USING THE MAPs

The MAP charts are designed to identify a field replaceable unit (FRU) or an adjustment for a symptom. The symptoms are arranged in the charts according to five combinations of conditions identified in the vertical columns. They are:

1. Power-on diagnostics complete to alarm, screen not blank, and conditions *not* normal with power on.
2. Power-on diagnostics complete to alarm, screen not blank, and conditions normal with power on.
3. Power-on diagnostics complete to alarm, but the screen is blank.
4. Power-on diagnostics did *not* complete, and the screen is not blank.
5. Power-on diagnostics did *not* complete, and the screen is blank.

Locate the correct combination of conditions in the vertical columns. Find the correct symptom in the Symptom column. The Checks or Comments column contains important information about the symptom or repair action.

The Repair Action column identifies the FRU or adjustment procedure. The numbers in parentheses are references to the *Maintenance Information* section that describes the replacement or adjustment.

### NORMAL CONDITIONS AFTER POWER ON

The following figure shows the normal conditions of the display station after power on and with the controller communicating. For further information concerning the status line, see reference 520 *Power-On Diagnostics*.

**Note:** When a key is pressed, the character should be displayed. The location of the cursor is determined by the controller.

#### Status Indicators (■ = on; - = off)

**System Available.** When on, it indicates that the system controller is communicating with the display station.

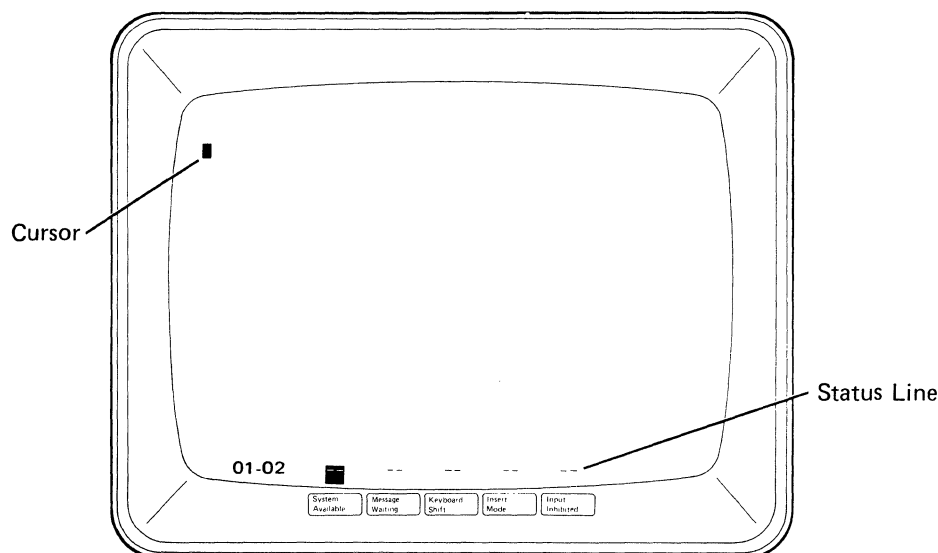
**Message Waiting.** When on, it indicates that a message is waiting for the display station operator.

**Keyboard Shift.** When on, it indicates that the uppercase (level) characters are active.

**Insert Mode.** When on, it indicates that an insert operation is in effect.

**Input Inhibited.** When on, it indicates that the system cannot process a keyboard scan code.

A four-digit cursor location code is also displayed on the status line. This code gives the row and column location of the cursor. When the cursor is in the upper leftmost corner, the code displayed is 01-02. The code is always displayed, except when an error occurs and an error status line is displayed (520).



**Note:** Some display stations may display a sign-on menu.



# START

## Normal Conditions After Power On (2-1):

1. System Available on.
2. Cursor location equal to 01-02.
3. Normal status line (no error codes).
4. Normal size screen and stable.
5. All characters and/or indicators correctly displayed. Raster not visible.

If a sign-on menu is displayed, select the on-line test (600) to operate in free key mode.

### Notes:

1. The alarm sounds when power on diagnostics are complete.
2. Clockwise (forward) rotation of the control knob increases the volume.

## MAP Chart 1

			Symptom	Checks or Comments	Repair Action	Symptom	Checks or Comments	Repair Action
P O W E R O N D I A G N O S T I C S C O M P L E T E T O A L A R M	S C R E E N I N F O R M A T I O N W I T H P O W E R O N	C O N D I T I O N S N O T N O R M A L	Rolling screen— Horizontal or vertical	Horiz. roll will appear as 2 unstable horiz. bands where cursor and status line should be.	Display unit or planar or I/O assembly (240, 347, 348)	Wrong display size (all sides)	+15 Vdc is too low or too high	Power supply board (345)
			Bright oversize raster and vertical band left center	Retrace line out of focus and Brightness control inoperative.	Display unit (240)	Unstable information	Ripple on the +15 Vdc	Power supply board (345)
			Everything except status line displays as a line of horizontal dashes	Displays only in the center Status line displayed above normal position	Display unit (240)	Vertical jitter	All other conditions normal after power on (2-1)	Power supply transformer (344)
			Status line normal. Cursor and characters displayed as multiple horizontal dashes in row 1	Display normal on all other lines	Display unit (240)	Continuous diagnostic loop	Loops on ERROR status line and alarm sounds with CE switch set off (422)	Planar/I/O assembly (347, 348)
			Raster displayed	Cursor and status line normal (2-1). Display station operates normally	Display unit (240)	Keyboard ID field equals KU or LU (520)	If LU is displayed with the keyboard disconnected, replace the planar (347). Check keyboard cable.	Keyboard/Planar (140, 347)
			Fuzzy (out of focus), narrow, off center, or tilted		Adjustment/Display unit (230, 240)	Stuck key field equals 1 (520)		Keyboard/Planar (140, 347)
			Only a horizontal line is displayed	Line may be solid or broken	Display unit (240)	Line check counter is counting (520)	System Available on or flashing and cursor on right	Power supply board (345)
			Only a vertical line is displayed	Line may be solid or broken Line may not be straight	Display unit (240)	No System Available or system available flashing. (Cursor on the right)	Check the -5 Vdc (311)	Fuse 3 or power supply board (311) (345)
			Wrong display size vertically	Characters display correctly	Adjustment/Display unit (230, 240)		Check the system network Check the system configuration (2 stations may be at the same address) Check the system cable	Planar (347) I/O assembly (348) Power supply board (345)
			No cursor	Characters display from keyboard OK	Planar (347)	Missing dots on displayed characters		Planar (347)
			Status line displayed as horizontal lines	Cursor position displayed as horiz. line at bottom of screen	Display unit (240)	Continuous or intermittent resetting screen. Cursor may be at right, left, or bottom.	Attempt to sign on. Work station will begin to loop.	Planar (347) Power supply board (345)
			Cursor on the right	System Available on	Planar (347)			
			Normal Status line not displayed correctly (2-1)	Extraneous data or missing dots on the screen or wrong characters displayed	Planar (347) Display (240) I/O assembly (348)			

CONDITIONS NORMAL WITH POWER ON	Displayed address does not match the switches	Power off Press and hold a key Power on	Set address (420), Planar/I/O assembly (347, 348)
	Missing attribute (620)	Attribute fails and no status line errors (520)	Planar (347)
	Line check counter is greater than 5	Call system operator to check the network	Failing network/Terminator switch (423)
	All keys fail to display from keyboard	Keylock (RPQ) is unlocked	Planar/Keylock (347, 346)
	Fails to blank data	Keylock (RPQ) is locked	Planar/Keylock (347, 346)
	Keyboard problems	Row, column, or single key or column failures, missing dots, etc.	Planar/Keyboard (347, 140)
	Display mode function failure	Fails to reverse image	Planar (347)
	Wrong characters displayed for keys pressed	Some keys fail. No status line errors (520)	Planar (347)
	Missing dots on characters		Planar (347)
	IPL sign-on displayed in place of USER ID sign-on.	Nondisplay attribute failed (620,A1)	Planar (347)
	Cursor select or row and column failure	Keyboard is OK	Planar (347)
	Blank Screen	Check the +15 Vdc at the planar test point (312).	If missing replace power supply board (345)
			Display (240) Planar (347) I/O assembly (348)

## MAP Chart 2

### CHECK THE ALARM

If the alarm does not sound, do the following:

- Power off.
- Remove the lower unit cover (341).
- Disconnect the alarm wires from the planar connector (312).
- Use a CE meter on the +6 Vdc scale.
- Measure across the connector pins 1(+) and 3(-).
- Power on.

The meter should deflect right-left-right. If deflection is correct, go to MIM 354, otherwise use MAP Chart 2.

	Symptom	Checks or Comments	Repair Action
POWER ON SCREEN DIAGNOSTICS BLANK	Keyboard ID field equals LU (520)	Check the address switch settings (421)	Planar/I/O assembly (347, 348)
	Wide band of horizontal lines in center of screen	Lines may or may not be rolling	Power supply board (345) Planar (347)
	Unstable horizontal lines	Not full screen	Power supply board (345) Planar (347)
	Failing +5 Vdc (311) Full raster vertically with bright horizontal bands on top and bottom; not stable	1. Fuse 2 is OK  2. If fuse 2 is blown, disconnect the keyboard (142) and replace fuse 2.	Power supply board (345) Planar (347)  If fuse 2 does not blow again, check the cable/replace the keyboard (140). If fuse 2 blows again, replace the power supply board/planar (345, 347)
	All of the above OK		Planar (347)
	Check the following in sequence.		
	1. Fuse 1 is blown (310, 331)		Fuse 1
	2. No AC voltage at TB1 (310, 331) Measure across TB1-1 and 2	Check for an open in line cord	Line cord/primary power assembly (349)
	3. 24 Vac is zero (311) Measure J1-5 to J1-6	Open transformer	Power supply transformer (344)
BLANK DIAGNOSTICS COMPLETE SCREEN	4. DC voltage failure (332)	+5 Vdc is less than 1.0 Vdc +15 Vdc is less than 6.0 Vdc	Planar/power supply board (347, 345)
	5. 24 Vac is low (311) Measure J1-5 to J1-6	Open capacitor	AC capacitor (343)
	6. Power-on reset failure (312)	Planar POR test point does not read +5 Vdc (4.6—5.5)	Planar/power supply board (347, 345)
	7. All of the above OK		Planar (347)

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## Maintenance Information

### USING THE MAINTENANCE INFORMATION

The *Maintenance Information* section is arranged into six subsections. Each of the subsections and the major divisions within them are identified by three-digit reference numbers.

The first three subsections are relative to the major hardware units of the display station. These are the keyboard unit (100), display unit (200), and the lower unit (300).

Within each of these subsections, the information is arranged to aid you to locate a specific part or area. Then adjustments, if necessary, are supplied. Lastly, instructions are supplied for removing and replacing the field replaceable units.

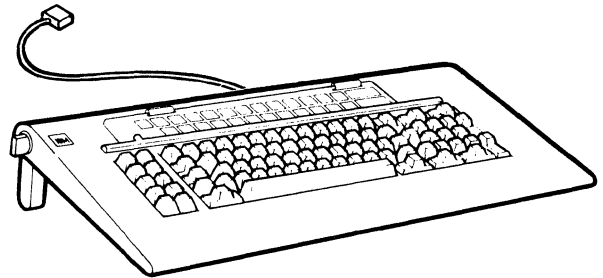
The remaining subsections contain information on the display station diagnostics (520) and online tests operation (600).

### 100 KEYBOARD UNIT

#### 110 Description and Parts Location

The keyboard unit includes the covers, the keyboard (logic card and key assembly) and the cable. No repair action will be performed on the logic card and key assembly. If it fails for any reason, replace it.

The keyboard cable connects to the planar (in the lower unit) of the display station and to the logic card in the keyboard unit.



## 140 Keyboard and Keyboard Cable Removal and Replacement Procedure

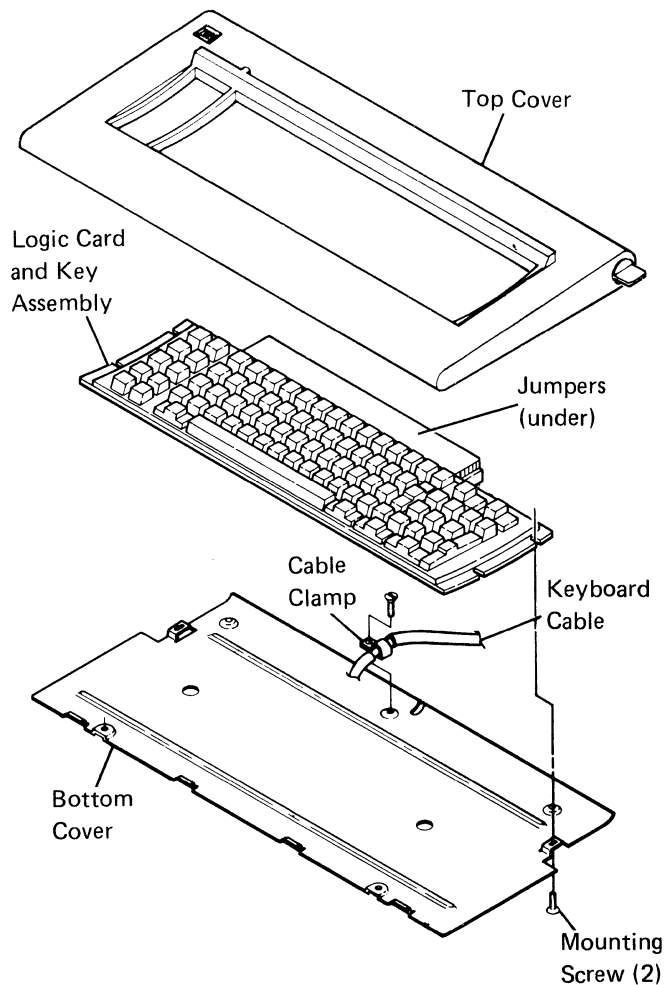
### 141 Keyboard (Logic Card and Key Assembly)

1. Power off and remove the line cord from the AC outlet.
2. Invert the keyboard unit.
3. Remove the two mounting screws on the bottom cover.
4. Lift off the bottom cover.

5. Disconnect the cable connector from the keyboard logic card.
6. Ensure that the new keyboard is jumpered the same as the old keyboard (143).
7. Lift the logic card and key assembly from the top cover.

Replace the new keyboard in the reverse order of removal.

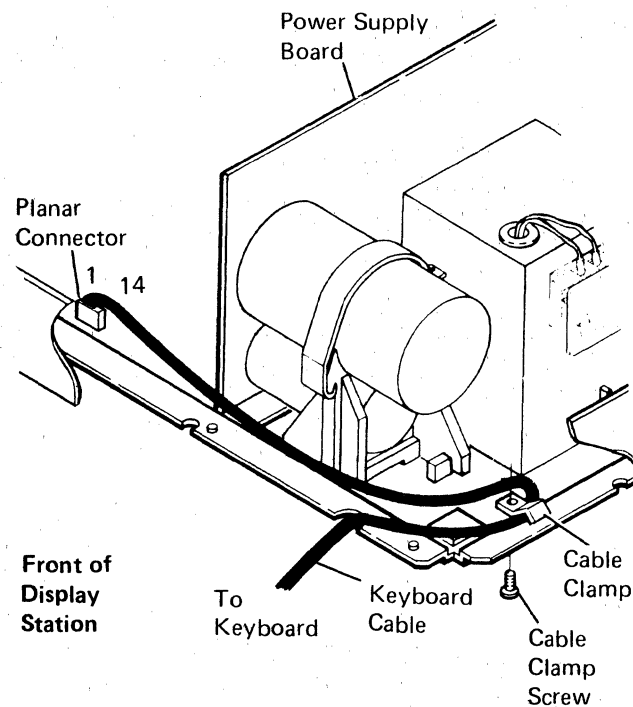
Ensure that the new keyboard ID, displayed on the status line, is the same as the ID for the old keyboard. (See *Keyboard ID Field* under 520 *Power-On Diagnostics*.)



**142 Keyboard Cable**

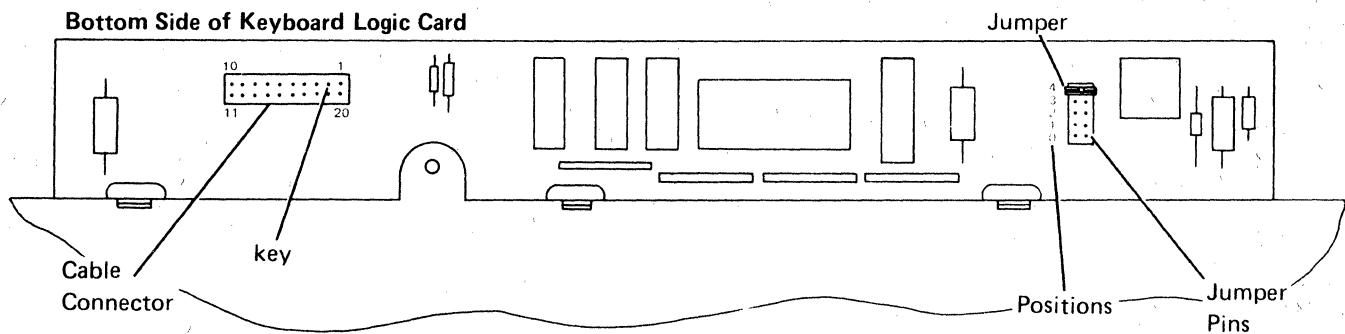
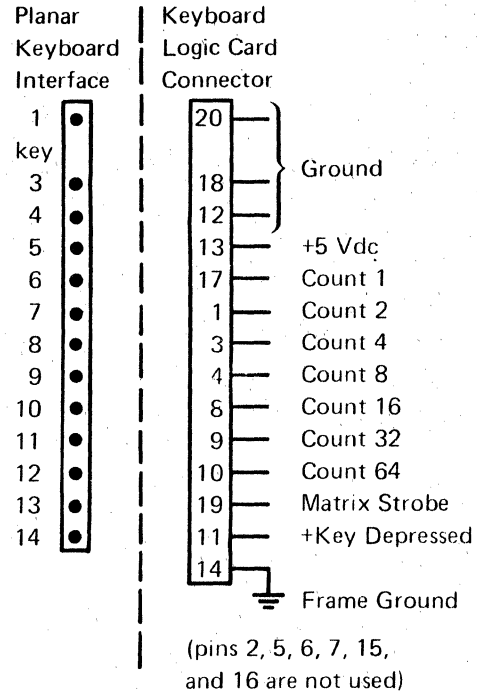
1. Power off and remove the line cord from the AC outlet.
2. Remove the keyboard unit bottom cover as follows (141):
  - a. Invert the keyboard unit.
  - b. Remove the two mounting screws on the bottom cover.
  - c. Lift off the bottom cover.
3. Remove the cable clamp from the bottom cover and then the cable.
4. Disconnect the cable from the logic card.
5. Remove the lower unit top cover (341).
6. Remove the keyboard cable connector from the planar connector.
7. Remove the keyboard cable clamp by removing the mounting screw from the bottom side of the lower unit and removing the clamp from the cable.
8. Pull the keyboard cable free from the lower unit.

Replace the keyboard cable in the reverse order of removal.



## 143 Keyboard Jumpers

ID Code	Language Group	Jumper Position
00	United States and Canada	No jumpers required
01	ASCII International	4
02	United Kingdom	3
03	Japan (English)	3 and 4
04	Spanish Speaking	2
05	Spain	2 and 4
06	Brazil	2 and 3
07	Portugal	2, 3, and 4
08	Austria and Germany	1
09	Finland and Sweden	1 and 4
10	Norway and Denmark	1 and 3
11	Italy	1, 3, and 4
12	France	1 and 2
13	Canada (French)	1, 2, and 4
14	Belgium	1, 2, and 3
15	Japan (Katakana)	1, 2, 3, and 4
16	Do not use	0-Invalid
through 31		



## 200 DISPLAY UNIT

The display unit shown below is to be replaced as an assembly. For adjustment procedures, go to reference 230.

## 230 Display Adjustments

THE DISPLAY ADJUSTMENTS ARE SEQUENCE SENSITIVE

READ CAREFULLY. Always do the procedures one step at a time. The procedures must be carried out exactly and in the order given.

### **DANGER**

High voltages are present inside the display unit. The CRT will implode if cracked or broken. Be especially careful not to bump the CRT socket.

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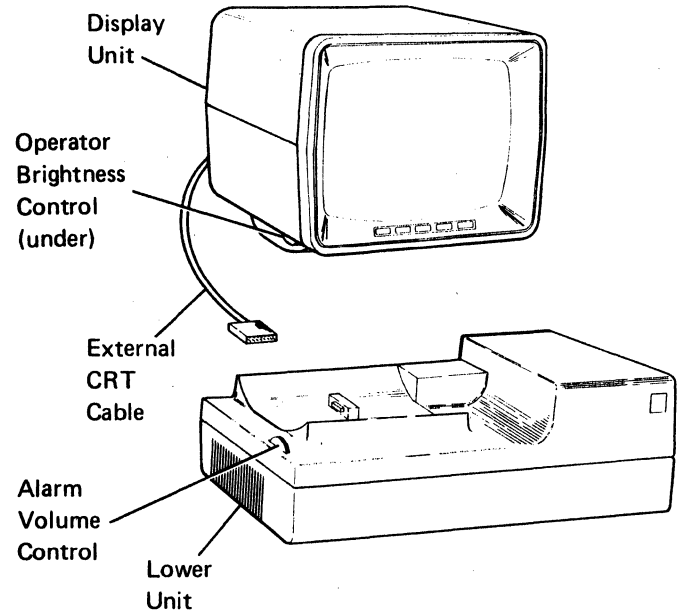
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### Procedure Setup:

1. Remove the top cover of the display unit (see 242).
2. Perform the Online Test (600) and select the Display Attributes screen (620) which supplies a border of Hs that outline the video area. Return to this procedure after you obtain the Display Attributes screen.
3. Read the following information carefully:
  - a. The location of the adjustments may vary from manufacturer to manufacturer. Refer to the adjustment label on the back of the CRT for locating the adjustments in your display station.
  - b. Use a fiber screwdriver (part 460811) to adjust the controls on the CRT PC board.
  - c. If any of the adjustments cannot be made, replace the display unit.





*Initial Brightness and Centering Adjustments***DANGER**

High voltage exists around the CRT anode and flyback transformer. Be careful when making adjustments.

Always wear safety glasses when adjusting the yoke or centering rings.

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1. Adjust the operator Brightness control to the lowest brightness level (dark screen).
2. Adjust the brightness control on the CRT PC board until a raster<sup>1</sup> appears.
3. If the raster is not squarely aligned, perform steps a through d. If the raster is squarely aligned on the screen, proceed to step 4.
  - a. Loosen the clamp on the yoke assembly.
  - b. Turn the yoke assembly to align the raster squarely on the screen.
  - c. Ensure that the yoke assembly is pressed tightly against the back of the CRT.
  - d. Tighten the clamp on the yoke assembly.
4. Adjust the centering rings on the yoke assembly so that the raster is centered on the screen vertically and horizontally.

<sup>1</sup>The raster is a condition of the display screen. It is visible when the Brightness control on the CRT PC board is adjusted so as to light the display screen background. A reverse image display could look similar to a raster. However, in reverse image, the status line is not in the lighted field. When a raster is displayed, the lighted area of the display includes the status line.

<sup>2</sup>It may be necessary to readjust the centering rings (step 4) while you make this adjustment.

5. If the Display Attributes screen is not visible on the raster, adjust the operator Brightness control until it appears.
6. Adjust the horizontal phase control on the CRT PC board<sup>2</sup> to center the Display Attributes screen horizontally on the raster.
7. Adjust the Brightness control on the CRT PC board until the raster disappears.
8. Adjust the operator Brightness control to display the Display Attributes screen at an easy viewing level.

*Vertical Size Adjustment*

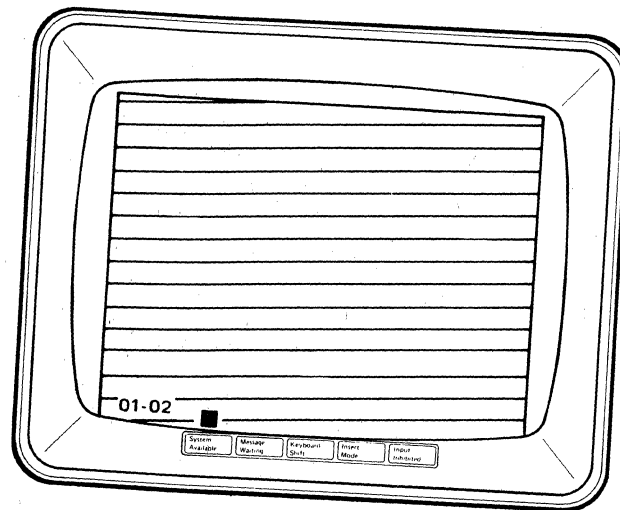
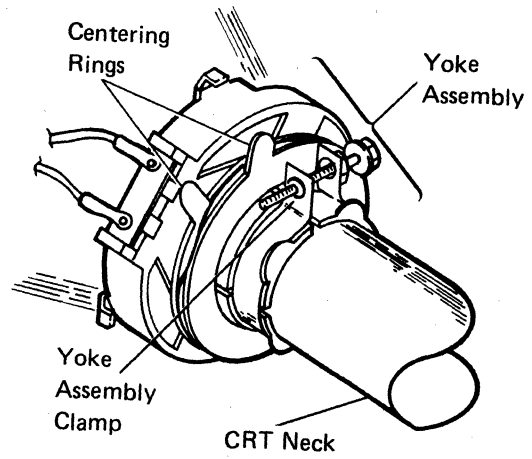
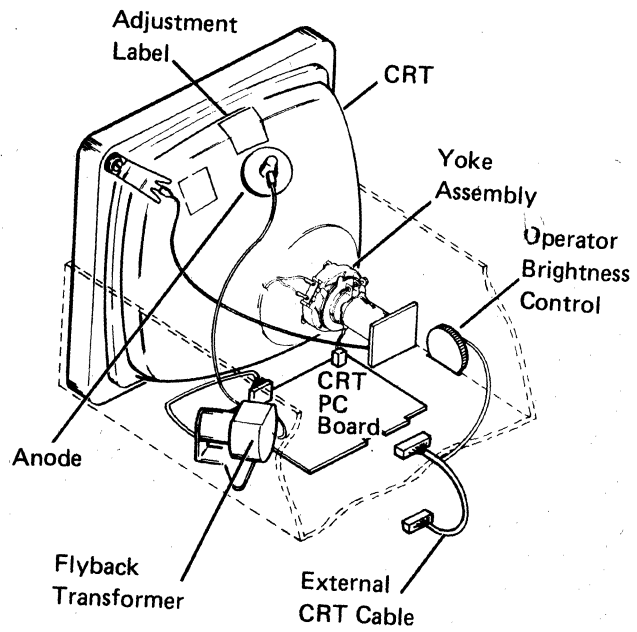
1. Use the outside border of Hs in making the following size adjustment.
2. Adjust the vertical size control on the CRT PC board to expand the screen vertically to  $152.4 \pm 6$  millimeters ( $6.0 \pm 0.24$  inches)<sup>2</sup>.

*Focus*

1. Ensure that the brightness of the Display Attributes screen is at an easy viewing level.
2. Adjust the focus control on the CRT PC board for the best overall definition of characters in the center and around the edges of the display.

*Verification*

Check that the display is correctly centered, and that the brightness is adjusted for easy viewing with no raster displayed. Check the characters for distinct focus. If these conditions cannot be met, replace the display unit.



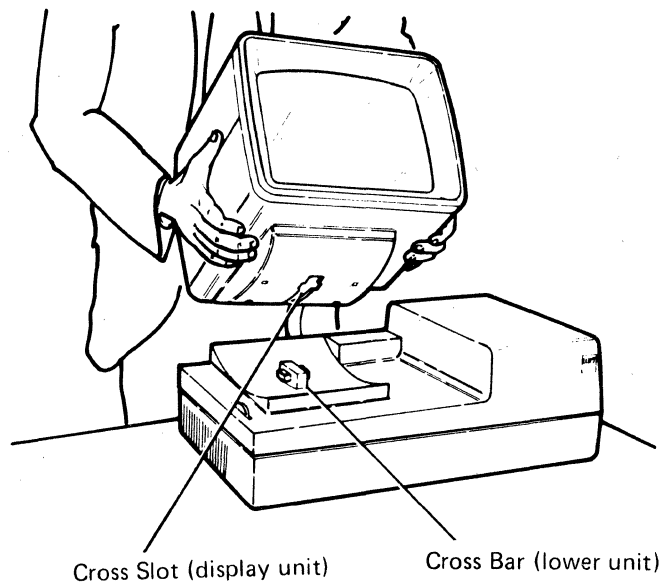
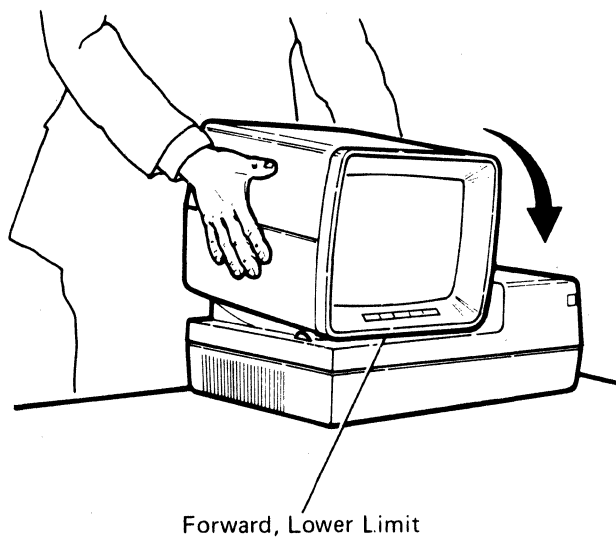
## 240 Display Unit Removal and Replacement Procedures

### 241 Display Unit

1. Power off and remove the line cord from the AC outlet.
2. Remove the external CRT cable from the lower unit.
3. Remove the display unit by positioning the unit in its forward, lower limit and lifting upward.

**Note:** To remove the display unit, the cross bar in the guide post on the lower unit must be aligned with the cross slot in the display unit.

Replace the display unit in the reverse order of its removal.

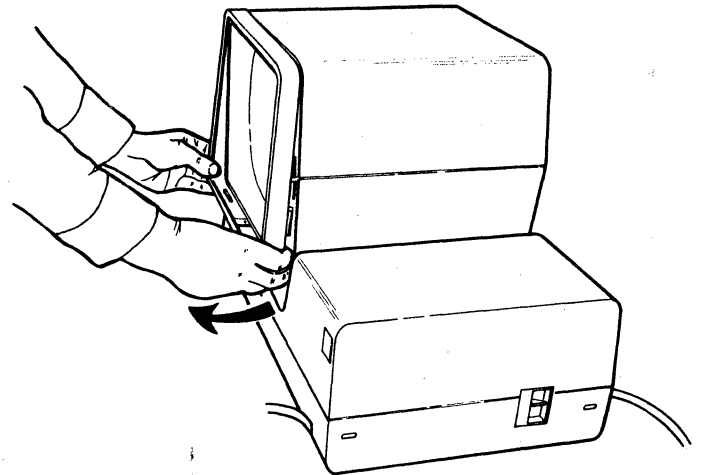
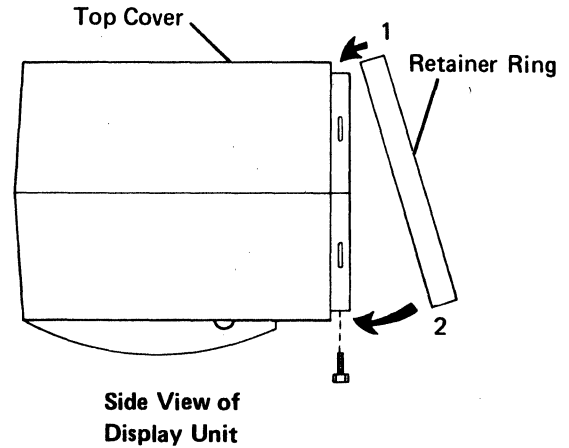


**242 Display Unit Top Cover<sup>1</sup>**

1. Power off and remove the line cord from the AC outlet.
2. Remove the hex-head screw that secures the retainer ring to the display unit. (The screw is located at the bottom center of the retainer ring.)
3. Remove the retainer ring by pulling the bottom half toward you.

**DANGER**

The removal of the top cover leaves the high voltage anode of the CRT and the high-voltage circuits around the flyback transformer unprotected. It also leaves the CRT unprotected. The CRT may easily be cracked or broken, especially around the CRT socket. The CRT will implode if broken or cracked.



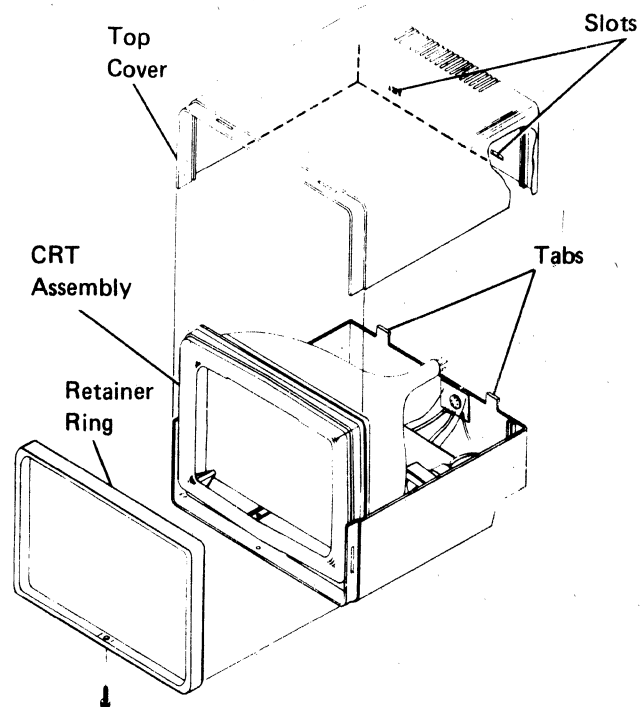
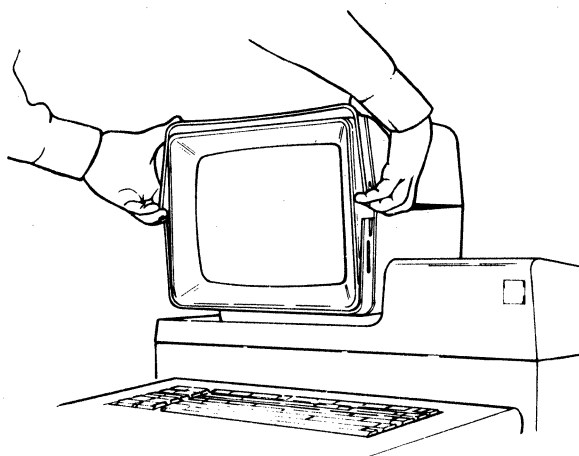
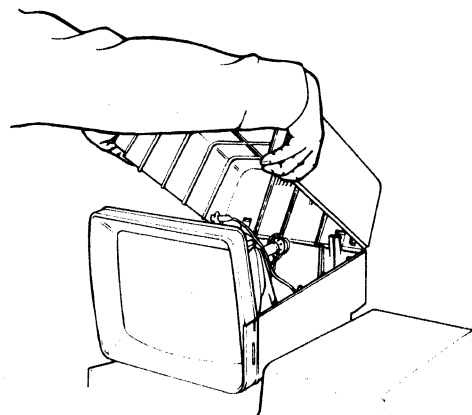
<sup>1</sup>Leave the display unit connected to the lower unit when removing the top cover of the display unit only.

## 242 (continued)

4. Remove the display unit top cover as follows:
  - a. Insert your fingers in the crack between the top and bottom covers.
  - b. Pull the top cover sides out and lift up to free the cover from the CRT frame.
  - c. Lift the top cover up and move it toward the rear of the display unit to free the cover from the tabs in the rear of the display unit.

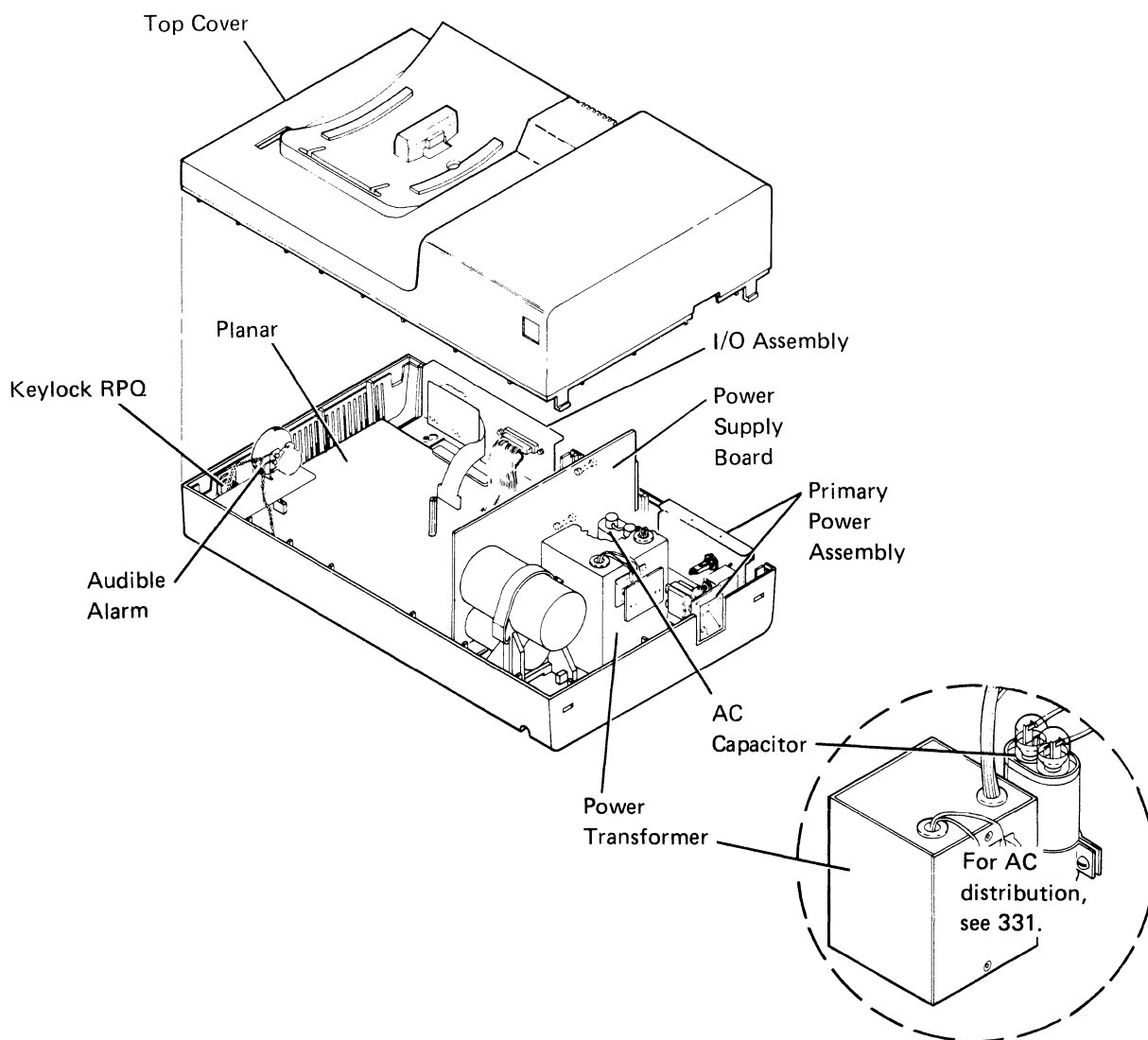
Replace the top cover in the reverse order of removal.

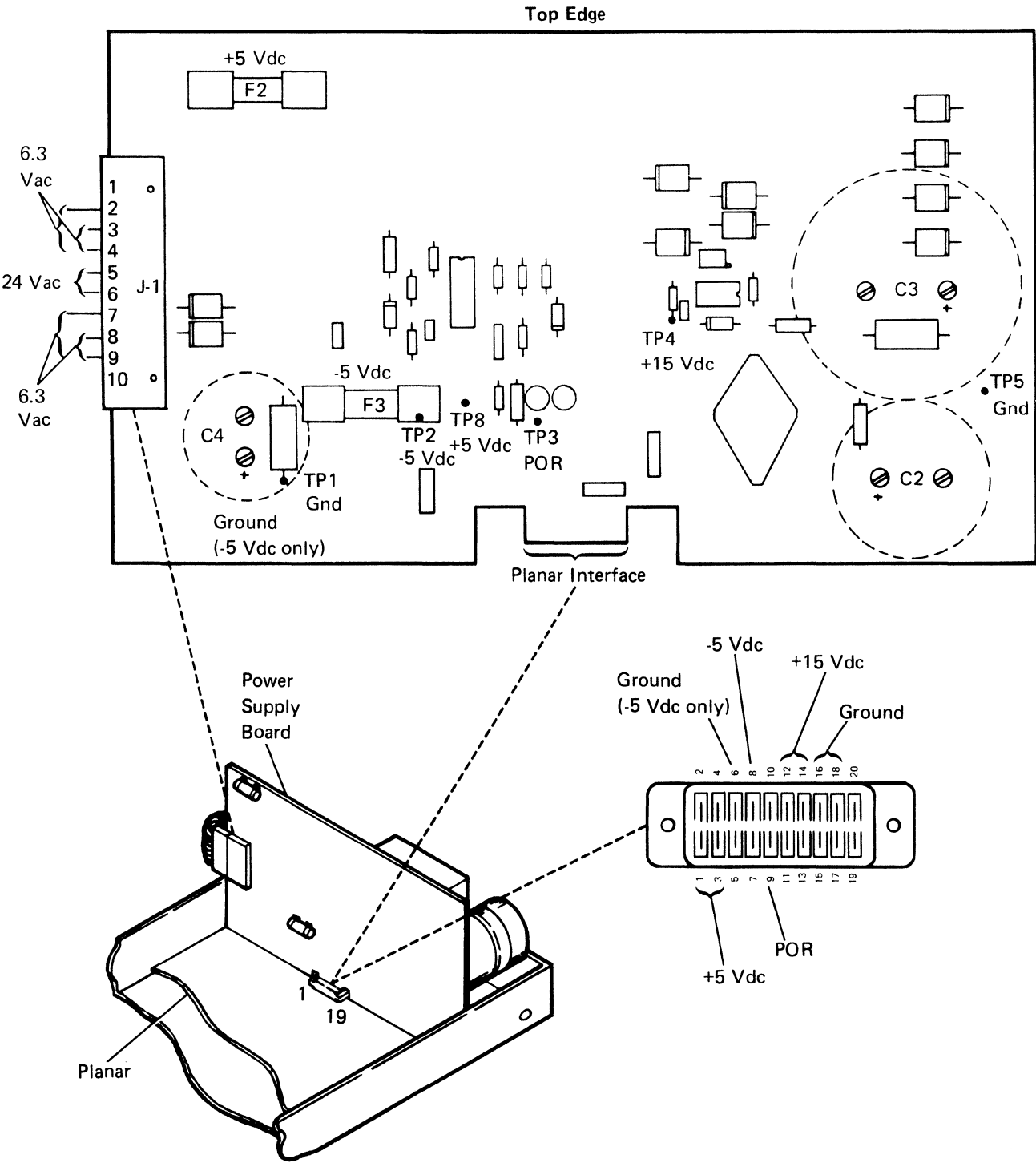
When replacing the retainer ring, set the top half in place first and then press the bottom half in place.

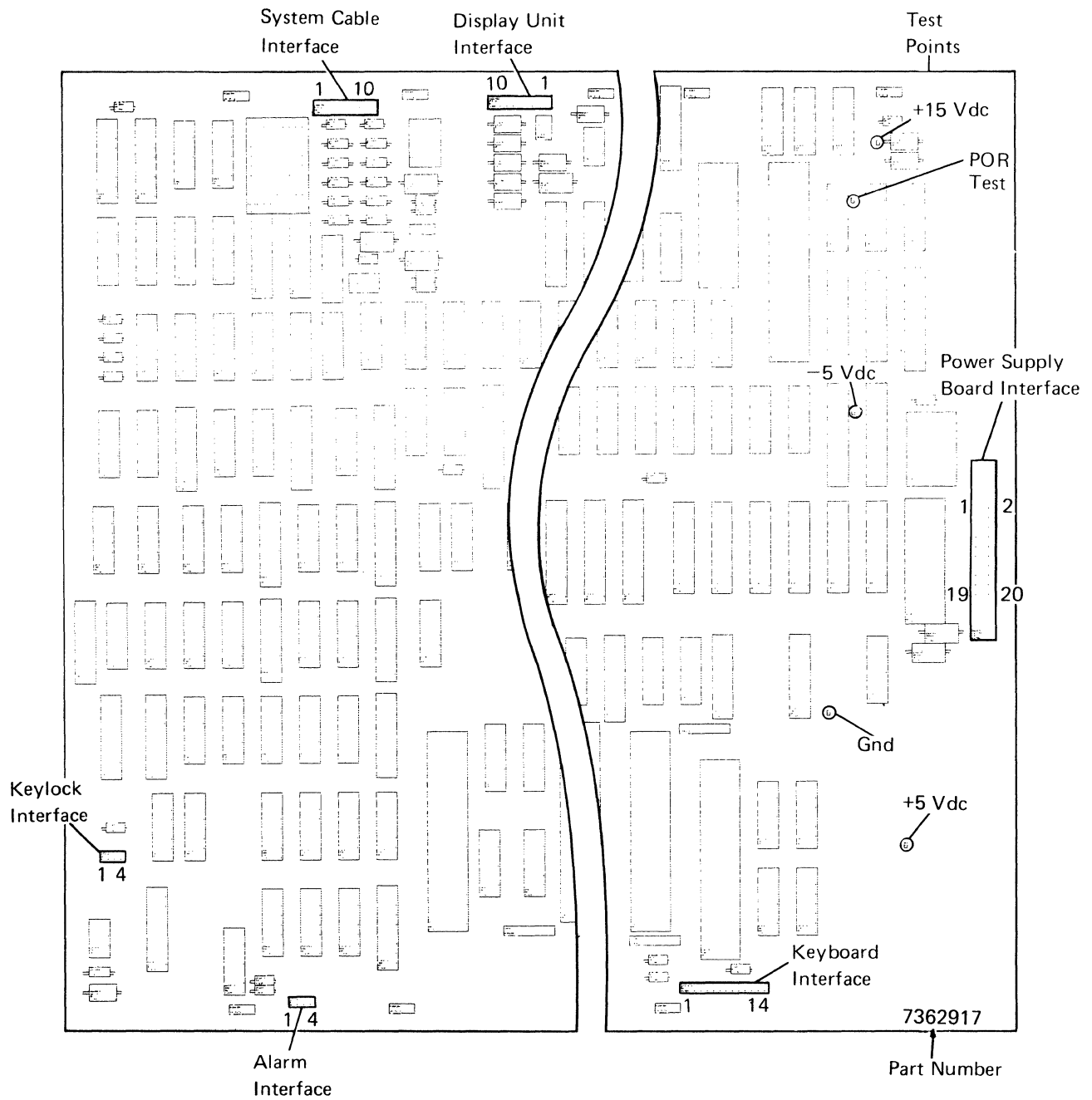


### 310 Description and Parts Location

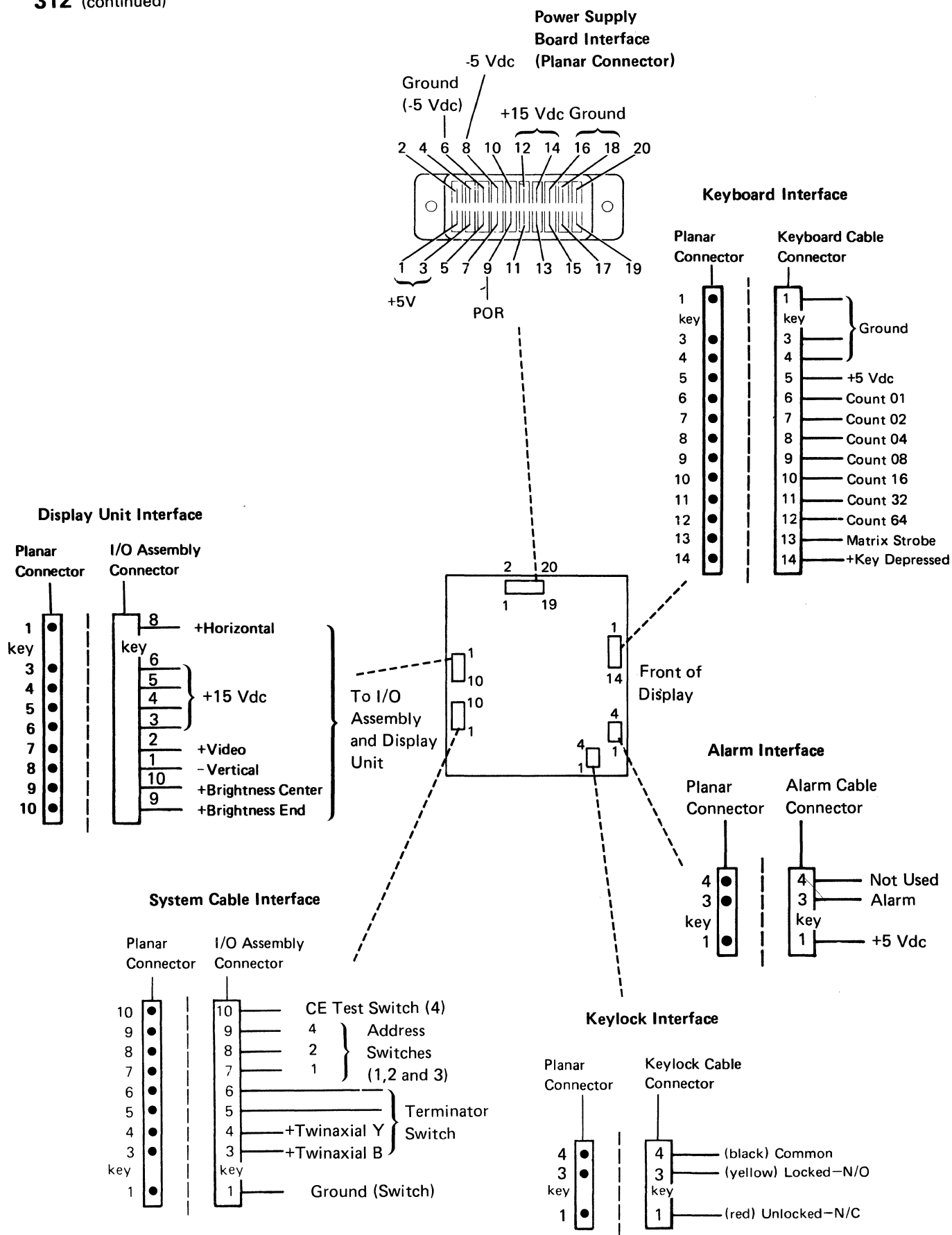
The lower unit shown below contains the power supply and the logic for the display station. The lower unit of your display station may look slightly different. The one shown below includes the Keylock RPQ.





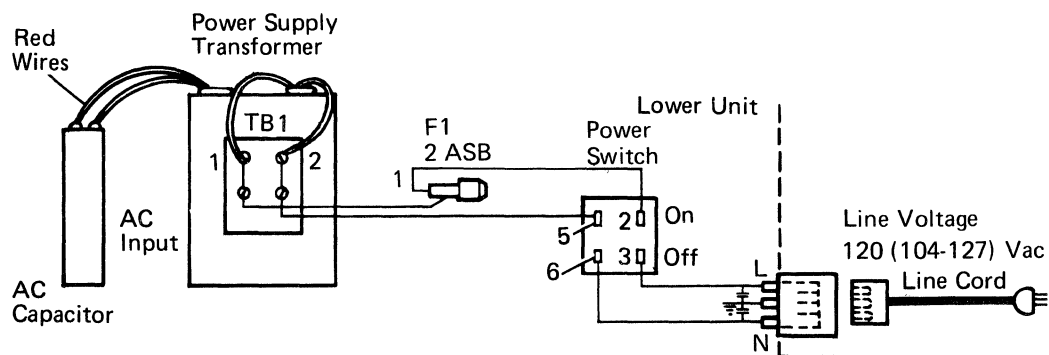
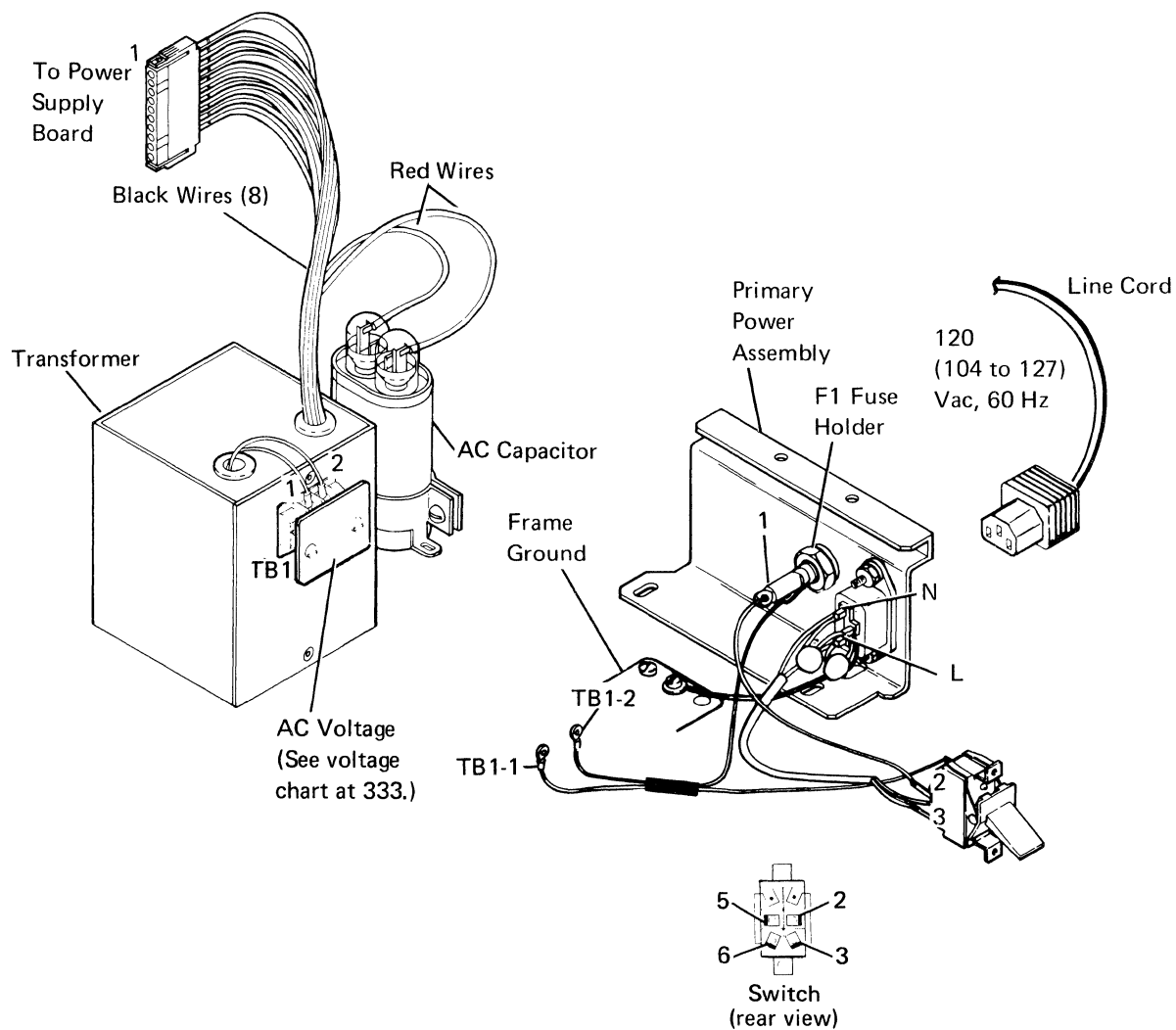




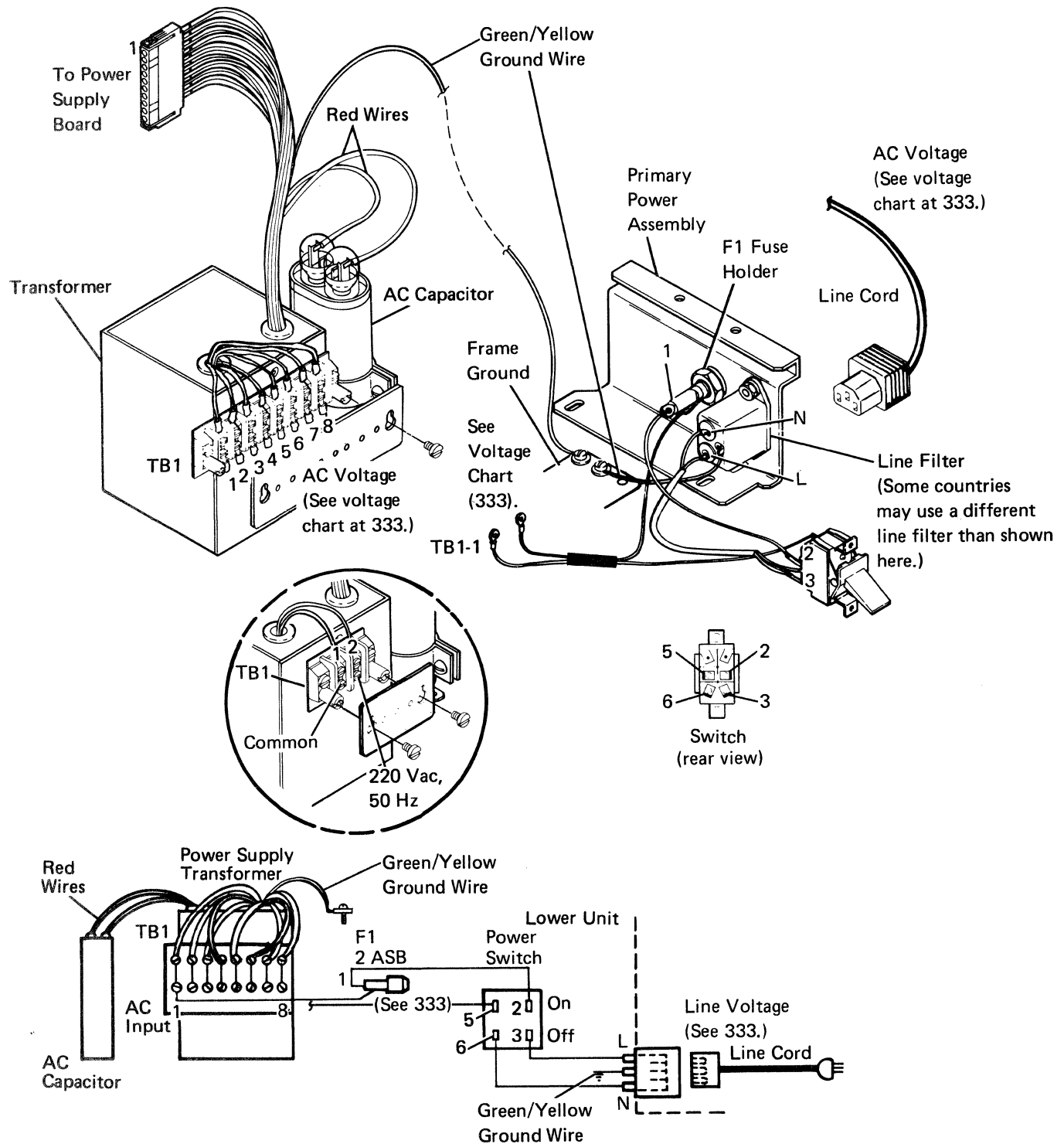


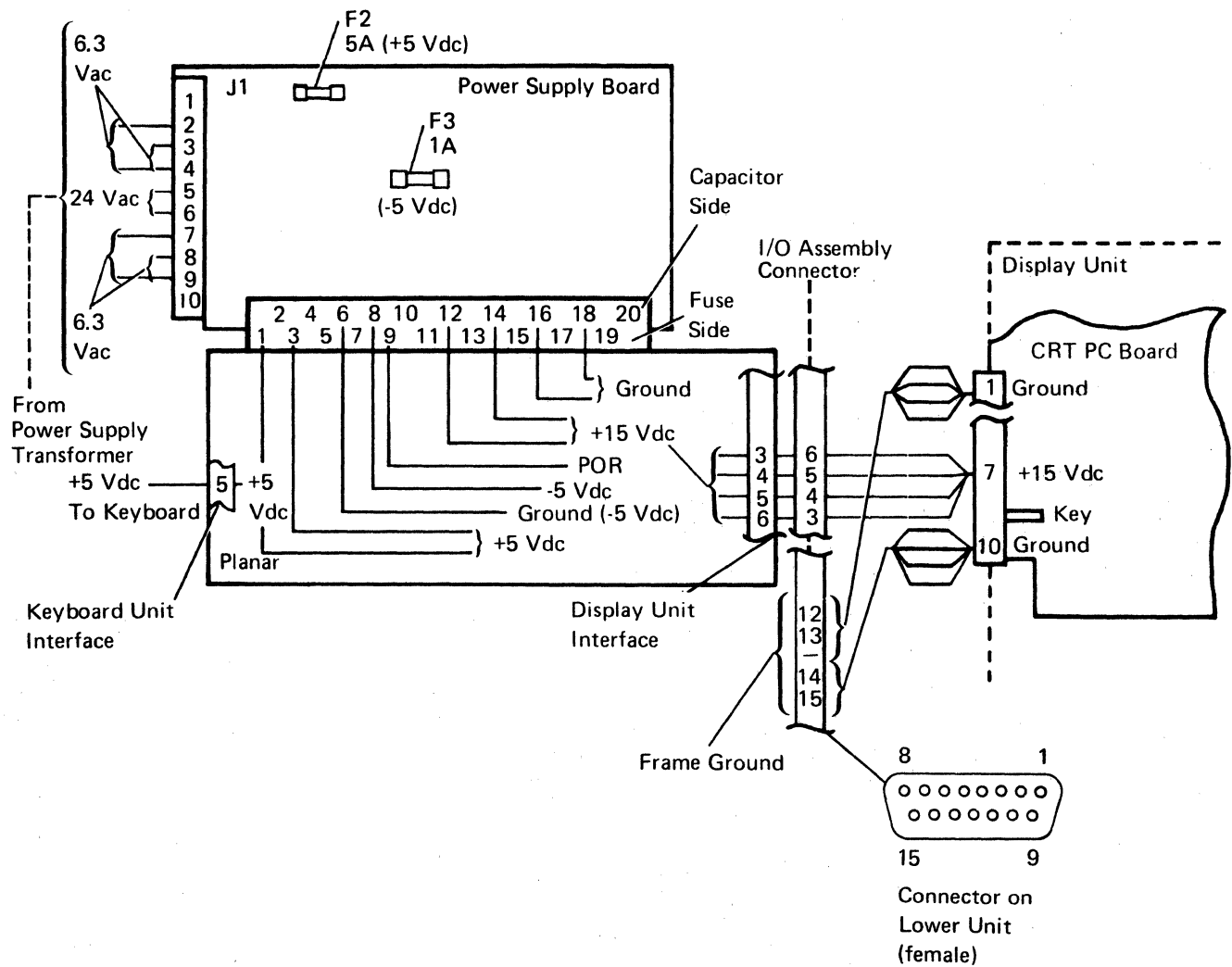
**331 AC Power Distribution**

U.S. Only



## World Trade Only





### 333 AC Voltage Chart and Fuse Specifications

#### U. S. Only

TB1 Con- nector	Test Point	Voltage Rating	Voltage Limits	Transformer Part Number
120 Vac, 60 ( $\pm 0.5$ ) Hz				
1	Common			
2	Fuse pin 2	120	104-127	2777440

#### World Trade

TB1 Con- nector	Test Point	Voltage Rating	Voltage Limits	Transformer Part Number
XXX Vac, 50 ( $\pm 0.5$ ) Hz				
1	Common			
2	Fuse pin 2	100	90-110	2777442
3	Fuse pin 2	110	97-119	2777442
4	Fuse pin 2	200	180-220	2777442
5	Fuse pin 2	220	193-238	2777442
6	Fuse pin 2	230	202-249	2777442
7	Fuse pin 2	240	210-259	2777442
220 Vac, 50 Hz				
1	Common			
2	Fuse pin 2	220	193-238	2777439
XXX Vac, 60 Hz				
1	Common			
2	Fuse pin 2	100	90-110	2777441
3	Fuse pin 2	110	97-119	2777441
4	Fuse pin 2	120	104-127	2777441
5	Fuse pin 2	127	111-137	2777441
6	Fuse pin 2	200/208	180-220	2777441
7	Fuse pin 2	220	193-238	2777441
8	Fuse pin 2	240	208-254	2777441

#### Fuse Specifications

Fuse No.	Ampere Rating	Fuse Part Number
F1	2	615683
F2	5	855251
F3	1	855253

## 340 Lower Unit Removal and Replacement Procedures

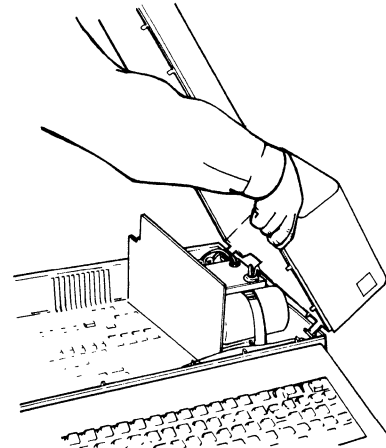
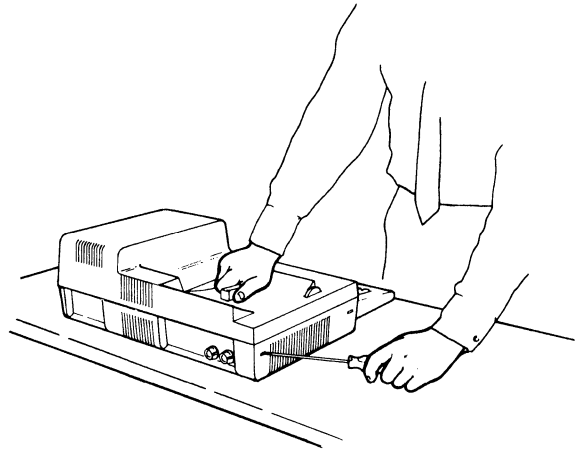
### 341 Lower Unit Top Cover

1. Power off and remove the line cord from the AC outlet.
2. Remove the external CRT cable from the lower unit.
3. Remove the display unit by positioning it in its forward, lower limit and lifting up (240). Set it out of the way.

**Note:** To remove the display unit, the cross bar in the guide post on the lower unit must be aligned with the cross slot in the display unit.

4. To remove the lower unit top cover:
  - a. Remove the screw beside the cross bar of the top cover.
  - b. Grasp the cross bar of the top cover firmly and lift up while pressing in on the tab, as shown, with a screwdriver.
  - c. Lift the top cover up and over the power supply board, and free the top cover tabs on the power supply side of the lower unit.

Replace the lower unit top cover in the reverse order of removal.



### 343 AC Capacitor

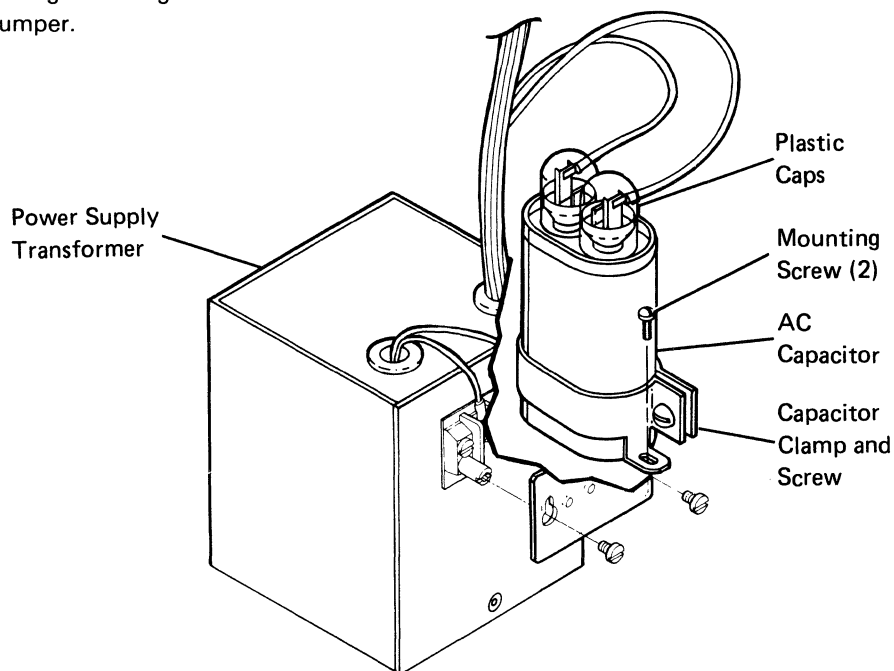
#### **DANGER**

High voltage may be present at the connectors on top of the AC capacitor.

1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove the plastic covers on the AC capacitor. (Press inward on the covers as you pull upward.)
4. Discharge the two connectors on top of the AC capacitor by shorting them together with a screwdriver or jumper.

5. Remove the two wires from the AC capacitor connectors.
6. Remove the two mounting screws holding the AC capacitor clamp to the lower unit.
7. Remove the AC capacitor and clamp from the lower unit.
8. Loosen the screw holding the clamp to the AC capacitor.
9. Remove the AC capacitor from the clamp.

Replace the AC capacitor in the reverse order of removal.



**344 Power Supply Transformer****DANGER**

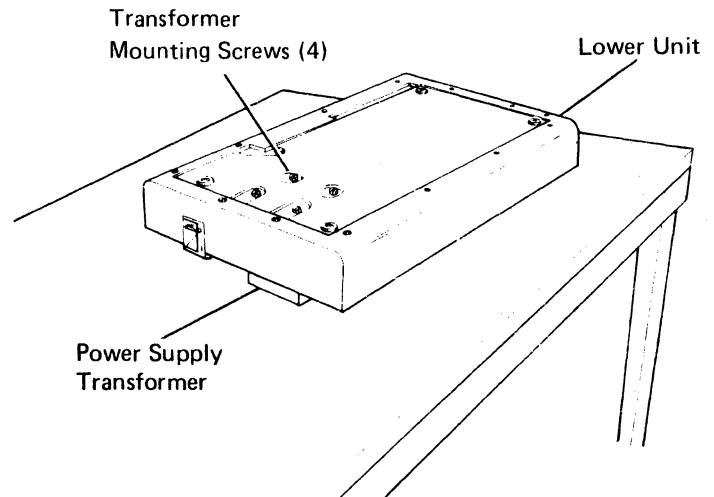
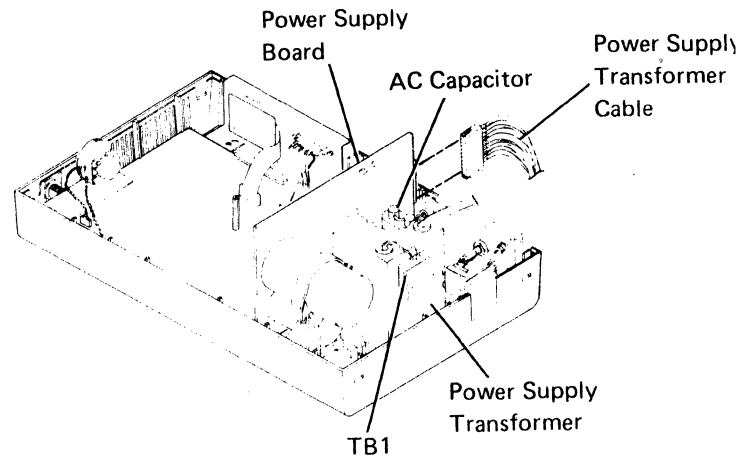
High voltage may be present at the connectors on top of the AC capacitor.

1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove the plastic cover on the AC capacitor. (Press inward on the cover as you pull upward.)
4. Discharge the two connectors on top of the AC capacitor by shorting them together with a screwdriver or jumper.
5. Remove the two wires from the AC capacitor connectors.
6. Remove the green and yellow ground wire from frame ground.
7. Remove the cover from TB1 on the power supply transformer by loosening the two mounting screws and sliding the cover up and over them.
8. Remove the wires from the lower connectors on TB1.
9. Remove the transformer cable from the power supply board by pressing the retainer tabs and pulling the connector away.
10. Remove the power supply board (345).
11. Remove the audible alarm assembly (354).
12. Carefully invert the lower unit.

**Note:** Ensure that the lower unit does not fall when the transformer mounting screws are removed.

13. Remove the four mounting screws that hold the transformer to the lower unit.
14. Lift the lower unit off the transformer and set it aside.

Replace the power supply transformer in the reverse order of removal.

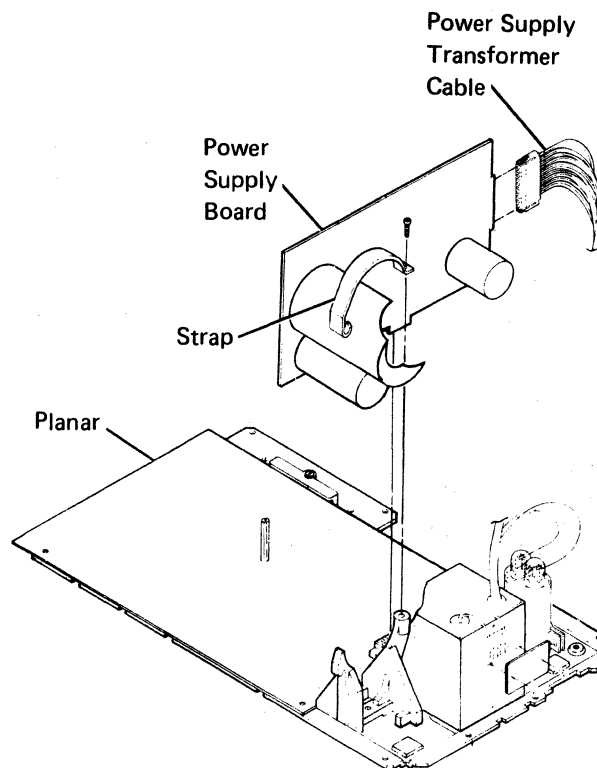




### 345 Power Supply Board

1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove the power supply transformer cable by pressing the retainer tabs and pulling the connector away.
4. Remove the strap holding the large capacitor on the power supply board to the lower unit.
5. Remove the power supply board by pulling it up and out of the connector on the planar.

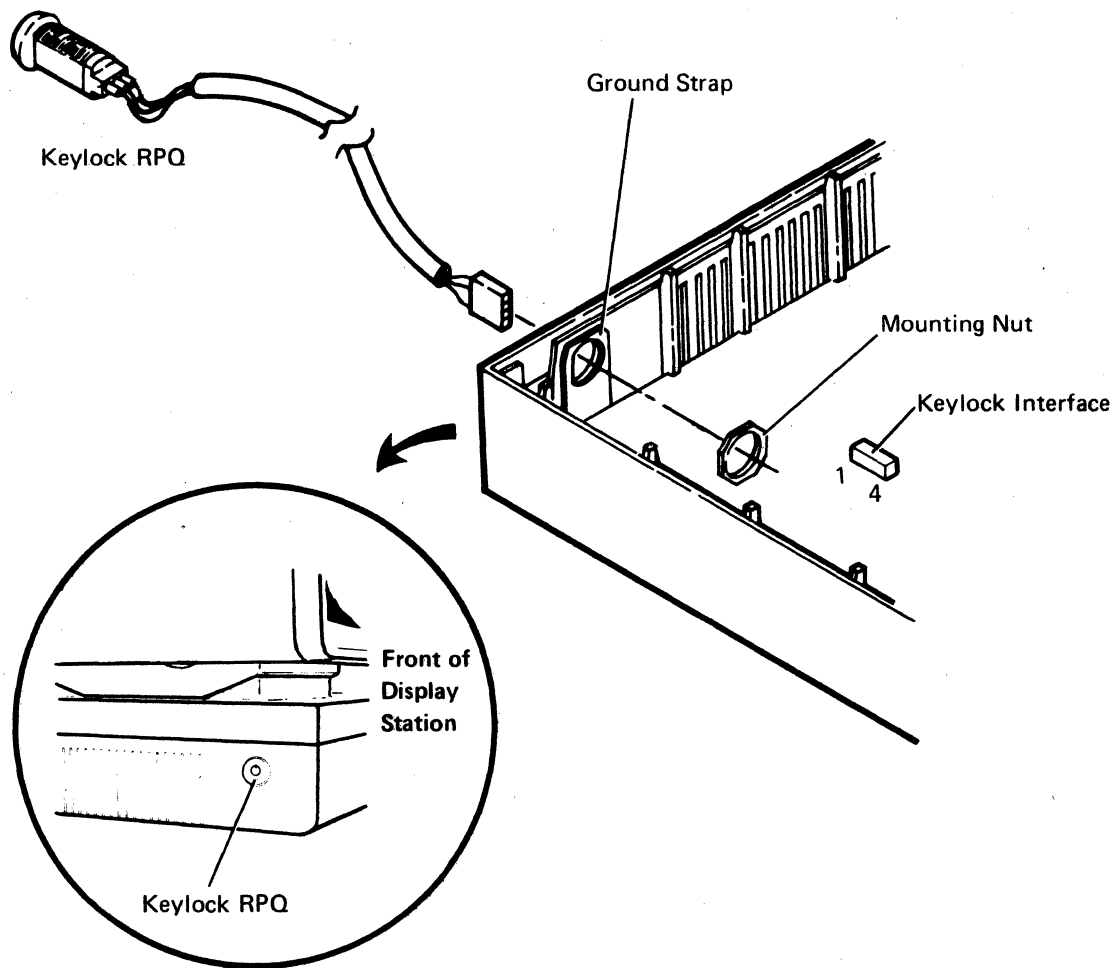
Replace the power supply board in the reverse order of removal.



**346** *Keylock RPQ*

1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove the keylock cable from the planar.
4. Remove the mounting nut from the keylock assembly.
5. Push the keylock out of the lower unit.

Replace the keylock in the reverse order of removal.



### 347 Planar

#### CAUTION

Twisting or bending the planar can damage the printed circuits. Be careful when removing and replacing the planar.

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1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove all cables attached to the planar.
4. Remove the power supply board (345).
5. Remove the mounting stud and mounting screw holding the planar to the lower unit.
6. Loosen or remove and place out of the way the two holding strips at the edges of the planar.
7. Carefully remove the planar from the lower unit.

#### CAUTION

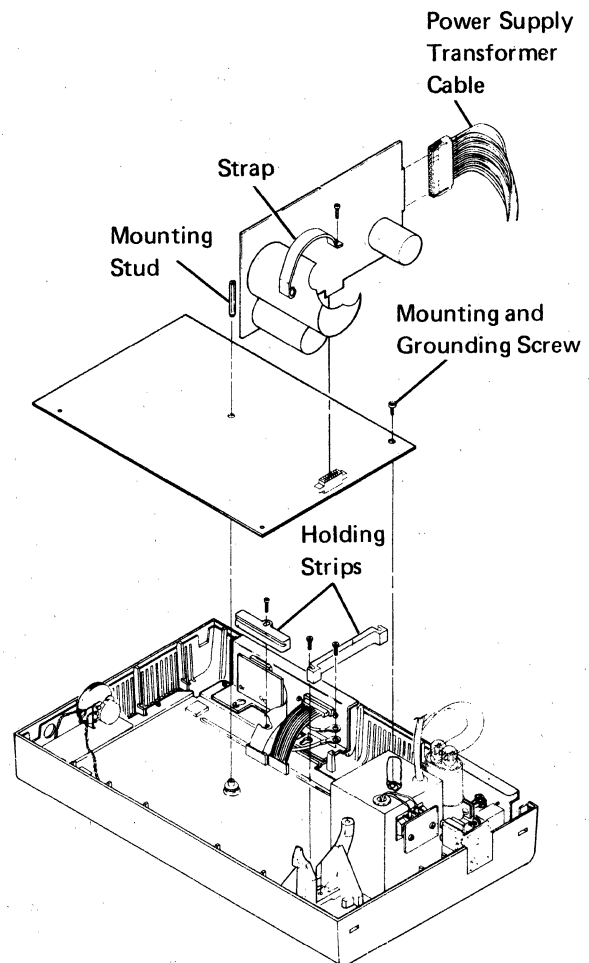
When replacing the planar, ensure that the mounting and grounding screw is tight.

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Replace the planar in the reverse order of removal.

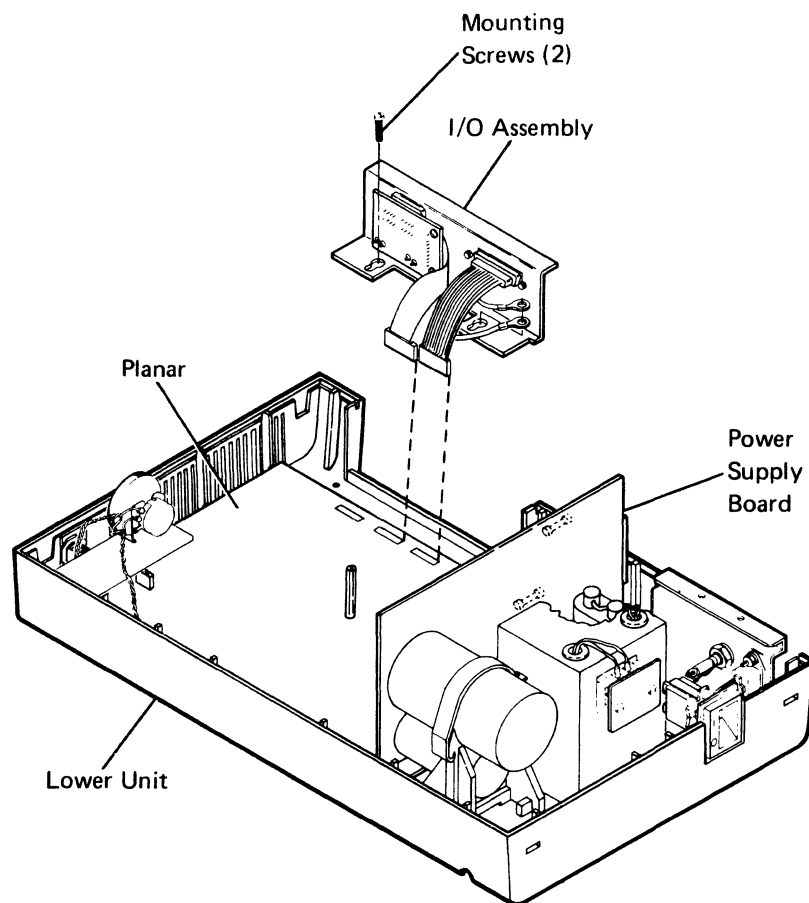


**348** I/O Assembly

Ensure that your address and terminator switches are properly set (420).

1. Power off and remove the line cord from the AC outlet.
2. Remove the lower unit top cover (341).
3. Remove the I/O assembly cables from the planar.
4. Loosen or remove the two mounting screws that hold the frame of the I/O assembly to the bottom of the lower unit.
5. Move the I/O assembly inward, and then lift it up and clear of the lower unit.

Replace the I/O assembly in the reverse order of removal.



### 349 Primary Power Assembly

The primary power assembly includes the panel at the rear of the display station and the power switch.

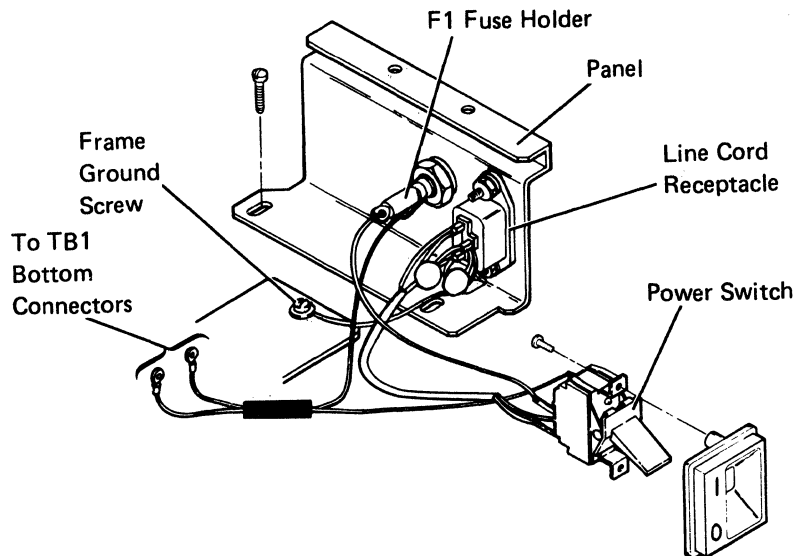
1. Power off and remove the line cord from the AC outlet.
2. Remove the line cord from the socket on the panel.
3. Remove the lower unit top cover (341).
4. Remove the cover on TB1 by loosening the two mounting screws and sliding the cover up and over them.
5. Remove the two wires from the bottom connectors of TB1 on the power supply transformer.
6. Remove the frame ground screw holding the ground wire.

7. Remove the two mounting screws that hold the panel to the lower unit.

**Note:** Steps 8 and 9 must be performed together because the panel and the power switch are connected together.

8. Remove the power switch by carefully forcing the rear of the switch out of the retainer with a screwdriver. Lift the switch straight up and out of its frame.
9. Remove the switch cover by removing the two mounting screws holding the switch to the cover. Keep the screws and switch cover for attaching them to the new switch.

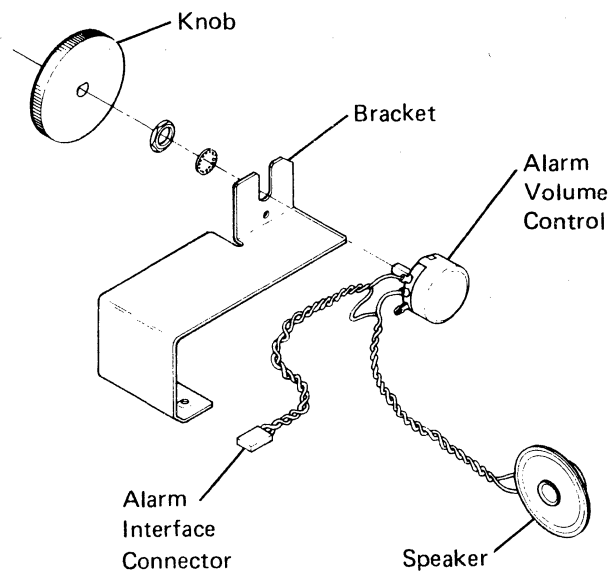
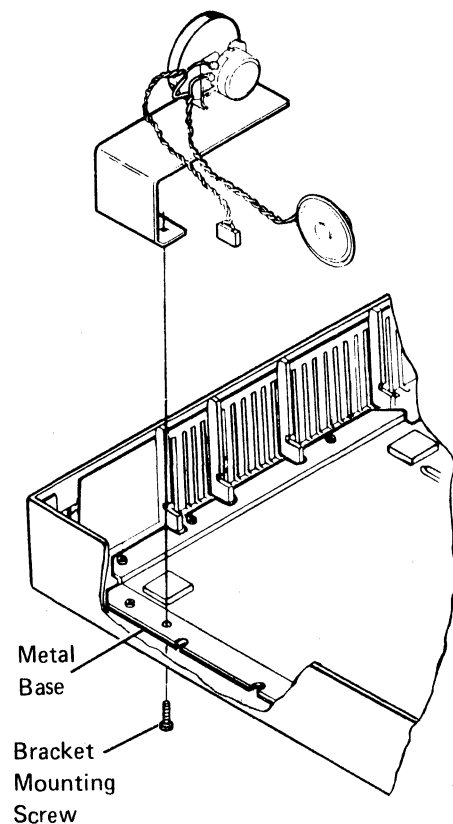
Replace the primary power assembly in the reverse order of removal. Ensure that the two wires to TB1 are connected correctly (331).



**354 Audible Alarm Assembly**

1. Power off the display station and remove the line cord from the AC outlet.
2. Remove the display station lower unit top cover (341).
3. Disconnect the alarm cable from the planar alarm interface.
4. Slide the alarm speaker up and out of the retainer on the side of the lower unit.
5. Remove the volume control assembly by loosening the mounting nut holding the volume control to the mounting bracket and sliding the volume control out of the slot.

Replace the audible alarm assembly in the reverse order of removal.



## 420 I/O Assembly Switches

The I/O Assembly switches are located at the rear of the lower unit. Functionally, the switches are divided into the three address switches, the CE test switch, and the terminator switch.

### 421 Address Switches (1, 2, and 3)

The first three switches from the left of the switch module are address switches. Each display station has a discrete address identifiable by the controller. This address is set into the display station by means of the address switches. Each switch has a discrete binary value that allows an address range from 0 to 6. An address of 7 is incorrect. The switch setting summary table shows how these switches are coded.

### 422 CE Test Switch (4)

The CE test switch is used along with power-on diagnostics by the customer engineer for intermittent fault isolation. For further information, see reference 525.

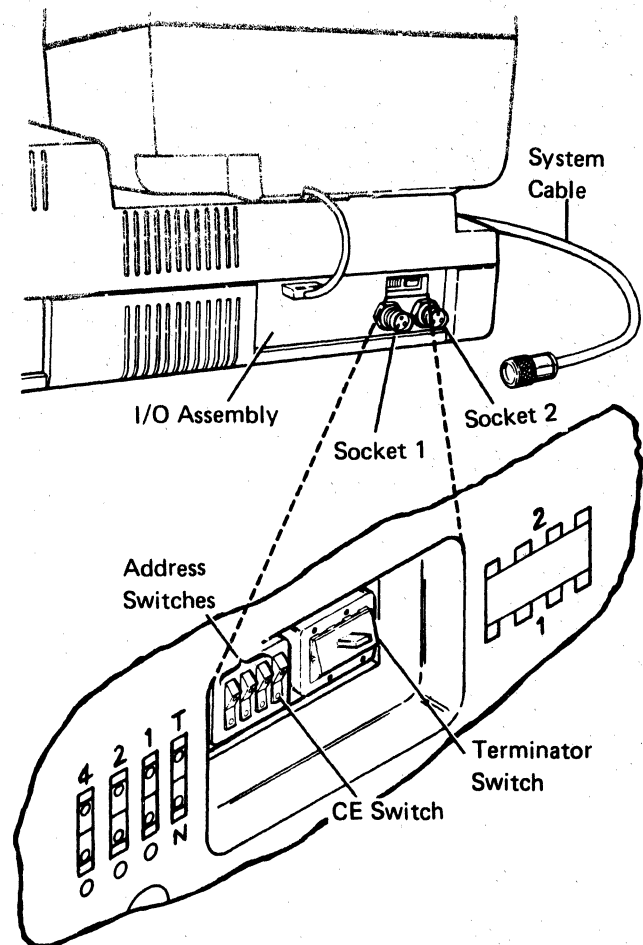
### 423 Terminator Switch

The terminator switch is on the I/O assembly at the rear of the lower unit. This switch, when at position 1, supplies electrical termination of the communications line when the display station is either the *last* station or the *only* station on the line. If the station is *not* the last or only station on the line, the terminator switch must be positioned at 2.

Switch Setting Summary

Switch Number	Binary Value	Station Address							
		0	1	2	3	4	5	6	7
1	4	Off	Off	Off	Off	On	On	On	<sup>1</sup>
2	2	Off	Off	On	On	Off	Off	On	<sup>1</sup>
3	1	Off	On	Off	On	Off	On	Off	<sup>1</sup>
4 <sup>2</sup>									
Terminator Switch		Inline Station			Last or Only Station				
		2			1				

<sup>1</sup> Not valid  
<sup>2</sup> Switch 4 is the CE test switch



450 Station Protector

See the *IBM 5250 Information Display System Planning and Site Preparation Guide*, GA21-9337, for detailed information.

The station protector is owned and maintained by the customer. Only two station protectors should be connected to any one port.

**DANGER**

Never handle cables or connectors during an electrical storm.

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*Service Hint*

**CAUTION**

This service hint is for *temporary* use only. Do not leave the station unprotected.

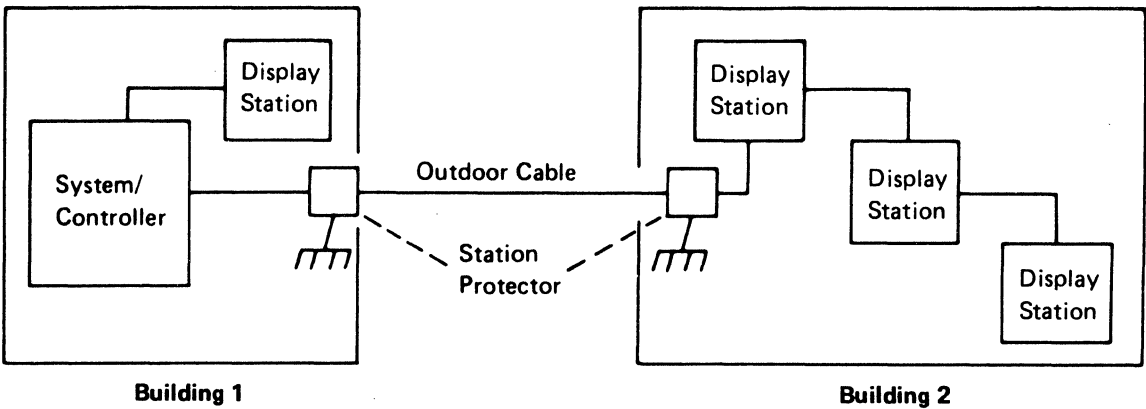
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If you have difficulty isolating the failure to the station protector, you can temporarily bypass the station protector by using the adapter (part 7362230, or a similar part).

Disconnecting the cables to the station protector will disconnect the stations from the system.



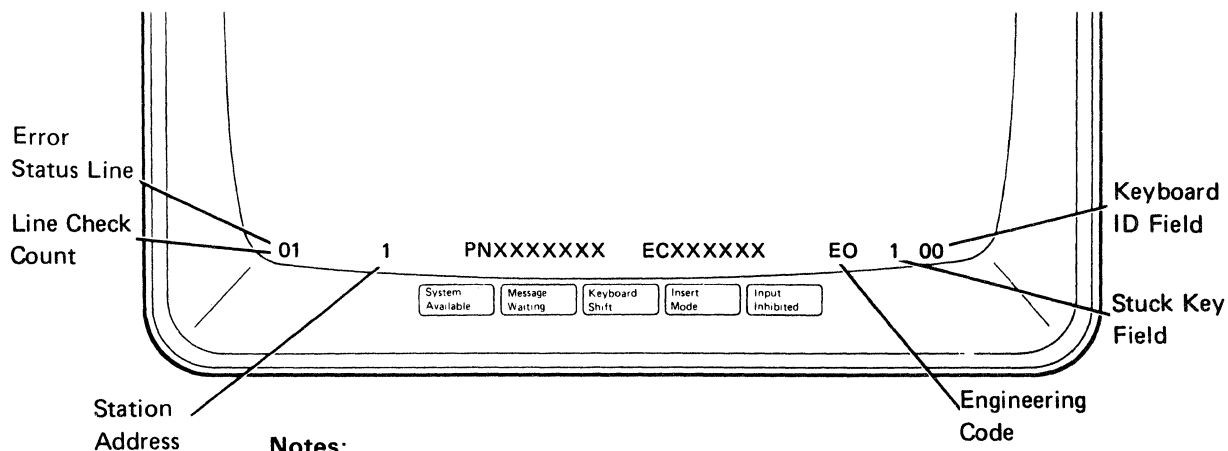


## 520 Power-On Diagnostics

The power-on diagnostics perform tests on all major parts of the display station. These tests are performed internal to the display station and, therefore, do not rely on a controller or host system.

The diagnostics take approximately 4 seconds to run. If there are no errors after all of the tests are run, the diagnostics place the display station in the normal mode of operation with a normal status line (see the start of the MAP section). If an error is found, the tests are stopped and an error status line will be displayed that contains coded information indicating the major part that failed. The image of the display screen identifies the type of information contained on the error status line. Status line information can also be obtained by holding down any key on the keyboard and then powering on the display station. As long as the key is held down, the status line will be displayed. When the key is released, the diagnostics place the display station in the ready mode for normal operation.

Loop-on diagnostics can be attained by using the CE test switch (525).



### Notes:

1. When the Status Line is displayed as shown above at power-on, it denotes an error condition. A normal display screen at power-on is shown at the start of the MAP section.
2. A description of the Status Line shown above is provided on the following pages.
3. Line check count will appear only if the error occurred when the System Available indicator is on.

### Status Line Information

The information on the status line describes the configuration of the display station and, if applicable, an error condition. The following paragraphs describe in detail the fields of an error status line. A normal status line after power-on is shown at the start of the MAPs section.

**Line Check Count:** This two-digit code (00 through 99) is the count of parity errors that occurred during the transmission of data from the system controller. This code appears only when an *online* error occurs.

**Station Address:** This one-digit code (0 through 7) is the display station address as set by the address switches at the rear of the display station. Addresses 0 through 6 are valid.

**ROS Part Number (PN):** The part number (PNXXXXXXX) shown is for the read only storage (ROS) module installed on the planar. This number, along with the engineering change number, is useful when discussing a failure with the IBM engineering representative.

**ROS Engineering Change (EC) Number:** This number (ECXXXXXX) identifies the change level of the ROS module installed on the planar. It is useful, along with the ROS part number, when discussing a failure with the IBM engineering representative.

**Engineering Code:** This two-digit code (E0 through E7) identifies the major function on the planar that failed. This is for engineering use only and is useful when discussing a failure with the IBM engineering representative.

**Stuck Key Field:** This one-digit code (blank or 1), when displaying a 1, means that a key on the keyboard is making contact. If no error is found, the field is blank.

**Keyboard ID Field:** This two-digit code (00 through 31) normally identifies the keyboard language group installed. Codes 00 through 31 are valid and are described below:

ID Code	Language Group
00	United States and Canada
01	ASCII International
02	United Kingdom
03	Japan (English)
04	Spanish-Speaking
05	Spain
06	Brazil
07	Portugal
08	Austria and Germany
09	Finland and Sweden
10	Norway and Denmark
11	Italy
12	France
13	Canada (French)
14	Belgium
15	Japan Katakana
16-31	Not used

When an error is found, this field will display a KU for a keyboard error or an LU (logic unit) for a planar error.

If any other alphabetic data besides ID codes, KU, or LU appears in the keyboard ID field, it means a planar failure has occurred.

At the end of this diagnostic, you can perform more tests using the free key mode (530) or the online verification tests (600), or you can sign on using the sign-on procedure.

## 525 CE Test Switch

The CE test switch (switch 4 on the I/O assembly) is a diagnostic aid for the customer engineer to use in fault isolation. There are two conditions in which the CE test switch may be used that provide different results.

If the CE test switch is positioned on *prior* to display station power-on, the diagnostics will loop continuously until an error, other than a keyboard wrap test error, is detected. Upon detecting an error, an error status line is displayed at the bottom of the screen (520). An error can be caused by pressing and holding any keyboard key (key struck error).

If the CE test switch is positioned on *after* the display station System Available indicator appears, the 2-second time-out is inhibited. With the 2-second time-out inhibited, the diagnostics will not loop and the information on the display screen will not be lost, even if the System Available indicator disappears (meaning that communication with the controller has been lost.)

## 530 Free Key Mode

The free key mode allows characters to be entered on the keyboard and displayed on the CRT to test the operation of the keyboard and character display circuits. While in the free key mode, the display station communicates with the controller, sending a code to the controller and receiving back a character code for displaying the character on the CRT.

The display station is in the free key mode after the station has been powered on and, depending on the system to which it is attached, . . .

- Has the System Available indicator on, but no sign-on menu displayed, or
- Is varied off, or
- Is in the online test mode, with the Prime Option Menu displayed (see 610).

The following function keys may display an error code if pressed while in the free key mode.

Print	Enter/Record Advance
Help	Attention
Roll↑ (Up)	Command function keys
Roll↓ (Down)	1 through 24
Duplicate	Field-

Use the online tests (600) to check these key operations.


## 600 ONLINE TESTS


Online tests include work station exerciser routines that are contained in the system. When the Prime Option Menu is displayed, it permits the selection of the following: display verification, printer verification, configuration data, ERAP (error recording analysis procedure), and link test. For the purpose of verifying the display station operation, only the Display Verification Menu option is described here.

The Display Verification Menu (620) permits the selection of the following tests: the display attributes test, the displayable characters test, the specified input fields test, and the function keys and features test. The display attributes test and the displayable characters test check the planar. The specified input fields test checks the controller. The function keys and features test checks the system and the features installed on the display station.

Online tests can be run on the work station while other jobs are being run on the system. However, the work station must be in a signed off condition before online tests can be run on that work station. There may be various methods that can be used to terminate or sign off a job. These methods are not described in this manual because they are system operating procedures.

To start the online tests, the display station must be communicating with the host system (the System Available indicator is on). The following procedure is appropriate for most systems. (Steps 1 and 2 are not necessary if a sign-on menu is already displayed.)

1. Press and hold the Shift key and press the Sys Req key.
2. Press the Enter key.
3. Press the Cmd key and then the test request key. (On typewriter keyboards, this is the 

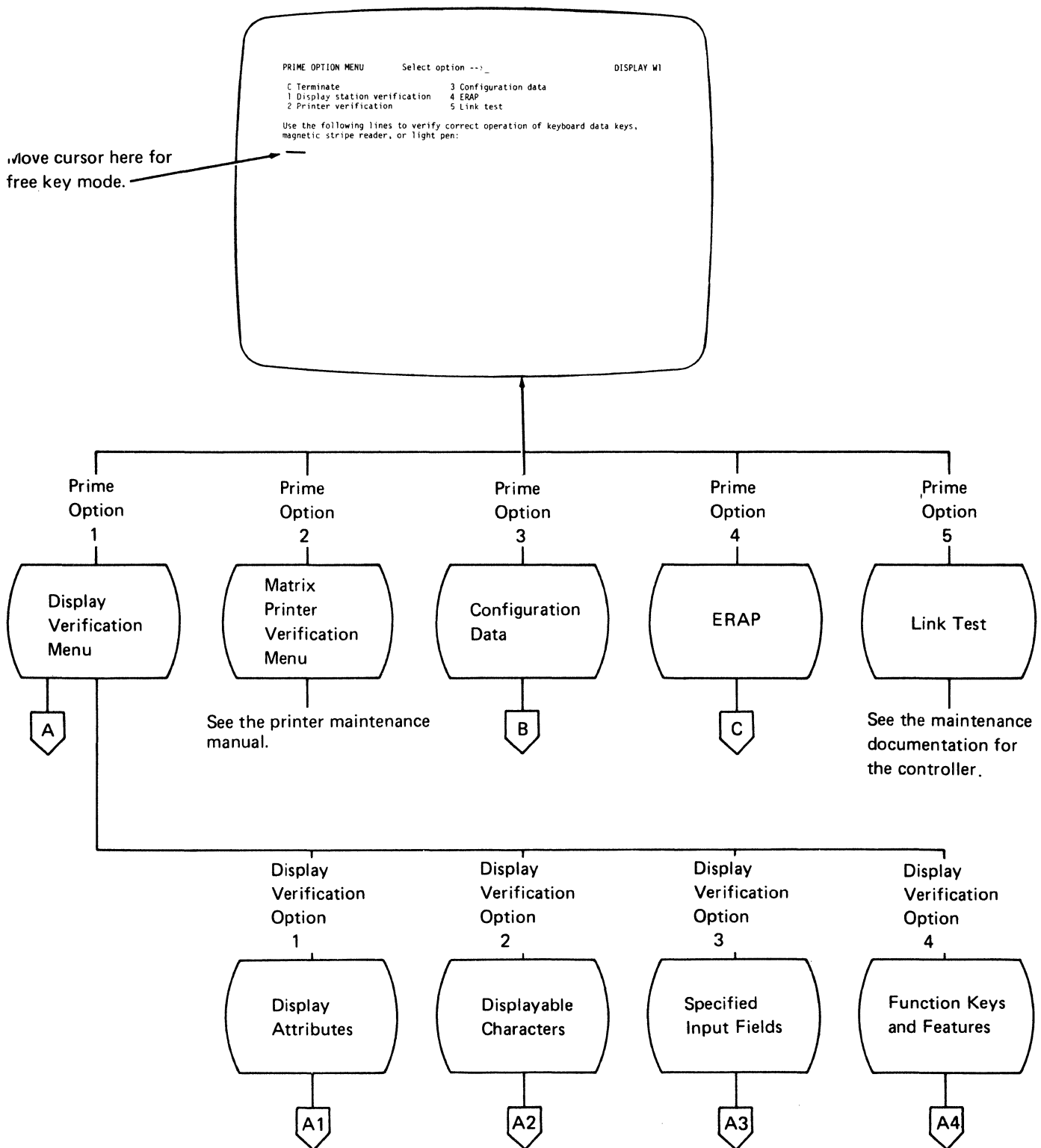
key; on data entry keyboards, this is the rightmost blank  key in the top row.)

The online test Prime Option Menu should now be displayed. If it is not displayed, check the following list of possible reasons:

- The display station is not signed off. Check with the operator before signing off the display station.
- The display station is varied off. Call the system operator.
- An error message is waiting on the System Console about this display station. Call the system operator.

## 610 Online Tests Overview

The following screens are examples only. Follow the instructions on your display screen to perform these tests.

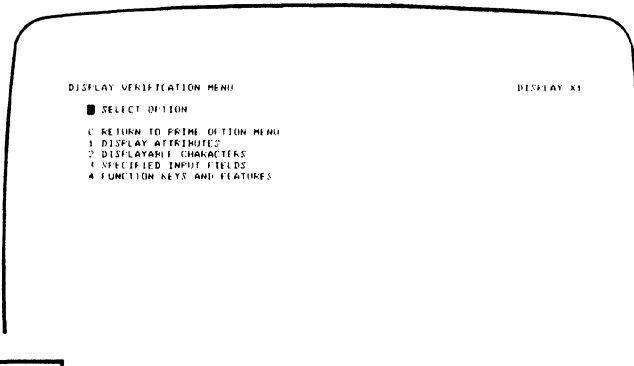


## 620 Online Tests Displays



**To select the Display Verification Menu:**

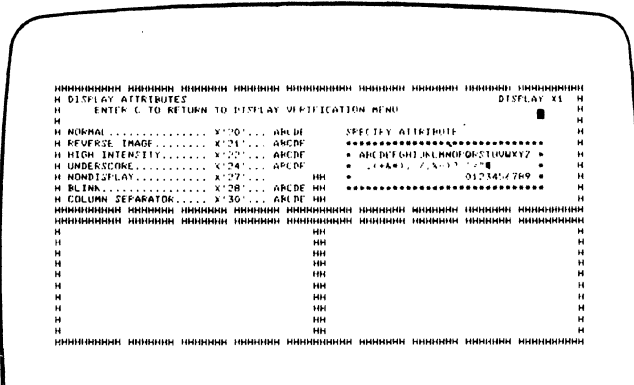
1. Press the 1 key.
2. Press the Enter key.



To select the display attributes option:

1. Press the 1 key.
2. Press the Enter key.

**This display tests the attributes, the Brightness control, and the alignment of characters on the display screen.**



**Note:** The nondisplay attribute (hexadecimal 27) will still display a blinking rectangle for a normally nondisplayable character.

How to use this display:

1. Slowly decrease the Brightness control; observe the pattern of Hs that alternates in intensity.
2. Adjust the Brightness control to obtain the best character image.
3. Press the Spacebar once to position the cursor to the right of SPECIFY ATTRIBUTES statement on the display screen.
4. Key in one of the hexadecimal numbers shown on the left side of the display screen; press the Enter key.

Observe the results that take place on the right side of the display screen. Compare these results with the attribute description on the left. If a wrong entry is made, the entry blinks at high intensity. Repeat steps 3 and 4 for each of the remaining hexadecimal numbers.

In addition to the attributes present on the display screen, the following hexadecimal codes, marked by an asterisk (\*), supply combinations of attribute options.

Hex Code	Description
20	Normal display
21	Reverse image
22	High intensity
23*	Reverse image, high intensity
24	Underscore
25*	Underscore, reverse image
26*	Underscore, high intensity
27	No display
28	Blink
29*	Blink, reverse image
2A*	Blink, high intensity
2B*	Blink, high intensity, reverse image
2C*	Blink, underscore
2D*	Blink, underscore, reverse image
2E*	Blink, underscore, high intensity
2F*	No display

Hexadecimal codes 30 through 3F are the same as 20 through 2F; however, codes 30 through 3F contain column separators between each character in the field.

620 (continued)

To return to the Display Verification Menu:

- 1. Press the C key.
- 2. Press the Enter key.



To select the Displayable Characters option:

- 1. Press the 2 key.
- 2. Press the Enter key.

This display shows the characters that are generated when the comparable keyboard keys are pressed. The US and Canada character set is shown below.

US/Canada

First Hex Char-		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Second Hex-Char	0					SP	&	-	ø	Ø		¢	{	}	\	/	0
	1					SP	é	/	é	a	j	£	À	J	º		1
	2									b	k	s	€	B	K	S	2
	3									c	l	t	R	C	L	T	3
	4					à	â			d	m	u		D	M	U	4
	5									e	n	ü		E	N	Ü	5
	6					ä	Ä			f	o	w		F	O	W	6
	7					ë	Ë			g	p	x		G	P	X	7

First Hex Char-		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Second Hex-Char	8					ç	Ç			h	q	y		H	Q	Y	8
	9					ñ	Ñ	`		i	r	z		I	R	Z	9
	A					ø	!	!	:				~	-			
	B					.	\$	,	#								
	C					&		<	*	%	@		≈	-		u	
	D							(	)	_	'			"			
	E					-		+	,	>	=		æ		'		
	F					■			~	?	"		ø		ö		ö

Character sets for other languages supported by this display station are shown on the following pages.

## ASCII International

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-	°	Ø			¢	{	}	\	0
1					SP	é	/	é	á	j	~	£	À	J	SP	1
2									b	k	s	£	B	K	S	2
3									c	l	t	R	O	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	ü		E	N	Ü	5
6					ã		Ä		f	o	w		F	O	W	6
7					ä		Å		g	p	×		G	P	×	7
8					ç		Ç		h	q	y		H	Q	Y	8
9					ñ		Ñ	`	ı	r	z		I	R	Z	9
A					[	]		:				¬	-			
B					.	\$	,	#								
C		×			<	*	%	@		æ		-		ü		
D					(	)	_	'				..				
E		-			+	;	>	=		Æ		'				
F		■			!	^	?	"		×			ø		ö	

## Austria/Germany

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-		°	µ		ä	ü	ö		0
1					SP	é	/	é	á	j	ß	£	À	J	SP	1
2									b	k	s		B	K	S	2
3					a		A		c	l	t		C	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	ü	§	E	N	Ü	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	×		G	P	×	7
8					ç	ı			h	q	y		H	Q	Y	8
9						ß		`	ı	r	z		I	R	Z	9
A					Ä	Ü	ö	:	«	»	ı		-			
B					.	\$	,	#	»	»	ı					
C		×			<	*	%	§					ö	ü	ö	ü
D					(	)	_	'		ı		..	ö	ü		
E					+	;	>	=	Æ		ß	'				
F		■			!	^	?	"		×						



## Belgium

First Hexadecimal Character

Second Hexadecimal Character	First Hexadecimal Character															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					sp	&	-			°	µ		€	€	¢	0
1					sp	€	/	é	a	j	°	£	A	J	sp	1
2									b	k	s		B	K	S	2
3					ä		Ä		c	l	t		C	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	u	§	E	N	U	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç	i			h	q	y		H	Q	Y	8
9						ß		`	i	r	z		I	R	Z	9
A					[	]	ù	:	«	»	i		-			
B						\$	,	#	»	«	¿					
C		×			<	*	%	à					ø	ü	ö	û
D					(	)	_					°	ø	ü		
E					+	,	>	=	£		£	'				
F		■			!	^	?	"		×						

## Brazil

First Hexadecimal Character

Second Hexadecimal Character	First Hexadecimal Character															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					sp	&	-	ø	Ø			¢	ö	€	\	0
1					sp	€	/	é	a	j	°	£	A	J	sp	1
2									b	k	s	¥	B	K	S	2
3									c	l	t	R	C	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	u		E	N	U	5
6					ä		Ä		f	o	w		F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç		Ç		h	q	y		H	Q	Y	8
9					ñ		Ñ	ã	l	r	z		I	R	Z	9
A					é	\$	¢	:				°	-			
B					.	\$	,	ö								
C		×			<	*	%	Ä		æ		-		ü		
D					(	)	_	'				°				
E		-			+	,	>	=	£		£	'				
F		■			!	^	?	"		×			ø		ö	

## Canada (French)

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-		°	µ		é	è	¸		0
1					SP	é	/	é	a	j	ü	£	À	J	SP	1
2									b	k	s		B	K	S	2
3					ä		Ä		c	l	t		Ö	L	T	3
4					à	é			d	m	u		D	M	U	4
5									e	n	ü	§	E	N	Ü	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	×		G	P	×	7
8					ç	i			h	q	¥		H	Q	¥	8
9					ß		`		i	r	z		I	R	Z	9
A					à	'	ù	:	«	»	i		-			
B					§		#	>	©	¿						
C		×			<	×	%	©					ø	ü	ö	ü
D					(	)	_	'		¸		¨	ø	ü		
E					+	,	>	=	£		£	'				
F		■			!	^	?	"		×						

## Finland/Sweden

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-		°	µ		ä	ä	é		0
1					SP	é	/	é	a	j	ü	£	À	J	SP	1
2									b	k	s		B	K	S	2
3					ä		Ä		c	l	t		Ö	L	T	3
4					à	é			d	m	u		D	M	U	4
5									e	n	ü	§	E	N	Ü	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	×		G	P	×	7
8					ç	i			h	q	¥		H	Q	¥	8
9					ß		é		i	r	z		I	R	Z	9
A					§	×	ø	:	«	»	i		-			
B					Ä	.	Ä	>	©	¿						
C		×			<	×	%	©					ø	ü	ö	ü
D					(	)	_	'		¸		¨	ø	ü		
E					+	,	>	=	£		£	'				
F		■			!	^	?	"		×						

## France

## First Hexadecimal Character

## Second Hexadecimal Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					sp	&	-			°	µ		€	€	¢	0
1					sp	é	/	É	a	j	ï	£	À	J	sp	1
2									b	k	s		B	K	S	2
3					a		À		c	l	t		C	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	o	§	E	N	U	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç	i			h	q	y		H	Q	Y	8
9					ß		`	ı	r	z			I	R	Z	9
A					°	§	ù	:	«	»	ı		-			
B					.	§	,	£	»	»	ı					
C		×			<	*	%	à					ö	ü	ö	ü
D					(	)	_	'		ı		..	ö	ü		
E					+	,	>	=	£		£	'				
F		■			!	^	?	"		×						

## Italy

## First Hexadecimal Character

## Second Hexadecimal Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					sp	&	-			°	µ		à	è	¢	0
1					sp	é	/	É	a	j	i	£	À	J	sp	1
2									b	k	s		B	K	S	2
3					a		À		c	l	t		C	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	o	§	E	N	U	5
6									f	o	w	¶	F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç	i			h	q	y		H	Q	Y	8
9						ß		ù	ı	r	z		I	R	Z	9
A					°	é	ò	:	«	»	ı		-			
B					.	§	,	£	»	»	ı					
C		×			<	*	%	§					ö	ü	ö	ü
D					(	)	_	'		ı		..	ö	ü		
E					+	,	>	=	£		£	'				
F		■			!	^	?	"		×						

620 (continued)

Japan (English)

First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-	ø	Ø			¢	{	}	\$	0
1					SP	é	/	É	a	j	¬	£	À	J	SP	1
2									b	k	s	¥	B	K	S	2
3									c	l	t	R	O	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	u		E	N	U	5
6					ä	Ä			f	o	w		F	O	W	6
7					ä	Ä			g	p	×		G	P	X	7
8					ç	Ç			h	q	y		H	Q	Y	8
9					ñ	Ñ	`		i	r	z		I	R	Z	9
A					£	!	!	:				¬	-			
B					.	¥	,	#								
C		※			<	*	%	@		æ		-		u		
D					(	)	_	'				..				
E		-			+	;	>	=		Æ		'				
F		■				¬	?	"		⌘			ø		ö	

Japan (Katakana)

First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-		ソ						\$	0
1					o	I	/		ア	ク	¬	£	À	J	SP	1
2					「	」			イ	チ	∧	¥	B	K	S	2
3					」	」			ウ	ツ	ホ		O	L	T	3
4					ゝ	ユ			イ	テ	マ		D	M	U	4
5					.	ヨ			オ	ト	ミ		E	N	U	5
6					ヲ	ツ			カ	ナ	ム		F	O	W	6
7					ヲ				キ	ニ	×		G	P	X	7
8					イ	-			ク	ヌ	モ		H	Q	Y	8
9					ウ				ケ	ネ	ヤ		I	R	Z	9
A					£	!	:	:	コ	ノ	ユ	レ	-			
B					.	¥	,	#				□				
C		※			<	*	%	@	ヲ		ヨ	フ				
D					(	)	_	'	シ	ハ	ラ	ン				
E					+	;	>	=	ス	ヒ	リ	"				
F						¬	?	"	セ	フ	ル	°				

# 620 (continued)

## Norway/Denmark

		First Hexadecimal Character															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Second Hexadecimal Character	0					SP	&	-	ø	Ø			¢	æ	å	\	0
	1					SP	é	/	é	á	j	ü	£	À	J	SP	1
	2									b	k	s	¥	B	K	S	2
	3									c	l	t	£	C	L	T	3
	4					à	è			d	m	u		D	M	U	4
	5									e	n	v		E	N	V	5
	6					ã		Ä		f	o	w		F	O	W	6
	7					ä		Å		g	p	x		G	P	X	7
	8					ç		Ç		h	q	y		H	Q	Y	8
	9					ñ		Ñ	`	i	r	z		I	R	Z	9
	A					#	¤	ø	:				¬	-			
	B					.	Ä	,	Æ								
	C		×			<	*	%	Ø		*		-		u		
	D					(	)	_	.				..				
	E		-			+	;	>	=		Æ		'				
	F		■			!	^	?	"		×			ø		ö	

## Portugal

		First Hexadecimal Character															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Second Hexadecimal Character	0					SP	&	-	ø	Ø			¢	ã	'	Ç	0
	1					SP	é	/	é	á	j	ç	£	À	J	SP	1
	2									b	k	s	¥	B	K	S	2
	3									c	l	t	£	C	L	T	3
	4					à	è			d	m	u		D	M	U	4
	5									e	n	v		E	N	V	5
	6					ã		Ä		f	o	w		F	O	W	6
	7					ä		Å		g	p	x		G	P	X	7
	8					ç		Ç		h	q	y		H	Q	Y	8
	9					ñ		Ñ	`	i	r	z		I	R	Z	9
	A					[	]	ø	:				¬	-			
	B					.	\$	,	Ä								
	C		×			Ç	*	%	Ö		æ		-		u		
	D					(	)	_	.				..				
	E		-			+	;	>	=		Æ		'				
	F		■			!	^	?	"		×			ø		ö	

## Spain

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-	©	®			¢	{	}	\	0
1					SP	é	/	É	à	j	''	£	À	J	SP	1
2									b	k	s	¥	B	K	S	2
3									c	l	t	£	O	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	u		E	N	U	5
6					ä		Ä		f	o	w		F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç		Ç		h	q	y		H	Q	Y	8
9					ñ		Ñ	`	i	r	z		I	R	Z	9
A					[	]	ñ	:				¬	-			
B					.	R	,	Ñ								
C		×			<	×	%	@		æ		-		u		
D					(	)	_	'				..				
E		-			+	,	>	=		Æ		'				
F		■				¬	?	"		×			ç		ö	

## Spanish Speaking

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-	©	®			¢	{	}	\	0
1					SP	é	/	É	à	j	''	£	À	J	SP	1
2									b	k	s	¥	B	K	S	2
3									c	l	t	£	O	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	u		E	N	U	5
6					ä		Ä		f	o	w		F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç		Ç		h	q	y		H	Q	Y	8
9					ñ		Ñ	`	i	r	z		I	R	Z	9
A					[	]	ñ	:				¬	-			
B					.	\$	,	Ñ								
C		×			<	×	%	@		æ		-		u		
D					(	)	_	'				..				
E		-			+	,	>	=		Æ		'				
F		■				¬	?	"		×			ç		ö	

## United Kingdom

## First Hexadecimal Character

Second  
Hexadecimal  
Character

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0					SP	&	-	ø	Ø			¢	{	}	\	0
1					SP	é	/	É	a	j	¬	£	À	J	SP	1
2									b	k	s	¥	B	K	S	2
3									c	l	t	R	O	L	T	3
4					à	è			d	m	u		D	M	U	4
5									e	n	v		E	N	V	5
6					ã		Ã		f	o	w		F	O	W	6
7					ä		Ä		g	p	x		G	P	X	7
8					ç		Ç		h	q	y		H	Q	Y	8
9					ñ		Ñ	`	i	r	z		I	R	Z	9
A					\$	!	!	:				¬	-			
B					.	£	,	#								
C		×			<	×	%	@		æ		-		u		
D					(	)	_	·				..				
E		-			+	,	>	=		Æ		'				
F		■				¬	?	"		×			ø		ö	

620 (continued)

To return to the Display Verification Menu:

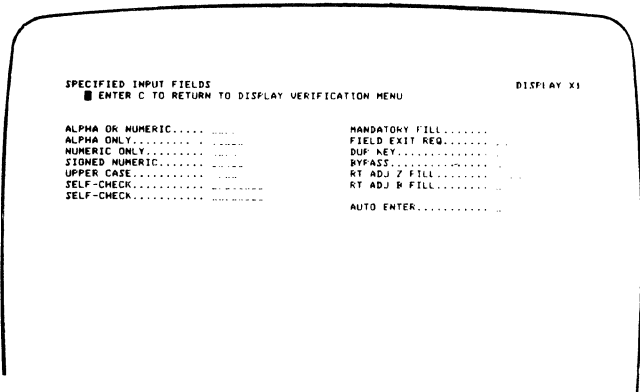
- 1. Press the C key.
- 2. Press the Enter key.



To select the Specified Input Fields option:

- 1. Press the 3 key.
- 2. Press the Enter key.

This display tests the controller operations that are used by the display station. Fields of information are entered, read by the controller, and written back to the display screen next to the input field.



To use this display:

- 1. Press the Spacebar once to position the cursor at the start of the first input field. The cursor moves from the field on the left to the field on the right when the input field information is entered.
- 2. Enter information in the fields described on the display screen. If an error is made, press the Error Reset key and correct the error.

The field descriptions are:

*Alpha or Numeric:* Key in five alphabetic or numeric characters.

*Mandatory Fill:* This field must be filled with five alphabetic or numeric characters.

*Alpha Only:* Key in five alphabetic characters.

*Field Exit Req:* Key in five alphabetic or numeric characters and then press the Field Exit key.

*Numeric Only:* Key in five numeric characters.

*Dup Key:* Press the Dup key once. The key code of the Dup key is shown until the screen is written by the controller. This field duplicates the Numeric Only field.

*Signed Numeric:* Key in four numeric characters. The cursor remains under the last character keyed. Press the Field Exit key (positive) or the Field- key (negative).

*Bypass:* This field is automatically bypassed and no entry is needed.

*Upper Case:* Key in five alphabetic characters.

*Rt Adj Z Fill:* Key in one alphabetic or numeric character. Press the Field Exit key. The character keyed is moved to the right (Rt) of the field and the left four positions will be filled with zeros.

*Self Check:* Key in A F 1 2 7 6 5 6.

*Rt Adj B Fill:* Key in one alphabetic or numeric character. Press the Field Exit key. The character keyed will be moved to the right (Rt) of the field and the left four positions are filled with blanks.



## 620 (continued)

**Self Check:** Key in A F 1 2 7 6 5 5.

**Auto Enter:** Key in five alphabetic or numeric characters.

As soon as the last character is keyed, the controller reads all the input fields, sends the information to the system, and writes the information back to the display screen next to the input fields.

To return to the Display Verification Menu:

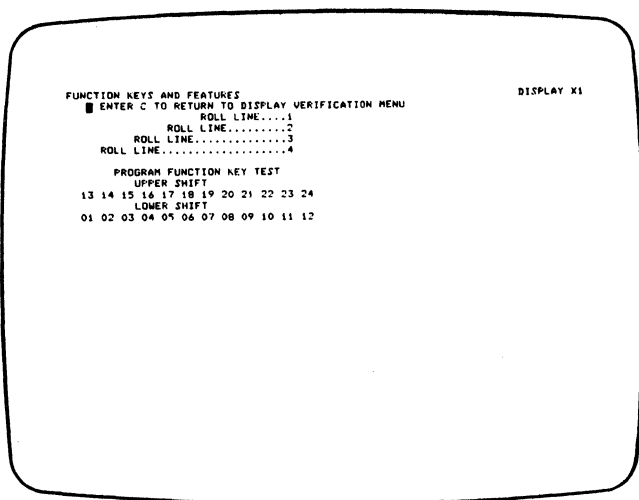
1. Press the C key.
2. Press the Enter key.



To select the Function Keys and Features option:

1. Press the 4 key.
2. Press the Enter key.

This display tests the roll keys and command function keys.



To use this display:

1. Press and hold the Upper Shift key while you press either the Roll↑ or Roll↓ key.
2. Observe roll lines 1, 2, 3, and 4. You can return lines that have rolled off the display screen by pressing the Enter key.
3. Observe the intensity of the numbers on the display screen while you perform step 4.
4. Press the Cmd key; then press command function key 1. Repeat until command function keys 1 through 12 have been pressed. Press the Cmd key again; then press and hold the Upper Shift key while pressing command function key 13. Release both keys. Repeat until command function keys 13 through 24 have been pressed.
5. Repeat step 4 to obtain a normal display of the numbers.

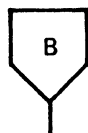
To return to the Display Verification Menu:

1. Press the C key.
2. Press the Enter key.

Return to the Prime Option Menu by:

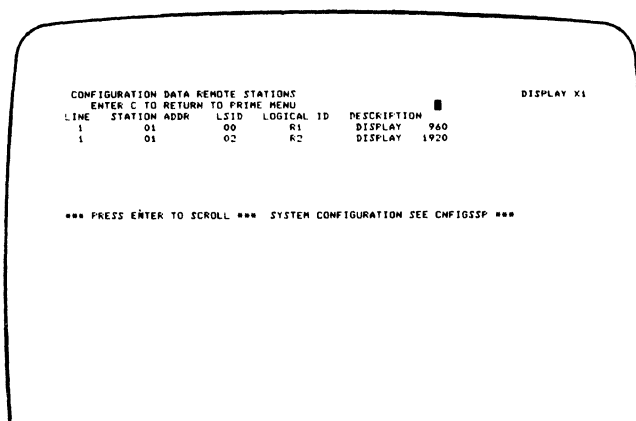
1. Press the C key.
2. Press the Enter key.

## 620 (continued)



To select the Configuration Data option:

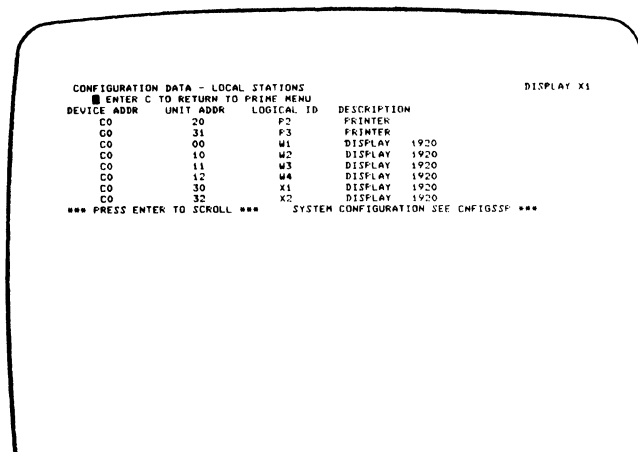
1. Press the 3 key.
2. Press the Enter key.



The following are descriptions of the configuration data for remote stations:

- Line is the communication line number that this display station is on.
- Station Addr is the address for the 5251 Model 2 or 12 controller. The station address permits the host system to address a specific Model 2 or 12 controller.
- LSID (logical session identifier) permits the host system to identify to the 5251 Model 2 or 12 controller which specific work station it wants to communicate with. The work station address is the last 6 bits of the LSID.
- Logical ID is the name the host system uses to address a specific work station.
- Description is the type of device being addressed.

Press the Enter key.



The following are descriptions of the configuration data for local stations:

- Device Addr is the address of the controller.
- Unit Addr is the address of the work station(s) assigned to the controller. The first digit is the physical port/cable number, and the second digit is the station address.
- Logical ID is the name the system uses to address the station(s) assigned to the controller.
- Description is the type of device being addressed.

To return to the Prime Option Menu:

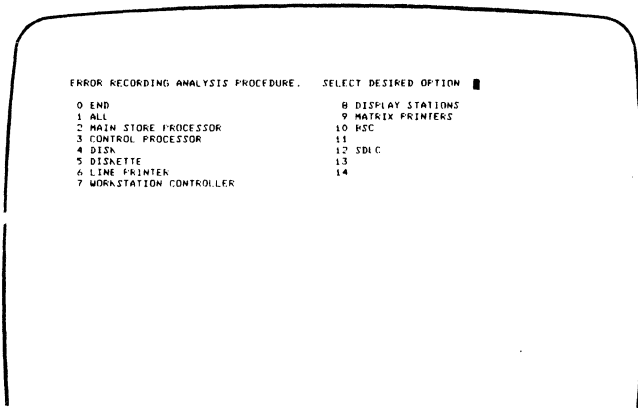
1. Press the C key.
2. Press the Enter key.



To select the Error Recording Analysis Procedure (ERAP) Menu:

1. Press the 4 key.
2. Press the Enter key.

**Note:** For a detailed ERAP description, see the system documents. For display station problem identification, see 640 *Error History Table* in this section.



**Note:** The format requires entering a two-digit option code. For example, to select ALL, enter 01.

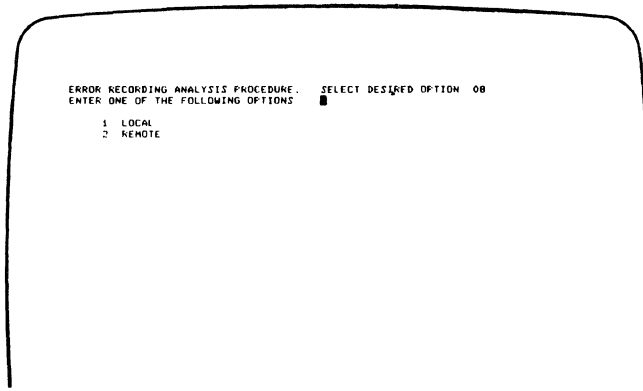
The following are descriptions of the ERAP options:

- If you select the END option, the ERAP function is terminated. If you select the END option and press the Field Exit key, the display returns to the sign-on menu.
- If you select the ALL option, the ERAP tables are displayed one at a time for all devices on the line. When the error history table for the first device is displayed and the Enter key is pressed, the I/O counter table for the second device is displayed. This sequence is repeated until the error history table for the last device on the line is displayed.
- If you select the Workstation Controller option, the Display Stations option, or the Matrix Printers option, you must also select a specific device. The I/O counter table, the error counter table, and the error history table are displayed for the selected device only.

This manual describes only the Display Stations option.

To select the Display Stations option:

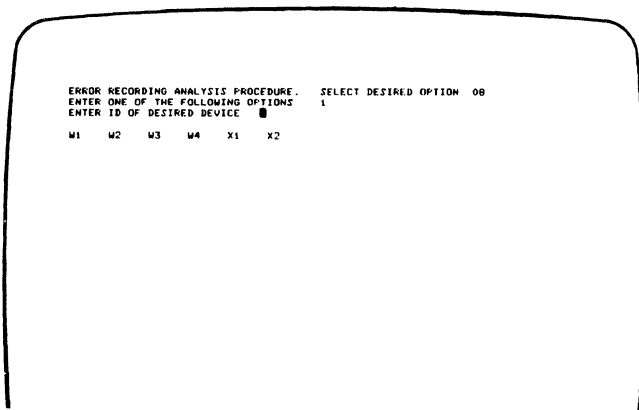
1. Press the 0 and 8 keys.
2. Press the Enter key.



#### Local Option

To select option 1 (local workstations):

1. Press the 1 key.
2. Press the Enter key.

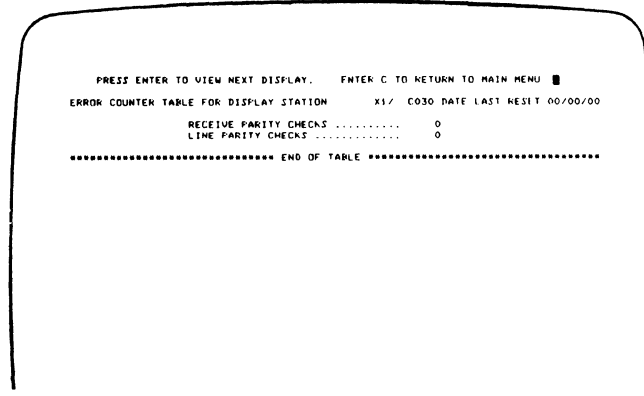
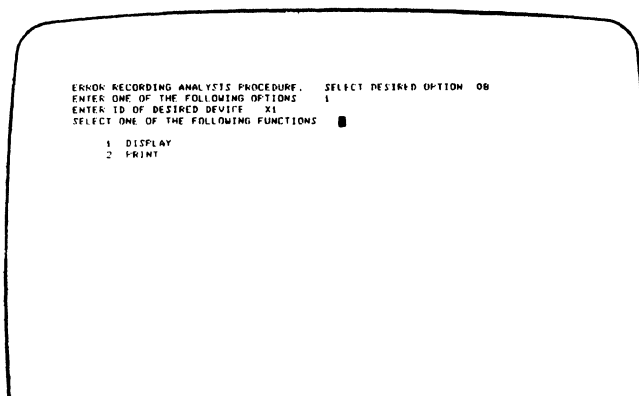


To select the desired device:

1. Key in the device ID.
2. Press the Enter key.

620 (continued)

Press the Enter Key.



If you want to look at the error tables on the display screen:

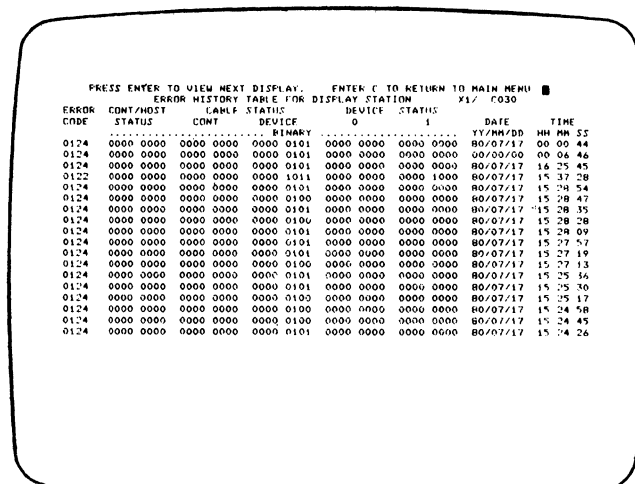
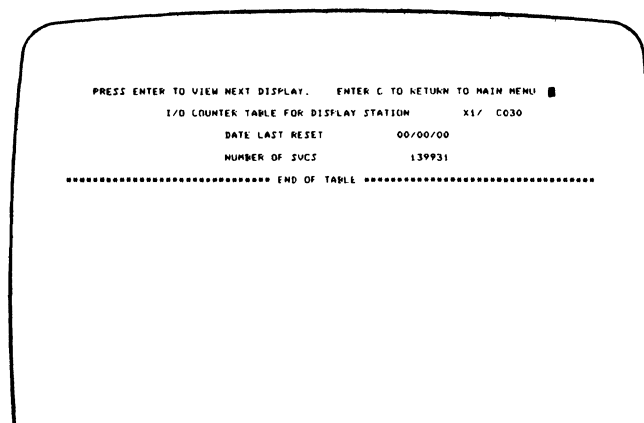
1. Press the 1 key.
2. Press the Enter key.

If you want a printout of the error tables:

1. Press the 2 key.
2. Press the Enter key.

The following three tables will be displayed again or printed again (in order) as many times as desired; you must press the Enter key after each table has been displayed or printed.

**Note:** For a description of the error history table, see 640.



Press the Enter key.

## 620 (continued)

To return to the main ERAP Menu:

1. Press the C key.
2. Press the Enter key.

### Remote Option

```
ERROR RECORDING ANALYSIS PROCEDURE.  SELECT DESIRED OPTION  ■
0 END                                8 DISPLAY STATIONS
1 ALL                                9 MATRIX PRINTERS
2 MAIN STORE PROCESSOR              10 BSC
3 CONTROL PROCESSOR                 11
4 DISK                              12 SDLC
5 DISKETTE                          13
6 LINE PRINTER                      14
7 WORKSTATION CONTROLLER
```

To select the Display Stations option:

1. Press the 0 and 8 keys.
2. Press the Enter key.

```
ERROR RECORDING ANALYSIS PROCEDURE.  SELECT DESIRED OPTION  08
ENTER ONE OF THE FOLLOWING OPTIONS  ■
1 LOCAL
2 REMOTE
```

To select option 2 (remote workstations):

1. Press the 2 key.
2. Press the Enter key.

```
ERROR RECORDING ANALYSIS PROCEDURE.  SELECT DESIRED OPTION  08
ENTER ONE OF THE FOLLOWING OPTIONS  2
ENTER ID OF DESIRED DEVICE  ■
R1  R2
```

To select the desired device:

1. Key in the device ID.
2. Press the Enter key.

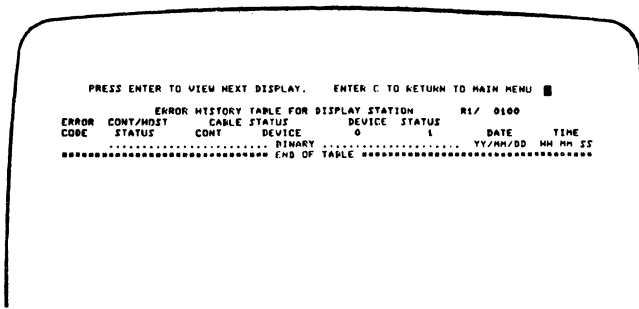
```
ERROR RECORDING ANALYSIS PROCEDURE.  SELECT DESIRED OPTION  08
ENTER ONE OF THE FOLLOWING OPTIONS  2
ENTER ID OF DESIRED DEVICE  X1
SELECT ONE OF THE FOLLOWING FUNCTIONS  ■
1 DISPLAY
2 PRINT
```

If you want to look at the error tables on the display screen; do the following:

1. Press the 1 key.
2. Press the Enter key.

If you want a printout of the error tables:

1. Press the 2 key.
2. Press the enter key.

**620** (continued)

To return to the main ERAP Menu:

1. Press the C key.
2. Press the Enter key.

To return to the Prime Option Menu:

1. Press the 0 (zero) key twice (00).
2. Press the Enter key.

To terminate the on-line tests:

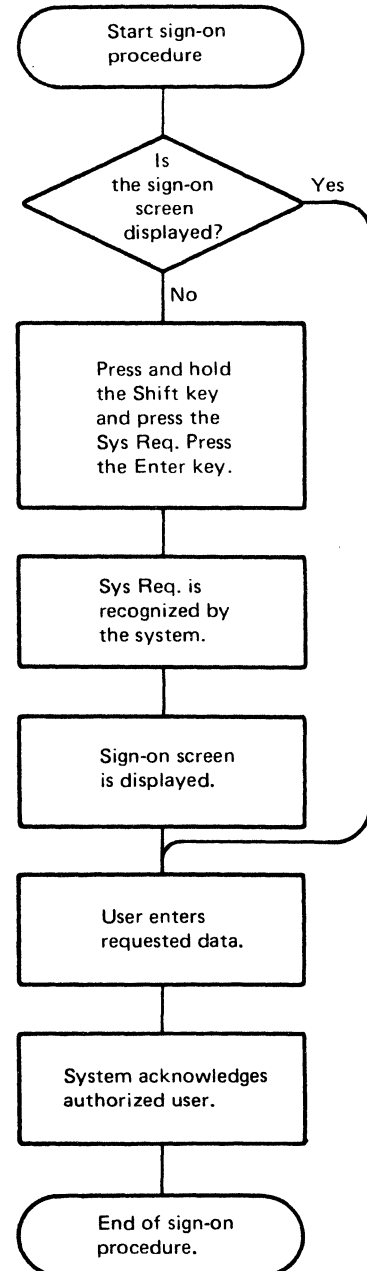
1. Press the C key.
2. Press the Enter key.

The sign-on screen should now be displayed. If not, ask the system operator to vary on the display station.

**630** Sign-On Procedure

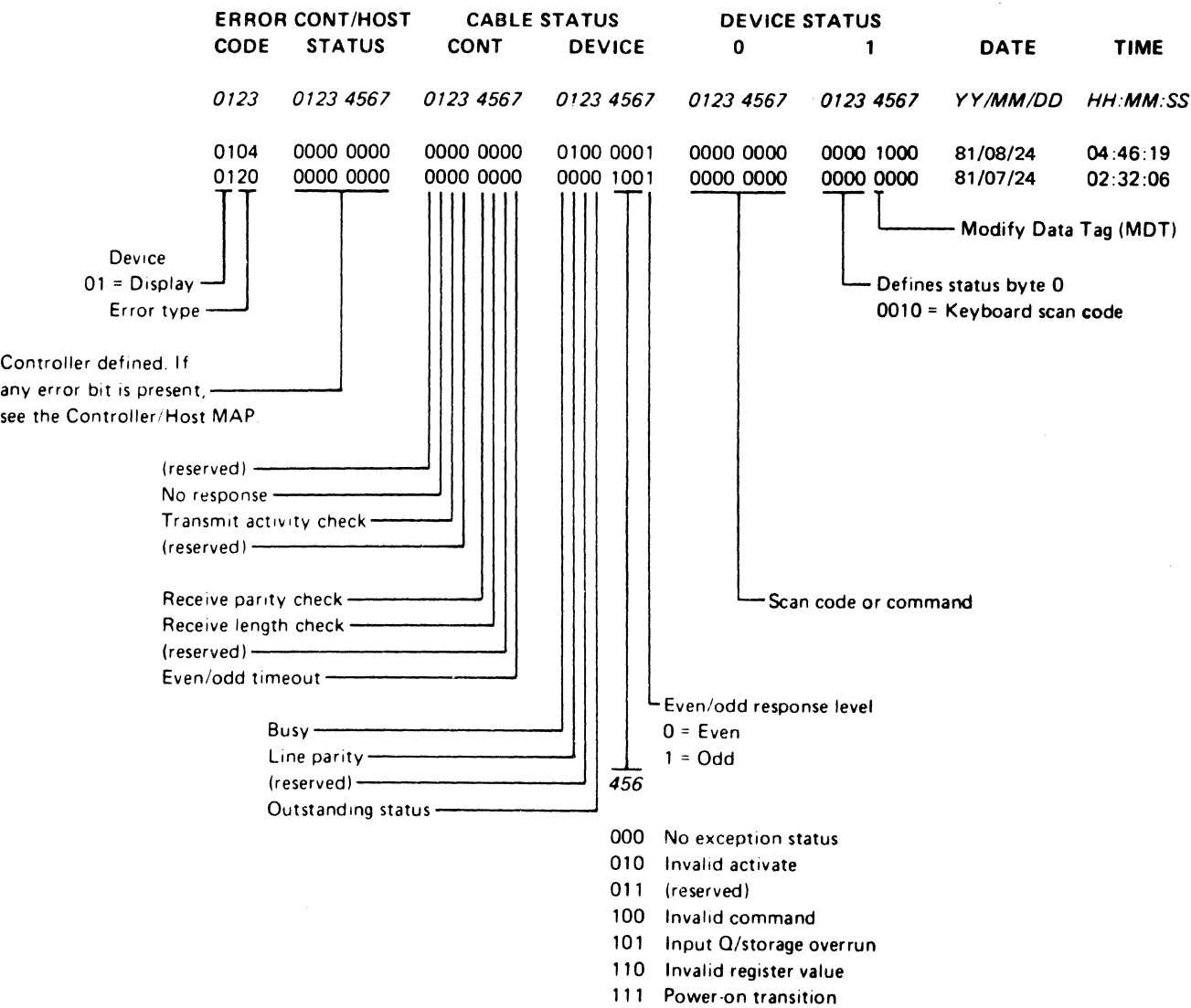
This is the procedure that the operator and customer engineer use to sign on and use the display station. It is also a check to verify that all parts of the display station, customer system cable, controller, and system are operating correctly.

The system initial program load (IPL) sign-on procedure must be completed before the display station sign-on procedure can be used.



640 Error History Table

This figure is an example of an error history table that describes the fields that can be displayed on the display station or printed on a printer.



**650** *Display Station Error Codes*

Errors that are relative to hardware failures or the servicing of a display station are listed first. The controller finds these errors by sensing the status sent from the display station or by sensing either no response or a wrong response. Errors are stored in the order in which they are received and are listed here in groups

*Line/Interface Errors***0100**    **No Response**

This error is reported when a display station and the controller are in session and the display station does not respond to a poll. This error is not normally logged.

**0101**    **Transmit Activity Check**

This error is found by the controller when a poll or command is executed by the controller.

**0103**    **Receive Parity Error**

The controller reports this error if the wrong parity was received in response to a poll or command.

**0104**    **Line Parity Check**

The display station reports this error if the wrong parity was received in a poll or command.

**0106**    **Receive Length Check**

The controller received the wrong number of bytes as a result of a poll or command.

**0107**    **Wrong Station Responded**

An incorrect station address was returned in response to a poll or other command from the controller.

**0108**    **Power-On Transition**

The power-on transition status bits are set when the display station is powered on. This error is reported only if the bits are set while the display station is in session.

**0109**    **Activate Command Failure**

The controller checked the device status and found that the busy bit was not on after an activate command had been sent.

*Keyboard Errors***0111**    **Scan Code Not Valid**

The eight-bit code sent in the keyboard response frame could not be translated to an assigned character or function that was specified by the controller.

*Command/Function Errors***0120**    **Command Not Valid**

This condition indicates that the poll or other command sent to the display station was not a valid command or that the device ID was not correct.

**0121**    **Register Value Not Valid**

This condition indicates that the address counter value was not within the user-accessible limits.

**0122**    **Storage or Input Queue Overrun**

This condition occurs if more than 16 commands and associated data frames are sent to the display station by the controller, or if an attempt is made to store data in storage that is not accessible to the user.

**0123**    **Null or Attribute Exception**

This condition indicates that no attribute was found or that the address counter pointed to an attribute.



0124    Activate Not Valid

This condition indicates that the activate command that was sent to the display station was not valid.

0125    Undefined Exception Status

This condition indicates that an undefined exception status was returned by the display station in response to a poll.

0149    Undefined Error Status

This condition indicates that the controller found an error but the cause of the error cannot be determined.

0182    Device Type Error

This condition indicates that an unrecognized device responded to a poll.

0183    Wrong Size Display Assembly

The CRT image size does not match the CRT image size set in the ID word sent by the display station.

0184    Incorrect Keyboard ID

The keyboard ID received by the controller was not correct.

0185    Incorrect Keyboard Specified

The keyboard ID received by the controller does not match the ID in the keyboard table in use for the display station.

0189    Invalid Outstanding Status

An outstanding status was sent in the poll response, and no outstanding status information was available.

*Time-Out Errors*

0190    Even/Odd Change in Status

This condition indicates that the status sent to the controller from the display station did not change within 225 milliseconds after the controller sent a positive acknowledgment and received a not busy response.

0191    Busy

This condition indicates that the controller found the busy bit had been on for a period of more than 400 milliseconds.

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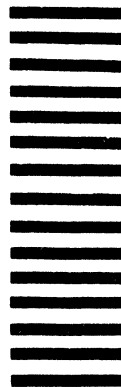
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