3278 Display Station Models 1, 2, 3, 4, and 5 Maintenance Information
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
Ferrocapacitor 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.
LINE VOLTAGE PRESENT WITHIN ENCLOSURE WITH MACHINE POWER OFF DANGER

Figure A. Lower Frame Labels
HAZARDOUS AREA
TRAINED SERVICE
PERSONNEL ONLY

Figure B. CRT and CRT Frame Assembly Labels

DANGER
18000 V

X-RADIATION
(Germany only)

Figure C. Upper Frame Labels

DANGER
TEMPERATURE
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.

Thumb and finger positions

Final mouth to mouth position
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
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 reseat/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 reseat 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**

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 workstation:**
   - **Subsystem Read:** ________________ or ________________
   - **Host Connection:** ________________ or ________________
   - If one of these three symbols is displayed, insert the 2 or 3-digit code following the symbol.
     - **Communication Problem:** __________
     - **Program Error:** __________
     - **PROG:** __________

3. If the display station is a 3279 or 3278, 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.**
   - **All keys fail.**
   - **All PF keys fail.**
   - **All character keys fail.**
   - **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.**

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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   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
        ± 10%.) See par. 5.4 for 44 V adjustment.
    4. Check the ferrocapacitor for proper opera-
        tion 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.

N

2
A
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.

---

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.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Display blank (no cursor, divider line, or light on screen):</td>
<td>Hold the intensity control fully clockwise (Test position), and check for symptoms a, b, and c.</td>
</tr>
<tr>
<td>a. Normal raster or raster on upper or lower half of screen</td>
<td>(D) A1E2 A1F2</td>
</tr>
<tr>
<td>b. Single line or glow at top of screen</td>
<td>A1G2</td>
</tr>
<tr>
<td>c. No raster</td>
<td>Check fuse 1 on the low-voltage power supply. Swap the high-voltage power supply.</td>
</tr>
</tbody>
</table>

2. Display dim at maximum intensity, or raster visible at minimum intensity. |

3. Displays single line at top or center of screen, or data only on bottom half of screen. |

4. Displays widely spaced diagonal lines or is out of sync (moving or vibrating screen). |

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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Displays full raster with intensity set to normal (cursor may also display); or each character position displays the full character space.</td>
<td>(D) A1E2 A1H2 A1F2</td>
</tr>
<tr>
<td>6. Displays one of the following:</td>
<td>A1F2 A1G2</td>
</tr>
<tr>
<td>• Divider Line only</td>
<td></td>
</tr>
<tr>
<td>• Divider Line and a line at bottom of screen</td>
<td></td>
</tr>
<tr>
<td>• Random data after power on</td>
<td></td>
</tr>
<tr>
<td>• Test pattern when online</td>
<td></td>
</tr>
<tr>
<td>8. a. Display size changes when intensity is changed.</td>
<td>Reseat/swap the high-voltage power supply. (See par. 6.2.5.1)</td>
</tr>
<tr>
<td>b. Intensity control has no effect.</td>
<td>Check the -44 V on the low-voltage power supply.</td>
</tr>
<tr>
<td>9. Display tilted or incorrect size.</td>
<td>Adjust the yoke or analog card potentiometers. (See par. 5.1.)</td>
</tr>
<tr>
<td>10. Cursor missing, will not blink, or reverse.</td>
<td>Verify with the Normal/Test switch in the Test position, Check the analog card adjustment. (See Chapter 5.)</td>
</tr>
<tr>
<td>(D) A1E2 A1G2</td>
<td></td>
</tr>
<tr>
<td>11. Normal/Text switch operation failure.</td>
<td>Check the switch and cables. (See Figure 4-13.)</td>
</tr>
<tr>
<td>12. Monocase (A, a/A) switch operation failure.</td>
<td>(D) A1E2 A1G2</td>
</tr>
<tr>
<td></td>
<td>Check the switch and cables (See Figure 4-13.)</td>
</tr>
<tr>
<td>Symptom</td>
<td>Action</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>13. Incorrect characters display and Device Check is indicated (Machine Check = X 77).</td>
<td>A1G2 A1F2</td>
</tr>
<tr>
<td>14. Incorrect characters display without Device Check; or extra or missing dots on screen.</td>
<td>(D) A1E2 A1G2 A1F2</td>
</tr>
<tr>
<td>If in APL/Text mode only</td>
<td>Reseat/swap ROS module in 01A/A1D2 (D) or 01A/A1E2 (M) (D) A1D2 or (M) A1E2</td>
</tr>
<tr>
<td>If PS characters only.</td>
<td>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)</td>
</tr>
<tr>
<td>15. Test Mode 1 characters incorrect on half or all of the screen, or in incorrect sequence.</td>
<td>A1G2 (D) A1E2 A1F2</td>
</tr>
<tr>
<td>16. Will not change row length (Model 5 only).</td>
<td>A1F2 A1H2</td>
</tr>
<tr>
<td>17. Keyboard not working, input inhibit not indicated. Characters do not enter.</td>
<td>(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).</td>
</tr>
<tr>
<td>Symptom</td>
<td>Action</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>18. One keyboard key fails.</td>
<td>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.</td>
</tr>
<tr>
<td>19. Incorrect characters enter from keyboard.</td>
<td>(D) A1G2&lt;br&gt;(M) A1F2&lt;br&gt;Reseat/swap the keyboard logic card. Check the keyboard/PC mounting screws. Check the keyboard cables. (See Figure 4-16.)</td>
</tr>
<tr>
<td>20. 3278 cannot be logged online.</td>
<td>Check:&lt;br&gt;- Run L Test 0 (AA/0) to enable&lt;br&gt;- Security Key on (clockwise)&lt;br&gt;- Normal/Test switch in Normal position&lt;br&gt;- Coaxial cable connector seated&lt;br&gt; A1G2&lt;br&gt; A1F2&lt;br&gt;(D) A1E2&lt;br&gt;Go to Entry Point A, MAP 05.</td>
</tr>
<tr>
<td>22. MSR/MHS failures.</td>
<td>A1B4&lt;br&gt;A1G2&lt;br&gt;Reseat/swap the MSR.</td>
</tr>
<tr>
<td>23. Error codes indicated.</td>
<td>See 3.3.2.3, Error Log Display, and 3.3.2.5, Error Log/Repair, Action.</td>
</tr>
<tr>
<td>24. APL/Text mode errors.</td>
<td>(D) A1D02&lt;br&gt;A1G02&lt;br&gt;(M) A1E2</td>
</tr>
</tbody>
</table>

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**MAP 01**

Terminal Failure MAP

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**ENTRY POINTS**

<table>
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<tr>
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<th>ENTRY POINT</th>
<th>PAGE NUMBER</th>
<th>STEP NUMBER</th>
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<tbody>
<tr>
<td>00</td>
<td>A</td>
<td>2</td>
<td>001</td>
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</tbody>
</table>

**EXIT POINTS**

<table>
<thead>
<tr>
<th>EXIT THIS MAP</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAGE NUMBER</td>
<td>STEP NUMBER</td>
</tr>
<tr>
<td>3</td>
<td>008</td>
</tr>
<tr>
<td>3</td>
<td>012</td>
</tr>
<tr>
<td>3</td>
<td>011</td>
</tr>
<tr>
<td>3</td>
<td>010</td>
</tr>
<tr>
<td>3</td>
<td>009</td>
</tr>
<tr>
<td>5</td>
<td>022</td>
</tr>
</tbody>
</table>

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)
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
NOTE: See Test Section 3.3.2.2 for feature test procedures.

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

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

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

Go To Map 00, Entry Point A.

Go To Map 05, Entry Point A.

Go To Map 04, Entry Point A.

Go To Map 03, Entry Point A.

Go To Map 02, Entry Point A.
After checking operator brightness control, adjust raster blanking (see 5.2 analog card adjustments step 7).

Is display still too dim?
Y N

Return to customer.

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

Is display still too dim?
Y N

Return to customer.

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

Are voltages correct?
Y N

Use Figures 4-12, 4-13, 4-14 to isolate.
Terminal Failure MAP

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

Did fuse fail?
Y N

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

Are all fuses good?
Y N

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

Did fuse or fuses fail again?
Y N

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

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

Did fuse(s) fail again?
Y N
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
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.
Repair or exchange the Low Voltage cable. See Figure 4-12 for wiring figure.

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

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

Reverify power source outlet. If outlet is good, exchange ferro.
Verify DC voltages:

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

(Voltages are ± 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+/−1volt 01D/PS1-J2-2, (derived from +8.5V supply).

Are all voltages correct?

Y N

Switch unit off.
Remove analog card.
Switch unit on.
Verify voltages as shown in preceding step.

Is one or more voltages incorrect?

Y N

Switch power off.
Exchange analog card 01A/A1H2.
Switch unit on.
Adjust as required (see 5.2).
Test for proper operation.
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
Switch unit off.
Exchange low voltage power supply. 
Reinsert logic cards, keyboard cable and analog card.
Switch power on.
Test for proper operation.

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

Exchange Intensity/Contrast Control (see 6.5.3).
Reinsert analog card, 01C/A1P1 and mask assembly.
Switch power on.
Test for proper operation.

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.
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
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.
Switch unit off.
Remove plug P3 from J3 on main power box.
Exchange fuse.
Switch Unit On.

Did fuse fail again?

Y N

Swich 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

Exchange low voltage power supply.
Verify correct operation.

Exchange ferro transformer.
Verify correct operation.

Exchange main power box.
Reconnect and verify correct operation.

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

Y N
Terminal Failure MAP

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.

SY27-2510-7 (3/83) 2-01-15
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

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### ENTRY POINTS

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<tr>
<th>FROM MAP NUMBER</th>
<th>ENTER THIS MAP</th>
<th>ENTRY POINT</th>
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<th>STEP NUMBER</th>
</tr>
</thead>
<tbody>
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<td>A</td>
<td>1</td>
<td>001</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>B</td>
<td>7</td>
<td>030</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>C</td>
<td>14</td>
<td>070</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>D</td>
<td>19</td>
<td>092</td>
<td></td>
</tr>
</tbody>
</table>

### EXIT POINTS

<table>
<thead>
<tr>
<th>EXIT THIS MAP</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAGE NUMBER</td>
<td>STEP NUMBER</td>
</tr>
<tr>
<td>2</td>
<td>002</td>
</tr>
<tr>
<td>23</td>
<td>112</td>
</tr>
<tr>
<td>2</td>
<td>004</td>
</tr>
<tr>
<td>24</td>
<td>117</td>
</tr>
<tr>
<td>MAP NUMBER</td>
<td>ENTRY POINT</td>
</tr>
<tr>
<td>01</td>
<td>A</td>
</tr>
<tr>
<td>03</td>
<td>A</td>
</tr>
<tr>
<td>04</td>
<td>A</td>
</tr>
<tr>
<td>05</td>
<td>A</td>
</tr>
</tbody>
</table>

**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)
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.
Insert 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
Is there a normal divider line on the screen? 
Y N

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

Is there a normal cursor on the screen? 
Y N

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

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

Does the intensity control affect the light on the screen? 
Y N

Exchange and adjust the 01A/A1H2 card.

Is the problem still present? 
Y N
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.
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.
Is the display flashing on and off?

Y  N

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.

Hold intensity control in override position.

Does raster flash off and on?

Y  N

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.

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

2-02-6  SY27-2510-7
Exchange Low Voltage Power Supply.
Check for proper operation.

Return to customer.

(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

Is the screen blank?
Y N

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

Is problem still present?
Y N

Reconnect coax signal cable, feature card(s).
Verify position of 01A/A2 for normal operation if present.
Test for proper operation.
MAP 02
Display MAP

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

Did fuse fail again? (permit 30 sec.)

Y N

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

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

Does fuse fail again?

Y N

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.

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.
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. Verify correct operation.

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.

Does raster appear normal? (Covers full display area)

Y N

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

Y N

1 1 1
1 1 1
S T U
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
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.

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

Is there a cursor on the screen? Y N

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

Is there a divider line on the screen? Y N

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

Is the divider line near the bottom of the screen? Y N
Go to Page 7, Step 030, Entry Point B.

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.)

Switch key to ON (Full clockwise).

Has the problem been corrected?

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

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

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

(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
Is there a reverse flashing cursor on the screen?

Y  N

Is the test pattern correct except for cursor?

Y  N

Is the display correctly adjusted?

Y  N

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.

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.
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
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.

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

Has the problem been corrected?
Y  N

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.

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

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

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

Is problem still present?
Y  N
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.
Are displayed characters readable but some/all missing or wrong?

Y  N

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

Exchange 01A/A1H2 card.
Verify correct operation.

End of call.

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

Are both upper and lower case characters displayed?

Y  N

2-02-20  SY27-2510-7
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.
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.
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.
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

Verify correct operation.

Go To Map 05, Entry Point A.
### ENTRY POINTS

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<td>001</td>
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<tr>
<td>05</td>
<td>A</td>
<td>1</td>
<td>001</td>
</tr>
</tbody>
</table>

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

Y  N

Exchange the module for the failing key. (See Keyboard section 6.7). Verify repair by using Test Mode 2.

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.
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.

Verify seating of keyboard cable connector to the terminal.

Is problem still present?
Y N

Verify correct operation.

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

Is problem still present?
Y N

Verify correct operation.
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.

Is this a clicker failure?
Y N

Exchange the failing part by using the Keyboard repair section.

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
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.
**ENTRY POINTS**

<table>
<thead>
<tr>
<th>FROM</th>
<th>ENTER THIS MAP</th>
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<tbody>
<tr>
<td>MAP NUMBER</td>
<td>ENTRY</td>
</tr>
<tr>
<td>01</td>
<td>A</td>
</tr>
</tbody>
</table>

**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
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

(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

Did the MSR feature card cause the problem?
Y N
<table>
<thead>
<tr>
<th>Step</th>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>007</td>
<td>Did the ECS/TEXT feature card cause the problem?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>008</td>
<td>Did the PS card cause the problem?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>009</td>
<td>Did the security key lock cause the problem?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>010</td>
<td>Did the audible alarm cause the problem?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>011</td>
<td>Is there a personal computer adapter card present?</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>012</td>
<td>Trouble has disappeared or is intermittent. Reconnect the coax signal cable and test for proper operation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.
MAP 04
Feature Error MAP

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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
Is this a failure of the PS feature?
Y N

Is this a failure of the security key lock?
Y N

Is this a failure of the audible alarm?
Y N

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

Start over at MAP 00.

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

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

Go to Page 18, Step 080, Entry Point H.
Go to Entry Point D to verify switch settings on ECS Feature Card.

Are switch settings correct?
Y N

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

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

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

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.
Return to customer.

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

- 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

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.

Return to customer.
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

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

End of call.

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

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(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

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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.
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

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

Did fuse fail?

Y N

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 (±10%).
Use Fig 4-15 to trace voltage from logic card to MSR connector.
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= minus 5 VDC.
01A/B5B11= plus 8.5 VDC.
If all voltages correct (±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.
Place the test/normal switch in TEST position. Read in the test card.

Did the yellow light on the MSR come on?

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).

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?

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?

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).
Return to customer.

Return to customer.
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

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

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.
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

Exchange the selector pen.
Verify for correct operation.

Is the problem still present?

Y N

End of call.

Exchange 01A/A1G02, E02, F02 (D) or 01A/A1F2, G2 (M).
Verify for correct operation.
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.
MAP 05
System Indicated Failure MAP

ENTRY POINTS

<table>
<thead>
<tr>
<th>FROM</th>
<th>ENTER THIS MAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAP NUMBER</td>
<td>ENTRY PAGE STEP NUMBER</td>
</tr>
<tr>
<td>01</td>
<td>A 1 001</td>
</tr>
<tr>
<td>01</td>
<td>B 2 007</td>
</tr>
</tbody>
</table>

001

EXIT POINTS

<table>
<thead>
<tr>
<th>EXIT THIS MAP</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAGE STEP NUMBER</td>
<td>MAP ENTRY POINT</td>
</tr>
<tr>
<td>7 037</td>
<td>03 A</td>
</tr>
<tr>
<td>5 020</td>
<td>04 A</td>
</tr>
<tr>
<td>7 035</td>
<td>04 A</td>
</tr>
</tbody>
</table>

<Entry Point A>

Does the indicator row, on the screen, display an error code?

Y N

7 2
A B

SY27-2510-7 (3/83) 2-05-1
Are there any characters or symbols displayed in the indicator row?

Y  N

Is the Test/Normal switch in the Normal position?

Y  N

Put switch in Normal position.
Verify correct operation.

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

Y  N

Switch ON and verify correct operation.

(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
No or Don’t Know. Switch unit off then on.

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

Y N

Exchange 01A/A1G2 card.

Is problem still present?

Y N

Verify correct operation.

(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

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.
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 reseat 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

2-05-4
SY27-2510-7
Does this Terminal contain feature cards?  
Y N

Exchange card 01A/A1G2.  
Verify correct operation

Go To Map 04, Entry Point A.

(Entry Point C)

Error code 77 for 3276 or 04 for 3274?  
Y N

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

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

End of call.

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

Is problem still present? 
Y  N

End of call.

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

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

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

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.
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

End of call.

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

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).

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 1: Pattern Display</td>
<td>Displays a predetermined pattern of characters.</td>
<td>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 character generator, storage, and control logic. 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.</td>
</tr>
<tr>
<td>Mode Entry:</td>
<td>Set Aa/A to Aa.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Set Normal/Test to Test.</td>
<td></td>
</tr>
</tbody>
</table>
Test Pattern for Model 1:

Line 1

Line 2

Op Inf Area

Test Pattern for Models 2, 3, 4, and 5:

Line 1

Line 2

Op Inf Area

Figure 3-1. Test Patterns
Test Pattern for Model 1:

Line 1

Line 2

Op Inf Area

Test Pattern for Models 2, 3, 4, and 5:

Line 1

Line 2

Op Inf Area

Figure 3-2. Japanese Katakana Test Patterns
Figure 3-3. Japanese English Test Patterns
3.3.1.2 Test Mode 2

Test Mode 2:
Key-to-CRT Test (used to test the keyboard 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 keytops, 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.

For 87-Key Keyboards
**Japanese Katakana**

<table>
<thead>
<tr>
<th>Test Mode 2: Key-to-CRT Test (used to test the keyboard scan codes)</th>
<th>Provides a path from keyboard to display.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Entry: Automatic, after display is loaded with Mode 1 pattern of characters.</td>
<td>Characters keyed in replace characters displayed in Test Mode 1, beginning at top left of display. This is a test of keyboard scan codes.</td>
</tr>
<tr>
<td>Key in any characters (but do not press Control key).</td>
<td>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.</td>
</tr>
</tbody>
</table>

![Keyboard Diagram](https://via.placeholder.com/150)

For 88-Key Keyboards
Test Mode 2:
Key-to-CRT Test (used to test the keyboard 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 keytops, 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

Control Key

For 88-Key Keyboards
### 3.3.1.3 Test Mode 3

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 3:</td>
<td></td>
<td>Note: All references to keys to be used in Test Mode 3 are identified</td>
</tr>
<tr>
<td>Test Logic Area</td>
<td></td>
<td>by the diagram shown for Test Mode 2. (Do not identify keyboard keys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>by the characters that appear on the keytops.)</td>
</tr>
<tr>
<td></td>
<td>Provides two paths from keyboard to logic:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>logic-area test path and data path.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mode Entry: Press Control key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logic Area Test Entry: See the following page for suggested sequence of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>logic area tests.</td>
<td></td>
</tr>
</tbody>
</table>

**Suggested Logic Area Test Sequence**

1. Press C key.
2. Press B key.

Press Control key. (Japanese/English Keyboard)

Press B three more times (to clear status).
Press Control key.

---

Characters keyed in during Test Mode 2 are replaced by Test Mode 1 pattern; initial power-on status is loaded into status register.

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.)

First position of operator information area becomes $0$. 

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 3</td>
<td>Press J key, Press Control key, (Japanese/English Keyboard)</td>
<td>A character — dependent upon the display model and keyboard type (see table below) — appears in the first position of the operator information area.</td>
</tr>
</tbody>
</table>

### Keyboard Types

<table>
<thead>
<tr>
<th>Character</th>
<th>Models 1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typewriter without Numeric Lock</td>
<td>$S$</td>
<td>$C$</td>
<td>$S$</td>
<td>$t$</td>
<td>$1$</td>
</tr>
<tr>
<td>Typewriter without Numeric Lock (Katakana or Japanese English)</td>
<td>Ú</td>
<td>Ñ</td>
<td>Ä</td>
<td>Ñ</td>
<td>é</td>
</tr>
<tr>
<td>Typewriter with Numeric Lock</td>
<td>C</td>
<td>E</td>
<td>G</td>
<td>Ò</td>
<td>M</td>
</tr>
<tr>
<td>Data Entry with Numeric Lock</td>
<td>s</td>
<td>u</td>
<td>w</td>
<td>Ï</td>
<td>A</td>
</tr>
<tr>
<td>Data Entry without Numeric Lock</td>
<td>p</td>
<td>b</td>
<td>p</td>
<td>p</td>
<td>p</td>
</tr>
<tr>
<td>Data Entry Keypunch with Numeric Lock</td>
<td>c</td>
<td>e</td>
<td>g</td>
<td>o</td>
<td>m</td>
</tr>
<tr>
<td>Data Entry Keypunch without Numeric Lock</td>
<td>c</td>
<td>ç</td>
<td>ç</td>
<td>ç</td>
<td>ç</td>
</tr>
<tr>
<td>APL</td>
<td>ü</td>
<td>ü</td>
<td>ê</td>
<td>û</td>
<td>î</td>
</tr>
<tr>
<td>APL with Numeric Lock</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>APL (Katakana)</td>
<td>¥</td>
<td>¥</td>
<td>¥</td>
<td>¥</td>
<td>¥</td>
</tr>
<tr>
<td>Text</td>
<td>^</td>
<td>^</td>
<td>^</td>
<td>^</td>
<td>^</td>
</tr>
<tr>
<td>Text with Numeric Lock</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>PS or Typewriter Attribute Select</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
</tr>
<tr>
<td>APL Attribute Select</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
<td>Ú</td>
</tr>
</tbody>
</table>

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.)

5. Press N key. 
Press Control key. (Japanese/English Keyboard) 

A character — dependent upon security key and monocase switches (see table below) — appears in first position of operator information area.

<table>
<thead>
<tr>
<th>Security Keylock</th>
<th>Monocase Switch:</th>
<th>A</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Security Keylock</td>
<td>0</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Security Keylock ON (full-clockwise position)</td>
<td>&amp;</td>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>Security Keylock OFF</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Press B key twice. 
Press Control key.

7. Press C key. 
Press Control key.

Test Mode 1 pattern remains displayed.

8. Press D key. 
Repeat pressing D as desired.

First position of operator information area is loaded with the character that is at cursor position when D is pressed. Cursor then advances one character position.

Note: Displays with the Katakana Keyboard will display characters in Column A.
<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 3</td>
<td></td>
<td><strong>Note:</strong> 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.)</td>
</tr>
<tr>
<td>(Cont'd)</td>
<td></td>
<td><strong>First position of operator information area is loaded with the character that is at cursor position when V is pressed.</strong></td>
</tr>
<tr>
<td>9</td>
<td>Press Control key, B key twice, then Control key.</td>
<td><strong>First position of operator information area is loaded with character 0.</strong></td>
</tr>
<tr>
<td>10</td>
<td>Press V key.</td>
<td><strong>Test Mode 1 pattern is displayed.</strong></td>
</tr>
<tr>
<td></td>
<td>Press Control key.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Press C key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press Control key.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Press B key twice.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Press F key.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Press C key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press Control key, B key twice, then Control key.</td>
<td></td>
</tr>
</tbody>
</table>

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. 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.

19. Press G key twice. Press Control key, B key twice, then Control key.
<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 3</td>
<td></td>
<td>Note: All references to keys to be used in Test Mode 3 are</td>
</tr>
<tr>
<td>(Cont'd)</td>
<td></td>
<td>identified by the diagram shown for Test Mode 2. (Do not</td>
</tr>
<tr>
<td></td>
<td></td>
<td>identify keyboard keys by the characters that appear on the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>keytops.)</td>
</tr>
<tr>
<td>20</td>
<td>Press K key; then press ‘ key.</td>
<td>Reverse cursor appears</td>
</tr>
<tr>
<td></td>
<td>(On Model 5: Press K key; then press S key.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press Control key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press C key, then Control key.</td>
<td>Test pattern reappears</td>
</tr>
<tr>
<td></td>
<td>Press K key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press one of the following keys, according to the function desired:</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Models 1 - 4</td>
<td>Model 5</td>
</tr>
<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>Q</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Press Control key, then C key, then Control key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press B key twice, then Control key.</td>
<td></td>
</tr>
</tbody>
</table>
Press W key.
Press * key.
Press Control key.
Press G key.
Press A key.
Press Control key.
Press B key.
Press Control key.
Press B key again, then Control key.
Press O (alpha) key.
Press I (alpha) key.
Press Control key, then B key twice.
Press Control key.
Press O (alpha) key.
Press Q key.

All positions from top left of screen to first "a" become O.

Loads first position of operator information area with ....

(Prepares for testing display intensity control.)

All characters on screen display with high intensity, except operator information area.

Cursor advances to first (*) in row 2.

All characters from cursor's previous position to end of screen and characters on the first line to the first lowercase "a" display with normal intensity. Cursor also advances to row 3.
<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Mode 3 (Cont'd)</td>
<td>Switch power off, then on.</td>
<td>Power-On Reset occurs.</td>
</tr>
<tr>
<td></td>
<td>Press Control key, B key twice, then Control key.</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press G key twice.</td>
<td>All positions become 0 except operator information area.</td>
</tr>
<tr>
<td></td>
<td>Press Control key, then B key twice.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press Control key.</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press G key twice.</td>
<td>Operator information area displays 0s.</td>
</tr>
<tr>
<td></td>
<td>Press Control key.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press B key twice.</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press M key.</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press and hold 2 key until 2's appear in top line ((D) type).</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Press and hold 3 key until 3's appear in top line ((M) type).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press and hold 4 key to enter eight to ten 4's ((D) type).</td>
<td></td>
</tr>
</tbody>
</table>

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.)
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.

Press Control key: press B key twice, then Control key.

Press W key

Press * key.

Press Control key.

Press B key twice, then Control key.

Press S key.

Press 2 key.

Press 3 key.

Press Control key.

Press B key twice, then Control key.

Press Q key.

Cursor moves back to last 2 entered (D) type.

Cursor moves back to last 3 entered (M) type.
<table>
<thead>
<tr>
<th>Test Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>Press 8 key.</td>
<td>Cursor moves forward to first 8 entered (ID) type.</td>
</tr>
<tr>
<td></td>
<td>Press 9 key.</td>
<td>Cursor moves forward to first 9 entered (IM) type.</td>
</tr>
</tbody>
</table>

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).
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/adapter other than a 3274 or 3276, refer to the documentation for the control unit/adapter for the differences to the online tests.
### 3.3.2.1 Requesting Online Tests

**CONTROL UNIT TO DISPLAY STATION ONLINE TESTS**
- Test primarily terminal adapter and coax—and, through interactive test (Test 0, Routine 3), also display station.
- Error log display and erase functions (referred to as "tests").
- Test requesting display—or another display (or printer DA and coax) specified by requesting display.
- Display test results at requesting display.
- Run concurrently with customer application in subsystem (but station to be tested must not be in session if SNA, and not in WAIT state if BSC).

<table>
<thead>
<tr>
<th>Objective</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Start test.</td>
<td>Press and hold ALT; strike TEST, and then release both keys.</td>
<td>Display is cleared. TEST is displayed in operator information area.</td>
</tr>
<tr>
<td>2. Do one of following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Run test 0 on requesting display.</td>
<td>Key in: / Press: Enter</td>
<td>Test 0 begins.</td>
</tr>
<tr>
<td>• Run test 0 on display other than requesting display.</td>
<td>Key in: AA/ Press: Enter</td>
<td>Test 0 begins.</td>
</tr>
<tr>
<td>• Run test other than 0 on requesting display.</td>
<td>Key in: /B Press: Enter</td>
<td>Selected test begins.</td>
</tr>
</tbody>
</table>

*See par. 3.3.2.2 for test details.*
• Run test other than 0 on terminal other than requesting display.

<table>
<thead>
<tr>
<th>Key in:</th>
<th>AA/B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press:</td>
<td>Enter</td>
</tr>
</tbody>
</table>

| Selected test begins. |

3. Re-enter if X symbol is displayed.

| ☐ You tried to select an in-session terminal for test 0 |
| ☐ You used an invalid test number or address. |
| ☐ You used more than one slash (/) and/or had space(s) in your format. |
| ☐ You did not begin test format at position 0 (upper-left position of display). |

| Press Reset; re-enter test format. |

| Do Not Enter X, Op Check )), and Function Not Available -f are displayed in operator information area. |
| Do Not Enter X, Op Check )), and Wrong Number # ? are displayed in operator information area. |

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: Applicable only to Test 0. |

5. Continue test.

| Press and hold ALT, and strike CLEAR. |

| Enter another test (step 2). |


| Press and hold ALT; strike TEST and then release ALT. |

| TEST is erased from display. |
### 3.3.2.2 Test 0, Display Operation

<table>
<thead>
<tr>
<th>Test or Routine Name</th>
<th>Activity</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test 0:</strong></td>
<td>To determine that terminal is functioning overall.</td>
<td>Stop on error. Display test result on requesting display. If no error, go to next routine.</td>
</tr>
<tr>
<td>Display Function.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Routine 1:</strong></td>
<td>Check basic TA functions—register, serdes, command decoder, etc., operations; driver/receiver operation excluded.</td>
<td>Stop on error. Display test result on requesting display. If no error, go to next routine.</td>
</tr>
<tr>
<td><strong>TA Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(3276 only)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Routine 2:</strong></td>
<td>Check link by issuing Reset and receiving a POR response.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Link Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(3276 only)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Routine 3:</strong></td>
<td>Permit operator testing of selector pen and keyboard functions.</td>
<td>Test pattern is displayed; it and test procedure are described below.</td>
</tr>
<tr>
<td><strong>Interactive Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(Display only; not for printer)</strong></td>
<td>Display test pattern. Sound audible alarm (if feature is installed).</td>
<td></td>
</tr>
<tr>
<td><strong>Test Pattern Definition</strong></td>
<td><strong>Test Pattern</strong></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Line 1:</strong> CCCC identifies the control unit (3274 or 3276) to which the 3278 is attached. NN is the port number (00 through 31).</td>
<td>(Line 1) TEST: CCCC NN</td>
<td></td>
</tr>
<tr>
<td><strong>Line 2:</strong> ?SEL PEN and SEL PEN are high-intensity, protected, and selector-pen-detectable fields.</td>
<td>(Line 2) ?SEL PEN SEL PEN</td>
<td></td>
</tr>
<tr>
<td><strong>Line 3:</strong> &amp;SEL PEN and SEL PEN are normal-intensity, protected, and selector-pen-detectable fields.</td>
<td>(Line 3) &amp;SEL PEN &gt; SEL PEN</td>
<td></td>
</tr>
<tr>
<td><strong>Line 4:</strong> 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.</td>
<td>(Line 4) DISPLAY INSERT CK</td>
<td></td>
</tr>
</tbody>
</table>
### Routine 3: Interactive Test, Test Procedure

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Move cursor under C of CK.</td>
<td>![display in operator info area] (displays in operator info area)</td>
</tr>
<tr>
<td>2. Press a key.</td>
<td>DISPLAY INSERT ACK (displays in fourth line)</td>
</tr>
<tr>
<td>3. Press A.</td>
<td>DISPLAY INSERT ABCK (displays in fourth line)</td>
</tr>
<tr>
<td>4. Press B.</td>
<td>DISPLAY INSERT ABCK (no change in fourth line)</td>
</tr>
<tr>
<td>5. Press C.</td>
<td>![display in operator info area] (displays in operator info area)</td>
</tr>
<tr>
<td>6. Press Reset.</td>
<td>![display in operator info area] is erased.</td>
</tr>
<tr>
<td>7. If no selector pen, ECS, PS, MSR, or MHS features, press and hold ALT, strike TEST, release ALT.</td>
<td>Test pattern is erased; TEST is erased. (Test is ended.)</td>
</tr>
<tr>
<td>8. If selector pen is a feature:</td>
<td></td>
</tr>
<tr>
<td>a. Touch pen on ?SEL PEN.</td>
<td>![display in operator info area] ? SEL PEN SEL PEN (displays in second line)</td>
</tr>
<tr>
<td>(If ![display in operator info area] appears in operator info area, reset and retry; if no change in display, increase brightness and retry.)</td>
<td></td>
</tr>
<tr>
<td>b. Touch pen again on same field.</td>
<td>![display in operator info area] &amp; SEL PEN ? SEL PEN (displays in third line)</td>
</tr>
<tr>
<td>c. Touch pen on ?SEL PEN.</td>
<td>![display in operator info area] &amp; SEL PEN ? SEL PEN (displays in third line)</td>
</tr>
<tr>
<td>d. Touch pen again on same field.</td>
<td>![display in operator info area] &amp; SEL PEN ? SEL PEN (displays in third line)</td>
</tr>
<tr>
<td>e. Do step 7 to end test.</td>
<td></td>
</tr>
</tbody>
</table>
9. If MSR is a feature (valid if the control unit is customized for the numeric character set):
   a. Move cursor to first position in fifth line (line below test pattern).
   b. Read test card
   c. Hold ALT and press TEST to end the test.

10. If ECS feature:
   a. Move cursor to sixth line.
   b. Hold ALT, and press APL or Text ON/OFF key.
   c. Type in any or all APL characters as shown on the keytops and key faces.
   d. Hold ALT and press TEST to end test.

11. If PS feature:
   a. 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.
   b. Verify symbols on lines 3 and 5 to make sure that the fonts displayed are the same as the fonts installed.
   c. 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

**Line, AA/1**

*Displays the most current low-order digits of the 200, 300, 400, and 500 series nnn numbers, 200 leftmost to 500 rightmost.*

Coax port address 00-31

**Line 2**

2 2 3 3

*Displays the statistical-counter information associated with this device.*

2 3 4 5 5

**Line 3**

XXXX

*Count of feature errors since last power on.*

XXXX

*Count of bad status received from the base since last power on.*

Not applicable.

Number of device checks (buffer parity errors) since last power on.

Number of coax parity errors since last power on.

Number of coax timeouts since last power on.
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 2xx, where xx is one of the 2-digit numbers listed below:

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

*Control unit may log off device. **Control unit will log off device.
### Test 1: Error Log Display

Display the terminal and common error logs.

Error logs are displayed at requesting display as follows:

**Error Log Display**

<table>
<thead>
<tr>
<th>Error code high-order digit</th>
<th>Error code low-order digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>XX</td>
</tr>
<tr>
<td>1X</td>
<td>---</td>
</tr>
<tr>
<td>2X</td>
<td>---</td>
</tr>
<tr>
<td>3X</td>
<td>XX</td>
</tr>
<tr>
<td>4X</td>
<td>---</td>
</tr>
<tr>
<td>9X</td>
<td>---</td>
</tr>
</tbody>
</table>

**Example:** See the explanation and the example that follow.

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)
- 42 Keyboard overrun
- 43 MSR data parity
- 44 SP data parity
- 60 MSR timeout
- 61 SP timeout
- 70 Timeout (no response from the terminal)*

    71 Adapter receive parity
    72 Data parity error*
    73 Lost Op complete*
    74 Feature timeout*
    77 Device Check (terminal buffer parity)*
    0A Total count of error code 70
    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

<table>
<thead>
<tr>
<th>Code</th>
<th>Error Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>(may not display terminal logged off), 01A/A1F2(M)</td>
</tr>
<tr>
<td>03</td>
<td>01A/A1G2, feature card B4 or C4(D), 01A/A1F2, feature card G4 or E2(M)</td>
</tr>
<tr>
<td>04</td>
<td>01A/A1F2, 01A/A1G2</td>
</tr>
<tr>
<td>05</td>
<td>Wrong feature card, 01A/A1G2</td>
</tr>
<tr>
<td>06</td>
<td>Wrong feature card, 01A/A1G2</td>
</tr>
<tr>
<td>07</td>
<td>01A/A1G2(D), 01A/A1F2, G2(M)</td>
</tr>
<tr>
<td>08</td>
<td>01A/A1G2(D), 01A/A1F2, G2(M)</td>
</tr>
<tr>
<td>09</td>
<td>Coax port transmission failure</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Error Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Keyboard logic card, keyboard cable, 01A/A1G2(D), 01A/A1F2(M)</td>
</tr>
<tr>
<td>42</td>
<td>Keyboard logic card, 01A/A1G2(D), 01A/A1F2(M)</td>
</tr>
<tr>
<td>44</td>
<td>01A/A1C4, 01A/A1E4, 01A/A1G2(D), 01A/A1G4, 01A/A1G2(M)</td>
</tr>
<tr>
<td>60</td>
<td>01A/A1B4, 01A/A1G2, MSR</td>
</tr>
<tr>
<td>61</td>
<td>01A/A1C4, 01A/A1E4, 01A/A1G2(D), 01A/A1B4, 01A/A1G2(M)</td>
</tr>
</tbody>
</table>

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

- On/Off Switch
- Light 1
- Light 2
- Light 3
- Audible Alarm Volume Control
- Contrast Control
- Security Keylock
- Brightness Control (Intensity Override)

Display upper/lowercase
Display uppercase characters (but store both)
Operating mode
Test mode — displays test pattern

Ready Symbol — first position of operator

Information area: ① (3274), ② (3276), or other symbol
Figure 4-2. Switches and Indicators (Katakana)
### Key Description

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ferro – US/Canada</td>
<td>8715339</td>
</tr>
<tr>
<td></td>
<td>EMEA/AFE 60 Hz Lo</td>
<td>8715341</td>
</tr>
<tr>
<td>2</td>
<td>AFE 50 Hz Lo</td>
<td>8715342</td>
</tr>
<tr>
<td>3</td>
<td>AFE 50 Hz Hi</td>
<td>8715343</td>
</tr>
<tr>
<td>4</td>
<td>EMEA 50 Hz Hi</td>
<td>4119686</td>
</tr>
<tr>
<td>5</td>
<td>Capacitor</td>
<td>6814311</td>
</tr>
<tr>
<td></td>
<td>Prime Power Asm</td>
<td>1743110</td>
</tr>
<tr>
<td>6</td>
<td>Primary Fuse (F1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>US/Canada</td>
<td>1149561</td>
</tr>
<tr>
<td></td>
<td>EMEA/AFE 60 Hz Lo</td>
<td>1149561</td>
</tr>
<tr>
<td></td>
<td>AFE 50 Hz Lo</td>
<td>1149561</td>
</tr>
<tr>
<td></td>
<td>AFE 50 Hz Hi</td>
<td>1176668</td>
</tr>
<tr>
<td></td>
<td>EMEA 50 Hz Hi</td>
<td>1176668</td>
</tr>
<tr>
<td>7</td>
<td>Low-Voltage Asm</td>
<td>1743120</td>
</tr>
</tbody>
</table>

**Figure 4-3. Lower Frame**

- J1: Capacitor 6814311
- J2: Prime Power Asm 1743110
- J3: Primary Fuse (F1) 1149561
- J4: Low-Voltage Asm 1743120
- 01D/T1: EMEA/AFE 60 Hz Lo 8715341
- 01D/J4: AFE 50 Hz Lo 8715342
- 01D/J5: AFE 50 Hz Hi 8715343
- 01D/S1: EMEA 50 Hz Hi 4119686
- 01D/C1: Capacitor 6814311
- 01D/A1: Prime Power Asm 1743110
- 01D/PS1: Low-Voltage Asm 1743120
Figure 4-4. Upper Frame
<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yoke</td>
<td>1743090</td>
</tr>
<tr>
<td>2</td>
<td>Indicator Card</td>
<td>1743525</td>
</tr>
<tr>
<td>3</td>
<td>On/Off Sw</td>
<td>1743178</td>
</tr>
<tr>
<td>4</td>
<td>Dual/Mono Sw</td>
<td>1655357</td>
</tr>
<tr>
<td>5</td>
<td>Normal/Test Sw</td>
<td>1655357</td>
</tr>
<tr>
<td>6</td>
<td>Contrast Pot/Audible Alarm Volume Ctrl</td>
<td>1743199</td>
</tr>
<tr>
<td></td>
<td>Intensity Pot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intensity Override</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CRT</td>
<td>1655349</td>
</tr>
<tr>
<td>8</td>
<td>Security Key Lock</td>
<td>5214866</td>
</tr>
<tr>
<td>9</td>
<td>CRT Socket</td>
<td>1743041</td>
</tr>
</tbody>
</table>

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.

Top Card Connector (TCC)
- F2 to G2: 1742982
- E3 to F3: 1742981
- D2 to E2: 1742980
- D5 to F5: 1742983
- C2 to E2: 1742984
- C3 to D3: 1742985

Analog Card:
- Adjusting Potentiometer
- Test Point

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

MSR Card

Font RAMs: E, F, C, D, A, B

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

PS Card

Selector Pen Card

Personal Computer Adapter Card

(See Entry Point D of MAP 04 for switch settings.)

Switch No. 1

Module Switches

Models 3 and 4 only

APL/Text or Indicator ROS Module

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

ECS Card

B. Feature Card Illustrations

Figure 4-7. Card Illustrations

4-8 SY27-2510-7
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)

Figure 4-8 (Part 2 of 2). Card Locations, (M) Type
Figure 4-9. Card Illustrations, (M) Type
Data Entry Keypunch with Numeric Lock* 1, 2, 3
Data Entry with Numeric Lock 1, 2
Data Entry Keypunch without Numeric Lock 2, 3
Data Entry without Numeric Lock 2
Typewriter without Numeric Lock 3
Typewriter with Numeric Lock 1, 3
APL with Numeric Lock 0, 1, 2
Text 0, 3
Text with Numeric Lock 0, 1, 3
PS or Typewriter Attribute Select 0, 2, 3
APL Attribute Select 0

*Keypadpunch keyboards have PF key to the left of the spacebar.

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)

Max Ripple Voltages at J Connectors (Peak to Peak)

J1 +8.5 Vdc 0.25 Vac
2 +8.0 V ± 1 V 1.5 Vac
5, 8 -12 Vdc 0.24 Vac
6 DC Return
3, 9 6.3 Vac and Return

J3 -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
<table>
<thead>
<tr>
<th>Channel</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>01C/P1-1</td>
<td>6.3 Vac</td>
</tr>
<tr>
<td>01C/P1-2</td>
<td>6.3 Vac</td>
</tr>
<tr>
<td>01A/A1-H2-P12</td>
<td>+8.5 V</td>
</tr>
<tr>
<td>01A/A1-H2-P10</td>
<td>-12 V</td>
</tr>
<tr>
<td>01A/A1-H2-J2</td>
<td>+8.0 V</td>
</tr>
<tr>
<td>01A/A1-H2-P6</td>
<td>-5 V</td>
</tr>
<tr>
<td>01A/A1-H2-P5</td>
<td>+44 V</td>
</tr>
<tr>
<td>01A/C1-P1-1</td>
<td>(±8.5 V)</td>
</tr>
</tbody>
</table>

Figure 4-12. Prime Power and DC Voltage Distribution

Figure 4-14 in place. Pl J1 4 6
01C/A1-1 6.3 Vac
01C/A1-2 +8.5 V
01A/A1-H2-P10 -12 V
01A/A1-H2-P6 -5 V
01A/A1-H2-P5 +44 V
01A/A1-H2-P12 +8.5 V
01A/A1-H2-J2 +8.0 V
01A/C1-P1-1 (±8.5 V)

To Logic Gate

To On/Off Switch

Grounded only when mounted and fastened in place.
Figure 4-13. Operator Controls
Figure 4-14. Operator Controls and Indicators
Figure 4-15. Feature Cabling

SY27-2510-7 (3/83) 4-17
Probe Points

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

Figure 4-16. Logic Gate to Keyboard Cables
Figure 4-17. DC Power Distribution

SY27-2510-7  (3/83)  4-19
<table>
<thead>
<tr>
<th>Pin Assignment</th>
<th>3278 Top Card Connector A2</th>
<th>3278 Rear I/O 01D/J5</th>
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</thead>
<tbody>
<tr>
<td>Y02</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Y03</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Y04</td>
<td></td>
<td>9</td>
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<tr>
<td>Y05</td>
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<td>17</td>
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<tr>
<td>Y07</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Y08</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Y09</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Y10</td>
<td></td>
<td>21</td>
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<tr>
<td>Y12</td>
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<td>3</td>
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<td>Y13</td>
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<td>23</td>
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<td>Y22</td>
<td></td>
<td>18</td>
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<tr>
<td>Y24</td>
<td></td>
<td>28</td>
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<tr>
<td>Y25</td>
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<td>2</td>
</tr>
<tr>
<td>Y26</td>
<td></td>
<td>7</td>
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<tr>
<td>Y27</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Y29</td>
<td></td>
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<tr>
<td>Y30</td>
<td></td>
<td>4</td>
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<td>Y32</td>
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<td>5</td>
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<td>Y33</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>Z02</td>
<td></td>
<td>8</td>
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<tr>
<td>Z03</td>
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<td>Z05</td>
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<td>10</td>
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<td>Z06</td>
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<td>Z25</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Z26</td>
<td>Signal Ground</td>
<td></td>
</tr>
<tr>
<td>Z31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4-18. Feature Bus Signal 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.
Cone Shield Retaining Screw

Cone Shield

CRT Socket

Yoke Shield

Cone Shield

CRT Bell

High-Voltage Power Supply

Focus Potentiometer

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

Centering Rings

CRT Neck

Yoke Clamp Screw

Figure 5-2. Yoke Adjustments

Grounding Clip

Spring tension must cut into yoke core insulation.

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)

6-10
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 keystem 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

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