



Maintenance Library

3279 - S3G

Color Display Station
Models 2A, 2B, 3A, and 3B

Maintenance Information

SY33-0069-3
(Part 1)



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(Part 1)**

Preface

This publication contains the information needed to service and maintain the IBM 3279 Color Display Station Models 2A, 2B, 3A, and 3B.

Part 1 comprises the Maintenance Information and Parts Catalog.

Part 2 comprises the Maintenance Analysis Procedures.

If this machine is fitted with any RPQ features, any extra RPQ documentation can be found in a tray under the keyboard.

Fourth Edition, November 1981

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Safety Guidelines

If you are aware of the guidelines for working with electrical and mechanical equipment and practice these guidelines, you can work safely with this equipment.

You need not fear electricity, but you must respect it.

You should 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 this is a potential problem.
2. Remove all power before removing or assembling major components, working in the immediate area of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. Power supplies, pumps, blowers, motor generators, and other units with voltages which exceed 30 V ac or 42.4 V dc must not be serviced with power on when the unit is removed from its normal installed position within the machine, unless maintenance documentation clearly states otherwise. (This is done to ensure that proper grounding is maintained.)
4. Unplug the power supply cord whenever possible before working on the machine. The wall box switch when turned off should be locked in the off position or tagged with a DO NOT OPERATE tag (form Z229-0237). Be aware that a non-IBM attachment to an IBM machine may be powered from another source and be controlled by a different disconnect or circuit breaker.
5. When it is absolutely necessary to work on equipment having exposed live electrical circuitry, observe the following precautions:
 - a. Another person familiar with power off controls must be in immediate vicinity. (Someone must be there to turn off power if it should become necessary.)
 - b. Do not wear any jewelry, chains, metallic frame eyeglasses, or metal cuff links. (In the event of contact, there will be more current flowing because of the greater contact area afforded by the metal.)
 - c. Use only insulated pliers, screwdrivers, and appropriate probe tips/extendors. (Remember, worn or cracked insulation is unsafe.)
 - d. Use only one hand when working on energized equipment. Keep the other hand in your pocket or behind your back. (Remember there must be a complete circuit for electrical shock. This procedure helps eliminate a path that could complete a circuit through you!)
 - e. When using test equipment, 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.
6. Follow special safety instructions when working with extremely high voltages. These instructions are outlined in CEMs and the safety portion of maintenance documentation. Use extreme care when checking high voltage.
7. Avoid use of tools and test equipment that have not been approved by IBM. (Electrical hand tools [wire wrap guns, drills, etc.] should be inspected periodically.)
8. Replace worn or broken tools and test equipment.
9. After maintenance, restore all safety devices, such as guards, shields, signs, and ground leads. Replace any safety device that is worn or defective. (These safety devices are there to protect you from a hazard. Don't defeat their purpose by not replacing them at the completion of the service call.)

10. Safety glasses must be worn when:
 - Using a hammer to drive pins, etc.
 - Power hand drilling.
 - Using spring hooks, attaching springs.
 - Soldering, wire cutting, removing steel bands.
 - Parts cleaning, using solvents, chemicals, and cleaners.
 - All other conditions which might be hazardous to your eyes.
 11. Never assume that a circuit is deenergized. (Check it first.)
 12. Always be alert to potential hazards in your working environment (i.e., damp floors, nongrounded extension cords, power surges, missing safety grounds, etc.).
 13. Do not touch live electrical circuits with the surface of the plastic dental mirrors. The surface of the dental mirror is conductive and can result in machine damage and personal injury.
 14. Four steps that should be taken in the event of an electrical accident:
 - a. USE CAUTION - DON'T BE A VICTIM YOURSELF.
 - b. TURN POWER OFF.
 - c. HAVE SOMEONE ELSE GET MEDICAL HELP.
 - d. ADMINISTER RESCUE BREATHING IF VICTIM IS NOT BREATHING.
 15. Do not use solvents, cleaners, or oils that have not been approved by IBM.
 16. Lift by standing or pushing up with stronger leg muscles. This takes strain off back muscles. Do not lift any equipment or parts which you feel uncomfortable with.
 17. Each customer engineer is responsible to be certain that no action on his/her part renders the product unsafe or exposes hazards to customer personnel.
 18. Place removed machine covers in a safe out-of-the-way location while servicing the machine. These covers must be in place on the machine before the machine is returned to the customer.
 19. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
 20. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled up above the elbow. Long hair and scarves must be secured.
 21. Ties must be tucked in shirt or have a tie clasp (preferably non-conductive) approximately three inches from the end when servicing a machine.
 22. Before starting equipment, make sure that fellow CEs and customer personnel are not in a hazardous position.
 23. Maintain good housekeeping in the area of the machines while performing and after completing maintenance.
 24. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
- Prevention** is the key to electrical safety. You should always be conscious of electrical safety and practice *good habits* such as:
- Making certain that the customer's power receptacle meets IBM equipment requirements.
 - Inspect line cords and plugs. Check for loose, damaged or worn parts.
 - Before removing a component which can retain a charge from the machine, review the procedure in the maintenance documentation. CAREFULLY discharge the necessary components exactly as directed by the service procedure.
 - Do not use an ordinary lamp as an extension trouble light.
- Never **assume** anything about a machine or circuit. No machine is completely safe *all* of the time. The exact condition of a machine may be unknown. Here are some of the reasons why:
- The power receptacle could be incorrectly wired.
 - Safety devices or features could be missing or defective.
 - The maintenance and/or modification history may be uncertain or unclear.

- A possible design deficiency could exist.
- The machine may have suffered transportation damage.
- The machine might have an unsafe alteration or attachment.
- An EC or sales change may have been improperly installed.
- The machine may have deteriorated due to age or environmental extremes.

- A component could be defective, creating a hazard.
- Some component of the machine may have been incorrectly assembled.

Relating to safety, these are some of the ways the condition of the machine can be affected. **Before you begin a service call or procedure, exercise good judgment and proceed with caution.**

Electrical Accidents

Administering First Aid

In implementing rescue procedures in an electrical accident one must

- **Use Caution** If the victim is still in contact with the electrical source, it may be necessary to use the room EPO (Emergency Power Off) or disconnect switch to remove the electrical current. If the EPO or disconnect switch cannot be located, use a dry stick or another nonconducting object to pull or push the victim away from contact with the electrical equipment.
- **Act Quickly** If the victim is unconscious, he/she may need rescue breathing and possibly external cardiac compression if the heart is not beating.
- **Call Fire Rescue** (Rescue Squad, Emergency, Ambulance, Hospital etc.) Have someone summon medical aid.

Determine if the victim needs rescue breathing.

1. Make certain that the victim's airway is open and that it is not obstructed. Check the mouth for objects that may be blocking the airway such as gum, food, dentures or even the tongue. Position the victim on his back and place one hand beneath the victim's neck and the other hand on his forehead. Then lift the neck with one hand and tilt the head backward with pressure on the forehead from the other hand as shown in Figure 1.

2. Now you must **look, listen, and feel** to determine if the victim is breathing freely. Place your cheek close to the victim's mouth and nose to listen and feel for the exhaling of air.



Figure 1

At the same time, look at the chest and upper abdomen to see if they rise and fall. If the victim is not breathing properly, you should:

- a. With the head in a backward tilt as shown in Figure 1, continue to exert pressure on the victim's forehead with your hand while rotating this same hand so that you can pinch the victim's nostrils together with the thumb and index finger (Figure 2).

CAUTION

Use extreme care when administering rescue breathing to a victim that may have breathed in toxic fumes. DO NOT INHALE AIR EXHAUSTED BY THE VICTIM.

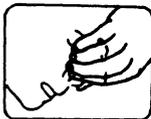


Figure 2

- b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim's mouth and blow into the victim's mouth (Figure 3).



Figure 3

- c. Remove your mouth and allow the victim to exhale while watching for the victim's chest to fall (Figure 4).



Figure 4

- d. Repeat this cycle once every five seconds until the victim breathes for himself or medical help arrives.

Reporting Accidents

It is a CE's responsibility to report all electrical accidents, potential electrical hazards, and "near miss" accidents to your **field manager**. Remember, a "near miss" accident might be the result of a design deficiency and prompt reporting will ensure that the situation will be resolved quickly.

It's important to report even a minor shock since the conditions which caused it need only be varied slightly to cause serious injury.

Cathode Ray Tube Safety

The primary hazard of CRTs is flying glass as a result of an implosion. The following sections deal with different phases of CRT SAFETY. All phases are equally important and negligence in any area could result in possible injury to an employee or customer.

Any additional information or variation from this information will be included under that specific unit's CEM/Service Aids.

Storage of Cathode Ray Tubes

1. Cathode Ray Tubes must be enclosed when received, transported, or otherwise moved from area to area. If they are shipped in a carton, they must be in the original carton or one of equivalent strength, and securely sealed to prevent accidental opening. Also,

original or equivalent packing materials and/or forms must be placed inside the carton to give the tube proper support and protection. If tubes are transported in a unit or piece of equipment, the equipment must be able to contain the glass fragments should an implosion occur.

2. CRTs should be stacked as per directions on manufacturer's carton. When in doubt, stack with faceplate (viewing surface) down. Cartons should not be stacked more than two high.
3. CRT storage areas will be away from normal flow of material handling equipment and pedestrian traffic. Also, storage areas must be dry to insure that cartons will not absorb moisture and collapse.

Maintenance and Installation

1. No one shall be permitted to install, adjust, maintain, replace, or handle high-vacuum tubes until he has reviewed this CEM.
2. Cathode Ray Tubes when received, transported, or otherwise moved from area to area should be completely enclosed in their original shipping carton and sealed.
3. When handling CRTs, personnel will wear safety equipment at all times. The required safety equipment is:
 - a. Safety Glasses - IBM Part 5715010
 - b. Long-Sleeved Garment.
4. Tubes under vacuum will not be permitted to remain out of their carton unless they are under test or inspection.
5. Avoid scratching or bumping any part of the tube because this may weaken the glass and possibly cause it to implode.
6. Prior to removal of any high-vacuum tube, discharge all stored potential which may exist on the tube's anode button or base socket pins and the capacitor in the high-voltage supply. (NOTE: *Some Cathode Ray Tubes contain a conductive coating on both the inside and outside surfaces to form a capacitor. Within some tubes, a second capacitive charge builds up following the original discharge. It is therefore important to discharge each tube a second time immediately before removal.*)
7. Do not handle Cathode Ray Tubes by the neck alone. The neck is the weakest part of the tube and is easily broken. Always handle tubes with two hands. If the CRT is shipped with a lifting strap, this strap should be used for the removal of a tube from, and placement of a tube into, the shipping container.
8. When inserting or removing tubes from equipment, they must be supported by the large end while carefully guiding the neck in or out of position. The lifting strap, if present, can be used in this process.
9. Avoid placing the tubes on a table or bench when there is any possibility of the tube rolling. If it is necessary to place a tube anywhere except in its special carton, a piece of felt or other soft material should be placed under it to prevent scratching the glass. Place larger tubes vertically on their faces, and not on their sides, to prevent the possibility of rolling.
10. When removing a tube from equipment, it should be enclosed in its shipping container as soon as possible to reduce the chances of breaking. Cathode Ray Tubes should be placed in the carton with the large face end up and the neck down. Be sure that the weight of the tube is not resting on the neck. The container should be sealed securely with strong tape and, to prevent tipping, turned over so the tube is positioned face down.

Disarming Cathode Ray Tubes

Field personnel should not disarm Cathode Ray Tubes. Tubes will be disarmed and disposed of in accordance with existing Environmental Protection Agency requirements at the plant of return.

Disposal of Cathode Ray Tubes

An Inventory/Distribution letter has been issued to the Branch Office with instructions on the disposal of CRTs.

July 14, 1980

Chapter 1. General Description and Locations

1.1 Introduction

The IBM 3279 Color Display Station is connected by a coaxial cable to the IBM 3274 Control Unit, or the IBM 3276 Control Unit/Display Station, or an Integrated Display Printer Adapter (IDPA) processor. The 3279 Display Station consists of a color display unit and an alphanumeric keyboard.

Four models of 3279 are available; 2A, 2B, 3A and 3B. Model 2 has 24 lines, each of 80 characters; Model 3 has 32 lines, each of 80 characters. An additional model 3279-2C is available as a system-control console, see *IBM 3279 Model 2C Color Display Console Maintenance Information, SY33-0090*. Models with an A-suffix can display four colors. Models with a B-suffix have highlighting and 7-color capability (ECS) and an additional font for APL/Text. Note that the 3276 Control Unit does not support models with a B-suffix, and that the IDPA supports only the model 2A.

Optional features include a selector light pen, a security keylock, and magnetic reader control (for

slot reader or hand scanner). Programmed symbols (PS2-two fonts, and PS4-four additional fonts) is an optional feature on model 3B.

Machines are available to operate from an ac supply of either 100 to 127 V (50 or 60 Hz) or 200 to 240 V (50 or 60 Hz). A battery is used to enable storage to retain convergence data when switched off.

1.1.1 Controls

1.1.1.1 Power On/Off Switch

This switch controls line voltage. Wait approximately 10 seconds after switching off before switching on again. This allows any stored fault conditions to reset.

1.1.1.2 Normal/Test Switch

This switch when operated takes the machine offline and into Test Mode.

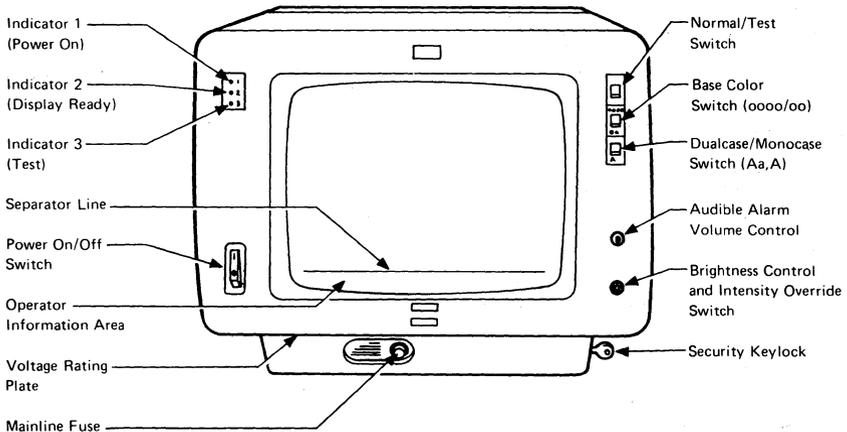


Figure 1-1. Controls and Indicators

1.1.1.3 Base Color Switch

When this switch is in the 'oo' position, the base colors blue and red are replaced by green and white respectively. The separator line and the operator information area remain blue. Green and white fields are not affected, nor are any fields controlled, by ECS.

1.1.1.4 Dualcase/Monocase Switch

When this switch is in the 'A' position, all alphabetic characters are displayed in uppercase.

1.1.1.5 Intensity Override Switch

This switch operates when the brightness control is turned fully counterclockwise. It sets the brightness circuits to maximum and the screen shows full rasters of red, blue, and green. See section 2.4 for details.

1.1.1.6 Audible Alarm Volume Control

This control sets the volume of the alarm.

1.1.1.7 Brightness Control

This control sets the brightness of the display.

1.1.1.8 Security Keylock

When in operation, this feature blanks the data area of the screen to prevent unauthorized access to the machine.

1.1.2 Indicators

1.1.2.1 Indicator 1 (Power On)

This indicates line supply and +5 V supply available. It does not confirm the availability of other voltages generated within the machine.

1.1.2.2 Indicator 2 (Display Ready)

This indicator lights when the display is unblanked, thus confirming that most of the analog circuits are operational. This condition occurs about 45 seconds after both deflection circuits are activated. The delay allows the CRT cathode time to warm up.

1.1.2.3 Indicator 3 (Test)

Indicator 3 Lights when Test Mode is selected.

1.1.2.4 Operator Information Area

The Operator Information Area is the row below the separator line, and displays characters that indicate the status of the 3279.

1.2 Display Unit

The display unit comprises a main enclosure assembly, a logic gate, and a bezel as shown in Figure 1-5. Field Replaceable Units (FRUs) are listed in the Parts Catalog.

The weight of the unit is approximately 27 Kg (58 lb) without keyboard.

1.2.1 Electrical Grounding

The ac ground and dc returns are electrically connected in the 3279 display unit. The coaxial cable return (shield) is isolated from the dc return at the 3279.

With the ac power cord disconnected, a correctly-wired unit should indicate continuity between ac and dc ground, and an open circuit between ground and the shield of the device coaxial cable.

See Figure 6-5 for a complete grounding diagram.

1.2.2 Equipment Lightning Protection

The 3279 is designed to provide a low-impedance energy path from the external coaxial cable shield to frame (ac) ground for potentials above 36 V.

Additional information on lightning protection requirements for the customer coaxial cable (customer responsibility) is provided in *IBM 3270 Information Display Station Installation Manual - Physical Planning*, GA27-2787.

1.2.3 Video Output Facility

This allows suitable monitors to display the contents of the 3279 screen (except for the separator line and Operator Information Area).

Red Video, Green Video, Blue Video and Sync signals are fed to individual coaxial sockets in the customer access area.

A sync polarity indicator and two switches (video control switch and sync polarity switch) are also provided in the customer access area.

1.2.3.1 Video Control Switch

This switch has three positions:

1. **Central position:** The monitor receives the same balance of color signals as the 3279 CRT.
2. **ENHANCE position:** The blue color of the monitor is brightened by the addition of a fifty-percent-green signal.
3. **TEST position:** The color signals to the monitor are internally connected to the 3279 CRT, thus allowing direct comparison of the two displays (except for the separator line and Operator Information Area).

1.2.3.2 Sync Polarity Switch

This switch is used to select either positive or negative sync pulses at the sync output socket. All devices attached at the same time will receive the same polarity.

1.2.3.3 Signal Test Indicator

This indicator lights when either

- The synchronizing signal is faulty,
or
- The Video Control Switch is set to TEST.

★ DANGER

Pins may be up to 250 V above ground potential
Use probe, IBM Part 1749249/1749250.

1	+12 V
2	±12 V Return
3	-12 V
4	103 V Return
5	103 V
6	Ground
7	Ground
8	LOPT
9	.LOPT Return
10	Line Input
11	● Line Test Point
12	Degauss
13	Degauss Return
14	● Neutral Test Point
15	Neutral Input
16	Ground

Test Points are shown as bullets (●)

Skip	26	1	Horizontal Sync
Skip ●	27	2	● Horiz Sync
Vertical Sync	28	3	● Vert Sync
-5 V	29	4	0 V form A3
Gnd from A3	30	5	● -5 V
+12 V LOPT	31	6	0 V to security keylock
- Display Ready	32	7	0 V to Color Sw
- Display Ready	33	8	
+5 V	34	9	0 V to A _a /A Switch
+8.5 V	35	10	0 V to LED Card
+8.5 V ●	36	11	
+5 V ●	37	12	"Power Good" (+5 V)
Gnd	38	13	Input Prohibited
+103 V	39	14	+103 V Return
Brightness Pot	40	15	+103 V
Intensity Override Sw 4	41	16	Brightness 3
Intensity Override Sw 1	42	17	Brightness 1
Brightness 2 To Color Balance	43	18	Intensity Override Sw 2
-135 V ●	44	19	Brightness 2
+6.3 V Return	45	20	Balance Pots Ret (-150 V/39 kΩ)
+70 V	46	21	
+6.3 V ●	47	22	Heater (6.3 V) Return
	48	23	+70 V to Video
	49	24	+70 V Return
	50	25	Heater (+6.3 V)

P3
Power Supply
Edge Connector
Pin Assignments

P4
Analog Card
Edge Connector
Pin Assignments

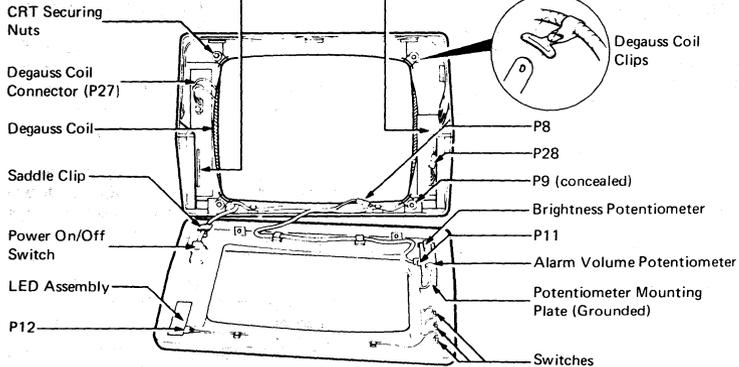


Figure 1-2. Display Unit - Front View with Bezel Removed

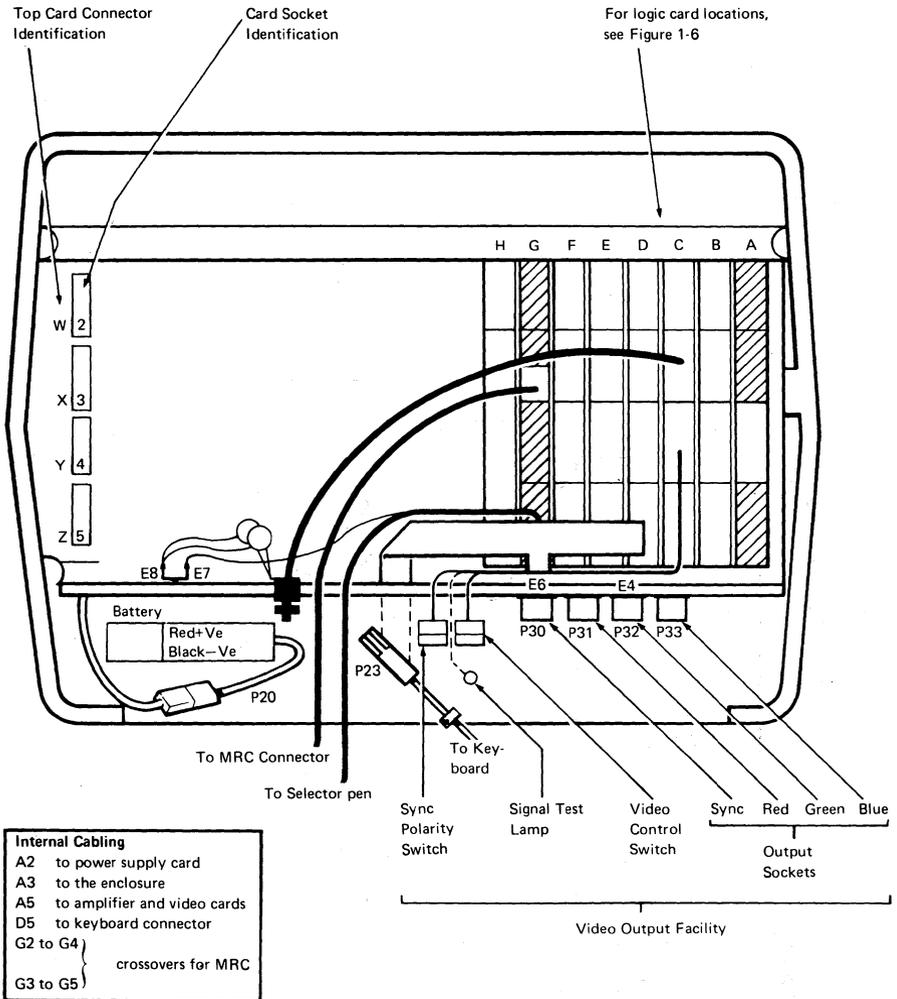
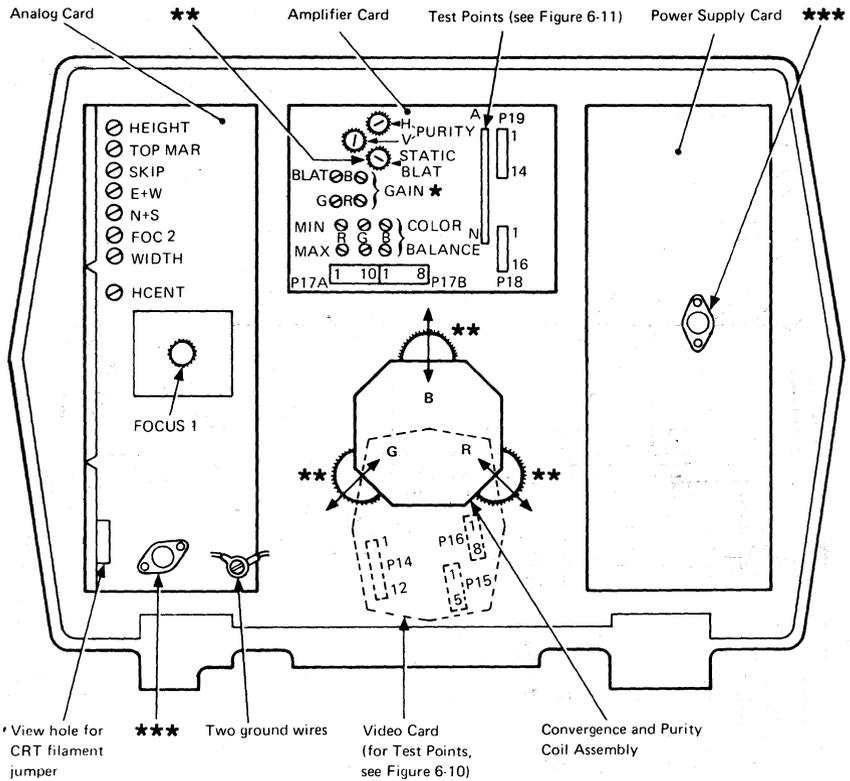


Figure 1-3. Display Unit - Rear View



★ Factory preset (some presets are only on early level cards)

** Four Static Convergence Controls

*** **DANGER** Ensure the insulated covers are in place on any transistor in these two positions as the cases are at dangerous potentials (1 kV pk)

Figure 1-4. Display Unit - Rear View, Open

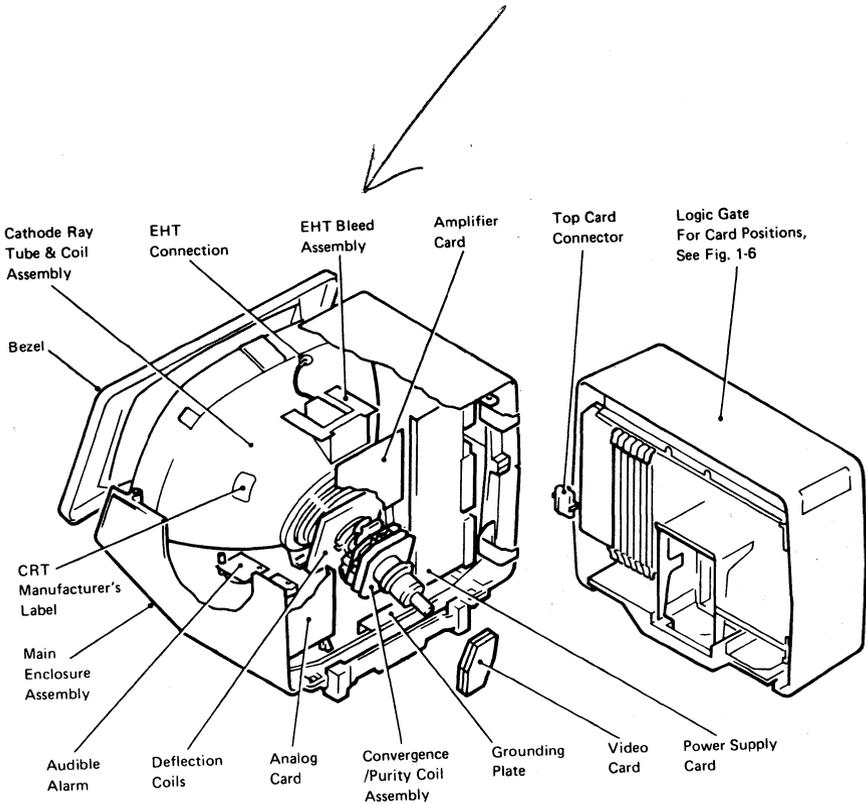
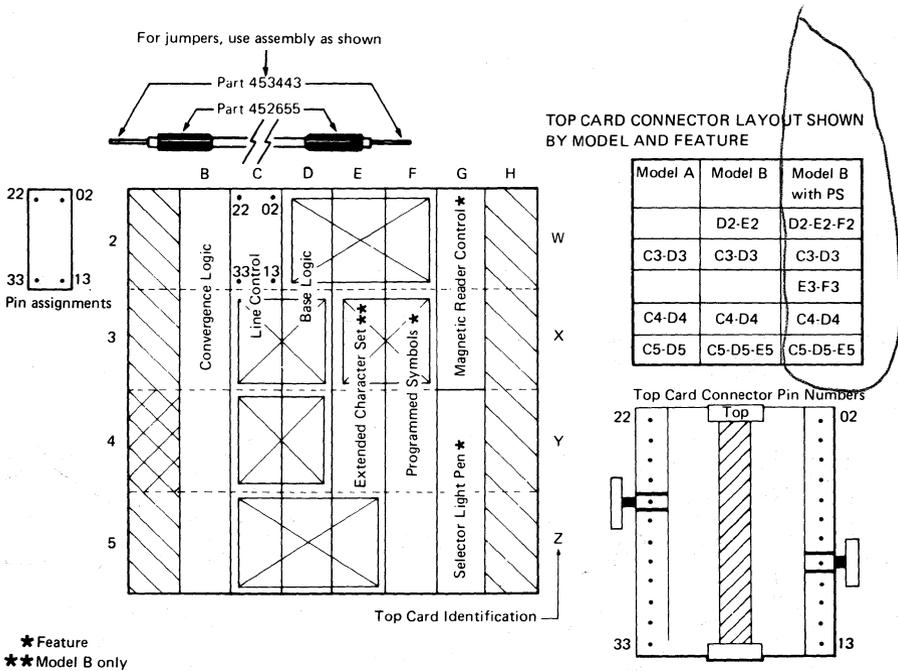


Figure 1-5. Display Unit - Interior View



Notes:

1. If Video Output Facility is installed, line control card is replaced by video output card.
2. When installing Top Card Connectors ensure that the longer (curved) pins are plugged into the card and the part number reads from top to bottom. Check that the cover and label have been installed correctly.

Figure 1-6. Logic Card and Top Card Connector Locations (card side).

1.3 Keyboards

1.3.1 Scan Codes

Pressing a key generates a seven-bit scan code that is presented serially to the control unit. The scan code for a specific key position is always the same. The control unit translates each scan code into the appropriate character or function.

1.3.2 Break Codes

Several keys, including the reset key, produce a second scan code (called a 'break code') as the key is released. The break code for the reset key is ignored by the control unit.

1.3.3 Keyboard Cable

This cable carries the control and data signals between the keyboard and the display unit. It also provides the +5 V supply for the keyboard (see Figure 6-12 for details).

1.3.4 System Upshift

System upshift cannot be selected from the keyboard; it is controlled by the application program and applies to all keyboard types. When the system is in upshift mode, the control unit (3274 or 3276), or IDPA, processes only specified characters. Characters other than those specified may be entered by an operator using the override capability.

1.3.5 Keyboard Type Identification

The keyboard logic card contains four pairs of pins that must be jumpered to indicate the type of keyboard (see Figure 6-11).

1.3.6 Keyboard Lock

The keyboard can be 'locked' (that is, keyed characters are ignored by the control unit). Specific data, for example a 'reset' scan code, may still be accepted.

The operator is made aware of keyboard lock by a change in the action of the keyboard clicker. The clicker normally clicks once for each key depression, but stops clicking after keyboard lock. If the operator has chosen to turn off the clicker for normal operation, then keyboard lock will cause it to click at each key depression.

An **X** is displayed in the Operator Information Area when the keyboard is locked.

1.3.7 Numeric Lock (Feature)

The numeric lock feature is selected by installing a keyboard jumper in position 1 of the keyboard ID jumper block. This feature limits the characters that can be entered into a numeric field to:

0 through 9
period (.) or comma (,)
minus (-)

The DUP key remains active. Depression of any other key while the cursor is in a numeric field causes the keyboard to lock with the symbol **X** **NUM** in the operator information area. Press RESET to clear the locked condition.

1.4 Tools and Test Equipment

The following tools and test equipment are required for maintenance of the 3279.

Item	IBM Part Number
Insulated probes*	1749249 and 1749250
General logic probe	453212
Miniprobe**	453718
GLP extension cable	453605
Keypot puller	9900373
Keylock retaining nut wrench	4418787
MRC test card	1742659
SLT jumper (3)	452655
SLT pins***	453443
Adjusting tool	1864853
Metric tools	1749235
Alignment mask	4423472
Isopropyl Alcohol	2200200
Lint-free cloth	2108930

* For use with standard CE meter

** This probe is for use on low voltage (up to 15 volts)

*** For use with jumpers on some top card connectors

1.4.1 General Logic Probe

To use the General Logic Probe (GLP), IBM Part 453212, set the switches as follows:

Technology	MULTI
Latch	NONE
Gate Ref.	GND

Power the probe from any D03 pin (red wire +5 V) and any D08 pin (black wire, ground). The ground lead on the probe tip must also be connected to a nearby ground.

Test GLP operation by probing on D03 and then D08.

Chapter 2. Maintenance Aids

2.1 Maintenance Plan

The maintenance plan for the 3279 assumes the use of:

1. Problem determination procedures (performed by the customer using the *Problem Determination Guide*, which is located under keyboard handrest).
2. The General Failure Index (GFI) (see MAP 0000) for simple symptoms.
3. The Maintenance Analysis Procedures (MAPs) (referred to in section 2.3) which comprise Part 2 of this manual.
4. Intensity override (section 2.4).
5. Offline test modes (section 2.5).
6. Online tests (section 2.6).
7. Adjustment procedures (see Chapter 5).
8. FRU removal and replacement (see Chapter 4). FRU locations can be found in the Parts Catalog at the back of this manual.

DANGER

Do not attempt to service FRUs under power outside the machine frame.

2.2 General Failure Index

This section has been moved to MAP 0000.

2.3 MAPs

This section also has been moved to MAP 0000.

2.4 Intensity Override

To engage intensity override, turn and hold the brightness control *fully* counterclockwise. Intensity override turns on the red, green, and blue electron-guns at maximum brightness.

When the Normal/Test switch is set to Test, the three rasters will be un converged (see Figure 2-1) unless the Test Mode 3 jumper (D2Y08 to D2Y09) is installed. Test mode checks analog and associated circuits.

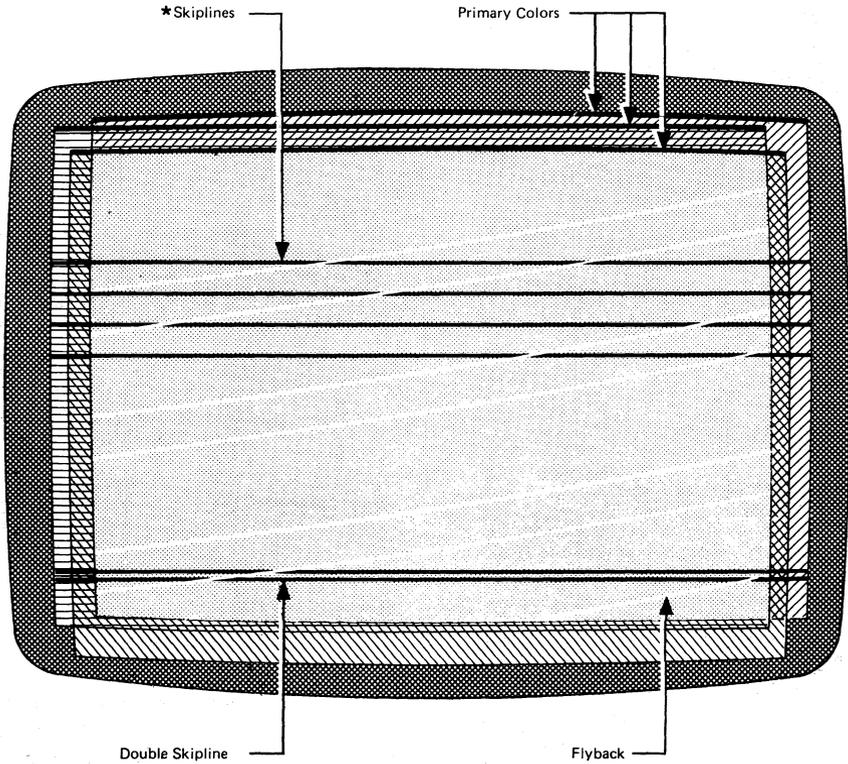
When the Normal/Test switch is set to Normal and the 3279 is connected to an active control unit, the red, green, and blue rasters should be converged. Skip and display geometry can be inspected.

2.5 Test Modes (Offline)

Note: When the display station is offline, the convergence correction circuits are not active. This will be obvious when more than one color is displayed.

2.5.1 Test Mode 1: Pattern

1. Set the Dualcase/Monocase (A,a/A) switch to A,a.
2. Set the Normal/Test switch to Normal and back to Test. The Test Mode 1 pattern is displayed.
3. Verify operation of Test Mode 1 by checking the displayed pattern carefully against the pattern shown in Figure 2-2. If the test fails, read MAP 0000 page 2 and then go to MAP 0100, Entry Point BB.



*At regular intervals across the screen on Model 2. Only the double skipline appears on Model 3. Each skipline appears as a dark line when converged.

Figure 2-1. Intensity Override (Test Mode)

2.5.3 Test Mode 3: Commands

Notes:

1. Use the keyboard diagram (Figure 2-3) to identify the keys listed below. Do not identify by keytop symbol (although the two may be identical).
2. **C** refers to the CONTROL key (see Figure 2-3).
3. When a single character is shown in the 'Results' column it will appear on the screen in the first position of the Operator Information Area (OIA) (bottom left hand corner). It is shown only when the result is important.

4. The display will be green unless specified otherwise.
5. If any action fails, recheck the test sequence and then exchange logic card C2, then D2, then read MAP 0000 page 2 and go to MAP 0100.

Perform the test in sequence (or the results are unpredictable) as follows:

Enter Test Mode 3 from Test Mode 1 or 2 by pressing the CONTROL key (Figure 2-3), or directly using a jumper - see section 2.7.

Step
(See Notes
1 & 2 above)

Press Keys

Result
(See Notes
3 & 4 above)

- | | |
|---|------------|
| 1 | C B |
| 2 | B B B |
| 3 | C |
| 4 | C J |
| 5 | C N |

$\bar{2}$
 $\bar{0}$
Test Mode 1 pattern is restored
See Keyboard ID table in Figure 6-11

Monocase Sw.		Security Keylock
A,a	A	
0	A	Not installed
&	Q	On (clockwise)
1	B	Off (counterclockwise)

- | | |
|----|---|
| 6 | C M A B C... |
| 7 | C D D D... |
| 8 | C C |
| 9 | C B W \bar{x} |
| 10 | C G A |
| 11 | C B O I |
| 12 | C B O Q |
| 13 | Set the Normal/Test switch to Normal and back to Test |
| 14 | C K 1 |
| 15 | 4 |
| 16 | 8 |

A B C... appear over cursor; cursor advances
Character over cursor is displayed at OIA first position and cursor advances

Line 1 displays $\bar{0}$ as far as 'a' two-thirds of the way along the line.
Display turns red.
Display mainly blue, some red remains.
Display turns green.

Cursor blinks.
Cursor is inhibited.
Cursor returns but display is inhibited.

<i>Step</i> (See Notes 1 & 2 above)	<i>Press Keys</i>	<i>Result</i> (See Notes 3 & 4 above)
17	0	Pattern returns to normal.
18	3	Cursor is blinking and reverse video.
19	2	Cursor is reverse video
20	<input type="checkbox"/> G G	Display contains all $\bar{0}$; reverse video cursor moves to OIA first position.
21	<input type="checkbox"/> G G	OIA fills with $\bar{0}$
22	<input type="checkbox"/> B U A	Cursor moves to start of line 2.
23	<input type="checkbox"/> E 5	Cursor moves to start of line 18.
24	<input type="checkbox"/> V	A
25	F	$\bar{5}$
26	<input type="checkbox"/> M 3 3 3 3 3 5 5 5 5 9 9	3333355559... appears on line 18.
27	<input type="checkbox"/> B W $\bar{\bar{}}$	
28	<input type="checkbox"/> S 3	Cursor moves to last '3' in line 18.
29	<input type="checkbox"/> B Q 9	Cursor moves to first '9' in line 18.
30	Set Normal/Test switch to Normal, then Test	

End of TEST MODE 3 SEQUENCE

2.6 Online Tests (Control Unit to Display Station)

<i>Test</i>	<i>Description</i>	<i>Refer to</i>
0	4-color test pattern	Section 2.6.2 and Figure 2-4
1	Error log for 3278/9	Section 2.6.3
2**	Control unit configuration data	MCM for the control unit
3	Status of attached devices	Section 2.6.4
4	Reset error log for 3278/9	Section 2.6.5
5**	Display control unit storage	MCM/MIM for the control unit
6*	Display key DCB information	MCM/MIM for the control unit
7	Operator convergence utility	See section 5.3.3
8**	7-color ECS/PS test pattern	See section 2.6.7 and Figure 2-7

* Not available on 3276 control unit.

** Not available on 3276 control unit or IDPA.

2.6.1 Running Online Tests

1. If the 'READY' symbol is not displayed in the OIA, set the Normal/Test switch to Test and back to Normal.
2. Hold down the ALT key, press the TEST key, and release both keys. TEST appears in the OIA.
3. Key in pp/n and press ENTER. (pp is the port number, 0-31, of the device to be tested or reported upon, and n is the number of the test.)

Notes:

- a. If pp is omitted the test is run on the requesting terminal.
 - b. The / must always be keyed in.
 - c. If n is omitted, test 0 is run.
4. To end the online tests:
Hold down the ALT key, press the TEST key, and release both keys. TEST disappears from the OIA.
 5. Error Indicators. (Press RESET to continue.)

- a. ✘ -f (Do not enter, Function not available) ... you tried to select an in-session terminal for Test 0.
- b. ✘ 1#? (Do not enter, Op check, What number) ... you used an invalid test number, or address, or wrong test format. (Begin test format at position 0 and use only one slash / and no spaces).

Note: ✘ c-f will appear instead if connected to an IDPA.

2.6.2 Test 0

2.6.2.1 Routines Only for Terminals Connected to IBM 3276 Controllor

The IBM 3276 control unit precedes the main test with two transmission test routines.

Note: Before going to a specific MAP reference, read the danger notice at the start of MAP 0000.

Test 0 - Routine 1 (3276 only)

This routine verifies the basic TA (Terminal Adapter) card functions - register, SERDES, command decode, and so on. Driver/Receiver

operations are not tested. If an error occurs, the test stops. See *IBM 3276 Control Unit Display Station Maintenance Information Manual*, SY18-2004.

Test 0 - Routine 2 (3276 only)

This routine is the Link test. It verifies the communications link by issuing reset and receiving a POR response. If an error occurs, the test stops. Read MAP 0000 page 2 and go to MAP 0100, Entry Point CC.

2.6.2.2 Four-color Pattern Test

This test is used to verify the following:

- The correct control of a field by the field attribute byte.
- The 3279 alarm.
- The interaction of the 3279 with the control unit or IDPA.
- The action of the 0000/oo switch.

To run test 0, see section 2.6.1.

1. Ensure the 0000/oo switch is set to 0000.
2. The alarm sounds when one of the patterns in Figure 2-4 appears.
3. Verify that the red and blue fields become white and green when the 0000/oo switch is changed to oo.

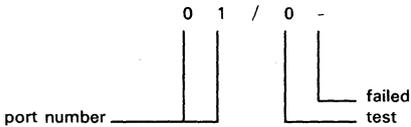
If this test fails read MAP 0000 page 2, and go to Map 0500 entry point A.

4. Reset the 0000/oo switch to 0000.
5. The pattern appears on the device connected to port number pp.

6. If the test request was to a different display, a suffix is appended to the request message.

Suffix	Meaning
+	Successful
-	Control unit or coaxial device cable failure
0	Display powered off

For example:



Control Unit Identifier
(I = IDPA)

Port

```
TEST: nnnn;pp
?SEL PEN SEL PEN
&SEL PEN >SEL PEN
DISPLAY INSERT CK
```

White
Intensified
Protected

Red
Intensified
Non protected

Green
Non protected

White
} Attributes only

NON precedes DISPLAY but is a non display field that is visible only if the blanking fails.

All other fields in the test patterns are blue and protected. See Figure 6-17 for attribute bits.

Figure 2-4. Online Test 0 Pattern

2.6.2.3 Interactive Test

This test permits a visual display of the operation of the keyboard, selector pen, and MRC with the control unit or IDPA.

*Action**Results*

1. Ensure that the A,a/A switch is set to A,a.
2. Move the cursor under the C of the CK field.
3. Press the insert (â) key. ^ appears in the OIA.
4. Press keys J K L. ✕ > appears in OIA and the field in the fourth line becomes jkCK.
5. Press RESET. ✕ > and ^ are erased.
6. Test the Sel Pen feature.
(You may simulate the Sel Pen by using the cursor and the cursor select key):
 - a. Touch the pen on ?SEL PEN field on the second line.
(If ✕-f appears in OIA, press RESET and retry with increased brightness.)
The second line becomes: >SEL PEN SEL PEN
 - b. Repeat step a. The second line becomes: ?SEL PEN SEL PEN
 - c. Touch the pen on >SEL PEN field on the third line.
The third line becomes: &SEL PEN ?SEL PEN
 - d. Repeat step c. The third line becomes: &SEL PEN >SEL PEN
7. To test the MRC feature:
Move the cursor to the first position in the fifth line (line below the test pattern), and pass the MRC test card through the reader.
If the read operation is successful, the cursor moves a number of positions equal to the number of characters on the MRC test card; the green light on reader turns on, and ✕-f is displayed in the OIA.
If the read operation is unsuccessful, the red light on the reader turns on; press the reset key and repeat the test from Step 7.

Failure In	Read MAP 0000 Page 2 Then Go to MAP
Keyboard	0700 Entry Point A
Sel Pen	0800 Entry Point DD
MRC	0800 Entry Point EE

2.6.3 Test 1: Error Log

Online Test 1 allows the error log for any device attached to the control unit to be inspected. It may be useful to reset the error using Online Test 4 before testing, but note the contents of the log before doing this.

To run Test 1, see section 2.6.1.

2.6.3.1 Online Test 1 Display: 3274 Control Unit or IDPA

```
pp/1
05XX  XXXX
XXXX  XXXX  XXXX
```

Figure 2-5. Test 1 Pattern

The most recent 3279 display error code appears in the first two digits on line 2. This code is prefixed by '2' when it appears in the operator information area.

For example, an error code of 205 (X 42 205) is logged as '05'.

3274 error codes for the 3279 display are listed in Figure 2-8.

2.6.3.2. Online Test 1 Display: 3276 Control Unit

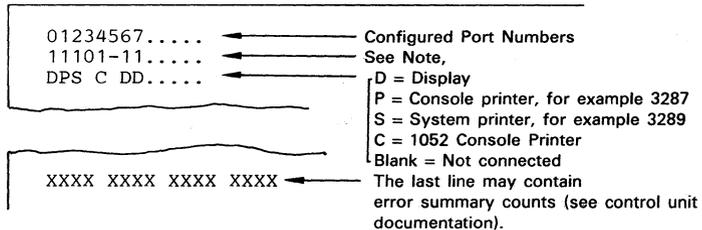
The pattern shown below is displayed. This is different from the 3274 because ALL errors are recorded and a count is kept.

Note that the 3276 error code is the same as that displayed in the OIA. For example: X 42 is logged as 42.

```
*** YY ***
0X  xx  --  xx  --  xx  --  ...
1X  --  xx  --  --  --  --  ...
2X  --  --  --  --  --  xx  ...
3X  xx  --  --  xx  --  --  ...
4X  --  --  03  --  --  --  ...
5X  --  --  --  --  --  --  ...
6X  --  --  --  --  --  --  ...
7X  --  --  --  --  --  --  ...
8X  --  --  --  --  --  --  ...
9X  --  --  --  --  --  --  ...
```

The above example shows that error code 42 (keyboard overrun) has occurred 3 times. For error code interpretation, see Figure 2-9.

2.6.4 Test 3: Status Summary



Notes:

Line 2 symbols refer to line 1 port numbers as follows:

- 1 Attached device has power on.
- TA card failed, or device is disabled because of control unit/IDPA detected error.
- 0 No TA card is installed, or the device has power off, or no device is attached to this port.

Figure 2-6. Test 3 Pattern

Test 3 gives data about each display unit attached to the control unit/IDPA.

To run Test 3, see section 2.6.1.

2.6.5 Test 4: Error Log Reset

Test 4 resets the error log. Its operation can be verified with test 1. A '+' response indicates that the Reset operation was successful.

To run Test 4, see section 2.6.1.

2.6.6 Test 7: Operator Convergence Utility.

See section 5.3.3 to use this test.

2.6.7 Test 8: 7-Color and Programmed Symbols (PS)

To run Test 8, see section 2.6.1. The pattern shown in Figure 2-7 is displayed.

If Extended Character Set (Models 2A and 3A) is not installed, the symbol ✕ †#? appears in the OIA and the test will not run.

If Test 8 fails, read MAP 0000 page 2 and go to MAP 0800, Entry Point CC.

3274 Code	Repair Action (3279 logic card)	Error Code Explanation
202	D2.	Control unit keystroke/status buffer overflow
203	D2, then features then B2.	Feature Bus error
204	D2, or C2.	Storage error (Device Check)
205 *	D2, then C2, then features.	Unsupported feature attached
206	D2, then B2, then features.	Incorrect feature response on initialization
207 *	D2, then C2.	Lost Operation Complete this display
208	D2, then C2.	Invalid (unexpected) Operation Complete
209	D2, then C2.	Command queue failure
210 *	Keyboard ID jumpers, then cable, then D2.	Invalid keyboard attached (not configured)
211 *	D2, then features.	Invalid status received
212 *	Keyboard logic, then cable, then D2.	Invalid scan code received
222	G4, (selector pen), then D2, then C2.	Invalid selector pen status or command queue failure
223	E2, then D2.	ECS buffer parity error
224	G2 (MRC), then D2.	Invalid MRC status or command queue failure
225	E2, then D2.	ECS status/initialization failure
226	E2, then D2.	ECS command queue failure
227	E2, then D2.	ECS write alternate command queue failure
228	B2, then D2, then C2.	Storage parity error
229	B2, or D2, or C2.	Storage parity error
234	E2.	Switches not set to include APL
295	D2, then C2.	Invalid type A adapter status
299	D2, then C2.	Non-command queue cycle sharing machine check
2% % }		Not customized for attached features
2EE		

- * Do the control unit and the customization support the 3279 features?
Check ECS card switches, PS jumper, and keyboard jumpers (see Figure 6-14).

Note: For other error codes, see control unit or installed RPO documentation.

Figure 2-8. Error Codes From IBM 3274 Control Unit

3276 Code	Repair Action (3279 logic card)	Error Code Explanation
41	Keyboard logic, then cable, then D2.	Invalid scan code received
42	Keyboard logic, then D2.	Keyboard overrun
43	G2 (MRC), then D2.	MRC data parity error
44	G4 (selector pen), then D2, then C2.	Selector pen data parity error
45	G2 (MRC), then D2.	No response from MRC
55	B2 then D2, then C2.	Storage parity error
56	B2 then D2, then C2.	Storage parity error
60	G2 (MRC), then D2.	MRC timeout
61	G4 (selector pen), then D2, then C2.	Selector pen timeout
70	C2, then coaxial cable, then D2.	No response from terminal (timeout)
71	C2, then coaxial then D2.	Adapter receive parity error
72	C2, then D2.	Data parity error
73 *	D2.	Lost Operation Complete this display
74	D2, then features.	Feature timeout
77	D2, then C2.	Device check (buffer parity)
78	D2, then C2.	POR signal error

- * Do the control unit and its features support the 3279 features?
Check ECS card switches, and keyboard jumpers (see Figure 6-14).

Note: For other error codes, see control unit or installed RPQ documentation.

Figure 2-9. Error Codes From IBM 3276 Control Unit

2.7 Jumper Positions

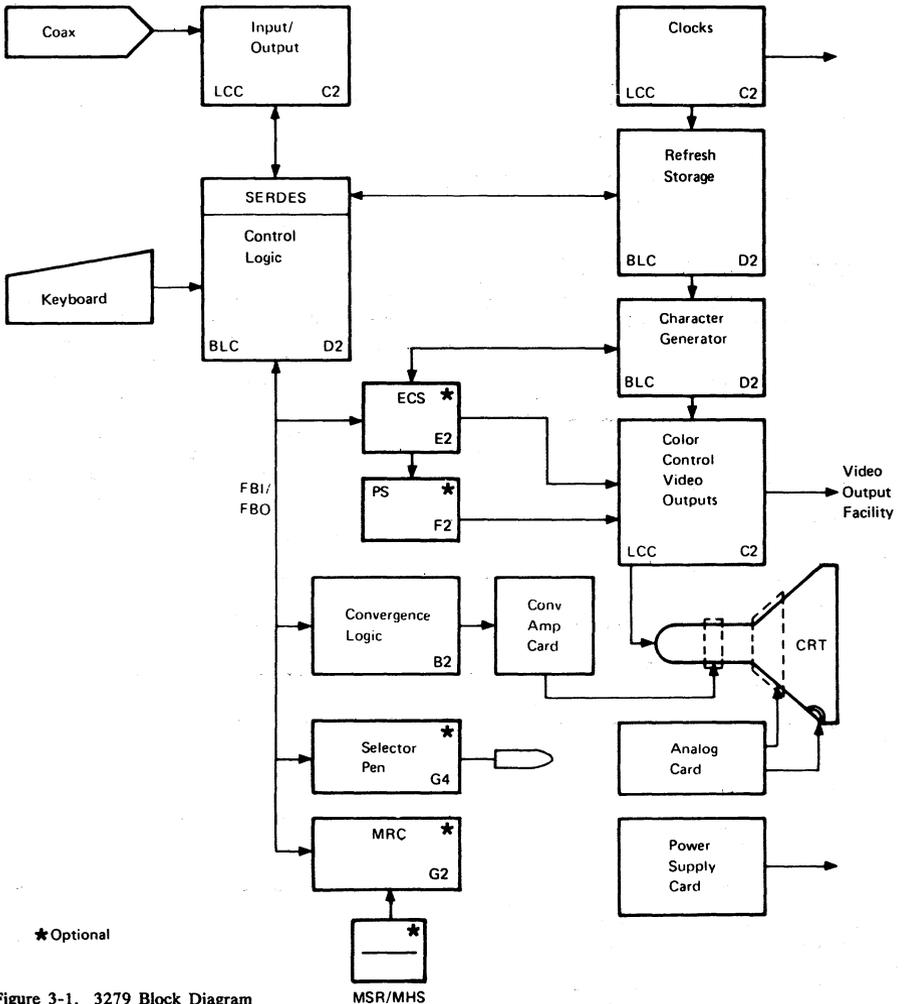
A number of jumper positions are available to aid display adjustments and fault-finding.

The positions and their uses are listed below. Note that *every* jumper position is activated when grounded. A recommended ground pin is listed.

<i>Name</i>	<i>Pin</i>	<i>Ground</i>	<i>Use/Description</i>
Force White	C2W07*	C2W28	All characters on the screen become white. Good test of convergence over whole screen, used to set up static convergence (at screen center).
Color Balance Bars	C2W09*	C2W28	A number of colored bars, 2 characters high, are displayed (must be characters on screen). Color balance.
Reverse Video	D2Y02*	D2Z04 or E2Z04	All characters are reversed. Used to check purity.
CE Jumper	D2Y09*	D2Y08	When the Normal/Test switch is set to the Test position, this jumper allows entry directly to Test Mode 3 without resetting the refresh buffer. Nulls display, attributes are blank, and red and white are interchanged.
Pen Detect Lines	D2Y10*	D2Y08	Displays selector pen detect lines.
Storage Power	B2B08	B2D08	Removes power from storage to force a convergence check. Used in setting up convergence.
Force Characters	C2G06	D2J08	Easy method of filling screen with characters when online to check overall convergence.
Disable Skip	C2J04	D2J08	Inter-row skip (Mod 2 only) is disabled. Separator line moves up. Used when adjusting image height.
Force Green	C2S11	C2U08	Green video is forced permanently on. Used to check green video amplifier and gun.
Force Blue	C2S12	C2U08	Blue video is forced permanently on. Used to check blue video amplifier and gun.
Force Red	C2U11	C2U08	Red video is forced permanently on. Used to check red video amplifier and gun.

*See Figures 1-6 and 6-3 for top card connector pin numbering.

Chapter 3. Functional Components



★ Optional

Figure 3-1. 3279 Block Diagram

3.1 Power Supply

The power supply switches the line voltage at high frequency using pulse width modulation.

The modulated voltage is fed to the primary windings of a power transformer. The outputs from the secondary windings are rectified to produce the following voltages:

<i>Voltage (V dc)</i>	<i>Tolerance (± %)</i>	<i>Max. Ripple (V pk-pk)</i>
+103	6	0.7
+12	10	0.4
-12	10	0.4
+8.5	10	0.26
+5	10	0.15
-5	10	0.15

The transformer incorporates a feedback winding to control the pulse width and hence the output voltages.

A signal from the analog card (LOPT sense) locks the power supply oscillator to the line timebase frequency, to eliminate interference on the display caused by the high frequency modulation. This signal also indicates to the power supply an overvoltage condition on the analog card.

If either the overvoltage or the overcurrent protection mechanism shuts down the power supply, it retries up to seven times, approximately once per second and the 'POWER GOOD' indicator light 1 flashes at this rate, provided that the failure is not on the +5 V line. An audible click may be heard from the supply at each retry by listening near the ventilation slots above the power supply card.

A fuse is located on the power supply card. If it fails, the power supply card must be exchanged.

3.2 Analog Card

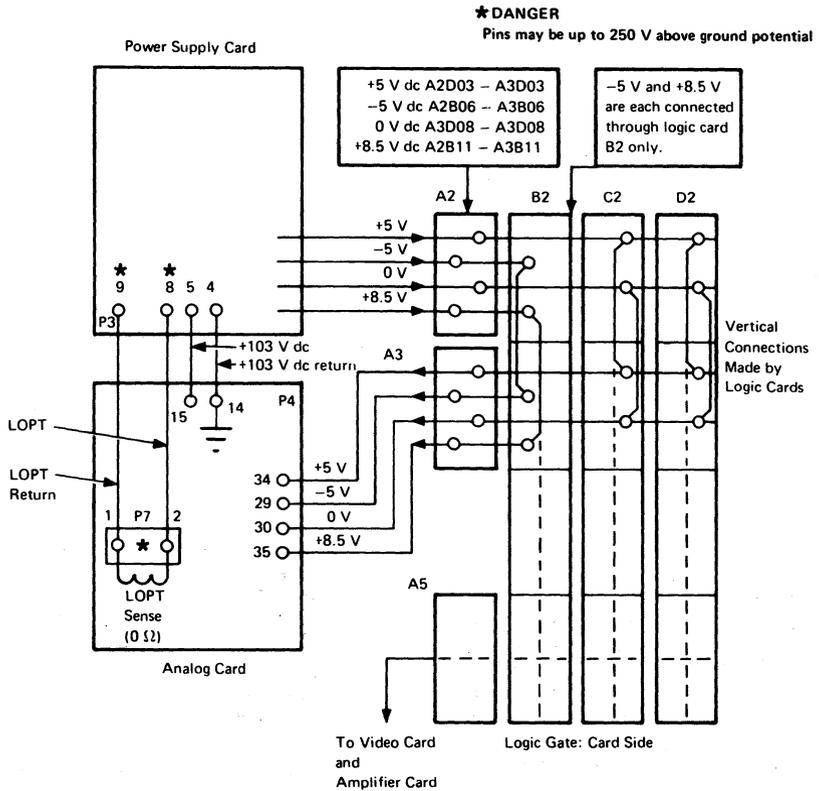
The analog card generates horizontal and vertical drives for the CRT scan coils and includes the extra-high-voltage (EHT) power supply. When the logic is supplying horizontal and vertical synchronizing signals, the timebases on the analog card lock to the imposed frequency.

The line output transformer (LOPT), in the horizontal drive circuit, provides the following supplies:

<i>Voltage (V dc)</i>	<i>Where Used</i>
+25	- On-card use, deflection amplifiers
-25	- On-card use, deflection amplifiers
+12	- On-card use and card B2
+70	- To video card
-150	- Through brightness control, amplifier card, and color balance controls to CRT grid
+280 to +450	- Focus circuits and CRT anode
+6 kV	- Focus circuits
+6.3	- CRT filament (see Figure 6-7)
+25 kV	- EHT supply to CRT

The analog card receives a further signal ('skip'), which forces the raster to move vertically a defined amount (see Figure 2-1).

To start up, the analog card requires ± 5 V dc, +8.5 V dc, and +103 V dc. When the power is turned on the horizontal drive circuit starts and produces the additional supplies. These enable the vertical drive circuit to start and this initiates a delay. After 45 seconds DISPLAY READY (indicator 2) turns on and a change in CRT grid voltage unblanks the screen.



See Figure 6-4 for voltage pins on Planar strips

Figure 3-2. Power Supplies to Logic Gate and Analog Card

3.3 Amplifier Card and Inputs

3.3.1 Convergence Circuits

The convergence amplifiers drive the convergence coils, which provide the necessary correction for all points on the screen to the three beams (see Figure 3-3).

The current in the convergence coils is controlled by data in a store which is read in step with the scanning of the screen. The data in this store may be altered by the operator to compensate for CRT ageing.

As data in the convergence store in the display is lost when power is turned off, the convergence store is supported by battery-maintained storage. When the 3279 display is switched on, the convergence logic card B2 generates a 'power on reset' to the logic. This resets most registers and sets the status to 'power on reset'. The next poll from the control unit to which the 3279 is connected detects the status and then reads the

data from the battery-maintained storage and processes it to set up the correct data in the convergence store. This is normally complete before the screen unblanks. The power on procedure also occurs when the Normal/Test switch is returned to Normal.

When the operator uses the convergence procedure in the online tests, the data in the battery-maintained storage is modified and the convergence store is updated.

Note that the convergence control circuits are packaged on two cards (see Figure 3-3):

- Logic card B2, (4Wx3H) carries the volatile and non-volatile stores and the logic.
- The amplifier card receives four convergence analog signals from the logic card and amplifies these to drive the convergence correction coils.
- The amplifier also may contain gain controls that are factory-preset.

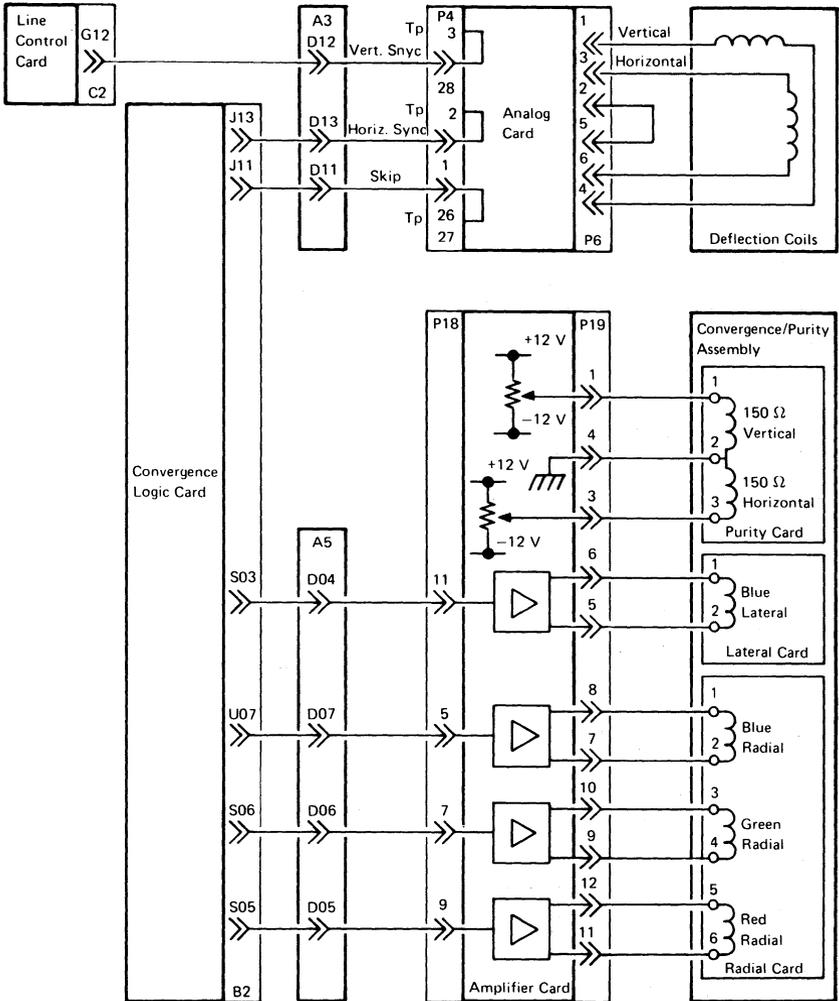


Figure 3-3. Synchronization, Convergence, Purity, and Deflection Coil Connections

3.3.2 Color Controls

Also located on the amplifier card are the six color-balance potentiometers. These receive a voltage of between -150 V dc and 0 V from the brightness control and work in pairs to set the minimum and maximum brightness levels for each color.

Two more potentiometers allow color purity adjustments.

3.4 Video Card

The video (tube neck) card receives the three video signals and amplifies them to drive the CRT cathodes (see Figure 6-7). The CRT filament supplies, the anode supply, and the grid (brightness) voltages go through this card to the CRT pins. The focus supply is wired directly to the CRT socket.

3.5 Cathode Ray Tube and Coil Assembly

The human eye contains detectors for red, green, and blue light. These are the 3 primary colors. Other colors (and white) are seen as mixtures of these. The screens of color CRTs are made of dots of 3 phosphors which emit red, green, and blue light when they are hit by electrons.

The red and green phosphor dots in the 3279 are pure, that is, they emit only red or green light. The blue dots are impure, that is, the blue light is mixed with a little green and red to improve the overall balance of the colors. This is done because pure blue is too dark. This means that any mixed colors that include blue will be changed. If the brightness of the primary colors is not balanced, the mixed colors will not be correct and the white will be colored.

<i>Phosphor Dots Illuminated</i>	<i>Color seen on 3279 Screen</i>
----------------------------------	----------------------------------

Red	Red
Green	Green
Blue	Blue
Red and Green	Yellow
Red and Blue	Pink (Violet, Magenta)
Green and Blue	Turquoise (Light Blue, Cyan)
Red, Green, Blue	White

Each primary color has a separate electron gun, with a separate grid to control its brightness, see figure 3-4. The three electron beams are accelerated and focused by a single anode assembly and deflected across the screen by a single set of deflection coils. The three beams arrive at the screen at slightly different angles. A mask (see Figure 3-4) which is at EHT voltage is located a few millimeters from the screen phosphor. The small holes in the mask break each beam into six or seven smaller beams before they hit the screen phosphor. The angle of the beam at the mask directs the beam to the correctly-colored phosphor dots.

Another group of coils is arranged around the neck of the CRT between the cathodes and the common anode. These are used to improve purity and convergence.

1. *Purity* - These coils move the three beams together under horizontal and vertical controls to strike the shadow mask at the correct angles.
2. *Static Convergence* - Three thumbwheels (mounted on an assembly on the CRT neck) and the blue lateral static convergence potentiometer (mounted on the convergence amplifier card) allow the three color beams to be aligned individually at the center of the screen.
3. *Dynamic Convergence* - The overall deflection distortion is corrected by normal pincushion correction controls. The distortion of each beam is, however, slightly different. These differences are corrected by the dynamic convergence circuits. Voltage waveforms are generated on the convergence logic card B2 and fed to the coils via the amplifier card. Thus the 3 primary color images lie on top of one another all over the screen. Observe the difference in quality of multi-colored images in Test Mode 3 compared with concurrent test 0.

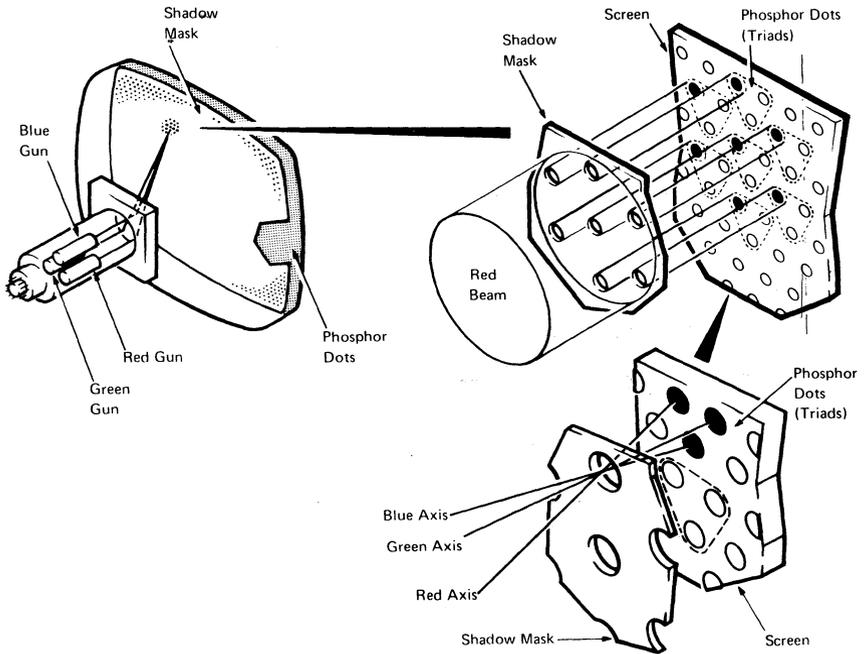


Figure 3-4. Shadow Mask

3.6 Convergence Logic Card (Location B2)

The convergence logic card (see Figure 3-5) provides digitally-controlled analog signals for convergence of the display unit. The card has two storage areas that hold the definitions of the currents required in the convergence coils. The digital information is converted to analog signals and fed to the amplifier card in the main enclosure assembly.

The card is connected to the base logic card through the feature bus so that the stores can be accessed and updated.

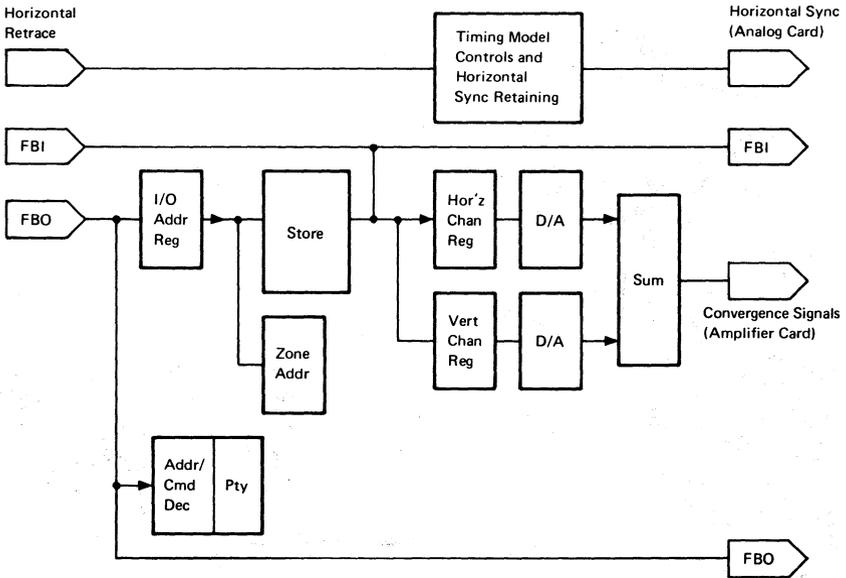


Figure 3-5. Convergence Logic Card (B2)

3.7 Line Control Card (Location C2)

The line control card (see lower part of Figure 3-6) contains:

- Circuits to handle transmission and reception of data down the coaxial line to the control unit.
- Main oscillator (14 MHz), dot counter and feature clock.
- A serializer that converts the ROS outputs from the base logic card to drive the three video outputs.
- Test circuits that force colored bar patterns on the screen adjustments.
- (Video Output Facility only) Circuits that produce red, blue, green, and sync signals for external monitors.

3.8 Base Logic Card (Location D2)

The base logic card (see upper part of Figure 3-6) contains:

- The display buffer, which holds the character code for each position on the screen.
- The ROS which stores the character shapes. It is addressed by the display buffer and the outputs are fed to the line control card.
- Attribute control circuits. The base attribute byte defines the characteristics of the field.
- Keyboard control circuits for keystrokes and responses.
- Logic for handling I/O operations with the display buffer. This involves the base I/O address counter which is also used by the features as an address for I/O operations.
- The character counters.
- Feature bus controls. The feature bus is the main path for transmitting data around the machine.

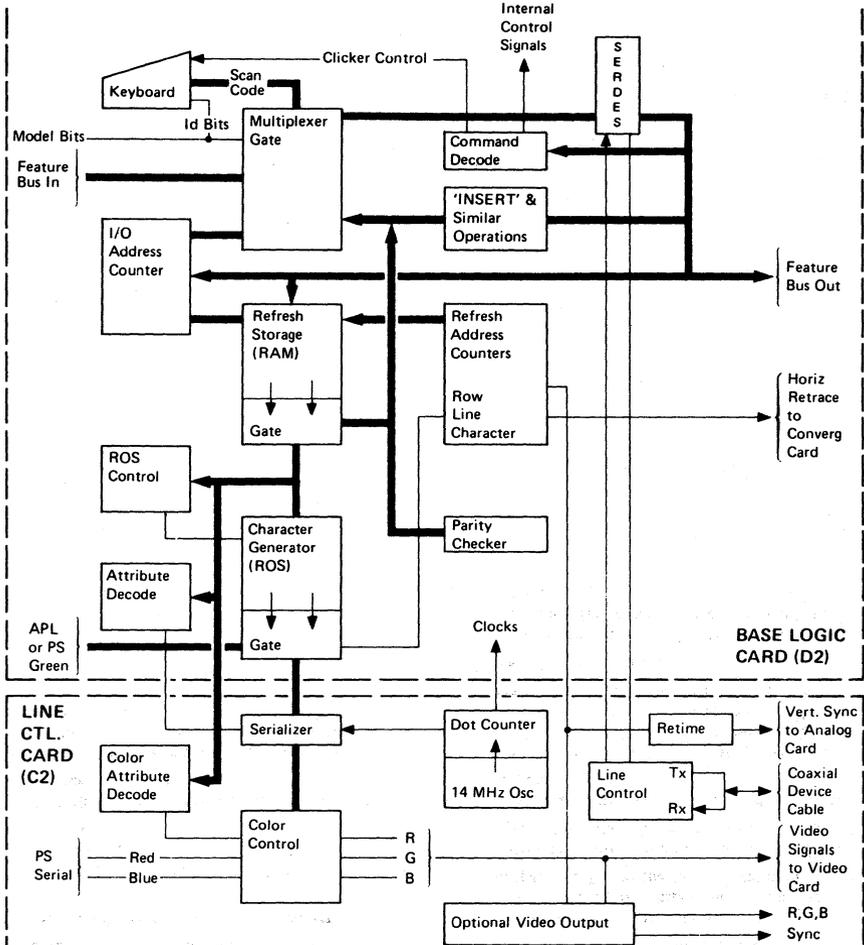


Figure 3-6. Base Logic Card (D2) and Line Control Card (C2)

3.9 APL/Extended Character Set (ECS) Card (Location E2)

The ECS card (see Figure 3-7) allows the user to define the color of characters on a character basis by providing a shadow buffer with a byte of information for each character position in the display buffer. This shadow buffer (see Figure 6-19) can select characters from the APL ROS (or several programmable fonts if the Programmed

Symbols feature is installed). It can cause the characters to appear in any of seven colors and can highlight the characters. The APL ROS is pluggable, although it is standard with the ECS/APL card in the 3279. The switches are set as shown in Figure 6-14. These return the correct response when the control unit addresses a 'Read ID' command to the ECS feature.

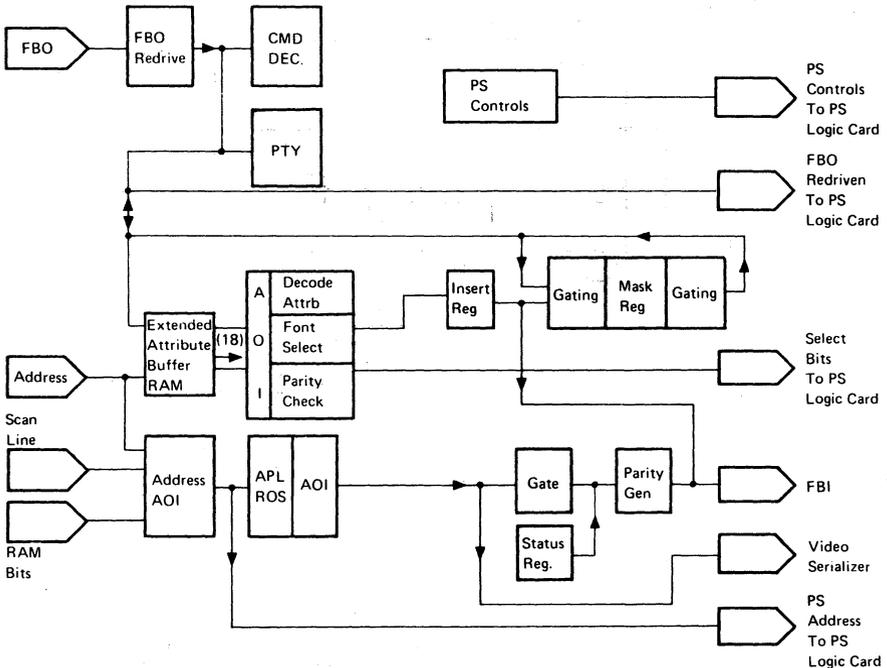


Figure 3-7. APL/ECS Card (E2)

3.10 Programmed Symbols (PS) Card (Feature) (Location F2)

The PS (Programmed Symbols) card (see Figure 3-8) allows the host, or the user through the host, to program the shapes of characters for display on the screen. Special character sets and graphic characters may be programmed. Two fonts (A and B, PS2 feature) or six fonts (A through F, PS2 and

PS4 feature) may be installed. Each font is used in the same manner as the APL ROS, selection being by ECS. When PS2 only is included the jumper is installed. This rearranges the addressing to bring the second programmed font within the storage module, see Figure 6-14.

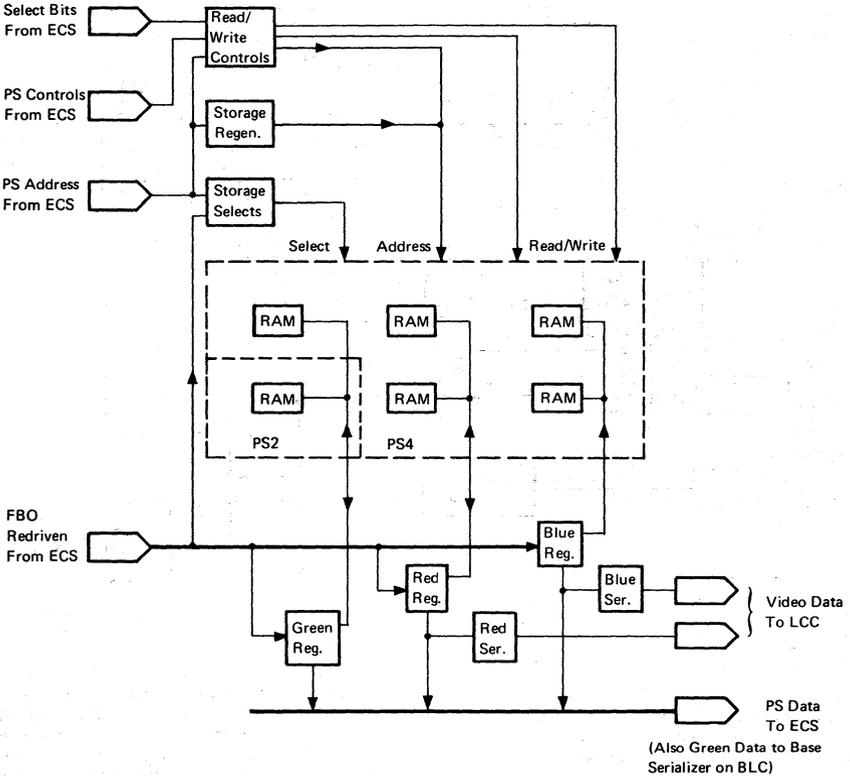


Figure 3-8. Programmed Symbols Card (F2)

Each PS font contains 190 programmable characters. The user can program each pel in the 9 x 12 matrix of each character. The color of the character is defined by the base or ECS attribute (see section 6.12).

For the triple fonts C, D, and F only, the user can program the color of each pel separately when the ECS byte color field is 111. For other combinations of the color field bits, the color of the complete character is defined by the ECS attribute, as for the other fonts.

3.11 Selector Light Pen (LP) Card (Feature) (Location G4)

This card contains the logic for the operation of the selector light pen (see Figure 6-13).

3.12 Magnetic Reader Control (MRC) Card (Feature) (Location G2)

This card contains the logic for the operation of the magnetic slot reader (MSR) or magnetic hand scanner (MHS) (see Figure 6-13).

Chapter 4. Removal and Replacement Procedures

4.1 General

It is recommended that the display be positioned near the corner of a table with the right-hand side of the bezel nearest the corner, leaving sufficient clearance for the bezel to be placed face down on the table in front of the display. If a tilt/rotate table is used, lock it in the horizontal position.

4.2 Logic Gate

To open the logic gate, insert an allen wrench in each of the two slots on the right-hand side of the display and turn the wrench a quarter turn in each slot. The rear enclosure assembly can then be swung open on the hinges.

4.3 Rear Cover

To remove the rear cover, open the customer access panel by pressing up on the two clips. Remove the three screws located along the hinged section of the cover.

4.4 Bezel

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the two allen screws from the under side of the bezel and lift the bezel up and away from the enclosure assembly.

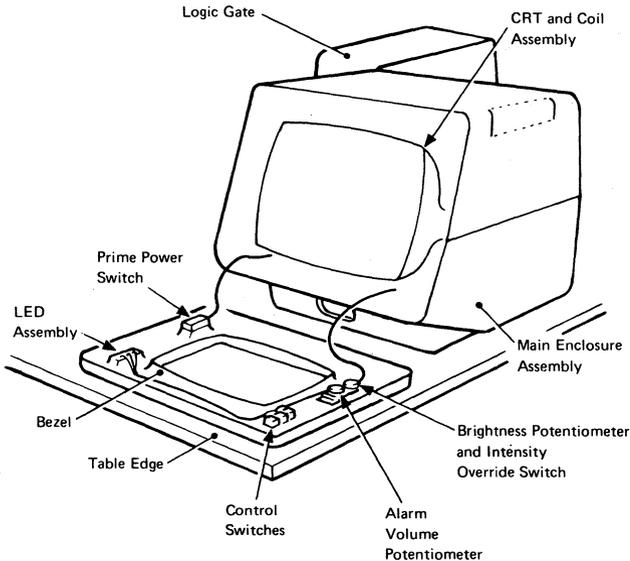


Figure 4-1. General View - Bezel Removed

4.4.1 ON/OFF Switch

1. Remove the bezel (see section 4.4).
2. Release the internal power cable from the clamp near the ON/OFF switch.
3. Press to one side the plastic catch at the side of the switch, and pull the switch out. Remove the power supply (see section 4.5.2).
4. Unplug connector P2 from the prime power box.
5. Reinstall in reverse sequence.

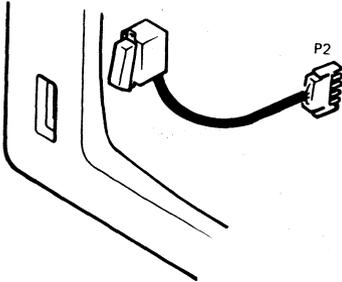


Figure 4-2. ON/OFF Switch

4.4.2 Brightness and Audible Alarm Volume Controls

1. Remove the bezel (see section 4.4).
2. Pull off the two knobs.
3. Remove the tape from around P11 and unplug it. Release the mounting bracket from the inside of the bezel.
4. Reinstall in reverse sequence.
5. Wrap two turns of adhesive tape around P11 to insulate the contacts (150 V) and hold the plug and socket together.

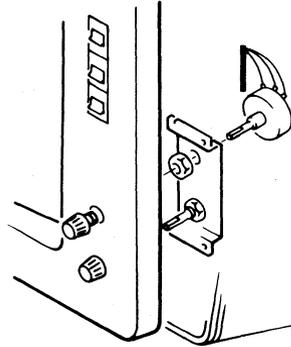


Figure 4-3. Brightness and Audible Alarm Volume Control Assembly

4.4.3 Normal/Test, Base Color, and Dualcase/Monocase Switches

Three switches on the upper right of the bezel are removed as follows:

1. Remove the bezel (see section 4.4).
2. Disconnect the wiring to the switch.
3. Pinch the spring clips together and push the switch and clip out through the front of the bezel.
4. Reinstall in reverse sequence.

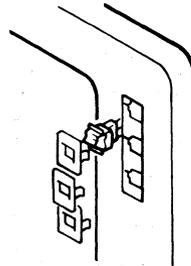


Figure 4-4. Switches

4.4.4 Indicator LEDs

Before removing the LED assembly, switch off power and remove the mainline power cable from the power socket. The indicator LEDs are contained on a PCB as shown in Figure 4-5.

4.4.5 Security Keylock

1. Remove the analog card (see section 4.5.4).
2. Disconnect P9 and remove the retaining nut (use wrench, IBM Part 4418787).
3. Withdraw the keylock assembly.
4. Replacement is the reverse of removal, but ensure that the keylock is inserted the correct way up so that the key can be turned without hitting the side of the display unit.

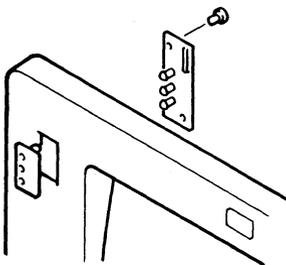


Figure 4-5. Indicator LED Assembly

4.5 Power Units

DANGER

Before any power unit replacement procedures are performed, the display must be powered off and the mainline power cable disconnected at the power socket.

4.5.1 Fuse

DANGER

Switch power off and remove the mainline power cable from the power socket before changing the fuse.

The main supply fuse is located in the front enclosure assembly below the bezel. Push the fuse cover and turn it counterclockwise to release the fuse.

4.5.2 Power Supply

The power supply is located to the right of the CRT as viewed from behind.

DANGER

Components on this card are hot. Before handling the card, allow it to cool for 5 minutes with power turned off.

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the rear cover (see section 4.3).
3. Unplug the A2 cable connector.
4. Remove the retaining clip that holds the cable to the inside of the logic gate.
5. Pull the flat cable through the gap (it is easier if the connector shroud is removed).
6. Remove the two screws and pull out the power supply card.
7. Reinstall in reverse sequence, ensuring that the card is correctly located in the bottom guide and both top guides.
8. See Chapter 5 for adjustments.

4.5.3 Prime Power Box

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the power supply as described in section 4.5.2.
3. Remove connectors P1 and P2 from the prime power box assembly.
4. Disconnect the ground wires from the assembly.
5. Remove the two screws that secure the assembly to the base of the enclosure.
6. Remove the assembly from the display.
7. Reinstall in reverse sequence.

DANGER

Ensure that all ground connections to the prime power assembly are reconnected.

4.5.4 Analog Card

The analog card is located to the left of the CRT when viewed from behind.

1. Switch power off and remove the mainline power cord from the power outlet.
2. Disconnect the two ground wires from the ground screw at the bottom of the card assembly.
3. Remove the two screws at the top and bottom of the analog card assembly and the center clamp.
4. Withdraw the assembly toward the rear of the machine taking care not to damage the cables connected to the card.
5. Unplug P5, P6, P7, and P26 (see Figure 4-7) from the analog card.
6. Unscrew the clamp that holds the red EHT wire at the Line Output Transformer (LOPT) connector, P21. Pull out the wire and discharge it to the frame.
7. Remove the analog card.
8. To reinstall, first check that the jumper matches the CRT.
Note: There are alternative positions for the CRT jumper depending on the level of the analog card, see Figure 4-7.
 - a. If the tube is manufactured by the Matsushita Electronics Corporation (see label on the bell of the CRT behind the analog card), install the jumper in position L.
 - b. If the tube is manufactured by the Mitsubishi Electric Corporation (see label on the bell of the CRT behind the analog card), install the jumper in position H.
9. Insert the EHT cable *fully* into the LOPT socket, P21 and screw down the cable clamp.
10. Continue installation in reverse sequence. Ensure that the card is correctly located in the top and bottom guides.
11. Reconnect 2 ground wires and screw down.

DANGER

Verify that all ground wires are reconnected securely. Refer to Figure 6-6 for grounding details.

12. See Chapter 5 for adjustments.

4.6 Logic Cards

4.6.1 Removal

Switch power off. Remove any attached top card connectors. Operate the levers in the directions shown by the arrows in Figure 4-6 and withdraw the card.

4.6.2 Replacement

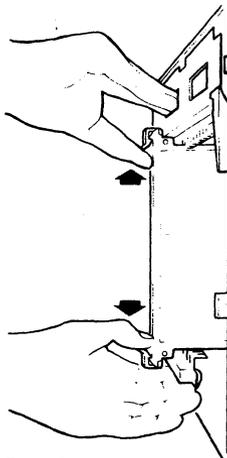
Push the card firmly into its socket and then operate the levers as shown in Figure 4-6. Replace the top card connectors, see Figure 1-6.

CAUTION

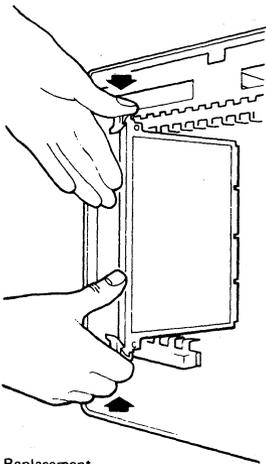
Always use a card shroud when reinstalling a card, to prevent contact with adjacent cards.

For ECS and PS feature cards (E2, F2) see Figure 6-14 for details of switch settings and module and jumper positions.

Note: 3279s with the Video Output Facility have a video output card instead of a line control card in location C2. The video output card has two extra modules. When this card is installed in location C2, the resistance between each video output socket and ground falls to less than 10 kilohms.



Removal



Replacement

4.7 Connectors

Most internal connectors have mechanical locking devices.

4.7.1 Multi-Pin Connections

Removal - Pinch the latch tabs together and pull the connector free from the pins.

Replacement - Reseat the connector ensuring that the tabs are latched.

4.7.2 Internal Coaxial Connection

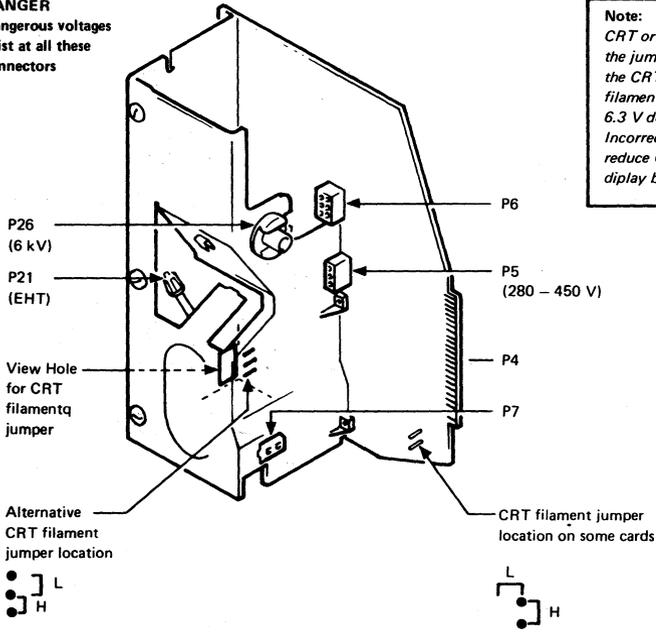
Removal - Press and hold the latch button and pull the connector free.

Replacement - Reseat the connector ensuring that it is latched (see Figure 6-13 for location).

Figure 4-6. Logic Card Removal and Replacement

DANGER
 Dangerous voltages
 exist at all these
 connectors

Note: When exchanging a CRT or Analog Card, match the jumper position to the CRT. This sets the filament voltage to 6.3 V dc. Incorrect setting may reduce CRT life or the display brightness.



Jumper Position Symbol	L	H
CRT Manufacture – See label on bell of CRT behind analog card.	Matsushita Electronics Corporation	Mitsubishi Electric Corporation
CRT filament current	Low (715 mA)	High (800 mA)
Filament configuration	Three in parallel	Three in series
Filament resistance (Cold)	1.9 Ω	1.4 Ω

Figure 4-7. Analog Card

4.8 Video Components

4.8.1 Amplifier Card

DANGER

Components on this card are hot. Before handling the card, allow it to cool for 5 minutes with power turned off.

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the four push-in multi-wire connectors P17A, P17B, P18 and P19 from the amplifier card (see Figure 6-10).
3. Remove the screws that secure the safety cover and remove the cover.
4. Pull the amplifier card off its four locating lugs.
5. Reinstall the amplifier card in reverse sequence. The multi-wire connectors cannot be mixed up because they are different sizes. Do not finally tighten the safety cover securing screws until these connectors have been reconnected.
6. See Chapter 5 for adjustments.

4.8.2 Video Card

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the analog card (see section 4.5.4, steps 1 through 4 only).
3. Unplug P5 and P26 from the analog card (see Figure 4-7).
4. Disconnect the three ground wires from the video card. Note the connection points and routing of the wires (see Figure 6-9).
5. Pull the video card off the CRT base.
6. Disconnect P14, P15 and P16 from the video card (see Figure 1-4).
7. Reinstall in reverse sequence.
8. See Chapter 5 for adjustments.

4.8.3 CRT and Coil Assembly

DANGER *Wear safety equipment (see 'Cathode Ray Tube Safety' at the front of this manual) when handling CRTs.*

4.8.3.1 Removal

CAUTION

Support the logic gate to prevent the display from falling backward when the CRT and coil assembly is removed.

1. Remove the mainline power cable from the power socket.
 2. Position the display as described in section 4.1, with logic gate open.
 3. Remove the bezel (see section 4.4) and place it face down in front of the display. Release the internal power cable from the rubber clamp near the ON/OFF switch.
 4. Remove:
 - The power supply (see section 4.5.2)
 - The analog card (see section 4.5.4)
 - The amplifier card (see section 4.8.1)
 - The EHT bleed assembly (see section 4.8.4, but do not remove the bleed assembly from the bracket)
 5. Pull the video card from the CRT base and place it on the table.
 6. Loosen the clamp and pull the convergence coil assembly from the CRT neck.
 7. Disconnect P27 (front left of the CRT screen - see Figure 1-2).
 8. Disconnect the ground braid clamp and its jumper link (Figure 6-9). Ensure that the braid can move forward freely.
- CAUTION**
The following steps free the CRT from its mounting. The CRT weighs approximately 7.5 kg; support it and protect it from excessive pressure that could damage it or other units. Handle the CRT by the bell only, NOT by the neck.
9. Remove the four hexagonal nuts and washers from the corners of the CRT face.
 10. Check that the logic gate is supported.

11. Observing normal CRT safety precautions (see "CRT Safety" at the front of this manual), move the CRT from the display unit and put it face down on the bezel.
12. Remove the wrap tie that secures the degauss coil.
13. Remove the degauss coil, ground braid and securing clips from the CRT.
14. Prepare a surface for the CRT and move the CRT to that surface.

4.8.3.2 Replacement

1. Ensure that the case that contains the new CRT is the correct way up.
2. Remove the new CRT from its case and set it on the bezel with the EHT connector to the front.
3. If you do not have a new piece of plastic foam (acoustic shield) to fit around the deflection coils, transfer the plastic foam from the old CRT.
4. Pack the old CRT in the case provided with the new CRT.
5. Install the degauss coil, ground braid and securing clips on the new CRT. Keep the ground braid between the tube and the degauss coil.
6. Secure the degauss coil in position with the wrap.
7. Observing normal CRT safety precautions, install the CRT in the display unit, taking care to avoid trapping or fouling any cables.
8. Insert the washers and nuts but do not tighten the nuts.
9. Check that all cables and connectors within the display unit are free and accessible.
10. Connect the degauss coil (P27).
11. Center the CRT in the display and tighten the nuts.
12. Check that the CRT is centered by replacing the bezel and repeat Step 11 as necessary.
13. Remove the pin protector from the CRT and insert it on the failed CRT.
14. Slide the convergence coil assembly onto the CRT neck and position the assembly over the interelectrode gap as shown in Figure 4-8. Adjust the angular alignment to the stated tolerance. Use the machine base as a reference. *Note: If the coil assembly is too far forward there will be too little sensitivity, if it is too far to the rear, there will be too much sensitivity.*
15. Secure the convergence coil assembly by the clamp but do not over-tighten the screw. *Note: If the coil assembly is too far forward there will be too little sensitivity, if it is too far to the rear, there will be too much sensitivity.*
16. Check that the jumper on the analog card matches the CRT type (see Figure 4-7).
17. Reconnect the ground braid clamp (see Figure 6-9) and replace the jumper link.
18. Install:
 - The EHT bleed assembly (see section 4.8.4.2. steps 2 through 4)
 - The amplifier card (see section 4.8.1)
 - The video card (see section 4.8.2)
 - The analog card (see section 4.5.4)
 - The power supply (see section 4.5.2)
19. Reconnect all plugs that were disconnected during the removal procedure.
20. Ensure that all ground connections are reconnected securely, including the two on the analog card heatsink.
21. Check that all cards and connectors are correctly seated.
22. Replace the rubber clamp on the internal power cable near the ON/OFF switch.
23. Secure the bezel to the front of the display unit (see section 4.4).
24. Carry out Display Setup as detailed in Chapter 5.
25. On completion of the initial checks and the setting up procedures, replace all the safety covers and close the logic gate.

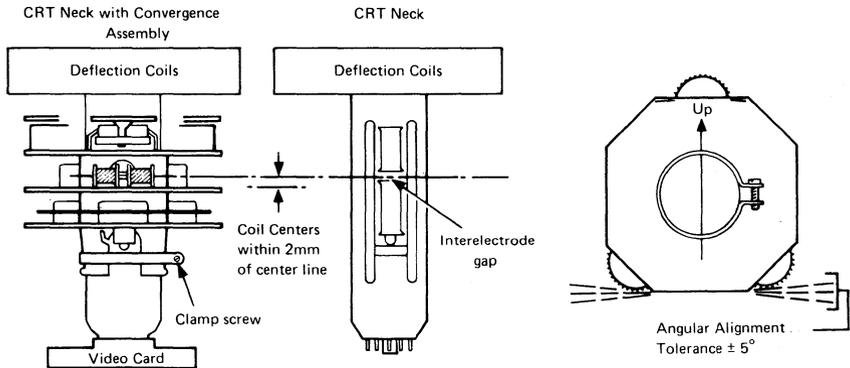


Figure 4-8. Convergence/Purity Coil Assembly

4.8.4 EHT Bleed Assembly

4.8.4.1 Removal

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the power supply card (section 4.5.2), analog card (section 4.5.4), and amplifier card (section 4.8.1)

DANGER

Do not let anything fall on the tube neck.

3. Loosen the two screws holding the bleed assembly/amplifier card bracket in the top of the box, and remove the assembly.

DANGER

The CRT retains a capacitive charge after the EHT lead has been disconnected (step 4). It must be discharged to ground with a suitably installed lead before the CRT is handled or the EHT lead is reconnected. Ensure that the discharge lead is connected to ground BEFORE touching it onto the CRT connector.

4. Supporting the bleed assembly, unplug the EBT cable from the top of the CRT. Lift the rubber cap at the edge to break the airlock, grasp the cap firmly, rock it to one side, and lift.

5. Disconnect the ground connector at the prime power box (see Figure 6-5).
6. Withdraw the bleed assembly/bracket, remove two securing screws, and take the bleed assembly from the bracket.

4.8.4.2 Replacement

1. Mount the bleed assembly on the bleed assembly/amplifier card bracket and secure it using the two screws removed in step 6 of section 4.8.4.1.
2. Connect the bleed assembly ground cable to the prime power box.
3. Connect the EHT cable to the CRT.
4. Attach the bracket to the display and tighten the two screws loosened in step 3 of section 4.8.4.1.
5. Reinstall the analog card (see section 4.5.4).

CAUTION

Verify that all ground wires are reconnected securely. Refer to Figure 6-5 for grounding details.

6. Reinstall the power supply card and the amplifier card and make all connections.
7. Ensure that all ground connections are replaced.

4.8.5 Degauss Coil

To remove and replace the degauss coil, go to section 4.8.3 "CRT and Coil Assembly". For removal, follow 'Removal' steps 1 through 13. For replacement, follow 'Replacement', steps 5 through 23 omitting step 13.

Display adjustments should not be affected, but refer to Chapter 5 if necessary. Reinstall all safety covers and close the logic gate.

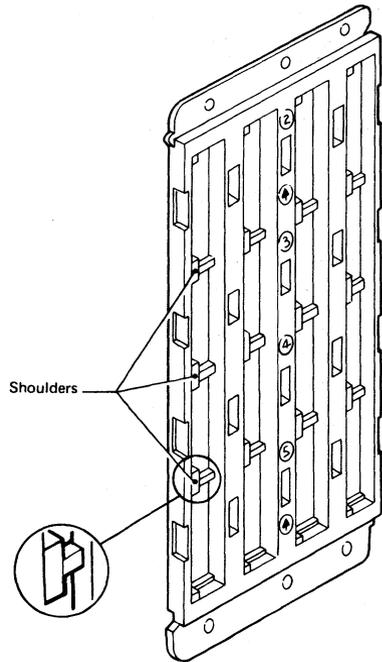
4.9 Logic Board Planar Strips

4.9.1 Removal

1. Switch power off and remove the mainline cable from the power socket.
2. Remove the rear cover (see section 4.3)
3. Disconnect all connectors and note their locations.
4. Remove the logic cards.
5. Remove the two diagonally opposite screws (top right and bottom left) that attach each rear planar strip holder to the logic gate.
6. Remove the rear holders and planar strips.

4.9.2 Replacement

1. Feed the cables that plug into the strips through the gap at the right-hand side of the logic gate (as viewed from the rear). It is easier if the shrouds are removed; replace them afterwards.
2. Ensure that the card-locating shoulders on the strip holders are positioned the correct way round (see Figure 4-9).
3. Insert the planar strips and rear holders in approximately their correct positions. Insert, but do not tighten, the strip-securing screws.
4. Plug all the logic cards into the gate and clip them in position.
5. Close the logic gate so that the enclosure positions it at the correct height, then tighten the strip-securing screws.
6. Open the logic gate. Reinstall all connectors (pass the keyboard cable through the gap at the right-hand side of the logic gate as viewed from the rear).



Note: Shoulders should be to the left and arrows pointing up for both card side and pin side of holders when viewed from the appropriate side.

Figure 4-9. Planar Strip Holders

4.10 Audible Alarm

1. Switch power off and remove the mainline power cable from the power socket.
2. Remove the analog card as detailed in section 4.5.4.
3. Remove the two screws that secure the audible alarm assembly to the base of the enclosure (see Figure 4-10).
4. Note the position of the five wires connected to the audible alarm assembly by push-in connectors (see Figure 4-10).
5. Lift the audible alarm assembly, remove the five connectors and withdraw the alarm from the display.
6. Reinstall the audible alarm assembly in the reverse sequence.

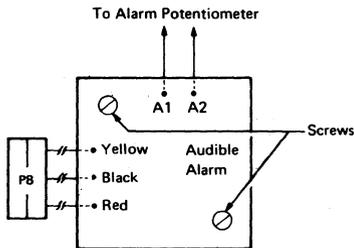


Figure 4-10. Audible Alarm Assembly.

4.11 Keyboard Units

4.11.1 Keyboard From Display Station

1. Turn power off.
2. Open the customer access panel at the rear of the display.
3. Remove the wing nut that holds the keyboard cable to the frame.
4. Free the cable clamp, and remove the keyboard cable connector from its socket.
5. Reinstall in the reverse sequence.
6. Ensure that all cable connectors are tightly seated in the sockets and that the ground straps are attached.

4.11.2 Keyboard Top Cover

1. Invert the keyboard.
2. Remove the four screws in the corners of the keyboard base.
3. Place the keyboard base on a flat surface.
4. Lift the top cover off the keyboard.
5. Reinstall in the reverse sequence.

Note: Check for cover clearance around the keys after the cover has been reinstalled. Adjust if required.

4.11.3 Keyboard Assembly From Base

1. Disconnect the keyboard from the display station (see section 4.11.1).
2. Remove the keyboard top cover (see section 4.11.2).
3. Disconnect the keyboard cable connector and clicker connector at the logic card.
4. Remove the two screws that hold the keyboard assembly to the base (mark for alignment reference).
5. Handle the keyboard assembly by the sides and lift it off the base, taking care not to press any keys.
6. Reinstall in the reverse sequence.
7. Ensure that the cable connector is tightly seated.

4.11.4 Clicker Assembly

1. Disconnect the keyboard from the display station (see section 4.11.1).
2. Remove the keyboard top cover (see section 4.11.2).
3. Disconnect the clicker connector.
4. Remove the clicker assembly by sliding the bail fastener from under the cast tabs.
5. Reinstall in the reverse sequence.

4.11.5 Keyputton

Keyputtons are removed by sliding the keytop puller over the keytop and pulling straight up.

4.11.6 Key Modules

Warning: The work area must be clean during work on the keyboard. Any particle between the key module flyplate and the printed circuit is a potential problem.

4.11.6.1 Removal

Note: See section 4.11.7 if the spacebar module is to be exchanged.

1. Disconnect the keyboard from the display station (see section 4.11.1).
2. Remove the keyboard top cover (see section 4.11.2).
3. Remove the keybutton from the module to be exchanged (see section 4.11.5).
4. Remove the keyboard assembly from the base (see section 4.11.3).
5. Remove the keyboard assembly, and place it on the base using the locating pins on the left and right sides.
6. Remove the screws that hold the bottom cover and circuit board to the keyboard assembly.
7. Lift the circuit board and bottom cover from the keyboard assembly, and place them in a clean area. The part that remains on the base is known as the all-keys assembly.
Note: Exchange the key module if a flyplate comes off. Do not attempt to repair the module. Repaired modules can cause intermittent failures.
8. Handle the all-keys assembly by the sides and take care not to press any keys. Turn it the correct way up onto the base, locating it on the pins
9. Press down on the key module until it is released from the holding plate.
10. Handle the all-keys assembly by the sides and take care not to press any keys. Invert it onto the base, locating it on the pins
11. Remove the module.

4.11.6.2 Replacement

1. Ensure that the alignment tab and the angled keystem are in the same position as those of the other modules in the all-keys assembly.
2. Install the new module by pressing the key module into the holding plate by hand.
3. Clean the printed circuit board by carefully wiping it with a lint-free cloth moistened with isopropyl alcohol. Inspect every key module fly-plate for any foreign matter, and carefully clean if needed.
4. Align the holding screw holes through the bottom cover, circuit board, insulator, and top insulator (if used). Lower the circuit board and bottom cover onto the all-keys assembly. Secure the circuit board to the all-keys assembly with the holding screws.
5. Reinstall the keyboard assembly on the base, maintaining its original alignment.
6. Reinstall the keybutton in the correct location. If you have removed the spacebar, see section 4.11.7.2.
7. Reinstall the keyboard cable connector and clicker cable to the logic card. Reinstall the keyboard top cover, and reconnect the keyboard to the display if it was removed.
8. Use Test Mode 2 to check for correct operation of the keyboard.

4.11.7 Spacebar

4.11.7.1 Removal

Perform the removals described in sections 4.11.1 and 4.11.2 for access to the keyboard assembly.

1. Hold the spacebar at each end (beyond the modules), and remove by pulling upward evenly.
2. Pivots can be removed (if necessary) by pushing with a screwdriver in the slot in the side of the pivot.

To remove the module see section 4.11.6.

4.11.7.2 Replacement

1. Press any pivots removed in step 2 (above) into the base.
2. Place the spacebar on its modules, and lower it into position while engaging the bar in the two pivots.
3. Press down on the spacebar at the spacebar modules to seat it.
4. Check the spacebar operation for binds. If it binds, the probable cause is a bent right module stem. This stem can be shaped to free the bind.
5. Install the keyboard top cover, and reconnect the keyboard to the display station if it was previously removed.

Logic Card Assembly

1. Remove the keyboard top cover (see section 4.11.2).
2. Disconnect the keyboard cable connector and clicker connector at the logic card.
3. Remove the two holding screws from each end of the logic card.
4. Remove the logic card.
5. Reinstall in the reverse sequence.

Note: Check that the keyboard ID jumpers on the new logic card are in the same position as on the old logic card. See Figure 6-11 if necessary.

Chapter 5. Display Adjustments

The complete adjustment procedure shown and detailed in this chapter is sufficient to set up a display from a totally unadjusted condition.

If only one control needs adjustment, for example color balance, go directly to the procedure in section 5.3 for that control. Adjustment of purity or any of the seven raster controls may disturb convergence. If the dynamic convergence has a marginal range, readjust the static convergence.

Also, after a single FRU change, there is no need to go through the complete procedure. The necessary adjustments are listed below.

1. **Power Supply Card:** Perform the initial checks (section 5.1), then go to static convergence (section 5.3.1) and work forward to make minor adjustments.
2. **Analog Card:** Perform the initial checks (section 5.1), then go to coarse adjustments (section 5.2) and work forward. Ignore Red Brightness and Color Balance (sections 5.2.1, 5.3.6, and 5.3.7) unless the display is too dim or too bright.
3. **Logic Card B2:** Perform the initial checks (section 5.1), then adjust static convergence (section 5.3.1) and dynamic convergence (section 5.3.3) only.
4. **Amplifier Card:** Perform the initial checks (section 5.1). Do not adjust the four controls marked GAIN on early level cards; these are preset during manufacture. Go to coarse adjustments (section 5.2) and carry on to adjust red brightness, color balance, purity, static convergence, and dynamic convergence only.
5. **Video Card:** Perform the initial checks (section 5.1), then if necessary, adjust red brightness and color balance (section 5.3.6 and 5.3.7).
6. **CRT:** Perform all the adjustments starting at section 5.1.
7. **Convergence/Purity Coil Assembly:** Perform the initial checks (section 5.1), then go to coarse adjustments (section 5.2) and carry on to adjust purity, static convergence, and dynamic convergence only.

8. **Planar Strips:** Perform the initial checks (section 5.1), then check dynamic convergence (section 5.3.3).

Warning: Use adjusting tool, IBM Part 1864853, to adjust potentiometers; screwdriver blades will damage them.

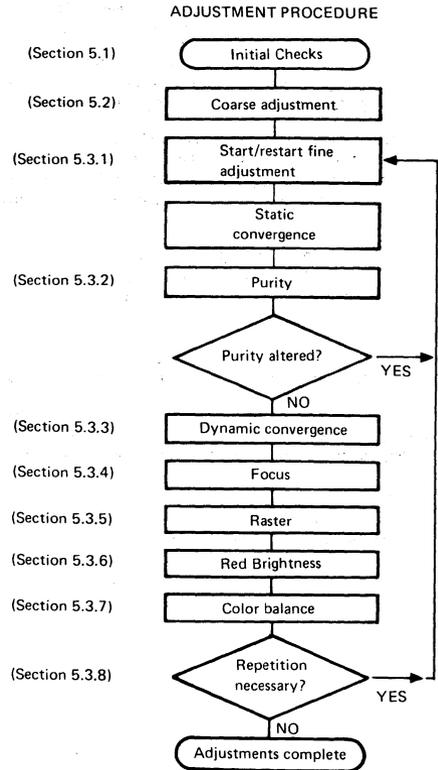


Figure 5-1. Adjustment Procedure

5.1 Initial Checks

1. Make ready the control unit (see control unit problem determination guide).
2. Plug the mainline power cable into the customer's outlet.
3. Switch power on and verify that indicator 1 (Power Good) is on.
4. Check that indicator 2 (Display Ready) turns on after approximately 45 seconds.

Note: The screen will probably brighten when the Display Ready indicator is on.

CAUTION

Use insulated probes, IBM Part 1749249 or similar, during the next step.

5. Measure the voltages in the following table and ensure they are correct. Go to MAP 0200 if you are unable to obtain the correct voltages. Use the potentiometer mounting plate on the bezel as a ground.

ANALOG CARD (P4) PIN	VOLTS (dc)	TOLERANCE (V dc)	RIPPLE (V pk-pk)
20	-135V*	±20	
43	-150	±20	
31	+12	±1.5	
48	+70	+10, -5	
37	+5.0	±0.5	0.25
5	-5.0	±0.5	0.25
30	0	.....
36	+8.5	±0.9	0.3
POWER SUPPLY CARD (P3) PIN	VOLTS (dc)	TOLERANCE (V dc)	RIPPLE (V pk-pk)
1	+12.0	±1.0	0.4
3	-12.0	±1.0	0.4
2	0	.....	.....
5	+103	±8	3.0
4	0	.....	.....

* -150V through 39kΩ

Figure 5-2. Voltage Table

6. Turn the BRIGHTNESS potentiometer counterclockwise until the Intensity Override switch operates - a white raster may appear. (The raster will probably be tinted due to purity/color brightness imbalances.) Now set the potentiometer to its mid-point.
7. Set the Normal/Test switch to Test. A full screen of characters may appear.

Notes:

1. The Control Key is used extensively by TEST MODE 3 but is not labelled CONTROL. Refer to the keyboard overlay in Figure 2-3 where the key is shown labelled CONTROL. On most keyboards this will be the RESET key.
2. During the set-up procedure. If **X** -f or **X** c-f appears in the operator information area, press the RESET key and retry the action.

If any action does not produce the expected results, repeat the action and then try repeating the whole section.

If the results are still not as expected you have a failure; go to MAP 0000, Entry Point A.

5.2 Coarse Adjustments

Start here to completely set up the display after replacing the CRT. See Page 5-1 for the adjustments that are required after other FRU exchanges.

Note that these coarse adjustments are intended to give a display that is an acceptable starting point for subsequent fine adjustments (see section 5.3). If any step fails, go to MAP 0000, Entry Point A.

Try to adjust the display without altering the RED MAX potentiometer (except after a CRT or amplifier card change).

Ready the display unit as follows:

1. Switch power on.
2. Turn the operator's brightness control fully clockwise.
3. Wait 45 seconds until Indicator 2 turns on.

5.2.1 Coarse Color Balance

Note: See Figure 1-4 for locations of controls.

1. Set the Normal/Test switch to Normal.
2. If the display is reasonably bright and the three primary colors are approximately balanced (look at the cursor), then go to section 5.2.2.

5.2.1.1 Green Gun

1. Set the Normal/Test switch to Normal then back to Test.
2. If the screen is completely blank, set the HEIGHT control fully counterclockwise.
3. If the screen is either still blank or is very dim, turn GREEN MAX (and, if necessary, GREEN MIN) clockwise until a reasonably bright image appears. The image will be green unless the static convergence or purity controls are badly out of adjustment.
4. If the HEIGHT control was altered in Step 2, adjust it to give a normal display height.

5.2.1.2 Blue Gun

1. Set the Normal/Test switch to Normal, then back to Test.
2. Press the following keys: CONTROL O Q (alphabetic)
3. If the screen is blank or very dim, turn BLUE MAX (and, if necessary, BLUE MIN) clockwise until a reasonably bright image appears.

5.2.1.3 Red Gun

1. Set the Normal/Test switch to Normal then back to Test.
2. Press the following keys: CONTROL O I (alphabetic)
3. It is better not to move the RED MAX potentiometer if you can continue the adjustments at the existing brightness level. If, however, the screen is blank or very dim, *mark the current position of the RED MAX potentiometer*. Turn RED MAX (and, if necessary, RED MIN) clockwise until a reasonably bright image appears. If an acceptable image cannot be obtained, set the RED MAX potentiometer back to its marked position and go to MAP 0000, Entry Point A.

5.2.2 Coarse Raster Adjustment

1. Set the Normal/Test switch to Normal and back to Test to display the test pattern.
2. If the four edges of the pattern are within 3 to 35 mm (0.1 to 1.4 inches) of the sides of the screen, then go to section 5.2.3. Otherwise, adjust the WIDTH and horizontal centering (H CENT) potentiometers until the vertical edges of the pattern are within 3 to 35 mm (0.1 to 1.4 inches) of the sides of the screen.
3. Adjust the top margin (TOP MAR) potentiometer until the top line is within 3 to 35 mm (0.1 to 1.4 inches) of the top of the screen.
4. Adjust the HEIGHT potentiometer (and if necessary the SKIP potentiometer) until the pattern is within 3 to 35 mm (0.1 to 1.4 inches) of the bottom of the screen.
Note: *The picture will blank if the Height control is set too low.*

5.2.3 Coarse Focus

1. Set the Normal/Test switch to Normal and back to Test.
2. See Figure 1-4. Adjust the static focus finger control (FOCUS 1) for best focus at screen center.

5.2.4 Coarse Static Convergence

At this point the raster may still be badly adjusted and any characters on the screen may be distorted. The color of the screen may still not be correct or uniform.

Note that a control unit that can support the 3279 color display must be available for the following procedures.

1. Display the convergence pattern as follows:
 - a. Set Normal/Test switch to Normal
 - b. Hold down the ALT key and press TEST then release both keys.
 - c. Press the following keys: / 7 ENTER
2. If the patterns are within 5 mm (0.2 inches) of each other, go to section 5.2.5.

3. If necessary, adjust the red and green (R and G) 'STATIC CONV CONTROLS' (see Figure 1-4) until the two patterns align vertically and horizontally.
4. Press the following key: R
5. Adjust the blue and blue lateral (B and BL) controls until the two patterns align horizontally and vertically.
Note: The static blue lateral control is a potentiometer on the amplifier card.
6. Press the following key: R
If the two patterns have moved apart, return to step 2.

5.2.5 Coarse Color Purity

1. Set the Normal/Test switch to Normal and back to Test.
2. Press the following keys to fill the screen with red characters:

CONTROL O I (alphabetic)
3. If necessary, adjust the two (H and V) 'PURITY' potentiometers (see Figure 1-4) until the characters appear RED over all the screen.

5.3 Fine Adjustments

Note: Do not attempt any fine adjustments until the 3279 has been powered on for at least 20 minutes (see section 2.6.1).

5.3.1 Static Convergence

This procedure will result in the three colors being correctly converged at the CENTER of the screen.

1. The display must be connected to a control unit that can support the 3279 color display. Step (b) removes the power supply to the convergence store. The control unit will detect a parity error and the default values will be written to the store.
 - a. Switch power off.
 - b. Connect a jumper from B2B08 to B2D08 (short circuit).
 - c. Remove the jumper after 5 seconds.
 - d. Switch power on and wait 45 seconds.
 - e. Set Normal/Test switch to Normal. An error code '228' or '55' may appear on the screen. Press RESET and ignore it.

- f. Hold down 'ALT' key and press 'TEST', then release both keys.
- g. Press the following keys: / 7 ENTER

The pattern '- | - | -' appears at the screen center.

2. The pattern displays in yellow (or green and red if misconverged).
3. Adjust red and green (R and G) 'STATIC CONV CONTROLS' until the two patterns align horizontally and vertically (see Figure 1-4).
4. Press the following key: R
The pattern displays in pink (or red and blue if misconverged).
5. Adjust blue (B) 'STATIC CONV CONTROL' until the patterns align vertically.
6. Adjust blue lateral 'STATIC CONV CONTROL' (see Figure 1-4) until the patterns align horizontally.
7. Go back to step 5 if necessary.
8. Press the following key: R
9. If the patterns diverge, return to Step 3 and work forward again.
10. Hold down 'ALT' key and press 'TEST', then release both keys. The screen clears.

5.3.2 Purity

1. Jumper D2Y02 to D2Y08. (Force Reverse Video see Figure 1-6.)

CAUTION

This jumper must not be left on for more than 30 seconds at a time, otherwise the shadow mask may distort. Remove and replace at each step.

2. Set the Normal/Test switch to Normal and then to Test. Press the following keys:

CONTROL O I (alphabetic)

3. Unless the raster is uniformly red, adjust horizontal and vertical (H and V) 'PURITY' potentiometers (see Figure 1-4) until the red area covers the screen. Pay close attention to the four corners.
Note: That as the color becomes pure it also becomes brighter and the adjustment should thus be made to leave the color both as pure and as bright as possible.
4. Set the Normal/Test switch to Normal and back to Test. Check that the raster is uniformly green.
5. Press the following keys: CONTROL O Q (alphabetic)
Check that the raster is uniformly blue.
6. If the green and blue rasters are not uniform, readjust the two purity potentiometers.
7. If any readjustment was necessary, return to step 1. If raster colors are not acceptable on the second time through the sequence, go to MAP 0000, Entry Point A.
8. Remove jumper D2Y02 to D2Y08.

5.3.3 Dynamic Convergence (Online Test 7)

This procedure converges the screen. The convergence pattern is stepped through 13 areas and each is converged in turn.

Note: If, after executing step 1.c, ✕ -f or ✕ c-f appears in the operator information area, another operator is probably using the convergence routine. Wait a few minutes before trying again. If the terminal is attached to an IDPA, the same effect occurs when the IDPA is in manual mode. If ✕ -f, ✕ c-f, or any other symbol appears in the operator information area at any other time, press the RESET key and retry the action.

1. Display the convergence pattern as follows:
 - a. Set the Normal/Test switch to Normal.
 - b. Hold down the 'ALT' key and press 'TEST', then release both keys. 'TEST' appears in the operator information area.
 - c. Press the following keys: / 7 ENTER

The pattern '- | - | -' appears at the center of the screen. Adjust the brightness control if necessary.

The following steps (2 through 7) are repeated 13 times with the pattern in different positions on the screen.

2. Use cursor control control keys to move the green pattern until the red and green images are superimposed (as closely as possible) to give a yellow pattern.
3. Press the following key: R
4. Use the cursor keys again to move the blue pattern until the blue and red images are superimposed (as well as possible) and give a pink pattern.
5. Press the following key: R
Go back to step 2 at least once to check.
6. Press the spacebar once or twice until the pattern appears in the next position.
7. When you press the spacebar after converging the 13th area, the (white) pattern appears simultaneously in all 13 positions. Until this happens go back to step 2 to continue converging.
8. *On the first pass through the complete fine adjustments*, when all 13 patterns appear, hold down ALT and press TEST then release both. The screen will clear. Go to section 5.3.4.
9. *On the second pass through the complete fine adjustments*, when all 13 patterns appear, check the convergence of each pattern. If any need further adjustment, press the spacebar once and return to step 2.
10. If, on the second pass, you cannot converge the screen, then there is a fault. Inspect the position of the convergence coil assembly, see Figure 4-8, and correct it if necessary. If you have exchanged the amplifier card go to section 5.3.9; otherwise, go to MAP 0600, Entry Point A.
11. Hold down the 'ALT' key and press 'TEST', then release both keys. The screen will clear.

5.3.4 Focus Adjustments

1. Set up a bright red pattern as follows:
 - Turn the brightness control fully clockwise.
 - Set the Normal/Test switch to Normal and then to Test.
 - Press the following keys: CONTROL O I (alphabetic)

2. Turn the FOC2 control fully counterclockwise.
3. Adjust the 'FOCUS1' control for the sharpest image in the center of the screen.
4. While examining the upper right corner of the screen, turn the FOCUS1 control slowly counterclockwise. If the focus in the corner improves (ignore the center), the FOC2 control will improve the overall focus.
5. Turn FOC2 one eighth of a turn clockwise.
6. Adjust the FOCUS1 control for the sharpest image at the center of the screen.
7. Repeat the three previous steps until there is no improvement.
8. If the last movement of FOC2 made the focus worse, turn it back one eighth turn to its previous best setting and readjust FOCUS1.
9. Press the following keys: CONTROL C
Verify that the focus on green is good.
10. Press the following keys: CONTROL O Q (alphabetic)
Verify that the focus on blue is good.
and FOC2 a little to achieve a good compromise between the focus of the red, green, and blue images.
12. Finally inspect all three colors and verify that an optimum focus setting has been achieved.
Key in: (alphabetic)
 - a. Green: CONTROL C.
 - b. Blue: CONTROL C CONTROL O Q.
 - c. Red: CONTROL C CONTROL O I.

5.3.5 Raster Controls

Note: The raster controls may be set accurately only when the display is online, that is, converged, and viewed from a normal operating position.

1. Set the Normal/Test switch to Normal.
2. Hold down the ALT key, press TEST, release both.
3. Jumper C2G06 to D2J08 (ground). Characters will fill the screen.
4. Attach the alignment mask (Figure 5-3) to the CRT face.

5.3.5.1 Raster Centering/Size Controls

Figure 1-4 shows the location of the controls referred to in the following steps. If any of the following controls has insufficient range to produce the desired adjustment, set it as nearly as possible and continue.

1. Adjust the top margin (TOP MAR) potentiometer until the top character row is centered in the top space on the alignment mask.
2. Adjust the WIDTH and horizontal centering (H CENT) potentiometers until the vertical edges of the images are correctly aligned.
3. *Model 2 only* Jumper C2J04 to D2D08 (ground). (Disable interrow skip.)
4. Adjust the HEIGHT potentiometer until the bottom trace of the last character row above the divider line centers on the HEIGHT space (for the correct model) on the alignment mask.
5. *Model 2 only* Remove jumper C2J04 to D2D08.
6. Adjust the 'SKIP' potentiometer until the bottom trace of the characters in the Operator Information Area is centered in the SKIP space of the alignment mask.
7. Repeat from the beginning of section 5.3.5.1, until the picture height and interrow gaps are correct.
8. Remove the alignment mask.

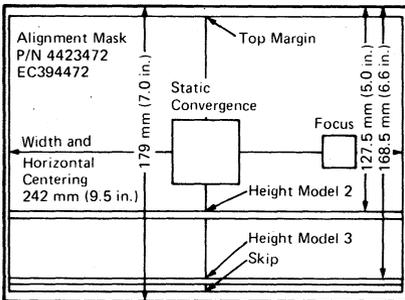


Figure 5-3. CRT Alignment Mask

5.3.5.2 Pincushion

1. Adjust the East and West (E + W) pincushion potentiometer on the analog card (Figure 1-4) until the vertical edges of the image are straight.
2. Adjust the North and South (N + S) pincushion potentiometer so that the top and bottom edges of the image are straight.
3. Repeat steps 1 and 2 if necessary.
4. Remove the jumper C2G06 to D2J08.

5.3.6 Red Brightness.

The adjustments in this section should only be required after exchanging a CRT or amplifier card or if the red characters are known to be too bright or too dim. Otherwise continue at section 5.3.7.

The maximum brightness of the red characters on the screen is controlled by the R MAX and R MIN potentiometers which are set during manufacture of the display unit. If the brightness is set too high the life of the CRT will be shortened.

Compare the red characters with those of another 3279 if possible, before assuming that adjustment is necessary.

1. Ensure that the focus adjustments have been done (see section 5.3.4).
2. Set the Normal/Test switch to Normal then back to Test.
3. Press the following keys: CONTROL B O I (alphabetic)
4. Turn the brightness control fully clockwise.
5. Turn the R MIN potentiometer to its mid position.
6. Find an '@' near the right-hand side of the fifteenth row. Adjust the R MAX potentiometer until the center of the '@' is just filled in. View the display from directly in front of the screen and turn back the potentiometer until the '@' is clear, and the center of the screen is legible.
7. Turn the brightness control fully counterclockwise (but not past the intensity override switch). Adjust the R MIN potentiometer until the characters are just visible (move the screen away from direct light if necessary).
8. Turn the brightness control fully clockwise. Verify step 6.

5.3.7 Color Balance

Note: Do not move the R MAX or R MIN potentiometers during this procedure.

This procedure sets the brightness of the green and blue characters which also controls the mixed colors: yellow, pink, turquoise, and white.

If the 3279 is not connected to an active display printer adapter, misconvergence may cause difficulty.

1. Set the Normal/Test switch to Normal.
2. See Figure 1-6 for jumper pin notation.
3. Connect the CE jumper D2Y09 to D2Y08 (ground). This will maintain convergence during Test Mode. See section 5.3.3 for more details if required.
4. Set the Normal/Test switch to Test and key in: CONTROL C . The screen fills with a pattern of characters.
5. Jumper C2W09 to C2W28 (color bars).
6. Set the B MIN and G MIN color balance potentiometers to their mid positions.
7. Ensure that the brightness control is turned fully clockwise.
8. Adjust the G MAX potentiometer until the green areas are as bright as the red, and the yellow is good.
9. Adjust the B MAX potentiometer until the blue areas are as bright as the red, and the turquoise, pink, and white areas are good.
10. Jumper D2Y02 to D2Z04 (reverse video); use E2Z04 if D2Z04 is not available.
11. Turn the brightness control to minimum (counterclockwise) but *not* past the switch into intensity override.
12. Adjust the G MIN and B MIN potentiometers so that the green and blue areas are as dim as the red; and the yellow, turquoise, pink, and white areas are good.
13. Remove the jumper from D2Y02.

14. Turn the brightness control to maximum and back again to check that the color balance is good over the whole range of the control. Pay special attention to the white areas. Make further small adjustments if necessary (but *not* to R MAX or R MIN).
15. Remove the jumpers.

5.3.8 Repetition

1. If necessary repeat the sequence of fine adjustments. Only small changes in the settings should be necessary and the repetition steps within the procedure can be omitted. Go to section 5.3.
2. If you have been through the complete procedure three times, and the display is still not satisfactory, go to MAP 0100, Entry Point A.
3. Return the brightness control to a normal setting. Set the Normal/Test switch to Normal. Replace the *Maintenance Manual* and close the covers.

5.3.9 Convergence Amplifier Gain Controls

The amplifier card may contain separate gain controls for one or more of the four convergence amplifiers. These are preset at the manufacturing plant and should NOT need adjustment. However, if you fail to achieve dynamic convergence after exchanging this card, readjustment may be necessary. When the gain is too low, the patterns have too little movement to converge; when too high, the patterns move in large steps with insufficient control to align precisely.

Before making any adjustments:

1. Use Online Test 7 to confirm that you can move the pattern in the correct direction. See MAP 0600.

2. Measure the supplies to the amplifier card:

Amplifier Card Test Point (see Figure 6-10)	Voltage and Tolerance
K	+12 V dc ± 1.5 V
N	-12 V dc ± 1.5 V

3. If any of these checks fail, read MAP 0000 page 2 and go to MAP 0600 (Entry Point A).
4. Inspect the amplifier card and write down the settings of the gain controls.
5. Normally controls R, G, and B (Red, Green and Blue) are set 3/4 clockwise, and B LAT (Blue Lateral) is set fully clockwise (Maximum Gain).
6. If any are set to a position that is not normal, set them to normal and try the convergence routine again (section 5.3.3). If you know which gain is set wrongly adjust only that control.
7. If convergence still fails, set all controls to maximum gain and try again (see section 5.3.3).
8. If convergence still fails, put the gain controls back to the settings you wrote down. Go to MAP 0600 Entry Point A.

If convergence is now working return to section 5.3.3.

Chapter 6. Support Information

6.1 Block Diagram

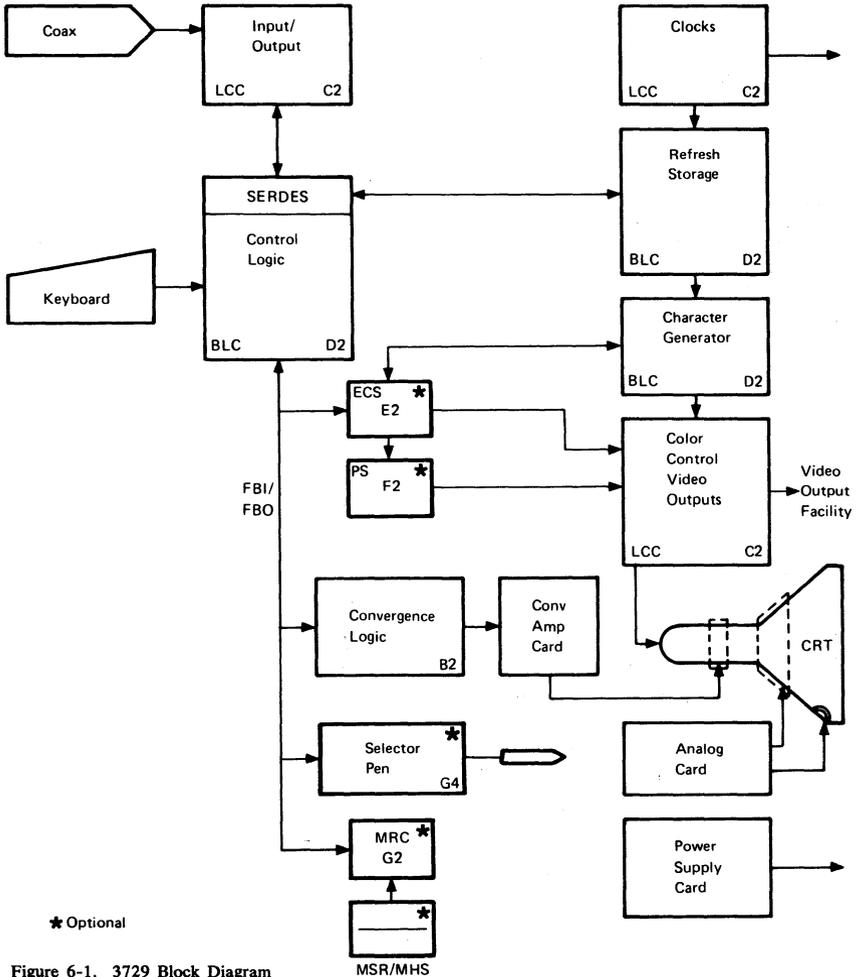
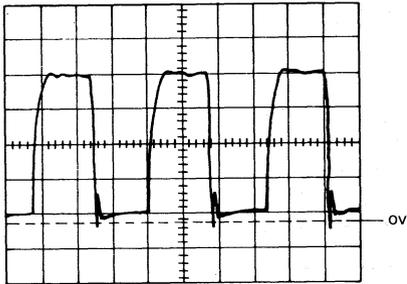


Figure 6-1. 3729 Block Diagram

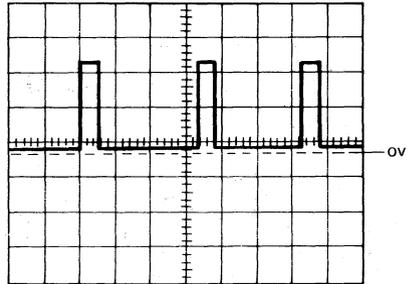
6.2 3279 Control Signals

6.2.1 Waveforms



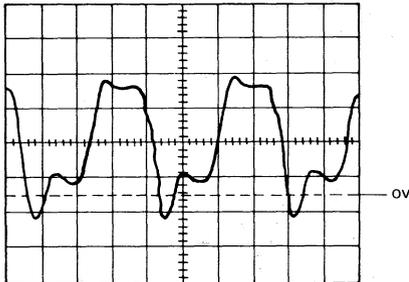
Feature Clock

Scopepoint C2 M08 Sync. Internal $0.2 \mu\text{s}/\text{cm}$, $1 \text{ V}/\text{cm}$ x 10 probe. If bad, change card C2 then B2, D2, E2.



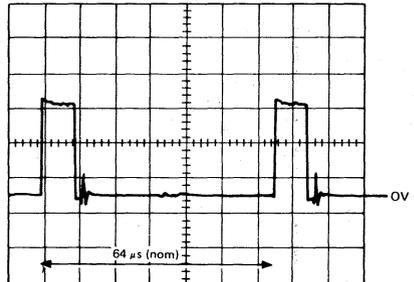
Horizontal Retrace

Scopepoint B2 G13 Sync. Internal $20 \mu\text{s}/\text{cm}$, $2 \text{ V}/\text{cm}$ x 10 probe. If bad, change card D2 then B2.



14 MHz Clock

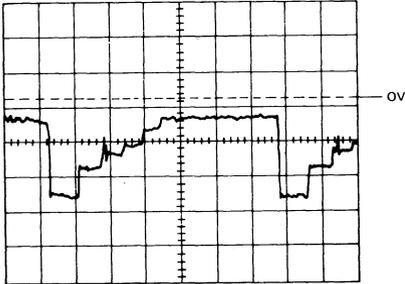
Scopepoint C2 P13 Sync. Internal $20 \text{ ns}/\text{cm}$, $1 \text{ V}/\text{cm}$ x 10 probe. If bad, change card C2.



Horizontal Sync.

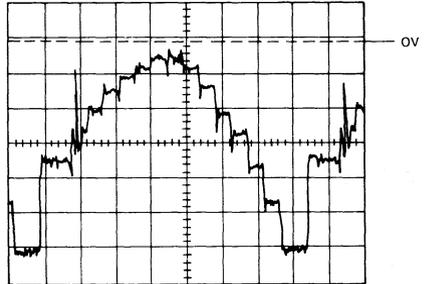
Scopepoint B2 J13 Sync. Internal $10 \mu\text{s}/\text{cm}$, $1 \text{ V}/\text{cm}$ x 10 probe. If bad, change card B2 then analog.

Figure 6-2 (Part 1 of 3). Waveforms



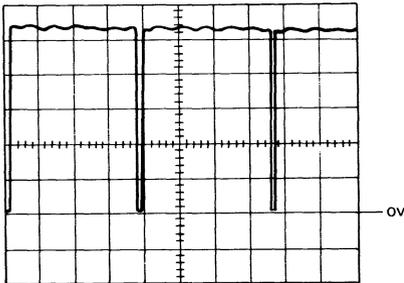
Example of Convergence Parabola for Badly Converged Screen

Scopepoint B2 S06 Sync, etc. as for Convergence Parabola. If unable to converge, change card B2 then analog.



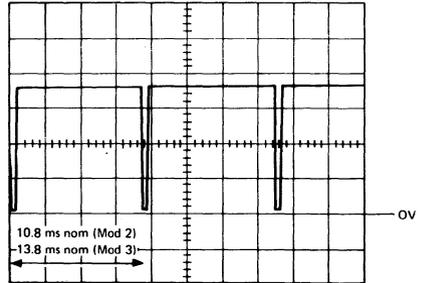
Convergence Parabola

Scopepoint B2 S06 Sync C2 Z08 (Indicator Row) Use 2 ms/cm Main sweep, 10 μ s/cm. Delayed sweep, 0.2 V/cm x 10 probe. If bad, change card B2 then analog.



— Skip (Model 2 only)

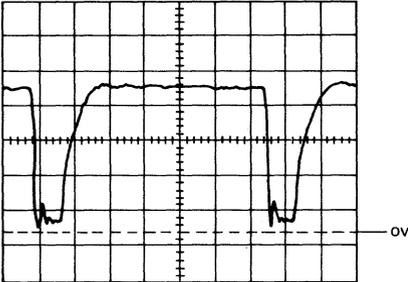
Scopepoint B2 G10 Sync. Internal 1 V/cm, 0.1 ms/cm x 10 probe. If bad, change card C2 then D2.



— Skip Out (Model 2 only)

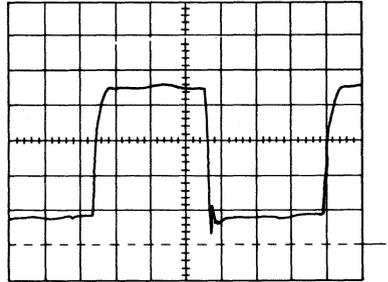
Scopepoint B2 J11 Sync, Internal 1 V/cm x 10 probe. If bad, change card B2 then analog.

Figure 6-2 (Part 2 of 3). Waveforms



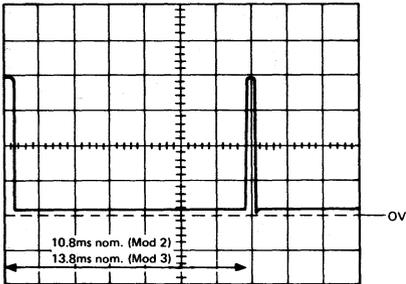
Dot 0

Scopepoint C2 B04 Sync. Internal $0.1 \mu\text{s}/\text{cm}$, $1 \text{ V}/\text{cm}$
 x 10 probe. If bad, change card C2 then D2, E2, F2.



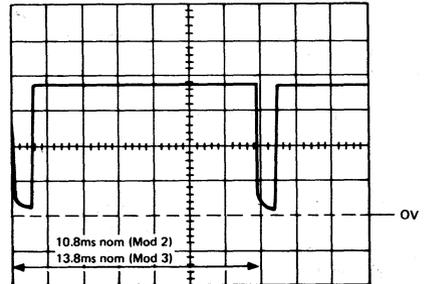
+ Videotime (and +7 x Trig)

Scopepoints C2 D02 C2 J10 Sync. Internal $0.2 \mu\text{s}/\text{cm}$,
 $1 \text{ V}/\text{cm}$ x 10 probe. If bad, change card D2, then C2,
 E2, F2.



+ Indicator Row

Scopepoint C2 Z08 Sync. Internal $1 \text{ V}/\text{cm}$ x 10 probe.
 If bad, change card D2 then C2, E2.

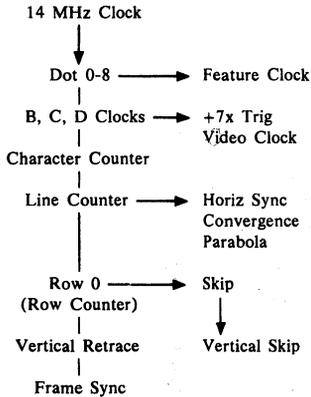


Frame Sync.

Scopepoint C2 G12 Sync. Internal $1 \text{ V}/\text{cm}$ x 10 probe.
 If bad, change card B2 then analog.

Figure 6-2 (Part 3 of 3). Waveforms

6.2.2 Activation Sequence



This diagram is a representation of some of the main control signals in the 3279, and the sequence in which they are developed.

The following connector strip diagrams show how these signals are distributed around the machine.

6.3 Top Card Connector and Planar Strip Wiring

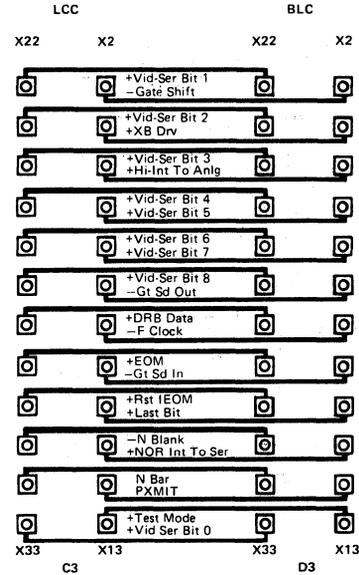


Figure 6-3 (Part 1 of 4). Top Card Connectors

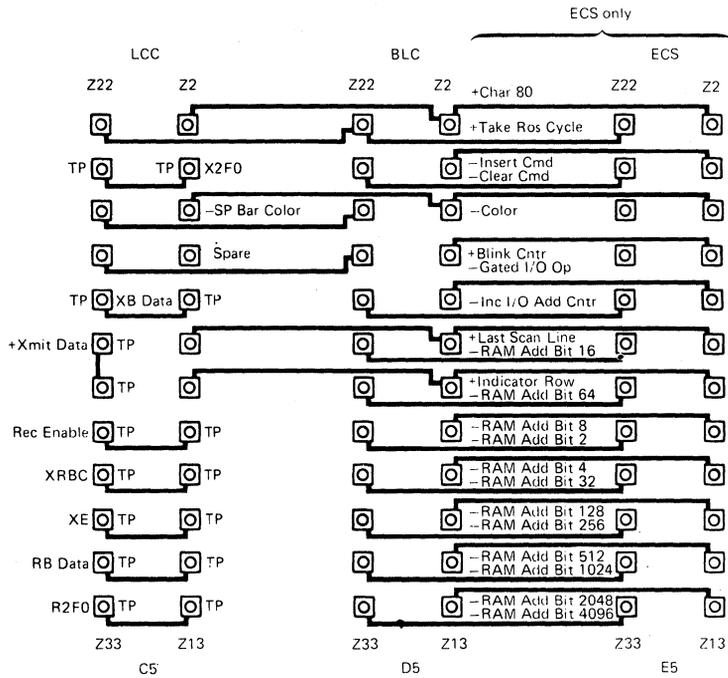


Figure 6-3 (Part 3 of 4). Top Card Connectors

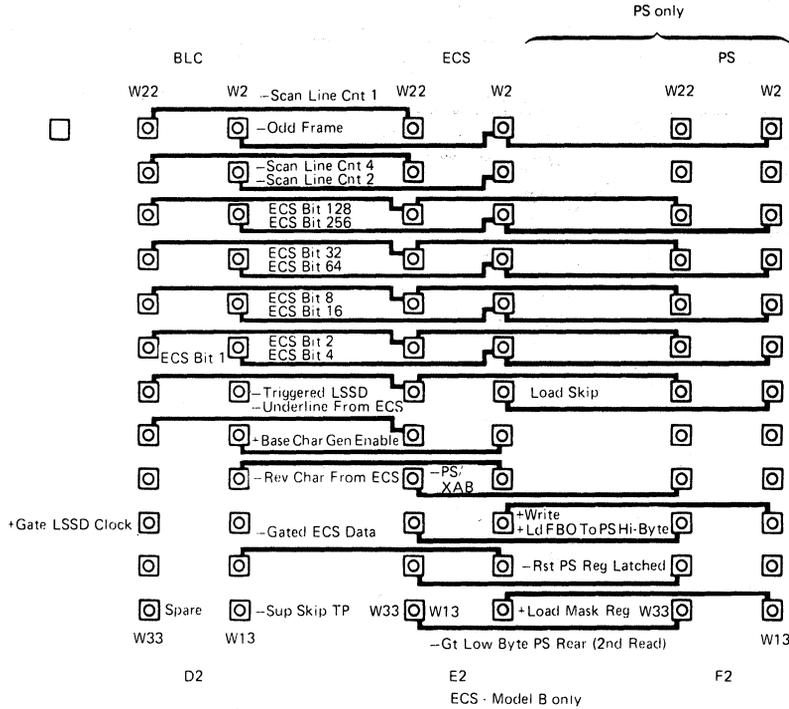
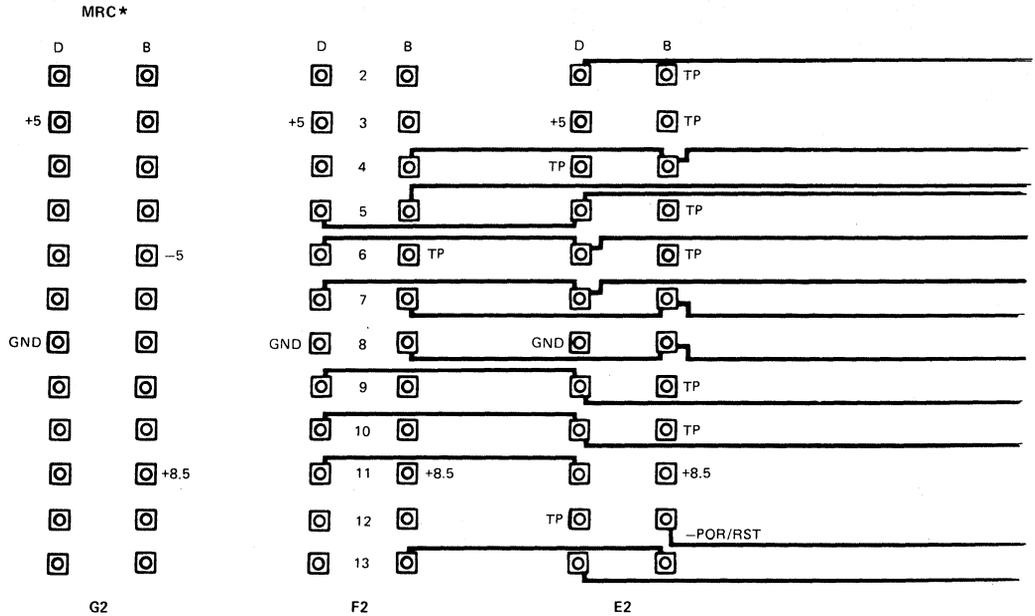


Figure 6-3 (Part 4 of 4). Top Card Connectors

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*Note that there is also a cable between G2 and G4 when MRC_{js} is installed, see Figure 6-6.

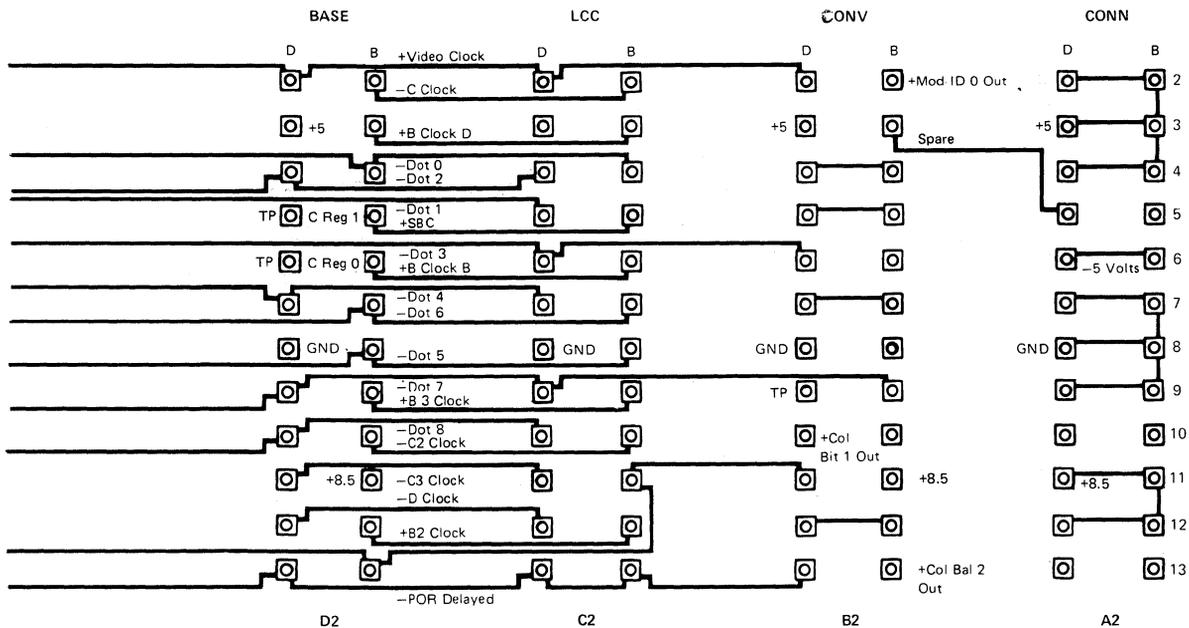
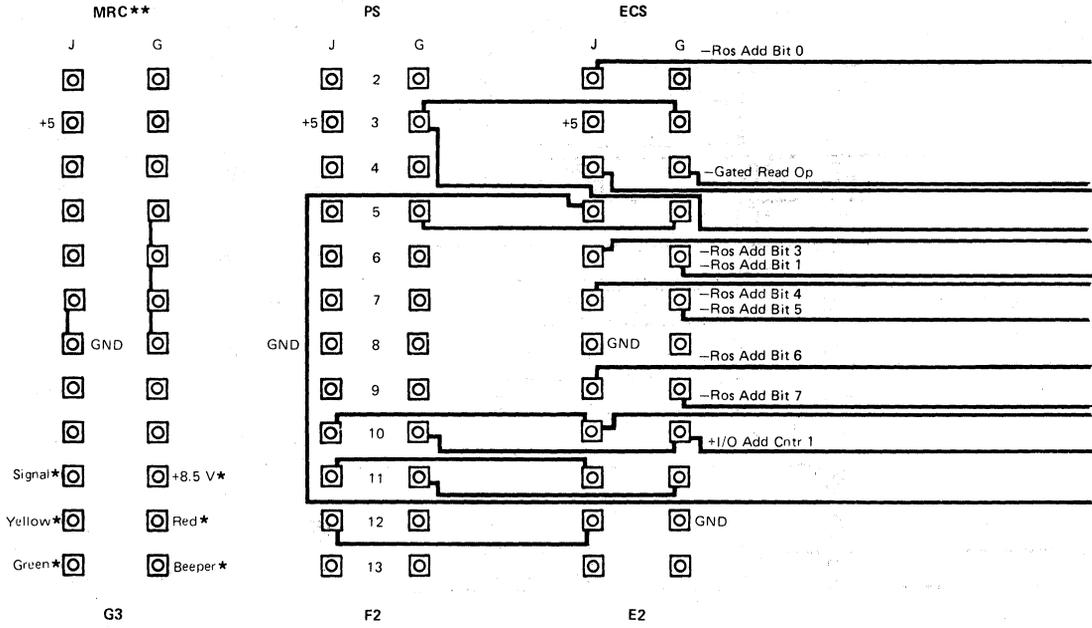
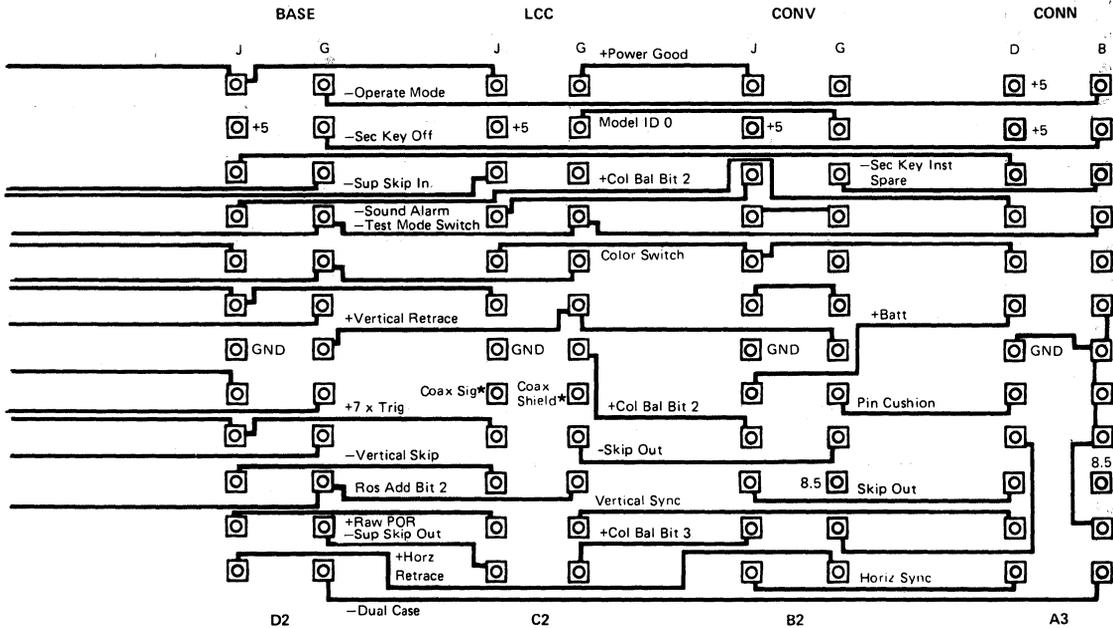


Figure 6-4 (Part 1 of 4). Planar Strips - BD



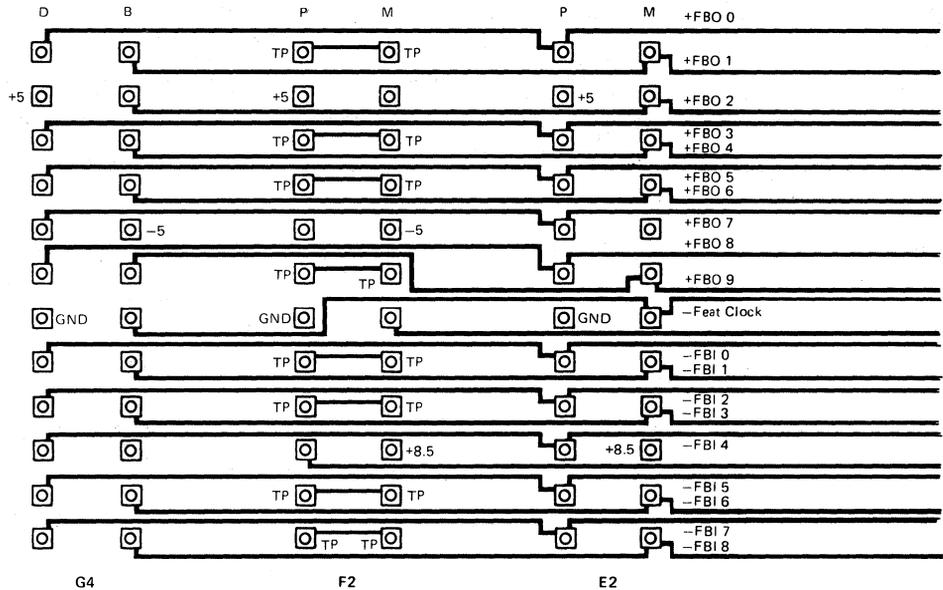
*Cable to MSR/MHS

**Note that there is also a cable between G3 and G5
When MRC is installed, see Figure 6-6.



*Coaxial device cable

Figure 6-4 (Part 2 of 4). Planar Strips - GJ



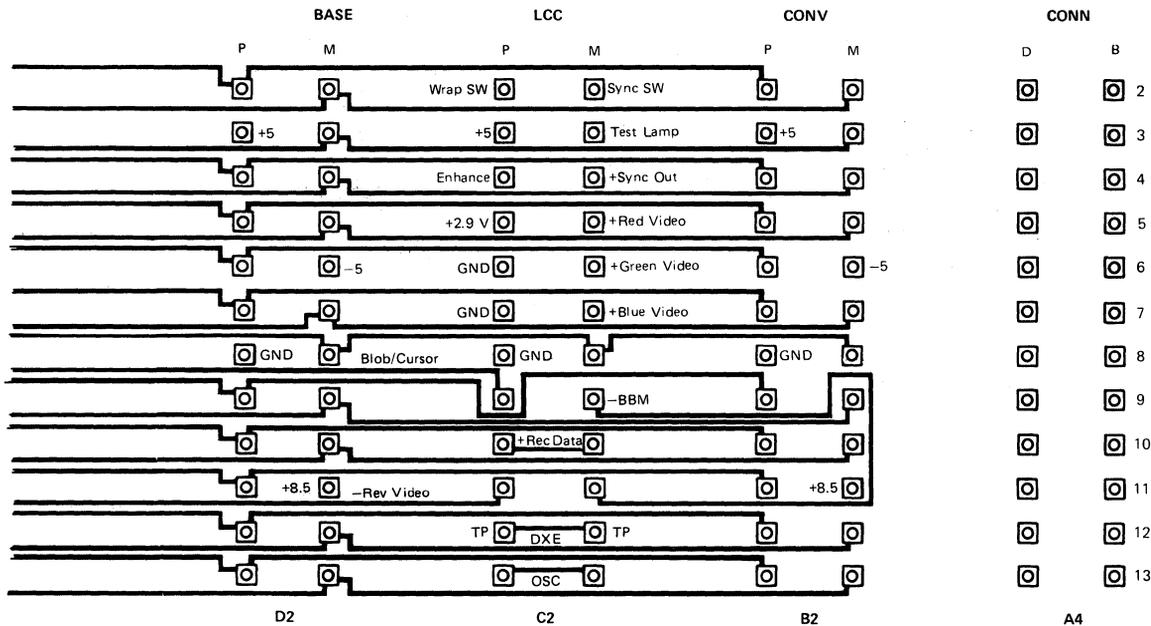
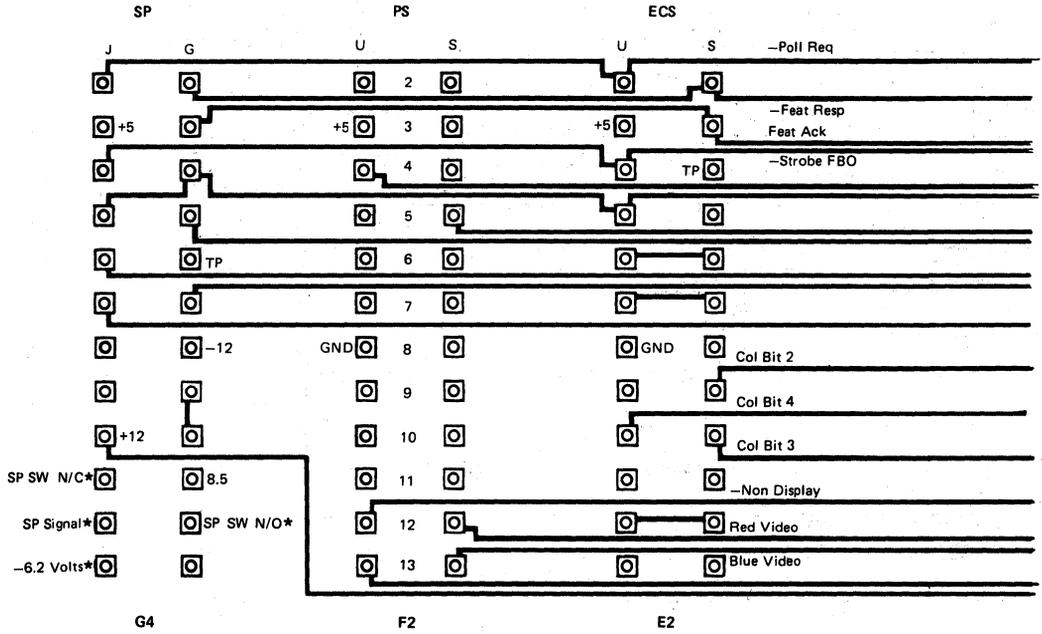
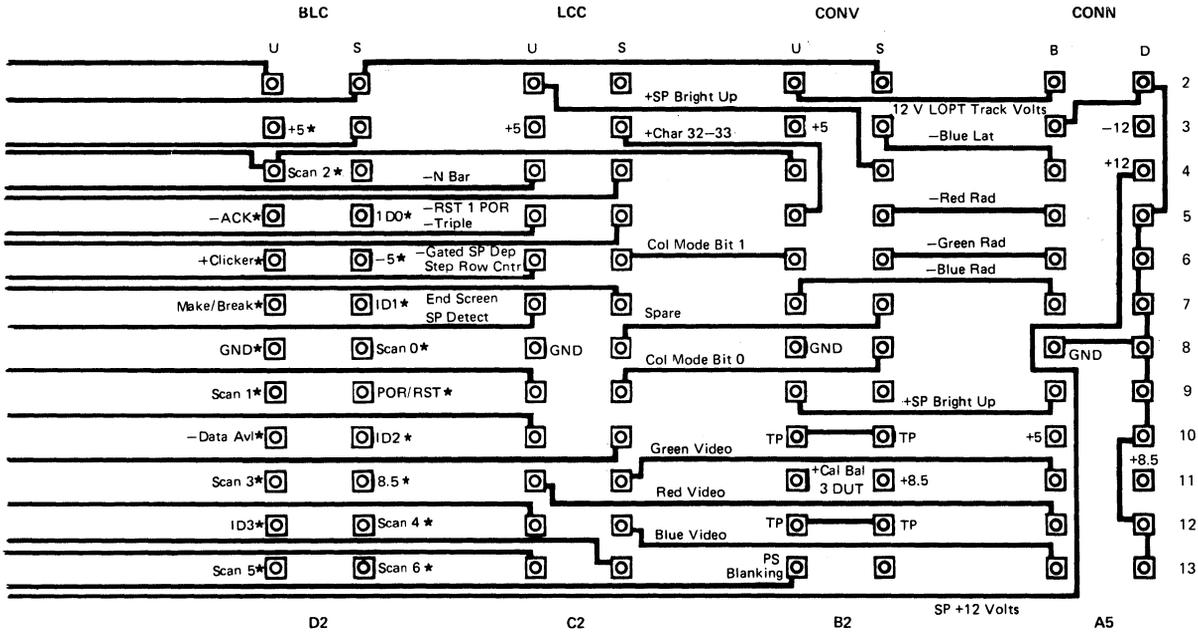


Figure 6-4 (Part 3 of 4). Planar Strips - MP



*Selector Light Pen Cable, see Figure 6-6.



*Key board cable

Figure 6-4 (Part 4 of 4). Planar Strips - SU

6.4 Grounding and Cables

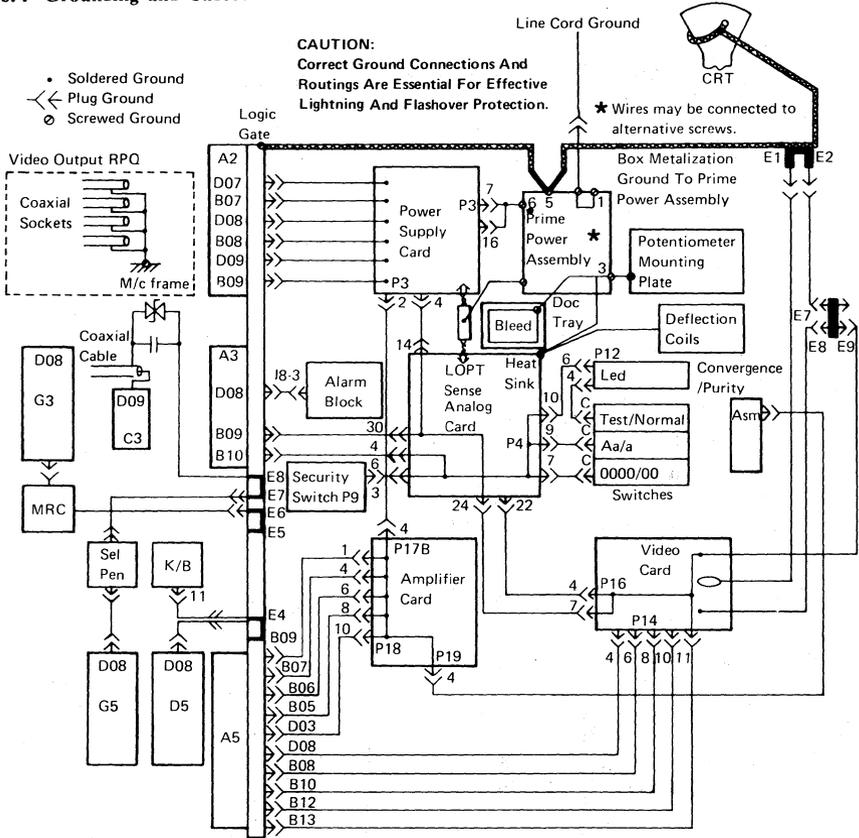
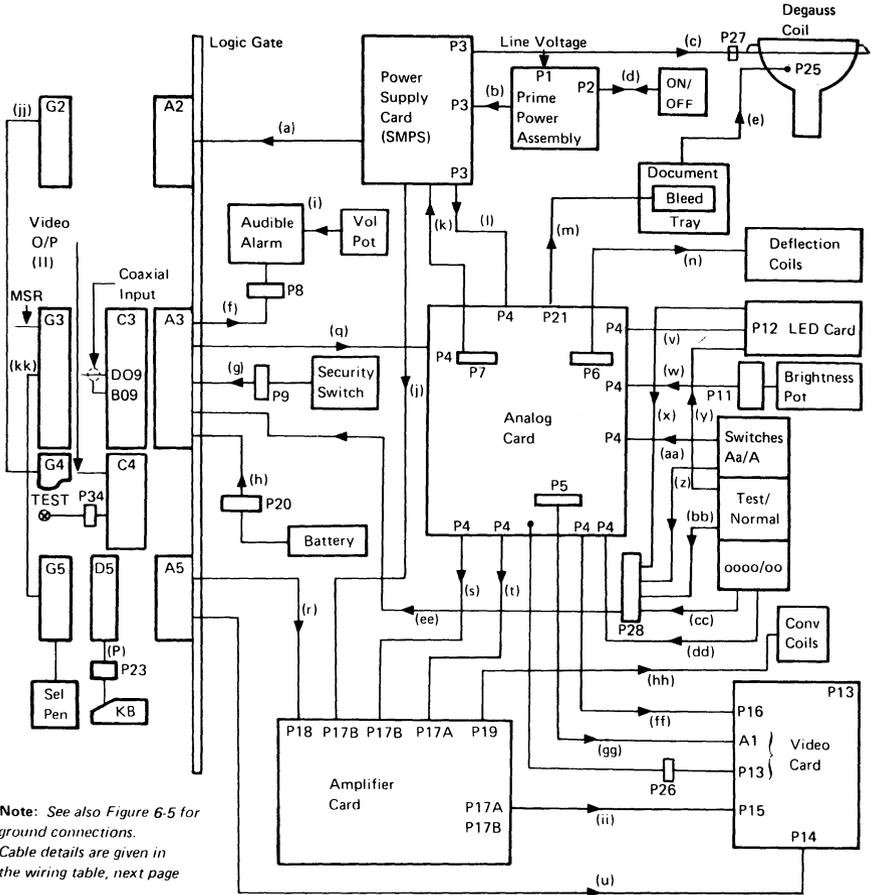


Figure 6-5. Grounding Diagram



Note: See also Figure 6-5 for ground connections. Cable details are given in the wiring table, next page

Figure 6-6. Cabling Diagram

Wiring Table (see Figure 6-6)

<i>Cable</i>	<i>Description</i>	<i>From</i>	<i>To</i>
	+5 V dc		A2D02
	+5 V dc		A2B02
	+5 V dc		A2D03
	+5 V dc		A2B03
	+5 V dc		A2D04
	+5 V dc		A2B04
	+12 V dc	Hard-Wired	A2B05
	-5 V dc		A2D06
	-5 V dc	at	A2B06
	0 V dc		A2D07
	0 V dc	Power Supply	A2B07
	0 V dc		A2D08
	0 V dc		A2B08
	0 V dc		A2D09
	0 V dc		A2B09
	-12 V dc		A2B10
	+8.5 V dc		A2D11
	+8.5 V dc		A2B11
	+8.5 V dc		A2D12
	+8.5 V dc		A2B12
b	Line	Hard-wired to fuseholder	P3-10
	Neutral	P2-2	P3-15
	Ground	Screw #6	P3-7
	Ground	Screw #6	P3-16
c	Degauss	P3-12	P27-2
	Neutral	P3-13	P27-1
d	Line (Switched)	P2-1	6 hard-wired
	Neutral (Switched)	P2-2	3 at power
	Neutral	P2-3	2 switch
	Line	P2-4	5
e	EHT Anode	Bleed Asm 2	P25
f	+5 V dc (red)	A3D02	P8-1
	0 V dc (black)	A3D08	P8-3
	Sound Alarm (yellow)	A3D05	P8-4
g	Security Key Op	P9-1	A3B03
	Security Key Ins	P9-4	A3D04
	Security Key Gnd	P9-3	P4-6
h	Battery +ve	P20-4	A3D07
	Battery -ve	P20-1	A3B07

Wiring Table (continued)

<i>Cable</i>	<i>Description</i>	<i>From</i>	<i>To</i>
i	Vol Pot 1 Vol Pot 2	3 (cw) 1 (ccw) + 2	Alarm A1 Alarm A3
j	+12 V dc ±12 V dc return -12 V dc	P3-1 P3-2 P3-3	P17B-3 P17B-4 P17B-6
k	LOPT Return LOPT Sense	P7-1 P7-2	P3-9 P3-8
l	103 V dc Return 103 V dc	P3-4 P3-5	P4-14 P4-15
m	EHT	P21	Bleed 1
n	Horiz Drive Horiz Return Vert Drive Vert Return Horiz Supply Voltage	P6-6 P6-3 P6-1 P6-4 P6-2	Hard-wired at yoke P6-5
p	+5 V dc Scan Bit 2 KB Ack KB Ident Bit 0 Clicker -5 V dc Make/Break KB Ident Bit 1 DC Return Scan Bit 0 Scan Bit 1 POR Data Available KB Ident Bit 2 Scan Bit 3 +8.5 V dc KB Ident Bit 3 Scan Bit 4 Scan Bit 5 Scan Bit 6	P23-16 P23-3 P23-4 P23-17 P23-5 P23-19 P23-6 P23-18 P23-11 P23-23 P23-8 P23-21 P23-9 P23-22 P23-10 P23-20 P23-7 P23-14 P23-12 P23-2	D5D03 D5B04 D5D05 D5B05 D5D06 D5B06 D5D07 D5B07 D5D08 D5B08 D5D09 D5B09 D5D10 D5B10 D5D11 D5B11 D5D12 D5B12 D5D13 D5B13
q	+5 V dc -5 V dc +8.5 V dc Skip	A3D03 A3B06 A3B11 A3D11	P4-34 P4-29 P4-35 P4-26

Wiring Table (continued)

<i>Cable</i>	<i>Description</i>	<i>From</i>	<i>To</i>
q	Vert Sync	A3D12	P4-28
	Horiz Sync	A3D13	P4-1
	0 V	A3B09	P4-30
	Ground	A3B10	P4-4
	Ground Separator	A3B04	-
	Ground Separator	A3B12	-
r	12 V dc LOPT	A5D02	P18-13
	12 V dc LOPT Return	A5B02	P18-12
	Ground Separator	A5D03	P18-10
	-12 V dc	A5B03	P18-15
	Lateral Blue	A5D04	P18-11
	+12 V dc	A5B04	P18-14
	Radial Red	A5D05	P18-9
	Ground Separator	A5B05	P18-8
	Radial Green	A5D06	P18-7
	Ground Separator	A5B06	P18-6
	Radial Blue	A5D07	P18-5
	Ground Separator	A5B07	P18-4
	Blue Bright-Up	A5D09	P18-3
Ground Separator	A5B09	P18-1	
s	Display Ready	P4-32	P17B-7
	12 V dc LOPT	P4-31	P17B-8
t	Bri Pot Wiper	P4-44	P17A-1
	Bri Pot	P4-41	P17A-3
	Bri Pot Return (-150 V)	P4-20	P17A-5
u	0 V dc	A5D08	P14-4
	Ground Separator	A5B08	P14-6
	+5 V dc	A5D10	P14-1
	Ground Separator	A5B10	P14-8
	Green Video	A5D11	P14-5
	+8.5 V dc	A5B11	P14-3
	Red Video	A5D12	P14-7
	Ground Separator	A5B12	P14-10
	Blue Video	A5D13	P14-9
	Ground Separator	A5B13	P14-11
v	0 V dc	P12-6	P4-10
	+5 V dc	P12-7	P4-12
	Display Ready	P12-8	P4-33

Wiring Table (continued)

<i>Cable</i>	<i>Description</i>	<i>From</i>	<i>To</i>
w	BR11	P11-6	P4-17
	BR12	P11-7	P4-19
	BR13	P11-8	P4-16
	Intensity Override Sw. 4	P11-3	P4-42
	Intensity Override Sw. 2	P11-4	P4-18
	Intensity Override Sw. 1+3	P11-5	P4-43
x	Test	P12-3	P28-3
y	Test	Test Sw. Top	P12-4
	0 V dc	Test Sw. Center	P12-5
z	Dualcase	A.a/A Sw. Bottom	P28-5
aa	0 V dc	A.a/A Sw. Center	P4-9
bb	Operate	Test Sw. Bottom	P28-4
cc	Base Col Supp	oooo/oo Sw. Bottom	P28-1
dd	0 V dc	oooo/oo Sw. Center	P4-7
ee	Test	P28-3	A3B05
	Operate	P28-4	A3B02
	Color Switch	P28-1	A3D06
	Monocase Switch	P28-5	A3B13
ff	70 V dc	P4-23	P16-1
	70 V dc Return	P4-24	P16-7
	+6.3 V dc	P4-25	P16-3
	+6.3 V dc Return	P4-22	P16-4
	Intensity Override	P4-13	P16-5
gg	A1 (+280 to +450 V dc)	P5-3	hard-wired
	Focus (6 kV)	P26	hard-wired
hh	Blue Radial Return	P19-8	Radial Card 1
	Blue Radial Drive	P19-7	Radial Card 2
	Green Radial Return	P19-10	Radial Card 3
	Green Radial Drive	P19-9	Radial Card 4
	Red Radial Return	P19-12	Radial Card 5
	Red Radial Drive	P19-11	Radial Card 6
	Vertical Purity Drive	P19-1	Purity Card 1
	Purity Return	P19-4	Purity Card 2
	Horizontal Purity Drive	P19-3	Purity Card 3
	Lateral Drive	P19-5	Lateral Card 2
	Lateral Return	P19-6	Lateral Card 1

Wiring Table (continued)

<i>Cable</i>	<i>Description</i>	<i>From</i>	<i>To</i>
ii	Red Grid	P17A-7	P15-1
	Green Grid	P17A-9	P15-5
	Blue Grid	P17B-1	P15-3
jj		G2B02	G4B02
		G2D02	G4D02
		G2B03	G4B03
		G2B04	G4B04
		G2D04	G4D04
		G2B05	G4B05
		G2D05	G4D05
		G2D06	G4D06
		G2B07	G4B07
		G2D07	G4D07
		G2B08	G4B08
		G2B09	G4B09
		G2D09	G4D09
		G2B10	G4B10
		G2D10	G4D10
	G2D11	G4D11	
	G2B12	G4B12	
	G2D12	G4D12	
	G2B13	G4B13	
	G2D13	G4D13	
kk		G2G02	G4G02
		G2J02	G4J02
		G2G03	G4G03
		G2G04	G4G04
		2J04	G4J04
	G2J05	G4J05	
ll	Sync Out	C4B04	J30
	Red Video	C4B05	J31
	Green Video	C4B06	J32
	Blue Video	C4B07	J33
	Wrap Test	C4D02	Video Ctl Sw. - Top
	Sync Polarity	C4B02	Sync Pol Sw. - Bot
	Ground	C4D08	Video Ctl Sw. - Ctr
	Ground	C4D08	Sync Pol Sw. - Ctr
	+5 V dc	C4D03	P34-1
	Signal Test Lamp	C4B03	P34-4
	Blue Enhance	C4D04	Video Ctl Sw. - Bot

6.5 CRT Drive Circuits

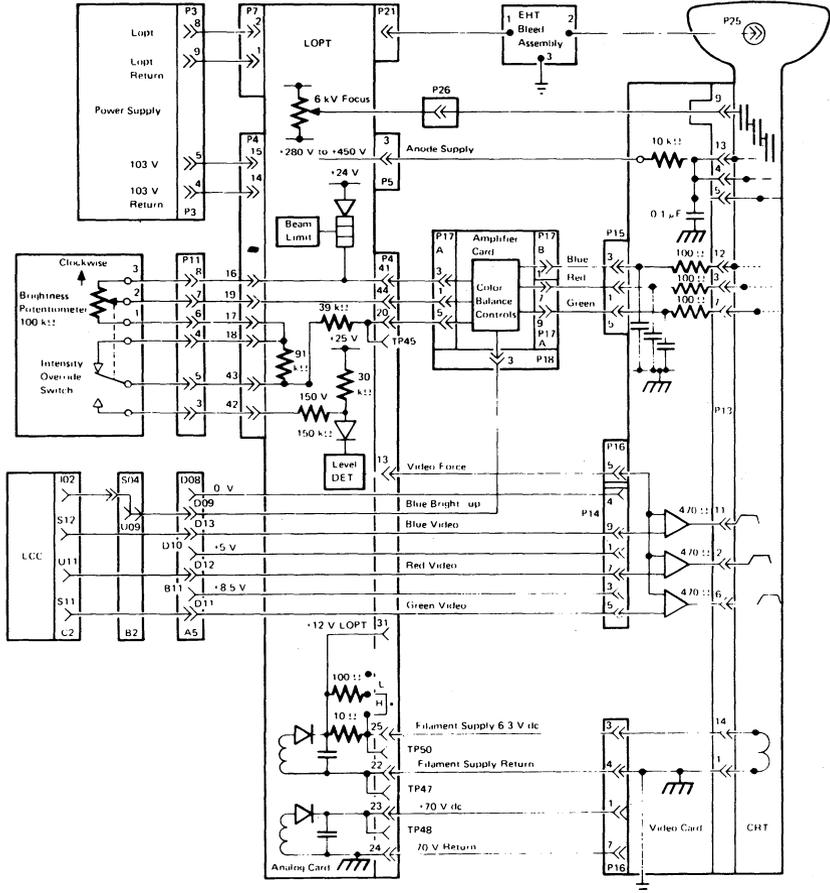


Figure 6-7. CRT Drive Circuits

6.6 Bezel Wiring

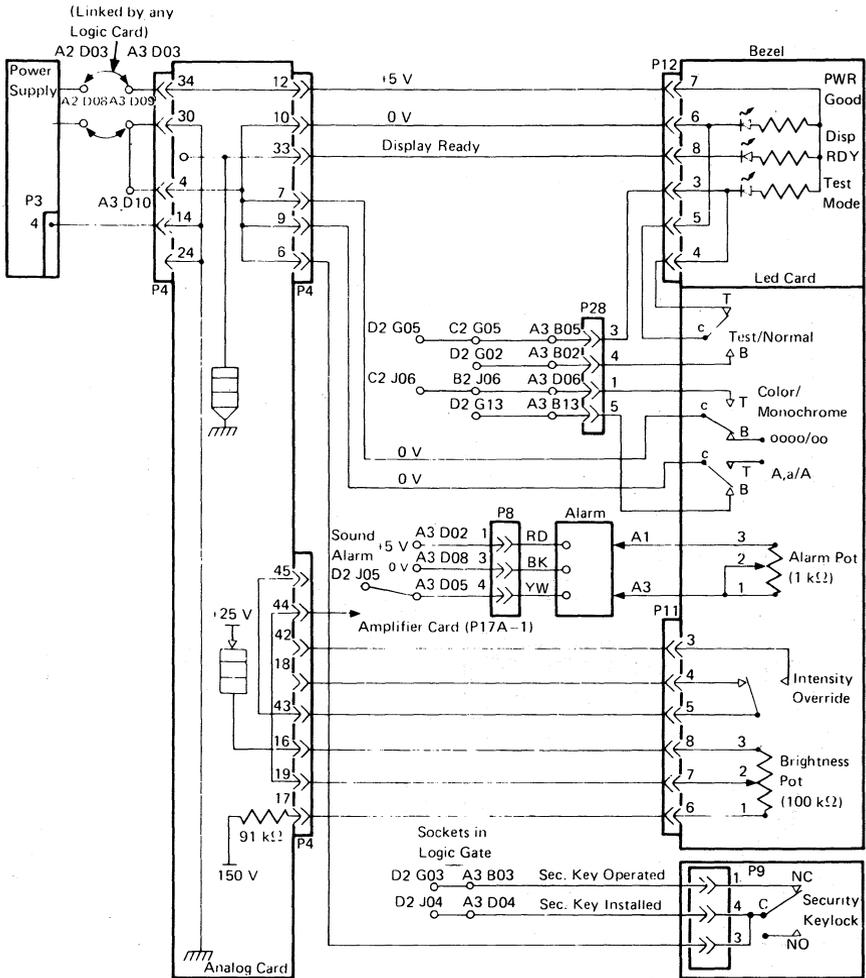


Figure 6-8. Bezel Wiring

6.7 Keyboard Jumpers and Cables

	Jumper Position	Keyboard ID response (See Test Model 3) Ensure that the Aa/A switch is set to Aa	
		Model 2	Model 3
Reserved	-	⊕	✕
Reserved	1	U	W
Typewriter	3	Ç	Š
Typewriter with Numeric Lock	1, 3	E	G
Data Entry	2	Ⓚ	▶
Data Entry with Numeric Lock	1, 2	u	w
Data Entry, Keypunch	2, 3	é	ž
Data Entry, Keypunch with Numeric Lock	1, 2, 3	e	g
APL with PSHICO	0	Û	Ê
RPO	0, 1	:	┘
Text	0, 3	Ù	Ö
Text with Numeric Lock	0, 1, 3	4	6
APL	0, 2	ü	ê
APL with Numeric Lock	0, 1, 2	/	ı
Typewriter with PSHICO	} 0, 2, 3	û	õ
Overlay with PSHICO			
Reserved	0, 1, 2, 3	̄	̂

If PSHICO present, Numeric lock is specified at CU customization and not by the keyboard I/D

PSHICO = PS, Highlighting and Color select on PF Keys (not valid on 3276 CU)

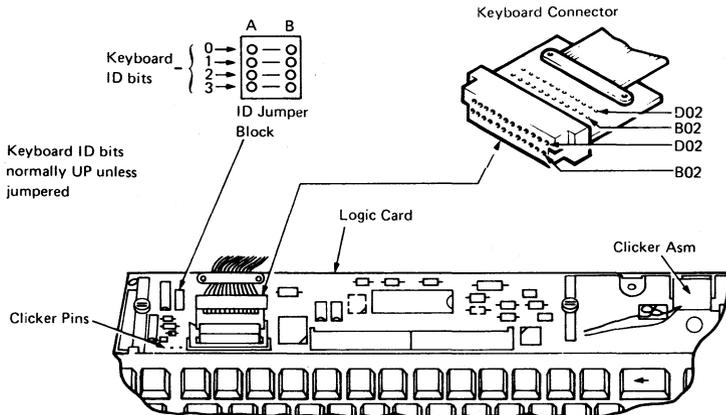


Figure 6-11. Keyboard Logic and Connector

6.8 Attachment Cabling

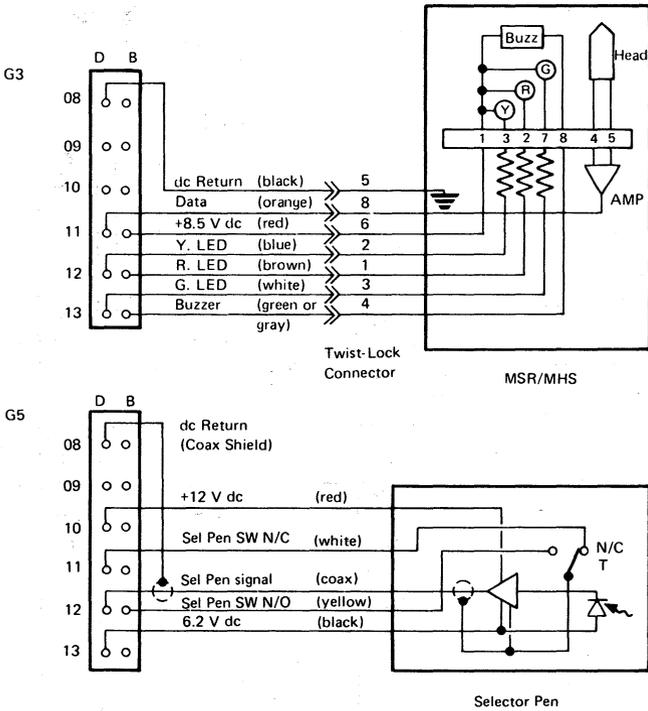


Figure 6-13 (Part 1 of 2). Attachment Cabling

C3

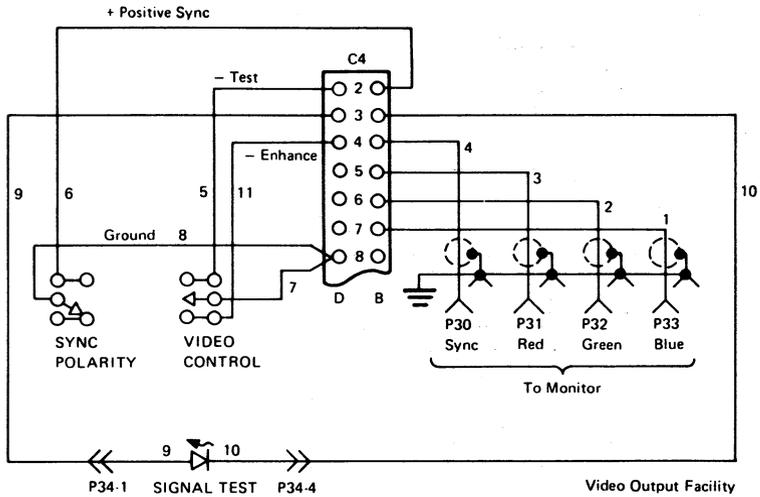
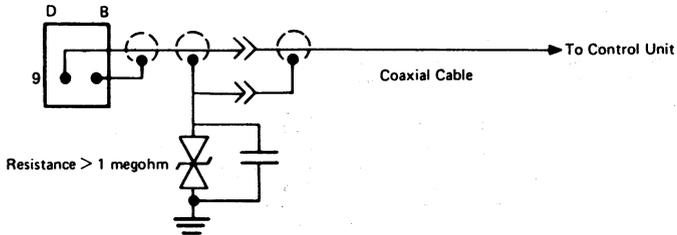
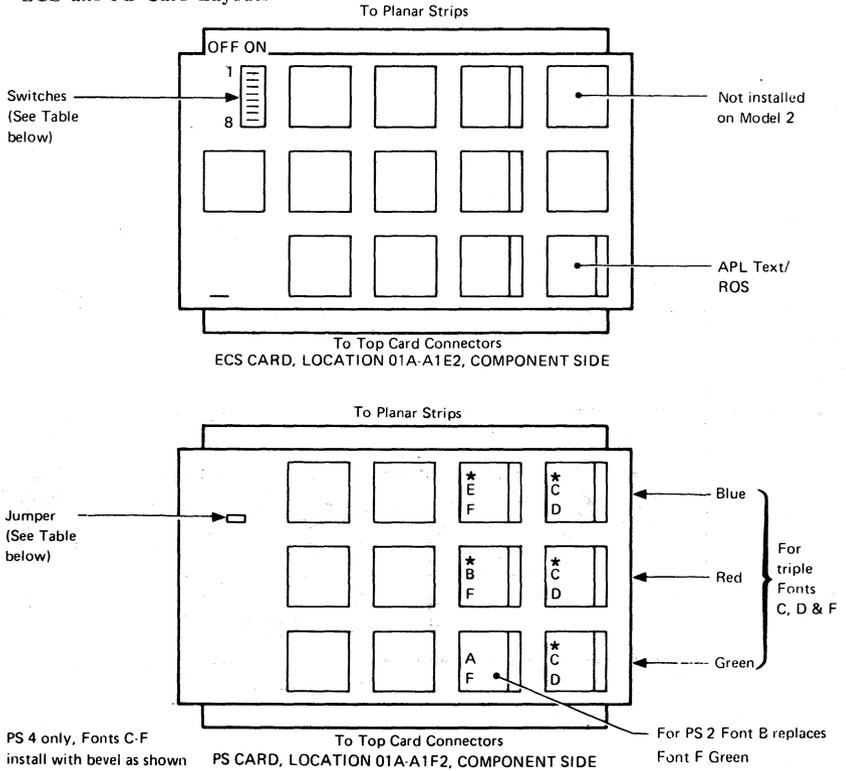


Figure 6-13 (Part 2 of 2). Attachment Cabling

6.9 ECS and PS Card Layouts



Feature	ECS Card Switches				PS Card **
	SW 2	SW 3	SW 1 & 4	SW 5-8	Jumper
No PS	OFF	OFF	ON	OFF	NO CARD
PS 2 **	OFF	ON	ON	OFF	INSTALL
PS 2 PS 4 **	ON	ON	ON	OFF	NO

** These features are only supported in the 3279 by certain control units (for example, 3274). If the feature is not supported by the control unit (including its features and customization), set switches SW 2 and SW 3 OFF. See Figures 2-6 and 2-7 for relevant error codes.

Figure 6-14. ECS and PS Card Layouts

6.10 Power Supplies

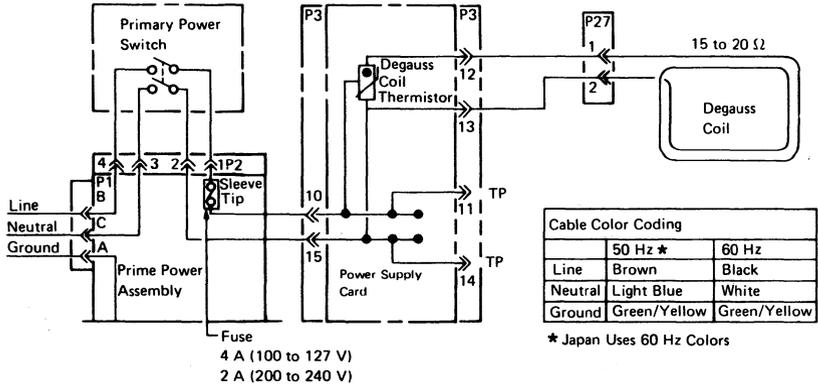


Figure 6-15. Mainline Supply

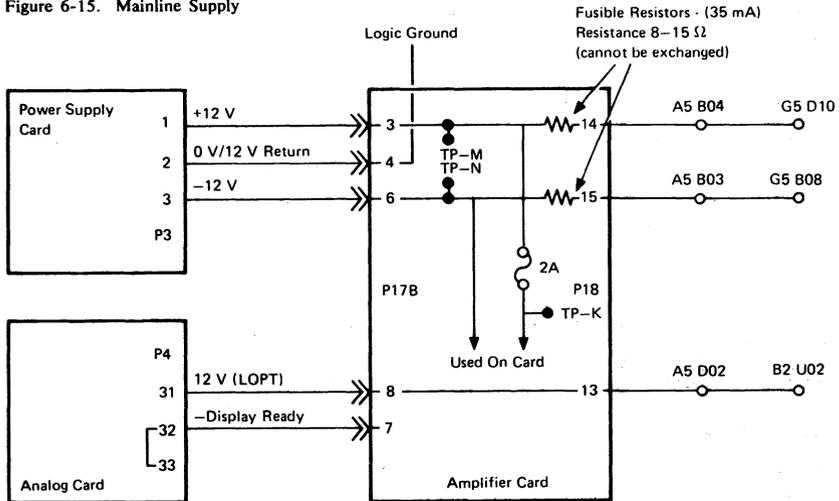


Figure 6-16. Supplies to Amplifier Card

6.11 Display Attributes and Modified Data Tags

Data in the refresh buffer (not the ECS buffer) may be examined for proper attributes and the setting or resetting of modified data tags (MDTs).

The procedure is as follows:

1. Jumper D2Y09 to D2Y08 (see section 2.5).
2. Position the cursor at the location of the attribute to be displayed.
3. Set the Normal/Test switch to Test. Nulls will display as % and attributes are blank.

Note that the colors of white and red fields (base) change to red and white respectively.

4. Press CONTROL D. The character, or attribute, at the cursor position is copied into the first position of the Operator Information Area and the cursor advances (see Test Mode 3, section 2.5.3).
5. Use the attribute bit definition figure and the attributes character tables (Figures 6-17 and 6-18) to determine if the attributes are being correctly interpreted by the hardware.

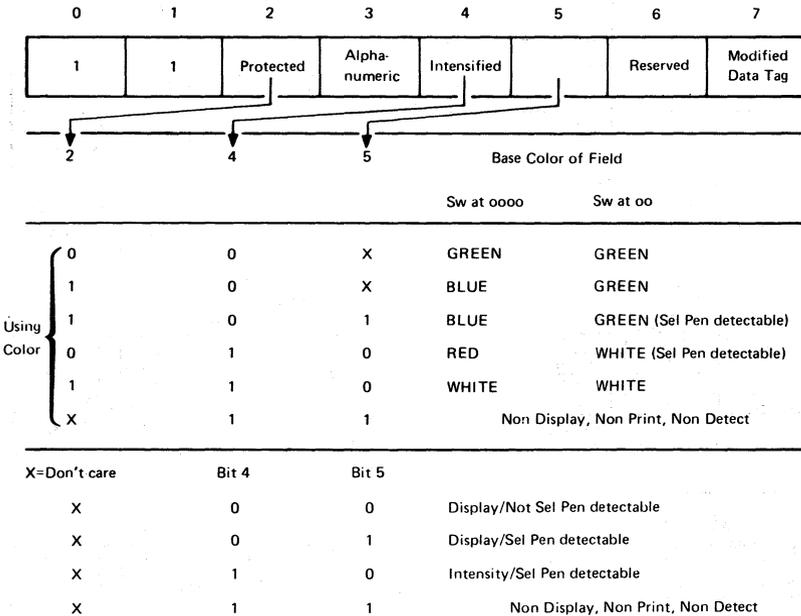


Figure 6-17. Base Field Attribute Byte

C	D	E	F	
ê	P	Ç	↖	0
ô	S	Ë	—	1
û	□	Û	Z	2
z	↗	Ž	—	3
é	□	Ć	⊙	4
ž	□	Ń	⊗	5
ý	□	Ś	⊗	6
ÿ	□	Ÿ	■	7
À	→	Ē	←	8
Å	↖	Š	↖	9
ä	↑	Đ	○	A
å	↖	Ð	└	B
ä	⊗	Þ	⊗	C
ä	⊗	I	⊗	D
ä	⊗	i	⊗	E
ä	⊗	κ	⊗	F
ä	⊗	¼	⊗	F

English

C	D	E	F	
ä	P	Ä	↖	0
σ	S	Ö	—	1
ü	□	Ü	Z	2
ä	↗	Ä	—	3
ñ	□	Ñ	⊙	4
ò	□	Ò	⊗	5
á	↖	Á	⊗	6
é	□	É	■	7
í	→	Í	←	8
ó	↖	Ó	↖	9
ú	↑	Ú	○	A
à	↖	à	└	B
è	⊗	è	⊗	C
ì	⊗	ì	⊗	D
ù	⊗	ù	⊗	E
ù	⊗	ù	⊗	F

Katakana and
Japanese English

Figure 6-18. Attribute Characters

6.12 Extended Character Set Buffer

The ECS buffer contains the Character Attribute (CA) bytes (defined in Figure 6-19). If the corresponding byte in the refresh buffer is itself an attribute, then the ECS byte becomes an extended field attribute (EFA).

Normally, the character attribute controls the displaying of the corresponding character, however, if the character attribute contains blank fields then attribute control defaults to the EFA. If the EFA also contains a blank color field, then color control defaults to the attribute byte in the refresh buffer.

The hardware is tested by Online Test 8, but no test exists to display the contents of the ECS buffer. (The OIA symbols can be used to determine the contents of the ECS buffer.)

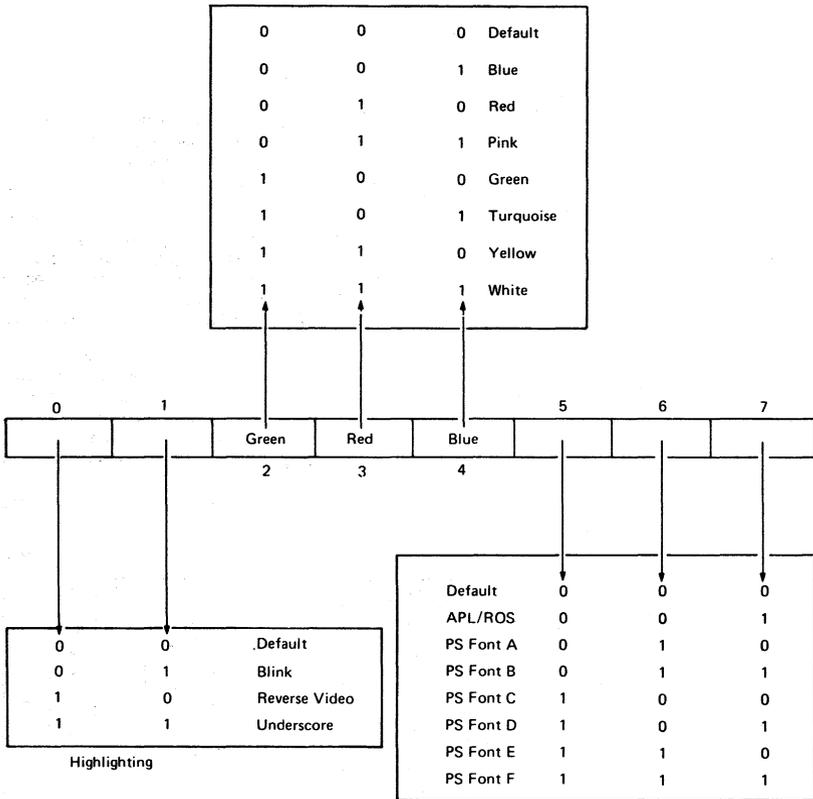
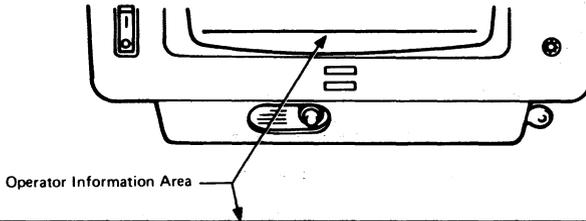


Figure 6-19. ECS Byte

Appendix A. Indicators In Operator Information Area



Col.	Readiness and System Connection	Do Not Enter (Input Inhibited)	Reminders	PS	Shift and Modes	High-lighting	Color	Insert Mode	Printer Status
	1 6	9 17	21 27	31 34	36 44	46 47	49 50	52	60 64

Note: The column numbers (0 - 64) of the indicator row do not appear on the screen.

Figure A-1. Layout of Operator Information Area

The following describes the symbols that may appear in the Operator Information Area.

-  3274 Control Unit is ready.
-  3276 Control Unit is ready.
-  IDPA is ready.
-  Control Unit is connected to system under 'a' rules.
-  Control Unit is connected to system under 'b' rules (SNA).
-  3279 is connected to application.
-  3279 is connected to system operator (control program).
-  3279 is connected to host but not to application or control program. Use SYS REQ to LOGON.
- TEST** 3279 is in online test mode (to control unit).
-  Wait for system to complete.
-  Keyboard overrun - RESET and retry.
-  System has locked keyboard while busy - wait for complete.

	Action must be taken elsewhere on the screen - RESET.
	Too many characters attempted to insert - RESET.
	Only numerals can be entered in numeric field - RESET.
	Wrong or invalid number entered - RESET.
	Requested function is unavailable - RESET.
	
	3279 logic failure - see Error Codes in section 2.6.6.
	As above.
	Communication check - see Control Unit MIM.
	As above.
	Host data stream programming error - see Control Unit MCM.
	As above.
	Assigned printer is busy. If  is displayed at right, the printer is busy on your work. Wait for printer to complete or use DEV CNCL. (Print in progress cannot be stopped by DEV CNCL.)
	Longer wait time expected than above.
	Assigned printer is not working. If  is displayed in printer status area, printer stopped while printing your work - use DEV CNCL.
	Function not allowed on this 3279.
	Security keylock is off. Key is needed to unlock.
	Questionable card - but usable in this operation.
	An invalid key was entered after the dead key accent.
	The symbol that was keyed is not available.
	A message from the operator was received and rejected.
	Errors are occurring on the link to the host.
	Host link established.
	Operator Selectable.
	Field Inherit.

S	Base symbols are selected.
PSA	Program Symbols Set A is selected.
	Reverse Video.
	Blink.
	Underscore.
a	Normal.
	Color in effect is shown by colored blob.
	Color is green or white by default.
NUM	Keyboard is in numeric mode (0123456789 -. and DUP only).
APL	The keyboard is in APL mode.
TEXT	The keyboard is in text mode.
	The keyboard is in upshift.
	The 3279 is in insert mode. (This symbol appears in position 41 on Model A or position 42 on Model B.)
	When printer ID/class is changed, two keyed-in numerals appear here.
	Authorization to use printer nn.
	Selected printer is printing your work.
	Selected printer stopped while printing for this 3279.
	Printer assignment for this 3279 has changed.

Abbreviations

A	Amp	MM	Millimetre
A/R	As Required	No No	No Number
ASM	Assembly	NOS	Numbers
BM	Bill of Material	OD	Outside Diameter
CAN/FR	Canadian French	P HD	Pan Head
COL	Column	P/N	Part Number
CONN	Connector	POSN	Position
CRT	Cathode Ray Tube	POT	Potentiometer
CSK	Countersunk	PT. NO.	Part Number
DIST	Distribution	PWR	Power
EX TH	External Tooth	QTY	Quantity
GAPL	Group Assembly Parts List	REF	Reference
GN	Green	RES	Resistor
GND	Ground	RH	Right Hand
HD	Head	SHLDR	Shoulder
HEX	Hexagon	STD	Standard
ID	Inside Diameter	SW	Switch
LCK W	Lock Washer	TEMP	Temperature
L.E.D.	Light Emitting Diode	THK	Thick
LG	Long	UNC	Unified National Coarse
LH	Left Hand	V	Volt
LOCN	Location	W.O.	Without
M	Metre	WSHR	Washer
MANUF	Manufacturing	WTC	World Trade Corporation
MFI	Machine Feature Index	YEL	Yellow

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Group Assembly Parts List

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HOW TO USE THIS PARTS CATALOG

This catalog is divided into three major sections:

The **Visual Index** contains small overall views of the machine, and gives references for all the major assemblies which are broken down in the Group Assembly Parts List (GAPL).

The **Group Assembly Parts List** contains exploded illustrations of the assemblies, subassemblies, and detail parts of the machine. Parts are cross-referenced by index number to the list of part numbers that accompanies each figure.

The **Numerical Index** follows the GAPL. It contains all of the part numbers on the GAPL in numerical order, and cross-references them by figure and index number.

Finding a Part

Turn to the visual index and find the general area of the machine in which the part is located. An arrow from that area will point to one or more reduced GAPL figures. Find the figure or figures containing the part required; there is a cross reference to indicate which GAPL figure contains the part.

Turn to the referenced figure in the GAPL to find the index number of the part required and locate the index number on the accompanying list. The list contains the following details:

- **Part Number**
- **Description**
(Trailer lines after the description are used for clarification or to indicate usage or obtainability of parts.)
- **Units per Assembly**
(This refers to the number of units used in the area indexed, or the number used for a similar purpose in the assembly.)

Circled Index Numbers

A circled index number indicates that the assembly is broken down within the figure.

Example for Ordering Parts

5726422	REF	FAN ASM POWER SUPPLY ENCLOSURE FOR NEXT HIGHER ASSEMBLY SEE FIGURE 1184 FOR ILLUSTRATION SEE FIGURE 9
1	334921	2 ● TERMINAL RING 18 22 AWG 6 HOLE INS
2	187854	1 ● SHIELD TERMINAL BLOCK 2 PDS
3	210984	1 ● SCREW RD HD 6 32 x 0 250 LG
4	5357050	1 ● FAN ASM RD CONN EC OR
5	52042	2 ● SCREW BIND. HD 10 22 x 0 375 LG
6	5357066	1 ● BLADE
7	5357067	1 ● MOTOR 208 V 230 V 60-HZ 220 V 50-HZ
8	336434	2 ● SCREW SLOTTED HEX HD 10 22 x 0 375 LG
9	58079	2 ● LOCKWASHER EXT TH 0 195 ID x 0 410 OD
10	5726436	1 ● HEADER POWER SUPPLY FAN

If the entire fan assembly is to be replaced, order part number 5726422; all of the items on that list will be supplied. If only the subassembly is required, order part number 5357050; it will include all of the two-dot items that immediately follow its attaching parts. Attaching parts must be ordered separately.

All parts may be ordered individually.

GLOSSARY

1 NO NO.

When this appears in the part number column, it denotes a group of parts for which no assembly part number has been assigned. The detail parts must be ordered separately.

2 AR

As Required (AR) in the units per assembly column denotes that the quantity is used as required.

3 ATT PT

Attaching Parts: These parts are used to attach a subassembly to an assembly. The attaching parts are listed immediately following the part to be attached.

4 REF

This entry in the units per assembly column denotes a part or assembly included for reference only. It is not part of the assembly breakdown and is also included elsewhere in the catalog.

5 INDENTURE

The relationship of a part to its next higher assembly is indicated by indentures. For example:

1 2 3 4

Unit

- Assemblies and Detail Parts of Unit
- Attaching Parts for Assemblies & Detail Parts
- • Subassemblies
- • • Attaching Parts for Subassemblies
- • • • Detail Parts for Subassemblies, etc.

6 NR

NR in the part number column denotes the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.

7 NP

The entry NP in the part number column denotes that the part is non-procurable. Order detail parts or next higher assembly, as applicable.

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM				DESCRIPTION
		1	2	3	4	
2						DRIVE MOTOR ASSEMBLY
	2199386	7	4			MOTOR ASM, DRIVE-220 VOLTS, 50 HZ FOR NEXT HIGHER ASM, SEE FIGURE 1-92 FOR ILLUSTRATION, SEE FIGURE 2
		NP	REF			
- 1	2199255		1			PULLEY
- 2	79842		2	AR		• SETSCREW, SPLINE DR CUP PT- 8-32 x 0.375 LG
- 3	2204116		1			• MOTOR ASM, 220 V AC 60 HZ
- 4	NO NO	1				• MOTOR ASM, 220 V AC, 50 HZ
- 5	5526	1				• SCREW, BIND HD-8-32 x 0.625 LG
- 6	2204082		4	5		• • FERRULE, OUTER
- 7	2204033		1			• • FERRULE, INNER
- 8	2199258		1			• • MOTOR, DRIVE - 220 V, 50 HZ
- 9	2199402	6				• PLATE, MOTOR MY-220 V, 50 HZ
		NR	1			

GROUP ASSEMBLY PARTS LIST

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	1 2 3 4				DESCRIPTION
			COVER ASSEMBLY				
1 -	4423162	REF					COVER ASM
- 1	4423377	1	.	.	.	.	CABINET, LOWER
- 2	4420421	4	.	.	.	.	SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 3	1622346	4	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 4	4420449	1	.	.	.	.	SPRING
- 5	4420448	1	.	.	.	.	SPRING
- 6	4423378	1	.	.	.	.	CABINET, UPPER
- 7	4423381	4	.	.	.	.	STUD
- 8	4423364	2	.	.	.	.	CLIP
- 9	4420395	1	.	.	.	.	HINGE, BRACKET
- 10	1673725	2	.	.	.	.	SCREW, P HD, M4, 12 MM LG
- 11	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 12	4420424	2	.	.	.	.	SCREW, HEX WSHR HD, 6-19, 16 MM LG, THD FORMING
- 13	1188748	2	.	.	.	.	WSHR, 0.172 IN ID, 0.5 IN, OD
- 14	4420348	1	.	.	.	.	CABLE CLAMP
- 15	4420394	1	.	.	.	.	HINGE BRACKET
- 16	1673725	2	.	.	.	.	SCREW, P HD, M4, 12 MM LG
- 17	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 18	4422079	2	.	.	.	.	LATCH ASM
- 19	4420481	2	.	.	.	.	CAM
- 20	4423376	1	.	.	.	.	COVER, REAR
- 21	4420398	1	.	.	.	.	HINGE, LOWER
- 22	1621190	2	.	.	.	.	SCREW, P HD, M4, 8 MM LG
- 23	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 24	1622304	2	.	.	.	.	WSHR, 4.3 MM ID, 9 MM OD
- 25	4420397	1	.	.	.	.	HINGE, UPPER
- 26	1621190	2	.	.	.	.	SCREW, P HD, M4, 8 MM LG
- 27	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 28	1622304	2	.	.	.	.	WSHR, 4.3 MM ID, 9 MM OD
- 29	4420401	1	.	.	.	.	PANEL, REAR
- 30	4420422	2	.	.	.	.	SCREW, HEX WSHR HD, 6-19, 10 MM LG, THD FORMING
- 30A	1621509	1	.	.	.	.	SCREW, SCK HD, M4, 8 MM LG FOR DETAILS SEE FIG 3 ITEM 3
- 31	4420441	1	.	.	.	.	LATCH, BRACKET
- 32	1621190	2	.	.	.	.	SCREW, P HD, M4, 8 MM LG
- 33	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 34	1622304	2	.	.	.	.	WSHR, 4.3 MM ID, 9 MM OD
- 35	4420400	1	.	.	.	.	PANEL, HINGE
- 36	4420442	1	.	.	.	.	LATCH, BRACKET
- 37	1621190	1	.	.	.	.	SCREW, P HD, M4, 8 MM LG
- 38	1622346	2	.	.	.	.	LCK W, EX TH, 4.3 MM ID
- 39	1622304	2	.	.	.	.	WSHR, 4.3 MM ID, 9 MM OD
- 40	4418777	1	.	.	.	.	LATCH, R.H.
- 41	4418778	1	.	.	.	.	LATCH, L.H.
- 42	4420424	4	.	.	.	.	SCREW, HEX WSHR HD, 6-19, 16 MM LG, THD FORMING
- 43	638537	3	.	.	.	.	WSHR

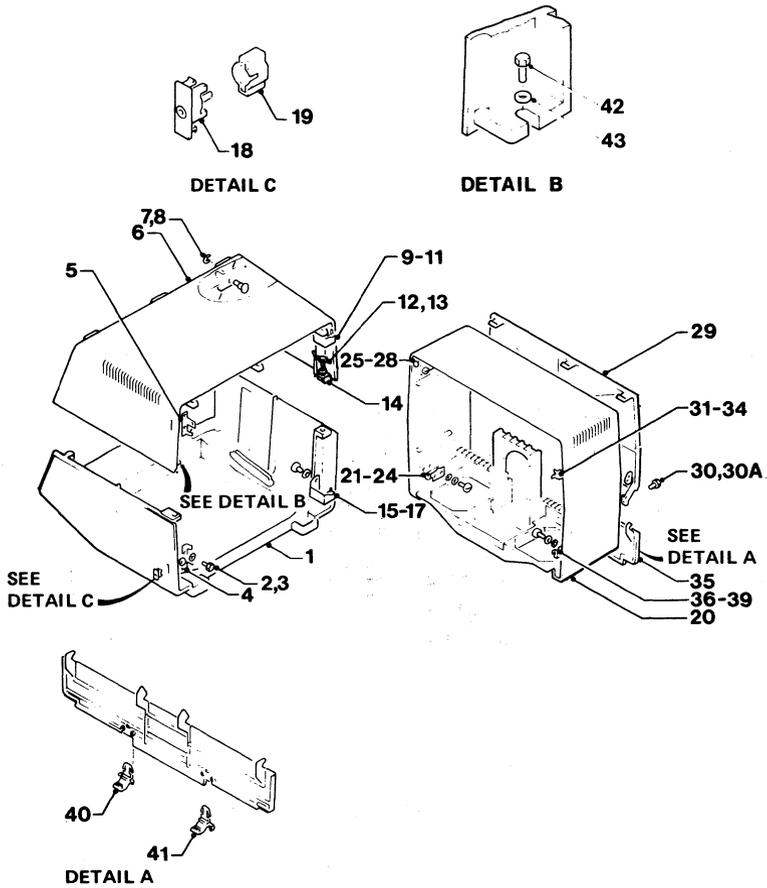


Figure 1. Cover Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			FRONT ENCLOSURE ASSEMBLY			
2 -	NO NO	REF	FRONT ENCLOSURE			
- 1	4423252	1	BEZEL ASM			
- 2	4423408	1	BEZEL			
- 3	4423410	1	INSERT, L.E.D.			
- 4	5830579	1	CARD ASM, L.E.D.			
- 5	4420426	2	SCREW, HEX WSHR HD, 4-20, 8 MM LG, THD FORMING			
- 6	1743194	1	LOGO			
- 7	1655357	3	SWITCH			
- 8	4423231	1	INSERT, NORMAL TEST			
- 9	4423232	1	INSERT, COLOR DEFAULT			
- 10	4423336	1	INSERT, MONO DUAL			
- 11	4423406	1	POTENTIOMETER ASM, BRIGHTNESS			
- 12	4420426	2	SCREW, HEX WSHR HD, 4-20, 8 MM LG, THD FORMING			
- 13	4423405	1	KNOB, BRIGHTNESS			
- 14	1743174	1	CUP			
- 15	2114043	1	CRADLE			
- 16	4420422	1	SCREW, HEX WSHR HD, 6-19, 10 MM LG, THD FORMING			
- 17	1743178	1	SWITCH, ON/OFF			
- 18	2114044	1	CLIP			
- 19	4423479	1	POTENTIOMETER ASM			
- 20	4423403	1	KNOB			
- 21	1743174	1	CLIP			
- 22	4420281	2	CAPSCREW, HEX SOC HD, M3, 8 MM LG			
- 23	615683	1	FUSE, 2 AMP (220 V)			
- 23	1143492	1	FUSE, 4 AMP (110 V)			
- 24	811427	1	RETAINER			
- 24A	2596291	1	CLIP, UPPER			
- 24B	2596275	1	CLIP, LOWER			

ITEMS 24A AND 24B MAY BE
FOUND ON OLDER MACHINES.
THEY ARE NOT SHOWN ON THE DRAWING

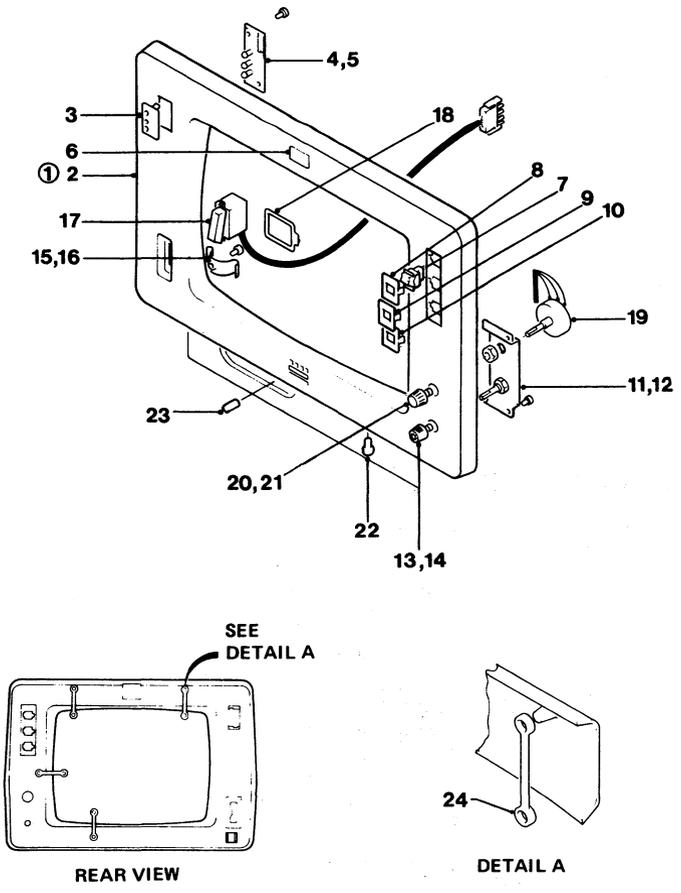


Figure 2 (Sheet 1 of 4). Front Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
FRONT ENCLOSURE ASSEMBLY (CONT)						
2 -						FRONT ENCLOSURE
- 25	SEE NOTE	1				AMPLIFIER CARD ASM
- 25A	855231	1				FUSE, 2 AMP
- 26	4423028	1				COVER
- 27	1621195	2				SCREW, P HD, M4, 25 MM LG
- 28	SEE NOTE	1				POWER SUPPLY CARD
						USED ON MACHINE 100-127 V
- 28	SEE NOTE	1				POWER SUPPLY CARD
						USED ON MACHINE 200-240 V
- 29	4420423	2				SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 30	4423344	1				HOUSING
- 31	SEE NOTE	1				CARD-VIDEO
- 32	4423029	1				COVER
- 32A	4422119	1				LABEL
						4420293 LABEL SUBSTITUTE FOR EMEA ONLY
- 33	SEE NOTE	1				ANALOG CARD ASM
- 34	4420423	2				SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 35	4420437	1				CLIP
- 36	4420423	1				SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 37	4420772	1				JUMPER

NOTE: WHEN REORDERING CARDS USE THE PART NUMBER ON THE FAILED CARD

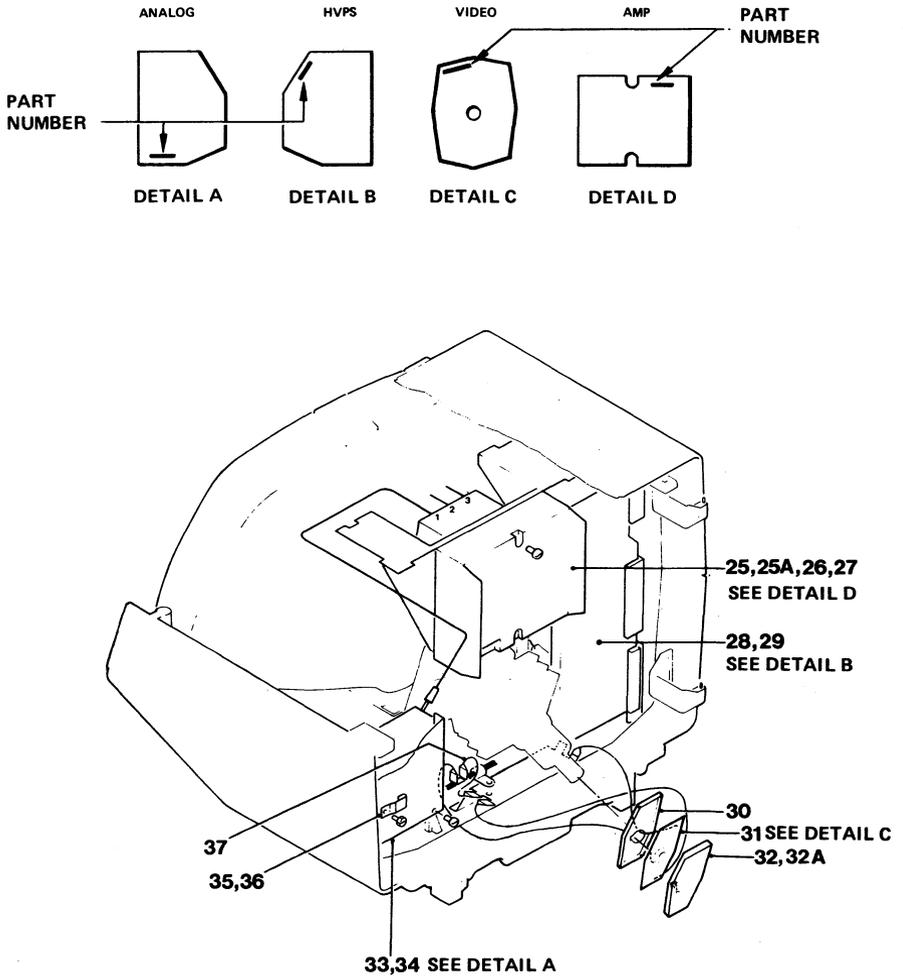


Figure 2 (Sheet 2 of 4). Front Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
FRONT ENCLOSURE ASSEMBLY (CONT)						
2 -						
- 38	4423140	1	.	.	.	FRONT ENCLOSURE
- 39	4423397	1	.	.	.	ENCLOSURE ASM
- 39A	4423462	1	.	.	.	CONVERGENCE ASM
- 39B	1621193	1	.	.	.	CLAMP
- 40	4422195	1	.	.	.	SCREW, P HD, M4, 16 MM LG
- 41	4422196	4	.	.	.	SCREEN
- 42	4420770	1	.	.	.	CLIP
- 43	4420422	1	.	.	.	PLATE
			.	.	.	SCREW, HEX WSHR HD, 6-19, 10 MM LG, THD FORMING
- 44	2102365	1	.	.	.	CLIP
- 45	4420422	1	.	.	.	SCREW, HEX WSHR HD, 6-19, 10 MM LG, THD FORMING
- 46	1743407	1	.	.	.	CARD ASM, AUDIBLE ALARM
- 47	4423373	2	.	.	.	THUMBSCREW, M3, 6 MM LG
- 48	4423357	2	.	.	.	INSERT
- 49	4423048	1	.	.	.	KEYSWITCH
- 50	4423317	4	.	.	.	CLIP
- 51	7341290	A/R	.	.	.	WASHER
						USE TO OBTAIN 2±2 MM BETWEEN CRT LUGS AND CABINET
- 52	4418776	4	.	.	.	NUT
- 53	4422109	1	.	.	.	COIL
- 54	5213306	4	.	.	.	CLIP
- 55	4422110	1	.	.	.	TIE, RELEASABLE
- 56	4423392	1	.	.	.	TUBE AND YOKE ASM, MODEL 2
						ORDER ITEM 57 WHEN ORDERING THIS ITEM
- 56	4423393	1	.	.	.	TUBE AND YOKE ASM, MODELS 3
						ORDER ITEM 57 WHEN ORDERING THIS ITEM
- 57	4420274	1	.	.	.	ACOUSTIC SHIELD
- 58	4423146	1	.	.	.	BLEEDER ASM
- 59	4423318	1	.	.	.	BRACKET
- 60	2568709	4	.	.	.	STAND-OFF
- 61	1621191	2	.	.	.	SCREW, P HD, M4, 10 MM LG
						NOTE: WHEN REORDERING CARDS, USE THE PART NUMBER ON THE FAILED CARD

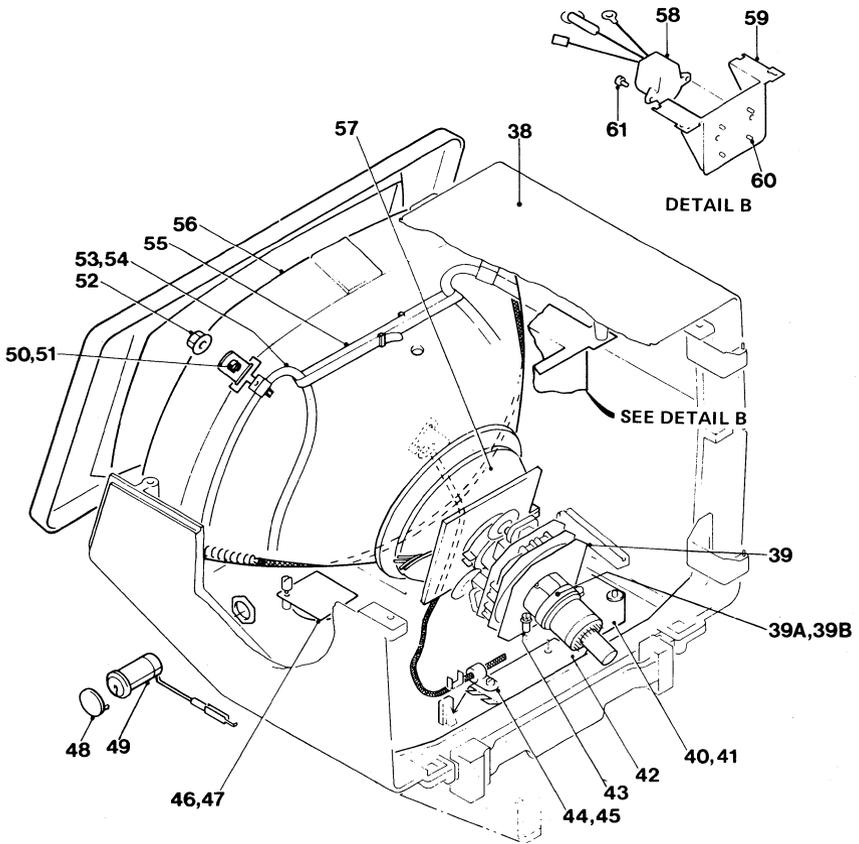


Figure 2 (Sheet 3 of 4). Front Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
FRONT ENCLOSURE ASSEMBLY (CONT)						
2 -						FRONT ENCLOSURE
- 62	4423490	1	.			DOCUMENT TRAY
- 63	4420421	4	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 64	4423353	1	.			BRACKET
- 65	4420425	1	.			SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 66	4420283	1	.			SPRING
- 67	4423244	1	.			FOOT
- 68	4423354	1	.			BRACKET
- 69	4420425	1	.			SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 70	219615	4	.			CLIP
- 71	4423385	1	.			SCREEN
- 72	4423494	1	.			BRACKET
- 73	1621190	2	.			SCREW, P HD, M4, 8 MM LG
- 74	1622346	2	.			LCK W, EX TH, 4.3 MM ID
- 75	1622304	2	.			WSHR, 4.3 MM ID, 9 MM OD
- 76	1621190	2	.			SCREW, P HD, M4, 8 MM LG
- 77	1622346	2	.			LCK W, EX TH, 4.3 MM ID
- 78	1622304	2	.			WSHR, 4.3 MM ID, 9 MM OD
- 79	4423493	1	.			BRACKET

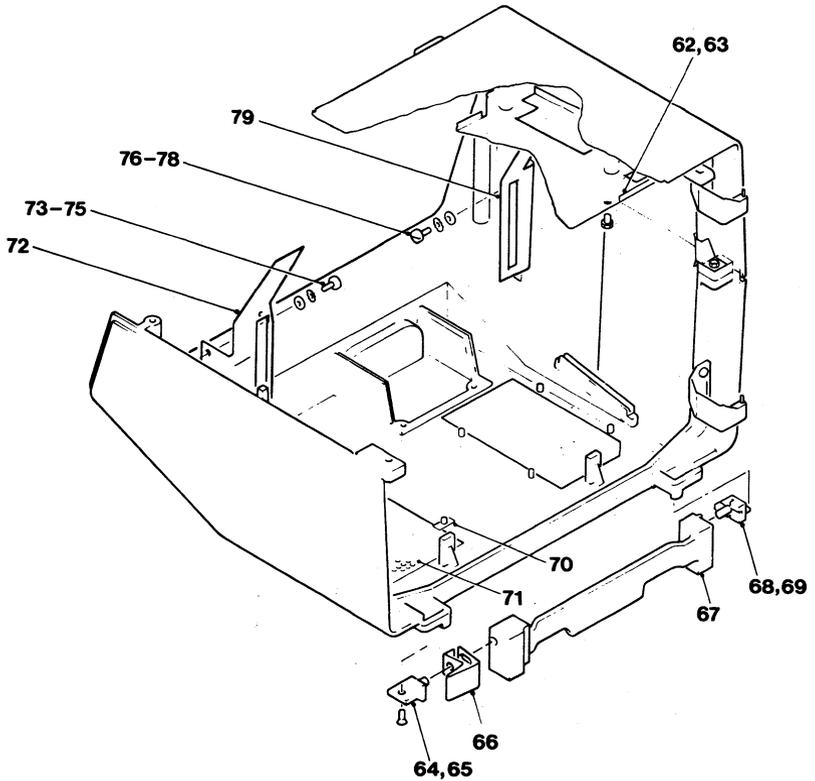


Figure 2 (Sheet 4 of 4). Front Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
						REAR ENCLOSURE ASSEMBLY.
3 -	NO NO	REF				REAR ENCLOSURE
- 1	4420421	3	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 2	4423374	1	.			THUMBSCREW, M4, 9 MM LG
- 3	1621509	1	.			SCREW, SCK HD, M4, 8 MM LG
- 4	4418790	1	.			GUARD
- 5	1621844	1	.			SCREW, P HD, M3, 6 MM LG, THD FORMING
- 6	NO NO	REF	.			BATTERY
						CUSTOMER REPLACEABLE ITEM
- 7	1743455	1	.			CLIP
- 8	4420350	1	.			PLATE
- 9	473442	1	.			GROMMET, 27 MM LG
- 9A	4423374	3	.			THUMBSCREW, M4, 9 MM LG (MODEL 2)
- 9B	4422107	1	.			PLATE (MODEL 2)
- 9C	4422106	1	.			STRAP (MODEL 2)
- 9D	4423312	3	.			CLAMP (MODEL 2)

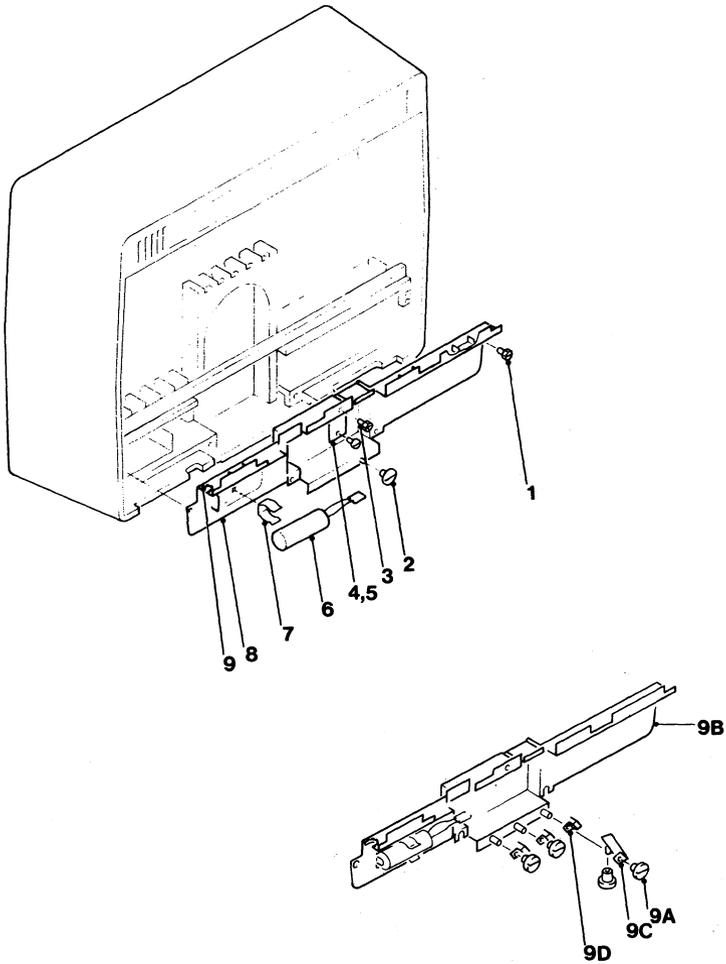


Figure 3 (Sheet 1 of 4). Rear Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			REAR ENCLOSURE ASSEMBLY (CONT)			
3 -						REAR ENCLOSURE
- 10	4423162	1	.			COVER ASM
- 11	4420368	1	.			GUARD
- 12	219615	6	.			CLIP
- 13	1621191	2	.			SCREW, P HD, M4, 10 MM LG
- 14	1622346	1	.			LCK W. EX TH, 4.3 MM ID
- 15	4423483	1	.			SUPPORT
- 16	4420421	4	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 17	4423365	8	.			GROMMET
- 18	4423233	1	.			PLATE, STOP
- 19	1621197	1	.			SCREW, P HD, M4, 6 MM LG
- 20	4420421	4	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 21	4423485	1	.			BRIDGE
- 22	1621197	2	.			SCREW, P HD, M4, 6 MM LG
- 23	811427	14	.			RETAINER

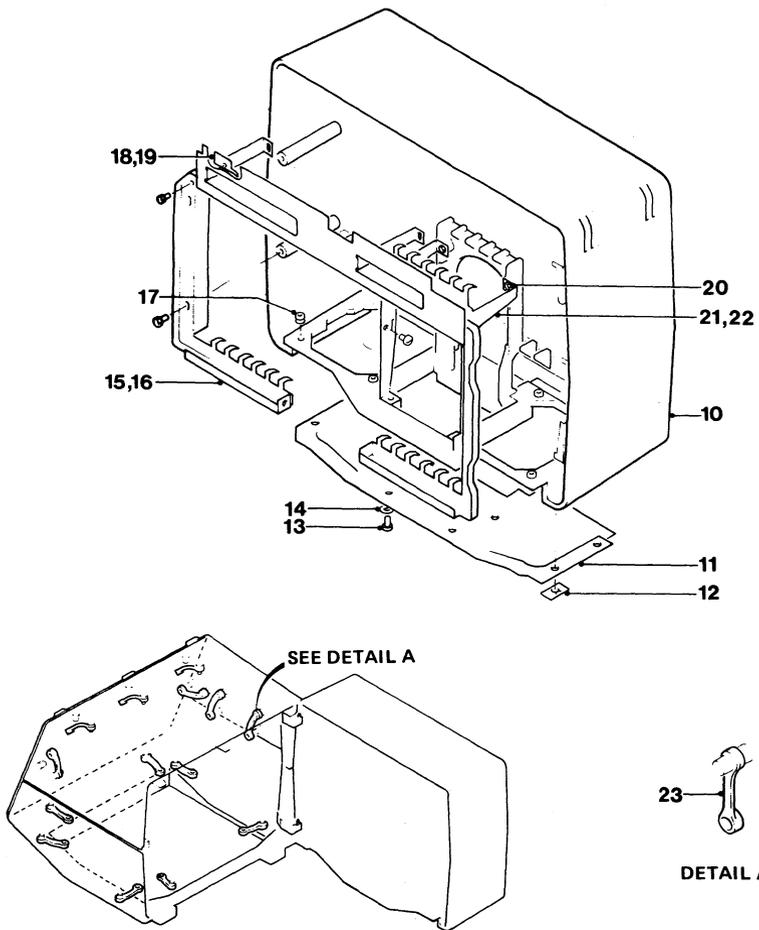


Figure 3 (Sheet 2 of 4). Rear Enclosure Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			REAR ENCLOSURE ASSEMBLY (CONT)			
3 -						REAR ENCLOSURE
- 24	NO NO	REF	.			LABEL
						FOR DETAILS SEE CHART Y
- 25	NO NO	REF	.			CONNECTOR, TOP CARD
						FOR DETAILS SEE CHART Y
- 26	4420426	4	.			SCREW, HEX WSHR HD, 4-20, 8 MM LG, THD FORMING
- 27	NO NO	REF	.			PLANAR STRIPS
						FOR DETAILS SEE CHART X
- 28	4420427	4	.			SCREW, HEX WSHR HD, 4-20, 16 MM LG, THD FORMING
- 29	4134800	4	.			STIFFENER

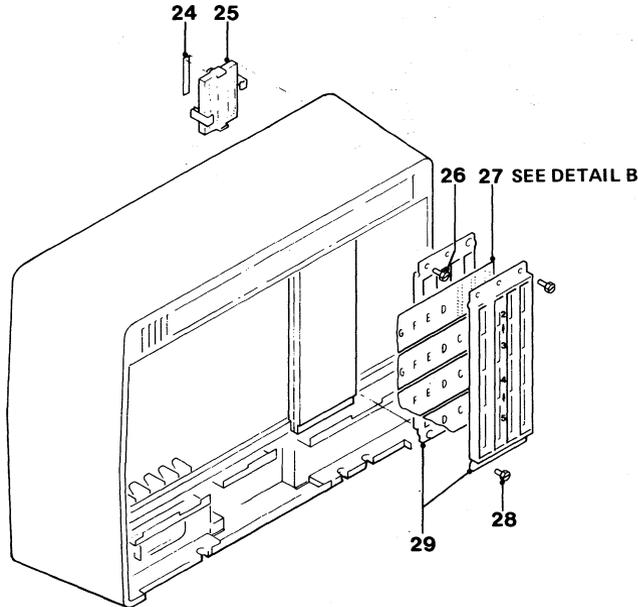
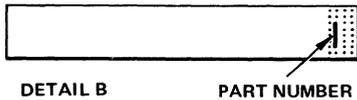


CHART X

ROW	FROM COL	TO COL	BM	PLANAR STRIP PART NUMBER			
				EC 393807	EC 394427	EC 394686	EC
2	A	G	A	5148164	5148932		EC
3	A	G	A	5148165	5148706		
4	A	G	A	5148166	5148707	5147535	
5	A	G	A	5148167	5148933		

CHART Y

LOCATION	TCC Asm Part No.	LABEL
C3-D3	2766726	4423095
C4-D4	2766726	4423089
C5-D5	4423325	4423090
D2-E2	4423324	4423093
C5-E5	4420450	4423091
D2-F2	4423323	4423092
E3-F3	2766726	4423094
C4-D4	4420718	4423089

NOTE: PLANAR STRIP, PART NO. 5148707, MAY HAVE BEEN REPLACED BY PART 5147535 IF RPQ 7J0039 IS INSTALLED

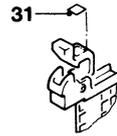
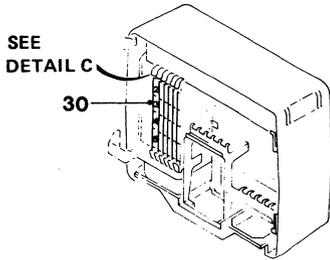
3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			REAR ENCLOSURE ASSEMBLY (CONT)			
3 -			.	.	.	REAR ENCLOSURE
- 30	NO NO	REF	.	.	.	CARD AND HOLDER FOR DETAILS SEE CHART A
- 31	1743002	1	.	.	.	LABEL, 'B'
- 31	1743003	1	.	.	.	LABEL, 'C'
- 31	1743004	1	.	.	.	LABEL, 'D'
- 31	1743005	A/R	.	.	.	LABEL, 'E'
- 31	1743006	A/R	.	.	.	LABEL, 'F'
- 31	1743007	A/R	.	.	.	LABEL, 'G'
						FOR DETAILS SEE CHART A
- 32	2731801	1	.	.	.	JUMPER
- 34	1599501	5	.	.	.	MODULE, CONC-T, PLUGGABLE SEE DETAIL H
- 35	5645546	1	.	.	.	MODULE, ROS, PLUGGABLE SEE DETAIL E NOTE: USE THE PART NUMBER ON THE CARD TO REORDER

CHART A

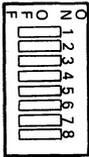
CARD DESCRIPTION	CARD HOLDER PART NUMBER	CARD LOCN	LABEL P/N	CARD DESCRIPTION	CARD HOLDER PART NUMBER	CARD LOCN	LABEL P/N
CONVERGENCE CARD	1743142	B2	1743002	ECS CARD MOD 2B LATIN	1743142	E2	1743005
LINE CONTROL CARD *	1743142	C2	1743003	ECS CARD MOD 3B LATIN	1743142	E2	1743005
BLC CARD MOD 2A LATIN	1743142	D2	1743004	ECS CARD MOD 2B KATAKANA	1743142	E2	1743005
BLC CARD MOD 3A LATIN	1743142	D2	1743004	ECS CARD MOD 3B KATAKANA	1743142	E2	1743005
BLC CARD MOD 2A KATAKANA	1743142	D2	1743004	PS2 CARD MOD 2B	1743142	F2	1743006
BLC CARD MOD 3A KATAKANA	1743142	D2	1743004	PS2 CARD MOD 3B	1743142	F2	1743006
BLC CARD MOD 2A LATIN	1743142	D2	1743004	PS4 CARD MOD 2B	1743142	F2	1743006
BLC CARD MOD 3A LATIN	1743142	D2	1743004	PS4 CARD MOD 3B	1743142	F2	1743006
BLC CARD MOD 2A KATAKANA	1743142	D2	1743004	SELECTOR PEN	1743141	G4	1743007
BLC CARD MOD 3A KATAKANA	1743142	D2	1743004	MAG READ CONTROL	1743141	G2	1743007
				SELECTOR PEN AND MAG READ CONTROL	1743141	G4	1743007

* IF RPQ 7J0039 IS INSTALLED, LINE CONTROL CARD IS REPLACED BY VIDEO OUTPUT CARD.



DETAIL C

SWITCH POSITIONS
FOR MODEL B

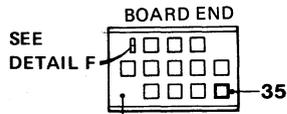


DETAIL F
ECS CARD SWITCH
SETTINGS

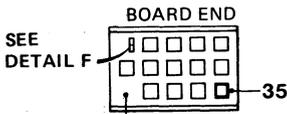
- 1 ON
- 2 } SEE BELOW
- 3 } SEE BELOW
- 4 ON
- 5 OFF
- 6 OFF
- 7 OFF
- 8 OFF

FOR PS

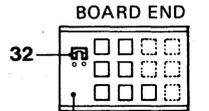
SWITCH BIT	2	3
NO PS	OFF	OFF
PS2	OFF	ON
PS4	ON	ON



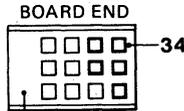
COMPONENT FACE
DETAIL E
(ECS CARD FOR MODEL 2B)



COMPONENT FACE
DETAIL G
(ECS CARD FOR MODEL 3B)



COMPONENT FACE
DETAIL D
(PS 2 CARD ASM)



COMPONENT FACE
DETAIL H
(PS 4 CARD ASM)

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			KEYBOARD ASSEMBLY 87/88 KEY			
4 -	4418901	REF				KEYBOARD FINAL ASM, 87 KEY FOR DETAILS SEE FIGURE 5
-	4418903	REF				KEYBOARD FINAL ASM, 88 KEY FOR DETAILS SEE FIGURE 5
-	4422623	REF				KEYBOARD FINAL ASM, 87 KEY FOR DETAILS SEE FIGURE 5
- 1	1742683	1	.	.	.	BASE ASM, 87 KEY
- 1	1742653	1	.	.	.	BASE ASM, 88 KEY
- 1	1742771	1	.	.	.	BASE ASM, 87 KEY
- 2	4406233	1	.	.	.	LABEL USED IN US/CANADA ONLY
- 3	1742689	1	.	.	.	STRAIN RELIEF
- 4	2181012	1	.	.	.	SCREW, HEX WSHR HD, 8-32, 11 MM (0.437) LG
- 5	1742668	1	.	.	.	CABLE ASM, 0.90 MM (3 FT) FOR COMPONENT PARTS SEE FIGURE 12 ITEMS 45-48
- 6	1742662	1	.	.	.	CLICKER ASM
- 7	1742643	1	.	.	.	CLICKER ASM
- 8	1742663	1	.	.	.	CUSHION
- 9	1742664	1	.	.	.	CRADLE
- 10	1742658	1	.	.	.	BAIL SPRING
- 11	NO NO	1	.	.	.	KEYBOARD ASM FOR FURTHER INFORMATION SEE FIGURE 5
- 11A	1809895	1	.	.	.	PAD CARD, 87 POSITION
- 11A	1752330	1	.	.	.	PAD CARD, 88 POSITION
- 12	1748131	REF	.	.	.	KEYMODULE, ACTIVE
- 13	NO NO	REF	.	.	.	KEYBUTTON FOR DETAILS, SEE FIGURE 9
- 14	2181005	2	.	.	.	SCREW, HEX WSHR HD, 6-32, 9.5 MM (0.375) LG
- 15	2125765	2	.	.	.	LCK W, IN TH, 14.27 MM (0.562) OD, SHAKEPROOF
- 16	1854442	1	.	.	.	SPACE BAR ASM
- 17	5183361	1	.	.	.	STABILIZER
- 18	1854443	1	.	.	.	SPACEBAR
- 19	5183362	2	.	.	.	PIVOT
- 20	1742779	1	.	.	.	COVER ASM, 87 KEY
- 20	1742657	1	.	.	.	COVER ASM, 88 KEY
- 21	4942245	4	.	.	.	SCREW, HEX WSHR HD, 8-32, 12.7 MM (0.50) LG
- 22	NO NO	1	.	.	.	PROBLEM DETERMINATION GUIDE FOR DETAILS SEE FIGURE 10
- 23	1742688	1	.	.	.	LATCH
- 24	1742686	1	.	.	.	ROD, HINGE
- 25	1742687	1	.	.	.	SPRING
- 26	1742685	1	.	.	.	REST, PALM
- 27	1650667	1	.	.	.	JUMPER
- 28	SEE NOTE	1	.	.	.	KEYBOARD LOGIC CARD, 87/88 KEY
- 29	1742635	1	.	.	.	CADDY, CE

NOTE: ORDER ITEM 28 USING THE PART NUMBER
ON THE FAILED CARD

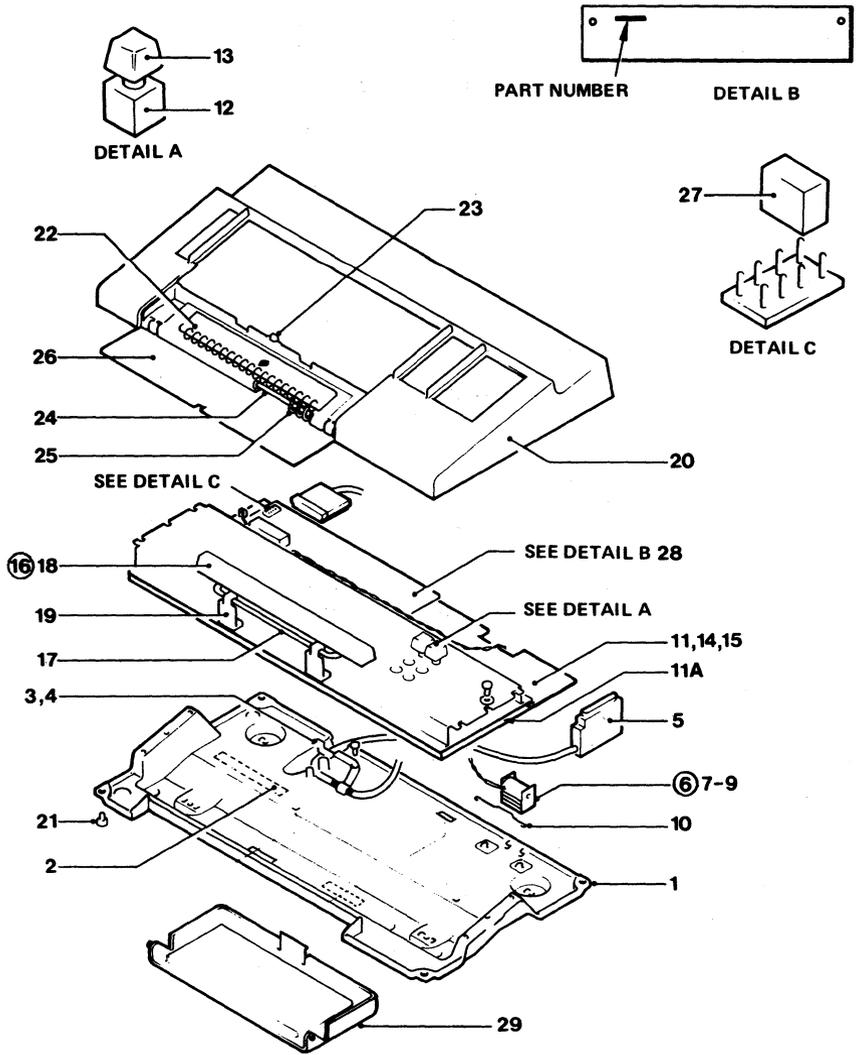


Figure 4. Keyboard Assembly 87/88 Key

LANGUAGE	KEYBOARD TYPE	KYBD ASM*	FINAL ASM	FINAL ASM WITH NUM LOCK
UNITED STATES	TYPEWRITER	1645100	1742700	1742720
	OCP TYPEWRITER			
	W/O CH TO CH			
	AND POWER ON	5194328	4942161	
	DATA ENTRY I	1645102	1742701	1742710
BELGIUM	DATA ENTRY II	1762694	1742702	1742711
	ASCII	1648531	1742704	4941978
	TYPEWRITER	1650668	4941771	4941940
	OCP TYPEWRITER			
BRAZIL	W/O CH TO CH			
	AND POWER ON	5194374	4942162	
	DATA ENTRY I	1650685	4941772	4941903
	DATA ENTRY II	1752424	4941773	4941904
	TYPEWRITER	1650669	4941777	4941942
CANADIAN FRENCH	OCP TYPEWRITER			
	W/O CH TO CH			
	AND POWER ON	5194387	4942163	
	DATA ENTRY I	1650686	4941778	4941905
	DATA ENTRY II	1752425	2941779	4941906
DENMARK	TYPEWRITER	1650684	4941783	4941944
	OCP TYPEWRITER			
	W/O CH TO CH			
	AND POWER ON	5194388	4942164	
FINLAND	DATA ENTRY I	1650702	4941784	4941907
	DATA ENTRY II	1752441	4941785	4941908
	TYPEWRITER	1650670	4941789	4941946
	OCP TYPEWRITER			
EBCDIC (WTC)	W/O CH TO CH			
	AND POWER ON	5194375	4942165	
	DATA ENTRY I	1650687	4941790	4941909
	DATA ENTRY II	1752426	4941791	4941910
	TYPEWRITER	1650671	4941795	4941948
FINLAND	OCP TYPEWRITER			
	W/O CH TO CH			
	AND POWER ON	5194386	4942166	
	DATA ENTRY I	1645102	1742701	1742710
FINLAND	DATA ENTRY II	1762694	1742702	1742711
	TYPEWRITER	1650672	4941801	4941950
	OCP TYPEWRITER			
FINLAND	W/O CH TO CH			
	AND POWER ON	5194376	4942167	
	DATA ENTRY I	1650689	4941802	4941913
FINLAND	DATA ENTRY II	1752428	4941803	4941914

*PART NUMBERS LISTED IN THIS COLUMN ARE KEYBOARDS ONLY.
FINAL ASM NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD TYPE	KYBD ASM*	FINAL ASM	FINAL ASM WITH NUM LOCK
FRANCE (QWERTY)	TYPEWRITER	1650673	4941807	4941952
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194377	4942168	
	DATA ENTRY I	1650690	4941808	4941915
	DATA ENTRY II	1752429	4941809	4941916
FRANCE (AZERTY)	TYPEWRITER	1752427	4941877	4941974
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194378	4942169	
	DATA ENTRY I	1650688	4941878	4941937
	DATA ENTRY II	1752897	4941879	4941938
AUSTRIA/ GERMANY	TYPEWRITER	1650674	4941813	4941954
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194373	4942170	
	DATA ENTRY I	1650691	4941814	4941917
	DATA ENTRY II	1752430	4941815	4941918
ITALY	TYPEWRITER	1650676	4941819	4941956
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194380	4942171	
	DATA ENTRY I	1650693	4941820	4941919
	DATA ENTRY II	1752432	4941821	4941920
INTERNATIONAL	TYPEWRITER	1650675	4941825	4941958
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194379	4942172	
	DATA ENTRY I	1650692	4941826	4941921
	DATA ENTRY II	1752431	4941827	4941922
NORWAY	TYPEWRITER	1650677	4941841	4941962
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194381	4942173	
	DATA ENTRY I	1650695	4941842	4941925
	DATA ENTRY II	1752434	4941843	4941926
PORTUGAL	TYPEWRITER	1650678	4941847	4941964
	OCP TYPEWRITER W/O CH TO CH			
	AND POWER ON	5194382	4942174	
	DATA ENTRY I	1650696	4941848	4941927
	DATA ENTRY II	1752435	4941849	4941928

* PART NUMBERS LISTED IN THIS COLUMN ARE KEYBOARD ONLY.
FINAL ASM NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD TYPE	KYBD ASM*	FINAL ASM	FINAL ASM WITH NUM LOCK
JAPAN/ ENGLISH	TYPEWRITER	1650737	4941831	4941960
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194389	4942179	
	DATA ENTRY I	1650694	4941832	4941923
	DATA ENTRY II	1752433	4941833	4941924
JAPAN/ KATAKANA	TYPEWRITER	1648549	4941835	4941976
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194390	4942180	
	DATA ENTRY I	1648550	4941836	4941939
UNITED KINGDOM	TYPEWRITER	1650682	4941871	4941972
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194384	4942178	
	DATA ENTRY I	1650700	4941872	4941935
	DATA ENTRY II	1752439	4941873	4941936
SPAIN	TYPEWRITER	1650679	4941853	4941966
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194383	4942175	
	DATA ENTRY I	1650697	4941854	4941929
	DATA ENTRY II	1752436	4941855	4941930
SPANISH SPEAKING	TYPEWRITER	1650680	4941859	4941968
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194391	4942176	
	DATA ENTRY I	1650698	4941860	4941931
	DATA ENTRY II	1752437	4941861	4941932
SWEDEN	TYPEWRITER	1650681	4941865	4941970
	OCP TYPEWRITER W/O CH TO CH AND POWER ON	5194385	4942177	
	DATA ENTRY I	1650699	4941866	4941933
	DATA ENTRY II	1752438	4941867	4941934

*PART NUMBERS LISTED IN THIS COLUMN ARE KEYBOARD ONLY.
FINAL ASM NUMBERS (IN NEXT COLUMN) INCLUDES COVER; CABLE, ETC.

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
						KEYBOARD ASSEMBLY 75/76 KEY
6 -	NO NO	REF				KEYBOARD ASM, 75 KEY FOR DETAILS SEE FIGURE 7
-	NO NO	REF	.			KEYBOARD ASM, 76 KEY FOR DETAILS SEE FIGURE 7
- 1	1742678	1	.			BASE ASM, 75/76 KEY
- 2	4406233	1	.			LABEL USED IN US/CANADA ONLY
- 3	1742689	1	.			STRAIN RELIEF
- 4	2181012	1	.			SCREW, HEX WSHR HD, 8-32, 11 MM (0.437) LG
- 5	1742668	1	.			CABLE ASM, 0.9 M (3 FT) FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 45-48
- 5	1742661	1	.			CABLE ASM, 1.8 M (6 FT) FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 45-48
- 6	1742662	1	.			CLICKER ASM
- 7	1742643	1	.			CLICKER ASM
- 8	1742663	1	.			CUSHION
- 9	1742664	1	.			CRADLE
- 10	1742658	1	.			BAIL SPRING
- 11	NO NO	1	.			KEYBOARD ASM FOR FURTHER INFORMATION SEE FIGURE 7
- 12	7388944	1	.			PAD CARD, 75 POSITION
- 12	1752366	1	.			PAD CARD, 76 POSITION
- 13	1748131	REF	.			KEY MODULE, ACTIVE
- 14	NO NO	REF	.			KEY BUTTON FOR DETAILS SEE FIGURE 9
- 15	2181012	2	.			SCREW, HEX WSHR HD, 8-32, 11 MM (0.437) LG
- 16	4942270	2	.			WSHR
- 17	1854442	1	.			SPACE BAR ASM
- 18	5183361	1	.			STABILIZER
- 19	1854443	1	.			SPACE BAR
- 20	5183362	2	.			PIVOT
- 21	1742773	1	.			COVER ASM, 75 KEY
- 21	1742637	1	.			COVER ASM, 76 KEY
- 21	1742672	1	.			COVER ASM, 75 KEY
- 22	2181012	4	.			SCREW, HEX WSHR HD, 8-32, 8-32, 11 MM (0.437)
- 23	NO NO	1	.			PROBLEM DETERMINATION GUIDE FOR DETAILS SEE FIGURE 10
- 24	742688	1	.			LATCH
- 25	1742686	1	.			ROD, HINGE
- 26	1742687	1	.			SPRING
- 27	1742085	1	.			REST, PALM
- 28	1650667	1	.			JUMPER
- 29	1742635	1	.			CADDY, CE
- 30	SEE NOTE	1	.			KEYBOARD LOGIC CARD, 75/76 KEY NOTE: ORDER ITEM 30 USING THE PART NUMBER ON THE FAILED CARD

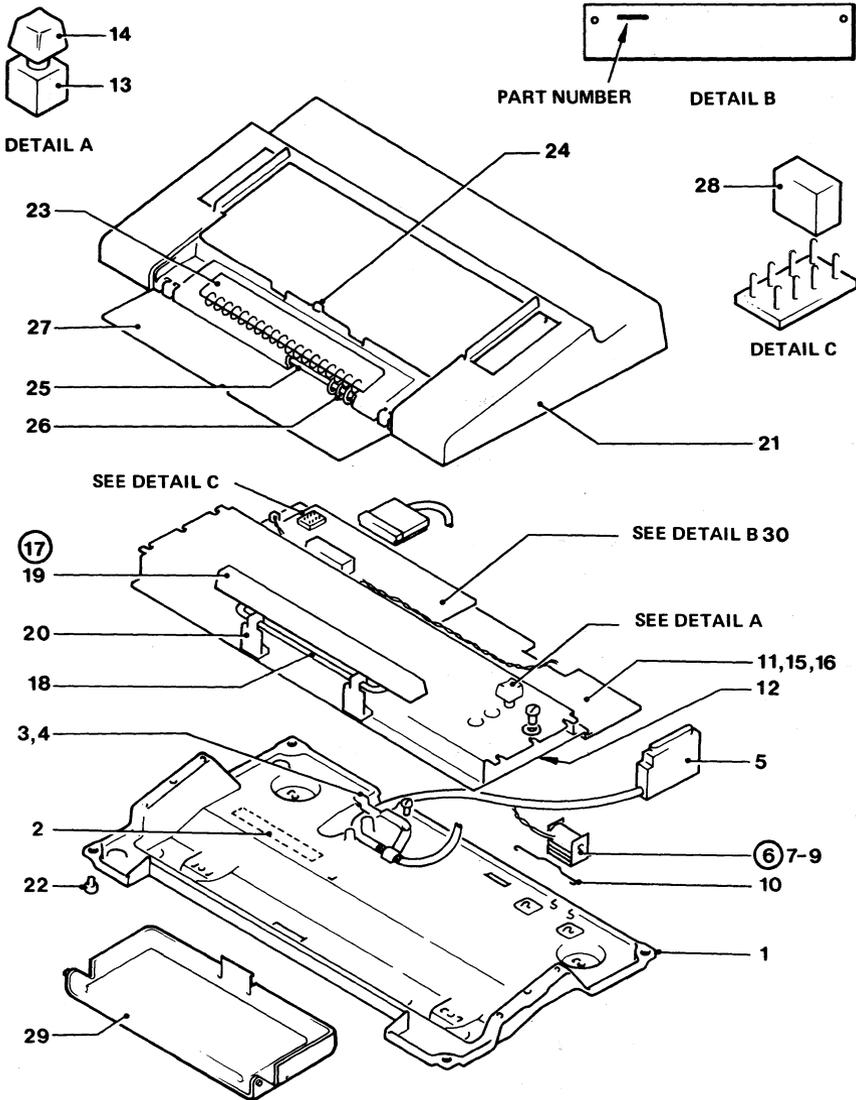


Figure 6. Keyboard Assembly 75/76 Key

LANGUAGE	KEYBOARD TYPE	KYBD ASM *	FINAL ASM	FINAL ASM WITH NUM LOCK	
UNITED STATES	TYPEWRITER	1645101	1742705	1742721	
	TYPEWRITER OVERLAY	1648552		4942225	
	TYPEWRITER PROG. CHAR. SET	1648552	1742708		
	TYPEWRITER ATTRIBUTE SELECT	8627024		4419251	
	ASCII	1752462	1742707	4941979	
	TEXT	5189580	1742709	1742719	
	APL	1752918	1742706	1742718	
	APL ATTRIBUTE SELECT	8627044		4419179	
	BELGIUM	TYPEWRITER	1650703	4941775	4941941
		TYPEWRITER OVERLAY	1752899		4942226
TYPEWRITER PROG. CHAR. SET		1752899	4941883		
TYPEWRITER ATTRIBUTE SELECT		8627027		4419267	
APL		1752919	4941776	4941980	
APL ATTRIBUTE SELECT		8627044		4419179	
BRAZIL		TYPEWRITER	1650704	4941781	4941943
		TYPEWRITER OVERLAY	1752900		4942227
	TYPEWRITER PROG. CHAR. SET	1752900	4941884		
	TYPEWRITER ATTRIBUTE SELECT	8627028		4419271	
	APL	1752920	4941782	4941981	
	APL ATTRIBUTE SELECT	8627048		4419199	
	CANADIAN FRENCH	TYPEWRITER	1650719	4941787	4941945
		TYPEWRITER OVERLAY	1752915		4942228
TYPEWRITER PROG. CHAR. SET		1752915	4941885		
TYPEWRITER ATTRIBUTE SELECT		8627039		4419311	
APL		1755757	4941788	4941982	
APL ATTRIBUTE SELECT		8627059		4419239	

* PART NUMBERS LISTED IN THIS COLUMN ARE KEYBOARDS ONLY.
FINAL ASM. NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD TYPE	KYBD ASM *	FINAL ASM	FINAL ASM WITH NUM LOCK
DENMARK	TYPEWRITER	1650705	4941793	4941947
	TYPEWRITER			
	OVERLAY	1752901		4942229
	TYPEWRITER			
	PROG. CHAR. SET	1752901	4941886	
	TYPEWRITER			
	ATTRIBUTE SELECT	8627029		4419275
	APL	1752921	4941794	4941983
	APL ATTRIBUTE SELECT	8627049		4419203
EBCDIC (WTC)	TYPEWRITER	1650706	4941799	4941949
	TYPEWRITER			
	OVERLAY	1752902		4942230
	TYPEWRITER			
	PROG. CHAR SET	1752902	4941887	
	TYPEWRITER			
	ATTRIBUTE SELECT	8627025		4419259
	APL	1752922	4941800	4941984
	APL ATTRIBUTE SELECT	8627045		4419187
FINLAND	TYPEWRITER	1650707	4941805	4941951
	TYPEWRITER			
	OVERLAY	1752903		4942231
	TYPEWRITER			
	PROG. CHAR. SET	1752903	4941888	
	TYPEWRITER			
	ATTRIBUTE SELECT	8627030		4419279
	APL	1752923	4941806	4941985
	APL ATTRIBUTE SELECT	8627050		4419207
FRANCE (QWERTY)	TYPEWRITER	1650708	4941811	4941953
	TYPEWRITER			
	OVERLAY	1752904		4942232
	TYPEWRITER			
	PROG. CHAR. SET	1752904	4941889	
	TYPEWRITER			
	ATTRIBUTE SELECT	8627031		4419287
	APL	1755746	4941812	4941986
	APL ATTRIBUTE SELECT	8627051		4419215

* PART NUMBERS LISTED IN THIS COLUMN ARE KEYBOARDS ONLY.
 FINAL ASM. NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD TYPE	KYBD ASM *	FINAL ASM	FINAL ASM WITH NUM LOCK
FRANCE (AZERTY)	TYPEWRITER	1752764	4941881	4941985
	TYPEWRITER OVERLAY	1752916		4942244
	TYPEWRITER PROG. CHAR. SET	1752916	4941901	
	TYPEWRITER ATTRIBUTE SELECT	8627032		4419283
	APL	1755758	4941882	4941987
	APL ATTRIBUTE SELECT	8627052		4419211
	TYPEWRITER	1650709	4941817	4941955
	TYPEWRITER OVERLAY	1752905		4942233
AUSTRIA/ GERMANY	TYPEWRITER PROG. CHAR. SET	1752905	4941890	
	TYPEWRITER ATTRIBUTE SELECT	8627026		4419263
	APL	1755747	4941818	4941988
	APL ATTRIBUTE SELECT	8627046		4419191
	TYPEWRITER	1650711	4941823	4941957
	TYPEWRITER OVERLAY	1752907		4942234
	TYPEWRITER PROG. CHAR. SET	1752907	4941891	
ITALY	TYPEWRITER ATTRIBUTE SELECT	8627034		4419295
	APL	1755749	4941824	4941989
	APL ATTRIBUTE SELECT	8627054		4419223
	TYPEWRITER	1650710	4941829	4941959
	TYPEWRITER OVERLAY	1752906		4942235
	TYPEWRITER PROG. CHAR. SET	1752906	4941892	
INTERNATIONAL	TYPEWRITER ATTRIBUTE SELECT	8627033		4419291
	APL	1755748	4941830	4941990
	APL ATTRIBUTE SELECT	8627053		4419219

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FINAL ASM. NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD TYPE	KYBD ASM *	FINAL ASM	FINAL ASM WITH NUM LOCK	
NORWAY	TYPEWRITER	1650712	4941845	4941963	
	TYPEWRITER OVERLAY	1752908		4942238	
	TYPEWRITER PROG. CHAR. SET	1752908	4941895		
	TYPEWRITER ATTRIBUTE SELECT	8627040		4419315	
	APL	1755750	4941846	4941991	
	APL ATTRIBUTE SELECT	8627060		4419243	
	PORTUGAL	TYPEWRITER	1650713	4941851	4941965
		TYPEWRITER OVERLAY	1752909		4942239
TYPEWRITER PROG. CHAR. SET		1752909	4941896		
TYPEWRITER ATTRIBUTE SELECT		8627035		4419299	
APL		1755751	4941852	4941992	
APL ATTRIBUTE SELECT		8627055		4419227	
SPAIN		TYPEWRITER	1650714	4941857	4941967
		TYPEWRITER OVERLAY	1752910		4942240
	TYPEWRITER PROG. CHAR. SET	1752910	4941897		
	TYPEWRITER ATTRIBUTE SELECT	8627036		4419303	
	APL	1755752	4941858	4941993	
	APL ATTRIBUTE SELECT	8627056		4419231	
	SPANISH SPEAKING	TYPEWRITER	1650715	4941863	4941969
		TYPEWRITER OVERLAY	1752911		4942241
TYPEWRITER PROG. CHAR. SET		1752911	4941898		
TYPEWRITER ATTRIBUTE SELECT		8627037		4419307	
APL		1755753	4941864	4941994	
APL ATTRIBUTE SELECT		8627057		4419235	

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FINAL ASM. NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

LANGUAGE	KEYBOARD	KYBD ASM*	FINAL ASM	FINAL ASM WITH NUM LOCK
SWEDEN	TYPEWRITER	1650716	4941869	4941971
	TYPEWRITER OVERLAY	1752912		4942242
	TYPEWRITER PROG. CHAR. SET	1752912	4941899	
	TYPEWRITER ATTRIBUTE SELECT	8627041		4419319
	APL	1755754	4941870	4941995
	APL ATTRIBUTE SELECT	8627061		4419247
	UNITED KINGDOM	TYPEWRITER	1650717	4941875	4941973
TYPEWRITER OVERLAY		1752913		4942243
TYPEWRITER PROG. CHAR. SET		1752913	4941900	
TYPEWRITER ATTRIBUTE SELECT		8627038		4419255
APL		1755755	4941876	4941996
APL ATTRIBUTE SELECT		8627058		4419183
JAPAN		TYPEWRITER		
	JAPAN/ENGLISH TYPEWRITER	1650739	4941837	4941961
	TYPEWRITER OVERLAY	1752461		4942236
	TYPEWRITER PROG. CHAR. SET	1752461	4941894	
	TYPEWRITER ATTRIBUTE SELECT	8627042		4419323
	APL	1755759	4941838	4941997
	APL ATTRIBUTE SELECT	8627062		4419331
JAPAN KATAKANA	TYPEWRITER	1648551	4941839	4941977
	TYPEWRITER OVERLAY	1755761		4942237
	TYPEWRITER PROG. CHAR. SET	1755761	4941893	
	TYPEWRITER ATTRIBUTE SELECT	8627043		4419327
	APL	1755760	4941840	4941998
	APL ATTRIBUTE SELECT	8627063		4419335

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FINAL ASM. NUMBERS (IN NEXT COLUMN) INCLUDES COVERS; CABLE, ETC.

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			CONTROLLER SWITCH ASSEMBLY			
8 -	4420277	REF				CONTROLLER SWITCH ASM
- 1	4422020	1	.			CONTROLLER SWITCH ASM
- 2	1743316	1	.			LABEL, ENGLISH
- 2	1743317	1	.			LABEL, FRENCH
- 2	1743318	1	.			LABEL, ITALIAN
- 2	1743319	1	.			LABEL, SPANISH
- 2	1743320	1	.			LABEL, GERMAN
- 2	1743313	1	.			LABEL, CANADIAN FRENCH
- 2	1743314	1	.			LABEL, PORTUGUESE
- 2	1743315	1	.			LABEL, JAPANESE

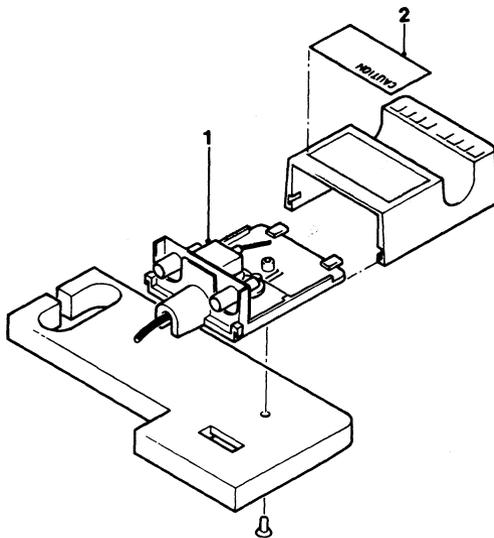
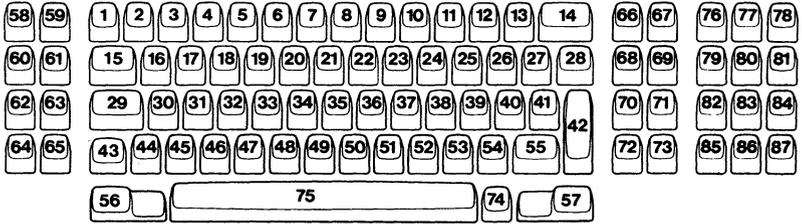
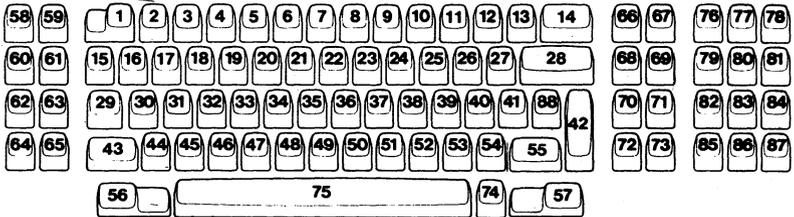


Figure 8. Controller Switch Assembly



Keybutton Positions for 87 Key Keyboard



Keybutton Positions for 88 Key Keyboard

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
1		1853775	2		1757481	3		8326284	3		1853547
		1854578			8326283			8626901			1855131
		5192898			8626900			1854857	4		1643628
		1752539			1853571			1853572			1752523
		8542644			1757230			1855131			1757145
		1643611			1757308			1854265			1757303
		1757229			1855167			1855149			1756271
		5587644			1853547			1855336			1757485
		5588068	3		1643633			1854098			1756278
2		1643634			1752521			1855164			5587610
		1752520			1756286			1752818			8326285
		1756284			1757483			1855169			8626914
		5587735			5587609			1854858			8626937

Figure 9 (Sheet 2 of 17). Keypbutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
4		8626952	5		1854859	7		1756266	7		1757185
		8626954			1855139			1752525			1757269
		1854858			1757301			1757146			5587622
		1855169			1855170			1757491			5588070
5		1643623			1854858			5587612	8		1643625
		1752532	6		1643624			8326288			1752526
		1756290			1756292			8626910			1756296
		5587736			1757489			8626902			1757493
		1757487			8326287			8627073			1756279
		1752532			1854860			1853606			5587613
		8326286			1855137			1757091			8326289
		8626909			5588069			5188362			8626903
		8626955	7		1643632			1757151			8626957

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
8		1853607	10		1752628	11		8642688	11		1757186
		1757148			1756300			5587616			5587646
		1855173			1757497			8326292	12		1643630
9		1643626			5887615			8626906			1752530
		1752527			8326291			8626958		? beta button with PF11"/>	1757125
		1756298			8626905			1853572		? + button with PF11"/>	1752533
		1757495			1854864			1853573		? i button with P11"/>	1756304
		5587614			1756276			1757231			1756281
		8326290			5588071			1757309			5587617
		8626904	11		1643629			5588072			8326293
		1854863			1752529			1854071		? - + button with !"/>	8626907
		1855174			1756302			1757092		? - + button with !"/>	8626933
10		1643627			1757499			1757243		? - + button with !"/>	8626912

Figure 9 (Sheet 4 of 17). Keypbutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
12		8626959	13		1757126	13		8626934	13		5588074
		1853573			1752531			8626908			1853572
		1853574			1752534			8626911			1757232
		1757232			1757147			8626915			1757310
		1757310			1756313			8626935	14		1643648
		5588073			5587653			8626938			8326295
		1853572			1756272			8626953			8626936
		1853571			1757306			8626956			8626932
		1757231			1761423			8626960			8626951
		1757309			5587618			1853574			8627074
		1761422			1752524			1853575			1752485
13		1643631			8326294			1757233			1756321
		1752517			8626913			1757311			1756316

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
14		1757174	17		5189788	19		1855120	20		1752819
		5587737			1854871			1855143			1855154
15		1643646			1855136			1855150			1855183
16		1853743			1855180			5194238	21		1853748
		1854104	18		1853745			1762676			1854105
		1752565			1752567			1855153			1752570
		5189786			1854872			1855182			5189906
		1854870			1855181	20		1853747			1854875
		1855132	19		1853746			1752569			1855126
		1855170			1752568			1854874			1854921
17		1853744			1854873			1855125			1855184
		1854105			1855124			1855133	22		1853749
		1752566			1854920			1855138			1752571

Figure 9 (Sheet 6 of 17). Keypbutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
22		1854876	25		1853752	26		1854285	26		5189761
		5182751			1752574			1854244			5189819
		1855185			1853814			1854266			5189851
23		1853750			1854879			1752575			1643612
		1752572			1855188			5189835			1855127
		1854877	26		1854107			5189909			185510
		5182752			1854108			5189791			1855141
		1855186			1855354			5189851			1855145
24		1853751			1854256			5189925			1757236
		1752573			1854283			5189965			1757312
		1854878			1854269			5189881			5588075
		5182753			1854289			5189917			1854076
		1855187			1854277			5189891			1757245

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
26.		5194240	27		5189871	27		1757312	31		1752579
		1757296			5189793	28		5194148			1854894
		5188352			5189853			5194344			1855193
		5587649			8542655	29		5194147	32		1853755
27		1854579			5189821			5588077			1752580
		1855036			1643613	30		1853753			1854895
		1854107			1643612			1854110			1855194
		1855025			1757237			1752578	33		1853756
		5194235			1757313			5189794			1752581
		5192899			5588076			1854893			1854896
		5188378			5188377			1855134			1855198
		5189739			1854076			1855192	34		1853757
		5189942			1757236	31		1853754			1752582

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
34		1854897	37		1752585	39		1854279	39		5189967
		8627065			1854900			1854271			5189863
		1854922			1855199			1854290			5189883
		1855196	38		1853761			1854114			5189919
35		1853758			1752586			1854111			5189873
		1752583			1854901			1854259			5189765
		1854898			1855200			1854148			5189937
		1855197	39		1853762			1752587			5189855
36		1853759			1752515			5189637			1853632
		1752584			1854113			5189855			1855128
		1854899			1854245			5189797			1757238
		1855198			1854258			5189899			1757197
37		1853760			1854294			5189927			5588078

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
40		1853763	40		1854149	40		5189767	40		1757180
		1752514			1854279			5189823			5587733
		1854118			1752589			5189939	41		1854580
		1855356			5189839			1643614			1855037
		1854259			5189857			1855129			5188335
		1854295			5189799			1855142			1855018
		1855030			5189901			1855144			1855024
		1854248			5189929			1757239			1855026
		1854291			5189969			1757197			1855027
		5194236			5189865			1645044			1855029
		1854116			5189885			1757314			5194237
		5587633			5189921			5588079			5192900
		1854258			5189893			1752522			5587634

Figure 9 (Sheet 10 of 17). Keybutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
41		1855030	41	PF7	1643614	42		1752487	43		1643637
		1752591		TAB	1645044			1757101			5588001
		5189840		SKIP	1853632			1756325	44		1854581
		5189910		PF6	1752522			1756320			1855039
		5189800		P8	1757240			1756320			5194319
		5189858		PF7	1757314			1756320			1752592
		5189970		PF8	5587836			1756320			8542649
		5189886		PF8 J	5588080			1756320		PF9	1643616
		5189795		PF4	1756315			1757246		PF8	1756270
		5189894		P7	1757239			5587845		PF6	1756268
		2542648		PF8	5587733			5587845	44	PF7	1756269
		5189824	42		8326350			5587845		P9	1757241
	PF8	1643615						1757297		PF9	1757316

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
44		1757315	46		1752594	49		1854909	51		1752599
		1854317			1854906			1853902			1854911
45		1853764			1855209			1854923			5182756
		1854129	47		1853766			1855151			1855214
		1854128			1752595			1855337	52		1853804
		1752593			1854907			5194239			1853868
		5189803			1855210			1762677			1853771
		5189802	48		1853767			1855212			5587637
		1854905			1752596	50		1853769			1854109
		1855130			1854908			1752598			1752600
		1855135			1855211			1854910			5189804
		1855200	49		1853768			1855213			8628917
46		1853765			1752597	51		1853770			5189771

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
52		5189831	53		5189827	54		5189829	56	RESET	1853564
		1854912			5189805		PF10	1643617		GRDSTG	1757122
		1855146			1854913		SPRG	1757113		RESTAUR	1757244
		5182757			1855148		PF7	1756269		RIPRIST	1757207
		1855215			5182758		PF8	1756270		REST	5188348
53		1853805	54		5588083		Ö	1855147		PF10	1752489
		1853869			1853773		FP10	5587734		PF8	1756317
		1853772			1854241		FP9	1757316		PF7	1756324
		5587638			5188364		PF10	5588084		P10	1757247
		1854115			1854119		←	1854143		FP10	5587651
		1752602			1752604	55	↑	1643644		FP9	1757299
		8626919			5189807		↓	5194149	57	ENTER	1853555
		5189773			5189935		カナ	5588085		DAT FREIG	1757124

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
57		1757178	59		1757089	62		5188817	63		5188342
		5188780			1757143			5194131	64		5194150
		1757295			1757184			5194135	65		5194153
		5587643			1757266			5194127			5194158
		5188375			5587607			5194129			5194159
		8326351			5188360			5194133			5194157
58		1643618	60		8326349	63		1853544			5194160
		1757806			8326353			1757099			5194156
		1757140	61		8326354			1757163	66		1643635
		1757181			8326356			1757195			1757149
		1756294			8326357			1757279			1757211
		5188358			8326358			5587632			5587620
59		1648441			6326355			5188638			1853594

Figure 9 (Sheet 14 of 17). Keybutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
78		8626989	79		8326414	80		8326419	82		8326387
		8626991			8326348	81		8326384			8326389
		8626990			8627334			8326386			8326388
		8627333	80		8627392			8326385			8326423
		8627391			8627370			8626992			8326425
		8627369			8627323			8626994			8326424
		8627322			8627381			8626993	83		8627337
		8627380			8627359			8627336			8627395
		8627358			8326379			8627394			8627373
79		8326375			8326383			8627372			8627326
		8326377			8326381			8627325			8627384
		8326376			8326417			8627383			8627362
		8326432			8326421			8627361			8326391

Figure 9 (Sheet 16 of 17). Keypbutton Group

Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N	Loc.	Character	P/N
83		8326395	84		8627375	86		8626983	87		8627388
		8326393			8627328			8626987			8627366
		8626971			8627386			8626985			
		8626975			8627364	87		8326411			
		8626973			8326400			8326413			
84		8326396	85		8326404			8326412			
		8326398			8326402			8626998			
		8326397			8626977			8627000			
		8626995			8626981			8626999			
		8626997			8626979			8627341			
		8626996	86		8326406			8627399			
		8627339			8326410			8627377			
		8627397			8326408			8627330			

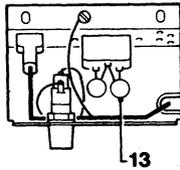
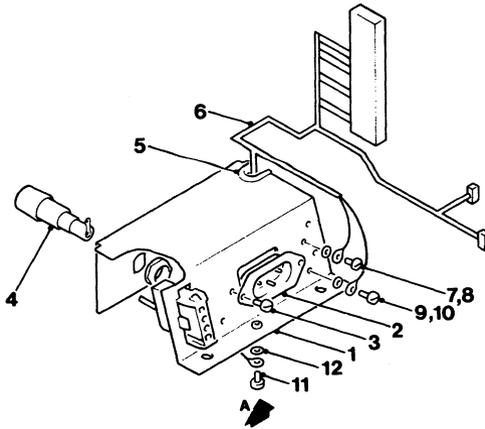
PROBLEM DETERMINATION GUIDE	
COUNTRY	FORM NUMBER
Brazil	GA17-0029
Canada	GA09-0090
Denmark	GA19-6031
Finland	GB11-6145
France	GA11-0118
Germany	GA12-2409
Italy	GA13-0158
Japan (English/Katakana)	NGA18-2067*
Japan (English/Katakana)	GA18-2067
Japan (WT)	NGA33-3051*
Netherlands	GA14-5193
Norway	GA15-3062
Spain	GA10-8174
Sweden	GA14-0526
US English	GA33-3051

*Printed in Japanese

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			AC BOX (POWER PLATE) ASSEMBLY (EMEA*)			
11 -	4420492	REF				AC BOX (POWER PLATE) ASM
- 1	4420460	1				PLATE
- 2	5640669	1				RECEPTACLE
- 3	1621286	2				SCREW, P HD, M3, 20 MM LG
- 4	6814322	1				FUSE HOLDER ASM
- 5	473442	1				GROMMET, 24 MM LG
- 6	4420488	REF				CABLE ASM, AC DISTRIBUTION
						FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 29,30
- 7	1621190	1				SCREW, P HD, M4, 8 MM LG
- 8	1622346	1				LCK W, EX TH, 4.3 MM ID
- 9	1621190	1				SCREW, P HD, M4, 8MM LG
- 10	1622346	1				LCK W, EX TH, 4.3 MM ID
- 11	1621197	1				SCREW, P HD, M4, 6 MM LG
- 12	1622346	1				LCK W, EX TH, 4.3 MM ID
- 13	4409572	2				CAPACITOR

* FOR COUNTRIES SERVICED BY IBM WORLD TRADE
EUROPE/MIDDLE EAST/AFRICA CORPORATION

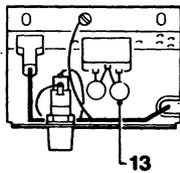
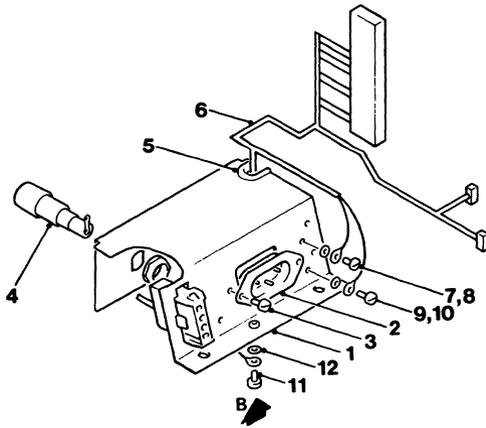


VIEW A

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			AC BOX (POWER PLATE) ASSEMBLY (US/AFEM)			
12 -	4420491	REF				AC BOX (POWER PLATE) ASM
- 1	4420461	1	.			PLATE
- 2	4406541	1	.			RECEPTACLE
- 3	1621844	2	.			SCREW, P HD, M3, 6 MM LG
- 4	6814322	1	.			FUSE HOLDER ASM
- 5	473442	1	.			GROMMET, 24 MM LG
- 6	4420488	REF	.			CABLE ASM, AC DISTRIBUTION FOR COMPONENT PARTS SEE FIGURE 15, ITEMS: 29, 30
- 7	1621190	1	.			SCREW, P HD, M4, 8 MM LG
- 8	1622346	1	.			LCK W, EX TH, 4.3 MM ID
- 9	1621190	1	.			SCREW, P HD, M4, 8 MM ID
- 10	1622346	1	.			LCK W, EX TH, 4.3 MM ID
- 11	1621197	1	.			SCREW, P HD, M4, 6 MM LG
- 12	1622346	1	.			LCK W, EX TH, 4.3 MM ID
- 13	4409572	2	.			CAPACITOR

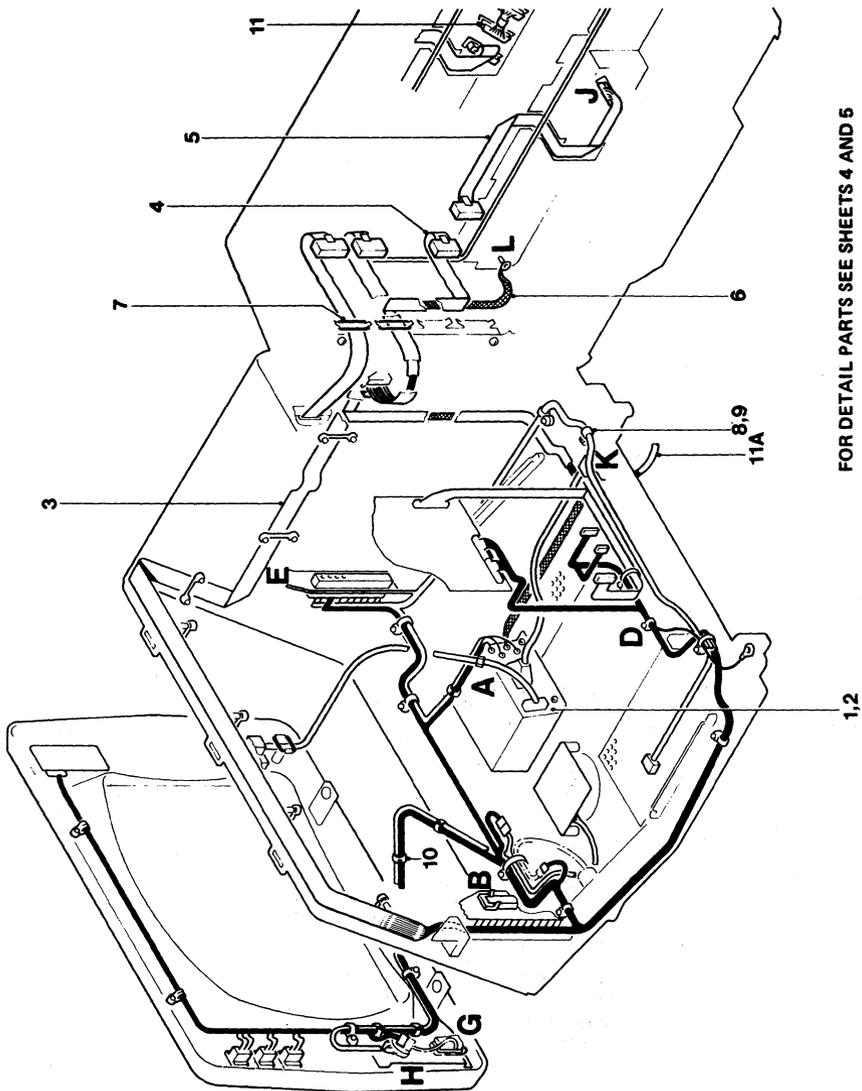
* FOR COUNTRIES SERVICED BY IBM WORLD
TRADE AMERICAS/FAR EAST CORPORATION



VIEW B

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
						CABLE ASSEMBLY
13 -		REF				CABLE ASM
- 1	4420491	1	.			POWER PLATE ASM (US/AFE)
- 1	4420492	1	.			POWER PLATE ASM (EMEA)
- 2	4420421	2	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 3	4423437	1	.			CABLE ASM, DISTRIBUTION FOR COMPONENT PARTS SEE FIGURE 15, ITEMS ITEMS 1-6, 9, 10, 12-14, 18, 20-22, 25, 27, 29, 30
- 4	4423237	1	.			CABLE ASM, LOGIC TO VIDEO AND AN 2 FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 7, 8, 12, 13, 18, 20
- 5	4423475	1	.			CABLE ASM, KEYBOARD INT FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 12, 13, 15, 18, 19, 32
- 6	4420793	1	.			GROUND JUMPER ASM FOR COMPONENT PARTS SEE FIGURE 15, ITEM 30
- 7	2114044	3	.			CABLE STRAP
- 8	472707	1	.			CABLE CLAMP
- 9	4420421	1	.			SCREW, HEX WSHR HD, 6-19, 8 MM LG, THD FORMING
- 10	5420242	4	.			CABLE TIE
- 11	1743057	1	.			CABLE ASM FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 15, 23, 45, 46
- 11A	NO NO	REF	.			LINE CORD SEE FIGURE 14

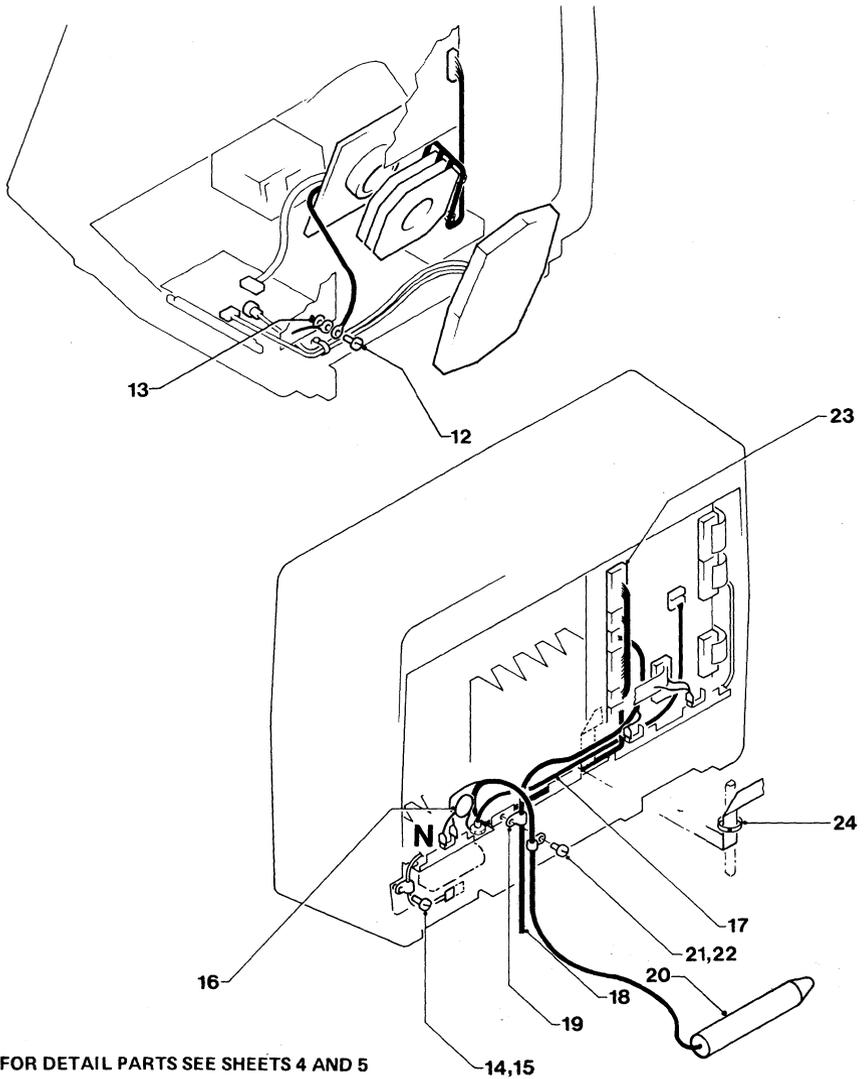


FOR DETAIL PARTS SEE SHEETS 4 AND 5

Figure 13 (Sheet 1 of 5). Cable Assembly

3279

FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			CABLE ASSEMBLY (CONT)			
13 - 12	1621191	1	.	.	.	SCREW, PHD, M4, 10 MM LG
- 13	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID
- 14	5213276	1	.	.	.	CABLE CLAMP
- 15	4420424	1	.	.	.	SCREW, HEX WSHR HD, 6-19, 10 MM LG, THD FORMING
- 16	4418786	1	.	.	.	FILTER ASM
- 17	4423481	1	.	.	.	CABLE ASM, COAX INT FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 16, 17, 26, 38, 39
- 18	4423250	1	.	.	.	CABLE ASM, MSR FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 11, 13, 18, 19, 24, 33, 35-37
- 19	2102364	1	.	.	.	CABLE CLIP
- 20	4423097	1	.	.	.	SEL PEN ASM, (OLD MODEL 3) SMALL LENS
- 20	4420407	1	.	.	.	SEL PEN ASM, (OLD MODEL 2) LARGE LENS
- 20	4422183	1	.	.	.	SEL PEN ASM, (NEW MODEL 3) SMALL LENS
- 20	4422184	1	.	.	.	SEL PEN ASM, (NEW MODEL 2) LARGE LENS
- 21	5213276	1	.	.	.	CABLE CLIP
- 22	1621852	1	.	.	.	SCREW, P HD, M4, 10 MM LG, THD FORMING
- 23	4423112	1	.	.	.	CABLE ASM, GATE CROSSOVER FOR COMPONENT PARTS SEE FIGURE 15, ITEMS 12, 13, 23
- 24	5420242	1	.	.	.	CABLE TIE



FOR DETAIL PARTS SEE SHEETS 4 AND 5

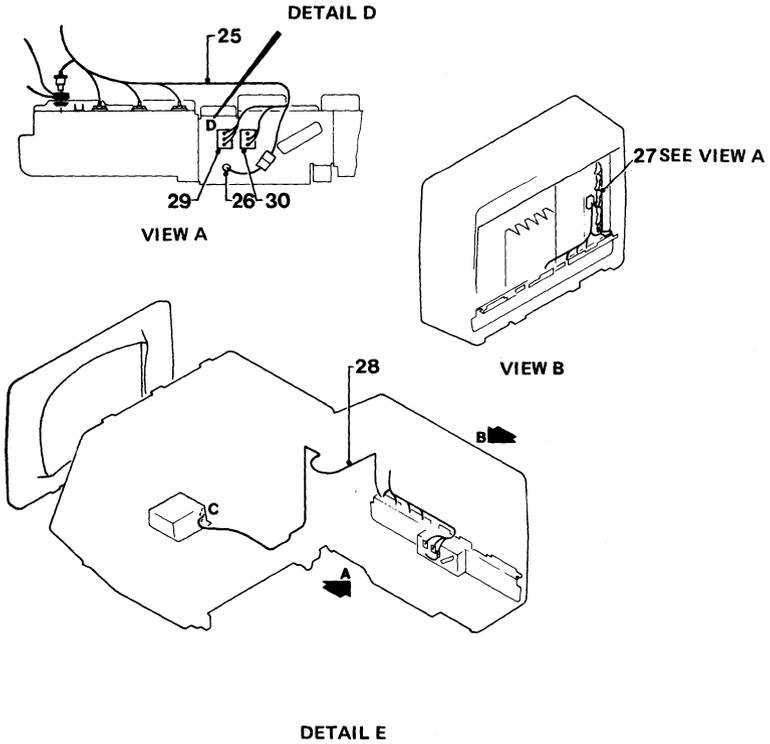
Figure 13 (Sheet 2 of 5). Cable Assembly

3279

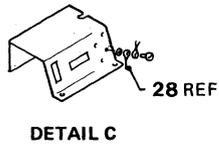
FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			CABLE ASSEMBLY (CONT)			
13 - 25	4418779	1	.	CABLE ASM, MON ATTACH FOR COMPONENT PARTS SEE FIGURE 15, ITEMS ITEMS 2, 10, 12, 13, 16, 18, 21, 27		
- 26	4420428	1	.	L.E.D. ASM		
- 27	5881129	1	.	BUS STRIP ASM		
- 28	5881272	1	.	EARTH STRAP ASM		
- 29	5881268	1	.	SWITCH, SP DT		
- 30	1655357	1	.	SWITCH, SP DT		



FIGURES DENOTE WIRE NUMBERS TO DETAIL D

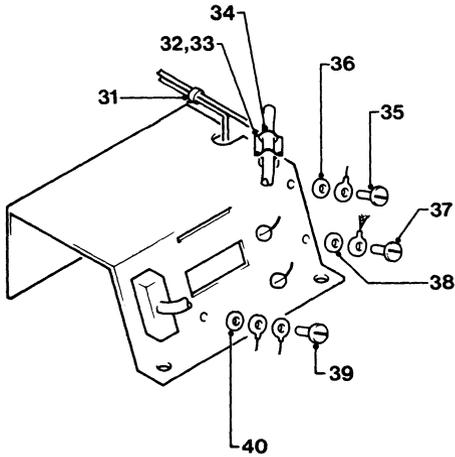


NOTE: THIS DRAWING SHOWS ADDITIONAL CABLES FOR RPQ 7J0039

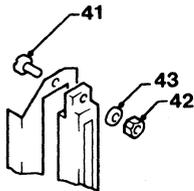


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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			CABLE ASSEMBLY (CONT)			
13 - 31	5420242	1	.	.	.	CABLE TIE
- 32	2114043	1	.	.	.	CRADLE
- 33	1621197	1	.	.	.	SCREW, P HD, M4, 6 MM LG
- 34	2114044	1	.	.	.	CLIP
- 35	1621190	1	.	.	.	SCREW, P HD, M4, 8 MM LG
- 36 ^a	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID
- 37	1621190	1	.	.	.	SCREW, P HD, M4, 8 MM LG
- 38	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID
- 39	1621190	1	.	.	.	SCREW, P HD, M4, 8 MM LG
- 40	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID
- 41	1621173	2	.	.	.	SCREW, P HD, M3, 12 MM LG
- 42	1622401	2	.	.	.	NUT



DETAIL A (SHEET 1)

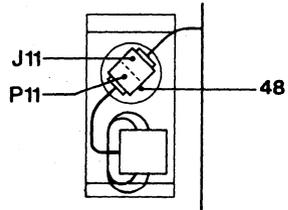


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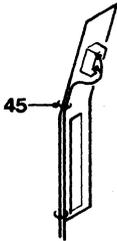
FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
CABLE ASSEMBLY (CONT)						
13 - 43	1622344	2	.	.	.	LCK W, EX TH, 3.2 MM ID
- 44	811427	2	.	.	.	RETAINER
- 45	5420242	2	.	.	.	CABLE TIE
- 46	1621852	1	.	.	.	SCREW, P HD, M4, 10 MM LG, THD FORMING
- 47	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID
- 48	450692	A/R	.	.	.	TAPE, 110 MM LG
- 49	2565092	2	.	.	.	SCREW, HEX HD, 4-40, 6.3 MM (0.248) LG, THD FORMING
- 49	2565092	4	.	.	.	SCREW, HEX HD, 4-40, 6.3 MM (0.248) LG, THD FORMING, USED ON MODEL 2
- 50	4420457	1	.	.	.	STRAIN RELIEF
- 51	4420423	2	.	.	.	SCREW, HEX WSHR HD, 6-19, 12 MM LG, THD FORMING
- 52	1622403	1	.	.	.	NUT
- 53	1622346	1	.	.	.	LCK W, EX TH, 4.3 MM ID



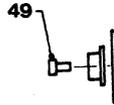
DETAIL D



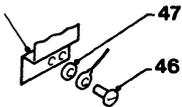
DETAIL H



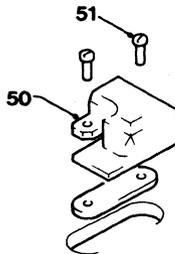
DETAIL E



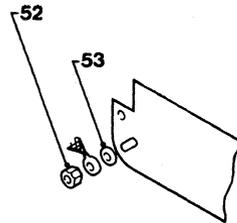
DETAIL J



DETAIL G



DETAIL K



DETAIL L

AFE (WITH UL M/C PLUG)								
COUNTRIES	VOLTAGE	FREQ (HZ)	CSU PLUG TYPE	WIRE COLOURS	PART NUMBERS			
					1.8M	2.8M	3.7M	4.6M
BAHAMAS	120	60	TYPE 'DD'	BLACK		1655379		1655424
BERMUDA	120	60	FIG 4	WHITE				
BOLIVIA	115	60	NON-LOCK	GN/YEL				
BRAZIL	120-127	60	↓	↓				
COLOMBIA	120	60						
COSTA RICA	120	60						
DOMINICAN REP	120	60						
ECUADOR	110	60						
EL SALVADOR	120	60						
GUATEMALA	120	60						
HONDURAS	110	60						
JAPAN	100	50/60						
MEXICO	127	60						
NETH. ANTILLES	120-127	60						
NICARAGUA	120	60						
PANAMA	120	60						
PHILLIPINES	110	60						
TAIWAN	110	60						
TRINIDAD	115	60						
VENEZUELA	120	60						
ARGENTINA	220	50	TYPE 'EE'	BROWN		1655392		4406528
CHILE	220	50	FIG 5	LIGHT BLUE				
PARAGUAY	220	50	NON-LOCK	GN/YEL				
URUGUAY	220	50	↓	↓				
AUSTRALIA	240	50						
NEW ZEALAND	230	50						
INDONESIA	220	50	TYPE 'MA'	BROWN		1655391		4406536
			FIG 15	LIGHT BLUE				
			NON-LOCK	GN/YEL				
JAPAN	200	60/60	TYPE 'MG'	BLACK		1743137		1743139
			FIG 20	WHITE				
			TWIST-LOCK	GN/YEL				
MALAYSIA	240	50	TYPE 'MJ'	BROWN		1655390		1655430
SINGAPORE	230	50	FIG 23	LIGHT BLUE				
			NON-LOCK	GN/YEL				
HONG KONG	200	50	TYPE 'MH'	BROWN	1743381	1743382	1743383	1743384
			FIG 21	LIGHT BLUE				
			NON-LOCK	GN/YEL				
BRAZIL	220	60	TYPE 'EE'	BLACK				
PERU	220	60	FIG 5	WHITE				
COLOMBIA	208/240	60	NON-LOCK	GN/YEL				
TRINIDAD	230	60	↓	↓				
VENEZUELA	208/240	50						
BARBADOS	120	50	TYPE 'DD'	BROWN				
CHILE	110	50	FIG 4	LIGHT BLUE				
JAMAICA	110	50	NON-LOCK	GN/YEL				

VERSION WITH NO CSU PLUG							
COUNTRIES	M/C PLUG TYPE	FREQ (HZ)	WIRE COLOURS	PART NUMBERS			
				1.8M	2.8M	3.7M	4.6M
US/AFE	UL	60	BLACK WHITE GN/YEL	4406504	4406505	4406506	4406507
AFE	UL	50	BROWN LIGHT BLUE GN/YEL	1655425	1655378	1655426	1655427
EMEA	CEE 22	50	BROWN LIGHT BLUE GN/YEL		5640660		4420410
EMEA	CEE 22	60	BLACK WHITE GN/YEL	5640673	5640687		4420418

EMEA (WITH CEE 22 M/C PLUG)								
COUNTRIES	VOLTAGE	FREQ (HZ)	CSU PLUG TYPE	WIRE COLOURS	PART NUMBERS			
					1.8M	2.8M	3.7M	4.6M
AUSTRIA	220	50	TYPE 'MA' FIG 15	BROWN LIGHT BLUE		5640663		4420411
BULGARIA	220	50		GRN/YEL				
FINLAND	220	50	NON-LOCK					
GERMANY	220	50						
ICELAND	220	50						
IRAN	220	50						
NORWAY	220	50						
POLAND	220	50						
PORTUGAL	220	50						
ROMANIA	220	50						
SPAIN	220	50						
SWEDEN	220	50						
TURKEY	220	50						
YUGOSLAVIA	220	50						
ALGERIA	220	50	TYPE 'MC' FIG 18	BROWN LIGHT BLUE		5640661		4420412
BELGIUM	220	50		GN/YEL				
FRANCE	220	50	NON-LOCK					
GREECE	220	50						
HUNGARY	220	50						
ITALY	220	50						
SWITZERLAND	220	50						
DENMARK	220	50	TYPE 'MF' FIG 19	BROWN LIGHT BLUE		5640667		4420415
			NON-LOCK	GN/YEL				
ISRAEL	230	50	TYPE 'XK' FIG 32	BROWN LIGHT BLUE		5640672		4420419
			NON-LOCK	GN/YEL				
ITALY	220	50	TYPE 'ML' FIG 25	BROWN LIGHT BLUE		5640668		4420417
			NON-LOCK	GN/YEL				
SAUDI ARABIA	127	60	TYPE 'GG' FIG 7 (15A)	BLACK WHITE		4420362		4420363
			TW-LOCK	GN/YEL				
SAUDI ARABIA	220	60		BLACK WHITE				
				GN/YEL				
SOUTH AFRICA	230	50	TYPE 'MI' FIG 22	BROWN LIGHT BLUE		5640666		4420414
			NON-LOCK	GN/YEL				
SWITZERLAND	220	50	TYPE 'MK' FIG 24	BROWN LIGHT BLUE		5640665		4420416
			NON-LOCK	GN/YEL				
UNITED KINGDOM	240	50	TYPE 'MJ' FIG 23	BROWN LIGHT BLUE		5640662		4420413
IRELAND	240	50	NON-LOCK	GN/YEL				
NETHERLANDS	220	50	TYPE 'MA' FIG 15	BROWN LIGHT BLUE		5641082		4420337
			NON-LOCK	GN/YEL				

DOMESTIC (WITH UL M/C PLUG)								
COUNTRIES	VOLTAGE	FREQ (HZ)	CSU PLUG TYPE	WIRE COLOURS	PART NUMBERS			
					1.8M	2.8M	3.7M	4.6M
USA	208/240	60	TYPE 'CC' FIG 2	BLACK WHITE				
			NON-LOCK	GN/YEL				
USA	120	60	TYPE 'GG' FIG 8 (20A)	BLACK WHITE				
			TWIST-LOCK	GN/YEL				
USA/CANADA	120	60	TYPE 'GG' FIG 7 (15A)	BLACK WHITE	1655402	1655401	1655431	1655432
			TWIST-LOCK	GN/YEL				
USA/CANADA	120	60	TYPE 'DD' FIG 4	BLACK WHITE	1655377	1655379	1655423	1655424
			NON-LOCK	GN/YEL				

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			JUMPER & CABLE COMPONENT ASM			
15 -						JUMPER & CABLE COMPONENT
- 1	2731835	.				HOUSING
- 2	2731850	.				HOUSING
- 3	2732354	.				HOUSING
- 4	2731851	.				HOUSING
- 5	2731836	.				HOUSING
- 6	2731852	.				HOUSING
- 7	2731838	.				HOUSING
- 8	2731839	.				HOUSING
- 9	2637689	.				INSERT
- 10	1743055	.				STRAIN RELIEF
- 11	2732337	.				HOUSING
- 12	2732338	.				HOUSING
- 13	2732342	.				SHROUD
- 14	6814383	.				HOUSING
- 15	1655336	.				CONNECTOR
- 16	5252661	.				CONNECTOR
- 17	1743169	.				HOUSING
- 18	2637691	.				CONTACT
- 19	2637690	.				CONTACT
- 20	1661528	.				CONTACT
- 21	2731384	.				CONTACT
- 22	2122259	.				CONTACT
- 23	1655337	.				CONTACT
- 24	1655358	.				CONTACT

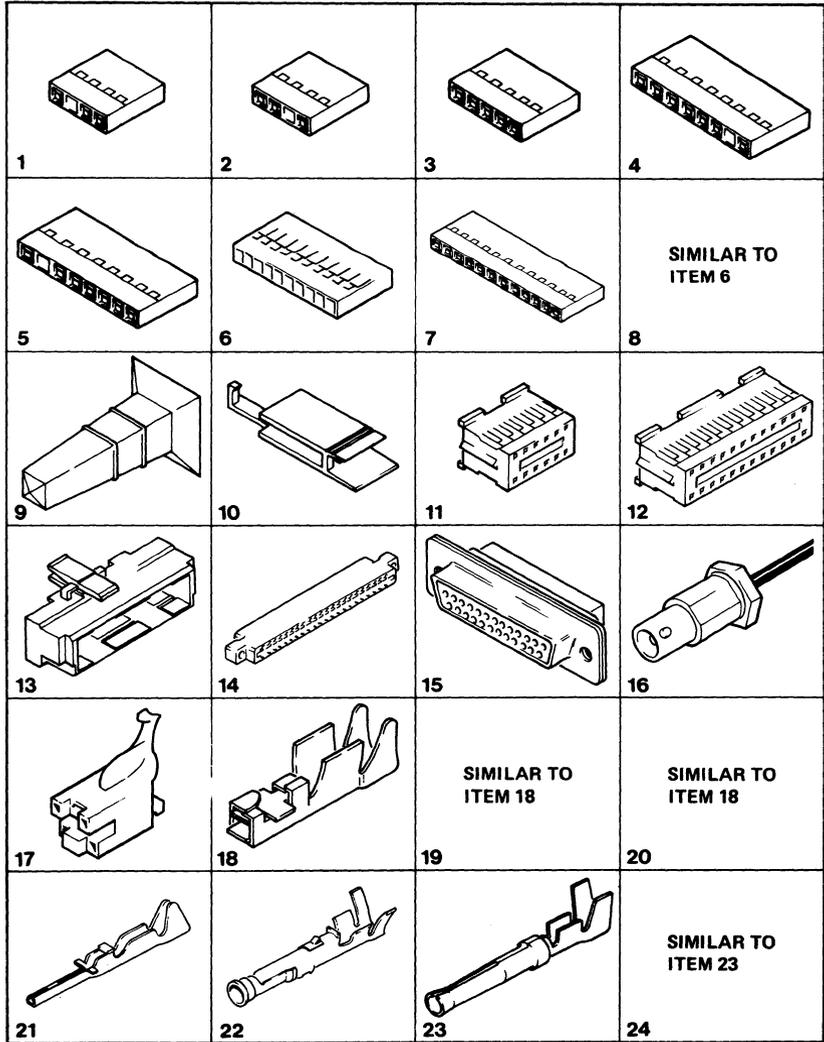


Figure 15 (Sheet 1 of 2). Jumper and Cable
Component Assembly

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FIGURE- INDEX NUMBER	PART NUMBER	UNITS PER ASM	DESCRIPTION			
			1	2	3	4
			JUMPER & CABLE COMPONENT ASM (CONT)			
15 -			JUMPER & CABLE COMPONENT			
- 25	6814354	.				CONTACT
- 26	816884	.				CONTACT
- 27	1608893	.				TERMINAL
- 28	6814371	.				HOUSING
- 29	483681	.				TERMINAL
- 30	483682	.				TERMINAL
- 31	1847525	.				HOUSING
- 32	523267	.				TERMINAL
- 33	430799	.				TERMINAL
- 34	1847529	.				HOUSING
- 35	4832993	.				RECEPTACLE
- 36	5576593	.				SEAL
- 37	4832957	.				CABLE CRIMP
- 38	2577718	.				BUSH
- 39	442458	.				WASHER
- 40	1847524	.				HOUSING
- 41	1847520	.				CONTACT
- 42	1847521	.				CONTACT
- 43	2122261	.				CONTACT
- 44	5275481	.				STRAIN RELIEF
- 45	1655338	.				CONNECTOR
- 46	1655339	.				CONTACT
- 47	1655359	.				CONTACT

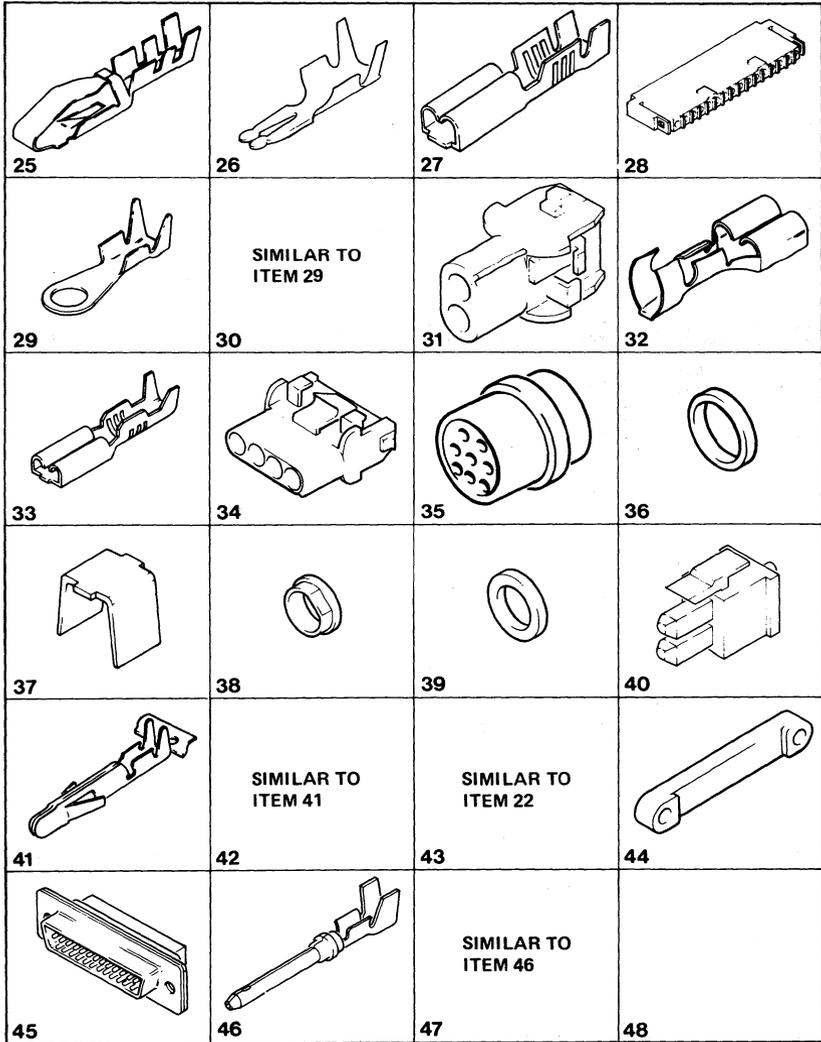


Figure 15 (Sheet 2 of 2). Jumper and Cable Component Assembly

NUMERICAL INDEX

PART NO.	LIST AND INDEX NO.						
219615	2 - 70	1622304	1 - 24	1742672	6 - 21	2181012	4 - 4
430799	3 - 12		1 - 28	1742678	6 - 1		6 - 4
442458	15 - 33		1 - 34	1742683	4 - 1		6 - 15
442458	15 - 39		1 - 39	1742685	4 - 26		6 - 22
450692	13 - 48		2 - 75	1742686	4 - 24	2565092	13 - 49
472707	13 - 8		2 - 78		6 - 25		13 - 49
473442	3 - 9	1622344	13 - 43	1742687	4 - 25	2568709	2 - 60
	11 - 5	1622346	1 - 3		6 - 26	2577718	15 - 38
	12 - 5		1 - 11	1742688	4 - 23	2596275	2 - 24B
483681	15 - 29		1 - 17	1742689	4 - 3	2596291	2 - 24A
483682	15 - 30		1 - 23		6 - 3	2637689	15 - 9
523267	15 - 32		1 - 27	1742771	6 - 1	2637690	15 - 19
615683	2 - 23		1 - 33	1742773	6 - 21	2637691	15 - 18
638537	1 - 43		1 - 38	1742779	4 - 20	2731384	15 - 21
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Abbreviations and Glossary

Abbreviations

ac. alternating current	EBCDIC. extended binary-coded decimal interchange code
ack. acknowledge	ECS. extended character set
addr. address	EFA. extended field attribute
alt. alternate	EHT. extra high tension (3279 = 25 kV)
APL. a programming language	EOM. end of message
B. bottom	E + W. east and west
bal. balance	FBI. feature bus in
BLC. base logic card	FBO. feature bus out
C. center	foe. focus
CA. character attribute	FRU. field replaceable unit
CCW. counter clockwise	FSU. functional storage unit
char. character	GLP. general logic probe
cm. centimeters	H CENT. horizontal centering
cmd. command	Hz. hertz
cntr. counter	ID. identification
coax. coaxial	ident. identification
col. color	int. internal
CRT. cathode ray tube	I/O. input/output
ctr. counter	KB. keyboard
CU. control unit	kg. kilograms
CW. clockwise	kV. kilovolts
D/A. digital to analog	kΩ. kilohms
DEC. decoder	

3279 MIM

lb. pounds**LCC.** line control card**LCM.** line control module**LED.** light emitting diode**LOPT.** line output transformer**LP.** light pen**MAP.** maintenance analysis procedure**MAX.** maximum**MCM.** Maintenance Concepts Manual**MHS.** Magnetic Hand Scanner**MHz.** megahertz**MIN.** minimum**MIM.** Maintenance Information Manual**mm.** millimeters**Mod.** model**MRC.** Magnetic Reader Control**MSR.** magnetic slot reader**No.** number**ns.** nanoseconds**num.** numeric**N + S.** north and south**OIA.** Operator Information Area**OP.** operation**O/P.** output**PDG.** problem determination guide**pk-pk.** peak-to-peak**POR.** power-on reset**pot.** potentiometer**PS.** programmed symbols**PSHICO:** PS, highlighting and color select**pty.** parity**RA.** read address**RAM.** random access memory**reg.** register**ret.** return**ROS.** read-only storage**RPQ.** request for price quotation**rx.** receiver**sec.** second**sel.** selector**SER.** serializer**SERDES.** serializer/deserializer**SUP.** suppress**Sw.** switch**sync.** synchronization**T.** top**TA.** terminal adapter**T/C.** timing and control

TOP MAR. top margin

TP. test point

trig. trigger

V. volts

vert. vertical

vid. video

VTL. vendor transistor logic

WA. write address

W/O. without

WR. write

μ F. microfarads

μ S. microseconds

Glossary

bezel. The front panel that surrounds the display screen.

coaxial cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

converged, convergence. Ideally, the condition in which the red, blue, and green electron beams together produce a white display with no colored fringes.

degauss coil. A coil that prevents misconvergence due to stray magnetic fields.

feature bus. The logical data path in the 3279, along which the base machine communicates with added features.

jitter. An irregular random repetitive movement of an image on the screen.

misconvergence. Opposite in meaning to "convergence" (see above).

pel. Picture element.

monochrome. Single color.

phosphors. The coatings on the inner surface of the screen that emit light when hit by an electron beam.

pincushion (distortion). The appearance of the display when the sides of the raster are curved.

raster. The pattern of lines on the display screen that is traced out by the scanning electron beams. The raster may be visible when the brightness control is turned up or when intensity override is engaged.

retimed. With improved timing.

ripple. An ac signal on a dc level.

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- 'horizontal sync' signal 6-2
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- 'row 0' signal 6-5

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IBM 3279 Color Display Station
Models 2A, 2B, 3A and 3B
Maintenance Information

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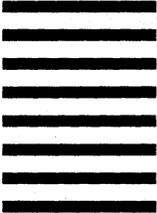
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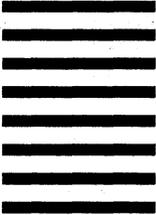
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Maintenance Library

3279

**Color Display Station
Models 2A, 2B, 3A, and 3B**

**Maintenance Analysis
Procedures (MAPs)**

SY33-0069-3
(Part 2)

IBM Maintenance Library

3279 Color Display Station
Models 2A, 2B, 3A, and 3B
Maintenance Analysis
Procedures (MAPs)

SY33-0069-3
(Part 2)

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	BB	6	010
0200	BB	6	010
0300	BB	6	010
0400	BB	6	010
0500	BB	6	010
0600	BB	6	010
0700	BB	6	010
0800	A	1	001
0800	BB	6	010
0900	BB	6	010
1000	BB	6	010

001

(ENTRY POINT A)

- Start here to isolate any failure on the IBM 3279 display station. After using the MAPs once without repairing the problem, you are directed to return to MAP 0000 entry point BB and go through the MAPs a second time. If the trouble remains, request assistance through your normal channels.
- The MAPs instruct you to reseal/exchange parts in a specific sequence. The first part is the most probable cause of failure, the second is the next most probable, and so on.
- Try reseating cards, top card connectors, and their associated cables and test before exchanging parts.
- Where a new part does not repair a problem, inspect the continuity of its associated cables connectors and planar strips.
- Reinstall the original when a new part does not repair the problem.
- When the analog card, the amplifier card, or any major FRU is exchanged, the 3279 may need adjustment. (See MIM Chapter 5).
- If the failure is intermittent, inspect cards and cable connectors for correct seating. Verify that the supply voltages are within tolerance as described in MIM Chapter 5.1.

(Step 001 continues)

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
6	005	0100	A
6	013	0100	A
6	008	0200	FF
6	007	0700	A
6	006	1000	A

GENERAL LOGIC PROBE (G.L.P.).

To use the General Logic Probe (P.N. 453212), set the switches as follows:-
 TECHNOLOGY...MULTI
 LATCH.....NONE
 GATE REF....GND
 Power up the probe by connecting:-
 Black wire to any D08 pin (ground) &
 Red wire to any D03 pin (+5V).
 Test by probing on D08 & D03 pins.

OSCILLOSCOPE.

If using an oscilloscope in place of a G.L.P., interpret the indicators on the G.L.P. as follows:-
 The GREEN light ON represents a voltage of less than +1V.
 The RED light ON represents a voltage of greater than +2V.
 Both lights ON indicates a waveform pulsing beyond both these limits.

(Step 001 continued)

DANGER

When the 3279 power ON/OFF switch is ON , the following are connected directly to the mainline power:-
 -The twisted-pair connection from P3 pins 8 and 9 (on the power supply) to the analog card (P7).
 -The degauss coil.
 -Front panel fuse & switch, and
 -Parts of the power supply card.
 •Be careful when measuring voltages in these areas.
 •Switch power OFF and remove the power cord from the mainline socket before such actions as:-
 -disassembling,
 -inspecting for failures,
 -making resistance measurements, etc.

(Step 001 continues)

(Step 001 continued)

- If a tilt/rotate table is used, lock it in the horizontal position.
- Ensure that the 3279 is correctly connected to a working Control Unit (or IDPA) with correct color setup code, or some symptoms will differ from those required for the MAPs.
- Always switch power off before disconnecting cards.

CAUTION

Correct ground connections and cable positions are essential for effective lightning and flashover protection. See Figure 6-5 for grounding details.

(Step 001 continues)

GENERAL
=====

FAILURE
=====

INDEX.
=====

After using this index, whether or not the repair action was good,

- Continue with the MAP at entry point AC (page 6).

SYMPTOM.	PROBABLE FAILING FRU OR REPAIR ACTION.
<p>Your problem may be described in this column, if so see right → If not, continue with the MAP at entry point AC (page 6).</p>	<p>For each symptom, this column contains a list of failing parts, repair actions, or adjustments, in order of probability. •Try them in the order shown. If you need confirmation before ordering (or while waiting for) spares •Continue with the MAP at entry point AC.</p>
<p>POWER.</p> <p>A1 Indicator LED 1 is OFF.</p> <p>A3 Indicator LED 2 is OFF & LED 1 ON) A4 Indicator LED 2 is ON immediately) after power on.</p> <p>A6 Frequent exchange of amplifier card or power supply required.</p> <p>A8 Display often switches power off.</p>	<p>1 Mainline power or fuse. 2 Power supply.</p> <p>1 Analog card.</p> <p>1 Selector pen (intermittent short in lead).</p> <p>1 Bleed assembly.</p>

(General Failure Index continues.)

GENERAL FAILURE INDEX (Continued).

SYMPTOM.	PROBABLE FAILING FRU OR REPAIR ACTION. *Afterwards, continue at Entry Point AC (page 6)
BRIGHTNESS.	
C1 Display blank (LEDs 1 & 2 ON).) C2 Screen bright all over.) C3 Brightness low or not adjustable.) C4 Very faint picture.) C5 Very bright,) badly focussed characters.)	1 Brightness control or connections.
NOTE. For symptoms C7, C8, & E1, record the position of the relevant controls before attempting adjustments. If correct adjustment can not be achieved, reset the controls to their original positions before continuing.	
C7 Blue or Green is too bright or too dim.	1 Adjust the Color Balance (NOT RED MAX); see preceding note and MIM 5.2.1 & 5.3.6
C8 Red is too bright or too dim.	1 Adjust the Red Brightness and Color Balance; see previous note and MIM 5.2.1, 5.3.5 & 5.3.6
DISPLAY	
E1 Display wrong size or not 'square'.	1 Adjust the raster controls; see preceding note and MIM 5.2.2 and Figure 1-4.
E3 Part of display is missing or part is too dim.	1 Analog card. 2 CRT.
E5 Jitter of, or unsteady display.	1 Disconnect P27, the degauss coil; if the jitter is reduced, 1) inspect the degauss coil for correct position (Parts catalog Figure 2) 2) exchange the power supply. 2 Relocate the 3279 away from adjacent electrical equipment. 3 For horizontal jitter only, try small adjustments of the H CENT potentiometer. 4 Verify EHT connection to analog card. (Inspect end of EHT lead for excess flux.) 5 Exchange bleed assembly.
SUBSYSTEM	
G1 Keyboard does not work in NORMAL) but is OK in TEST mode.)	1 Check the coaxial device cable. 2 If connected to IDPA - is it set to Manual Operation Mode?
G2 No ready symbol.)	3 Logic card C2.
G3 All characters cursor and separator line are green.)	4 Verify that the system diskette is customized for color.
CONVERGENCE	
J1 Convergence is poor, (or primary colors displaced) AND convergence routine causes no obvious movement.	1 Use MAP 0600, Entry Point A. 2 Amplifier card. 3 Logic card B2. 4 Convergence/purity coils, Verify position before exchanging. 5 Verify ± 12 V supplies to amplifier card. 6 Logic card C2.
J3 Convergence is poor.	1 As above. 2 Inspect error log for timeouts and parity error (indicating coaxial device cable problems).
J5 Display has to be converged each time power is switched on.	1 Battery. (Inspect the date stamp.) 2 Battery wiring. (See figure 6-6 & 6-4 part2.) 3 Use MAP 0600, Entry point A.

(General Failure Index continues.)

GENERAL FAILURE INDEX (Continued).

SYMPTOM.	PROBABLE FAILING FRU or REPAIR ACTION. *Afterwards, continue at Entry Point AC (page 6)
<p>CONTROLS.</p> <p>L1 All characters are either green) or white. (No red or blue.)) L2 0000/00 switch does not function.)</p> <p>L4 A,a/A switch does not function.</p> <p>L5 NORMAL/TEST switch does not function.</p> <p>L7 Indicator 3 always ON.</p> <p>L8 Security key does not function.) L9 X 0= always appears in OIA.)</p>	<p>1 0000/00 switch or cable (Figure 6-8) 2 Logic card C2 then D2.</p> <p>1 Switch or cable (Figure 6-8). 2 Logic card D2.</p> <p>1 Switch or cable (Figure 6-8). 2 Logic card D2 then C2.</p> <p>1 NORMAL/TEST Switch or cable. (Figure 6-8).</p> <p>1 Security key or connections (Figure 6-8). 2 Use MAP 0800, Entry point GG</p>
<p>KEYBOARD.</p> <p>N1 One or more keyboard keys failing. (Confirm with Offline Test Mode 2, see MIM section 2.5.2)</p> <p>N3 Attribute select keys have no effect.</p>	<p>1 Reseat keyboard cable plug (P23). 2 If no character enters, exchange key module. 3 If wrong character enters, exchange keyboard logic card. 4 If character is correct, inspect keyboard ID jumpers (Figure 6-11) 5 Use MAP 0700, Entry point A.</p> <p>1 Verify keyboard jumpers for PSHIC0; figure 6-1.</p>
<p>FEATURES</p> <p>R1 No APL (Use Offline Test Mode to read keyboard ID. MIM 2.5.3 and Figure 6-11.)</p> <p>R3 Incorrect APL characters.</p>	<p>1 Verify keyboard jumpers (Figure 6-11) or exchange keyboard if incorrect. 2 Inspect logic card E2 for APL module (Fig 6-14) and correct top card connectors (Figure 1-6). 3 Verify Control Unit customization.</p> <p>1 APL module on logic card E2.</p>

(General Failure Index continues.)

GENERAL FAILURE INDEX (Continued).

VIDEO OUTPUT FACILITY.

=====

The following symptoms are associated only with this option.
The switches, indicator, and BNC connectors are in the customer access area (Figure 1-3).

- If the repair fails, go to MAP 1000 entry point A.
- If O.K. continue with MAP at entry point AC (page 6).

SYMPTOM.	PROBABLE FAILING FRU or REPAIR ACTION.
<u>SYMPTOMS ON 3279.</u>	
T1 No separator line and no symbols in OIA (but at least, cursor visible).	1 Ensure the VIDEO CONTROL switch is NOT set to TEST. 2 Inspect VIDEO CONTROL switch and wiring.
<u>SYMPTOMS ON THE ATTACHED MONITOR.</u>	
V1 No separator line and no symbols in OIA (but at least cursor visible).	1 No fault. This is normal.
V2 The display is missing or unstable. (Loss of sync.)	1 Ensure that the customer has used the PDG. 2 Inspect the SYNC POLARITY switch, the SYNC BNC connector and internal cable (Figure 6-13). 3 Logic card C2.
V3 The display has one or more colors missing or incorrect. (Loss of video.)	1 Ensure that the customer has used the PDG. 2 Inspect the R G and B BNC connectors and internal cable (Figure 6-13). 3 Logic card C2.
V4 Blue too light or too dark. (Note. Enhance mode increase the brightness of the blue by adding green at half intensity.)	1 Inspect the VIDEO CONTROL switch and cable (Figure 6-13.) 2 Logic card C2.
V5 Excessive flicker.	1 Ask the customer to readjust the BRIGHTNESS and CONTRAST controls on the monitor; some tend to flicker at high brightness. 2 Logic card C2.

(Step 001 continues)

260CT81

MAP 0000-5

(Step 001 continued)

(ENTRY POINT AC)

Start here after using the Failure Index.

Is the problem repaired by using the Failure Index?

Y N

002

Does the power supply fail when the 3279 is in use or being serviced? (Lamp 1 changes from ON to OFF - it may flash a few times.)

Y N

003

Inspect the keyboard. Is there a keyboard clicker problem or a mechanical failure of the keyboard, for example: a broken key, missing keytop or jammed key?

Y N

004

Does it look as if the problem is with the Video Output (RPQ) logic?

Y N

005

GO TO MAP 0100, ENTRY POINT A.

006

GO TO MAP 1000, ENTRY POINT A.

007

GO TO MAP 0700, ENTRY POINT A.

008

GO TO MAP 0200, ENTRY POINT FF.

009

GO TO STEP 010, ENTRY POINT BB.

010

(ENTRY POINT BB)

Return here after attempting a repair.

- *Switch power OFF \square .
- *Reinstall any parts removed.
- *Replug any connectors.
- *Remove any jumpers used in the MAPS.
- *Correct any adjustments as necessary.
- *Verify correct operation.

Is all correct?

Y N

011

Is this the first time through this step of the MAPS?

Y N

012

Use the ERROR LOG and the ERROR CODE - to - FRU list (MIM section 2.6.3 and MIM section 2.6.8) to aid you in your action plan. Also examine the Failure Index again, (see above). Some examples are:

1. -Swap the suspected FRU from another machine.
2. -Request assistance through your normal support channels.
3. -Measure voltages for level (and ripple if possible). See MIM section 3.1 and MIM section 3.2.
4. -Verify connections to control unit; inspecting for ground loops, and bad AC ground connections.
5. -Inspect the line voltage for sudden changes. Verify that the line voltage matches the machine voltage label and that the power supply card part number is correct.
6. -The MAPS do not point to failures in the logic connector strips. If the MAPS call for a card exchange and this does not correct the problem, suspect associated strip or top card connectors or cables.

013

GO TO MAP 0100, ENTRY POINT A.

014

- *Check all ground connections have been replaced correctly, see Figure 6-5.
- *Replace all covers and bezel.
- *Replace MIM in document tray and close rear gate.
- *Replace any MIM supplement used, in the keyboard tray.
- *Verify correct operation.
- *End of call.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001
0200	BB	5	046

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
3	032	0000	BB
5	051	0200	A
2	010	0300	A
4	040	0300	A
7	088	0300	A
7	090	0300	A
7	096	0300	A
8	101	0300	A
3	026	0300	BB
3	028	0300	BB
7	089	0300	BB
3	030	0300	CC
5	055	0400	A
5	057	0400	CC
4	036	0400	DD
4	038	0400	DD
4	042	0500	A
8	104	0500	A
9	126	0500	A
2	008	0600	A
3	022	0600	A
3	024	0600	A
4	034	0600	A
3	018	0700	A
3	020	0700	A
8	098	0700	A
9	122	0700	A
6	081	0700	BB
9	120	0700	CC
9	121	0700	EE
9	124	0700	EE
5	053	0800	A
7	094	0800	A
3	016	0800	CC
2	012	0800	DD
2	014	0800	EE
4	045	0800	FF
8	112	0900	BB

001
(ENTRY POINT A)

DANGER

When the 3279 power ON/OFF switch is ON , the following are connected directly to the mainline power:-

- The twisted-pair connection from P3 pins 8 and 9 (on the power supply) to the analog card (P7).
- The degauss coil.
- Front panel fuse & switch, and
- Parts of the power supply card.

•Be careful when measuring voltages in these areas.

•Switch power OFF and remove the power cord from the mainline socket before such actions as:-

- disassembling,
- inspecting for failures,
- making resistance measurements, etc.

(Step 001 continues)

TO RUN ONLINE TESTS 0 - 8.
=====

For more detail see MIM section 2.6.1

- Set the TEST/NORMAL switch to TEST and back to NORMAL.
 - Hold down the ALT key, press TEST, and release both.
- The word TEST appears in the OIA.
- Key in /n and press ENTER where n is the test number.
- One of patterns shown in the MIM section 2.6 should display.
- TO LEAVE THE TEST,
- Hold down ALT and press TEST.

CONTROL MAP

PAGE 2 OF 9

(Step 001 continued)

- Switch power OFF and remove the power cord from the mainline power socket.
- Check the screws holding the analog card and power supply cards.
- Reseat the plugs on the video and amplifier cards.
- Reseat the video card.
- Reseat the cards in the logic gate and the top card connectors.
- Reseat the connectors on the rear of the logic gate. (A2, A3, A5)
- Lift off the bezel.
- Reseat the plugs on the bezel. (P11, P12) (Figure 1-2)
- Reseat the plug (P28) near the analog card socket.

•Switch power ON .

•Set switches:-

TEST/NORMAL to TEST,
0000/00 to 0000,
A,a/A to A,a.

- Turn security key (if present) fully clockwise.
 - Turn BRIGHTNESS knob fully clockwise.
 - Wait at least 1 minute or until an image appears.
 - Turn BRIGHTNESS knob until the screen brightness is acceptable.
- The pattern shown in Figure 2-2 (TEST MODE 1) should display in green, with a green cursor in the top left corner. The characters should be good.

Is EVERYTHING in this image correct?

Y N

002

GO TO PAGE 5, STEP 046,
ENTRY POINT BB.

003

Test operation with the control unit and

the coaxial device cable as follows:-

- Run ONLINE TEST 0; see page 1.

The pattern shown in Figure 2-4 should display.

Is ALL correct?

(Ignore any convergence problems).

Y N

004

GO TO PAGE 7, STEP 091,
ENTRY POINT CC.

005

•Return cursor under C of CK field. (If

misconverged, use the green cursor.)

- Press keys \hat{a} (insert) J K L

Field should become jKCK

The symbols X \hat{a} should appear in the

operator information area.

Are ALL actions correct?

Y N

006

GO TO PAGE 7, STEP 091,
ENTRY POINT CC.

A

MAP 0100-2

007

- Press the RESET key.

Is the convergence good?

Take the Y path if you don't know.

Y N

008

GO TO MAP 0600, ENTRY POINT A.

009

The brightness should change smoothly as the control is turned from minimum to maximum.

Can the brightness be changed as expected by the brightness control?

(Ignore problems affecting BLUE only)

Y N

010

GO TO MAP 0300, ENTRY POINT A.

011

If a selector pen is NOT installed take the Y path now.

- Set the brightness control to center position.

•Press the light pen tip (do not point it at the screen).

White bars appear through all characters

in lines 2 and 3 of the test pattern.

The blue characters become BRIGHTER but the red and green do not change.

•Set the brightness control back to an acceptable level.

•Press the pen against the white >SEL PEN field in line 2.

The field changes to >SEL PEN.

•Press the pen against the blue >SEL PEN field in line 3.

The field changes to ?SEL PEN.

•If X-f appears in the indicator row, press RESET key and retry.

Did all occur as expected?

Y N

012

GO TO MAP 0800, ENTRY POINT DD.

013

•If an MSR/MHS is NOT installed, take the Y path now.

•Move the cursor to the first position of the 5th row.

•Use the MSR/MHS to read the test card.

The green lamp on the MSR/MHS should light

and the cursor move. (The characters read from the card may or may not display.)

X-f will appear in the indicator row.

Did all occur as expected?

Y N

014

GO TO MAP 0800, ENTRY POINT EE.

200CT81

A

3
B

MAP 0100-2

015
•If ECS or PS (feature cards E2 and F2) are NOT installed, take the Y path now.
•Run ONLINE TEST 8; see page 1.
The pattern shown in Figure 2-7 should display.
Is the pattern correct?

Y N

016
GO TO MAP 0800, ENTRY POINT CC.

017
•Set the TEST/NORMAL switch to TEST.
•Press all the keys in turn (except CONTROL).
The characters shown in Figure 2-3 (TEST MODE 2) should appear. Note the 4 keys which give double characters.
Are all keys correct?

Y N

018
GO TO MAP 0700, ENTRY POINT A.

019
•Set the TEST/NORMAL switch to NORMAL.
•Press any alphanumeric key four or five times.
Does the clicker sound each time a key is pressed?

Y N

020
GO TO MAP 0700, ENTRY POINT A.

021
•Run ONLINE TEST 7; see page 1.
A yellow (or red on green) pattern (-|-|-) should appear at the center of the screen.
Does this occur?

Y N

022
GO TO MAP 0600, ENTRY POINT A.

023
•Press space bar 26 times, until 13 patterns display together in white.
•Look for any misconvergence. Do not mistake misconvergence for bad focus or bad color balance (impure white).
Is the convergence good?

Y N

024
GO TO MAP 0600, ENTRY POINT A.

025
•Set the brightness control fully clockwise.
Is the display as bright as you would expect?

Y N

026
GO TO MAP 0300, ENTRY POINT BB.

027
(ENTRY POINT DD)
•Check color purity as follows:
•Set the TEST/NORMAL switch to TEST.
•Press keys CONTROL 0 I (red characters).
•Jumper D2Y02 to D2Y08 (reverse video).
Do not leave this jumper connected for more than 20 seconds.

Is the red color good over ALL the screen?

Y N

028
•Go to MIM section 5.3.2 to adjust the color purity. If this corrects the problem,
GO TO MAP 0000, ENTRY POINT BB.
If you cannot correct the problem,
GO TO MAP 0300, ENTRY POINT BB.

029
•Check the color balance as follows:
•Remove the jumper D2Y02 to D2Y08.
•Jumper C2W09 to C2W28 (color bars).
•Jumper C2G06 to C2D08 (force characters).
•Set the TEST/NORMAL switch to NORMAL.
The three primary colors (red, green, blue) should be equally bright and the secondary colors distinct, at both high and low settings of the front panel BRIGHTNESS control.
Is all correct?

Y N

030
•Go to MIM section 5.3.7 to correct the color balance. If this corrects the problem,
GO TO MAP 0000, ENTRY POINT BB.
If you cannot correct the problem,
GO TO MAP 0300, ENTRY POINT CC.

031
•Look at the focus in this test pattern.
•Look at both the center of the screen and the corners.
Is the focus good?

Y N

032
•Go to MIM section 5.3.4 to adjust the image focus.
•Switch power OFF .
•If you cannot correct the problem, see Figure 4-7 and Figure 6-7 to check the continuity of the FOCUS connection through P26. If the problem remains, exchange the analog card then the video card then the CRT.
GO TO MAP 0000, ENTRY POINT BB.

033

- Remove the jumper C2M09 to C2M28.
 - Jumper C2M07 to C2M28. (force white).
 - Hold down the ALT key, press the TEST key, release both.
- The screen will be full of white characters.
- Check convergence carefully all over the screen.

Is the convergence good?

Y N

034

GO TO MAP 0600, ENTRY POINT A.

035

- Fit the alignment mask to the screen.
- Is the image SIZE and SHAPE correct?

Y N

036

- Remove jumpers.
- Go to MIM section 5.3.5 to adjust the raster controls correctly (See also Figure 1-4).
- If this corrects the problem, GO TO MAP 0000, ENTRY POINT BB.
- If you cannot correct the problem, GO TO MAP 0400, ENTRY POINT DD.

037

- Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
- Look for a skip gap above and below the separator line. It should be 1-3 mm (0.05-0.1 inches) wide. See Figure 2-1.

Is the skip good?

Y N

038

GO TO MAP 0400, ENTRY POINT DD.

039

- Remove jumpers.
 - Set the TEST/NORMAL switch to TEST.
 - Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
- Does the image appear as shown in Figure 2-1?

Y N

040

GO TO MAP 0300, ENTRY POINT A.

041

- Release Intensity Override.
 - t0
 - Set the 0000/00 switch to 00.
- The color of the pattern (Figure 2-4) should change so that all characters become green except the characters on line 2 which will be white. The separator line and characters in the OIA remain blue.
- Does this occur?

Y N

042

GO TO MAP 0500, ENTRY POINT A.

043

- Set the 0000/00 switch back to 0000.
 - Check that the A,a/A switch is set to A,a
 - Move the cursor down a few lines and press the 'q' key.
- A character 'q' should appear.
- Set the A,a/A switch to A .
- The 'q' will become 'Q' .
- Does this occur?

Y N

044

- Switch power OFF .
 - See Figure 6-8 to check for an open or short circuit in the wiring to the A,a/A switch.
 - Check the switch. Exchange any failing FRU.
 - If no failure is found, exchange logic card D2.
- GO TO MAP 0000, ENTRY POINT BB.

045

GO TO MAP 0800, ENTRY POINT FF.

046

(ENTRY POINT BB)

•Observe the TEST MODE 1 pattern:
(If the image is missing or too poor to answer the question, take the Y path.)
Do the focus, and purity adjustments look good?

Y N

047

•Make any necessary adjustments to the controls (see Figure 1-4).
You may use MIM section 5.3.4 (Focus) or MIM section 5.3.2 (Purity) to make the adjustment.
If this corrects the problem,
GO TO MAP 0000, ENTRY POINT BB.
If the problem is still present,
GO TO PAGE 3, STEP 027,
ENTRY POINT DD.

048

•Observe the TEST MODE 1 pattern:
(If the image is missing or too poor to answer the question, take the Y path.)
Do the raster adjustments look good?
If the TEST MODE 1 pattern is visible but the width or height is wrong or the corners of the pattern are not square (for example) take the N path.

Y N

049

•Make any necessary adjustments to the controls (see Figure 1-4).
You may use MIM section 5.3.5 to make the adjustment.
If this corrects the problem,
GO TO MAP 0000, ENTRY POINT BB.
If the problem is still present,
GO TO PAGE 3, STEP 027,
ENTRY POINT DD.

050

Is lamp 1 (power good) ON ?

Y N

051

GO TO MAP 0200, ENTRY POINT A.

052

•If this display contains no feature cards, (E2, F2, G2, G4) take the Y path now.
•Switch power OFF and remove any feature cards.
•Replace the C5-D5(-E5) top card connector, if moved. See Figure 1-6.
•Observe TEST MODE 1 pattern again (step 001).

Is test still bad?

Y N

053

GO TO MAP 0800, ENTRY POINT A.

054

•Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
The image on the screen may not be very bright.
•If the image is unstable, take the Y path now.
•Look for the following:-
(A) The image filling most of the screen.
(B) A blank margin at right-hand side.
(C) The 3 rasters not aligned so that the 3 primary colors Red, Green and Blue are visible. See Figure 2-1.
Are (A), (B), and (C) all good?
Ignore other problems.

Y N

055

GO TO MAP 0400, ENTRY POINT A.

056

•Continue to engage Intensity Override.
•Look near the bottom of the image for the gaps by the separator line and look at the diagonal flyback lines.
•See Figure 2-1.
Are these gaps and lines VISIBLE and STABLE?
(If you don't know take the Y path.)

Y N

057

GO TO MAP 0400, ENTRY POINT CC.

058

•Release Intensity Override.
Is the image now stable?
(Take the Y path if you don't know.)

Y N

059

•Exchange logic card C2 then D2
GO TO MAP 0000, ENTRY POINT BB.

060

Is there a permanent raster in one or more of the 3 colors? (It may be very dim.)

Y N

061

Is the screen completely blank or do all characters display too dim or too bright?

Y N

062

Do some groups of '0' characters (or a full screen of '0') appear?

Y N

063

There may be distorted characters on the screen. These may have dots missing or have too many dots (vertical lines) or may be flashing. (Ignore convergence.)
Do any characters look similar to this?

Y N

064

Are there any diagonal lines across the display or any smeared characters?

Y N

065

Does the cursor appear under the 2nd or 3rd character on the top line of the test pattern?

Y N

066

•Verify the TEST/NORMAL switch as follows:
•Set the TEST/NORMAL switch to NORMAL. The ready symbol should appear.
•Set the TEST/NORMAL switch to TEST. The TEST MODE 1 pattern should return. Is the switch OK?

Y N

067

•See Figure 6-8 to check the continuity of the wiring to the TEST/NORMAL switch, especially the 0V connection from analog card P4 pin 10 to LED card P12 pin 6.
•Check the switch.
•Exchange any failing FRU.
•If no failure is found, exchange logic card C2 then D2 then E2.
GO TO MAP 0000, ENTRY POINT BB.

068

Does a green pattern similar to the correct TEST MODE 1 pattern appear, but has characters in the wrong sequence or upper case characters only?

See Figure 2-2.

Y N

069

Are there any '8' characters on the screen?

Check in NORMAL mode also.

Y N

070

•Set the TEST/NORMAL switch to NORMAL.
Does the ready symbol appear?

Y N

071

•Exchange logic card C2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

072

•Run ONLINE TEST 0; see page 1.
•Check the pattern displayed against Figure 2-4.
Is it correct? (Ignore color problems.)

Y N

073

•Exchange logic card D2 then C2.
GO TO MAP 0000, ENTRY POINT BB.

074

Are the COLORS correct also?

Y N

075

•Exchange logic card E2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

076

•Exchange logic card D2 then C2.
GO TO MAP 0000, ENTRY POINT BB.

077

•Exchange logic card D2 then C2.
GO TO MAP 0000, ENTRY POINT BB.

078

•Verify that the A,a/A switch is set to A,a. Press the TEST key.

Does a large 'X' character appear?

Y N

079

•Exchange logic card C2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

080

•Switch power OFF .
•See Figure 6-8 to check the continuity of the wiring to the A,a/A switch.
•Check the switch.
•Exchange any failing FRU.
•If no failure is found, exchange logic card D2 then C2.
GO TO MAP 0000, ENTRY POINT BB.

081

GO TO MAP 0700, ENTRY POINT BB.

082

•Exchange logic card C2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

083

- Check the +5v and the +8.5v on the video card test points - see Figure 6-9.

Are both voltages correct?

Y N

084

- Switch power OFF .
- See Figure 6-7 to check the continuity of the voltage supplies. Repair any failure found.

GO TO MAP 0000, ENTRY POINT BB.

085

- Exchange logic card C2 then D2.
- GO TO MAP 0000, ENTRY POINT BB.

086

- Exchange logic card D2 then C2.
- GO TO MAP 0000, ENTRY POINT BB.

087

- If the screen is not blank, take the Y path now.
 - Press keys CONTROL and B O I
 - Set the TEST/NORMAL switch to NORMAL.
- Does the screen always remain completely blank?

Y N

088

- Exchange logic card C2. If this corrects the problem, GO TO MAP 0000, ENTRY POINT BB.
- If the problem remains, GO TO MAP 0300, ENTRY POINT A.

089

GO TO MAP 0300, ENTRY POINT BB.

090

GO TO MAP 0300, ENTRY POINT A.

091

(ENTRY POINT CC)

- Observe the TEST 0 pattern at high and low settings of the BRIGHTNESS control on the front panel.
 - Take the Y path if the image is missing or too poor to answer the question.
 - Do not mistake a missing color(s) or a continuous raster for poor color balance.
- Do the raster, focus, purity and color balance adjustments look good?

Y N

092

- Make any necessary adjustments to the CE controls (see Figure 1-4). You may use MIM section 5.3.5 (Raster) or MIM section 5.3.4 (Focus) or MIM section 5.3.2 (Purity) or MIM section 5.3.7 (color balance) to make the adjustment. Only use MIM section 5.3.6 if necessary.

If this corrects the problem, GO TO MAP 0000, ENTRY POINT BB.

If the problem is still present, GO TO PAGE 3, STEP 027, ENTRY POINT DD.

093

- If this display contains no feature cards, (E2, F2, G2, G4) take the Y path now.
 - Switch power OFF and remove any feature cards.
 - Replace the C5-D5(-E5) top card connector, if moved. See Figure 1-6.
 - Switch power ON .
 - Repeat preceding test (step 003 or 005).
- Is test still bad?

Y N

094

GO TO MAP 0800, ENTRY POINT A.

095

- Set the TEST/NORMAL switch to TEST.
 - Engage Intensity Override. (Turn the brightness knob fully counterclockwise.) The image on the screen may not be very bright.
- Around some of the edges the three rasters should not be aligned and the 3 primary colors (Red, Green, Blue) should be visible in some areas around the edge. See Figure 2-1.
- Does the image look similar to this?

Y N

096

GO TO MAP 0300, ENTRY POINT A.

117
•Hold down the ALT key, press the TEST key, & release both.

Does the word 'TEST' appear in the indicator row?

Y N

118
•Hold down the ALT key, press the ALT CURSOR key, & release both.

Does the reverse cursor appear?

Y N

119
Does the normal flashing cursor appear?

Y N

120
GO TO MAP 0700, ENTRY POINT CC.

121
GO TO MAP 0700, ENTRY POINT EE.

122
GO TO MAP 0700, ENTRY POINT A.

123
•Press the '/' key.
Does a '/' symbol appear on the screen (in the top left hand corner)?

Y N

124
GO TO MAP 0700, ENTRY POINT EE.

125
•Press the ENTER key.
(ONLINE TEST 0).
The pattern shown in Figure 2-4 should display.
Are the colored fields displayed in the correct colors?
Ignore any other differences.

Y N

126
GO TO MAP 0500, ENTRY POINT A.

127
•Exchange logic card C2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

004

- Remove the power cord from the mainline power socket.
 - Remove the bezel.
 - With the power switch in the ON position, measure the continuity from the power supply edge connector (P3) to the power cord.
- Pins 11 and 14 (test points) of P3 should be connected one to each power cord pin. See Figure 1-2 and Figure 6-15.

Are both connections good?

Y N

005

- Switch power OFF .
- Check the mainline fuse.

Has the fuse failed?

Y N

006

- See Figure 6-15 to check the continuity of the ON/OFF switch, fuse and fuseholder and the connecting cables.

•Exchange the failing FRU.
GO TO MAP 0000, ENTRY POINT BB.

007

- Exchange the fuse and test operation.
- Switch OFF and wait 1 minute.
- Switch ON and wait 10 minutes.

Did the fuse fail again?

Y N

008

GO TO MAP 0000, ENTRY POINT BB.

009

- Switch power OFF and remove the power cord from the mainline power socket.
- Remove power supply card.
- Exchange the mainline fuse again.
- Switch power ON WITHOUT reinstalling the power supply card.

Did the fuse fail?

Y N

010

- Switch power OFF and remove the power cord from the mainline power socket.

•Exchange the power supply card.
GO TO MAP 0000, ENTRY POINT BB.

011

- Remove the power cord from the mainline power socket.

•See Figure 6-15 to verify the insulation of the input power wiring.
GO TO MAP 0000, ENTRY POINT BB.

012

- Switch power OFF and remove the power cord from the mainline power socket.
- Remove the power supply card.
- Check the fuse on the power supply card.

NOTE: If necessary, remove the plastic cover to inspect the fuse. Replace the cover.

Is the fuse good?

Y N

013

- Do NOT repair or exchange the fuse.
- Exchange the power supply card.

GO TO MAP 0000, ENTRY POINT BB.

014

- Leave the power supply card out.
- See Figure 1-2 and Figure 3-2. Check the continuity of the LOPT sense winding to the analog card as follows:
- Measure resistance between locations 8 and 9 on the power supply card edge connector SOCKET (P3).

Is the resistance 0 ohms?

Y N

015

- See Figure 4-7. Check that P7 (LOPT sense) is plugged-in.

•If the resistance is still not 0, verify the continuity of the cable from P3 to P7 and repair.
•If no problem is found, exchange the analog card.
GO TO MAP 0000, ENTRY POINT BB.

016

- Verify the seating of the power supply card in the card edge connector.
- If no problem found, exchange the power supply card.

•Ensure that it matches the machine voltage label and the mainline ac voltage.

GO TO MAP 0000, ENTRY POINT BB.

017

- Connect the meter to +5 V on the logic board.

(0 V = B2D08, +5 V = B2D03).

Does the meter indicate +4.5 to +5.5 Volts?

Y N

018

- Switch power OFF .
- Disconnect the logic gate A3 cable.
- Switch power ON .

Does the meter now indicate +4.5 to +5.5 volts?

Y N

019

- Switch power OFF and remove the power cord from the mainline power socket.

•Exchange the power supply card.
GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	FF	6	065
0100	A	1	001
0400	CC	6	060

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
5	058	0100	BB

001
(ENTRY POINT A)

DANGER

When the 3279 power ON/OFF switch is ON , the following are connected directly to the mainline power:-

- The twisted-pair connection from P3 pins 8 and 9 (on the power supply) to the analog card (P7).
- The degauss coil.
- Front panel fuse & switch, and
- Parts of the power supply card.

•Be careful when measuring voltages in these areas.

•Switch power OFF and remove the power cord from the mainline socket before such actions as:-

- disassembling,
- inspecting for failures,
- making resistance measurements, etc.

- Switch power OFF .
- Verify that the power cord is plugged in to an active outlet.
- Reseat the A2 and A3 logic gate cables and verify that the problem is still present.
- Switch power OFF .
- Wait 10 seconds.
- Switch power ON and look CAREFULLY at lamp 1.

Does lamp 1 (POWER GOOD) flash at least once and then go OFF?

Y N

002

- Connect a meter to +8.5 V on the logic board. (0 V = B2D08, +8.5 V = B2B11).
 - Switch power OFF and wait at least 30 seconds.
 - Switch power ON .
- Did the voltage pulse once or several times (approximately once a second) and then fall to zero? The voltage pulse may be very small. Switch the meter down a range if necessary.

Y N

003

Is the voltage constant between 7.6 and 9.4 Volts?

Y N

3 3 2 2
A B C D

020

- Switch power OFF .
 - Unseat the analog card.
 - See Figure 6-8 and Figure 3-2.
 - Check the +5v cable from the logic A3 connector to the analog card P4-34 for continuity and short circuit to ground.
 - If no problem is found exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

021

- See Figure 6-8 and Figure 3-2 and the table below to check the supplies to the analog card and the LED Indicators.

VOLTAGE.	TOL.	LOGIC GATE	ANALOG CARD P4	
			Wire	TP
+5 Vdc	0.5V	B2J03	34	37
-5 Vdc	0.5V	B2G06	29	5
+8.5Vdc	0.9V	B2G11	35	36
0 V	....	B2J08	30	10

- Switch power OFF .
- Check continuity:-
Analog P4-10 to LED P12-6.
Analog P4-34 to LED P12-7.

Did you find a problem?

Y N

022

- Exchange the analog card (then the power supply card)
- GO TO MAP 0000, ENTRY POINT BB.

023

- Trace and repair wiring if possible or exchange any failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

024

GO TO STEP 025,
ENTRY POINT BB.

025

(ENTRY POINT BB)

- Switch power OFF and connect a meter to +5 V on the logic board.
(0 V = B2D08, +5 V = B2D03).

There now follows a sequence of FRU disconnecting and reconnecting to find which FRU is overloading the power supply.

CAUTION

When investigating with FRUs disconnected:-

- Do NOT switch power ON for more than 5 minutes.
- Do NOT leave the 3279 unattended with power on.

Remember POWER should not be switched back (Step 025 continues)

(Step 025 continued)

ON until 10 seconds after POWER OFF.

- Disconnect the keyboard.
 - Switch power ON .
- Is the +5 V supply now present (between +4.5 V and +5.5 V)?

Y N

026

- Leave the keyboard disconnected.
 - Switch power OFF .
 - Disconnect the video card plugs P14 and P16. See Figure 1-4.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

027

- Switch power OFF .
 - Reconnect the video card connectors P14 and P16.
 - Disconnect amplifier card plug P18. See Figure 1-4.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

028

- Switch power OFF .
 - Reconnect amplifier card connector P18.
 - Disconnect amplifier card connectors P17A and P17B.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

029

- Switch power OFF .
 - Reconnect amplifier card connectors P17A and P17B.
 - Disconnect the logic gate A3 cable.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

030

- Switch power OFF .
 - Reconnect the logic gate A3 cable.
 - Disconnect the logic gate A2 cable.
 - Connect a meter to power supply connector P3-1 (+12V). See Figure 1-2.
 - Use the potentiometer mounting plate as ground.
 - Switch power ON .
- Does the +12 V supply pulse once or several times and then fall to zero?

Y N

031

Is the +12 V supply constant between +10 and +15 Volts?

Y N

032

- Switch power OFF and remove the power cord from the mainline power socket.
 - Exchange the power supply card.
- GO TO MAP 0000, ENTRY POINT BB.

033

There may be a short circuit in a logic card.

- Switch power OFF .
- Reconnect the A2 logic gate connector.
- Remove the logic cards one at a time in the following order, each time testing the +12V:

Feature cards G4, G2, F2, E2

Base cards C2, D2

Convergence logic card B2

- If the problem disappears, exchange the last card removed.

Has the problem gone?

Y N

034

GO TO PAGE 6, STEP 060,
ENTRY POINT CC.

035

GO TO MAP 0000, ENTRY POINT BB.

036

- Switch power OFF .
 - Reconnect the logic gate A2 connector.
 - Unseat the analog card from its edge connector (P4).
 - Switch power ON .
- Does the +12 V supply (at P3-1) still pulse once or several times and then fall to zero?

Y N

037

- Switch power OFF .
 - Disconnect P5 from the analog card. (Figure 4-7)
 - Reseat the analog card.
 - Switch power ON .
- Does the +12 V supply at P3-1 now pulse once or several times and then fall to zero?

Y N

038

- Switch power OFF .
 - Exchange the video card.
- GO TO MAP 0000, ENTRY POINT BB.

039

- See Figure 1-2.
 - Meter the +103V supply to the analog card at test points P3-39 and 40.
- Does it pulse when power is switched ON?

Y N

040

- Switch power OFF .
- See Figure 3-2.
- Meter the 103V wiring for short circuits.
- Repair or exchange any failing FRU.
- If no problem found, exchange the power supply card.

041

- Switch power OFF .
 - Exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

042

- Switch power OFF and remove the power cord from the mainline power socket.
 - Exchange the power supply card.
- GO TO MAP 0000, ENTRY POINT BB.

043

(ENTRY POINT EE)

- Switch power OFF .
- Reconnect the logic gate A3 cable.
- Unseat the analog card from its edge connector P4.
- Switch power ON .
- See Figure 1-2 and Figure 3-3 and use a logic probe to trace these signals:

HORIZ RETRACE: D2J13-B2G13

HORIZ SYNC: B2J13-A3D13-Analog card P4-1
to Analog card P4-2 (TP).

VERT RETRACE: D2G08-C2G07-B2G08

VERT SYNC: C2G12-A3D12-Analog card P4-28
to Analog card P4-3 (TP).

Do BOTH probe lamps light at ALL the above points?

Y N

044

- Switch power OFF .
 - Check cables and connectors for continuity or short circuits to ground.
 - Repair or exchange any failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

045

- Switch power OFF .
 - Reconnect the logic gate A3 cable.
 - Remove the EHT cable from the LOPT on the analog card. See MIM section 4.5.4 para6. The free end of the EHT cable is safe - let it remain in the bottom of the box.
 - Reinstall the analog card.
 - Switch power ON .
- Is the +5 V supply now present?
Y N

046

- There is probably a short circuit on the analog card.
- Switch power OFF .
 - First disconnect both the audible alarm connector P8 and the bezel lamps card connector P12. See Figure 1-2.
 - Switch power ON and test.
 - Switch power OFF if the problem remains, and exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

047

- Switch power OFF and remove the power cord from the mainline power socket.
 - Exchange the bleed assembly. (See MIM section 4.8.4.)
 - If the problem is still present, exchange the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

048

- Switch power OFF .
 - Exchange the amplifier card.
 - See MIM Chapter 5 to make adjustments.
- GO TO MAP 0000, ENTRY POINT BB.

049

- Switch power OFF .
- Reconnect the amplifier card connector P18.

Does this display have a selector pen installed?

Y N

050

GO TO STEP 052,
ENTRY POINT DD.

051

- Remove the selector pen logic card G4.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

052

- Reinstall the selector pen card.
- (ENTRY POINT DD)

- Remove the convergence logic card B2.
 - Switch power ON .
- Is the +5 V supply now present?

Y N

053

- There seems to be a short circuit in the wiring of the the +12V and -12 V supplies to the selector pen card. The problem may be present even if there is no selector pen installed.
- Switch power OFF and see Figure 6-16. Repair any problem.
- GO TO MAP 0000, ENTRY POINT BB.

054

- Exchange logic card B2.
- GO TO MAP 0000, ENTRY POINT BB.

055

- Exchange logic card G4.
- GO TO MAP 0000, ENTRY POINT BB.

056

- Switch power OFF .
 - Exchange the video card. If the problem remains, verify the connections to the video card shown in Figure 6-7.
 - Repair any problem.
- GO TO MAP 0000, ENTRY POINT BB.

057

Can the TEST MODE 1 pattern now be displayed?

Y N

058

- There is a slight overload on the power supply - the analog card is probably failing. Leave the keyboard disconnected and
- GO TO MAP 0100, ENTRY POINT BB.

059

- Switch power OFF .
 - Meter the keyboard cable for short circuits (Figure 6-12) and repair as necessary.
 - If no problem, exchange the keyboard logic card.
- Another possible failure is a slight overload on the power supply; removing a FRU has lowered the current within tolerance. See MIM section 3.1.
- GO TO MAP 0000, ENTRY POINT BB.

060

(ENTRY POINT CC)

- Switch power OFF and remove the power cord from the mainline power socket.
- Reinstall any disconnected FRUs.
- Remove the analog card.
- Disconnect the deflection coils (Connector P6, near the center of the analog card with 4 colored wires) - see Figure 4-7.
- Inspect the plug and connector for loose and dirty contacts and broken wires.
- Repair any damage.

Did you find the problem?

Y N

061

The horizontal scan coil is connected to the RED and BLUE wires.
The vertical scan coil is connected to the YELLOW and GREEN (or BLACK) wires.
The resistance of each coil should be less than 2 ohms.

- Measure the resistance of the 2 scan coils.

Do both coils seem good?

Y N

062

- Exchange the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

063

- Exchange the analog card.
 - If the problem remains, exchange the power supply card, then CRT.
- GO TO MAP 0000, ENTRY POINT BB.

064

GO TO MAP 0000, ENTRY POINT BB.

065

(ENTRY POINT FF)

- Start here to isolate problems causing the power supply to stop (i.e. lamp 1 changing from ON to OFF - with or without flashing).
- Wait one minute.
- Look at lamp 1 carefully.
- Switch power ON .

Does lamp 1 flash?

Y N

066

Is lamp 1 ON?

Y N

067

GO TO PAGE 1, STEP 001,
ENTRY POINT A.

068

If, during more testing,
lamp 1 changes to OFF again:-

- Switch power OFF .
- Wait one minute.
- Switch power ON .
- If lamp 1 lights, continue MAP from where you stopped.
- If lamp 1 remains off,
GO TO STEP 001,
ENTRY POINT A.

- Probe pins P4-2 & 3 (horizontal & vertical sync Test Points on analog card).

Do both lamps light on both pins?

Y N

069

GO TO PAGE 4, STEP 043,
ENTRY POINT EE.

070

- Switch power OFF and remove the power cord from the mainline power socket.
- Reinstall any disconnected FRUs.
- Remove the analog card.
- Disconnect the deflection coils (Connector P6, near the center of the analog card with 4 colored wires) - see Figure 4-7.
- Inspect the plug and connector for loose and dirty contacts and broken wires.
- Repair any damage.

Did you find the problem?

Y N

7 7 7
V W X

23NOV81

MAP 0200-6

V W X
6 6 6

POWER MAP

MAP 0200-7

PAGE 7 OF 7

071

The horizontal scan coil is connected to the RED and BLUE wires.
The vertical scan coil is connected to the YELLOW and GREEN (or BLACK) wires.
The resistance of each coil should be less than 2 ohms.
•Measure the resistance of the 2 scan coils.

Do both coils seem good?

Y N

072

•Exchange the CRT.
GO TO MAP 0000, ENTRY POINT BB.

073

•See MIM section 3.1
GO TO MAP 0000, ENTRY POINT BB.

074

GO TO MAP 0000, ENTRY POINT BB.

075

GO TO PAGE 1, STEP 001,
ENTRY POINT A.

23NOV81

MAP 0200-7

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	BB	4	042
0100	CC	2	008
0400	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
2	023	0800	HH

001

(ENTRY POINT A)

- Set the TEST/NORMAL switch to TEST.
 - Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
- You should see all 3 colors (red, green and blue) in some areas around the edge of the screen - as in Figure 2-1.
- Can you see all the 3 colored rasters ?

Y N

002

Are only one or two colored rasters visible? (No characters.)

Y N

003

The following symptoms in Intensity Override should not prevent the display from operating normally:

- Only 2 of the 3 rasters visible and some dim characters just visible.
- The rasters do not appear and any characters remain in view.

Have you got either of these problems?

Y N

004

- Release Intensity Override.
- GO TO PAGE 4, STEP 042,
ENTRY POINT BB.

005

- If symptom (a) is present, exchange the video card.
 - For symptom (b), probe the VIDEO FORCE signal on the video card (Test Point G1, Figure 6-9).
- The signal should normally be UP and should go DOWN when Intensity Override is engaged.

Does this occur?

Y N

006

- Switch power OFF
 - See Figure 6-7 to trace the VIDEO FORCE signal.
 - See Figure 6-7 to verify the continuity of the connections to the Intensity Override switch on the brightness potentiometer.
 - If you find no problem, exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

007

- Switch power OFF .
 - Exchange the video card.
- GO TO MAP 0000, ENTRY POINT BB.

008

- Release Intensity Override.

(ENTRY POINT CC)

- See Figure 6-7 and Figure 6-9.
- Meter the 3 video card grid test points shown below. Use the -150 V dc meter range. Use a ground braid or the brightness potentiometer plate as ground.
- With the brightness control set to MINIMUM, the voltages on the test points should be between -50 V dc and -80 V dc.
- With the control set to MAXIMUM, the test point voltages should be between -20 V dc and -60 V dc.

GREEN GRID Test Point = GG

BLUE GRID Test Point = BG

RED GRID Test Point = RG

Do the 3 grid voltages look good?

Y N

009

Is only the blue grid voltage bad?

Y N

010

(ENTRY POINT DD)

- On the amplifier card, adjust the settings of the color balance potentiometers for the bad color. See Figure 1-4.

Can the bad grid voltage be corrected?

Y N

011

Are all 3 voltages bad?

Y N

012

- See Figure 6-7 and Figure 1-4.
 - Switch power OFF .
 - Check the continuity of the P15 connector on the video card to the amplifier card connectors P17A and P17B.
 - If the continuity is good exchange the amplifier card.
- Has the problem gone?

Y N

013

- Exchange the video card, then the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

014

GO TO MAP 0000, ENTRY POINT BB.

015

- Verify the continuity from P4-20 to P17-5 and the brightness potentiometer circuit. See figure 6-7. If the continuity is good, exchange the analog card.

016

- Set up the red brightness & color balance. See MIM section 5.3.6 & MIM section 5.3.7.

- Check for a possible intermittent problem.
- GO TO MAP 0000, ENTRY POINT BB.

017

Is the blue grid voltage constant (and between -10 V and -20 V dc) as the brightness control is turned?

Y N

018

GO TO STEP 010,
ENTRY POINT DD.

019

Meter the TP 'J' on the amplifier card. See Figure 6-10.

Is the voltage between 0 - 0.2V dc?

Y N

020

- Switch power OFF .
 - Check continuity of the blue bright-up signal from IP 'J' on the amplifier card to P18-3 through C2U02. See Figure 6-7.
- Is continuity good?

Y N

021

- Repair or exchange failing FRU:- strip, wiring or amplifier card.
- GO TO MAP 0000, ENTRY POINT BB..

022

- Exchange card C2 then amplifier card then B2.
- GO TO MAP 0000, ENTRY POINT BB..

023

GO TO MAP 0800, ENTRY POINT HH.

024

- Switch power OFF .
 - Exchange the video card.
 - If the problem remains exchange the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

A
1

025

•Release Intensity Override.
Turn up the brightness.
Is the problem that ALL 3 rasters are permanently on (as if Intensity Override is always active)?

Y N

026

Is the problem that ONE RASTER is permanently on?
(that is, there is a solid RED, GREEN, or BLUE raster which may be dim or bright). Some characters may be just visible.

Y N

027

•Set the TEST/NORMAL switch to TEST.
•Look at the normal cursor - it should be WHITE - that is, made up of RED and BLUE and GREEN.

Is the problem that ONE of the 3 primary colors is never displayed on the screen?

Y N

028

GO TO PAGE 4, STEP 042,
ENTRY POINT BB.

029

•Ground the suspect video signal for a few seconds, where it comes on to the video card.

GREEN = Test Point GI
RED = Test Point RI
BLUE = Test Point BI

See Figure 6-9.

Does a full raster appear in the correct color?

Y N

030

•Switch power OFF .
•Exchange the video card.
•If the problem remains, exchange the CRT.
GO TO MAP 0000, ENTRY POINT BB.

031

•Switch power OFF .
•Check the continuity of the connections below. See Figure 1-4 for plug locations.

VIDEO SIGNAL	LOGIC	Through	VIDEO CARD Wire	ITP.
Green	C2S11	A5D11	P14-5	GI
Red	C2U11	A5D12	P14-7	RI
Blue	C2S12	A5D13	P14-9	BI

•Repair any problem found or exchange logic card E2 then the video card.
GO TO MAP 0000, ENTRY POINT BB.

K L

MAP 0300-3

032

•Switch power OFF .
•Remove the P14 connector from the video card. See Figure 1-4.
•Switch power ON .
•Set the TEST/NORMAL switch to NORMAL.
•Use a LOGIC PROBE to look at the 3 video signals on the logic board.
GREEN = A5D11
RED = A5D12
BLUE = A5D13

Are any of them DOWN all the time?

Y N

033

•Verify the +5V supply to the video card. (See Figure 6-7.) If no problem found, Switch power OFF and exchange the video card.
GO TO MAP 0000, ENTRY POINT BB.

034

•Switch power OFF .
•Measure the resistance to ground of the suspect signal.

Is it 10 ohms or less?

Y N

035

•Exchange logic card C2.
GO TO MAP 0000, ENTRY POINT BB.

036

There appears to be a short to ground.
•Disconnect logic card C2.

Has the short disappeared?

Y N

037

•Look for a failure in the wiring between the video card and the logic board or on the logic board. See Figure 6-7 and Figure 3-2.
GO TO MAP 0000, ENTRY POINT BB.

038

•Exchange logic card C2.
GO TO MAP 0000, ENTRY POINT BB.

039

•Switch power OFF .
•Reseat the video card on the CRT.
•Switch power ON .
•See Figure 6-9 to check that the following supplies are present on the card.

TEST POINT	VOLTAGE		TOLERANCE
70	+70 Vdc	+10 -5 V	
8.5	+8.5Vdc	±0.9 V	
5	+5 Vdc	±0.5 V	
RG	-20V to	-80Vdc	

NOTE: RG comes from the -150V supply and is changed by the BRIGHTNESS control.

Are the voltages correct?

Y N

040

- See Figure 1-4 and Figure 6-7 to check bad voltages and cable connections.
 - Exchange the failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

041

- Switch power OFF .
 - See Figure 6-7 to verify the continuity of the VIDEO FORCE signal.
 - See Figure 6-7 to verify the continuity of the connections to the Intensity Override switch on the brightness potentiometer.
 - If you find no problem, exchange the video card, then the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

042

(ENTRY POINT BB)

- (Do not use Intensity Override.)
- You may have:
 - a) screen too DIM or BRIGHT
 - b) brightness not variable
 - c) limited brightness or brightness does not change smoothly when control turned from minimum to maximum
 - d) screen BLANK

Were you sent here for any of the above problems?

Y N

043

- You may have a color balance or purity problem.
- Go to the adjust instructions (MIM Chapter 5).
- If necessary adjust the purity controls (MIM section 5.3.2) to make the color the same all over the screen.
- If necessary adjust the color balance controls (MIM section 5.3.7) to make white.

Are the purity and color balance correct?

Y N

044

Is it a purity problem?

Y N

045

GO TO PAGE 2, STEP 008,
ENTRY POINT CC.

046

- Switch power OFF .
 - See Figure 1-2 and Figure 6-15 to verify the degauss coil and its plug (P27).
- The degauss coil should measure 15 - 20 ohms.
- Verify the continuity of the purity coils from amplifier card P19 - see Figure 3-3 and Figure 1-4.
- Each coil should measure between 130 and 170 ohms.

Are all coils good?

Y N

047

- Exchange the failing coil assembly.
 - If the problem remains, exchange the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

048

- Check the amplifier card fuse and exchange if necessary.
 - If the problem remains, exchange the amplifier card then the analog card, then the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

049

GO TO MAP 0000, ENTRY POINT BB.

050

- Meter -150V ($\pm 20V$) supply, from the analog card (P4-43). Use the potentiometer mounting plate as ground.
 - If voltage is bad, switch power OFF and exchange the analog card.
 - Verify the adjustment of the Red Brightness and Color Balance controls. See MIM section 5.3.6 & MIM section 5.3.7
 - Switch power OFF .
 - See Figure 6-7 for the connections to the brightness potentiometer and the Intensity Override switch.
 - Check continuity of the wiring from these controls to the analog and amplifier cards. Repair or exchange as necessary.
 - Reseat the analog card.
 - Reseat P15 on video card - see Figure 1-4
 - If no problem found, exchange the analog card (then the amplifier card, then the video card).
- GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM		ENTER THIS MAP	
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	CC	5	056
0100	DD	5	068

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
4	053	0200	CC
4	055	0300	A
5	065	0500	BB

001
(ENTRY POINT A)

DANGER

When the 3279 power ON/OFF switch is in ON , the following are connected directly to the mainline power:-

- The twisted-pair connection from P3 pins 8 and 9 (on the power supply) to the analog card (P7).
- The degauss coil.
- Front panel fuse & switch, and
- Parts of the power supply card.

•Be careful when measuring voltages in these areas.

•Switch power OFF and remove the power cord from the mainline socket before such actions as:-

- disassembling,
- inspecting for failures,
- making resistance measurements, etc.

- Release Intensity Override. (If engaged.)
- Switch power OFF .
- Reset the A2, A3 & A5 logic gate connectors.
- See Figure 6-5. Check the continuity of frame ground (potentiometer mounting plate on bezel) to P3-4 and P4 pins 14, 24 and 30.
- Repair if necessary.
- Switch power ON .
- Measure the voltages shown in the table opposite using the brightness potentiometer plate as ground.

Was ALL correct?

Y N

002

- Switch power OFF .
- Check continuity of A2D08 to the frame ground.
- Repair if necessary. See Figure 6-8 and Figure 3-2.
- Switch power ON .
- Measure the voltages shown in the table opposite using the brightness potentiometer plate as ground.

Was ALL correct?

Y N

003

Was any voltage less than 1.0V dc?

Y N

Y N

Y N

ANALOG CARD P4 TEST POINTS	VOLTAGES AND TOLERANCES
37	+5.0 Vdc ± 0.8 V
36	+8.5 Vdc ± 1.0 V
5	-5.0 Vdc ± 0.8 V

LOGIC GATE PINS	VOLTAGES AND TOLERANCES
B2D03	+5.0 Vdc ± 0.8 V
B2B11	+8.5 Vdc ± 1.0 V
B2B06	-5.0 Vdc ± 0.8 V

004

- Switch power OFF .
- Remove and reseat the power supply card and then reseat the power supply cable in the logic board (A2).

Is the problem solved?

Y N

005

- Switch power OFF .
- Disconnect the logic gate A2 cable.
- Switch power ON .
- Meter the 103V supply (P3-5), using the potentiometer mounting plate as ground.

Is the supply between 110 Vdc and 140 Vdc?

Y N

006

- Switch power OFF .
 - Exchange the power supply card.
- GO TO MAP 0000, ENTRY POINT BB.

007

- Switch power OFF .
 - Exchange the analog card.
- (Other FRU'S or wiring problems may give similar symptoms.)
GO TO MAP 0000, ENTRY POINT BB.

008

GO TO MAP 0000, ENTRY POINT BB.

009

- Switch power OFF .
 - Verify seating of logic gate A2 connector.
 - If no problem found, exchange power supply card.
- GO TO MAP 0000, ENTRY POINT BB.

010

- See Figure 3-2 to check the power distribution to the analog card.
 - Reseat connectors and logic cards or exchange/repair the failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

011

- Measure the voltages shown in the table below using the potentiometer mounting plate as ground.

ANALOG CARD P4 PINS	VOLTAGES AND TOLERANCES
14	0V & 103V return
15	+103Vdc ±8.0V
39	GND test point
40	+103Vdc test point

Is ALL correct?

Y N

E F

012

Are the voltages measured on pins 15 and 40 different?

Y N

013

- Measure 103V dc at power supply connector P3-5.
- See Figure 1-2.

Is the voltage more than 111 V dc?

Y N

014

Is the voltage less than 95 V dc?

Y N

015

- Switch power OFF .
 - Exchange analog card then the power supply.
- GO TO MAP 0000, ENTRY POINT BB.

016

- Switch power OFF .
 - Exchange the power supply then the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

017

Is the voltage the same at the analog card test point? (P4-40)

Y N

018

- There is a problem in the 103 V connection from the power supply to the analog card.
- Use Figure 3-2 to isolate and repair.
- GO TO MAP 0000, ENTRY POINT BB.

019

- Switch power OFF .
- Exchange analog card.
- If this corrects the problem GO TO MAP 0000, ENTRY POINT BB.
- If the problem remains, GO TO PAGE 3, STEP 037, ENTRY POINT EE.

020

- Switch power OFF .
 - Check seating of the analog card in its edge connector. There should be continuity between pins 15 and 40 when the analog card is seated.
 - Exchange the analog card if no problem found.
- GO TO MAP 0000, ENTRY POINT BB.

021

Wait one minute or until lamp 2 lights. Is lamp 2 lighted?

Y N

3 3
G H

022

•Turn HEIGHT control fully counterclockwise. See Figure 1-4.
Is lamp 2 lighted?

Y N

023

- Switch power OFF .
- Exchange the analog card.
- If this corrects the problem, GO TO MAP 0000, ENTRY POINT BB.
- If the problem remains, GO TO STEP 037, ENTRY POINT EE.

024

•See MIM section 5.3.5 to make necessary adjustments to raster.
•Switch power OFF and exchange the analog card if raster can not be correctly adjusted.
GO TO MAP 0000, ENTRY POINT BB.

025

•See Figure 1-2 and the table below to check the output voltages at the analog card socket P4.
•Use the brightness potentiometer mounting plate as meter ground.

ANALOG CARD SOCKET (P4) PIN NO.	VOLTAGES AND TOLERANCES
31	+12 Vdc $\pm 1.5V$
50 (TP)	+6.3Vdc $\pm 0.8V$
43	-150 Vdc $\pm 20 V$
48 (TP)	+70 Vdc $\pm 10 V$ -5 V

Are they all correct?

Y N

026

Is pin 43 between -70 and -170 volts?

Y N

027

GO TO STEP 037,
ENTRY POINT EE.

028

Is pin 50 voltage wrong?

Y N

029

- Switch power OFF .
- Exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

030

NOTE: The filament voltage (P4-50) can rise to 12 V dc or more if there is a broken connection to the filament or if the filament has an open circuit.
•Measure the voltage between analog card P4-31 (12 Vdc) and P4-47 (return).
Is there more than 8 Vdc?

Y N

031

- Switch power OFF .
- Exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

032

There may be an open circuit in the 6.3 V supply or return to the CRT filament.
•Switch power OFF .

- Use Figure 6-7 to check continuity.
- See Figure 4-7 for filament resistance.
- Isolate to one of:
 - a) Wiring or connectors
 - b) CRT filament
 - c) Video card
 - d) Analog card
- GO TO MAP 0000, ENTRY POINT BB.

033

•Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
Is there any image on the screen?

Y N

034

•Release Intensity Override.
Is the CRT filament lighted?

Y N

035

- Switch power OFF .
- See Figure 6-7 to measure voltages and resistances to isolate the failure.
- Exchange the failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

036

•Turn HEIGHT control fully counterclockwise.
Is problem solved?

Y N

037

(ENTRY POINT EE)

- Switch power OFF and remove the power cord from the mainline power socket.
- Remove the analog card.
- Disconnect the deflection coils (Connector P6, near the center of the analog card with 4 colored wires) - see Figure 4-7.
- Inspect P6 for loose and dirty contacts and broken wires.
- Repair any damage.
- Did you find the problem?

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

038

The horizontal deflection coil is connected to the RED and BLUE wires. The vertical deflection coil is connected to the YELLOW and GREEN (or BLACK) wires. The resistance of each coil should be less than 2 ohms.

- Measure the resistance of the 2 deflection coils.
- Inspect the short wire jumper on the plug and verify its continuity.

Do both coils and the jumper seem good?

Y N

039

- Repair wiring or connector if possible (then exchange the CRT).
- GO TO MAP 0000, ENTRY POINT BB.

040

- Assemble any disconnected FRU's.
- Switch power ON [I].
- See Figure 6-9, video card test points.
- Measure the voltage at these points:

VIDEO CARD TEST POINTS	VOLTAGES AND TOLERANCES
400	280 - 450 Vdc
5	5.0 Vdc $\pm 0.5V$

Are both voltages correct?

Y N

041

- Switch power OFF [O].
 - See Figure 6-7 to find open or short circuits.
 - Exchange/repair video card, analog card, wiring or CRT.
- GO TO MAP 0000, ENTRY POINT BB.

042

- See Figure 6-8 to verify the connections to the brightness potentiometer.
- Was the problem found?

Y N

043

- Switch power OFF [O].
 - Remove the analog card completely.
- CAUTION
- Touch the EHT conductor to ground.
 - Disconnect the EHT cable from the CRT. You may need to remove the bleed assembly to do this - See MIM section 4.8.4.
 - Inspect the EHT cable and bleed assembly.
 - Measure the resistance of the EHT cable from end to end (less than 25k ohm) and resistance to ground (either end) (240M ohm).

Is all correct?

Y N

044

- Exchange the bleed assembly.
- GO TO MAP 0000, ENTRY POINT BB.

045

- Exchange the analog card.
- Has the problem gone?

Y N

046

- Exchange the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

047

- GO TO MAP 0000, ENTRY POINT BB.

048

- GO TO MAP 0000, ENTRY POINT BB.

049

- GO TO MAP 0000, ENTRY POINT BB.

050

- See MIM Chapter 5 to make necessary adjustments.
- GO TO MAP 0000, ENTRY POINT BB.

051

- (Intensity Override still engaged).
 - Check the shape of the image. There should be...
 - ...rester(s) of lines so closely spaced that they nearly merge. (Look carefully at left and right hand edges).
 - ...the image filling most of the screen.
 - ...a blank edge at one side, at least.
- Is the SHAPE correct?

Y N

052

- Release Intensity Override.
 - Check adjustments of HEIGHT, WIDTH, H.CENT, FOCUS1 and FOC2 controls.
 - See MIM section 5.3.4 and MIM section 5.3.5 and Figure 1-4.
- Is the problem corrected?

Y N

053

- GO TO MAP 0200, ENTRY POINT CC.

054

- GO TO MAP 0000, ENTRY POINT BB.

055

- GO TO MAP 0300, ENTRY POINT A.

056

(ENTRY POINT CC)

- Release Intensity Override.
 - Turn brightness control clockwise until the image is bright.
 - Set the TEST/NORMAL switch to NORMAL.
- Is there a single, stable separator line near the bottom of the screen?

Y N

057

- Connect the logic probe to the analog card socket P4-3. (Vert Sync TP) See Figure 1-2.
 - (Ground probe to potentiometer mounting plate.)
- Do both lamps light?

Y N

058

- Probe pin C2G12.
- Do both lamps light?

Y N

059

- Exchange logic card C2 then B2 then D2.
- GO TO MAP 0000, ENTRY POINT BB.

060

- Reset logic gate connector A3 and continue probing for Vert Sync signal until broken connector is found. (See Figure 3-3)
- GO TO MAP 0000, ENTRY POINT BB.

061

GO TO STEP 063,
ENTRY POINT BB.

062

Is there a single stable cursor?

Y N

063

(ENTRY POINT BB)

- Connect the logic probe to the analog card socket P4-2. (Horiz Sync TP) See Figure 1-2.
 - (Ground probe to potentiometer mounting plate.)
- Do both probe lamps light?

Y N

064

- Probe pin B2J13.
- Do both probe lamps light?

Y N

065

GO TO MAP 0500, ENTRY POINT BB.

066

- Reset logic gate connector A3, and continue probing for Horiz Sync signal until broken connection is found & repair it. See Figure 3-3.
- GO TO MAP 0000, ENTRY POINT BB.

067

- Switch power OFF .
 - Exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

068

(ENTRY POINT DD)

- Engage Intensity Override. (Turn the brightness knob fully counterclockwise.)
- Are the skip gaps visible?

(See Figure 2-1).

Y N

069

- Adjust the 'SKIP' potentiometer on the analog card. See Figure 1-4.
- Has it any effect?

Y N

070

- See Figure 3-3.
 - Use a LOGIC PROBE to trace the SKIP signal from the B2 logic card to the analog card.
 - Also use a meter to check continuity.
- At each of the following points BOTH probe lamps should be ON.

LOGIC board B2J11.
LOGIC board A3D11.
Analog card P4-26.
Analog card P4-27.
(Test Point)

- Isolate the problem to a connection failure or to the loss of a signal.
 - Reset the A3 logic gate connector. If no failure can be found, exchange the analog card.
 - If the signal source has been lost, exchange logic card C2 then B2.
- GO TO MAP 0000, ENTRY POINT BB.

071

- Set up the correct amount of SKIP. See MIM section 5.3.5.
 - If not possible, switch power OFF and exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

072

- Adjust the 'SKIP' potentiometer on the analog card. See MIM section 5.3.5 and Figure 1-4.

Can you correct the problem?

Y N

073

- Switch power OFF and exchange the analog card.
- GO TO MAP 0000, ENTRY POINT BB.

074

GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0400	BB	2	010
1000	A	1	001

EXIT POINTS .

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	002	0000	BB

001
(ENTRY POINT A)
 •Check the operation of the base color switch as follows. Probe B2J06.
 When switch is set to 0000 this pin should be DOWN.
 When switch is set to 00 this pin should be UP.
Is all correct?

Y N
002
 •See Figure 6-8 to check switch wiring and repair.
 GO TO MAP 0000, ENTRY POINT BB.

003
 •Check operation of the 2 color control signals as follows :
 •Set NORMAL/TEST switch to TEST.
 B2S08 should be UP.
 B2U06 should be UP.
Are they correct?

Y N
004
 •Exchange logic card B2 then C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

005
 •Set NORMAL/TEST switch to NORMAL.
 B2S08 should be DOWN.
 B2U06 should be DOWN.
Are they correct?

Y N
006
 •Exchange logic card B2 then C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

007
 •Run ONLINE TEST 7; see page 1..
 B2S08 should be DOWN.
 B2U06 should be UP.

Are they correct?
 Y N
008
 •Exchange logic card B2 then C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

009
 •Exchange logic card C2 then D2 then C2.
 GO TO MAP 0000, ENTRY POINT BB.

TO RUN ONLINE TESTS 0 - 8.
 =====
 For more detail see MIM section 2.6.1

•Set the TEST/NORMAL switch to TEST and back to NORMAL.
 •Hold down the ALT key, press TEST, and release both.
 The word TEST appears in the OIA.
 •Key in /n and press ENTER where n is the test number.
 One of patterns shown in the MIM section 2.6 should display.
 TO LEAVE THE TEST,
 •Hold down ALT and press TEST.

LOGIC MAP

PAGE 2 OF 2

A B

MAP 0500-2

010

(ENTRY POINT BB)

- See Figure 1-2 and Figure 3-3 and use a logic probe to trace the VERTICAL SYNC. signal.

LOGIC board C2G12 (source)
 LOGIC board A3D12
 ANALOG card PIN 28
 ANALOG card P4-3 (test point)

At all of the above points BOTH probe lamps should light.

Do they?

Y N

011

Is the signal at C2G12?

Y N

012

- Exchange logic card C2.
 GO TO MAP 0000, ENTRY POINT BB.

013

- Switch power OFF .
- Check continuity and repair.
 GO TO MAP 0000, ENTRY POINT BB.

014

- See Figure 1-2 and Figure 3-3 and use a logic probe to trace the HORIZONTAL SYNC signal.

LOGIC board D2J13 (source)
 LOGIC board B2J13 (retimed)
 LOGIC board A3D13
 ANALOG card P4-1
 ANALOG card P4-2 (test point)

At all of the above points BOTH probe lamps should light.

Do they?

Y N

015

(ENTRY POINT CC)

- Probe D2J13 on the logic board.
 BOTH probe lamps should light.

Do they?

Y N

016

- Use a logic probe on :
 C2D10 (DOT 8)
 C2B08 (DOT 5)
 C2D05 (DOT 1)
 C2B04 (DOT 0)
 Do BOTH lamps light each time?

Y N

017

- Exchange logic card C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

018

- Exchange logic card D2 then B2.
 GO TO MAP 0000, ENTRY POINT BB.

019

- Use a logic probe on :
 C2D10 (DOT 8)
 C2B08 (DOT 5)
 C2D05 (DOT 1)
 C2B04 (DOT 0)
 Do BOTH lamps light each time?

Y N

020

- Exchange logic card C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

021

- Use a logic probe on B2M08 (FEATURE CLOCK).

Do BOTH lamps light?

Y N

022

- Exchange logic card C2 then D2.
 GO TO MAP 0000, ENTRY POINT BB.

023

- Exchange logic card B2, (then C2, then inspect B2G13 connection).
 GO TO MAP 0000, ENTRY POINT BB.

024

- Switch power OFF .
- Reset the analog card.
- Switch power ON and test.
 Has the problem gone?

Y N

025

- Switch power OFF .
- Exchange the analog card.
- Make any necessary adjustments.
 GO TO MAP 0000, ENTRY POINT BB.

026

- GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0800	A	1	001
0800	EE	1	009

001

TO RUN ONLINE TESTS 0 - 8.
=====

For more detail see MIM section 2.6.1

- Set the TEST/NORMAL switch to TEST and back to NORMAL.
- Hold down the ALT key, press TEST, and release both.

The word TEST appears in the OIA.

- Key in /n and press ENTER.

where n is the test number.

One of patterns shown in the MIM section 2.6 should display.

TO LEAVE THE TEST:

- Hold down ALT and press TEST.

If the BATTERY or some circuits on the convergence logic card B2 are failing, an error code 55 or 228 will appear on the screen when the 3279 is switched on. (The 3279 may have to be switched off for some hours before an error is generated.) The error code will be resettable (RESET key) and the operator could converge the screen using ONLINE TEST 7.

The battery is marked with its date (mmyy - month and year) and would be suspect if more than 3 years old. Some other failures will cause error codes 55, 56, 228, or 229 to appear but will NOT be resettable.

(ENTRY POINT A)

- Connect the 3279 to a control unit or IDPA and ready it.

Do any of these error codes appear at any time: 55,56, 228, or 229 ?

Y N

002

- Enter the convergence routine (see MIM section 5.3.3) and attempt to converge EACH of the 13 positions.

Could you do so?

Y N

003

Did the convergence pattern appear in the correct colors?

Y N

004

- Exchange logic card B2 (then D2).

GO TO MAP 0000, ENTRY POINT BB.

005

The convergence patterns should have moved smoothly when you pressed the cursor keys in step 002.

Was there ANY movement?

Y N

006

GO TO STEP 009,
ENTRY POINT EE.

007

Was the movement always smooth?

Y N

008

- Exchange logic card B2 (then D2).

GO TO MAP 0000, ENTRY POINT BB.

009

(ENTRY POINT EE)

- Meter the amplifier card test points as shown in the table below and verify that the correct voltages are present.
- See Figure 6-10 for locations, and Figure 6-16 for circuit.

AMPLIFIER CARD TEST POINT	VOLTAGES AND TOLERANCES
M	+12 Vdc ±1.5 V
N	-12 Vdc ±1.5 V
K (fused)	+12 Vdc ±1.5 V

Use B2D08 as your meter ref.

Are the correct voltages present?

Y N

010

Is the voltage only wrong at test point 'K'?

Y N

011

- Probe the power supply card edge connector (P3) pins as shown in the table below.

Power Supply Card	
P3 Connector	VOLTAGES AND TOLERANCES
1	+12 Vdc ±1.5V
3	-12 Vdc ±1.5V

Use P3-2 as meter ref.

Are the correct voltages present?

Y N

012

If only the -12 V supply was lost the fuse on the amplifier card may have failed.

- Switch power OFF .
- Exchange the fuse if necessary.
- Switch power ON .
- If the fuse fails again (or if it was good), switch power OFF and remove the power cord from the mainline power socket and exchange the power supply.

GO TO MAP 0000, ENTRY POINT BB.

013

There seems to be a broken connection in the 12 volt supplies or return to the amplifier card.

- See Figure 6-16 to trace wiring and isolate the failure.

NOTE: If only the -12 V supply was lost, the fuse on the amplifier card should have failed.

- Exchange it if necessary after repairing the connection failure.

GO TO MAP 0000, ENTRY POINT BB.

014

- Switch power OFF .
- Exchange the fuse on the amplifier card and test. If the fuse fails again, exchange the amplifier card.
- See MIM Chapter 5 to make adjustments.

GO TO MAP 0000, ENTRY POINT BB.

015

- Meter 12 V LOPT supply:
 - + Meter lead — A5D02
 - Meter lead — A5B02

Is the voltage between 10 and 14 volts?

Y N

016

- Switch power OFF .
- Use Figure 6-16 to check the 12 V LOPT back to the analog card.
 - Isolate to one of:
 - a) Cables or connectors
 - b) Amplifier card
 - c) Analog card

GO TO MAP 0000, ENTRY POINT BB.

017

Set the TEST/NORMAL switch to NORMAL.

- Set the A₁/A switch to A.
- Hold down the ALT key, press the TEST key, release both. (This is to ensure the screen is clear).
- Jumper C2G06 to C2D08. Most locations on the screen will contain an 'A' character.
- Jumper C2W07 to C2W28. The Characters should become white. If the convergence is bad they will be many-colored.

Is the convergence good (or nearly good) near the center of the screen but gets worse toward the edges and corners?

Y N

Y N

018

- Verify that the convergence coil assembly is correctly located on the CRT. See Figure 4-8.
- Attempt to improve the convergence at the center of the screen by adjusting the three static convergence thumbwheels and the blue lateral (STATIC BLAT) potentiometer. See Figure 1-4 and MIM section 5.3.1.

Is the convergence now nearly good at the center of the screen, getting worse toward the edges?

Y N

019

(ENTRY POINT BB)

- Remove the jumpers.
- Use a logic probe to probe B2G08. (Vertical Retrace).

Do BOTH probe lamps light?

Y N

020

- Exchange logic card D2.

GO TO MAP 0000, ENTRY POINT BB.

021

- Switch power OFF .
- Exchange logic card B2, (then the amplifier card, then logic card D2).

GO TO MAP 0000, ENTRY POINT BB.

022

GO TO STEP 023,
ENTRY POINT FF.

023

(ENTRY POINT FF)

- Remove the jumpers.
- Use a logic probe to probe B2G08 (Vertical Retrace).

Do BOTH probe lamps light?

Y N

024

- Exchange logic card D2.

GO TO MAP 0000, ENTRY POINT BB.

025

- Run ONLINE TEST 7; see page 1. (convergence routine).
- Press the SPACE BAR ten (10) times. NOTE: The next few steps check the convergence circuits.
- Press the UP cursor key and hold for about 10 seconds.
- Now press and hold the DOWN cursor key.
- Check that the GREEN pattern moves diagonally down (↘) 3-10 mm (0.1-0.4 inches).

Did the GREEN pattern move as expected?

Y N

026

Did the GREEN pattern show ANY movement?

Y N

Y N

027
GO TO STEP 035,
ENTRY POINT DD.

028
GO TO PAGE 5, STEP 050,
ENTRY POINT CC.

029
•Press and hold the UP cursor key.
•Check that the RED pattern moves diagonally down (↘) a similar amount to the green (3-10mm, 0.1-0.4 inches).
Did the RED pattern move as expected?

Y N
030
Did the RED pattern show ANY movement?
Y N

031
GO TO STEP 035,
ENTRY POINT DD.

032
GO TO PAGE 5, STEP 050,
ENTRY POINT CC.

033
(A) •Press the R key.
•Press the DOWN cursor key and hold for about 10 seconds.
•Now press and hold the UP cursor key. The blue pattern should move VERTICALLY up 4-10 mm (0.1 - 0.4 inches).
(B) •Press the LEFT cursor key and hold for about 10 seconds.
•Now press and hold the RIGHT cursor key. The RED pattern should move HORIZONTALLY (left) 2-8 mm (0.08 - 0.3 inches).
Were the expected movements seen?

Y N
034
Was SOME movement seen in BOTH (A) and (B) in the last step?
Y N

4 6
N P Q

035
(ENTRY POINT DD)
•Switch power OFF [M].
•Disconnect the P19 connector from the amplifier card. (See Figure 1-4).
•Inspect the convergence/purity coils for loose components.
•Check the continuity of the convergence coils from the plug on the end of the cable (P19):

COIL	P19 pins.	Resistance.
RED	11 12	<1 ohm
GREEN	9 10	<1 ohm
BLUE	7 8	<1 ohm
BLUE LAT	5 6	1-5ohm

Are all correct?
Y N

036
•Exchange the convergence coil assembly.
•See MIM Chapter 5 for adjustments to be made.
GO TO MAP 0000, ENTRY POINT BB.

037
•Reconnect the P19 connector.
•Switch power ON [N].

The following procedure will test all 4 convergence amplifiers. A fixed voltage (-5 V) will be connected to the INPUT of each amplifier in turn. Each time it will be checked that the colors move in the expected directions. If you know which amplifier is failing, you need test only that one.

•Set the NORMAL/TEST switch to TEST.

— GREEN —
•Jumper B2M06 (-5 V) to B2S06 for about 3 seconds.

The image should move in the direction shown in the figure below and hold there while the jumper is on. The movement should be 15-30 mm (0.6-1.2 inches).

— RED —
•Press keys CONTROL C CONTROL O I
•Jumper B2M06 (-5 V) to B2S05 for about 3 seconds.

The image should move in the direction shown in the figure below and hold there while the jumper is on. The movement should be 15-30 mm (0.6-1.2 inches).

— BLUE —
•Press keys CONTROL C CONTROL O Q
•Jumper B2M06 (-5 V) to B2U07 for about 3 seconds.

The image should move in the direction shown in the figure below and hold there (Step 037 continues)

CONVERGENCE MAP

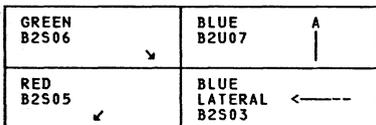
PAGE 4 OF 5

(Step 037 continued)
while the jumper is on.
The movement should be 15-30 mm (0.6-1.2 inches).

— BLUE LATERAL —

•Jumper B2M06 (-5 V) to B2S03 for about 3 seconds.

The image should move in the direction shown in the figure below and hold there while the jumper is on.
The movement should be 2-8 mm (0.2-0.6 inches).



Did your results match the expected results?

Y N

038

•See Figure 1-4. The amplifier card may have the 4 potentiometers marked 'GAIN'.

•If not take the N path now.

These are the gain controls for the convergence amplifiers.

•First write down their settings.

The red, green and blue controls are normally set 3/4 away from the counterclockwise position, and the blue lateral set fully clockwise (Maximum gain).

•If any are set less than normal, set them to normal and repeat step 037.

•If the results are still not as expected set all 4 gain controls to maximum (fully clockwise), and repeat step 037.

Do your results now match the expected results?

Y N

039

•Switch power OFF .

•Reset all 4 GAIN controls to the positions you wrote down.

•Reseat the A5 connector on the logic gate and the P18 connector (Figure 1-4) on the amplifier card.

•Switch power ON .

Is the problem fixed?

Y N

N P R S T U
3 3

MAP 0600-4

040

- Switch power OFF .
- Check the continuity of the connections in the table below. (See Figure 6-10)

LOGIC GATE PIN.	AMPLIFIER CARD TEST POINT
B2S05	F (red)
B2S06	G (green)
B2U07	H (blue)
B2S03	E (blue lat)

Is the continuity of each good?

Y N

041

- Locate and repair bad connection. See Figure 3-3
GO TO MAP 0000, ENTRY POINT BB.

042

- Exchange the amplifier card.
GO TO MAP 0000, ENTRY POINT BB.

043

- GO TO MAP 0000, ENTRY POINT BB.

044

- GO TO MAP 0000, ENTRY POINT BB.

045

- Exchange logic card B2 (then C2 then D2).
GO TO MAP 0000, ENTRY POINT BB.

046

- GO TO PAGE 5, STEP 050, ENTRY POINT CC.

047

- Go to the adjust instructions, MIM Chapter 5 to set up static convergence and purity.
- Start at MIM section 5.3.1 to set up static convergence, then go to MIM section 5.3.2 to set up purity.
- If you make any purity adjustment, go back to MIM section 5.3.1 to check the static convergence.
- Verify that the raster is correctly centered etc. and then go to MIM section 5.3.3 to set up the dynamic convergence. Could you set up the purity and static convergence?

Y N

R S T U

5 5
V W

200CT81

MAP 0600-4

048

- Switch power OFF .
 - Verify the connections to the convergence/purity coil assembly from P19 on the amplifier card. (See Figure 3-3 and Figure 1-4.)
 - If no failure is found, exchange the amplifier card, then the convergence coil assembly
- GO TO MAP 0000, ENTRY POINT BB.

049

Could you set up dynamic convergence?
Y N

050

(ENTRY POINT CC)

- Switch power OFF .
 - Check position of the convergence coil assembly. See Figure 4-8.
 - Exchange the amplifier card if no problem is found.
 - See MIM Chapter 5 to carry out adjustments.
 - If the problem remains, exchange the B2 logic card (then D2 then C2).
- GO TO MAP 0000, ENTRY POINT BB.

051

GO TO MAP 0000, ENTRY POINT BB.

052

•Leave the convergence routine by holding down the ALT key and pressing TEST. Did an Error Code 228 or 229 (3274) or 55 or 56 (3276) appear?

Y N

053

•Set the TEST/NORMAL switch to TEST and back to NORMAL.
Is the convergence worse than you left it?

Y N

054

It may be an intermittent problem.
•See if the convergence coil assembly is loose.
•Look for loose cables and connectors and reset the convergence amplifier card and logic card B2.

GO TO MAP 0000, ENTRY POINT BB.

055

•Exchange logic card B2 (then D2 then C2)

GO TO MAP 0000, ENTRY POINT BB.

056

•Exchange logic card B2 (then D2 then C2.)

GO TO MAP 0000, ENTRY POINT BB.

057

Is the error code resettable?

Y N

058

•Exchange logic card B2 (then D2 then C2).

GO TO MAP 0000, ENTRY POINT BB.

059

- Switch power OFF .
- Check the connections to the battery.
- Disconnect the A3 logic gate connector.
- Probe the free end of the A3 connector to measure the battery voltage:
 - + meter lead to pin D07
 - meter lead to pin B07.

A new battery will measure 4.1 V.

Is it less than 3.5 V?

Y N

060

- Reconnect the A3 connector.
- Measure the voltage on B2B08. This voltage should be 0.5 V to 1.0 V less than the battery voltage.

Is it correct?

Y N

061

- Measure the voltage on B2J09. This should be the same as the battery voltage.

Is it correct?

Y N

062

There is a connection failure.

- Check:
 - B2J09..A3D07..P20-4..Battery/red
 - B2J08..A3B07..P20-1..Battery/black
- Exchange the failing FRU.

GO TO MAP 0000, ENTRY POINT BB.

063

- Exchange logic card B2.

GO TO MAP 0000, ENTRY POINT BB.

064

The battery seems good.
•Exchange logic card B2.
•Set up Dynamic convergence; See MIM section 5.3.3.

GO TO MAP 0000, ENTRY POINT BB.

065

- Check for correct voltage at the following points:-
 - B2J09..A3D07..P20-4..Battery/red
 - B2J08..A3B07..P20-1..Battery/black
- If the problem is still present get the customer to exchange the battery.
- If the problem remains when the customer installs a new battery, exchange logic card B2.

GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001
0100	A	1	001
0100	BB	1	002
0100	CC	1	006
0100	EE	2	019
0800	A	1	001
0900	A	1	001
1000	EE	2	019

001 (ENTRY POINT A)
 •Switch power OFF .
 •Reconnect the keyboard if it is disconnected.
 Keys binding, broken or worn are mechanical failures.
 Is this a mechanical failure or clicker problem?
 Y N

002 (ENTRY POINT BB)
 •Switch power OFF .
 •Remove the keyboard top cover. See MIM section 4.11.2.
 •Disconnect and reseal the internal keyboard connector. (See Figure 6-11.) the keyboard cable connector and the keyboard cable connector on the logic gate. (D5).
 •Switch power ON .
 •See Figure 6-11 and Figure 6-12 and Table 7.1 (column 2) and check the voltages at the internal keyboard cable connector.

Voltage. Tolerance.	Internal Keyboard Connector	Logic Gate.
0V meter ref	D08	D5D08
+5 Vdc ±0.5V	D03	D5D03
+8.5Vdc ±0.9V	B11	D5B11
-5 Vdc ±0.5V	B06	D5B06

Are all voltages correct?
 Y N

003
 •Disconnect the keyboard cable connector from the logic gate (D5).
 •See Figure 6-11 and Figure 6-12.
 •Check the voltages shown in Table 7.1 (column 3) on the logic gate.
 Are all the voltages correct?
 Y N

004
 There is probably a failure in the logic board strips.
 •See Figure 3-2 and Figure 6-4.
 GO TO MAP 0000, ENTRY POINT BB.

005
 •See MIM Figure 6-11 and Figure 6-12 and Table 7.1 to check connections and isolate to a failing cable or connector.
 GO TO MAP 0000, ENTRY POINT BB.

006 (ENTRY POINT CC)
 •See Figure 6-11 and verify that the keyboard jumpers are plugged correctly for this type of keyboard.
 Were they correct?
 Y N

007
 •Set up keyboard jumpers correctly.
 GO TO MAP 0000, ENTRY POINT BB.

008
 •(Check keyboard ID bits.)
 •Probe the keyboard connector in the back of the logic gate (D5). See Table 7.2 (column 2).
 •Record if each signal is UP or DOWN. Bits which are jumpered should be DOWN and bits which are not jumpered should be UP.

ID bit	Logic Gate	Keyboard internal connector
0	D5B05	D04
1	D5B07	D05
2	D5B10	D09
3	D5D12	D10

Are the ID bits correct?
 Y N

009
 •Probe the internal keyboard connector. See Table 7.2 (column 3) and record the results. Bits which are jumpered should be DOWN. Bits which are not jumpered should be UP.
 Are the ID bits correct?
 Y N

010
 •Switch power OFF .
 •Exchange the keyboard logic card.
 GO TO MAP 0000, ENTRY POINT BB.

011

- Switch power OFF .
- See Figure 6-11 and Figure 6-12 and Table 7.2 to check connections and isolate to a failing cable or connector.

GO TO MAP 0000, ENTRY POINT BB.

012

- Probe internal keyboard connector pin D07 (POR).

The UP lamp on the probe should be on.

The DOWN lamp should flash when the

TEST/NORMAL switch is operated.

Is all correct?

Y N

013

- Probe D5B09 (POR).
- Repeat the last test.

Is all correct?

Y N

014

- Switch power OFF .
- See Figure 6-12 and trace the connections from keyboard pin D07 to D5B09.
- Isolate to a failing cable or connector.

GO TO MAP 0000, ENTRY POINT BB.

015

- Exchange logic card D2.

GO TO MAP 0000, ENTRY POINT BB.

016

- Probe D5D10 (DATA AVAILABLE).
- Press each keyboard key. The signal should pulse DOWN once as each key is pressed. Ignore any characters displayed on the screen.

Did any key fail this test?

Y N

017

- Probe internal keyboard connector pin D02 (KEYBOARD ACKNOWLEDGE).
- Press ANY keyboard key. The signal should pulse DOWN as the key is pressed. Ignore any characters displayed on the screen.

Was a down pulse seen?

Y N

018

- Switch power OFF .
- See Figure 6-11 and Figure 6-12 and check continuity from internal keyboard connector pin D02 to logic gate D5D05.
- Repair or exchange as necessary.
- If the continuity is good, exchange logic card C2.

GO TO MAP 0000, ENTRY POINT BB.

019

(ENTRY POINT EE)

- Probe D5D07 (MAKE /BREAK).
- Press the following keys - ALT, SHIFT (right and left) and SHIFT LOCK. (These keys are identified with the following legends in Figure 2-3 (TEST MODE 2): mm nn oo pp).

The signal should pulse UP as each of these keys is RELEASED.

Did these keys pass this test?

Y N

020

- Probe on the internal keyboard connector pin B12 (MAKE/BREAK).
- Press the following keys - ALT, SHIFT (right and left) and SHIFT LOCK. (These keys are identified with the following legends in Figure 2-3 (TEST MODE 2): mm nn oo pp).

The signal should pulse UP as each of these keys is RELEASED.

Did the keys pass this test?

Y N

021

- Exchange the keyboard logic card.

GO TO MAP 0000, ENTRY POINT BB.

022

- See Figure 6-12 and trace the connections from internal keyboard connector pin B12 to D5D07.
- Isolate to a failing cable or connector.

GO TO MAP 0000, ENTRY POINT BB.

023

- Probe the logic gate pins shown in Table 7.3 Column 3.

- Press the Q key (see Figure 2-3) each time. Each pin should pulse UP as the Q key is pressed.

Scan bit	Keyboard Connector		Logic Gate
	1	2	
0	B05	D5B08	
1	D06	D5D09	
2	D13	D5B04	

Did each pin pulse up?

Y N

024

- Probe the internal keyboard connector pins shown in Table 7.3 Column 2.
- Press the Q key each time. The signal should pulse UP each time the Q key is pressed.

Did each pin pulse up?

Y N

025

- Switch power OFF .
- Exchange the keyboard logic card, then the keyboard cable (there may be a short circuit between two lines in the cable or to ground). GO TO MAP 0000, ENTRY POINT BB.

026

- See Figure 6-12 and Table 7.3 to trace connections and isolate to a failing cable or connector. GO TO MAP 0000, ENTRY POINT BB.

027

- See Figure 6-11 and Figure 6-12 and probe the logic gate pins shown in Table 7.4 Column 3.
- Press the P key (see Figure 2-3) each time. The signal should pulse UP each time the key is pressed.

Keyboard Scan bit	Connector	Logic Gate
3	B08	D5D11
4	B09	D5B12
5	B10	D5D13
6	B13	D5B13

Did each pin pulse up?

Y N

028

- Probe the internal keyboard connector pins shown in Table 7.4 Column 2.
- Press the P key each time. Each pin should pulse UP as the P key is pressed.

Did each pin pulse up?

Y N

029

- Switch power OFF .
- Exchange the keyboard logic card, then the keyboard cable (there may be a short circuit between two lines in the cable or to ground). GO TO MAP 0000, ENTRY POINT BB.

030

- See Figure 6-12 and Table 7.4 to trace the connections and isolate to a failing cable or connector. GO TO MAP 0000, ENTRY POINT BB.

031

- Switch power OFF .
- Exchange logic card D2 then the keyboard logic card. GO TO MAP 0000, ENTRY POINT BB.

032

Did only one key fail the last test?

Y N

033

- Switch power OFF .
- See Figure 6-12 and verify the continuity of, DATA AVAILABLE (D5D10 to keyboard internal connector B07) KEYBOARD ACKNOWLEDGE (D5D05 to keyboard internal connector D02)
- Repair any problem found. Was any problem found?

Y N

034

- Exchange the keyboard logic card, then logic card D2, then the keyboard base card. GO TO MAP 0000, ENTRY POINT BB.

035

GO TO MAP 0000, ENTRY POINT BB.

036

- Switch power OFF .
- Exchange the key module for the failing key. GO TO MAP 0000, ENTRY POINT BB.

037

Clicker may be permanently enabled or disabled or not sounding correctly. Is this a clicker failure?

Y N

038

(ENTRY POINT DD)

- See MIM section 4.11 and check keyboard logic card and base card for failures. Are there any visible failures?

Y N

039

- Clean base card with isopropyl alcohol and assemble.

040

- Exchange any failing module and assemble. GO TO MAP 0000, ENTRY POINT BB.

041

See MIM section 4.11.4 and Figure 6-11 and check that the assembly is tight. Is the clicker assembly tight?

Y N

042

- Tighten the assembly and exchange the fastening spring if necessary. GO TO MAP 0000, ENTRY POINT BB.

043

- Switch power ON .
- Set the TEST/NORMAL switch to NORMAL.
- Ensure that the 3279 is online.
- Probe D5D06. This pin should go alternately UP and DOWN as the clicker () key on the keyboard is repeatedly pressed.

When the signal is UP the clicker should be enabled and when DOWN it should be disabled.

Does this occur?

Y N

044

Attempt to enter ONLINE TEST MODE as follows:

- alltest.

Is 'TEST' displayed in the indicator row?

Y N

045

The clicker is probably OK.
GO TO PAGE 1, STEP 002,
ENTRY POINT BB.

046

•Exchange logic card D2.
GO TO MAP 0000, ENTRY POINT BB.

047

- Probe internal keyboard connector pin B03. The signal should go alternately UP and DOWN as the clicker () key on the keyboard is repeatedly pressed.

Does this occur?

Y N

048

- Switch power OFF .
 - See Figure 6-12 and check the connection D5D06 to internal keyboard connector pin B03.
 - Isolate to a failing cable or connector and repair.
- GO TO MAP 0000, ENTRY POINT BB.

049

- Meter the +8.5 V at pin B11 on the internal keyboard connector.

Is the voltage correct?

Y N

050

- See Figure 6-12 and Table 7.1 to check connections and isolate to a failing cable or connector.
- GO TO MAP 0000, ENTRY POINT BB.

051

- Leave the clicker enabled (signal in UP condition).
- Probe the clicker pin farthest from the keyboard connector on the keyboard logic card and press any alphanumeric key.

Does the DOWN lamp flash on for each key pressed?

Y N

052

- Switch power OFF .
 - Exchange the keyboard logic card.
- GO TO MAP 0000, ENTRY POINT BB.

053

- Switch power OFF .
 - Exchange the clicker assembly.
- GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	A	1	001
0100	CC	1	002
0100	DD	4	031
0100	EE	7	077
0100	FF	3	015
0300	DD	4	031
0900	A	1	001
0900	GG	3	025

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
2	003	0000	BB
5	050	0600	EE

**001
(ENTRY POINT A)**

If you know which feature is causing the problem go to the entry point shown in the table below:

FEATURE or FUNCTION	ENTRY POINT
AUDIBLE ALARM	FF -page 3
SECURITY KEYLOCK	GG -page 3
MRC, MSR or MHS	EE -page 7
SELECTOR PEN	DD -page 4
ECS or PS	CC -page 1
KEYBOARD	MAP 0700 A
CONVERGENCE	MAP 0600 A
VIDEO OUTPUT RPQ	MAP 1000 A

CAUTION

Switch power OFF before exchanging logic cards.

The PS modules are easily damaged by static electricity.

- Do NOT touch the pins.
- Do NOT put the module down except in the packing supplied or on to a conducting pad.

If there is a machine check (X nnn) error code displayed on the screen or in the error log for this display go to the entry point in the table below:
(See MIM section 2.6.3 on how to read the error log)

ERROR CODE	ENTRY POINT
44, 61 or 222	DD -page 4
43, 45, 60 or 224	EE -page 7
41, 42, 210 or 212	MAP 0700 A
223, 225,	CC -page 1
226, 227 or 234	CC -page 1
55, 56, 228 or 229	MAP 0600 A
Any other error code	MAP 0900 A

TO RUN ONLINE TESTS 0 - 8.
=====

For more detail see MIM section 2.6.1

- Set the TEST/NORMAL switch to TEST and back to NORMAL.
- Hold down the ALT key, press TEST, and release both.

The word TEST appears in the OIA.

- Key in /n and press ENTER where n is the test number.

One of patterns shown in the MIM section 2.6 should display. TO LEAVE THE TEST,

- Hold down ALT and press TEST.

- Reinstall cards E2 and F2 (ECS & PS) if removed.
 - If the ECS feature is NOT installed take the Y path now.
 - Repeat the failing test, if known, (or use ONLINE TEST 8.)
- Is the test good?

Y N
002
(ENTRY POINT CC)

Are both ECS and PS features (E2 and F2 cards) installed on this machine?

Y N
|
|
|

003

- Exchange ECS logic card E2 (then D2 then C2).
- GO TO MAP 0000, ENTRY POINT BB.

004

- Remove the ECS and PS cards (E2 and F2) if not removed earlier.
 - Write down the settings of the switches on the ECS logic card and verify using Figure 6-14.
 - Now set the switches on the ECS logic card for 'NO PS INSTALLED' (see Figure 6-14).
 - Reinstall the ECS card (E2) and its top card connectors.
 - Run ONLINE TEST 8 (see this MAP page 1.) Each PS symbol should display as a green '1'.
- See MIM Figure 2-7 for correct display. Is the test pattern OK?.

Y N

005

- Exchange logic card E2 (ECS) then D2 then C2.
- GO TO MAP 0000, ENTRY POINT BB.

006

- Set the switches on the ECS card (E2) to their original settings. (See step 004 above)
 - Check these settings and the PS card jumper with MIM Figure 6-14.
 - Check that the Control Unit has the correct features and microcode.
 - Reinstall the F2 logic card (PS) and its top card connectors.
 - Repeat ONLINE TEST 8.
- Is the problem present?

Y N

007

GO TO MAP 0000, ENTRY POINT BB.

008

Are both PS2 and PS4 features installed on this machine? (There will be five pluggable modules on the F2 card if both features present).

Y N

009

- Exchange logic card F2 (PS) then E2 then D2.
- GO TO MAP 0000, ENTRY POINT BB.

010

- It could be a PS card or a PS pluggable module failure.
- If the failing font is known, use Figure 6-14 to isolate the failing module.
 - Otherwise order a new F2 logic card for the PS2 feature, and five new pluggable modules as well.
 - Fit the new modules to the new card.
 - Remove the jumper on the card if it is present.
 - Temporarily install the new F2 card and its top card connectors.
- Has the problem gone?

Y N

011

- Exchange logic card E2 then D2 then C2.
- GO TO MAP 0000, ENTRY POINT BB.

012

- Verify the old PS card as follows.
 - Remove the pluggable modules from the old PS card.
 - Remove the new PS card from the machine and move the five new modules to the old card.
 - Now install the old PS card.
 - Repeat the preceding test.
- Is the problem present?

Y N

013

- One or more of the old PS modules was failing.
- Remove the new modules from the old card (now in the machine), and replace with the old modules one at a time, to locate the failure. Test after each change.
 - Run TEST 8 to verify correct operation. See MIM section 2.6.7 and Figure 2-7.
- GO TO MAP 0000, ENTRY POINT BB.

014

- The PS logic is failing (not one of the pluggable modules).
- Remove the PS card from the machine (that is, the failing card with the good modules installed).
 - Plug the old modules to the new PS card and install.
 - Run TEST 8 to verify correct operation. See MIM section 2.6.7 and Figure 2-7.
 - Return any unused good parts to stock.
- GO TO MAP 0000, ENTRY POINT BB.

015
(ENTRY POINT FF)

Test the operation of the audible alarm as follows:

- Turn the alarm volume control fully clockwise.
 - Run ONLINE TEST 0; see page 1. The alarm should sound once when the test pattern shows.
- If the alarm does NOT sound:
- Switch power OFF .
 - Reseat the A3 logic gate connector.
 - Run ONLINE TEST 0 again; see page 1.

Does the alarm sound?

Y N

016

- Probe D2J05.
- Is the UP lamp on?

Y N

017

- Disconnect P8 from audible alarm, see Figure 1-2. (Should be accessible from front of box).

Is the UP lamp on?

Y N

018

- Switch power OFF .
 - Meter the wiring for a short circuit to ground.
 - If less than 100 ohms, repair the wiring.
 - If not, exchange logic card D2.
- GO TO MAP 0000, ENTRY POINT BB.

019

- Switch power OFF .
 - Exchange the alarm FRU.
- GO TO MAP 0000, ENTRY POINT BB.

020

- Run ONLINE TEST 0 again; see page 1.
- Does the DOWN lamp pulse on?

Y N

021

- Disconnect P8 (Figure 1-2).
 - Run ONLINE TEST 0 again; see page 1.
- Does the DOWN lamp pulse on?

Y N

022

- Exchange logic card D2.
- GO TO MAP 0000, ENTRY POINT BB.

023

- Switch power OFF .
 - Exchange the alarm FRU.
- GO TO MAP 0000, ENTRY POINT BB.

024

- Switch power OFF and remove the power cord from the mainline power socket.
- Verify continuity of the connections in the table below.

ALARM CONNECTOR	Through	LOGIC GATE
P8-1	A3D02	A2D03 (5 Vdc)
P8-3	A3D08	A2D08 (0 Vdc)
P8-4	A3D05	D2J05 (ALARM)

- Also check continuity from the alarm potentiometer to pins A1 and A3 on the alarm card (Figure 6-8).
 - Verify the potentiometer.
 - Repair or exchange any failing FRU.
 - If no failure found, exchange the Alarm FRU.
- GO TO MAP 0000, ENTRY POINT BB.

025

The audible alarm is operating correctly.

(ENTRY POINT GG)

If the Security Keylock is NOT installed, take the Y path now.

Test the operation of the Security Keylock as follows:

- Set the TEST/NORMAL switch to NORMAL.
 - Check that the security key is turned fully clockwise.
 - Now turn the key fully counterclockwise. The symbol X₀ should appear in the operator information area and the screen above the separator line should become blank except for the cursor.
 - Turn the key fully clockwise. The X₀ symbol should disappear and the display should return.
- Did all occur as expected?

Y N

026

- Turn the security key fully clockwise.
- Use a logic probe to check the following pins:

D2G03 should be UP - Keylock
D2J04 should be DOWN-Keylock installed

Are they correct?

Y N

027

- Switch power OFF .
 - Check the switch and its associated wiring.
 - See Figure 6-8.
 - Exchange the failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

028

- Turn the Security Key fully counterclockwise.
- Use a logic probe to check the following pins:

C2G03 should be DOWN - Keylock.
C2J04 should be DOWN-Keylock installed.

Are they correct?

Y N

029

- Switch power OFF .
- Check the switch and its associated wiring.
- See Figure 6-8.
- Repair or exchange failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

030

- Exchange logic card D2.
- GO TO MAP 0000, ENTRY POINT BB.

031

(ENTRY POINT DD)

If the Selector Pen feature is NOT installed, take the Y path now.

- If logic card G4 (selector pen) was removed earlier, Switch power OFF and reinstall it.

Test the operation of the Selector Pen as follows:

- Run ONLINE TEST 0 (see page 1).
- Set the brightness control to an acceptable level.
- Press the pen against the white ?SEL PEN field in line 2.

The field changes to >SEL PEN.

- Press the pen against the blue >SEL PEN field in line 3.

The field changes to ?SEL PEN.

- If X-f appears in the indicator row, press RESET and retry.

Did all occur as expected?

Y N

032

- Turn the Brightness control to mid position.
 - Press the light pen tip (do not point it at the screen).
- The blue characters should become bright (they may only flash) but the red and green should not change.

Does this occur?

Y N

033

- Meter TP 'J' on the amplifier card. See Figure 6-10.
- Check using table below.
- Use brightness potentiometer mounting plate as meter ground.

PEN TIP.	EXPECTED VOLTAGE.
RELEASED	0 Vdc - 0.2 Vdc
PRESSED	1.0 Vdc - 1.5 Vdc

Are the voltages correct?

Y N

034

- Meter the light pen switch voltages. The table below shows the expected voltages.

PEN TIP	YELLOW G5B12	WHITE G5D11
RELEASED	1.8 Vdc	0 Vdc
PRESSED	0 Vdc	2.2 Vdc

Are the voltages correct?

Y N

035

- Open up the selector pen.
- Verify the continuity of the 3 connections to the light pen switch. See Figure 6-13.

- (1) SWITCH n/o (yellow) G5B12
- (2) SWITCH n/c (white) G5D11
- (3) SWITCH common G5D08 (coaxial cable shield)

- Verify correct operation of the switch.

NOTE: the separate ground connector on the selector pen cable is only connected to a cable shield.

- Isolate to wiring or selector pen.

If no problem found, exchange selector pen logic card G4.

GO TO MAP 0000, ENTRY POINT BB.

036

- Switch power OFF .
- Check continuity of blue bright-up signal from TP 'J' on the amplifier card to P18-3 through to C2U02. See Figure 6-7.

- Check for short to ground.

Is connection good?

Y N

037

- Repair or exchange failing FRU.
- GO TO MAP 0000, ENTRY POINT BB.

038

Switch power ON .

- Run ONLINE TEST 0; see page 1.

Are blue characters always bright (not controlled by the brightness control)?

Y N

039

- Switch power OFF [O].
 - Disconnect wire 3 from P18 on the amplifier card.
 - Switch power ON [I].
 - Wait until the image appears.
 - Run ONLINE TEST 0; see page 1.
 - Decrease the brightness.
- Are the blue characters now always bright?

Y N

040

- Switch power OFF [O].
 - Exchange the amplifier card.
- GO TO MAP 0000, ENTRY POINT BB.

041

- Probe C2505 and press the selector pen tip. The DOWN light should come on and remain on as long as the tip is pressed.

Does this occur?

Y N

042

- Exchange logic card G4 (then the selector pen).
- GO TO MAP 0000, ENTRY POINT BB.

043

- Exchange logic card C2.
- GO TO MAP 0000, ENTRY POINT BB.

044

- Meter the voltage at TP 'J' on the amplifier card. Press and release the selector pen tip.
- Is the voltage always between 1.0 V dc and 1.5 V dc?

Y N

045

- Switch power OFF [O].
 - Exchange the amplifier card.
- GO TO MAP 0000, ENTRY POINT BB.

046

- Exchange logic card C2.
- GO TO MAP 0000, ENTRY POINT BB.

047

(ENTRY POINT HH)

Do the blue characters change in brightness as the brightness control is turned?

Y N

048

- Probe video card TP 'BG' (Blue Grid). See Figure 6-9.
 - Turn the brightness control from minimum to maximum.
- The voltage measured should change (approximately) from -70 V dc to -20 V dc.

Does this occur?

Y N

Q R S

049

- Meter the amplifier card test point 'K'.
- Expect +12 V (± 1.5 Vdc).
Is the voltage good?

Y N

050

GO TO MAP 0600, ENTRY POINT EE.

051

- Switch power OFF [O].
 - Check the continuity of the Blue Grid supply: P17B-1 to P15-3 to TP 'BG' to P13-12.
 - Check for short to ground. See Figure 6-7.
 - Isolate to one of:
 - (a) Wiring
 - (b) Video card
 - (c) Amplifier card.
- GO TO MAP 0000, ENTRY POINT BB.

052

- Switch power OFF [O].
 - Exchange the video card then the CRT.
- GO TO MAP 0000, ENTRY POINT BB.

053

- Switch power OFF [O].
 - Exchange the amplifier card.
- GO TO MAP 0000, ENTRY POINT BB.

054

- Press the light pen tip (do NOT point it at the screen). White bars appear through all characters on lines 2 and 3 of the test pattern.
 - Set the brightness control to an acceptable level.
 - Press the pen against the white ?SEL PEN. field in line 2. The field changes to >SEL PEN.
 - Press the pen against the blue >SEL PEN field in line 3. The field changes to ?SEL PEN.
 - If X-f appears in the indicator row, press RESET and retry.
- Did all occur as expected?

Y N

055

NOTE: The light pen tip for Model 2 is P/N 2570128 (large lens) and for Model 3 1742655.

- See Figure 6-13 throughout these tests.
 - Switch power OFF [O].
 - Disconnect the selector pen logic gate connector G5.
 - Switch power ON [I].
 - Meter the following pins: G5D10 (+12 V) and G5B08 (-12 V). Use G5D08 as GND.
- Are the voltages present?

Y N

7 6 6
T U V

200CT81

MAP 0800-5

056

- See Figure 6-10.
 - Meter the amplifier card test points M (+12 V dc) and N (-12 V dc).
- Are both voltages present?

Y N

057

- Switch power OFF .
 - There must be a convergence problem.
- See Figure 1-2 and Figure 6-16 to check wiring.
- GO TO MAP 0000, ENTRY POINT BB.

058

- Switch power OFF .
- Reset the logic gate A5 connector and P18 on the amplifier card and check the +12 V and -12 V wiring. (See Figure 6-16)

Has the problem gone?

Y N

059

- One (or both) of the fused resistors on the amplifier card has failed. This will have been caused by an overload or short circuit on the +/-12 V supplies to the amplifier card.

CAUTION

Do not insert a new amplifier card until the cause of the overload has been repaired.

- Switch power OFF .
 - Look for a short circuit in the +12 V and -12 V wiring from the amplifier card to the selector pen card. (See Figure 6-16.)
 - Repair any problem found. If there is no wiring problem, exchange the selector pen logic card (G4).
 - Exchange the amplifier card.
- GO TO MAP 0000, ENTRY POINT BB.

060

GO TO MAP 0000, ENTRY POINT BB.

061

- Reinstall the selector pen and card (G4) if removed.
- Have you seen any of the following error codes on the screen or in the error log for the display: 44, 61 or 222 ? (See MIM section 2.6.3)

Y N

062

- Probe C2S05 and press the selector pen tip. The DOWN light should come on and remain on as long as the pen tip is pressed.

Does this occur?

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

063

- Use your probe to verify the conditions shown in the table below.

PIN ON LOGIC GATE	SEL. PEN SWITCH	
	PRESESSED	RELEASED
G5B12 yellow	DOWN	---
G5D11 white	UP	DOWN

G5D08 is ground

Are they correct?

Y N

064

- Exchange the selector pen then logic card G4.
- GO TO MAP 0000, ENTRY POINT BB.

065

- Exchange the selector pen logic card G4 (then C2 then D2).
- GO TO MAP 0000, ENTRY POINT BB.

066

- Run ONLINE TEST 0; see page 1.
- Probe C2S05 and use the pen to select each of the 4 pen-detectable fields in the test pattern.
- Each time, press and hold the pen against the screen at the correct position. The DOWN light will come on and remain on until the field is sensed. (The white bars should also disappear.)

NOTE: If X-f appears in the indicator row, press RESET and retry. The red SEL PEN field and the blue &SEL PEN field will normally cause X-f to appear. Were all 4 of the fields sensed correctly?

Y N

067

- Probe the back of the selector pen connector (G5) and check voltages as in the table below.

PIN ON LOGIC GATE	VOLTAGES AND TOLERANCES
G5D10 (red)	+12 Vdc $\pm 1.5V$
G5D13 (black)	-6.2 Vdc $\pm 0.6V$
G5B08	-12 Vdc $\pm 1.5V$

Use G5D08 as ground

Are they correct?

Y N

068

Is only the -6.2 V wrong?

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

Y N

200CT81

069
•Use Figure 6-16 to trace the +12 and -12 Volt supplies to the selector pen card (G4).
•Isolate to cables, connectors or amplifier card.
GO TO MAP 0000, ENTRY POINT BB.

070
•Exchange logic card G4 (then C2 then D2).
GO TO MAP 0000, ENTRY POINT BB.

071
•Set the TEST/NORMAL switch to NORMAL and enter TEST 0.
•Probe G5D12 (selector pen signal). It should be UP.
•Set brightness control to maximum. The DOWN light should also light when the pen is pointed at any characters on the screen.
Does this occur?
Y N

072
•Switch power OFF .
•Check the selector pen lens is clean and exchange or clean if necessary. If no problem found, exchange the selector pen then logic card G4.
GO TO MAP 0000, ENTRY POINT BB.

073
•Exchange the selector pen logic card G4.
GO TO MAP 0000, ENTRY POINT BB.

074
•Exchange logic card D2 (then G4 then C2).
GO TO MAP 0000, ENTRY POINT BB.

075
•Exchange logic card G4 (then D2 then C2).
GO TO MAP 0000, ENTRY POINT BB.

076
The Selector Pen appears to be working correctly.
GO TO MAP 0000, ENTRY POINT BB.

077
(ENTRY POINT EE)

If the MHS or MSR feature is NOT installed, take the Y path now.
•If logic card G2 (MRC) was removed earlier, Switch power OFF and reinstall it.
Test the operation of the MHS/MSR as follows:
•Run ONLINE TEST 0 (see page 1).
•Move the cursor to the first position in the fifth line (line below the test pattern).
•Read the MSR test card.
The cursor should move, the green light turn ON and X-f show in the OIA.
If the red (reader) light turns ON, press RESET and retry.
Did all occur as expected?
Y N

078
Has the customer used the PDG and the Customer Replacement Procedures Manual (shipped with the MSR/MHS unit)?
Y N

079
•Do the tests recommended in the Customer Replacement Procedures Manual (Form No GA24-3663).
Did you find the problem?
Y N

080
•Switch power OFF .
•See Figure 6-13. Verify all the connections in the cable from logic gate G3 to the MSR/MHS connector. Also verify the ground connection.
Is there a problem?
Y N

081
•Exchange logic card G2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

082
•Repair or exchange the cable. Verify correct operation.
GO TO MAP 0000, ENTRY POINT BB.

083
GO TO MAP 0000, ENTRY POINT BB.

084
•Switch power OFF .
The customer did not find the problem.
•See Figure 6-13. Verify all the connections in the cable from logic gate G3 to the MSR/MHS connector. Also verify the ground connection.
Is there a problem?
Y N

085
•Exchange logic card G2 then D2.
GO TO MAP 0000, ENTRY POINT BB.

086

•Repair or exchange the cable.
GO TO MAP 0000, ENTRY POINT BB.

087

Do all 3 indicator lights on the 3279 bezel, function correctly?

Y N

088

(ENTRY POINT JJ)

•See Figure 6-8 to check voltages and continuity to the LED card.
•If all 3 lights are off, check the 5 V supply to the LED card pin 7.
•Switch power OFF .
•Repair or exchange the failing FRU.
GO TO MAP 0000, ENTRY POINT BB.

089

•Perform the tests described in OFFLINE TEST MODE 3 MIM section 2.5.3.

Are all the tests good?

Y N

090

•Exchange logic cards as recommended in MIM section 2.5.3.
GO TO MAP 0000, ENTRY POINT BB.

091

There does not seem to be a problem.

•Ask the customer if the problem is intermittent.

Is it?

Y N

092

•If the ECS feature (logic card E2) is not installed, take the N path now.
•Ask the customer if there is an ECS (7-color and highlighting) failure or PS (Programmed symbols) failure.
Is there an ECS or PS failure?

Y N

093

•Inspect the error log (MIM section 2.6.3) and ask the customer to show you the problem.
GO TO MAP 0000, ENTRY POINT BB.

094

•Switch power OFF .
•Verify the settings of the 8 switches on the ECS logic card (E2). See Figure 6-14.
•If the PS logic card (F2) is installed, check the jumper. The jumper should only be present if this is a PS2 feature card (no pluggable modules installed).
GO TO MAP 0000, ENTRY POINT BB.

095

There is an intermittent problem.
GO TO MAP 0000, ENTRY POINT BB.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0100	BB	1	007
0800	A	1	001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
1	004	0000	A
3	040	0700	A
3	038	0800	A
3	053	0800	GG

001
 (ENTRY POINT A)
 Does the indicator row on the screen display any error indicator other than an error code?
 Y N

002
 Does the indicator row, on the screen, display an error code?
 Y N

003
 Is the TEST/NORMAL switch in the NORMAL position?
 Y N

004
 •Put switch in NORMAL position.
 GO TO MAP 0000, ENTRY POINT A.

005
 Is the security keylock turned fully clockwise? (Use the Y path if there is no security keylock feature).
 Y N

006
 Turn the switch clockwise.
 GO TO MAP 0000, ENTRY POINT BB.

007
 (ENTRY POINT BB)
 Are other displays connected to the same Control Unit operating normally?
 Y N

008
 •See the Control Unit MIM to isolate the failure.

009
 •Use the ERROR LOG to determine if this terminal has had errors that cause the Control Unit to disable the terminal. (See MIM section 2.6.3).
 Does the error log contain any of the error codes given in MIM section 2.6.8?
 ? Take the N path if you don't know.
 Y N

010
 •Switch power OFF then to ON .
 Does the READY SYMBOL appear in the Operator Information area?
 Y N

E
1

SYSTEM INDICATED FAILURE

PAGE 2 OF 3

G H

MAP 0900-2

011

If this display does NOT use a Switch Control Unit, take the N path now.

- Disconnect the Switch Control Unit and connect the coaxial cable directly to the display.
- Switch power OFF then to ON .

Does the READY SYMBOL appear in the OIA ?

Y N

012

(The following is a test of the coaxial device cable from the display. Signals on the cable will not affect test.)

- Switch power OFF .
- Disconnect the coaxial cable from the terminal.
- Measure the resistance from the center pin of the connector on the cable to the outer case of the connector.
- Use Rx10 range.

Is resistance between 1.8k ohms and 2.6k ohms?

Y N

013

Resistance higher than 2.6k ohms indicates an open cable, bad cable connector or failure at the Control Unit. (Cable resistance is 30 ohms/1000 feet).

- Repair or exchange - See Control Unit MIM.

GO TO MAP 0000, ENTRY POINT BB.

014

(The following is a test from the coaxial connector on the terminal connector to card C2).

- Test the resistance from the center contact of the connector on the terminal to the outer case of the connector. Do not use the frame of the terminal.
- Use Rx1 range.

Does resistance measure between 0 and 3 ohms?

Y N

015

- Reseat the C2 logic card.
- Verify the continuity, location and seating of the coaxial cable (conductor and shield) from the coaxial cable socket to the logic gate. See Figure 6-13. Repair or exchange the cable as necessary.
- If no problem is found exchange the C2 card.

GO TO MAP 0000, ENTRY POINT BB.

016

- Disconnect logic card C2. Repeat the last test (step 014).

Does the meter show an open circuit?

Y N

017

The internal wiring from the logic gate to the external coaxial device cable connector is failing.

- Repair or exchange it.

GO TO MAP 0000, ENTRY POINT BB.

018

- Exchange C2 card.

Is the problem still present?

Y N

019

GO TO MAP 0000, ENTRY POINT BB.

020

- Exchange logic cards D2 then B2.

Is the problem still present?

Y N

021

GO TO MAP 0000, ENTRY POINT BB.

022

(ENTRY POINT DD)

Has the terminal LOGGED OFF because of errors?

(see ERROR LOG codes, MIM section 2.6.8, for log off codes)

Y N

023

Switch power OFF .

Does this terminal contain feature cards?

Y N

024

- Inspect the coaxial cable ground, the internal coaxial cable and the logic board strips for failures.

GO TO MAP 0000, ENTRY POINT BB.

025

- Remove the feature cards one at a time and test each time.
- Exchange the card removed when the problem goes away.

GO TO MAP 0000, ENTRY POINT BB.

026

(ENTRY POINT CC)

Is there an error code 77 or 204 ?

Y N

027

Is the error code associated with a feature or the convergence logic card (B2)? (See MIM section 2.6.8 for codes).

Y N

028

- Verify coaxial cable connectors, cable and seating of C2 card.
- If errors remain, exchange C2 card.

GO TO MAP 0000, ENTRY POINT BB.

3
F G H

3 3
J K

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MAP 0900-2

029

- If the feature causing error is identified exchange that card.
- If the feature is not identified or this terminal does not have features, exchange C2 card.

Is the problem still present?

Y N

030

GO TO MAP 0000, ENTRY POINT BB.

031

- Exchange D2 card.

 GO TO MAP 0000, ENTRY POINT BB.

032

- Exchange logic cards D2 then C2.

 GO TO MAP 0000, ENTRY POINT BB.

033

The Switch Control Unit is failing.
GO TO MAP 0000, ENTRY POINT BB.

034

- Exchange logic cards C2 then D2.

 GO TO MAP 0000, ENTRY POINT BB.

035

GO TO PAGE 2, STEP 026, ENTRY POINT CC.

036

Is error code other than 41, 42, 210 or 212 ?

Y N

037

- Remove any feature cards present. (E2, F2, G2, G4)

Is problem still present?

Y N

038

GO TO MAP 0800, ENTRY POINT A.

039

- Disconnect keyboard cable from terminal.

Is problem still present?

Y N

040

GO TO MAP 0700, ENTRY POINT A.

041

- Exchange logic card C2 then D2.
- Reconnect keyboard cable to terminal.

 GO TO MAP 0000, ENTRY POINT BB.

042

GO TO PAGE 2, STEP 022, ENTRY POINT DD.

A

1

043

Is the symbol X_{0-n} present in the Operator Information Area?

Y N

044

Does either X-f or X_{i#?} appear in the Operator Information Area when you attempt to enter the convergence routine? (Online Test 7)

Y N

045

- Go to MIM Appendix A to find the meaning of the symbol(s) displayed and to take action.

GO TO MAP 0000, ENTRY POINT BB.

046

Does X-f appear?

Y N

047

- X_{i#?} appears...Reset logic card B2.

 Has the problem gone?

Y N

048

- Exchange logic card B2.

 Has the problem gone now?

Y N

049

- Exchange logic card C2 then D2.
- Reinstall the original B2 logic card.

GO TO MAP 0000, ENTRY POINT BB.

050

- Go to MIM section 5.3.5 to set up convergence.

 GO TO MAP 0000, ENTRY POINT BB.

051

GO TO MAP 0000, ENTRY POINT BB.

052

Another operator on the same Control Unit is probably using the convergence routine.

- Press RESET and wait a few minutes before repeating.

053

GO TO MAP 0800, ENTRY POINT GG.

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
0000	A	1	001
0200	BB	3	026

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
5	057	0000	BB
2	014	0500	A
2	012	0700	EE

001
(ENTRY POINT A)

- Switch power OFF .
- Wait at least 10 seconds.
- Switch power ON .
- If the fault appears on the 3279 display as well as the attached video devices, return to the General Failure Index to determine the correct MAP entry point.

(ENTRY POINT AA)

- Ask the customer to detach any attached video devices.
- Note the settings of the VIDEO CONTROL and SYNC POLARITY switches (on the rear panel).
- Set the VIDEO CONTROL switch to NORMAL or ENHANCE.
- Check that the 3279 is connected to a control unit.
- Set the TEST/NORMAL switch to NORMAL.
- Set the oo/oooo switch to oooo.
- Turn the BRIGHTNESS knob fully clockwise.
- Wait at least 1 minute or until an image appears on the 3279 screen.
- Turn the BRIGHTNESS knob until the screen brightness is acceptable.
- Hold down the ALT key, press the TEST key, release both.

Does "TEST" appear in the Operator Information Area (OIA)?

Y N

002

Is the separator line visible?

Y N

003

Is the video control switch set to TEST?

Y N

004

- Check that the wiring of the VIDEO CONTROL switch is not reversed.
- See Figure 6-13.

Is wiring OK?

Y N

005

- Wire the switch correctly.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

006

- Exchange logic card C2.
- Has the problem gone?

Y N

007

- Inspect the cable in position C4.
- Inspect the VIDEO CONTROL switch.
- Exchange any failing FRU.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

008

- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

009

- Set the VIDEO CONTROL switch to NORMAL or ENHANCE.
- GO TO PAGE 1, STEP 001,
- ENTRY POINT A.

010

- Verify that the control unit is connected and working.
- Go to the General Failure Index (MAP 0000 page 3).

011

- Press the '/' key.
- Does a '/' appear on the screen?

Y N

012

- GO TO MAP 0700, ENTRY POINT EE.

013

- Press ENTER .
- The pattern shown in Figure 2-4 (Online Test 0) should display.
- Are the COLORS correct? (Ignore any other differences.)

Y N

014

- GO TO MAP 0500, ENTRY POINT A.

015

- Observe the SIGNAL TEST lamp located on the rear panel.
- Is it off?

Y N

016

- Lamp is on.
- GO TO PAGE 3, STEP 026,
- ENTRY POINT BB.

017

- Set the VIDEO CONTROL switch to TEST.
- Observe the SIGNAL TEST lamp.
- Is it on?

Y N

018

- GO TO PAGE 3, STEP 026,
- ENTRY POINT BB.

019

- Compare the picture on the 3279 screen with Figure 2-4.
- Video signals normally sent to the monitor are now displayed on the 3279 screen.
- Check the image for missing or wrong colors.

Are the colors OK?

Y N

020

- Exchange logic card C2.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

021

- Check the image for distortion.
- Is the image OK?

Y N

022

- Set the VIDEO CONTROL switch to NORMAL.
- Is the image OK?

Y N

023

- Return to the General Failure Index to determine correct MAP entry point.

024

- Exchange logic card C2.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

025

- GO TO PAGE 4, STEP 039,
- ENTRY POINT CC.

026
(ENTRY POINT BB)

- Switch power OFF .
- Remove cable connector in position C4.
- Remove logic card C2.
- Measure resistance between C4D05 and C4D08, and between C4D04 and C4D08.

Are both open-circuit?

Y N

- 027
- Use delete tool (PN 452626) to delete connections on card side of the board at C4D04.
 - Also delete wiring at C4D05.
 - Reinstall logic card C2 and top-card connectors.
 - Reinstall connector in position C4.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

- 028
- Reinstall logic card C2 and top-card connectors.

- Switch power ON .
- Set meter to 6Vdc range.
- Measure voltage between C4D05(+) and C4D08(-).

Does meter indicate between 2.6 and 3.2

Vdc?

Y N

- 029
- Exchange logic card C2.
 - Reinstall connector in location C4.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

030

- Switch power OFF .
- Reinstall connector in location C4.
- Disconnect SYNC TEST lamp at connector J34 (behind rear panel).
- Measure voltage between pin 1 (+) and pin 4 (-).

(NOTE: blank plug is at pin 2.)

- Switch power ON .
- Set VIDEO CONTROL switch to TEST.

Does meter indicate between 2.0 and 3.0

Vdc?

Y N

- 031
- Switch power OFF .
 - Reinstall connector J34.
 - Remove the cable connector from position C4.
 - Check the wiring between connector C4 and the video output RPQ switches and indicator.

(See Figure 6-13).

Is the wiring OK?

Y N

- 032
- Repair/exchange cable.
 - Reinstall connector in position C4.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

033

- Exchange logic card C2.
 - Reinstall connector in position C4.
 - Reinstall connector J34.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

034

- Set the VIDEO CONTROL switch to NORMAL.
- Does meter indicate less than 0.5 Vdc?

Y N

035

- Check the VIDEO CONTROL switch and wiring to connector C4.
- Are switch and wiring OK?

Y N

036

- Repair/exchange failing FRU.
 - Reinstall connector J34.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

037

- Exchange logic card C2.
 - Reinstall connector J34.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

038

- Check connector J34/P34 is not damaged.
 - Inspect/exchange the cable in position C4.
 - If the cable is OK, exchange SIGNAL TEST lamp assembly.
 - Reinstall connector J34.
- GO TO PAGE 5, STEP 057,
ENTRY POINT FF.

039
(ENTRY POINT CC)

- Check the video signals as follows:
- Set the TEST/NORMAL switch to TEST (green characters fill the screen).
- Jumper D2Y02 to D2Y08 (on C4/D4 top-card connector) to force reverse video.
- Set meter to 6Vdc range and negative lead to any D08.
- Use pointed probe on positive lead to probe the inner contact of each BNC video socket in turn.
- Green video should be 1.1 to 1.4 Vdc.
- Red and blue video should be less than 0.5 Vdc.
- Press CONTROL O B (alpha keys) - see Figure 2-3. The test pattern turns blue.
- Check again:
- Blue video should now be 1.1 to 1.4 Vdc.
- Red and green video should be less than 0.5 Vdc.
- Press CONTROL C
- Press CONTROL O I (alpha keys) - see Figure 2-3. The test pattern turns red.
- Check again:
- Red video should now be 1.1 to 1.4 Vdc.
- Green and blue video should be less than 0.5 Vdc.

Are all voltages correct?

Y N

040

- Remove cable in position C4.
- Use meter to check video signals at pins C4B05(red), C4B06(green) and C4B07(blue).
- Follow the same procedure as in the previous step.

Are all voltages now correct?

Y N

041

- Remove jumper D2Y02 to D2Y08.
- Reinstall cable in position C4.
- Exchange logic card C2.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

042

- Remove jumper D2Y02 to D2Y08.
- Inspect cable removed from C4 for breaks or shorts in the 3 coaxial video cables.
- Exchange any failing FRU.
- Reinstall cable in position C4.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

043

- Remove jumper D2Y02 to D2Y08.
- Set SYNC POLARITY switch to '+'.
- Measure voltage at SYNC output socket (black).

Is the voltage between 1.5 Vdc and 2.0 Vdc?

Y N

044

- Without removing the connector from position C4, measure the voltage at C4B04.
- Is the voltage between 1.5 Vdc and 2.0 Vdc?

Y N

045

- Remove the cable from position C4.
- Measure resistance between B02 and D08 on the free end of the cable.
- With the SYNC POLARITY switch set to '+', resistance should be about 0 ohms.
- With the SYNC POLARITY switch set to '-', meter should indicate an open circuit.

Is all correct?

Y N

046

- Inspect the cable assembly in position C4 and the SYNC POLARITY switch.
- Exchange any failing FRU.
- Reinstall cable in position C4.
- Exchange any failing FRU.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

047

- Exchange logic card C2.
- Reinstall cable in position C4.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

048

- Inspect/exchange the cable in position C4.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

049

- Set SYNC POLARITY switch to '-'.
- Measure voltage at SYNC output socket.

Is the voltage between 0 Vdc and 0.4 Vdc?

Y N

050

- Inspect wiring of SYNC POLARITY switch. (See Figure 6-13)
- Repair or Exchange any failing FRU.
- GO TO PAGE 5, STEP 057,
- ENTRY POINT FF.

051

(ENTRY POINT EE)

- Remove cable from position C4.
- Set the TEST/NORMAL switch to NORMAL and back to TEST.
- Press CONTROL O B (Alpha keys, see Figure 2-3).

Does the character pattern turn blue?

Y N

052

- Exchange logic card C2.
 - Reinstall cable in position C4.
- GO TO STEP 057,
ENTRY POINT FF.

053

- Install a jumper between C4D04 and C4D08,
and a jumper between C4D02 and C4D08.
 - Observe the image on the 3279 screen.
- Does a faint green image appear with the
blue?

Y N

054

- Remove jumpers.
 - Exchange logic card C2.
 - Reinstall cable in position C4.
- GO TO STEP 057,
ENTRY POINT FF.

055

- Remove jumpers.
 - Measure resistance between D04 and D08 on
the free end of the connector.
- With the VIDEO CONTROL switch set to
ENHANCE the resistance should be
approximately 0 ohms.
- With the VIDEO CONTROL switch set to
NORMAL the connection should be
open-circuit.
- Is all correct?

Y N

056

- Inspect cable and VIDEO CONTROL switch.
 - Exchange any failing FRU.
 - Reinstall cable in position C4.
- GO TO STEP 057,
ENTRY POINT FF.

057

- Reinstall cable in position C4.
 - Exchange logic card C2.
- GO TO STEP 057,
ENTRY POINT FF.

(ENTRY POINT FF)

- Perform VIDEO OUTPUT checkout procedure
in PDG.
 - Return VIDEO CONTROL and SIGNAL POLARITY
switches to their original settings.
- GO TO MAP 0000, ENTRY POINT BB.

SY33-0069-3

(Part 2)

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