

IBM Maintenance Library

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**3278 Display Station
Models 1, 2, 3, 4, and 5
Maintenance Information**

Eighth Edition (March 1983)

This is a revision of SY27-2510-6, which is now obsolete. This edition incorporates the changes released in Technical Newsletter SN31-1403, additions to include the IBM 3270 Personal Computer Attachment, and minor technical changes. Changes or additions to the text and to illustrations are indicated by a vertical line to the left of the change. Information in this manual is subject to change from time to time; any such change will be reported in subsequent revisions or Technical Newsletters.

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Safety Notices

DANGER

All power unit removal and replacement procedures must be performed with power turned off and with the power cord disconnected.

DANGER

All persons handling a CRT or who are near an exposed CRT under vacuum must wear safety glasses and long-sleeved garments.

DANGER

High voltage can be present when Indicator 2 is off.

DANGER

Safety glasses must be worn when you are working on the machine with power on or off.

DANGER

Voltages are present in the heat sinks on the analog card when the power is on. Also, be careful when removing this card because the heat sinks will be hot (at high temperatures).

DANGER

Ferrocapsitor 01D/C1 is grounded only when the capacitor is retained by its mounting spring.

The machine frame is grounded only when the prime power assembly 01D/A1 is mounted and fastened in place.

The ferrotransformer assembly 01D/T1 is grounded only when it is mounted and fastened in place.

CAUTION

The 3278 must be off before cards and cables are reseated or swapped. Be careful not to loosen cards or cables when working on the 3278. This could cause intermittent failures then or at a later time.

CAUTION

The indicator above the ON/OFF switch is *not* a primary Power On indicator. Machine voltage may be present when this indicator is off.

CAUTION

Do not connect or disconnect the device cables during an electrical storm.

Warning: The CRT weighs about 7.25 kg (16 pounds). Protect and support the CRT when removing and replacing it to prevent damage to the CRT and other units.

3278 DISPLAY STATION CHECKLIST

Start all safety inspections here. (Refer to Chapter 5 for detailed removal instructions.)

1. Ensure that machine power is off and that the power cable is disconnected from the outlet.
2. Check for non-IBM additions. If there are any, has the R009 non-IBM alteration/attachment survey been completed? _____ (Contact your field manager to obtain the required survey.)
3. Remove the lower front cover:
 - a. Check the voltage rating label on the low-voltage power supply shield (Figure A).
 - b. Check the power line cable for frayed or damaged areas; check that the cable has a ground pin (Figure 4-12). If the cable is damaged or the ground pin is missing, the cable must be replaced. See parts catalog S126 0020 for a list of power cables.
4. Remove the left and right side covers. Check the following safety notices:
 - a. The *HAZARDOUS* label on the left side of the cathode-ray tube (CRT) frame (Figure B).
 - b. The *DANGER 18000 V* label on the yoke shield (Figure B).
 - c. The *DANGER* and *Hazardous* labels on the inside of the low-voltage power supply shield and at the left end of the card gate (Figure A).
 - d. The *DANGER* label for high temperature on the top right of the card gate (Figure C).
 - e. The *X-RADIATION* label on the right side of the CRT frame — Germany only (Figure B).
5. Check the following:
 - a. The ferrocapacitor for bulges, split seams, and leaks (Figure 4-3).
 - b. The CE access area for exposed sharp edges. Correct sharp edges with a file.
 - c. Grounds at the CRT harness, yoke, and CRT socket.

- d. The prime power and low-voltage supply fuses for the correct value, as shown in Figures 4-3 and 4-11. Replace with the correct value as needed.
 - e. The low-voltage power supply screw for tightness (bottom center).
 - f. The wires from the ferrotransformer to the low-voltage power supply for damaged insulation.
6. Reinstall the low-voltage power supply shield.
Check for less than 1 ohm between the power-line ground pin and the upper and lower metal frames.
7. Reinstall the left, right, and front covers.
Check that all covers fit tight and are securely latched.
8. Plug the power cable into the customer-supplied outlet.
Switch on the unit and check that the power-on sequence is complete. If the display fails to power up or down, refer to the MAPs (Chapter 2) for problem isolation. The power on/off switch must be functional.

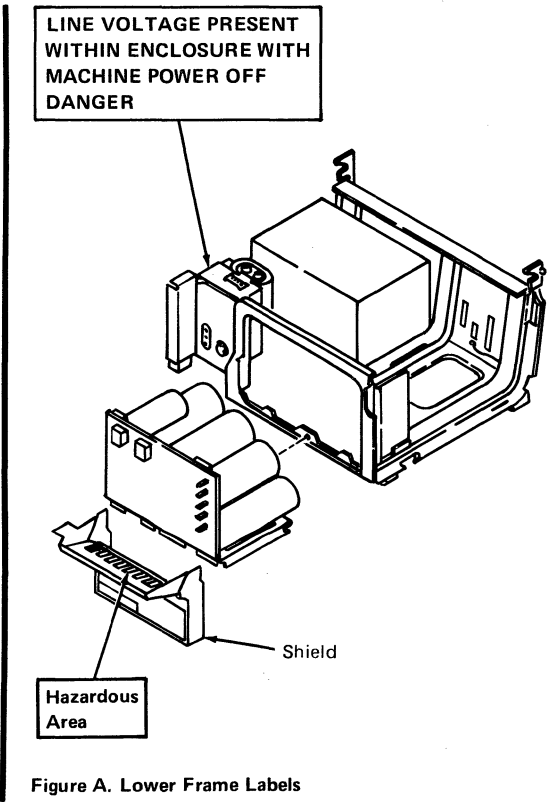
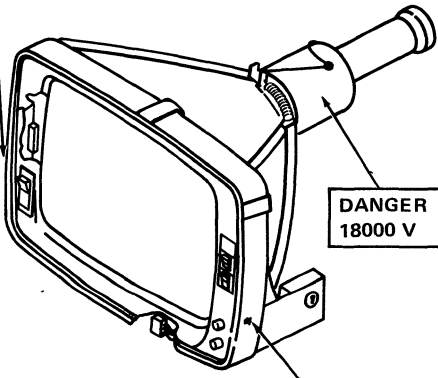


Figure A. Lower Frame Labels

HAZARDOUS AREA
TRAINED SERVICE
PERSONNEL ONLY



DANGER
18000 V

X-RADIATION
(Germany only)

Figure B. CRT and CRT Frame Assembly Labels

DANGER
TEMPERATURE

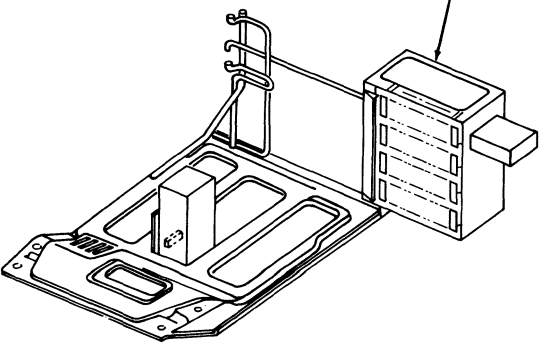


Figure C. Upper Frame Labels

CE SAFETY PRACTICES

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

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you **MUST** work alone.
2. Remove all power AC and DC when removing or assembling major components, working in immediate area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuitry. Pull the power plug from the receptacle to remove power source.
3. Wall box power switch, when used to disconnect power, should be locked or tagged in off position. "Do not Operate" tags, form 229-1266, should be securely attached to power switch or to outside of power box.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, the following precautions must be followed:
 - a. At least one other person familiar with power off controls, emergency power off procedures, and the location of the wall box power switch, must be in the immediate vicinity at all times.
 - b. Rings, wrist watches, chains, bracelets, metal cuff links, shall not be worn.
 - c. Only insulated pliers and screwdrivers shall be used.
 - d. Keep one hand in pocket.
 - e. When using test instruments be certain they are of proper capacity and controls are set correctly. Only insulated probes are used.
 - f. Avoid contacting ground potential (metal floor strips, machine frames, etc. — use suitable rubber mats purchased locally if necessary).
5. Safety Glasses must be worn when:
 - a. Using a hammer to drive pins, riveting, staking, etc.
 - b. Power hand drilling, reaming, grinding, etc.
 - c. Using spring hooks, attaching springs.
 - d. Soldering, wire cutting, removing steel bands.
 - e. Parts cleaning, using solvents, sprays, cleaners, chemicals, etc.
 - f. All other conditions that may be hazardous to your eyes. **REMEMBER, THEY ARE YOUR EYES.**
6. Special safety instructions such as handling Cathode Ray Tubes and extreme high voltages, must be followed as outlined in CEM's and Safety Section of the Maintenance Manuals.
7. Do not use solvents, chemicals, greases or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. The maximum load to be lifted is that which in the opinion of you and management does not jeopardize your own health or well-being or that of other employees.

11. All safety devices such as guards, shields, signs, ground wires, etc., shall be restored after maintenance.
12. Each Customer Engineer is responsible to be certain that no action on his part renders product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before machine is returned to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., when lubricating, checking for play, etc.).
17. When using stroboscope — do not touch ANYTHING — it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before powering up or starting equipment, make certain other CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machines while performing and after completing maintenance.
22. Even though preventive measures are taken, accidents do occur. CEs and support personnel should be prepared to follow emergency first aid procedures as outlined below.

First Aid — General

1. If accidental electrocution occurs:
 - a. Remove power source before touching victim.
 - b. If power cannot be removed, pull victim away from equipment by using non-conductive material such as a broom handle, leather belt, or necktie.
 - c. Immediately begin rescue breathing; see below.
 - d. Begin CPR if necessary and only if trained person is available.
 - e. Call a doctor.
Have someone summon medical aid.
 - f. Remain in position.
After victim revives, be ready to resume respiration if necessary.
2. For serious injury:
 - a. Summon medical aid.
 - b. Do not move victim unless absolutely necessary to remove from danger.
 - c. Attempt to stop serious bleeding by using pressure points or a pressure bandage.
 - d. Loosen clothing and keep victim warm.

Artificial Respiration

General Considerations

1. Start Immediately, Seconds Count
Do not wait or look for help or stop to loosen clothing, warm the victim or apply stimulants.

2. Check Mouth for Obstructions
Remove foreign objects – Pull tongue forward.

**Rescue Breathing for Adults – Place
Victim on His Back Immediately**

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



Preface

This publication contains the information needed to service and maintain the IBM 3278 Display Station Models 1, 2, 3, 4, and 5. Part numbers for the usually needed field replaceable units (FRUs) are given in Chapter 4; keyboard assembly FRUs are given in paragraph 6.7 (Chapter 6). Additional information on the ordering of parts is contained in the *IBM 3278 Display Station Parts Catalog*, order number S126-0020.

Organization

This publication has seven chapters:

- Chapter 1 is a brief introduction to the 3278 and to the maintenance plan for the 3278.
- Chapter 2 contains the maintenance analysis procedures (MAPs).
- Chapters 3 through 7 contain reference material that supports the MAPs.

The Glossary defines terms used in this publication.

Starting Point

The starting point for all failure isolation on the 3278 is MAP 00, Start/Restart MAP.

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Chapter 1. Introduction

1.1 General

The IBM 3278 Display Station must be attached to a port of the IBM 3274 Control Unit or of the IBM 3276 Control Unit Display Station (or other compatible controllers) by a coaxial cable. The 3278 contains field replaceable units (FRUs), as shown in Figures 1-1 and 1-2.

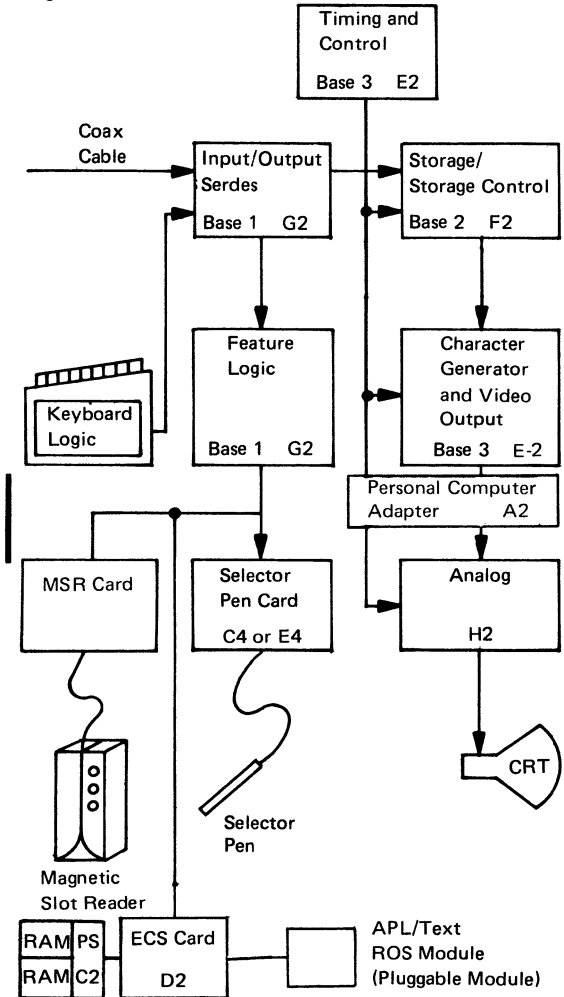


Figure 1-1. 3278 Field Replaceable Units, (D) Type

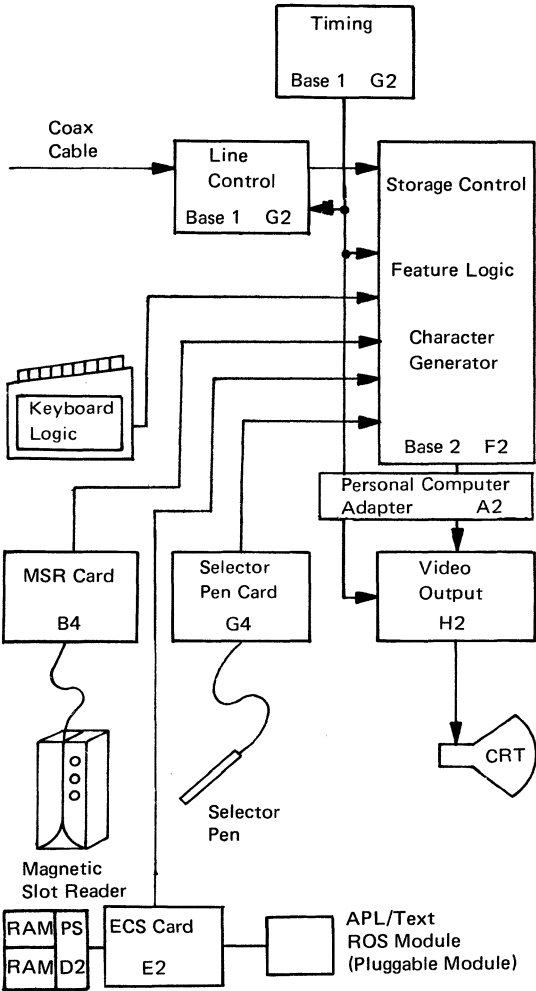


Figure 1-2. 3278 Field Replaceable Units, (M) Type

There are two configurations of the logic for the 3278 Display Station. The first is the (D) type, shown in Figures 1-1, 4-6, and 4-7. Three base logic cards are used in this configuration: base 1 (G2), base 2 (F2), and base 3 (E2). The second configuration, the (M) type, shown in Figures 1-2, 4-8, and 4-9, has two base cards: base 1 (G2) and base 2 (F2). Note the new locations of the feature cards when present with the second configuration.

The 3278 Display Station Model 5 has the (M) configuration only, and can display either an 80- or a 132-character line. The offline test describes the method for testing and aligning the Model 5.

The (D) type basic logic is packaged on three cards, one 2WX3H and two 4WX3H, and contains basic functions as follows:

Base card 1 – 01A/A1G02

Interface to coax, command decode and gates, and paths to features.

Base card 2 – 01A/A1F02

Storage, counters, and storage control.

Base card 3 – 01A/A1E02

Character generator, dot character line and row counters, video serializer, and control.

The (M) type base logic is packaged on two cards, one 2WX3H and the other 4WX3H. Most of the basic functions are contained in the 4W card, which is located at 01A/A1F2. The interface to the coax cable, the dot counter, and the video serializer are located on the card in 01A/A1G2.

1.2 Magnetic Slot Reader

The magnetic slot reader (MSR) and the magnetic hand scanner (MHS) accessories allow the 3278 to enter data recorded on a magnetic stripe. They attach to the display station through a cable. The magnetic slot reader reads information when a magnetic striped card is passed through a slot in the reader. The magnetic hand scanner reads data when it is passed over a magnetic stripe. (The magnetic

hand scanner is only supported on a 3278 attached to a 3274 customized for the alphanumeric character set.)

1.3 Selector Pen

The Selector Pen feature for the 3278 Display Station is used to select a field or fields displayed on the screen. The point of the pen contains a device that can detect the light of a character on the screen; pressing the point of the pen against the screen activates a switch in the point.

1.4 APL/Text

The APL/Text feature allows users to use APL or Text applications at the 3278. A 3278 with APL/Text installed can:

- Display the 222-character-plus-space APL/Text character set.
- Be used to enter 94 EBCDIC characters and 81 APL-specific characters plus space on the APL keyboard.
- Be used to enter 94 U.S. English characters and 65 Text-specific characters plus space on the Text keyboard.

1.5 Personal Computer Attachment

The IBM 3270 Personal Computer Attachment allows a user to connect an IBM Personal Computer System Unit to a 3278 display. This enables the display station to operate in two modes:

- Host-computer mode - The display station operates as a 3278 and performs all 3270 functions.
- Personal-computer mode - The display station operates as a personal computer and performs all the functions of the IBM Personal Computer. The 3278 display is its monitor, and the 3278 keyboard the input device.

This feature also allows for the transferring of files between the host and the personal computer and for the copying (screen capture) of data from the 3278 screen to the personal computer printer or diskette.

1.6 Electrical Grounding

The 3278 is electrically connected between ac and dc returns at the unit. A ground wire is attached from the upper chassis to the gate and then to dc return at card location 01A/A1H2P8.

The coax return (shield) is isolated from the dc return at the 3278. With the ac power cord disconnected, a correctly wired unit should indicate continuity between ac and dc ground, and an open circuit between the customer coax shield and the 3278 dc ground.

Major frame static points exist around the CRT area of the machine. Poor or no contact at these points may cause intermittent or erratic display operation such as:

- No display (blank screen)
- Erratic raster on the lower or the upper half of the screen
- A bright miniature raster in the center of the screen
- The high-voltage power supply cycling on and off
- A single line on the top of the screen

If the initial MAP procedures do not isolate the erratic display problem, check the following static ground points before retrying the MAPs.

- CRT harness (see Figure 4-5)
- Yoke shield and CRT connector (see Figure 5-1)
- Yoke/centering rings (see Figure 5-3)
- Contrast/intensity control (see Figure 4-5)
- Yoke grounding clips (see Figure 5-3)

The brightness-contrast assembly is grounded through a spring clip located behind the brightness assembly. Verify this connection by removing the brightness knob and checking for continuity between the frame and the brightness potentiometer shaft (Figure 4-5).

Failure to maintain good grounding connections at all ground locations may cause erratic POR reset operation.

1.7 Equipment Lightning Protection

The 3278 is designed to provide a low-impedance energy path from the external coax shield to frame (ac) ground for potentials above 36 V. Additional information on lightning protection for the customer coax (customer responsibility) is provided in the *IBM 3270 Information Display System: Installation Manual—Physical Planning, GA27-2787*.

1.8 Maintenance Plan

The maintenance plan for the 3278 uses the following:

- Operation tests to sense failures, both for problem determination and for verification.

- FRU swapping as an aid to failure isolation.
- Maintenance analysis procedures (MAPs) to give a planned procedure to isolate and repair any failure on the 3278.

1.9 Operation Tests

Note: *If the display has the Personal Computer Attachment installed, set the personal computer system unit on/off switch to off.*

Operation tests include offline and online tests.

- Offline tests (Test mode) – The 3278 offline tests are activated by placing the Normal/Test switch in the Test position, taking the 3278 offline from its control unit, and putting it in Test mode.
- Online tests – The 3278 online tests are in the control unit to which the 3278 is attached. Online tests may be requested from any online display station with a keyboard, and may be run on any specified online terminal attached to the same control unit. The results of the test are displayed at the requesting display station. Online tests include a routine to display the error log for any terminal attached to the same control unit, and for the control unit.

Operation tests are described in detail in Chapter 3.

1.10 FRU Swapping

The FRU swapping procedures are given in Chapter 2; FRU locations and part numbers, in Chapter 4.

Power supply FRUs at EC levels 788977A and 329955 differ in that the +44 Vdc supply adjustment was found to be not needed at EC level 329955; see paragraph 5.4 in Chapter 5.

1.11 MAPs

The MAPs are designed to give a quick and effective procedure for isolating and repairing any problem on the 3278. To use the MAPs effectively, you must observe the following rules:

1. Before the 3278 MAPs are used, the customer should have performed problem determination, using the *3278 Problem Determination Guide (PDG)*, located under the keyboard handrest.

2. If a failure was sensed while the *3278 PDG* was being used, the failing step number was recorded on a problem report form (GX23-0201, or GX18-1033 for Japanese English or Katakana; see Figure 1-3). This step number will be useful when the MAPs are being used.
3. If the failure is intermittent, cards and cable connectors should be checked for correct seating, and voltages should be checked for correct tolerances as described in MAP 01. Check the tightness of the screws on the capacitors in the low-voltage power supply.
4. The *3278* should be online to its control unit unless the MAP instructs you to place the *3278* offline. If the *3278* is offline (in Test mode), some of the symptoms may differ from those for which the MAPs were designed.
5. The MAPs will instruct you to reseal/swap cards in a specific sequence. The first card is the first probable cause of the failure, the next card is the next probable cause, etc.
6. Always reseal the cards and their associated cables, and test before swapping parts. Reseat the cables, and check the capacitor screws for tightness before swapping the low-voltage power supply.
7. When the analog card (card 01A-H2) is swapped, the new card may need adjustment.
8. Always reinstall the original part when the new part did not repair the problem.
9. If you go through the MAP once without repairing the problem, go back to the starting point and go through the MAP a second time. If, after a second pass through the MAPs, the trouble is not repaired, call for assistance.
10. The ECS card 01A/A1D02 (D) or 01A/A1E2 (M) may contain a pluggable APL/Text character generator ROS module. Static discharge can damage the ROS module if you do not follow proper grounding procedures when handling a loose module, that is, one not installed in a card socket. Hand contact should first be made to the foam or wrapping in which

IBM 3276/3278/3279 Problem Report Form

Unit Identification	_____
Unit Location	_____
Unit Type 3276 3278 3279 (circle one)	_____
Unit Serial Number	_____
Telephone Number	_____
Date and Time	_____
Reported by	_____



1 Record the step number where you detected the failure:

Step Number: ____-____

2 Circle all of the following symbols that are displayed in the Operator Information Area of the failing display station(s):

Note: If not a or a , record the symbol.

Subsystem Ready	<input type="checkbox"/>	or	<input type="checkbox"/>	or	_____
Host Connection	<input type="checkbox"/>	or	<input type="checkbox"/>		_____
Communication Problem	<input checked="" type="checkbox"/>				---
Display Station Problem	<input checked="" type="checkbox"/>				---
Program Error	_____		PRDG		---

If one of these three symbols is displayed, insert the 2- or 3-digit code following the symbol.

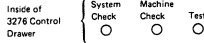
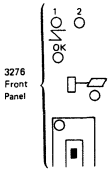
3 If the display station is a 3278 or 3279, go to step 6; if the display station is a 3276, continue.

4 Are all attached terminals failing?

If "NO" is checked, identify all the failing terminals:

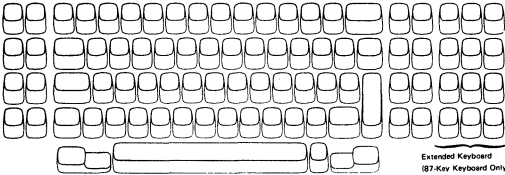
YES NO

5 Write an "X" in each circle below for each light that was on when the error occurred.



6 If the keyboard is failing, fill in the appropriate section below. On the keyboard diagram, write an X in the appropriate location for each key that failed.

- | | |
|---|---|
| <input type="checkbox"/> All keys fail. | <input type="checkbox"/> All PF keys fail. |
| <input type="checkbox"/> All character keys fail. | <input type="checkbox"/> Extended-keyboard failure. |



7 If this display station is a 3279, note with an X which front panel lights are on.

1
2
3

8 After completing this form, follow your organization's procedure for reporting problems and save this form for the service representative.

It is possible that this material may contain reference to, or information about, IBM products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that IBM intends to announce such IBM products, programming, or services in your country.

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Figure 1-3. IBM 3276/3278 Problem Report Form

the module is packed. Also, while holding a module to be installed in a socket, first make hand contact to the socket pins to drain off any static charge.

11. Terminals that have the ECS feature, card location 01A/A1D02 (D), will have the selector pen card in location 01A/A1E4. All references to the selector pen card for the (D) type will be location 01A/A1C04 or 01A/A1E4.

CAUTION

The 3278 must be off before cards and cables are reseated or swapped. Be careful not to loosen cards or cables when working on the 3278. This could cause intermittent failures then or at a later time.

Chapter 2. MAPs

MAP 00, Start/Restart MAP

Start here to isolate any failure on the 3278 Display Station.

Note: *The two different logic types used in the 3278 are indicated by (M) and (D): (M) indicates the logic using two base cards (Figures 1-2 and 4-8); (D) indicates the logic using three base cards (Figures 1-1 and 4-6). Throughout the MAPs an (M) or a (D) will follow the card callouts to indicate in which logic the problem card is located. Where neither (M) nor (D) is indicated, the card is the same for both logic types.*

001

(Entry Point A)

Is this the first time through this MAP ?

(Highly intermittent or not failing now; take NO leg.)

Y N

Use the Error Log and Error Code to FRU list (par. 3.3.2.3); use the Symptom/Repair List to aid you in developing your action plan.

A few examples are:

1. Swap suspected FRU; for example, if 3276 log shows 41 and 77 errors, swap A-G2 for isolation.
2. Request a Retain Data Bank/EWS Search (based on logged error codes, gathered data, and your observation of the problem).
3. Check voltages for proper levels and/or ripple. (See Figure 4-11; all voltages are $\pm 10\%$.) See par. 5.4 for 44 V adjustment.
4. Check the ferrocapacitor for proper operation by doing the following:
 - a. Switch off the unit.
 - b. Discharge the capacitor by performing steps 1, 2, and 3, from par. 6.2.2.

Note: *Exchange the capacitor if it is distorted from internal pressure.*
 - c. Set the CE meter to the R x 1K scale.

2
A

A
1

- d. Touch the test leads of the CE meter across the capacitor terminals; the meter should momentarily deflect. Reverse the meter test leads; the meter should deflect again. If there is no meter deflection, exchange the ferrocapacitor.
5. Check coax connectors and electrical grounding as described in par. 1.6.
6. Contact FSC/Branch Support for assistance.

002

Is one or more light-emitting diode (LED) "off" (3 LEDs to left of screen)?

Y N

003

Is card kit or FRUs available for swapping?

Y N

| Go to MAP 01-001 Entry Point A.

004

Use Symptom/Repair List or go to MAP 01-001 Entry Point A as experience dictates.

005

Go to MAP 01-001 Entry Point A.

SYMPTOM/REPAIR LIST

Note: *If the IBM 3270 Personal Computer Attachment is present, remove, reverse, and reinstall the Personal Computer Adapter card A2. If this corrects the trouble, exchange A2. If not, leave A2 reversed and continue. Reinstall A2 in its original position after the problem is corrected.*

Symptom	Action
	<ul style="list-style-type: none"> ● Reseat/swap cards called out in this column. ● Swap/adjust card A1H2 where called out. ● All logic cards are in the 01A gate.
1. Display blank (no cursor, divider line, or light on screen):	Hold the intensity control fully clockwise (Test position), and check for symptoms a, b, and c.
a. Normal raster or raster on upper or lower half of screen	(D) A1E2 A1F2
b. Single line or glow at top of screen	(D) A1G2 A1E2 A1F2 A1H2
c. No raster	Check fuse 1 on the low-voltage power supply. Swap the high-voltage power supply. A1H2 Swap/adjust the CRT yoke.
2. Display dim at maximum intensity, or raster visible at minimum intensity.	Check analog card adjustment (raster blanking). A1H2 Check intensity potentiometer and cables. (See Figure 4-13.)
3. Displays single line at top or center of screen, or data only on bottom half of screen.	A1H2 A1F2 Swap/adjust the CRT yoke.
4. Displays widely spaced diagonal lines or is out of sync (moving or vibrating screen).	(D) A1E2 A1F2 A1H2

Symptom	Action
5. Displays full raster with intensity set to normal (cursor may also display); or each character position displays the full character space.	(D) A1E2 A1H2 A1F2
6. Displays one of the following: <ul style="list-style-type: none"> • Divider Line only • Divider Line and a line at bottom of screen • Random data after power on • Test pattern when online 	A1F2 A1G2
7. Cursor flashes at random locations.	A1G2 A1F2
8. a. Display size changes when intensity is changed. b. Intensity control has no effect.	Reseat/swap the high-voltage power supply. (See par. 6.2.5.) Check the -44 V on the low-voltage power supply.
9. Display tilted or incorrect size.	Adjust the yoke or analog card potentiometers. (See par. 5.1.)
10. Cursor missing, will not blink, or reverse.	Verify with the Normal/Test switch in the Test position. Check the analog card adjustment. (See Chapter 5.)
11. Normal/Text switch operation failure.	(D) A1F2 A1E2 A1G2 A1G2 A1H2 Check the switch and cables. (See Figure 4-13.)
12. Monocase (A, a/A) switch operation failure.	(D) A1E2 A1G2 Check the switch and cables (See Figure 4-13.)

Symptom	Action
13. Incorrect characters display and Device Check is indicated (Machine Check =X 77).	A1G2 A1F2
14. Incorrect characters display without Device Check; or extra or missing dots on screen.	(D) A1E2 A1G2 A1F2
If in APL/Text mode only	Reseat/swap ROS module in 01A/A1D2 (D) or 01A/A1E2 (M) (D) A1D2 or (M) A1E2
If PS characters only.	Reseat/swap RAM modules 01A/A1C2 (D) Reseat/swap RAM modules 01A/A1D2 (M) Reseat/swap 01A/A1C2, D2 (D) Reseat/swap 01A/A1D2, E2 (M)
15. Test Mode 1 characters incorrect on half or all of the screen, or in incorrect sequence.	(D) A1G2 A1E2 A1F2
16. Will not change row length (Model 5 only).	A1F2 A1H2
17. Keyboard not working, input inhibit not indicated. Characters do not enter.	(D) A1G2 (M) A1F2 Set the Normal/Test switch to the Test position, and try to enter from the keyboard. If you cannot enter, swap the keyboard logic card. Verify keyboard cables (Figure 4-16).

Symptom	Action
18. One keyboard key fails.	Set the Normal/Test switch to the Test position, and check the code for the failing key. (See par. 3.3.1.2, Test Mode 2.) If the character is incorrect, swap the keyboard logic card. (See Chapter 6.) If the character is correct, check the keyboard ID jumpers. (See Figure 4-10.) If the jumpers are correct, swap the keyboard logic card.
19. Incorrect characters enter from keyboard.	<p>(D) A1G2 (M) A1F2</p> Reseat/swap the keyboard logic card. Check the keyboard/PC mounting screws. Check the keyboard cables. (See Figure 4-16.)
20. 3278 cannot be logged online.	Check: <ul style="list-style-type: none"> ● Run L Test 0 (AA/0) to enable ● Security Key on (clockwise) ● Normal/Test switch in Normal position ● Coaxial cable connector seated
21. Selector-pen failures.	<p>A1G2 A1F2 (D) A1E2</p> Go to Entry Point A, MAP 05. <p>(D) A1C4 (D) A1E4 (M) A1G4</p> Reseat/swap the selector pen.
22. MSR/MHS failures.	<p>A1B4 A1G2</p> Reseat/swap the MSR.
23. Error codes indicated.	See 3.3.2.3, Error Log Display, and 3.3.2.5, Error Log/Repair, Action.
24. APL/Text mode errors.	<p>(D) A1D02 A1G02 (M) A1E2</p>
25. Personal Computer Adapter	<p>A1A2 (D) A1E2 A1F2 A1G2 (M) A1F2 A1G2</p>

MAP 01

Terminal Failure MAP

PAGE 1 OF 16

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
00	A	2	001

001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
3	008	00	A
3	012	02	A
3	011	03	A
3	010	04	A
3	009	05	A
5	022	05	A

NOTE: If the 01A/A1H2 card is exchanged the adjustments must be verified. It is possible for an adjustment to be in a position that may appear to be a failure. Test mode 1 can be used to verify that the 01A/A1H2 card is correctly adjusted for width, height and raster blanking. See Adj. Section 5.2. (Step 001 continues)

MAP 01

Terminal Failure MAP

PAGE 2 OF 16

(Step 001 continued)

NOTE: If this terminal has the personal computer adapter feature, verify that the feature cables are correctly plugged at both ends.

(Entry Point A)

Is one or more light emitting diodes (lights 1,2 and 3) 'OFF' or very dim?

Y N

002

Is there an error code displayed for this failure?
(See 3.3.2.3 for applicable codes)

Y N

003

Is this just a dim display?

Y N

004

(A normal display is - cursor, divider line, indicators and/or system written data as expected.)

Is there an INCORRECT display?

Y N

005

Is this a Keyboard failure? (Exercise keyboard in test mode, use Y path if results are unexpected)

Y N

5 5 4 3 3 3
A B C D E F

D E F
2 2 2

MAP 01

Terminal Failure MAP

PAGE 3 OF 16

006

NOTE: See Test Section 3.3.2.2 for feature test procedures.

Is this a Feature failure? (Does not include keyboard)

Y N

007

Is this a subsystem indicated failure (error code displayed or failures not detected by off line tests 1, 2 or 3.)?

Y N

008

Use test mode procedure (section 3.3.1), to identify problem.

Go To Map 00, Entry Point A.

009

Go To Map 05, Entry Point A.

010

Go To Map 04, Entry Point A.

011

Go To Map 03, Entry Point A.

012

Go To Map 02, Entry Point A.

C
2

MAP 01

Terminal Failure MAP

PAGE 4 OF 16

013

(Display dim)

After checking operator brightness control, adjust raster blanking (see 5.2 analog card adjustments step 7).

Is display still too dim?

Y N

014

Return to customer.

015

Exchange 01A/A1H2 card and adjust (5.2).

Is display still too dim?

Y N

016

Return to customer.

017

Verify filament voltage at CRT socket by measuring across varistor (pins 1-14) for 6.3V ac \pm 10%.
Verify voltage at 01A/A1H2-D12 for +10 to -10V dc.

Are voltages correct?

Y N

018

Use Figures 4-12, 4-13, 4-14 to isolate.

5
G

A B G
2 2 4

MAP 01

Terminal Failure MAP

PAGE 5 OF 16

019

Exchange CRT socket assembly.

Is display still dim?

Y N

020

Return to customer.

021

Exchange CRT.

Check for proper operation.

Return to customer.

022

Go To Map 05, Entry Point A.

023

Is light 3 above power ON/OFF switch on? (If very dim use N path.) See Fig 4-1, 2 for location)

Y N

024

Verify that the power on switch is on, line power cable plugged in an active outlet and seated at the primary power box.

Are above conditions correct?

Y N

025

Correct and verify.

1
4 6
H J

J
5

MAP 01

Terminal Failure MAP

PAGE 6 OF 16

026

Switch unit off.

Verify Fuse F1 in main power box (Figure 4-3).

Did fuse fail?

Y N

027

Verify low voltage supply fuses (F1, F2, F3, F5, F6).
(See fuse locator Figure 4-11).

Are all fuses good?

Y N

028

Exchange failing fuse or fuses.
Switch Unit On. (Wait 30 sec.)

Did fuse or fuses fail again?

Y N

029

Verify correct operation.
If problem occurs again start over at Entry
Point A of this MAP to identify new symptom.

030

Switch unit off.
Remove 01A/A1H2 card and exchange fuse(s).
Switch Unit On.

Did fuse(s) fail again?

Y N

1
3 8 7 7
K L M N

M N
6 6

MAP 01

Terminal Failure MAP

PAGE 7 OF 16

031

Switch unit off.

Exchange 01A/A1H2 card and adjust.

If fuse fails after new 01A/A1H2 card is installed problem can be in high voltage power supply, yoke, or CRT socket (a defective CRT socket can damage the H2 card and cause F5 to fail).

Remove connector on high voltage power supply, yoke, and CRT socket to isolate.

032

Switch unit off.

Short is in Low voltage power cable, logic cards or keyboard. Reinstall 01A/A1H2 removed in step 20.

Remove logic cards and keyboard cable.

Exchange failing fuse and switch unit on.

Did fuse fail again?

Y N

033

Exchange logic cards one at a time in the following sequence; 01A/A1G2, F2, E2 (D), or 01A/A1F2, G2 (M), then feature cards.

Switch unit off and ON for each exchange. (Permit 30 sec. for power to be on each time).

If fuse does fail after a card is reinstalled, exchange that card with a new card and start over.

If fuse does not fail when all the logic cards are reinstalled, reconnect keyboard cable. If reinstalling the keyboard cable causes the fuse to fail exchange the keyboard logic card. Should exchanging of the keyboard card not repair the problem the keyboard should be exchanged.

8
P

L P
6 7

MAP 01

Terminal Failure MAP

PAGE 8 OF 16

034

Repair or exchange the Low Voltage cable. See Figure 4-12 for wiring figure.

035

Remove Line Power cable from power outlet.

Switch Unit On and measure resistance across pins of line power cable plug.

(This is a continuity test of the line power cable, main power box, power switch, ferro primary and fuse F1 in the main power box, normal is less than 5 ohms.)

Measures 5 ohms or more?

Y N

036

Plug line power cable in and switch unit on.

Verify voltage at J4 on the low voltage power supply between pins 1 and 4 for 48 volts AC. (See Figure 4-11).

Is the voltage correct?

Y N

037

Reverify power source outlet. If outlet is good, exchange ferro.

1
2 9
Q R

R
8

MAP 01

Terminal Failure MAP

PAGE 9 OF 16

038

Verify DC voltages:

(DC Common is at C3 - (minus) on low voltage power supply

(Voltages are $\pm 10\%$ except +8)(See Figure 4-11)

+5 at fuse F6.

+8.5 at fuse F3.

+44 at fuse F5.

-5 at 01D/PS1-J3-3.

-12 across C1 (F2).

-44 at 01D/PS1-J3-1.

+8V \pm 1volt 01D/PS1-J2-2,
(derived from +8.5V supply).

Are all voltages correct?

Y N

039

Switch unit off.

Remove analog card.

Switch unit on.

Verify voltages as shown in preceding step.

Is one or more voltages incorrect?

Y N

040

Switch power off.

Exchange analog card 01A/A1H2.

Switch unit on.

Adjust as required (see 5.2).

Test for proper operation.

1 1
2 0
S T

T
9

MAP 01

Terminal Failure MAP

PAGE 10 OF 16

041

Is the -44 volts incorrect?

Y N

042

Switch unit off.

Disconnect keyboard cable at 01A/A1G5 (D) or
01A/A1F5 (M).

Switch power on.

Verify failing voltage.

Is voltage still incorrect?

Y N

043

Exchange keyboard logic card and/or keyboard
cable/cables as required.

Reinsert analog card in 01A/A1H2.

Switch power on.

Test for proper operation. Return to customer.

044

Switch power off.

Remove all logic cards.

Switch unit on.

Is voltage still incorrect?

Y N

045

Switch unit off.

Reinsert logic cards one at a time to isolate failing
card.

1 1
1 1
U V

U V
1 1
0 0

MAP 01

Terminal Failure MAP

PAGE 11 OF 16

046

Switch unit off.

Exchange low voltage power supply.

Reinsert logic cards, keyboard cable and analog card.

Switch power on.

Test for proper operation.

047

Switch power off.

Remove mask assembly (see 6.5).

Disconnect 01C/A1P1 from 01C/A1J1 (See Fig. 4-5).

Switch unit on.

Verify -44 volts at 01D/PS1-J3-1.

Is voltage still incorrect?

Y N

048

Exchange Intensity/Contrast Control (see 6.5.3).

Reinsert analog card, 01C/A1P1 and mask assembly.

Switch power on.

Test for proper operation.

049

Verify seating of connectors on low voltage power supply. If all connectors are seated but problem is still present exchange Low Voltage power supply.

Switch Unit On and test for proper operation.

0 S
8 9

MAP 01

Terminal Failure MAP

PAGE 12 OF 16

050

Verify seating of the power distribution cable at the low voltage power supply (P2 and P3) and at the logic gate. If reseating the connectors does not correct the problem, verify the DC voltages at the logic gate. See Figure 4-12.

Exchange the 01A/A1H2 card, adjust and test for proper operation.

051

Remove line power cable from main power box(P1). Verify resistance from pin B to pin C of line power cable socket (J1) (See Figure 4-12).

Measures 5 ohms or more?

Y N

052

Exchange line power cable and test for correct operation.

053

Remove plug P3 from J3 on main power box. Verify resistance from pin 1 to pin 3 on P3 (Ferro Primary verify).

Measures 5 ohms or more?

Y N

1 1
3 3
W X

K W X
6 1 1
2 2

MAP 01

Terminal Failure MAP

PAGE 13 OF 16

054

Remove Plug P2 from J2 on main power box.
Test for 1 ohm or less between pins 2 and 3 then
between pins 1 and 4 on P2. (Test of main power
switch). (See Figure 4-12)

Measures 1 ohm or less for both tests?

Y N

055

Exchange ON/OFF switch.
Reinsert previously removed plugs.
Reconnect in terminal and test for proper
operation.

056

Exchange prime power asm. (Figure. 4-3).
Test for proper operation.

057

Exchange Ferro Transformer.
Check ferro capacitor for short as described in MAP
00, Entry Point A, N leg items 4C and 4D.
Verify correct operation.

058

Exchange fuse F1 in main power box.
Switch Unit On and wait up to 30 sec.

Did fuse fail again?

Y N

059

Verify correct operation.

1
4
Y

H Y
5 1
3

MAP 01

Terminal Failure MAP

PAGE 14 OF 16

060

Switch unit off.

Remove plug P3 from J3 on main power box.

Exchange fuse.

Switch Unit On.

Did fuse fail again?

Y N

061

Switch unit off.

Reconnect P3 to J3 on main power box.

Remove plugs from J1 and J4 on low voltage power supply. (See Figure 4-11)

Switch Unit On.

Did fuse F1 fail again?

Y N

062

Exchange low voltage power supply.

Verify correct operation.

063

Exchange ferro transformer.

Verify correct operation.

064

Exchange main power box.

Reconnect and verify correct operation.

065

Is light 1 (Sweep Indicator) (LED#1) ON? (Use N path if very dim)

Y N

1
1 5
5 A
Z A

Z A
1 A
4 1
4 4

MAP 01

Terminal Failure MAP

PAGE 15 OF 16

066

Switch unit off.

Exchange the 01A/A1H2 card.

Switch Unit On, adjust and verify correct operation.

067

**Is light 2 (High Voltage Indicator) ON, or very dim?
See Fig 4-1, 2 for location).**

DANGER

**High Voltage can be present when the High Voltage
Indicator is OFF**

Y N

068

Switch unit off.

Exchange the High Voltage power supply.

Switch Unit On and verify correct operation.

Is light 2 ON?

Y N

069

Switch unit off.

Exchange and adjust the 01A/A1H2 card.

Verify correct operation.

If the problem remains, exchange low voltage
power supply, yoke.

070

Verify correct operation.

1
6
A
B

A
B
1
5

MAP 01

Terminal Failure MAP

PAGE 16 OF 16

|
071

Is light 2 very dim?

Y N

|
072

Start over at MAP 00 Entry Point A if first time through MAP.

073

Exchange and adjust card 01A/A1H2.
Verify correct operation.

MAP 02

Display MAP

PAGE 1 OF 24

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
02	A	1	001
02	B	7	030
02	C	14	070
02	D	19	092

001

EXIT POINTS

EXIT THIS MAP		TO	
PAGE NUMBER	STEP NUMBER	MAP NUMBER	ENTRY POINT
2	002	01	A
23	112	03	A
2	004	04	A
24	117	05	A

NOTE: If this terminal has the personal computer adapter feature, verify that the feature cables are correctly plugged at both ends.

(Entry Point A)

(Step 001 continues)

MAP 02

Display MAP

PAGE 2 OF 24

(Step 001 continued)

Are all three lights (#1, 2 and 3. See Fig 4-1 for location) on?

Y N

002

Go To Map 01, Entry Point A.

003

Switch power off.

Remove feature cards if present.

Reinsert feature logic card 01A/A2, if present, by turning the card around and plugging (top card connector end) into the board socket. (The display cannot operate if this card is not inserted.) Do not plug cables in 01A/A2 W, Y and Z while card is reversed. Switch power on.

Is there a problem now other than a feature card problem?

Y N

004

Go To Map 04, Entry Point A.

005

Disconnect coax signal cable at 01S1/J4 (Figure 4-4). Set TEST/NORMAL switch to TEST then to NORMAL.

Is there a normal Cursor or normal divider line displayed on the screen? (Use N path if no display or raster on screen or flashing on and off or erratic.)

Y N

1
2 3
A B

B
2

MAP 02

Display MAP

PAGE 3 OF 24

006

Is there a normal divider line on the screen?

Y N

007

Go to Page 7, Step 030, Entry Point B.

008

Is there a normal cursor on the screen?

Y N

009

Go to Page 14, Step 070, Entry Point C.

010

Is the screen blank? (No light) (Use N path if flashing or erratic.)

Y N

011

Does the intensity control affect the light on the screen?

Y N

012

Exchange and adjust the 01A/A1H2 card.

Is the problem still present?

Y N

7 4 4 4
C D E F

D E F
3 3 3

MAP 02

Display MAP

PAGE 4 OF 24

013

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.
Identify new problem if present.

014

Verify the following:

1. Cable and connectors from analog card to CRT base socket (Figure 4-14).
2. Cable and connectors from analog card to intensity control potentiometer (Figure 4-13).
3. Intensity control potentiometer.
4. Intensity override switch (Spring loaded).
5. Possible short circuited CRT
6. Reconnect coax signal cable, feature card(s).
7. Verify position of 01A/A2 for normal operation if present.

015

Is the display on the screen normal? (Good characters, in focus and normal size. Use intensity override if necessary to determine size and condition of raster)

Y N

016

Is display size or focus a problem? (Use N path if raster problem)

Y N

017

Go to Page 7, Step 030, Entry Point B.

6 5
G H

H
4

MAP 02

Display MAP

PAGE 5 OF 24

018

Use analog adjustment procedure to verify correct adjustment of 01A/A1H2 card and focus of high voltage power supply.

Is problem still there after verifying analog adjustments? (Chapter 5.2)

Y N

019

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

020

Exchange and adjust 01A/A1H2 card.

Problem still there?

Y N

021

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.

022

Exchange High Voltage power supply.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

G
4

MAP 02

Display MAP

PAGE 6 OF 24

023

Is the display flashing on and off?

Y N

024

Exchange the 01A/A1H2, E2, F2, G2 (D), or 01A/A1H2, F2, G2 (M) cards one at a time. Reconnect coax signal cable, feature card(s). Verify position of 01A/A2 for normal operation if present. Verify correct operation.

025

Hold intensity control in override position.

Does raster flash off and on?

Y N

026

Exchange cards 01A/A1F2, 01A/A1E2 (D), or 01A/A1G2, F2 (M). Reconnect coax signal cable, feature card(s). Verify position of 01A/A2 for normal operation if present. Test for proper operation.

027

Exchange High Voltage power supply. Reconnect coax signal cable, feature card(s). Verify position of 01A/A2 for normal operation if present. Verify correct operation.

Has the trouble been corrected?

Y N

7 7
J K

C J K
3 6 6

MAP 02

Display MAP

PAGE 7 OF 24

028

Exchange Low Voltage Power Supply.
Check for proper operation.

029

Return to customer.

030

(Entry Point B)

Use the intensity override control to force a display on the screen.

Does the screen have a raster displayed with override ON?

Y N

031

Is the screen blank?

Y N

032

Exchange logic card 01A/A1E2 (D), or 01A/A1F2 (M).

Is problem still present?

Y N

033

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.

1
0 8 8
L M N

M N
7 7

MAP 02

Display MAP

PAGE 8 OF 24

034

Exchange and adjust 01A/A1H2 card.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.

035

Exchange and adjust the 01A/A1H2 card.

Is problem still present?

Y N

036

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.

037

Observe the neck of the CRT to see if a light from the filament is visible. (Remove cone shield on neck of CRT if necessary. Chapter 5.1.1)

Is there a light?

Y N

038

Switch unit off.
Verify fuse F1 on low voltage power supply.

Is fuse good?

Y N

1 1
0 0 9
P Q R

R
8

MAP 02

Display MAP

PAGE 9 OF 24

039

Exchange fuse (1A SB) and switch unit on.

Did fuse fail again? (permit 30 sec.)

Y N

040

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

041

Switch unit off.
Remove socket from CRT.
Exchange fuse.
Switch Unit On.

Does fuse fail again?

Y N

042

Exchange CRT. Do alignment procedure,
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

043

Test for short in cable from Low Voltage power supply to CRT socket (Remove plug J2 from Low Voltage power supply and test for short between pins 1 and 14 at the CRT socket). Repair or exchange as needed.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

L P Q
7 8 8

MAP 02

Display MAP

PAGE 10 OF 24

044

Remove and verify the connections at the CRT socket.

Measure resistance on pins 1 and 14 at CRT base. If more than 5 ohms exchange CRT.

If less than 5 ohms verify cable and connections from Low Voltage power supply to CRT socket. (See Figure 4-14.

Test for an open wire from J2-3 to CRT socket pin 1 and for an open between J2-9 to CRT socket pin 14. (Figure 4-12)

Repair or exchange cable if open.

If cable tests good exchange the CRT.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

045

Exchange the High Voltage power supply.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

046

Does raster appear normal? (Covers full display area)

Y N

047

Is there a single line at or near the top of the screen?

Y N

1 1 1
1 1 1
S T U

S T U
1 1 1
0 0 0

MAP 02

Display MAP

PAGE 11 OF 24

048

(Raster abnormal and/or on lower part of screen only.)

Exchange one at a time, card 01A/A1E2, G2, F2, H2 (D), or 01A/A1F2, G2, H2 (M).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

049

Exchange 01A/A1H2, F2, E2 (D), or 01A/A1H2, G2, F2 (M) card.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

050

Exchange 01A/A1G2, F2 card (D) or 01A/A1F2, G2 (M).

Is problem still present?

Y N

051

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

052

Exchange 01A/A1H2, 01A/A1F2 card.

Has the problem been corrected?

Y N

1 1
2 2
V W

A V W
2 1 1
1 1

MAP 02

Display MAP

PAGE 12 OF 24

053

Use Figure 4-13 to isolate problem to the cable, connector or intensity/contrast assembly.
Repair or exchange.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

054

Adjust 01A/A1H2 card.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

055

Is there a cursor on the screen?

Y N

056

Go to Page 14, Step 070, Entry Point C.

057

Is there a divider line on the screen?

Y N

058

Go to Page 7, Step 030, Entry Point B.

059

Is the divider line near the bottom of the screen?

Y N

1 1
3 3
X Y

X Y
1 1
2 2

MAP 02

Display MAP

PAGE 13 OF 24

060

Go to Page 7, Step 030, Entry Point B.

061

Verify position of the security key for ON (Full clockwise) if feature is installed.

Was the security key in the correct position? (If the security key is not installed use the Y path.)

Y N

062

Switch key to ON (Full clockwise).

Has the problem been corrected?

Y N

063

Verify wiring to the security key switch.
Repair or exchange (See Figure 4-14).
Reconnect coax signal cable, feature card(s).
Verify correct operation.

064

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
End of call.

065

Does the cursor appear normal? (Flashing and reverse are normal)

Y N

1 1
6 A
Z A

A
A
1
3

MAP 02
Display MAP
PAGE 14 OF 24

066

Is there a divider line near the bottom of the screen?

Y N

067

Exchange 01A/A1G2 card.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.

Problem still present?

Y N

068

End of call.

069

Exchange 01A/A1H2 card and adjust.
Test for proper operation.

070

(Entry Point C)

Put the Test/Normal switch in the Test position.

Is the test pattern displayed and does the cursor appear to be a bar under the first character at top left of the screen?

Y N

1 1
6 5
A A
B C

A
C
1
4

MAP 02

Display MAP

PAGE 15 OF 24

071

Press 'Reset' key one time. (Test Mode 3).

Press 'K' key.

Press ',' key.

Is there a reverse flashing cursor on the screen?

Y N

072

Is the test pattern correct except for cursor?

Y N

073

Is the display correctly adjusted?

Y N

074

Use adjustment procedure for 01A/A1H2 card and yoke. (Chapter 5.2).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

075

Exchange 01A/A1F2, E2, or G2 (D), or

01A/A1F2, G2 card (M).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

1 1
6 6
A A
D E

Z A A A
1 B D E
3 1 1 1
4 4 5 5

MAP 02

Display MAP

PAGE 16 OF 24

076

Exchange 01A/A1G2, F2 (D), or 01A/A1G2, F2 card (M).
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

077

Exchange 01A/A1G2, F2, or E2 card (D), or 01A/A1G2, F2 card (M).
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

078

The cursor was inhibited or placed off the screen by the controller. Verify controller failure by swapping coax cables with another terminal to ensure that the problem follows.

079

Is the cursor and divider line the only display on the screen?

Y N

080

Is the Test Pattern displayed?

Y N

1 1 1
7 7 7
A A A
F G H

A A A
F G H
1 1 1
6 6 6

MAP 02

Display MAP

PAGE 17 OF 24

081

Exchange cards 01A/A1G2, F2, E2 (D), or 01A/A1G2, F2 (M) one at a time to isolate bad card.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

082

Go to **Page 19, Step 092, Entry Point D.**

083

Does the display alignment and focus appear correct? (Position, size). Use test mode 1 to verify.

Y N

084

Use the adjustment procedure to correct alignment or focus of the display. If the problem cannot be corrected by adjustment exchange the 01A/A1H2 card, high voltage power supply.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

085

Does the intensity and contrast control work correctly?

Y N

1 1
8 8
A A
J K

A A
J K
1 1
7 7

MAP 02

Display MAP

PAGE 18 OF 24

086

Exchange 01A/A1H2, 01A/A1F2 card.

Has the problem been corrected?

Y N

087

Use Figure 4-13 to isolate problem to the cable, connector or intensity/contrast assembly.
Repair or exchange.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

088

Adjust 01A/A1H2 card.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

089

Does the Test/Normal switch cause the Test Pattern to be displayed when in Test position only?

Y N

090

Exchange cards 01A/A1G2, 01A/A1F2, 01A/A1E2 (D), or 01A/A1G2, F2 (M).

Is problem still present?

Y N

1 1 1
9 9 9
A A A
L M N

A A A
L M N
1 1 1
8 8 8

MAP 02
Display MAP
PAGE 19 OF 24

091

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

092
(Entry Point D)

See Figure 4-13 to verify switch and cable to logic.
Repair or exchange.
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

093

Put the Test/Normal switch in Test position.

Is test pattern 1 correct? (See 3.3.1).

Y N

094

Is there a cursor, divider line or any characters on the screen?

Y N

095

Exchange 01A/A1G2 (D), or 01A/A1F2, G2 card (M).
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

2 2
3 0
A A
P Q

A
Q
↑
9

MAP 02
Display MAP
PAGE 20 OF 24

|
096

Are displayed characters readable but some/all missing or wrong?

Y N

|

097

Exchange 01A/A1G2 (D), or 01A/A1G2, F2 card (M).
Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Verify correct operation.

Problem corrected?

Y N

|

098

Exchange 01A/A1H2 card.
Verify correct operation.

099

End of call.

100

Verify dual case/mono case switch is in Aa position.

Are both upper and lower case characters displayed?

Y N

| |

2 2
2 1
A A
R S

A
S
2
0

MAP 02

Display MAP

PAGE 21 OF 24

101

Switch unit off.

Measure resistance from 01A/A1E2J13 to J08 (D) or 01A/A1F2G13 (M) to J08.

Is resistance less than 5 ohms?

Y N

102

Use Figure 4-13 to isolate open in switch or cable to 01A/A1H2G13.

Repair or exchange.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

103

Exchange 01A/A1G2 card.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

Problem still present?

Y N

104

End of Call.

105

Exchange 01A/A1E2 (D), or 01A/A1F2 (M).

Verify correct operation.

106

Are the characters displayed in the correct sequence? (See Figure 3-1, 3-2, 3-3)

Y N

107

Remove feature cards if present.

Reinsert feature logic card 01A/A2 if present by plugging the top card connector end into the board socket. (The display cannot operate if this card is not inserted.)

Is the problem still present?

Y N

108

If only one feature card is installed, exchange with another card and test for correct operation. If more than one feature card is present, isolate to one card by exchanging one card at a time.

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

109

Exchange 01A/A1F2, 01A/A1G2, 01A/A1E2 (D), or 01A/A1F2, G2 (M).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

A A
P T
1 2
9 2

MAP 02

Display MAP

PAGE 23 OF 24

|
|

110

Exchange 01A/A1F2, 01A/A1E2 card (D), or
01A/A1F2, G2 (M).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if
present.

Verify correct operation.

111

Is keyboard exercise of test mode 2 correct?

Y N

|

112

Go To Map 03, Entry Point A.

113

(Display is not recognized to be ON LINE to the
controller).

Verify that the controller is operational.

**Is the controller communicating with other
terminals?**

Y N

|

114

Use controller Maintenance Information Manual to
locate cause of problem.

2
4
A
U

A
U
2
3

MAP 02

Display MAP

PAGE 24 OF 24

115

Put test/normal switch in normal position.

Exchange 01A/A1G2, 01A/A1F2, 01A/A1E2 (D), or 01A/A1G2, F2 cards (M).

Reconnect coax signal cable, feature card(s).

Verify position of 01A/A2 for normal operation if present.

Is problem still present?

Y N

116

Verify correct operation.

117

Go To Map 05, Entry Point A.

MAP 03

Keyboard MAP

PAGE 1 OF 5

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
01	A	1	001
05	A	1	001

001

(Entry Point A)

NOTE: If this terminal has a personal computer attached, power off the personal computer before proceeding to isolate keyboard problems. Verify personal computer cables are correctly plugged at both ends.

Is this a mechanical failure? (Key binds, broken, worn or clicker sound failing)

Y N

|

002

Use Test Mode 2 to verify failing key or keys.

Is there more than one key failing?

Y N

|

003

Does any character enter from the failing key?

Y N

|

|

4 3 3 2
A B C D

D
1

MAP 03

Keyboard MAP

PAGE 2 OF 5

004

Does the cursor move, advance, in test mode when the key is pressed?

Y N

005

Exchange the module for the failing key. (See Keyboard section 6.7).

Verify repair by using Test Mode 2.

006

Verify seating of keyboard cable connector to the terminal.

Verify internal keyboard cable connector to logic gate (See Figure 4-16).

If problem is not corrected by reseating of cable connectors, exchange the keyboard logic card.

Verify the keyboard I.D. jumpers to be sure that the new logic card is the same.

(If exchange of the keyboard logic card does not correct the problem, use the keyboard cable chart to trace cable wires, connector pins to isolate a failing cable or connector.)

Verify using Test Mode.

B C
1 1

MAP 03
Keyboard MAP
PAGE 3 OF 5

007

Verify seating of keyboard cable connector to the terminal.

Verify internal keyboard cable connector to logic gate. (See Figure 4-16)

If problem is not corrected by reseating of cable connectors, exchange the keyboard logic card.

Verify the keyboard I.D. jumpers to be sure that the new logic card is the same.

(If exchange of the keyboard logic card does not correct the problem, use the keyboard cable chart to trace cable wires, connector pins to isolate a failing cable or connector.)

Verify using Test Mode.

008

Verify seating of keyboard cable connector to the terminal.

Is problem still present?

Y N

009

Verify correct operation.

010

Exchange 01A/A1G2 then E2 card (D), or 01A/A1G2 then F2 (M).

Is problem still present?

Y N

011

Verify correct operation.

4
E

A E
1 3

MAP 03

Keyboard MAP

PAGE 4 OF 5

012

Verify internal keyboard cable connector to logic gate. (See Figure 4-16)

If problem is not corrected by reseating of cable connectors, exchange the keyboard logic card.

Insert the keyboard I.D. jumpers ensuring that the new logic card is jumpered the same as the card exchanged.

(If exchange of the keyboard logic card does not correct the problem, use the keyboard cable chart to trace cable wires, connector pins to isolate a failing cable or connector.)

Verify using Test Mode.

013

Is this a clicker failure?

Y N

014

Exchange the failing part by using the Keyboard repair section.

015

For D Type only.

Put the Test/Normal switch in Test position.

Clicker should sound for each key depression.

For M Type -- use N leg.

Does the clicker sound?

Y N

5 5
F G

F G
4 4

MAP 03

Keyboard MAP

PAGE 5 OF 5

016

Exchange logic card 01A/A1G2 (D), or 01A/A1F2 (M).

Is trouble still present?

Y N

017

End of call.

018

Exchange the clicker. (See keyboard Repair Section for exchange. See Chapter 6-7).

Verify correct operation.

Does clicker sound?

Y N

019

Exchange the keyboard logic card.

020

End of call.

021

Clicker has been disabled by the system.

MAP 04

Feature Error MAP

PAGE 1 OF 18

ENTRY POINTS

FROM	ENTER THIS MAP		
MAP NUMBER	ENTRY POINT	PAGE NUMBER	STEP NUMBER
01	A	1	001

001

(Entry Point A)

Does this terminal contain one or more feature cards?

Y N

002

Exchange 01A/A1G2 (D), or 01A/A1G2, F2 (M).
Reconnect coax signal cable.
Verify correct operation.

003

NOTE: The PS Feature Card is driven by the ECS card.
The ECS card must be plugged in to test PS feature.

NOTE: See Section 3.3.2.2 for online test procedures for all features.

Is this a failure of only one feature? (Use N path if don't know)

Y N

5 2
A B

B
1

MAP 04

Feature Error MAP

PAGE 2 OF 18

004

Switch power off.

Remove all feature cards if not previously removed.

Reinsert feature logic card 01A/A2, if present, by turning the card around and plugging (top card connector end) into the board socket. (The display cannot operate if this card is not inserted.) Do not plug cables in 01A/A2 W, Y and Z while card is reversed. Reconnect coax cable if previously removed.

Switch power on.

Is there a problem present other than a feature problem?

Y N

005

(Entry Point E)

Reinstall each of the previously removed feature cards, one at a time, starting with SEL PEN, then MSR, ECS-APL/TEXT, PS and replug P.C. adapter card in normal position until the problem occurs again.

Did the selector pen feature card cause the problem?

Y N

006

Did the MSR feature card cause the problem?

Y N

5 5 5 3
C D E F

007

Did the ECS/TEXT feature card cause the problem?

Y N

008

Did the PS card cause the problem?

Y N

009

Did the security key lock cause the problem?

Y N

010

Did the audible alarm cause the problem?

Y N

011

Is there a personal computer adapter card present?

Y N

012

Trouble has disappeared or is intermittent.

Reconnect the coax signal cable and test for proper operation.

5 4 4 4 4
G H J K L

H J K L
3 3 3 3

MAP 04

Feature Error MAP

PAGE 4 OF 18

013

(Entry Point AA)

Exchange 01A/A2 card.
Replug cables W, X, and Z.
Reconnect coax signal cable.
Verify for proper operation.

Has trouble been corrected?

Y N

014

Exchange 01A/H2 or either 01A/F2 (D)
or 01A/G2 (M). Verify for proper
operation.

Has trouble been corrected?

Y N

015

Verify cables and connectors for the P.C.
attachment option cables. See Figures
4-19 and 5-4.

016

Return to customer.

017

Return to customer.

018

Go to Page 18, Step 080, Entry Point G.

019

Go to Page 18, Step 080, Entry Point H.

020

Go to Page 7, Step 036, Entry Point J.

A C D E G
1 2 2 2 3

MAP 04

Feature Error MAP

PAGE 5 OF 18

021

Go to Page 9, Step 049, Entry Point D.

022

Go to Page 12, Step 057, Entry Point C.

023

Go to Page 16, Step 072, Entry Point B.

024

Exchange 01A/A1G2 (D), or 01A/A1G2, F2 (M).
Reinsert feature cards if previously removed.
If present, remove and reinsert 01A/A2 card in
normal operating position.
Replug cables in 01A/A2 W, X and Z positions.
Reconnect coax signal cable.
Verify correct operation.

025

Is this a failure of the MSR feature?

Y N

026

Is this a failure of the Selector pen feature?

Y N

027

Is this a failure of the ECS/TEXT/APL feature?

Y N

1 1
2 1 9 6
M N P Q

0
5

MAP 04

Feature Error MAP

PAGE 6 OF 18

028

Is this a failure of the PS feature?

Y N

029

Is this a failure of the security key lock?

Y N

030

Is this a failure of the audible alarm?

Y N

031

Is this a failure of the P.C. adapter feature?

Y N

032

Start over at MAP 00.

033

Go to Page 4, Step 013, Entry Point AA.

034

Go to Page 18, Step 080, Entry Point G.

035

Go to Page 18, Step 080, Entry Point H.

7
R

R
6

MAP 04

Feature Error MAP

PAGE 7 OF 18

036

(Entry Point J)

Go to Entry Point D to verify switch settings on ECS Feature Card.

Are switch settings correct?

Y N

037

Set switches.

Verify proper operation using on-line test described in 3.3.2.1, Routine 8.

038

Does the PS Feature Card contain pluggable modules? (See Fig. 4-7 for module location)

Y N

039

Exchange PS Feature Card 01A/A1C2 (D) or 01A/A1D2 (M).

Verify proper operation using on-line test described in 3.3.2.1, Routine 8.

Has trouble been corrected?

Y N

040

Exchange ECS Feature Card 01A/A1C2 (D) or 01A/A1D2 (M).

Verify switch settings.

Verify proper operation using on-line test described in 3.3.2.1, Routine 8.

Return to customer.

8 8
S T

S T
7 7

MAP 04

Feature Error MAP

PAGE 8 OF 18

041

Return to customer.

042

Is trouble with fonts C-D and/or E-F only (or don't know)?

Y N

043

- Remove pluggable modules from PS feature card (if present).

CAUTION

See 1.5 Step 10 for precautions when handling ROS or RAM modules.

- Exchange PS Feature Card (plug RAM modules back in new card.)
- Verify proper operation using on-line test as described in 3.3.2.1.

Has trouble been corrected?

Y N

044

Exchange ECS Feature Card 01A/A1C2 (D) or 01A/A1D2 (M). Verify switch settings. Verify proper operation using on-line test described in 3.3.2.1.

045

Return to customer.

9
U

046

Exchange pluggable module for font causing trouble.
Verify proper operation using on-line test described
in 3.3.2.1.

Has trouble been corrected?

Y N

047

Exchange PS Feature Card 01A/A1C2 (D) or
01A/A1D2 (M).
Verify proper operation.

048

End of call.

049**(Entry Point D)**

The ECS feature card contains a switch module and
may contain a pluggable ROS character generator.
Verify the switch settings as follows when exchanging
this card. See Fig. 4.7 for Switch, ROS, and RAM
Locations.

Switch Position

- 1 Set to 1 if a ROS is present on ECS card.
- 2 - 3. 00 IF no PS Feature card.
01 IF One RAM on PS card.
11 IF 3 RAMS on PS card.
- 4 Set to 0.
- 5 - 6 - 7 - 8. (ID for ECS Card ROS)

(Step 049 continues)

MAP 04

Feature Error MAP

PAGE 10 OF 18

(Step 049 continued)

0000 for APL/TEXT ROS.

1111 for Indicator ROS.

Note: The APL/TEXT ROS module may be present if the APL/TEXT feature has been removed via MES. In this case set switches for ROS indicator (1111).

CAUTION

The ROS module can be damaged by static discharge when not plugged in a card. Persons handling this module must first make hand contact to the conductive foam in which the module is packed. Hand contact must also be made to a conductive surface of the card before plugging in this module.

Is there an error code displayed for this trouble?

Y N

050

Switch power off.

Remove the ECS feature card 01A/A1D02 (D), or 01A/A1E2 (M).

Exchange pluggable module.

Verify switch settings. (Entry Point D)

Reinsert card.

Connect coax cable and insert other feature cards if previously removed.

Verify position of 01A/A2 for normal operation if present.

Use on line tests to verify correct operation.

(See Section 3.3.2.2).

Is trouble still present?

Y N

1 1 1
1 1 1
V W X

N V W X
5 1 1 1
0 0 0

MAP 04
Feature Error MAP

PAGE 11 OF 18

051
Return to customer.

052
Go to Step 053, Entry Point F.

053
(Entry Point F)

Switch power off.
Remove card 01A/A1D02 (D) or 01A/A1E2 (M).
Remove pluggable module from card. See Fig. 4-7.
Install module in new card.
Verify switch settings on card. (Entry Point D)
Install card in unit.
Connect coax signal cable and reinsert other feature cards if previously removed.
Verify position of 01A/A2 for normal operation if present.
Test for proper operation using on line test. See 3.3.2.2.

Has trouble been corrected?

Y N

054
Reinstall the original card in 01A/A1D02 (D) or 01A/A1E2 (M) after reinstalling ROS module in the original card.
Swap cards 01A/A1G02, 01A/A1F02.
Test for proper operation.

055
Return to customer.

056
Go to Page 16, Step 072, Entry Point B.

M
5

MAP 04

Feature Error MAP

PAGE 12 OF 18

057

(Entry Point C)

Verify with customer that the MSR, Short jumper or extension cable if used and test card, PN. 1742659, operate correctly on another terminal. Also verify jumper is present on 01A/F2D13 to 01A/G2U5. After verifying customer components.

Do any lights on the MSR come on when the power switch is switched on?

Y N

058

Switch power off.

Verify fuse at 01C/F1 (See Fig. 4.4).

Did fuse fail?

Y N

059

Switch Power On.

Verify voltages at the following. For (M) version check at 01A/A1C4, C5 positions.

01A/B4B06- minus 5 VDC.

01A/B4B11-plus 8.5 VDC.

01A/B4D03-plus 5 VDC.

01A/B5D03-plus 5 VDC.

01A/B5B11-plus 8.5 VDC.

If all voltages are correct ($\pm 10\%$).

Use Fig 4-15 to trace voltage from logic card to MSR connector.

1 1
4 3
Y Z

Z
1
2

MAP 04

Feature Error MAP

PAGE 13 OF 18

060

Exchange fuse.
Switch Unit On.

Are any lights on the MSR on?

Y N

061

Switch unit off.
Verify fuse at 01C/F1.

Did fuse fail again?

Y N

062

Verify voltages at the following points. For (M) version check at 01A/A1C4, C5 positions.

01A/B4B06- minus 5 VDC.

01A/B4B11-plus 8.5 VDC.

01A/B4D03-plus 5 VDC.

01A/B5D03-plus 5 VDC.

01A/B5B11-plus 8.5 VDC.

If all voltages correct ($\pm 10\%$).

Use Fig 4-15 to trace voltage from logic card to MSR connector.

063

Use Fig 4-15 to trace voltage from logic card to MSR connector.

064

Check for proper operation.

Y
1
2

MAP 04
Feature Error MAP
PAGE 14 OF 18

065

Place the test/normal switch in TEST position.
Read in the test card.

Did the yellow light on the MSR come on?

Y N

066

Exchange logic card 01A/A1B04 (D) or 01A/A1C4 (M), read in test card again. If yellow light does not light verify cables from logic gate to MSR connector. (See Fig. 4-15).

067

Put the Test/Normal switch in normal position. Verify correct operation by performing test as described in section 3.3.2.2. starting at Step 9 Routine 3.

Was test successful?

Y N

068

Exchange logic card 01A/A1B04 (D) or 01A/A1C4 (M).

Verify correct operation by performing tests as described in section 3.3.2.2 starting at step 9 Routine 3.

Was test successful?

Y N

069

Exchange logic card 01A/A1G02, perform test for MSR as described in 3.3.2.2. If trouble persists verify cable from logic gate to MSR connector (See Fig 4-15).

1 1
5 5
A A
A B

A A
A B
1 1
4 4

MAP 04

Feature Error MAP

PAGE 15 OF 18

|

070

Return to customer.

071

Return to customer.

MAP 04

Feature Error MAP

PAGE 16 OF 18

072

(Entry Point B)

Verify that the selector pen lens is clean. If lens is dirty or damaged, exchange or clean using isopropyl alcohol, as required. See Chapter 6.8 for removal and exchange. Verify screen intensity level by increasing brightness for intermittent or solid failures.

Does the selector pen still fail?

Y N

073

Check selector pen using on-line tests as described in 3.3.2.2 Test 0 routine 3.

074

Verify +44 volts at 01A/A1C2U09, 01A/A1E2U09 (D), or use 01A/A1G2U09 (M).

Verify -12 volts at 01A/A1C2S08, 01A/A1E2S08 (D), or use 01A/A1G2S08 (M).

Are voltages correct?

Y N

075

Exchange card 01A/A1H02.

Reconnect coax signal cable.

Reinsert feature cards if removed.

Verify position of 01A/A2 for normal operation if present.

Verify for correct operation.

1
7
A
C

A
C
1
6

MAP 04
Feature Error MAP
PAGE 17 OF 18

076

Exchange the selector pen feature card at 01A/A1C04 or 01A/A1E04 (D) or for 01A/A1G4 (M).

Reconnect coax signal cable.

Reinsert feature cards if removed.

Verify position of 01A/A2 for normal operation if present.

Verify for correct operation.

Has the problem been corrected?

Y N

077

Exchange the selector pen.

Verify for correct operation.

Is the problem still present?

Y N

078

End of call.

079

Exchange 01A/A1G02, E02, F02 (D) or 01A/A1F2, G2 (M).

Verify for correct operation.

1
8
A
D

A
D
1
7

MAP 04

Feature Error MAP

PAGE 18 OF 18

080

Return to customer.

(Entry Point G)

Use Diagram at Figure 4-13 and 4-14 to isolate problem.

01A/A1H2J5 connects to 01A/A1G2J5 (D) or 01A/A1F2J5 (M). Alarm should sound when G2J5 (D) or F2J5 (M) is grounded (+-2 sec). Verify audible alarm control setting if alarm does not sound.

Exchange 01A/A1G2 (D) or 01A/A1F2 (M) card or audible alarm assembly 01C/DS1 to correct problem.

(Entry Point H)

Use diagram at 4-14 to isolate problem. 01A/A1H2G3 is ground when the security key is off (removed).

01A/A1H2J4 is ground when the security key feature is present.

End of call.

B
1

MAP 05

System Indicated Failure MAP

PAGE 2 OF 8

002

Are there any characters or symbols displayed in the indicator row?

Y N

003

Is the Test/Normal switch in the Normal position?

Y N

004

Put switch in Normal position.
Verify correct operation.

005

Is the security key ON (full clockwise)? (Use the Y path if there is no security key feature).

Y N

006

Switch ON and verify correct operation.

007

(Entry Point B)

Use the error log to determine if this terminal has had errors that cause the control unit to disable this terminal.

Has this terminal been logged off by the control unit? (See error log codes, 3.3.2.3, for log off codes.)

Y N

7 7 3
C D E

E
2

MAP 05

System Indicated Failure MAP

PAGE 3 OF 8

008

NO or Don't Know.
Switch unit off then on.

Does the subsystem ready indicator come on in the indicator row?

Y N

009

Exchange 01A/A1G2 card.

Is problem still present?

Y N

010

Verify correct operation.

011

(The following is a test of the coax cable from the terminal to the controller. The presence of controller signals will not affect test). Disconnect the coax 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 and 2.6K ohms?

Y N

012

Resistance higher than 2.6K indicates an open cable, bad cable connector or defect at the controller. (Coax resistance is 30 ohm/1000 feet).
Repair or exchange.

6 4
F G

G
3

MAP 05

System Indicated Failure MAP

PAGE 4 OF 8

013

(The following is a test from the coax connector on the terminal to card 01A/A1G2).

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

014

If resistance is too high, test the coax connector on the card gate, cable for breaks and reseal the 01A/A1G2 card. Remove 01A/A1G2 card. Meter should indicate an open condition. If not exchange coax cable from terminal connector to logic gate.

015

Exchange 01A/A1F2 and 01A/A1E2 (D) or 01A/A1F2 (M).

Is problem still present?

Y N

016

Verify correct operation.

017

(Entry Point D)

Was the terminal logged off because of errors?

(See error log codes, 3.3.2.3, for log off codes)

Y N

5 5
H J

H J
4 4

MAP 05

System Indicated Failure MAP

PAGE 5 OF 8

018

Does this Terminal contain feature cards?

Y N

019

Exchange card 01A/A1G2.
Verify correct operation

020

Go To Map 04, Entry Point A.

021

(Entry Point C)

Error code 77 for 3276 or 04 for 3274?

Y N

022

Errors because of Feature error? (See 3.3.2.3 for codes)

Y N

023

Verify coax connectors (external), internal coax cable and seating of 01A/A1G2 card.
If errors remain, exchange 01A/A1G2 card.

6 6
K L

F K L
3 5 5

MAP 05

System Indicated Failure MAP

PAGE 6 OF 8

024

If the feature causing error is identified exchange that card.

If the feature is not identified or this terminal does not have features, exchange 01A/A1G2 card.

Is the problem still present?

Y N

025

End of call.

026

Exchange 01A/A1F2, E2 (D) or 01A/A1F2 (M).
Verify correct operation.

Is problem still present?

Y N

027

End of call.

028

Exchange internal coax cable between card gate and I/O connector panel (01S1/J4, see Figure 4-4).

Verify correct operation.

029

Exchange 01A/A1F2, G2 cards.
Verify correct operation.

030

Exchange 01A/A1G2, F2, E2 (D) or 01A/A1G2, F2 (M).
Verify correct operation.

A C D
1 2 2

MAP 05

System Indicated Failure MAP

PAGE 7 OF 8

031

Go to Page 5, Step 021, Entry Point C.

032

Go to Page 2, Step 007, Entry Point B.

033

Is Error Code other than 41, 42, 210 or 212?

Y N

034

Remove feature cards if present.

Reinsert feature logic card 01A/A2 if present by plugging the top card connector end into the board socket. (The display cannot operate if this card is not inserted.)

Is problem still present?

Y N

035

Go To Map 04, Entry Point A.

036

Disconnect Keyboard cable from Terminal.

Is problem still present?

Y N

037

Go To Map 03, Entry Point A.

8 8
M N

M N
7 7

MAP 05

System Indicated Failure MAP

PAGE 8 OF 8

038

Exchange 01A/A1G2.

Connect Keyboard cable to Terminal.

Reinsert feature cards.

Verify position of 01A/A2 for normal operation if present.

Verify correct operation.

Is problem still present?

Y N

039

End of call.

040

Exchange internal coax cable between card gate in I/O connector panel (01S1/J4, see Figure 4-4).

Verify correct operation.

041

Go to Page 4, Step 017, Entry Point D.

Chapter 3. Maintenance Aids

3.1 Introduction

Maintenance aids for the 3278 Display Station include switches, indicators, and diagnostic tests.

3.2 Switches and Indicators

The 3278 switches and indicators are described in Figures 4-1 and 4-2 in Chapter 4.

3.3 Operation Tests

Operation tests are used to sense failures both for problem determination and for repair verification. Both offline and online tests are available.

3.3.1 Offline Tests

The 3278 offline tests are in 3278 logic. The test logic is activated by setting the Normal/Test switch to the Test position, taking the 3278 offline to its control unit, and putting it in test mode. There are three test modes: Test Mode 1, Test Mode 2, and Test Mode 3.

3.3.1.1 Test Mode 1

DISPLAY STATION TEST

- Tests 3278 Display Station offline from the control unit.
- Does *not* test coax driver/receiver and display features; they may be tested with online test 0 (refer to 3.3.2.2).

<i>Test Name</i>	<i>Activity</i>	<i>Result</i>
Test Mode 1: Pattern Display	Displays a predetermined pattern of characters. Mode Entry: Set Aa/A to Aa. Set Normal/Test to Test.	Fills display with pattern of characters shown in Figure 3-1, 3-2, or 3-3. Compare the test pattern lines shown in the figure with the corresponding lines on the screen. Verify that the characters are in correct sequence. This is a test of the <i>character generator, storage, and control logic</i> . Character-generator failure causes wrong or defective characters to be displayed at any point or points on the screen, and control failure affects all characters.

3.3.1.2 Test Mode 2

Test Mode 2:
Key-to-CRT
Test (used to
test the key-
board scan
codes)

Provides a path from keyboard to display.

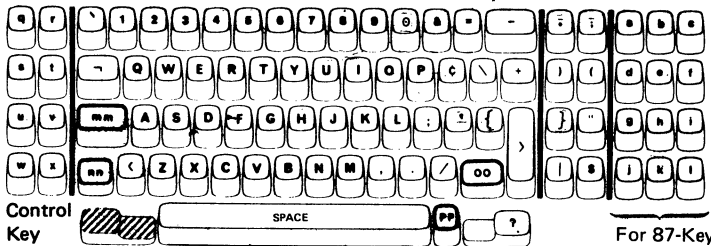
Mode Entry: Automatic, after display is loaded
with Mode 1 pattern of characters.

Key in any characters (but do not press
Control key).

Characters keyed in replace characters displayed in Test
Mode 1, beginning at top left of display. This is a test of
keyboard scan codes.

Note: *Regardless of the characters that appear on the key-
tops, the characters displayed are those shown in the
diagram below. Notice that certain keys cause double-
character entry, the first when the key is pressed and
the second when it is released: these keys are labeled
nn, mm, oo, and pp in the diagram.*

Keyboard



For 87-Key
Keyboards

Japanese Katakana

Test Mode 2:
Key-to-CRT
Test (used to
test the key-
board scan
codes)

Provides a path from keyboard to display.

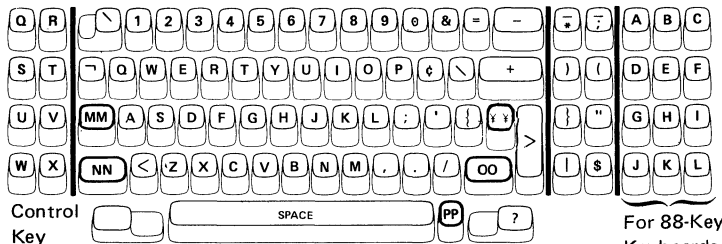
Mode Entry: Automatic, after display is loaded
with Mode 1 pattern of characters.

Key in any characters (but do not press
Control key).

Characters keyed in replace characters displayed in Test
Mode 1, beginning at top left of display. This is a test of
keyboard scan codes.

Note: *Regardless of the characters that appear on the key-
tops, the characters displayed are those shown in the
diagram below. Notice that certain keys cause double-
character entry, the first when the key is pressed and
the second when it is released: these keys are labeled
NN, MM, OO, ッッ, and PP in the diagram.*

Keyboard



For 88-Key
Keyboards

Japanese English

Test Mode 2:
Key-to-CRT
Test (used to
test the key-
board scan
codes)

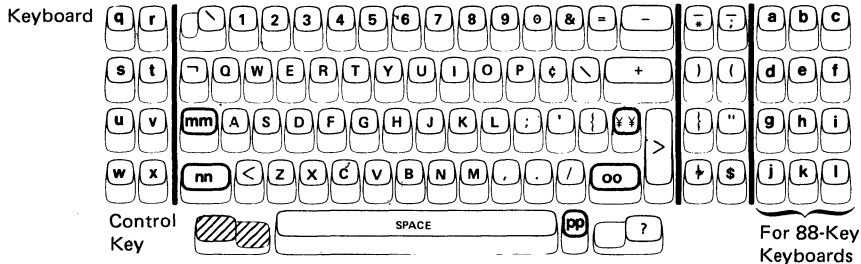
Provides a path from keyboard to display.

Mode Entry: Automatic, after display is loaded
with Mode 1 pattern of characters.

Key in any characters (but do not press
Control key).

Characters keyed in replace characters displayed in Test
Mode 1, beginning at top left of display. This is a test of
keyboard scan codes.

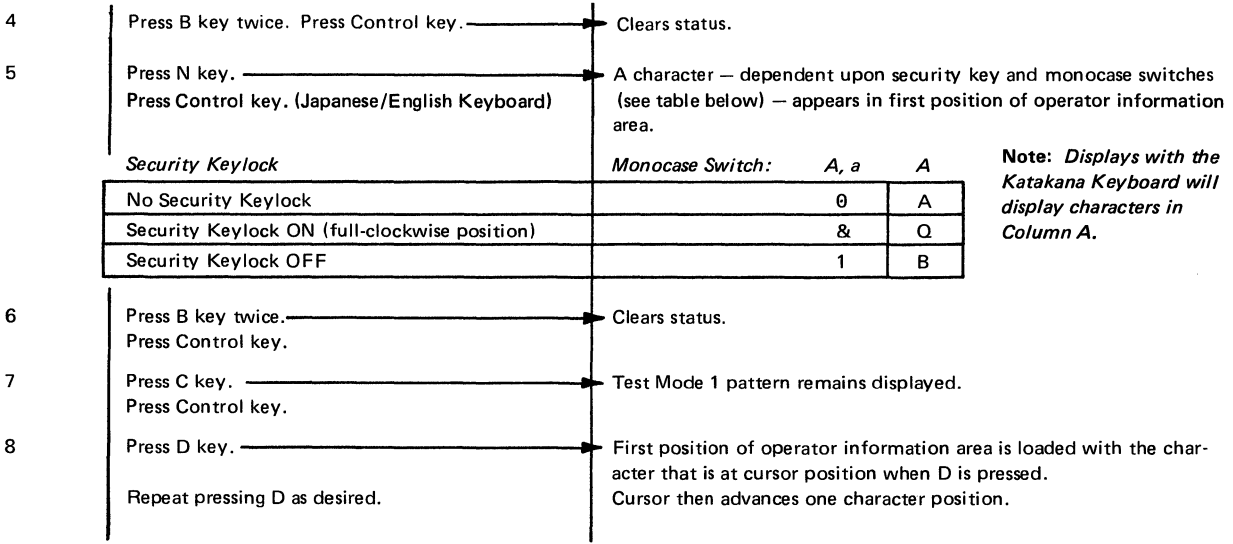
Note: *Regardless of the characters that appear on the key-
tops, the characters displayed are those shown in the dia-
gram below. Notice that certain keys cause double-
character entry, the first when the key is pressed and
the second when it is released: these keys are labeled
nn, mm, oo, ¥¥, and pp in the diagram.*






3.3.1.3 Test Mode 3

Test Name	Activity	Result
<p>Test Mode 3: Test Logic Area</p>	<p>Provides two paths from keyboard to logic: logic-area test path and data path.</p> <p>Mode Entry: Press Control key.</p> <p>Logic Area Test Entry: See the following page for suggested sequence of logic area tests.</p> <p>Suggested Logic Area Test Sequence</p> <p>1 Press C key. —————→ Press Control key. (Japanese/English Keyboard)</p> <p>2 Press B key. —————→</p> <p>Press B three more times (to clear status). —————→ Press Control key.</p>	<p>Note: All references to keys to be used in Test Mode 3 are identified by the diagram shown for Test Mode 2. (Do not identify keyboard keys by the characters that appear on the keytops.)</p> <p>Characters keyed in during Test Mode 2 are replaced by Test Mode 1 pattern; initial power-on status is loaded into status register.</p> <p>2 appears in first position of operator information area. (Correct response for power-on status.) (A tone sounds if the audible alarm feature is installed, on (D) type only.)</p> <p>First position of operator information area becomes 0 .</p>

Test Name	Activity	Result																
Test Mode 3 (Cont'd) 3	Press J key. Press Control key. (Japanese/English Keyboard)	A character – dependent upon the display model and keyboard type (see table below) – appears in the first position of the operator information area.																
<table border="1"> <thead> <tr> <th data-bbox="574 246 1290 315">Keyboard Types</th> <th colspan="5" data-bbox="1290 246 1742 280">Character</th> </tr> <tr> <td></td> <th data-bbox="1290 280 1444 315">Models 1</th> <th data-bbox="1444 280 1517 315">2</th> <th data-bbox="1517 280 1591 315">3</th> <th data-bbox="1591 280 1664 315">4</th> <th data-bbox="1664 280 1742 315">5</th> </tr> </thead> </table>		Keyboard Types	Character						Models 1	2	3	4	5	<p>Note: All references to keys to be used in Test Mode 3 are identified by the diagram shown for Test Mode 2. (Do not identify keyboard keys by the characters that appear on the keytops.)</p>				
Keyboard Types	Character																	
	Models 1	2	3	4	5													
Typewriter without Numeric Lock	Š	Ć	Š	Ł	I													
Typewriter without Numeric Lock (Katakana or Japanese English)	Ü	Ñ	Á	ŕ	é													
Typewriter with Numeric Lock	C	E	G	O	M													
Data Entry with Numeric Lock	s	u	w		ã													
Data Entry without Numeric Lock	p	b	▶	?	B													
Data Entry Keypunch with Numeric Lock	c	e	g	o	m													
Data Entry Keypunch without Numeric Lock	s	c	Z	i	i													
APL	i	ü	ê	ú	í													
APL with Numeric Lock	/	/		P _t	£													
APL (Katakana)	チ	ナ	マ	マ	^													
Text	I	U	O	Y	O													
Text with Numeric Lock	2	4	6	%,	#													
PS or Typewriter Attribute Select	i	ù	ø	ü														
APL Attribute Select	i	Ü	È	Ú														










Note: Displays with the Katakana Keyboard will display characters in Column A.



Test Name	Activity	Result
Test Mode 3 (Cont'd)		Note: All references to keys to be used in Test Mode 3 are identified by the diagram shown for Test Mode 2. (Do not identify keyboard keys by the characters that appear on the keytops.)
9	Press Control key, B key twice, then Control key.	
10	Press V key.  Press Control key.	First position of operator information area is loaded with the character that is at cursor position when V is pressed.
11	Press C key. Press Control key.	
12	Press B key twice.	
13	Press F key. 	First position of operator information area is loaded with character 0.
14	Press C key.  Press Control key, B key twice, then Control key.	Test Mode 1 pattern is displayed.

15	Press M key. Press any keys except Control key. Press Control key.	Characters keyed in replace characters displayed in Test Mode 1.
16	Press U key. Press any keys except Control key. Press Control key.	Cursor moves with each key depression, but stays within a 256-character-position area. If cursor is within unchanged Test Mode 1 pattern, it will move under same character as on key that is pressed (except for uppercase characters displayed in the top row).
17	Press E key. Press any keys except Control key. Press Control key.	Cursor moves many positions with each key depression — off screen, with most keys.
18	Press C key. Press Control key. Press B key twice, then Control key.	
19	Press G key twice. Press Control key, B key twice, then Control key.	Display changes to all 0s, except for operator information area; cursor (which can be made visible by next step) moves to first position of operator information area.

Test Name	Activity	Result																								
Test Mode 3 (Cont'd) 20 21 22	Press K key; then press ' key. (On Model 5: Press K key; then press S key.) Press Control key. Press C key, then Control key. Press K key. Press one of the following keys, according to the function desired: <table border="1" data-bbox="782 500 1513 780"> <thead> <tr> <th>Function</th> <th>Models 1 – 4</th> <th>Model 5</th> </tr> </thead> <tbody> <tr> <td>Reverse and blink cursor</td> <td>, (comma)</td> <td>T</td> </tr> <tr> <td>Reverse cursor</td> <td>' (apostrophe)</td> <td>S</td> </tr> <tr> <td>Blink cursor</td> <td>=</td> <td>R</td> </tr> <tr> <td>Normal cursor</td> <td>Space key</td> <td>Q</td> </tr> <tr> <td>Inhibit cursor</td> <td>/</td> <td>U</td> </tr> <tr> <td>Inhibit display</td> <td>?</td> <td>Y</td> </tr> <tr> <td>Change from 132- to 80-character length (Model 5 only)</td> <td></td> <td>Q</td> </tr> </tbody> </table>	Function	Models 1 – 4	Model 5	Reverse and blink cursor	, (comma)	T	Reverse cursor	' (apostrophe)	S	Blink cursor	=	R	Normal cursor	Space key	Q	Inhibit cursor	/	U	Inhibit display	?	Y	Change from 132- to 80-character length (Model 5 only)		Q	<p data-bbox="1373 156 2015 273">Note: All references to keys to be used in Test Mode 3 are identified by the diagram shown for Test Mode 2. (Do not identify keyboard keys by the characters that appear on the keytops.)</p> <p data-bbox="1373 291 1616 314">Reverse cursor appears</p> <p data-bbox="1373 370 1616 394">Test pattern reappears.</p> <p data-bbox="1556 594 1701 646">132-character length only</p>
	Function	Models 1 – 4	Model 5																							
	Reverse and blink cursor	, (comma)	T																							
Reverse cursor	' (apostrophe)	S																								
Blink cursor	=	R																								
Normal cursor	Space key	Q																								
Inhibit cursor	/	U																								
Inhibit display	?	Y																								
Change from 132- to 80-character length (Model 5 only)		Q																								
Press K key; then press ' key. (On Model 5: Press K key; then press S key.)	Reverse cursor appears																									
Press C key, then Control key.	Test pattern reappears.																									
Press Control key, then C key, then Control key. Press B key twice, then Control key.																										

- | | | |
|----|---|--|
| 23 | Press W key. | |
| 24 | Press $\bar{*}$ key.
Press Control key. | |
| 25 | Press G key. | |
| 26 | Press A key. 
Press Control key. | All positions from top left of screen to first "a" become 0. ^{....} |
| 27 | Press B key. 
Press B key again, then Control key. | Loads first position of operator information area with 3. ^{....} |
| 28 | Press O (alpha) key. 
Press Control key, then B key twice.
Press Control key. | (Prepares for testing display intensity control.)
All characters on screen display with <i>high intensity</i> ,
except operator information area.
Cursor advances to first (*) in row 2. |
| 29 | Press O (alpha) key. | |
| 30 | Press Q key.  | All characters from cursor's previous position to end of
screen and characters on the first line to the first lowercase
"a" display with <i>normal intensity</i> . Cursor also advances
to row 3. |

<i>Test Name</i>	<i>Activity</i>	<i>Result</i>
Test Mode 3 (Cont'd)		
31	Switch power off, then on.  Press Control key, B key twice, then Control key.	Power-On Reset occurs.
32	Press G key twice.  Press Control key, then B key twice. Press Control key.	All positions become 0 except operator information area.
33	Press G key twice.  Press Control key. Press B key twice.	Operator information area displays 0s.
34	Press M key.	<p>Note: All references to keys to be used in Test Mode 3 are identified by the diagram shown for Test Mode 2. (Do not identify keyboard keys by the characters that appear on the keytops.)</p>
35	Press and hold 2 key until 2's appear in top line ((D) type). Press and hold 3 key until 3's appear in top line ((M) type).	
36	Press and hold 4 key to enter eight to ten 4's ((D) type).	

- 37 Press and hold 5 key to enter eight to ten 5's ((M) type).
Press and hold 8 key to enter eight to ten 8's ((D) type).
Press and hold 9 key to enter eight to ten 9's ((M) type).
- 38 Press Control key: press B key twice, then Control key.
- 39 Press W key
- 40 Press \bar{w} key.
Press Control key.
Press B key twice, then Control key.
- 41 Press S key.
- 42 Press 2 key.  Cursor moves back to last 2 entered ((D) type).
Press 3 key.  Cursor moves back to last 3 entered ((M) type).
Press Control key.
- 43 Press B key twice, then Control key.
- 44 Press Q key.

<i>Test Name</i>	<i>Activity</i>	<i>Result</i>
45 *****	Press 8 key. _____ Press 9 key. _____ This concludes tests that can be performed by the Offline Test (Test Mode). Display station features must be tested online; see Online Test 0 (par. 3.3.2.2).	Cursor moves forward to first 8 entered ((D) type). Cursor moves forward to first 9 entered ((M) type).

3.3.2 Online Tests

The 3278 online tests are in the control unit to which the 3278 is attached. When the 3278 is attached to a 3274 or 3276, online tests may be requested from any online display station with a keyboard, and may be run on any online terminal attached to the same control unit. Results, if any, of the test are displayed at the requesting display station. Eight online tests can be selected:

Test 0 — Display Operation

Test 1 — Error Log Display

Test 2

Test 3

Test 4 — Error Log Erase (for 3274, erases error log for selected device;
for 3276, erases entire error log)

Test 5

Test 6

Test 8 — PS Feature Test Pattern

(Refer to the control unit documentation for a description of tests 2, 3, 5,
and 6.)

When the 3278 is attached to a control unit/adaptor other than a 3274 or 3276, refer to the documentation for the control unit/adaptor for the differences to the online tests.








<ul style="list-style-type: none"> Run test other than 0 on terminal other than requesting display. 	Key in: AA/B Press: Enter	Selected test begins.
3. Re-enter if X symbol is displayed,	<input type="checkbox"/> You tried to select an in-session terminal for test 0 <input type="checkbox"/> You used an invalid test number or address. <input type="checkbox"/> You used more than one slash (/) and/or had space(s) in your format. <input type="checkbox"/> You did not begin test format at position 0 (upper-left position of display).	Do Not Enter \times , Op Check \ddagger , and Function Not Available -f are displayed in operator information area. Do Not Enter \times , Op Check \ddagger , and Wrong Number # ? are displayed in operator information area.
	Press Reset; re-enter test format.	Only TEST is displayed.
4. Interpret test results.	Invoking message is retained and is suffixed with +, -, or 0, where: + = succeeded - = failed 0 = device power off and these may be prefixed by a routine number.	Example: AA/ 2- ↑ ↑ ↑ TA Address Test 0 Routine 2 Failed Note: <i>Applicable only to Test 0.</i>
5. Continue test.	Press and hold ALT, and strike CLEAR.	Enter another test (step 2).
6. End test.	Press and hold ALT; strike TEST and then release ALT.	TEST is erased from display.




3.3.2.2 Test 0, Display Operation

<i>Test or Routine Name</i>	<i>Activity</i>	<i>Result</i>
Test 0: Display Function.	To determine that terminal is functioning overall.	
Routine 1: TA Test (3276 only)	Check basic TA functions—register, serdes, command decoder, etc., operations; driver/receiver operation excluded.	Stop on error. Display test result on requesting display. If no error, go to next routine.
Routine 2: Link Test (3276 only)	Check link by issuing Reset and receiving a POR response.	Stop on error. Display test result on requesting display. If no error and if a display is being tested, go to next routine; otherwise stop.
Routine 3: Interactive Test (Display only; not for printer)	Permit operator testing of selector pen and keyboard functions. Display test pattern. Sound audible alarm (if feature is installed).	Test pattern is displayed; it and test procedure are described below.

<i>Test Pattern Definition</i>		<i>Test Pattern</i>	
Line 1:	CCCC identifies the control unit (3274 or 3276) to which the 3278 is attached. NN is the port number (00 through 31).	(Line 1)	TEST: CCCC NN
Line 2:	?SEL PEN and SEL PEN are high-intensity, protected, and selector-pen-detectable fields.	(Line 2)	?SEL PEN SEL PEN
Line 3:	&SEL PEN and > SEL PEN are normal-intensity, protected, and selector-pen-detectable fields.	(Line 3)	&SEL PEN > SEL PEN
Line 4:	Non-display field with NON preceding normal-intensity and protected field DISPLAY INSERT. If blanking circuits on analog card fail, NON can be seen. CK (and two null characters) is normal-intensity, unprotected, and non-detectable field, followed by another normal-intensity, unprotected, and non-detectable field containing cursor.	(Line 4)	DISPLAY INSERT CK _

(Routine 3: Interactive Test, Test Procedure)

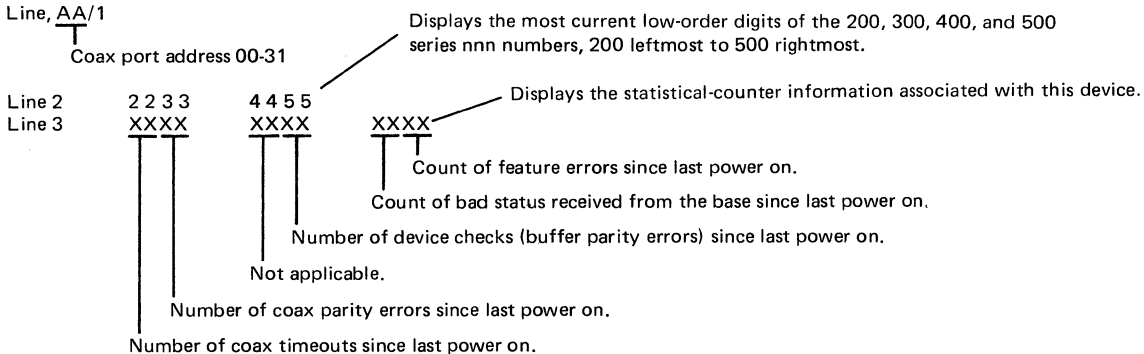
<i>Test Procedure</i>	<i>Result</i>
1. Move cursor under C of CK.	
2. Press \hat{a} key. 	\wedge (displays in operator info area)
3. Press A. 	DISPLAY INSERT ACK (displays in fourth line)
4. Press B. 	DISPLAY INSERT ABCK (displays in fourth line)
5. Press C. 	DISPLAY INSERT ABCK (no change in fourth line)
6. Press Reset. 	\times \uparrow \gg \wedge (displays in operator info area)
7. If no selector pen, ECS, PS, MSR, or MHS features, press and hold ALT, strike TEST, release ALT. 	\times \uparrow \gg \wedge is erased. Test pattern is erased; TEST is erased. (Test is ended.)
8. If selector pen is a feature:	
a. Touch pen on ?SEL PEN.  (If \times appears in operator info area, reset and retry; if no change in display, increase brightness and retry.)	\gg SEL PEN SEL PEN (displays in second line)
b. Touch pen again on same field.	? SEL PEN SEL PEN (displays in second line)
c. Touch pen on \gg SEL PEN.	& SEL PEN ? SEL PEN (displays in third line)
d. Touch pen again on same field.	& SEL PEN \gg SEL PEN (displays in third line)
e. Do step 7 to end test.	

9. If MSR is a feature (valid if the control unit is customized for the numeric character set):
- Move cursor to first position in fifth line (line below test pattern).
 - Read test card  Cursor moves number of positions equal to number of characters on test card plus three spaces; green light on reader lights, and ✕-f is displayed in operator information area.
 - Hold ALT and press TEST to end the test.
10. If ECS feature:
- Move cursor to sixth line.
 - Hold ALT, and press APL or Text ON/OFF key.  APL or Text appears in indicator row.
 - Type in any or all APL characters  Correct character should appear for each key entered.
as shown on the keytops and key faces.
 - Hold ALT and press TEST to end test.
11. If PS feature:
- Request online test 8 by following procedure in 3.3.2.1, step 2 if already in test mode or steps 1 and 2 if not in online test mode.
 - Verify symbols on lines 3 and 5 to make sure that the fonts displayed are the same as the fonts installed.
 - Hold ALT and press TEST to end test.
12. If the Personal Computer Attachment is installed, verify that the personal-computer wrap test has been successfully run per the *IBM 3270 Personal Computer Attachment User's Guide*.

3.3.2.3 Test 1, Error Log Display

From the last time that control unit power was turned on, all errors sensed by the control unit were recorded in the error log. When control unit power is turned off, the error log is erased. The error log for any terminal attached to the control unit can be displayed by requesting online test 1. The following error log formats are displayed at the requesting display station:

3274 Error Log



For example:

```
03/1
0400 0000
0000 0002 0000
```

The last error detected by the display was error code 204. This was a storage error (buffer parity error). Two of these errors have been detected since the display was powered on.

3274 Display Error Log Codes

These errors appear on the screen as ~~X~~ 2xx, where xx is one of the 2-digit numbers listed below:

02	= "Hot tube". Normally, error code is seen in log of another terminal.	22	= Invalid Selector Pen Status or Command Q failure
03	= Feature bus error	23	= ECS buffer parity
04*	= Storage error	24	= Invalid MSR Status or Command Q failure
05	= Unsupported feature attached	25	= ECS Status/Initialization error
06	= Incorrect feature address	26	= ECS Command Q failure
07*	= Lost Op Complete this display	27	= ECS WRT ALT/Command Q failure
08	= Invalid Op Complete (received unexpected Op Complete)	34	= ECS without ROS extension
09*	= Command Q failure	35**	= P.C. Invalid Status or Command Q failure
10	= Invalid keyboard attached (no table)	36**	= P.C. Lost Op Complete
11	= Invalid Status received	37**	= P.C. Message protocol error
12	= Invalid Scan Code received	38**	= P.C. Inbound message exceeded maximum allowable length

*Control unit may log off device.

**Control unit will log off device.

3276 ERROR LOG

Test 1:
Error Log Display

Display the terminal and common error logs.

Error logs are displayed at requesting display
as follows:

Error Log Display

	* * * Y Y * * *												
Error code high-order digit	X0	X1	X2	X3	X4	X5	X6	X7	X8	X9	XA	XB	Error code low-order digit.
0X	XX	---	XX	---	XX	---	---	---	---	XX			
1X	---	XX	---	---	---	---	---	XX	---	---			
2X	---	---	---	---	---	XX	---	---	XX	---			
3X	XX	---	---	XX	---	---	---	---	XX	---			
4X	---	---	03	---	---	---	---	---	---	---			
Example: See the explanation and the example that follow.													
9X	---	XX	---	---	XX	---	XX	---	---				

where:

YY = Terminal address
 XX = Error count (in hexadecimal)
 --- = No error encountered.

To find the occurrences of errors, draw a horizontal line across the high-order digit row, and a vertical line down the low-order column. The intersection of these lines gives the occurrences of this error since the last *power on*.

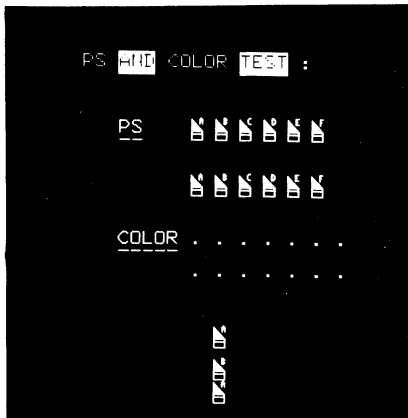
Example: Draw a horizontal line from the high-order 4X, and a vertical line from the low-order X2. This shows three occurrences of 42 (keyboard overrun) since the last *power on*.

Error log codes (3276 Control Unit):

41 Keyboard error (invalid code)	71 Adapter receive parity
42 Keyboard overrun	72 Data parity error*
43 MSR data parity	73 Lost Op complete*
44 SP data parity	74 Feature timeout*
60 MSR timeout	77 Device Check (terminal buffer parity)*
61 SP timeout	0A Total count of error code 70
70 Timeout (no response from the terminal)*	0B Total count of adapter Receive parity

*Control unit may log off device.

Refer to the control unit manuals for definitions of other error codes.



3.3.2.4 Test 8, PS Feature Test Pattern (Applies Only to the Requesting Terminal)

Line 1: The letters "PS" and the word "COLOR" will blink. The words "AND" and "TEST" are displayed in reverse video.

Line 3: PS is underscored.

Lines 3 and 5: A symbol is displayed for each PS storage installed. The leftmost symbol is PS "A"; the rightmost is PS "F". A dot is displayed if the PS storage is not installed.

Line 7: "COLOR" is underscored.

Lines 10, 11, and 12: Symbols A, B, and A, respectively, are displayed.

Lines 2, 4, 6, and 9 are blank.

Notes:

1. *Model 4 only: Does not display bottom portion of PS symbols on lines 3 and 5.*
2. *Models 3 and 4: There is no space between PS symbols on lines 10 and 11.*
3. *Models 1, 2, 3, and 4: There is no space between PS symbols on lines 11 and 12.*

3.3.2.5 Error Log/Repair Action**3274 Control Unit**

- 02 (may not display terminal logged off),
01A/A1F2(M)
- 03 01A/A1G2, feature card B4 or C4(D),
01A/A1F2, feature card G4 or E2(M)
- 04 01A/A1F2, 01A/A1G2
- 05 Wrong feature card, 01A/A1G2
- 06 Wrong feature card, 01A/A1G2
- 07 01A/A1G2(D), 01A/A1F2, G2(M)
- 08 01A/A1G2(D), 01A/A1F2, G2(M)
- 09 Coax port transmission failure

- 10 Keyboard ID jumpers
- 11 01A/A1G2(D), 01A/A1F2, G2(M)
- 12 01A/A1G2, keyboard logic card
- 22 01A/A1C4, E4, G2(D), 01A/A1G2, G4(M)
- 23 Feature card 01A/A1D02, G02(D), 01A/A1E2, G2(M)
- 24 01A/A1B4, G4(D), 01A/A1B4, G2(M)
- 25 Feature card 01A/A1D02, G02(D), 01A/A1E2, G2(M)
- 26 Feature card 01A/A1D02, G02(D), 01A/A1E2, G2(M)
- 27 Feature card 01A/A1D02, G02(D), 01A/A1E2, G2(M)

3276 Control Unit

- 41 Keyboard logic card, keyboard
cable, 01A/A1G2(D), 01A/A1F2(M)
- 42 Keyboard logic card, 01A/A1G2(D),
01A/A1F2(M)
- 44 01A/A1C4, 01A/A1E4, 01A/A1G2(D),
01A/A1G4, 01A/A1G2(M)
- 60 01A/A1B4, 01A/A1G2, MSR
- 61 01A/A1C4, 01A/A1E4, 01A/A1G2(D),
01A/A1B4, 01A/A1G2(M)

- 70 01A/A1G2 (check Control Unit logic), coax cable
- 71 Card A-G2, coax cable
- 72 01A/A1G2, 01A/A1F2
- 73 01A/A1G2
- 74 01A/A1G2, feature card B4, E4, or C4
- 77 01A/A1F2, 01A/A1G2

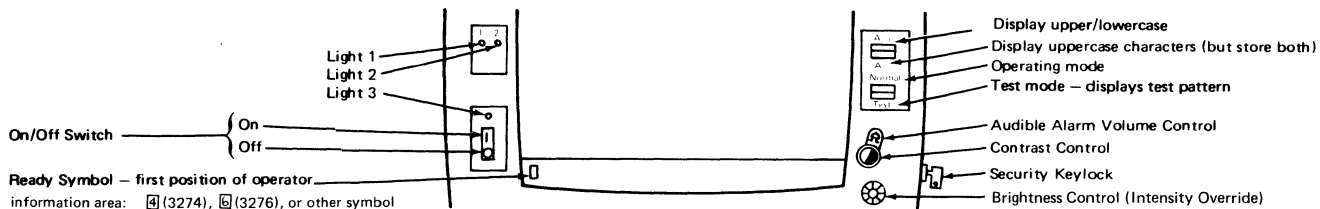


Figure 4-1. Switches and Indicators

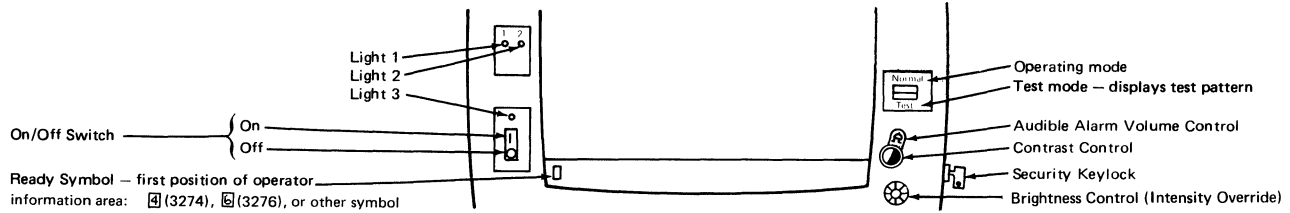


Figure 4-2. Switches and Indicators (Katakana)

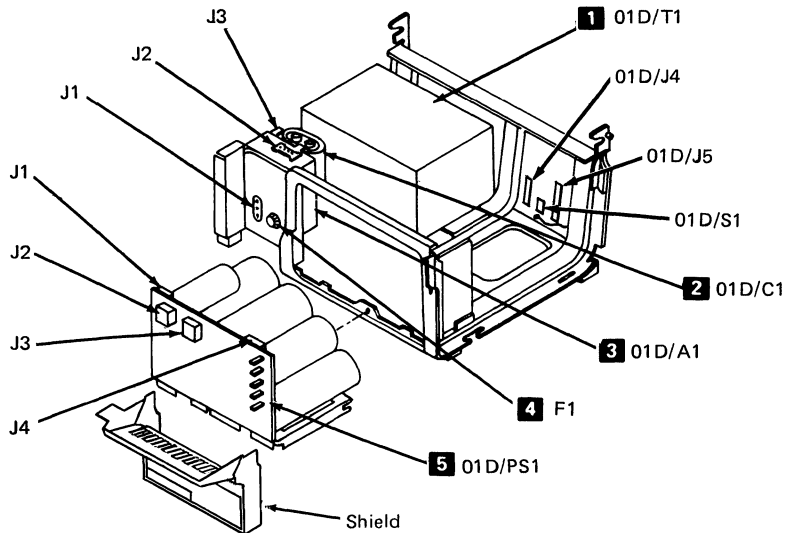


Figure 4-3. Lower Frame

Key	Description	PN
1	Ferro – US/Canada	8715339
	EMEA/AFE 60 Hz Lo	8715341
	AFE 50 Hz Lo	8715342
	AFE 50 Hz Hi	8715343
	EMEA 50 Hz Hi	4119686
2	Capacitor	6814311
3	Prime Power Asm	1743110
4	Primary Fuse (F1)	
	US/Canada	1149561
	EMEA/AFE 60 Hz Lo	1149561
	AFE 50 Hz Lo	1149561
	AFE 50 Hz Hi	1176668
	EMEA 50 Hz Hi	1176668
5	Low-Voltage Asm	1743120

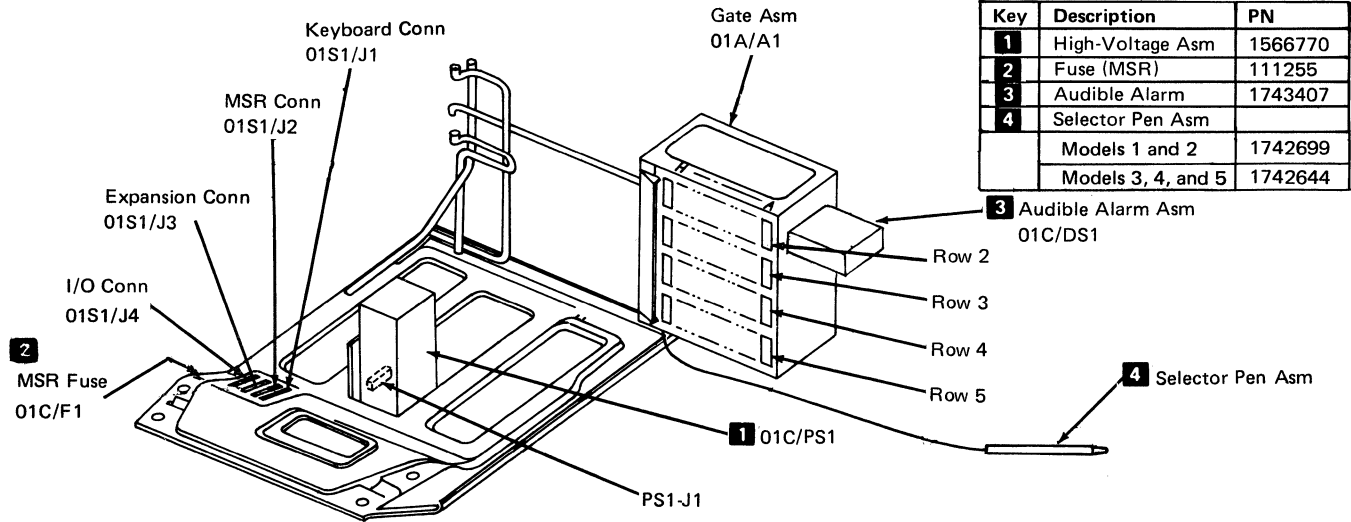
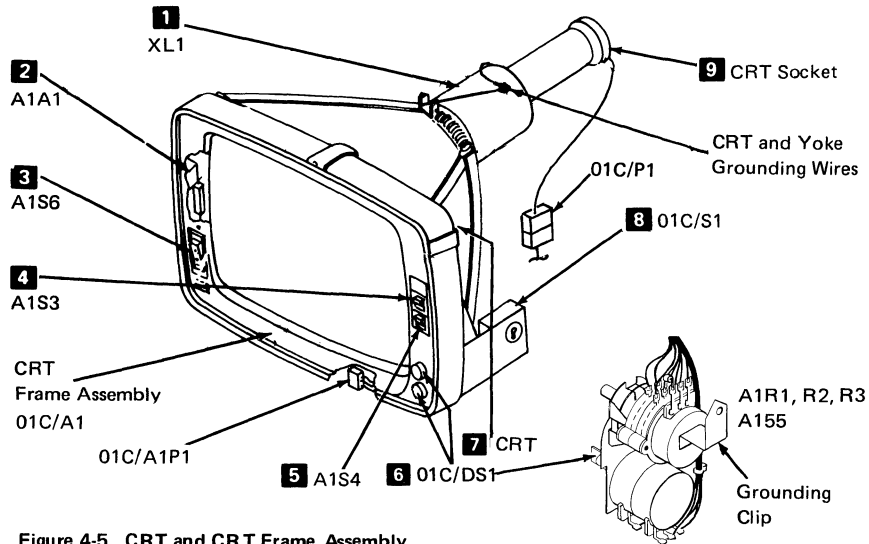


Figure 4-4. Upper Frame



Key	Description	PN
1	Yoke	1743090
2	Indicator Card	1743525
3	On/Off Sw	1743178
4	Dual/Mono Sw	1655357
5	Normal/Test Sw	1655357
6	Contrast Pot/Audible Alarm Volume Ctrl Intensity Pot Intensity Override	1743199
7	CRT	1655349
8	Security Key Lock	5214866
9	CRT Socket	1743041

Figure 4-5. CRT and CRT Frame Assembly

Top Card Connectors without PS Installed

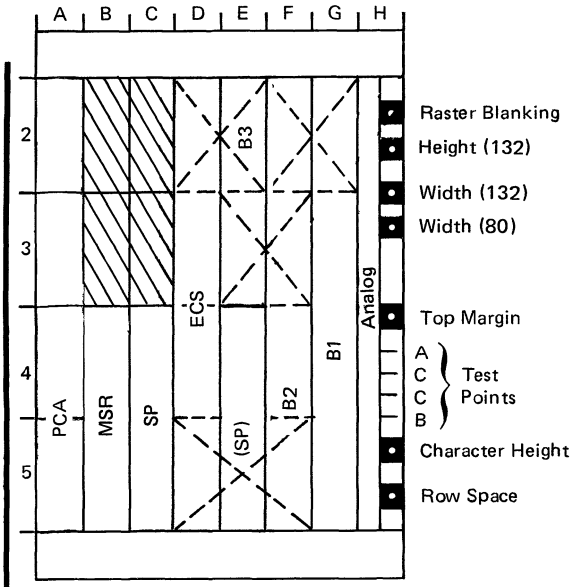
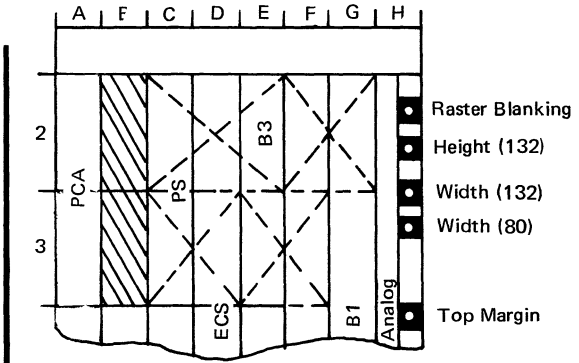


Figure 4-6 (Part 1 of 2). Card Locations, (D) Type

Top Card Connectors with PS Installed



Legend:

- B1 - Base Card 1
- B2 - Base Card 2
- B3 - Base Card 3
- ECS - Extended Character Set Card
- MSR - Magnetic Slot Reader Card
- PCA - Personal Computer Adapter Card
- PS - Programmed Symbols
- SP - Selector Pen Card (location depends on feature)

Note for CE jumper: If no SP card, use male jumper for test.

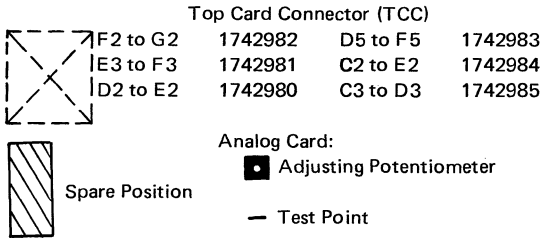
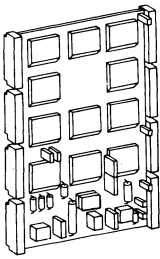
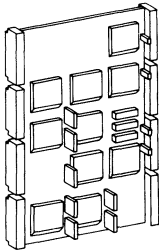


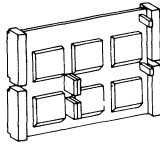
Figure 4-6 (Part 2 of 2). Card Locations, (D) Type



Base Card 1

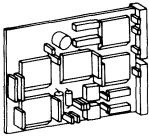


Base Card 2

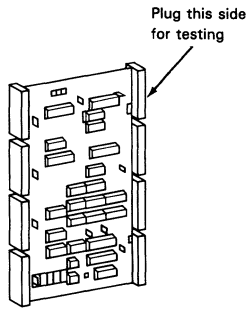


Base Card 3

A. Base Card Illustrations, (D) Type

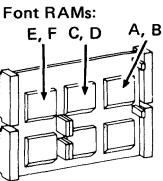


MSR Card



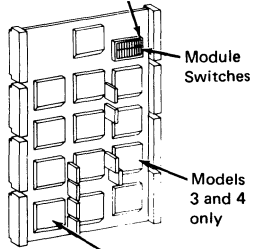
Personal Computer Adapter Card

(See Entry Point D of MAP 04 for switch settings.)
Switch No. 1



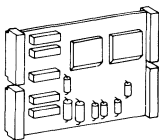
Note: RAMs C, D, E, and F are pluggable.

PS Card



APL/Text ROS
Models 1, 2 and 3 = 5643710
Models 4 and 5 = 5645546
Indicator ROS
All Models = 5666701

ECS Card



Selector Pen Card

B. Feature Card Illustrations

Figure 4-7. Card Illustrations

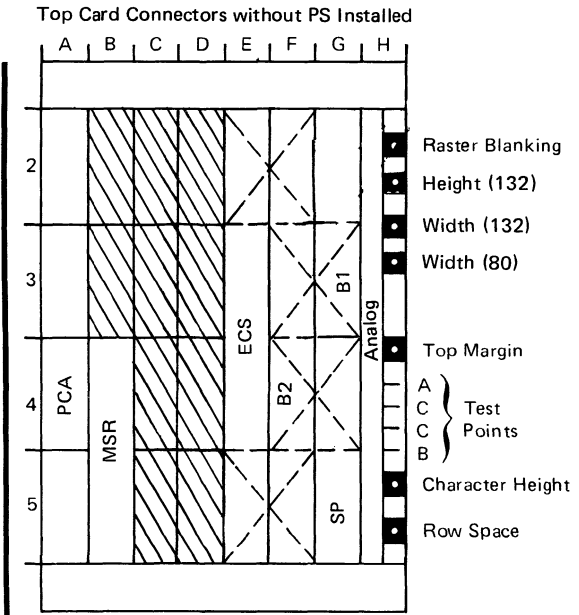
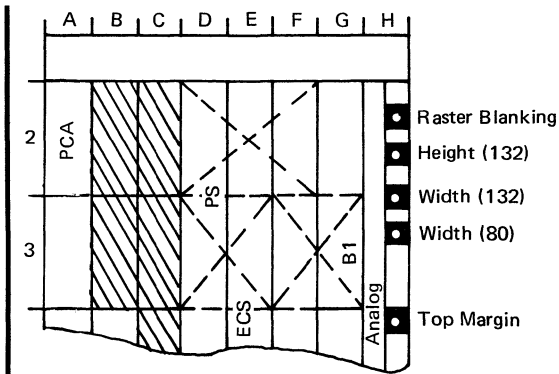


Figure 4-8 (Part 1 of 2). Card Locations, (M) Type

Top Card Connectors with PS Installed

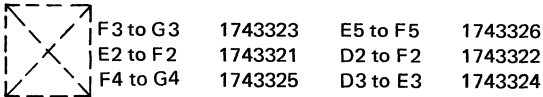


Legend:

- B1 - Base Card 1
- B2 - Base Card 2
- B3 - Base Card 3
- ECS - Extended Character Set Card
- MSR - Magnetic Slot Reader Card
- PCA - Personal Computer Adapter Card
- PS - Programmed Symbols
- SP - Selector Pen Card

Note for CE jumper: If no SP card, use male jumper for test.

Top Card Connector (TCC)

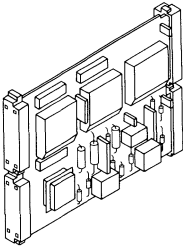


Spare Position

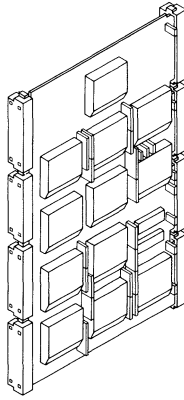
Analog Card:

- Adjusting Potentiometer
- Test Point

Figure 4-8 (Part 2 of 2). Card Locations, (M) Type



Base Card 1



Base Card 2

Figure 4-9. Card Illustrations, (M) Type

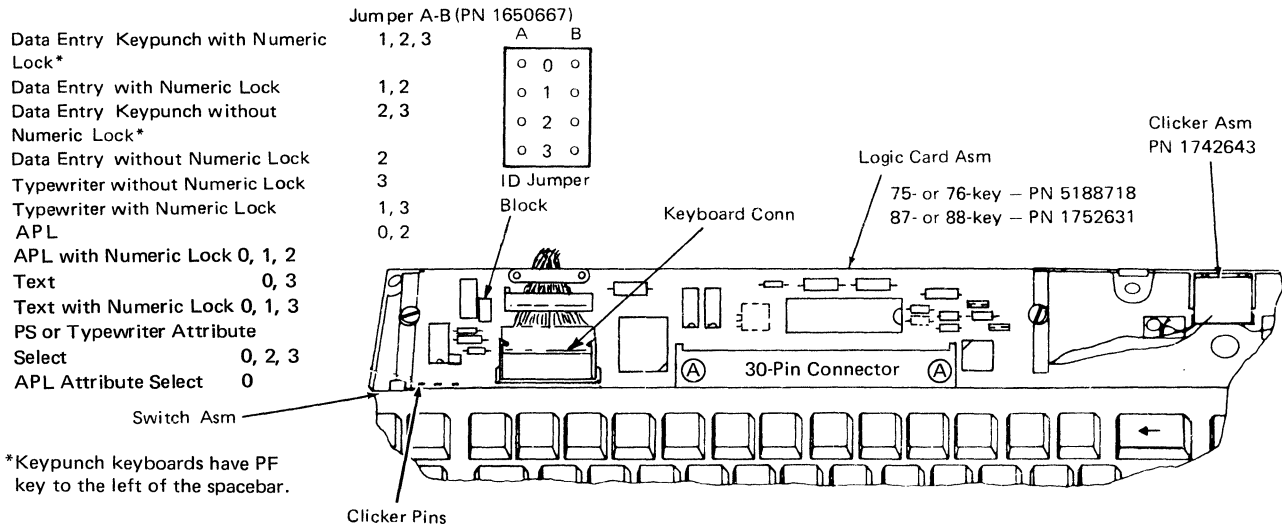


Figure 4-10. Keyboard

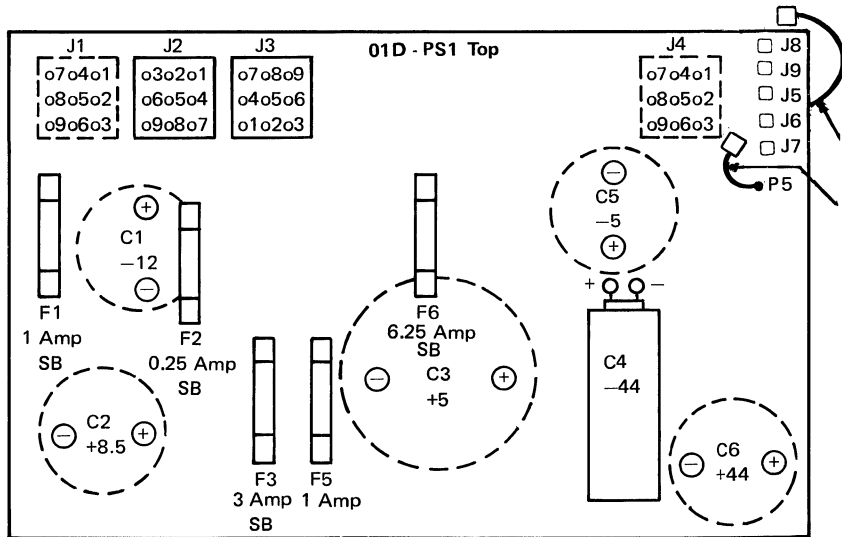


Figure 4-11. Fuse Locations – Low-Voltage Power Supply

Fuse	Voltage	PN
F1	6.3	303549
F2	-12	111261
F3	+8.5	338165
F5	+44	855253
F6	+5	2130253

Slip-On Conn to Ferro (present only on power supplies at EC level 788977A; not present on supplies at EC level 329955)

Jumper (must be connected to pin J6 with power supplies at EC level 329955)

Voltages at J Connectors	Max Ripple (Peak to Peak)
J2 - 1, 4, 7 +8.5 Vdc	0.25 Vac
2 +8.0 V \pm 1 V	1.5 Vac
5, 8 -12 Vdc	0.24 Vac
6 DC Return	
3, 9 6.3 Vac and Return	
J3 - 1 -44 Vdc	0.88 Vac
2, 5, 8 +5 Vdc	0.15 Vac
3, 6 -5 Vdc	0.15 Vac
4 +44 V	0.88 Vac
7, 9 DC Return	

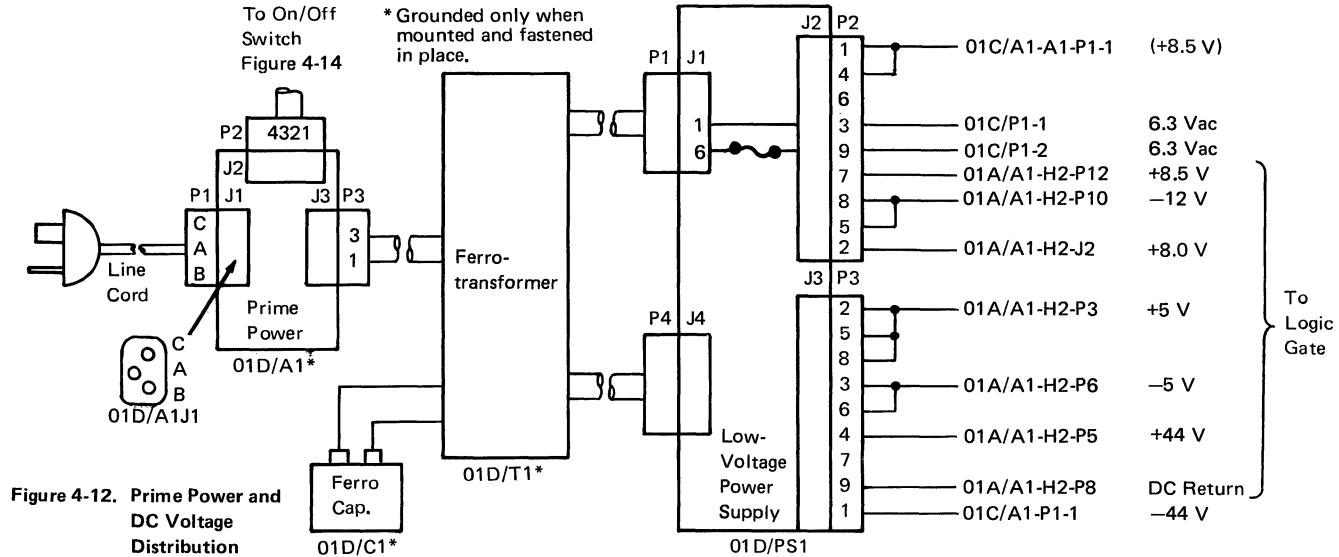


Figure 4-12. Prime Power and DC Voltage Distribution

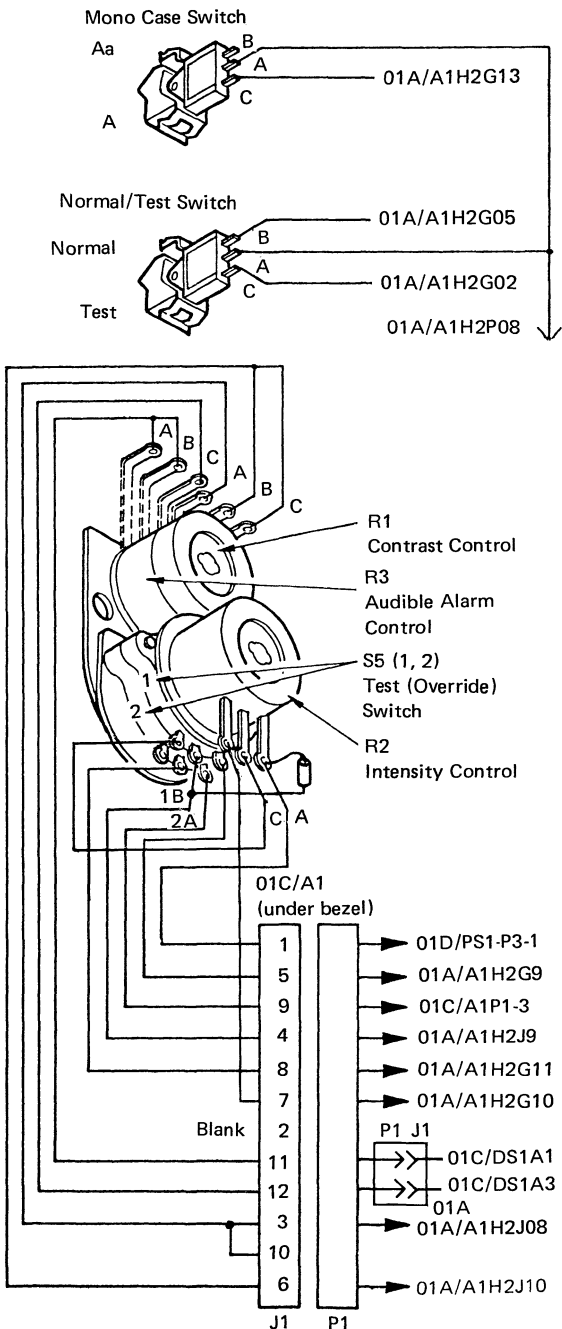


Figure 4-13. Operator Controls

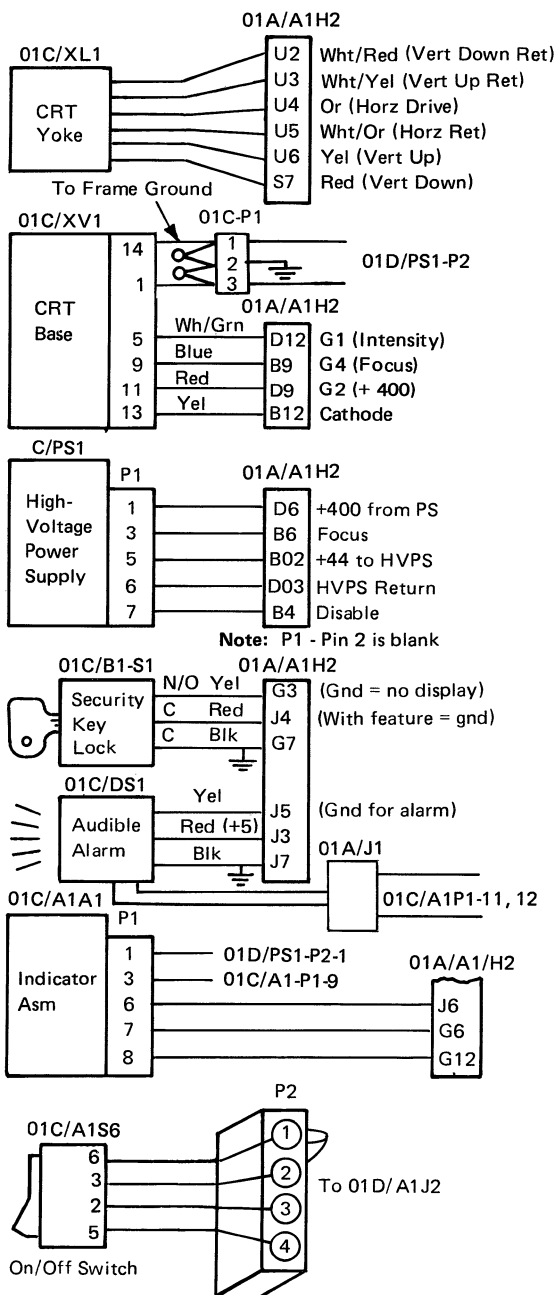


Figure 4-14. Operator Controls and Indicators

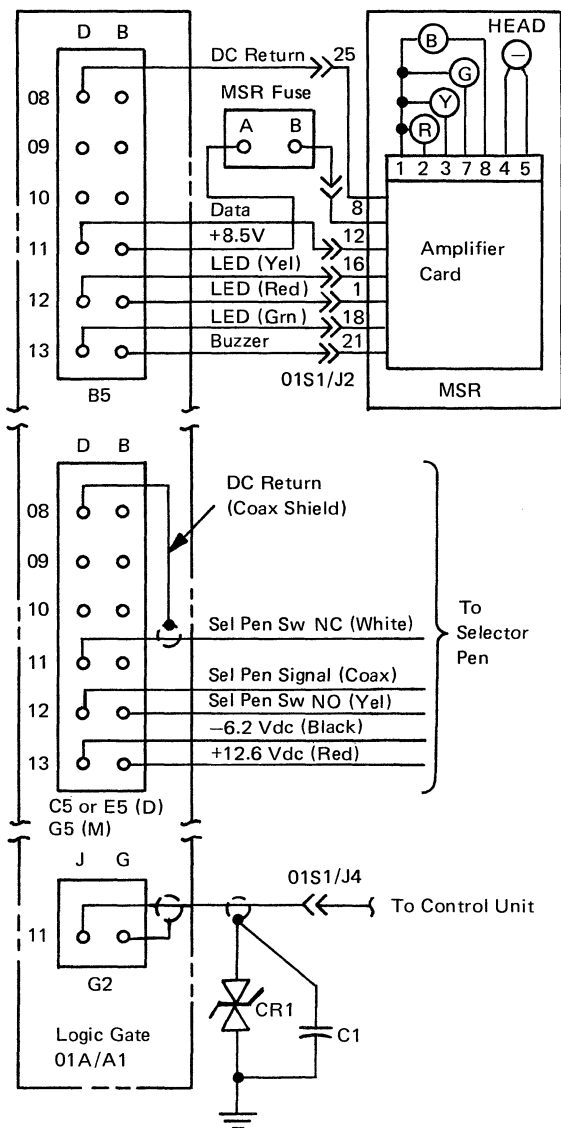
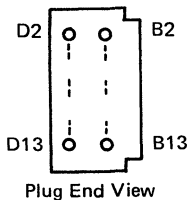
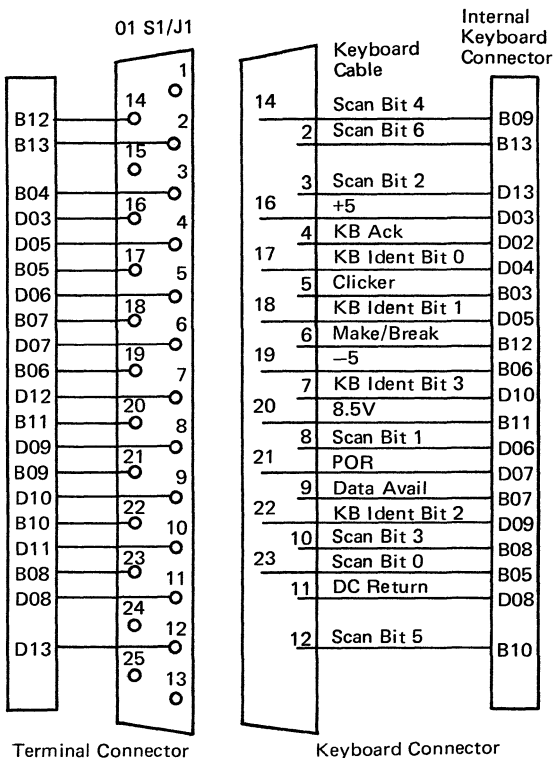


Figure 4-15. Feature Cabling

(M) 01A/A1F5
(D) 01A/A1G5



Probe Points

<i>Line Name</i>	<i>Static</i>	<i>Active</i>
1 Scan Bits 0–6	Down	Pulse up
2 Kybd ID Bits 0–3	Down/Jmpr	Up no jmp
3 Kybd ACK	Up	Pulse down
4 Clicker	Down	Up click
5 Make/Break	Down	Up pulse
6 POR	Up	Down after POR
7 Data Available	Up	Down pulse

Figure 4-16. Logic Gate to Keyboard Cables

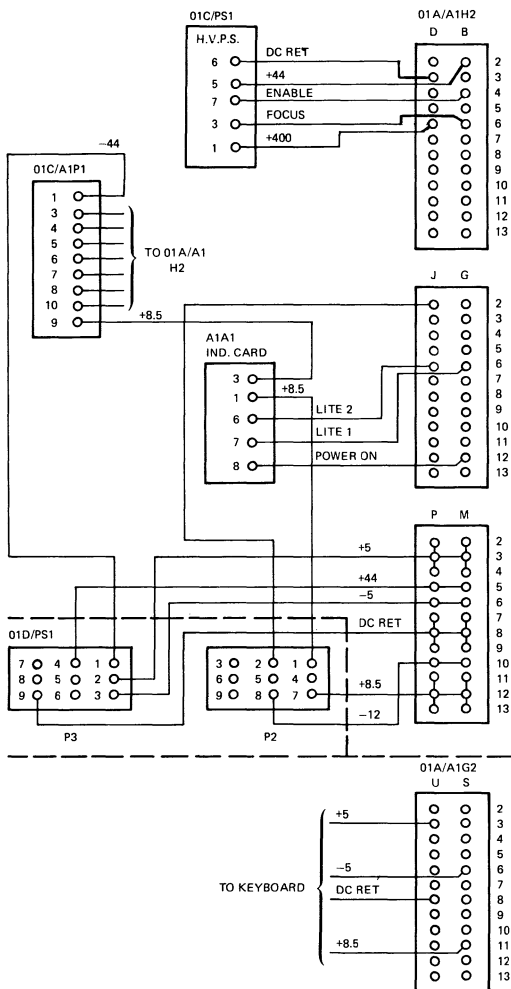


Figure 4-17. DC Power Distribution

3278 Top Card
Connector A2

3278 Rear I/O
01D/J5

22 0 0 2

33 0 0 13

W, X, or Z
Pin
Assignment

Y02		6
Y03		13
Y04		9
Y05		17
Y07		19
Y08		1
Y09		14
Y10		21
Y12		3
Y13		23
Y22		18
Y24		28
Y25		2
Y26		7
Y27		25
Y29		24
Y30		4
Y31		11
Y32		5
Y33		30
Z02		8
Z03		29
Z05		10
Z06		16
Z07		15
Z08		32
Z09		31
Z22		12
Z24		22
Z25		20
Z26	Signal Ground	27
Z31		26

Figure 4-18. Feature Bus Signal Cable

3278 Top Card
Connector A2

3278 Rear I/O
01D/J4

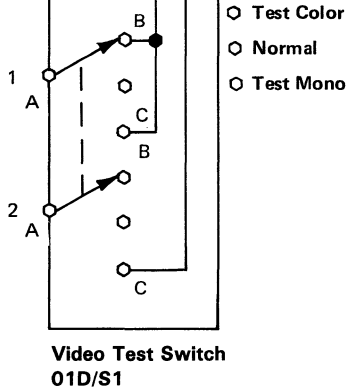
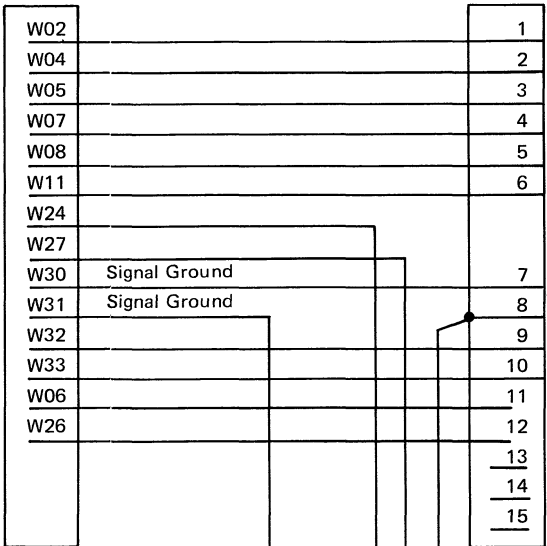


Figure 4-19. Video Cable

Chapter 5. Display Image Adjustments

Before checking the following adjustments, determine that all voltages are within tolerance (see MAP 01, step 028), set the Normal/Test switch to the Test position to display the test pattern, and install the alignment mask (PN 1743248) on the display screen.

5.1 Yoke Alignment and Centering

Disable vertical deflection by installing jumpers on the analog card test points (see Figure 4-6). Jumper test point A to C and C to B, or wrap a bare wire around all four pins. A single horizontal trace should be displayed. This trace should be parallel to, and vertically and horizontally centered on, line 1 on the alignment mask. If the trace is not parallel to line 1, the yoke must be aligned. If the trace is not centered, the centering rings must be adjusted (see Figure 5-2). In either case, the CRT cone shield must be removed before the adjustment is made.

5.1.1 Removing Cone Shield

To remove the cone shield, do the following after removing the top and side covers:

DANGER
Switch off the 3278, and then disconnect the power cord.

1. Remove the socket from the base of the CRT (see Figure 5-1).
2. Loosen the cone shield retaining screw (see Figure 5-1), rotate the cone shield counterclockwise until the locking tabs disengage, and pull the cone shield straight back to clear the CRT neck. Do not remove the yoke or yoke shield.
3. Reseat the socket on the CRT base, connect the power cord, and turn on the 3278.

5.1.2 Yoke Alignment

To adjust the yoke alignment, do the following:

1. Loosen the yoke clamp screw (see Figure 5-2).
2. Rotate the yoke by turning the yoke shield until the horizontal trace is parallel to line 1 on the alignment mask.
3. Be sure the yoke is firmly seated against the CRT bell, and tighten the yoke clamp screw.

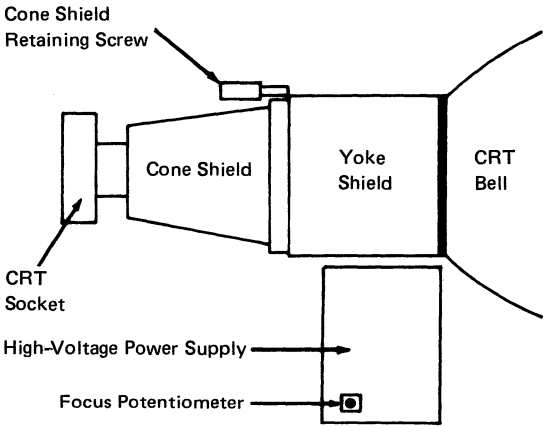


Figure 5-1. CRT and High-Voltage Power Supply

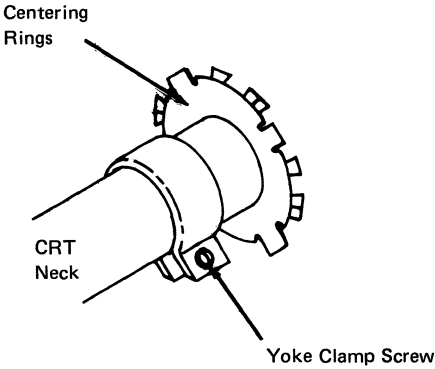


Figure 5-2. Yoke Adjustments

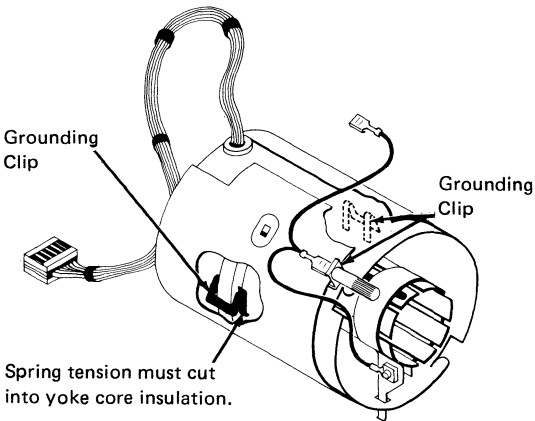


Figure 5-3. Yoke Grounding Clips

5.1.3 Centering and Horizontal Width

Turn the centering rings (Figure 5-2) to center the horizontal trace, both vertically and horizontally, on line 1 of the alignment mask. The width (length of the horizontal trace) should be 266.7 mm (10.5 in.) as indicated by line 2 on the alignment mask. You may have to adjust the width potentiometer, width (80), on the analog card (Figure 4-6), with the centering rings.

5.1.4 Reinstalling Cone Shield

When the yoke alignment, centering, and width adjustments are correct, remove the jumpers from the analog card test points and replace the cone shield by reversing the procedure in paragraph 5.1.1.

5.2 Analog Card Adjustments

There are five potentiometers (seven for Model 5) on the analog card (see Figure 4-6), which may need adjustment when the analog card is swapped, or at other times. Check the conditions described in the first paragraph of this chapter before continuing.

Note: *The Normal/Test switch must be in the Test position.*

1. See paragraph 5.1.3 for a description of the width potentiometer.
2. Install a jumper between pins E02 G04 and E02 J08 (D) or F2G12 to F2J08 (M).
3. Adjust the top margin potentiometer so the top trace of the first character line is centered on line 3 on the alignment mask for the appropriate model.
4. Adjust the character height potentiometer so the bottom trace of the last character line is near the line on the alignment mask for this 3278 model.
5. Remove the jumper installed in step 2, and adjust the row space potentiometer to obtain the total vertical height of 101.6 mm (4 in.) for a Model 1, 203.2 mm (8 in.) for all other models (line 7).
6. For Model 5 only:
 - a. Set the display to 132-character-width mode. For this test the Normal/Test must be in the Normal position and the 3278 must be connected to a properly customized 3274.

See step 21 of Test Mode 3 in paragraph 3.3.1.3; use normal cursor.

- b. Adjust the height and width potentiometers (Figure 4-6) to screen size as shown on the alignment mask.

7. Do *a* or *b* of this step.

- a. For displays without the IBM 3270 Personal Computer Attachment:

With the intensity control fully clockwise (and released) and the raster blanking potentiometer fully counterclockwise, is the background raster visible? If so, adjust the raster blanking potentiometer clockwise to just blank out the raster lines. With the intensity control fully counterclockwise, no display should be visible. Set the intensity control for readability. With the contrast control fully clockwise, the contrast between the high-intensity and normal-intensity fields is maximum. The normal-intensity fields may not display if intensity is set at a low level. Set the contrast control for readability.

- b. For displays with the IBM 3270 Personal Computer Attachment:

- (1) Set the contrast control and brightness controls fully clockwise.
- (2) Set the video test switch on the back of the display (Figure 5-4) to the Test Color position. A bar pattern will appear on the screen (Figure 5-5). With the intensity control fully clockwise and released, adjust the raster blanking potentiometer fully counterclockwise. Adjust the raster blanking potentiometer clockwise until the dimmest bar on the screen is just visible. The contrast control will have no effect with the video test switch in this position.
- (3) For Models 1-4 only:
Set the video test switch on the back of the display (Figure 5-4) to the Test Mono position. A bar pattern will appear on the screen (Figure 5-6).

Using the Model 5 analog card adjustment potentiometers (Figure 4-6), adjust the width (132) until the right edge of the right bar is centered on the right end of line 2 (width) on the alignment mask. The leftmost bar may extend beyond the left edge of the screen. If there is not enough range on the potentiometer to achieve this adjustment, adjust the potentiometer to its maximum width.

Adjust the height (132) potentiometer until the bottom trace of the mono bars is centered on line 5) CHAR HGT MOD 1 of the alignment mask.

- (4) Set the video test switch on the back of the display to the Normal position.

Set the brightness and contrast controls for readability.

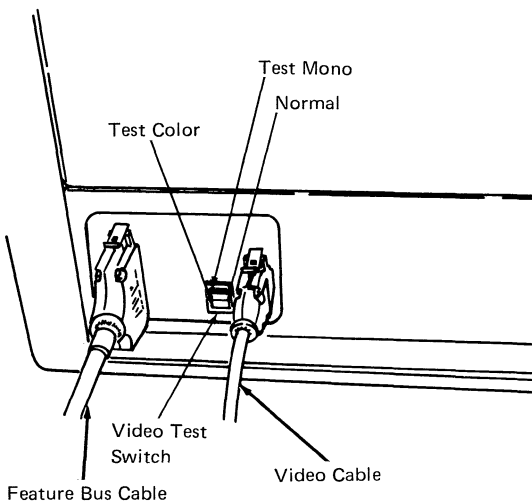


Figure 5-4. Rear of 3278 Display Cabled for IBM 3270 Personal Computer Attachment

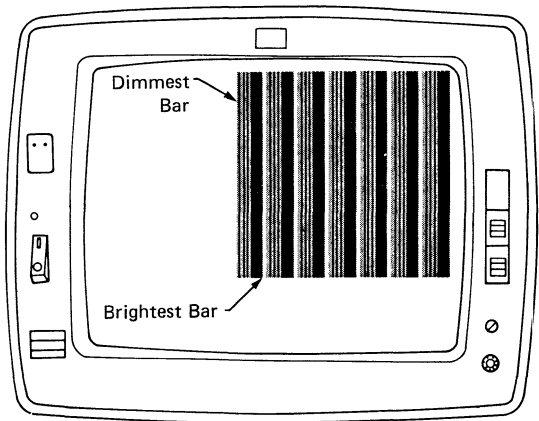


Figure 5-5. Test Color Video Test Pattern

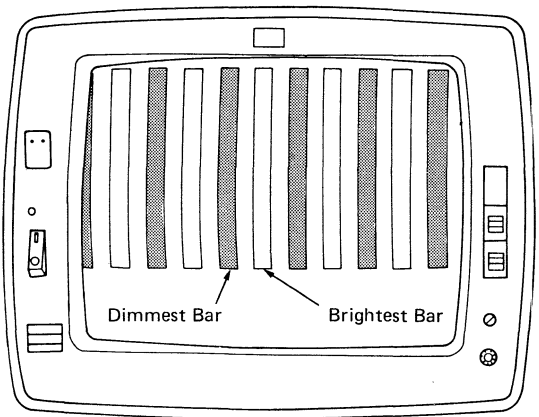


Figure 5-6. Test Mono Video Test Pattern

5.3 Focus Adjustment (U.S.A. and Canada Only at EC 329955 T)

The focus potentiometer is located on the high-voltage power supply (see Figure 5-1). Adjust the focus potentiometer for the best overall definition of the screen image characters at the center and those at the edge of the display area.

5.4 +44 V Power Supply Adjustment Procedures (Power Supplies at EC Level 788977A Only)

Note: *Power supplies at EC level 329955 are not adjustable, and the jumper must be connected to pin J6. (See Figure 4-11.)*

To adjust the +44 V power supply to the correct operating range (+44 to +48 V), perform the following steps.

A. Preparation

1. Switch off the 3278.
2. Connect the jumper to pin J6 on the low-voltage power supply. (See Figure 4-11.)
3. Switch on the 3278.

B. First Measurement

1. Measure the voltage at fuse 5 (+) to dc return (—).
2. If the voltage is between +44 and +48 V the adjustment is completed. Skip the following steps.
3. If the voltage is less than +44 V, go to step C.
4. If the voltage is greater than +48 V, go to step D.

C. Voltage Measured Is Less Than +44 V

1. Switch off the 3278.
2. Connect the jumper to pin J5. (See Figure 4-11.)
3. Switch on the 3278.
4. Measure the voltage at fuse 5 (+) to dc return (—).
5. If the voltage is between +44 and +48 V, the adjustment is completed. Skip the following steps.
6. If the voltage is still less than +44 V, one or more of the following conditions are present:
 - a. The +44 V power supply is defective.
 - b. The ferrotransformer is defective.
 - c. There is a logic or cable short.

D. Voltage Measured Is Greater Than +48 V (with jumper connected to pin J6)

1. Switch off the 3278.
2. Connect the jumper to pin J7.
3. Switch on the 3278.
4. Measure the voltage at fuse 5 (+) to dc return (-).
5. If the voltage is between +44 and +48 V, the adjustment is completed. Skip the following steps.
6. If the voltage is still greater than +48 V, go to step E.

E. Voltage Measured Is Greater Than +48 V (with jumper connected to pin J6)

1. Switch off the 3278.
2. Connect the jumper to pin J9.
3. Switch on the 3278.
4. Measure the voltage at fuse 5 (+) to dc return (-).
5. If the voltage is between +44 and +48 V, the adjustment is completed.
6. If the voltage is still greater than +48 V, one or more of the following conditions may be present:
 - a. The +44 V power supply is defective.
 - b. The ferrotransformer is defective.
 - c. There is a logic or cable short.

Chapter 6. Removals and Replacements

6.1 Covers

All removal and exchange procedures require that the desired unit be made accessible by removing the correct covers. You may leave the top cover on the display station while performing many maintenance procedures. This protects the CRT by partially covering it.

1. **Front cover:** Push backward on the latch at the top center. The cover moves forward at the top while pivoting on two pins at the bottom. Lift the cover off the pins.
2. **Side covers:** Before removing the right side cover, remove the security key, if it is inserted. Pull the front pin (under the front of the side cover) toward the front of the display. When the pin reaches the limit of movement, pivot the rear edge of the cover slightly away from the base and top cover. Lift the cover from the display station. The WTC side covers use a rear retainer spring that prevents movement of the front pin. Release the spring by using a screwdriver on the spring.
3. **Top/rear cover:** The top/rear cover can be removed only after both side covers are removed. Pull out the spring-loaded knobs at the lower right and lower left of the top cover and pivot up. Pull the top cover back slightly to disengage it from the guides in the CRT frame. Carefully lift the cover off the display station.

6.2 Power Units

DANGER

All power unit removal and exchange procedures must be performed with power off and with the power cord disconnected at the wall outlet.

(Switch off power before disconnecting the plug.)

6.2.1 Low-Voltage Power Supply

1. Remove the low-voltage shield by loosening the screw at the center of the shield.
2. Disconnect the two cable connectors (P2 and P3) on the low-voltage supply (J2 and J3); disconnect the slip-on connector from the tab at the upper-right corner of the assembly (Figure 4-11).

Note: *The slip-on connector is present on power supplies at EC level 788977A only.*

3. Remove the screw holding the assembly to the lower frame. (The screw is located at the bottom center of the assembly.)
4. Slide the assembly partially from the display station, and disconnect the two cables connected on the back of the assembly.
5. Slide the assembly from the display station.
6. Reinstall in the reverse sequence.
7. Use the adjustment procedure in paragraph 5.4 for the +44 V power supply (applies to power supplies at EC level 788977A only).

6.2.2 AC Capacitor

1. Holding the insulated handle of a screwdriver, short out the capacitor terminals with a metal shaft to discharge the capacitor.
2. Remove the rubber cover from the top of the capacitor (see Figure 4-3), and slide it back on the wire leads.
3. Pull the two leads from the capacitor terminals.
4. Pull the capacitor from the spring holder.
5. Reinstall in the reverse sequence. (This capacitor has no polarity.)

6.2.3 Prime Power Box

1. Disconnect the cable connectors plugged into the rear and top of the prime power box (see Figure 4-3).
2. Remove the ac capacitor as described in paragraph 6.2.2.
3. Disconnect the line cord from the receptacle if not previously done.
4. Remove the two screws holding the prime power box to the front of the frame.
5. Remove the assembly from the machine.
6. Reinstall in the reverse sequence.

6.2.4 Ferrotransformer

1. Remove the low-voltage power supply shield.
2. Remove the leads from the ac capacitor as described in paragraph 6.2.2.
3. USA/Canada: Remove the ferro connector from the prime power assembly.

4. WT except Canada: Disconnect the two wires (two screws) leading from the ferro terminal strip to the prime power assembly. Note where the leads are connected for reinstallation.
5. EMEA ferrotransformer only: Remove the screw fastening the ground wire (green/yellow) from the side of the prime power assembly.
6. Disconnect the two cable connectors and slip-on connector from the ferrotransformer to the low-voltage assembly.
7. Remove the outer mounting screw holding the ferro to the frame and loosen the inner screw.
8. Slide the transformer out of the frame.
9. Reinstall in the reverse sequence.
10. Check the +44 V supply using procedure 5.4 (applies to power supplies at EC level 788977A only).

6.2.5 High-Voltage Power Supply

1. Using an insulated jumper wire, ground the CRT anode terminal to discharge static charge. Carefully disconnect the CRT anode lead; static charge may be present.
2. Disconnect the input cable at the lower edge of the high-voltage assembly (see Figure 4-4).
3. Open the logic gate by loosening the front mounting screw located in back of the high-voltage supply support shield.
4. Remove the high-voltage supply mounting screw on the back of the high-voltage support shield.
5. Slide the power supply out of the support shield.
6. Reinstall in the reverse sequence. Ensure that the anode lead is firmly seated on the CRT bell.

6.2.6 Fuses

1. Fuses are located near the line-voltage cord socket and under the low-voltage shield.

6.2.7 Card/Connector Removal and Replacement Procedures

All cards and internal connectors (except the CRT socket) have mechanical locking devices.

6.2.7.1 Internal Connectors

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

Exchanging – Reseat the connector, and ensure that the tabs are latched.

6.2.7.2 Internal Coax

Removal – Press and hold the latch button, and pull the connector free from the pins.

Exchanging – Reseat and ensure that the connector is latched.

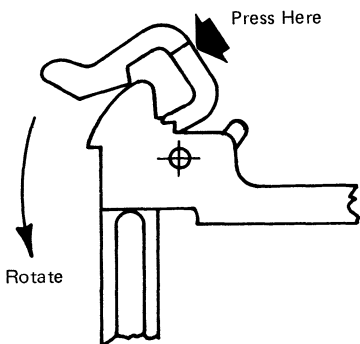
6.2.7.3 Cards

Removal – Unlock and rotate the extractor levers simultaneously at the top and bottom until the card disengages.

Exchanging – Open both extractor levers fully.

Insert the card holder tracks into the front guide fingers (card components towards hinge). Push in until the card holder tracks engage the rear fingers. *Do not use the extractor levers to reseat the card.* Apply firm finger pressure to the card holder (or connector housing for double-ended cards) to ensure proper contact seating.

After reseating, press firmly on the indicated surface of both extractor levers (top and bottom) and rotate simultaneously in the direction shown until latched.



6.2.8 Circuit Board Segments

1. Disconnect all the cabling at the gate.
2. Remove the top and the bottom board mounting screws.
3. Pull the outermost stiffener straight out until it is free of the alignment pins.
4. Remove the affected circuit board segment(s) by inserting the guide pins into the alignment holes in the inner stiffener, starting in card column "H". Ensure that the numerals and "This Side Out" (pin side) face out and that the "arrows" point upward. Seat the segment(s) firmly into all the card connectors.
5. Reinstall the outer stiffener over the alignment pins with the numeral "2" at the top and the "arrows" pointing upward.
6. Reinstall the mounting hardware and ensure that the card holders are equally centered in the gate opening; then tighten the screws and reinstall the cabling.
7. Check by using procedure 3.3.1 through step 2 of 3.3.1.3 (Test Mode 3) and procedure 3.3.2.2.

6.3 CRT

DANGER

All persons handling a CRT or who are near an exposed CRT under vacuum must wear safety glasses and long-sleeved garments.

1. Disconnect the power cord at the wall receptacle.
2. Remove the left, right, and top covers.
3. Open the logic gate by loosening the front mounting screw located in back of the high-voltage supply.
4. On units with the security keylock feature:
 - a. Mark the location of the keylock assembly mounting bracket on the side of the frame.

- b. Remove the screws holding the bracket to the frame.
 - c. Place the keylock assembly to give access to the lower-right CRT holding nut.
5. Using an insulated jumper wire, ground the CRT anode to discharge electricity.
6. Carefully disconnect the CRT anode lead. There may be an electric charge on the anode.
7. Disconnect the CRT socket ground lead from the CRT bell ground strap, located in front of the yoke assembly.
8. Remove the socket from the end of the CRT.
9. Remove the cone shield from the end of the CRT:
 - a. Loosen the cone shield retaining screw.
 - b. Turn the cone counterclockwise until the locking tabs disengage.
 - c. Pull the cone shield straight back and free of the CRT.
10. Remove the yoke ground wire from the CRT bell ground strap.
11. Loosen the yoke clamp screw, slide the yoke assembly off the CRT, and place it on the upper frame.
12. Open the new CRT container, and place the pad on a stable surface near the display station to support the old CRT when it is removed.

Warning: The following steps free the CRT from its mounting. The CRT weighs about 7.25 kg (16 pounds). Protect and support the CRT from too much pressure, which could damage the CRT or other units.

13. Remove the CRT holding nuts (4).
14. With the CRT resting on the mounting studs, carefully remove the grounding straps.
15. Connect the lifting strap (supplied with the new CRT) to the top CRT mounting tabs.
16. Carefully slide the CRT toward the rear of the display station and lift it from the unit.
17. Place the CRT face down on the pad.
18. Install the new CRT in the reverse sequence.

19. When tightening the CRT mounting nuts, ensure that the ground strap is flat against the CRT bell and under the spring. Gradually tighten the nuts, alternating from nut to nut until all are fully tightened.
20. See that the yoke cable is located at the top when replacing the yoke assembly.
21. Perform all display station image adjustments (see Chapter 5).
22. Tighten the yoke mounting screws after adjustments.

6.4 Yoke and Shields

The yoke and shield assemblies are removed from the CRT neck as a unit. After the assemblies are removed, they can be separated.

Note: *The top and rear covers must be removed, and the logic gate must be opened.*

1. Disconnect the yoke cable from the gate, and disconnect the ground wire(s) from the CRT bell ground strap.
2. Cut the yoke cable fasteners on the logic gate, and support. Disconnect the CRT socket ground lead from the CRT bell ground strap, located in front of the yoke assembly.
3. Remove the socket from the base of the CRT.
4. Remove the cone shield from the base area of the CRT:
 - a. Loosen the shield retaining screw.
 - b. Turn the cone shield counterclockwise until the locking tabs disengage.
 - c. Pull the cone straight back and clear of the CRT.
5. Loosen the yoke clamp, and carefully slide the assembly off the CRT.
6. Remove the clamp from the centering magnet assembly.
7. Separate the yoke from the shield by pressing the plastic tabs (4) located around the shield circumference, and slide the yoke forward (away from the clamp).

8. Remove the two grounding clips, noting the positions of these clips, and install them in the same positions on the new yoke.

CAUTION

Do not cut into the yoke wiring with the clips. Also ensure that the clips are cutting through the white insulation coating on the yoke core.

9. Before removing the centering magnet assembly from the yoke, note the orientation of the centering magnet assembly guides in relation to the split in the yoke windings. This assembly must be reinstalled with the assembly guides in the same orientation or the yoke wiring will not be positioned properly when installed in the shield. Remove the centering magnet assembly by lifting the four plastic tabs, and install them on the new yoke with the same orientation that they had on the old yoke.

Warning: Ensure that the centering magnet assembly guides are lined up with the split in the yoke winding.

10. Reinstall in the reverse sequence.
11. See that the yoke cable is located at the top when replacing the yoke assembly.
12. Push the yoke tightly against the CRT bell when tightening the yoke clamp. Do not tighten the screw fully until after the adjustments have been made.
13. Perform all the display image adjustments (see Chapter 5).
14. Tighten the yoke mounting screw fully after the adjustment.

6.5 Operator Controls

Operator controls are mounted to the CRT mask assembly. The mask assembly must be removed to replace any of the following controls.

6.5.1 CRT Frame Assembly

1. Remove the side and top covers.
2. Disconnect the On/Off switch cable connector from the top of the prime power box and remove the rubber cable retainer.
3. Remove the two screws from the upper rear of the CRT support.
4. While pulling the mask forward, press the plastic tabs located under the top cover ground spring, near the on/off switch, and near the intensity control.
5. Pivot the mask down in front of the unit.

6.5.2 On/Off Switch

1. Remove the rubber clamp from the cable clamp.
2. Press the plastic catch at the rear of the switch to one side, and pull the switch out.

6.5.3 Intensity and Contrast Controls

1. Pull off the two knobs and spacer or the audible alarm knob.
2. Disconnect the connector, and slip it out of the fasteners.
3. Expand the spring clips (2) with a screwdriver, and pull the control assembly off the pins.

6.5.4 Indicator Card Assembly

1. Remove the screw with spring.
2. Remove the connector and card assembly.

6.5.5 Switches

1. Remove the cable connectors. (Note where the leads are connected for reinstallation.)
2. Press the spring latch, and remove the switch.
3. Reinstall in the reverse sequence.

6.6 Optional Features

6.6.1 Audible Alarm

The audible alarm circuits are in a small metal box on the logic gate.

1. Remove the audible alarm box from the gate by loosening the mounting screws.
2. Remove the circuit board from the metal box.
3. Remove the cable wires from the audible alarm circuit board with longnose pliers or with a small screwdriver.
4. Reinstall in the reverse sequence. The circuit board is marked with the color code of wires to be connected.

6.6.2 Security Keylock

1. Remove the screws that hold the keylock assembly to the frame.
2. Remove the keylock assembly cover.
3. Remove the cable leads from the switch with pliers or with a small screwdriver. Note the terminals from which the leads are removed (for later connection).
4. Remove the cable fastener from the hole in the switch assembly.
5. Remove the cable from the keylock assembly.
6. Reinstall in the reverse sequence. Be sure to align the keylock assembly with the hole in the right side cover.

6.7 Keyboard Units

This section describes the procedures for removing and reinstalling the keyboard units. The following equipment may be required:

- | | | |
|--------------------|---|--|
| Keytop puller tool | - | PN 9900373 (preferred),
PN 75475, or PN 627953 |
| Isopropyl alcohol | - | PN 2200200 (or IBM tape
transport cleaner -
PN 453511) |
| Cloth (lint-free) | - | PN 2108930 (or tissue -
PN 2123106) |

6.7.1 Keyboard from Display Station

1. Switch off power.
2. Remove the display station front cover.
3. Remove the cable ground wing nut from the frame.
4. Free the cable fastener, 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.

6.7.2 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.*

6.7.3 Keyboard Assembly from Base

1. Switch off power.
2. Disconnect the keyboard from the display station. (See par. 6.7.1.)
3. Remove the keyboard top cover. (See par. 6.7.2.)
4. Disconnect the keyboard cable connector and clicker connector at the logic card.
5. Remove the two screws that hold the keyboard assembly to the mounting. (Mark for alignment reference.)
6. Lift the keyboard assembly off the mounting and remove the logic card assembly from the keyboard per paragraph 6.7.8.
7. Reinstall in the reverse sequence.
8. Ensure that the cable connector is tightly seated.

6.7.4 Clicker Assembly

1. Switch off power.
2. Disconnect the keyboard from the display station. (See par. 6.7.1.)
3. Remove the keyboard top cover. (See par. 6.7.2.)
4. Remove the keyboard assembly from the base. (See par. 6.7.3.)
5. Disconnect the clicker connector.
6. Remove the clicker assembly by sliding the bail fastener from under the cast tabs.
7. Reinstall in the reverse sequence.

6.7.5 Keybutton

Remove buttons by sliding the keytop puller tool over the keytop and pulling straight up.

6.7.6 Key Module

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

1. Switch off power.
2. Disconnect the keyboard from the display station. (See par. 6.7.1.)
3. Remove the keyboard top cover. (See par. 6.7.2.)
4. Remove the keybutton from the module that will be swapped. (See par. 6.7.5.)
5. Remove the keyboard assembly from the base. (See par. 6.7.3.)
6. Invert the keyboard, and place it on the base pins located on the left and right sides.

6.7.6.1 Key Module Removal (Including Spacer Module)

Note: See par. 6.7.7A, *Spacebar Removal*, if the spacebar module is to be swapped.

1. Remove the screws that hold the base plate and circuit board to the all-keys assembly.

2. Lift the circuit board from the all-keys assembly, and place the circuit board on its base in a clean area.
3. Handle the all-keys assembly by the sides. Be careful not to press any keys. Lift the all-keys assembly off the base, turn it over, and place it on the base.

Note: *Swap the key module if the flyplate comes off. Do not attempt to repair the module. Repaired modules can cause intermittent failures.*

4. Press down on the key module until it is free of the holding plate.
5. Lift the edge of the all-keys assembly nearest the key module that has just been removed. Remove the bad module.
6. Lift the all-keys assembly by the edges, and invert it on its base.

6.7.6.2 Key Module Replacement

1. Ensure that the alignment tab and the angled key-stem are in the same position as those of the other modules in the all-keys assembly.
2. Install the new module (PN 1748131) 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 all key module flyplates for any foreign matter, and carefully clean if needed.
4. Align the holding screw holes through the baseplate, circuit board, insulator, and top insulator (if used). Lower the circuit board assembly on 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.

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.

6.7.7 Spacebar

Perform the removals described in pars. 6.7.1 and 6.7.2 for access to the keyboard assembly.

A. Spacebar Removal

1. Hold the spacebar button at each end (beyond the modules), and remove by pushing upward evenly.
2. Remove pivots (if necessary) by pushing with a screwdriver in the slot in the side of the pivot.

B. Spacebar Exchange

1. Press any pivots removed in step 2 (above) into the mounting frame.
2. Place the spacebar button 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 the spacebar button.
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 if it was previously removed.

6.7.8 Logic Card Assembly

1. Disconnect the keyboard from the display station.
2. Remove the keyboard top cover. (See par. 6.7.2.)
3. Disconnect the keyboard cable connector and clicker connector at the logic card.
4. Remove the two holding screws from each end of the logic card.

5. Remove the logic card by pressing outward on each end of the 30-pin connector housing (points A in Figure 4-10).

Reinsert the card by applying pressure inward on the same area of the 30-pin connector housing as for removal.

Note: *Always remove and insert the logic card by applying pressure to the 30-pin connector housing. Do not pull, tilt, or press on the card area.*

6. Reinstall in the reverse sequence.

Note: *Check that the keyboard ID jumpers on the new logic card are in the same positions as on the old logic card. See Figure 4-10.*

6.8 Selector Pen

1. Switch off the unit.
2. Hold rear portion of barrel and selector-pen cord in one hand. Unscrew cone-shaped tip counterclockwise to remove the lens assembly.
3. Reinstall the lens assembly, and screw the cone-shaped tip clockwise to reassemble the selector pen.

Warning: Do not overtighten the cone-shaped tip when reassembling.

Chapter 7. Magnetic Slot Reader Information

The magnetic slot reader (MSR) and the magnetic hand scanner (MHS) are devices used to read data encoded on different types of magnetic striped documents, such as adhesive labels on card stock, tags, and plastic cards. An audio beeper and three light indicators present feedback information to the operator.

The MSR components are packaged in a plastic housing which has a slot that serves as the document path. The MHS is a hand-held device whose components are also packaged in a plastic housing. The repair and maintenance of both devices is a customer responsibility.

Neither device may read magnetic stripes accurately if the stripes contain any of the following defects: tears, scratches, contaminants, demagnetized areas, wrinkles (surface irregularities), and voids.

Head element cleaning is performed by the customer as required. The recommended method of cleaning is to wipe the element with a cloth wetted with isopropyl alcohol. Refer the customer to the *Magnetic Hand Scanner – Magnetic Slot Reader Replacement Procedures* manual, GA24-3663.

Glossary

The terms defined in this glossary apply to the 3278 Display Station and its attachment to the 3274 and 3276 Control Units.

Analog card: A circuit card that converts digital information into high-level signals for writing characters on the display screen.

Attribute: A byte of data that specifies the kind of display field. An attribute can specify the field as protected or unprotected, for numeric, alphanumeric, intensity, selector-pen detectability, and modification.

Bell: The sides of the cathode-ray tube (CRT) between the display screen and the neck. (See Figure 5-2.)

Blanking: The ability to prevent writing on the screen.

Clicker: An assembly that, when enabled, generates a small sound when a key on the keyboard is pressed. The sound indicates to the operator that the keyboard has recognized the key pressed.

Coax: A shielded cable containing a single conductor.

Cone shield: A shield mounted on the neck of the CRT. (See Figure 5-1.)

Contrast: The difference in light intensity between displayed characters.

Cursor: An underscore symbol that identifies a character position in a screen display, usually the character position at which the next character to be entered from the keyboard will be displayed.

(D): The logic type using three base cards. (See Figures 1-1, 4-6, and 4-7.)

Divider scan: The straight line that is continuously written on the display screen above the bottom line. (See Figure 3-1.)

Dual intensity: The ability to have two levels of brightness for the characters displayed on the display screen.

Ferro: The ferrotransformer. (See Figure 4-3.)

Filament: An internal part of the CRT, located in the neck, that glows when voltage is applied.

Flyplate: The part of the key module, suspended on springs, that snaps on the circuit board when the keybutton is pressed.

Handrest: The part of the keyboard cover where the heel of the hand can be placed for greater ease in entering data and operating the repeat-action keys.

Keybutton: The molded keytop that is installed on the keystem.

(M): The logic type using two base cards. (See Figures 1-2, 4-8, and 4-9.)

Mask: The frame surrounding the display screen. (See Figure 4-5.)

Neck: The narrow portion of the CRT between the bell and the CRT socket. (See Figure 5-1.)

Prime: The compartment where the power cord is attached to the display station.

Raster: The visual sweep of the electron beam on the display screen. The raster is normally present only when the intensity control is in the override position.

Security Keylock: A key-operated switch that allows use of the display station.

Sweep: A single movement of the electron beam, either vertically or horizontally, on the display screen.

Top card connector: A connector that is used to provide additional connections between two or more logic cards that have connectors on the edge of the card opposite the card base.

Yoke: The deflection coil assembly that is installed on the CRT neck. (See Figures 4-5 and 5-1.)

READER'S COMMENT FORM

3278 Display Station
Models 1, 2, 3, 4, and 5
Maintenance Information

SY27-2510-7

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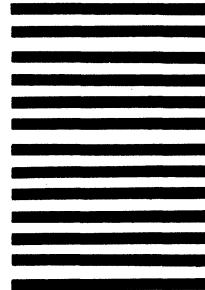
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