IBM Maintenance Library

3274 Control Unit
Models 1A, 1B, 1C, 1D, 21A, 21B, 21C, 21D, 31A, 31C, 31D, 41A, 41C, 41D
Maintenance Concepts

SY27-2512-6

Preface

This manual contains the information needed by the support Field Engineering (FE) Customer Engineer to maintain the 3274 Control Unit Models 1A, 1B, 1C, 1D, 21A, 21B, 21C, 21D, 31A, 31C, 31D, 41A, 41C,41D.

Note: *For purposes of brevity and clarity, the one- and two-digit numbers associated with the 3274 Models A, B, C, and D units are not used in this manual. All unit designations are abbreviated by model type only, such as: 3274 Model A, 3274 Model B, 3274 Model C and 3274 Model D.*

The maintenance procedures described in this manual and performed by the Support Customer Engineer represent a part of the overall support structure for the 3274 Control Unit. This support structure begins at the 3274 operator level and is briefly described as follows:

- *3274 Operator* — Performs initial problem isolation and recording of 3274 status indications by following the procedure in the *3274 Problem Determination Guide,* GA27-2854. If the problem involves other than a customer operating procedure or customer-supplied power, the operator completes the *3274 Problem Report Form* and requests IBM service.
- *Product Customer Engineer* — Performs the maintenance procedures described in this manual to isolate the problem to a field replaceable unit (FRU). The *3274 Problem Report Form* prepared by the operator gives the 3274 indications necessary for performing these procedures. If the problem cannot be isolated and corrected, the Product Customer Engineer requests assistance from the next level of the support structure.
- *Support Customer Engineer* — Verifies the results obtained by the Product Customer Engineer and thoroughly analyzes the problem by means of the following:
  - Tests
  - Log Information
  - Error Code Definitions
  - Result of Host Test Routines
  - Special Tools and Test Equipment

If the problem cannot be isolated and resolved using these service aids, the Support Customer Engineer records the problem indications and supporting information on the 3274 Problem Checklist and requests assistance from the next level of the support structure.

Organization

This manual is organized as follows:

- Chapter 1 — Maintenance Approach and System Overview
- Chapter 2 — Subsystem Indicators, Symbols, and Messages
- Chapter 3 — Subsystem Error Logs and Test Formats
- Chapter 4 — Subsystem Tests, External Tests, and Subsystem Service Aids
- Chapter 5 — Reference Data
- Chapter 6 — Tools and Test Equipment
- Appendix A — Support Structure Information Form
- Appendix B — Models A, B, C, and D Error Codes
- Appendix C — X.25
- List of Abbreviations

Seventh Edition (Dec 1983)

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Warning: This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

This warning is also applicable to all attaching units produced for use in the USA that have been manufactured after December 31, 1980. A notice of compliance has been affixed within the customer access area of all affected units.

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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. Do not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all AC and DC power 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. Never wear rings, wrist watches, chains, bracelets, metal cuff links, etc.
   c. Use only insulated pliers and screwdrivers.
   d. Keep one hand in pocket.
   e. When using test instruments be certain they are of proper capacity and controls are set correctly. Use only insulated probes.
   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. Using solvents, sprays, cleaners, chemicals, etc., to clean parts.
   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 CEMs 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 your opinion and that of 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 ensure that no action on his part renders a product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe, inaccessible 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 (i.e., under desk or table) where no one can trip over it.
16. Avoid touching mechanical moving parts (when lubricating, checking for play, etc.).
17. When using stroboscope, do not touch ANYTHING -- it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or held by 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.

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Chapter 1. Maintenance Approach and System Overview

This chapter contains information to assist the support customer engineer in isolating and correcting 3274 subsystem problems that cannot be attributed to a failing field replaceable unit (FRU). The information supplements existing documentation covering problem isolation, use of serviceability aids, specialized tools, and test equipment. The topics presented include the following:

- *Overall Maintenance Approach:* The maintenance approach is outlined to provide flexibility both in the type of approach taken and in the selection of supporting serviceability aids. The maintenance approach identifies and refers to procedures, tests, specialized tools, and test equipment that will most likely help isolate various types of 3274 problems. Detailed descriptions of these serviceability aids and their use are contained in other chapters in this publication. In addition, examples using these serviceability aids are given for typical 3274 problems.
- *Subsystem Operation Overview:* This overview gives a general description of 3274 operations and functions.
- *Serviceability Aids:* A general description of serviceability aids and their use is given. These aids include the operational indicators, display symbols, error suffix codes, logouts, tests, test equipment, and host error recording.
- *Reference Material:* All supporting reference material in this publication is identified and described. This reference material provides detailed descriptions of error recording and indications, tests, error recovery procedures, 3270/3274 operational differences, error suffix code action chart, and tools and test equipment.
- *Supporting Publications:* Supporting IBM publications are identified, and their contents briefly described.
- *Procedure for Requesting Assistance:* A procedure for requesting assistance from the next level of the support structure is outlined. This procedure includes 3274 problem recording which will aid the support structure in problem determination.

1.1 MAINTENANCE APPROACH

This maintenance approach is outlined to provide flexibility both in the type of approach taken and in the selection of supporting service aids. The approach used to isolate a specific 3274 problem may vary because of multiple error indications and the type of operation being performed at the time the error occurred. Therefore, the maintenance approach to typical problems described in the following is not necessarily the only effective approach that could be used.

The suggested maintenance approach identifies and refers to various procedures, tests, tools, and test equipment that will most likely aid in isolation of the problem. This approach has four basic steps, which are performed in sequence:

Step 1

Review and verify the results obtained by the product customer engineer by using the following reference material:

- *3274 Problem Report Form*
- *3274 Control Unit Maintenance Information*

Step 2

Analyze operational indicators (8 4 2 1), display symbols, and error suffix codes (nnn codes).

Step 3

Analyze logouts, hang conditions, and failing operation sequences.

Step 4

Record all problem symptoms, and complete the Support Structure Information Form in preparation for requesting assistance. The effectiveness of the assistance will depend largely on the information that you provide.

These four steps are illustrated in Figure 1-1.

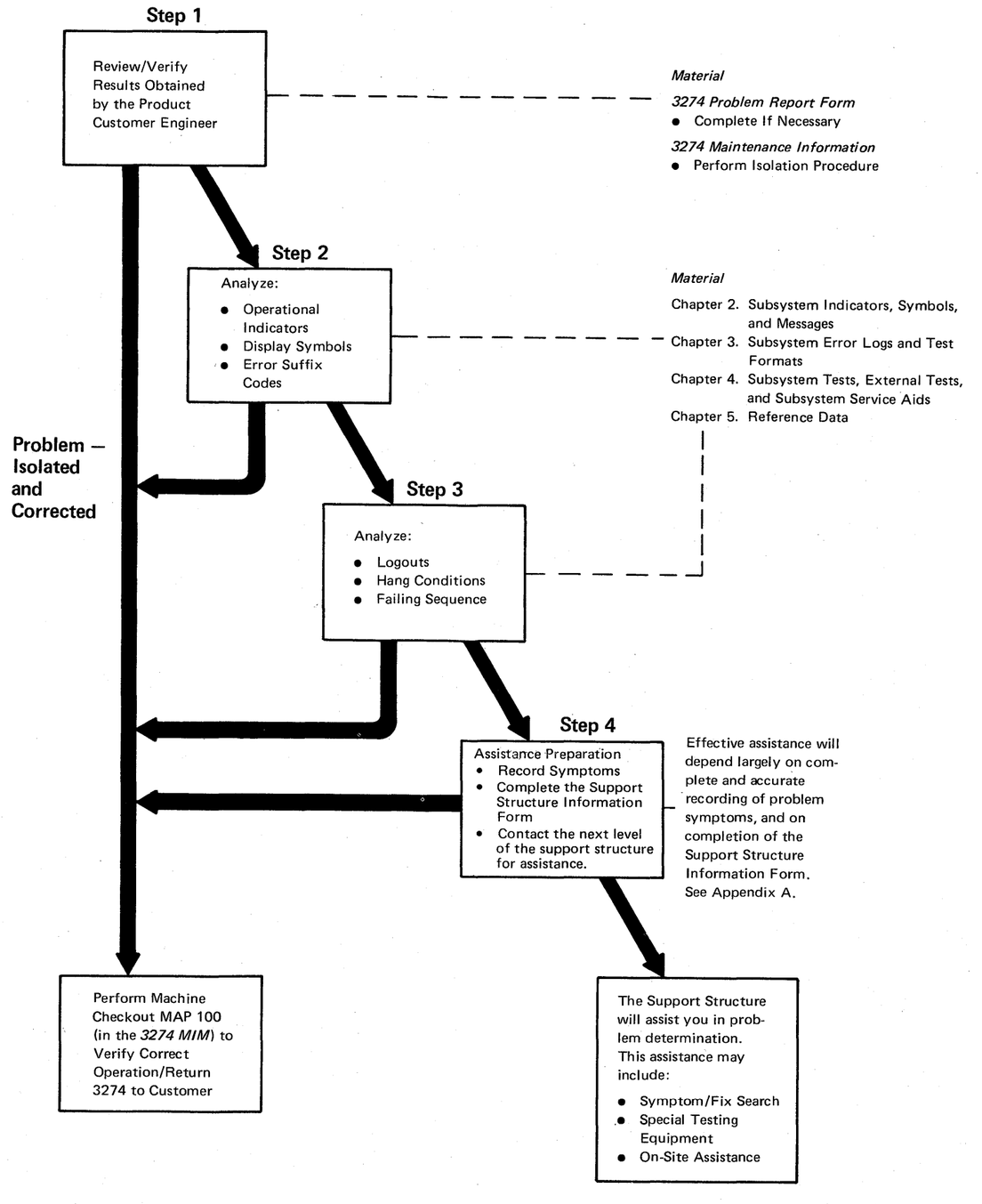


Figure 1-1. Support Customer Engineer Maintenance Approach

1.2 SUBSYSTEM DATA FLOW

The 3274 subsystem data flow consists of test data, control data (unit code); status, error, and log data; and message data between the components of the subsystem. Figure 1-2 illustrates the 3274 subsystem configuration including use of the 3299 Terminal Multiplexer. The data flow is described as follows:

- Initial Machine Load (IML) of Test Data — Loading the IML test data residing on the system diskette into control storage (paragraph 1.2.1 and Figure 1-3).
- Initial Machine Load (IML) of Unit Code — Loading the unit code residing on the system diskette into control storage (paragraph 1.2.2 and Figure 1-3).
- Message Data Flow between 3274 Control Unit and Attached Devices — The flow of message data between the 3274 Control Unit and attached devices (paragraph 1.2.3 and Figure 1-4).
- Message Data Flow between 3274 Control Unit and Host System — The flow of message data between the 3274 Control Unit and the host system (paragraph 1.2.4 and Figure 1-5).
- Status, Error, and Log Data Flow — The flow of data from the 3274 Control Unit, the host system, and attached devices to the data control block area of control storage (paragraph 1.2.5 and Figure 1-6).

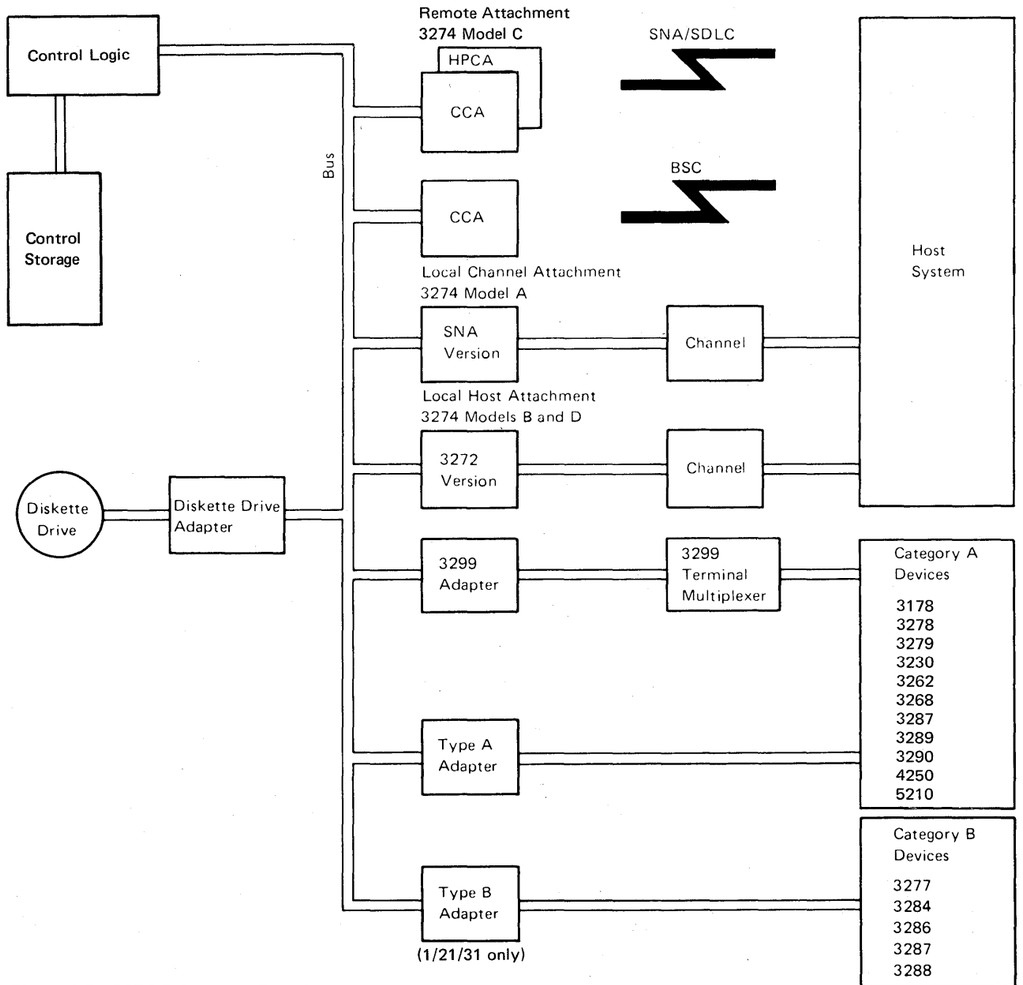


Figure 1-2. 3274 Subsystem Overview

1.2.1 IML Test Data Path

The IML test data path is shown in Figure 1-3, IML test data is retrieved from the diskette drive adapter after IML tests 0000, 0001, and 0002 have been successfully completed. IML test 0002 verifies that the diskette drive and adapter are functionally operational. The data path, from origin to destination, is identified as follows:

- Diskette Drive
- Diskette Drive Adapter
- Bus
- Control logic
- Control storage

1.2.2 IML of Unit Code

The data path of IML (loading of unit code) is the same as the IML test data path. Unit code is normally loaded after the IML tests have been successfully completed. Placing the ALT switch in the ALT 1 position and pressing the IML pushbutton will cause the IML test to be bypassed and initiate loading of the unit code.

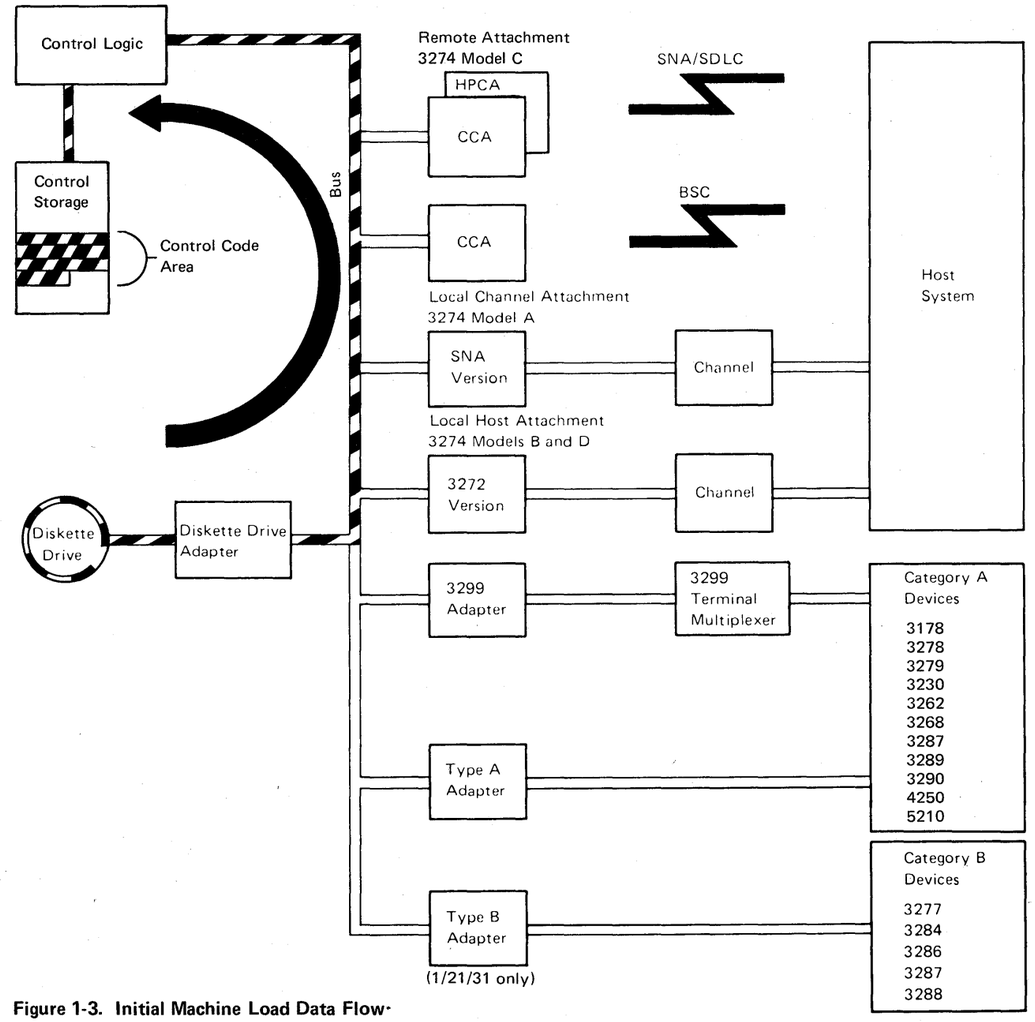


Figure 1-3. Initial Machine Load Data Flow

1.2.3 Message Data Flow between 3274 Control Unit and Attached Devices

Message data flow between the 3274 Control Unit and attached devices is shown in Figure 1-4. The message data paths, from origin to destination, are identified as follows:

3274 Control Unit to Device

- Control storage (message buffer area)
- Control logic
- Bus
- Type A or B adapter
- Category A or B device

Device to 3274 Control Unit

- Category A or B device
- Type A or B adapter
- Bus
- Control logic
- Control storage (message buffer area)

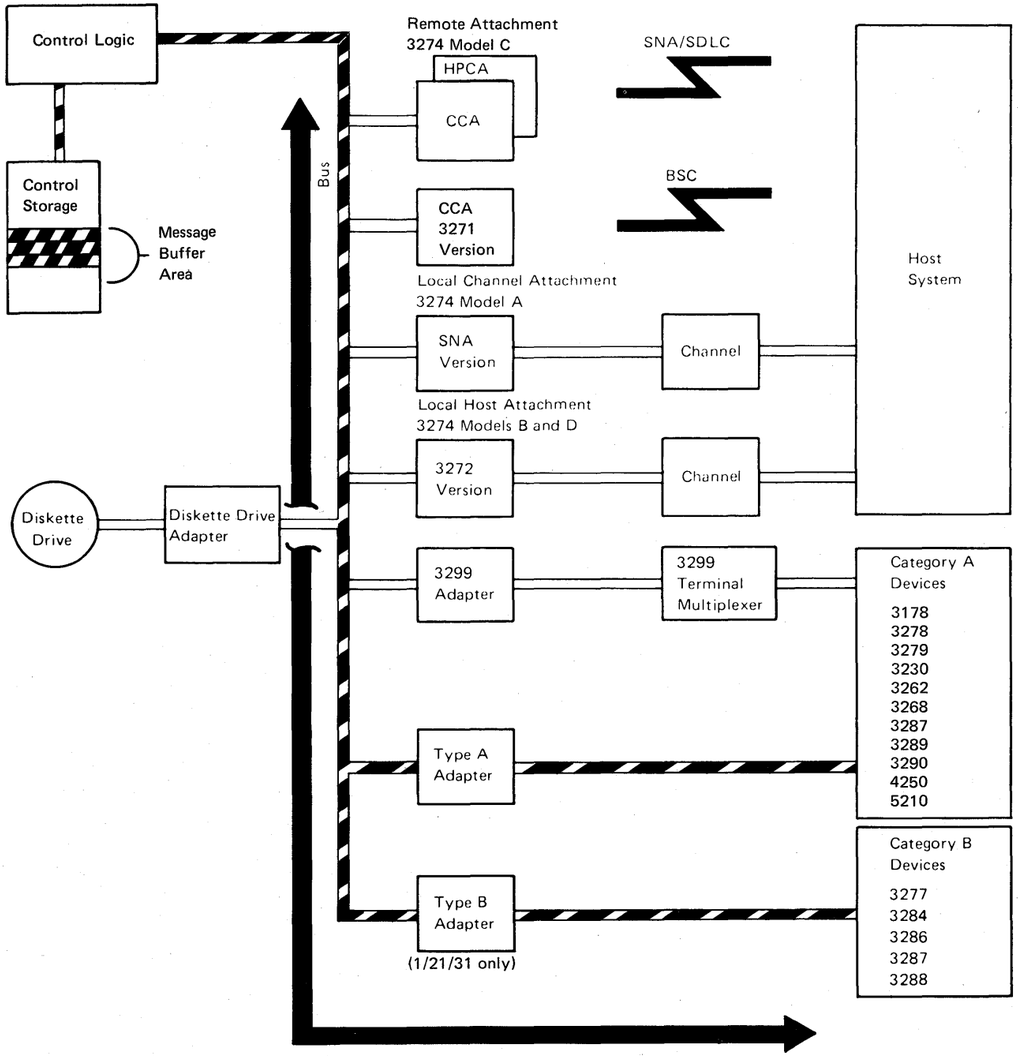


Figure 1-4. Message Data Flow between 3274 Control Unit and Devices

1.2.4 Message Data Flow between 3274 Control Unit and Host System

Message data flow between the 3274 Control Unit and the host system is shown in Figure 1-5. The message data paths, from origin to destination, are identified as follows:

3274 Control Unit to Host

- Control storage (message buffer area)
- Control logic
- Bus
- Remote host adapter/ local channel attachment or local host attachment
- Host system

Host to 3274 Control Unit

- Host system
- Remote host adapter/ local channel attachment or local host attachment
- Bus
- Control logic
- Control storage (message buffer area)

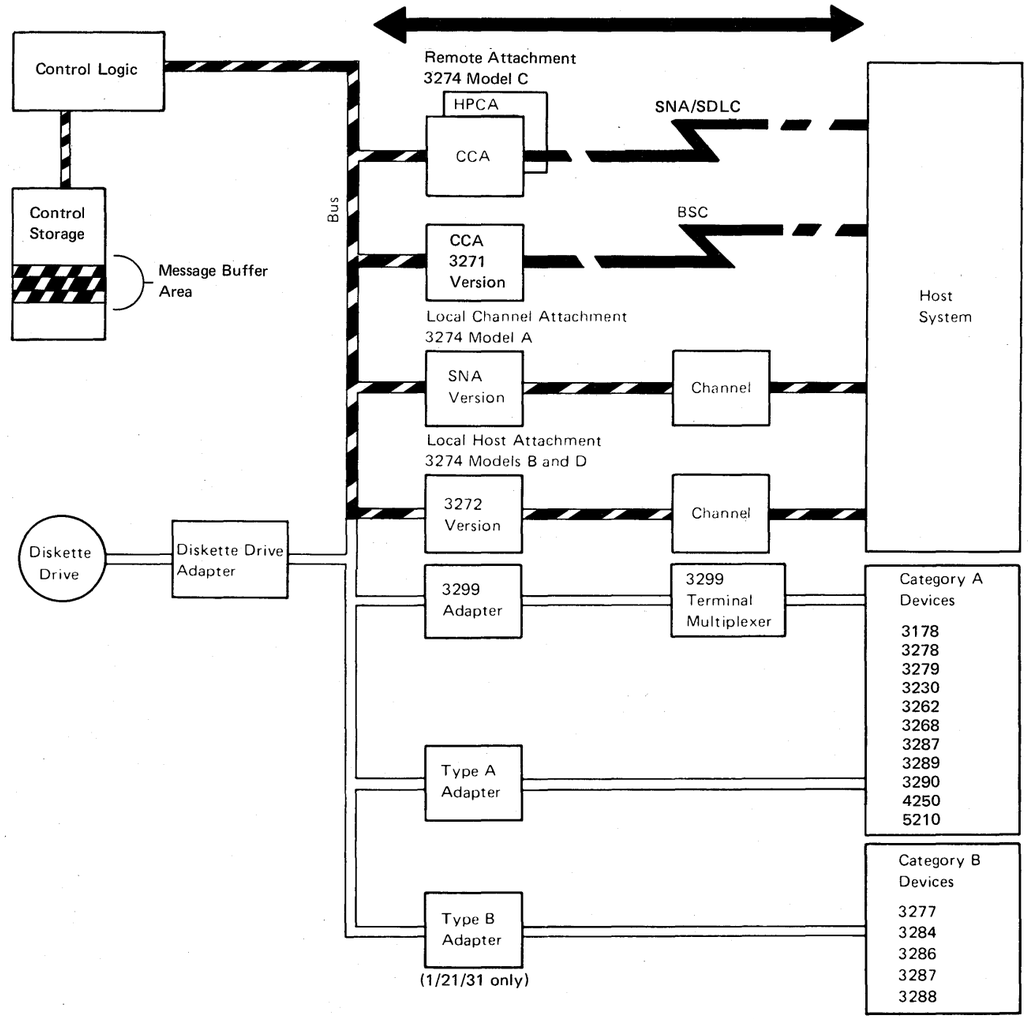


Figure 1-5. Message Data Flow between 3274 Control Unit and Host System

1.2.5 Status, Error, and Log Data Flow

Status, error, and log data flow is shown in Figure 1-6. The data paths, from origin to destination, are identified as follows:

Host System

- Remote host adapter/local channel attachment or local host attachment

Category A and B Devices

- Type A or B adapter

Diskette Drive

- Diskette Drive adapter

- Bus
- Control logic
- Control storage (control block area)

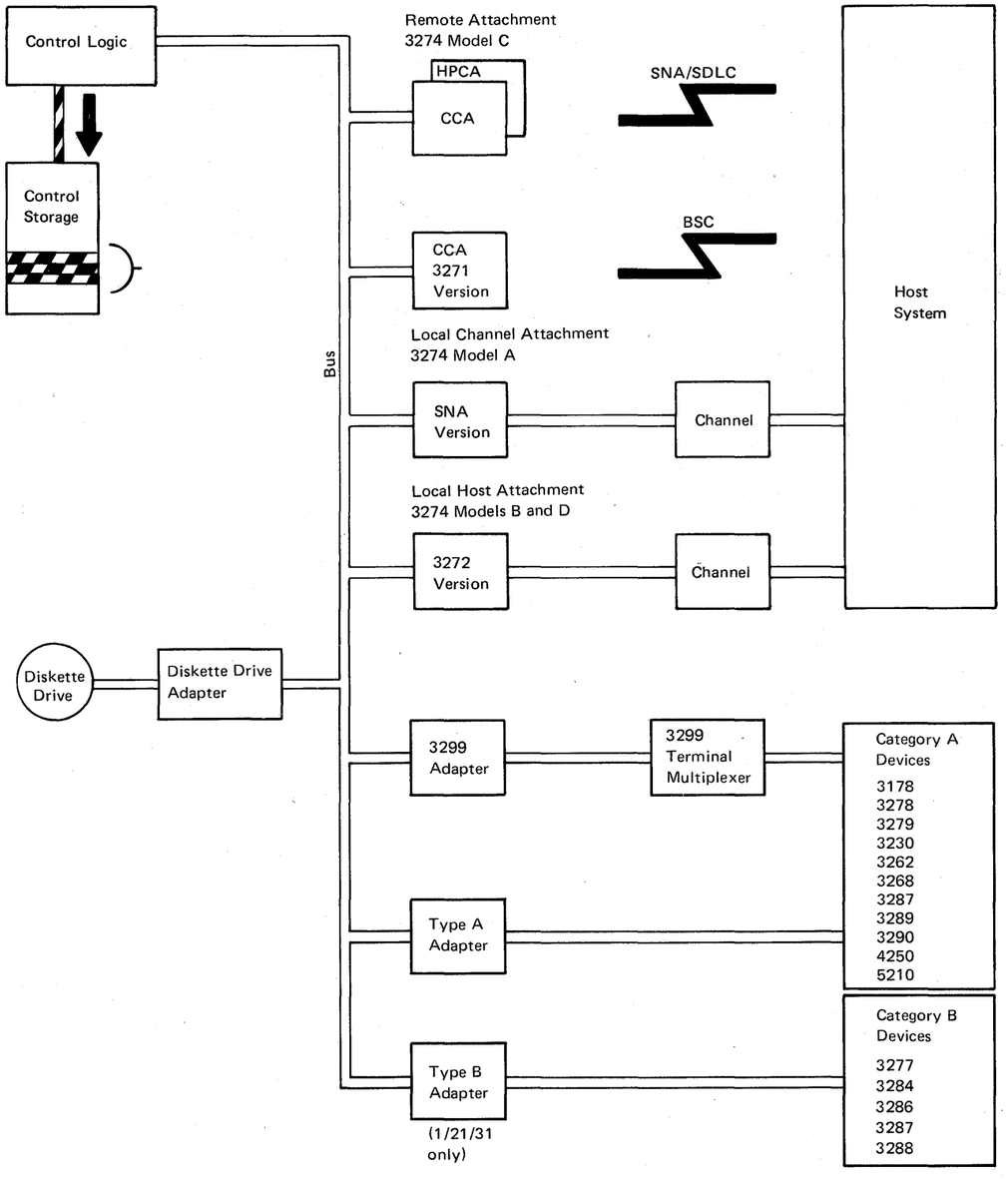


Figure 1-6. Status, Error, and Logic Data Flow

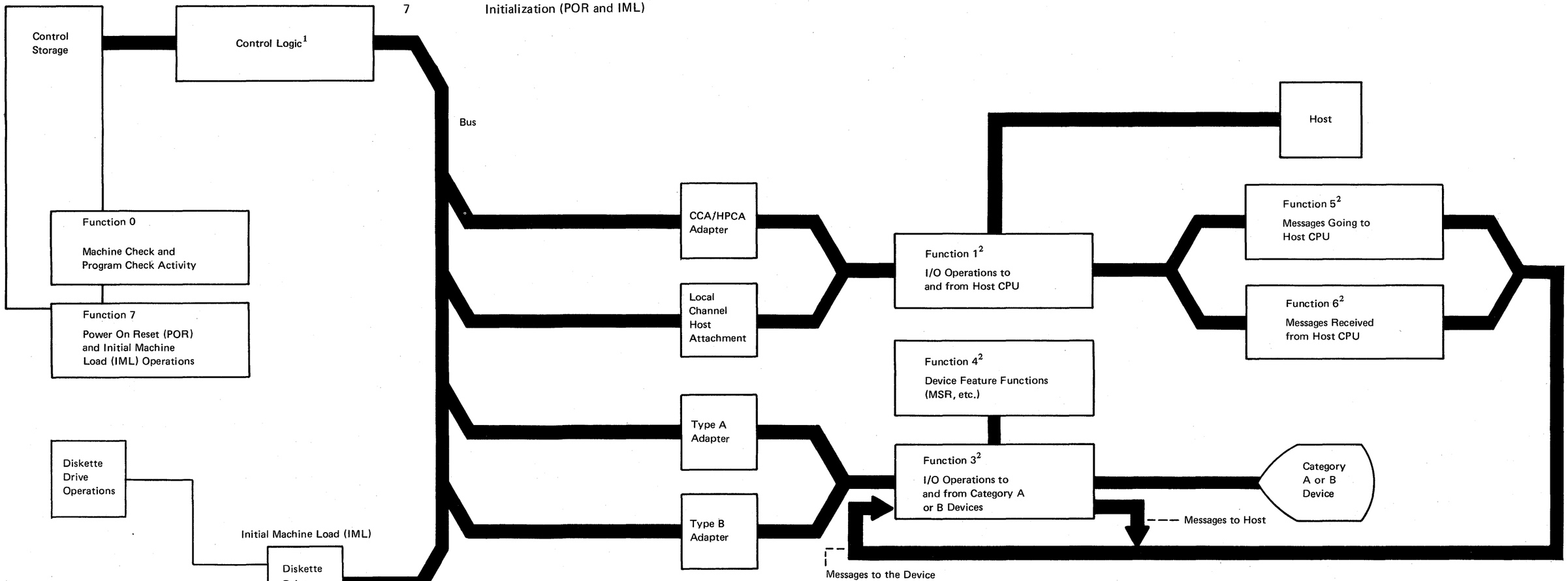
1.3 SUBSYSTEM FUNCTIONS

The following functions are provided by the 3274 subsystem:

The 3274 subsystem functions are illustrated in Figure 1-7.

Function	*Description*
0	Machine check/program check activity
1	I/O operations to and from the host CPU
2	Diskette drive operations
3	I/O operations to and from Category A and Category B devices
4	Device feature functions
5	Messages sent to the host CPU
6	Messages received from the host CPU
7	Initialization (POR and IML)

The 3274 functions may be described in more general terms by grouping them into six basic categories: (1) Power On Reset (POR) operations, (2) keytracking (moving data from the keyboard to the display screen), (3) receiving from the host, (4) sending to the host, (5) error handling and logging, and (6) internal testing.



[1] The functions shown in this diagram are provided by the control logic.
[2] Functions 1 through 6 reside in the control logic; they are shown here to illustrate their association with the adapters, devices, and the host.

Figure 1-7. 3274 Subsystem Functions

1.3.1 Control Unit Power-On Reset (Except 41X Models)

When the 3274 is powered on, the +5 Vdc supply originating at the low-voltage power supply (LVPS) provides input to the POR circuit at LVPS card point E15. The POR signal is then generated to the 01A-A1 board as output from LVPS card point E1. POR to the A1 board generates a restart to the control logic and subsequently starts a normal IML sequence.

1.3.2 Keystroke Handling

The requests and status from the attached devices are handled by the Keystroke control function. When an operator presses a key, the keyed data is read by the display base card 1, which, if it receives a poll, sends the data to the terminal adapter (Category A devices only). The terminal adapter then loads the status and scan code of the actuated key into a queue. The terminal adapter control retrieves this information from the buffer queue.

Keystroke control converts the scan code and distributes the data to the appropriate functions. See Figure 1-8 for an illustration of Type A adapter keystroke handling.

As an example of keystroke handling, when a graphic character key is pressed, the graphic key scan code is converted into internal code and then into regen code by means of a language code conversion table. The converted regen code is moved into the device regen buffer, after which the graphic character keyed may be seen displayed on the screen.

When a device is polled, if it has an error condition or request from a feature (selector pen, MSR), it sends status to the terminal adapter, and keytracking control handles the status as it does a status preceding keyed data.

An error condition detected by the device is signaled to the terminal adapter when the device is polled. Error conditions are (1) device check (a parity error was detected in the regen buffer), (2) keyboard overrun (keystrokes too close together), and (3) feature timeout (no response from the feature card within the expected time).

Special keyboard scan codes are used for the device POR signal and keyboard overrun conditions. Selector-pen data is sent to the terminal adapter by read commands. The row count is sent on the first read, and the field count is sent on the second.

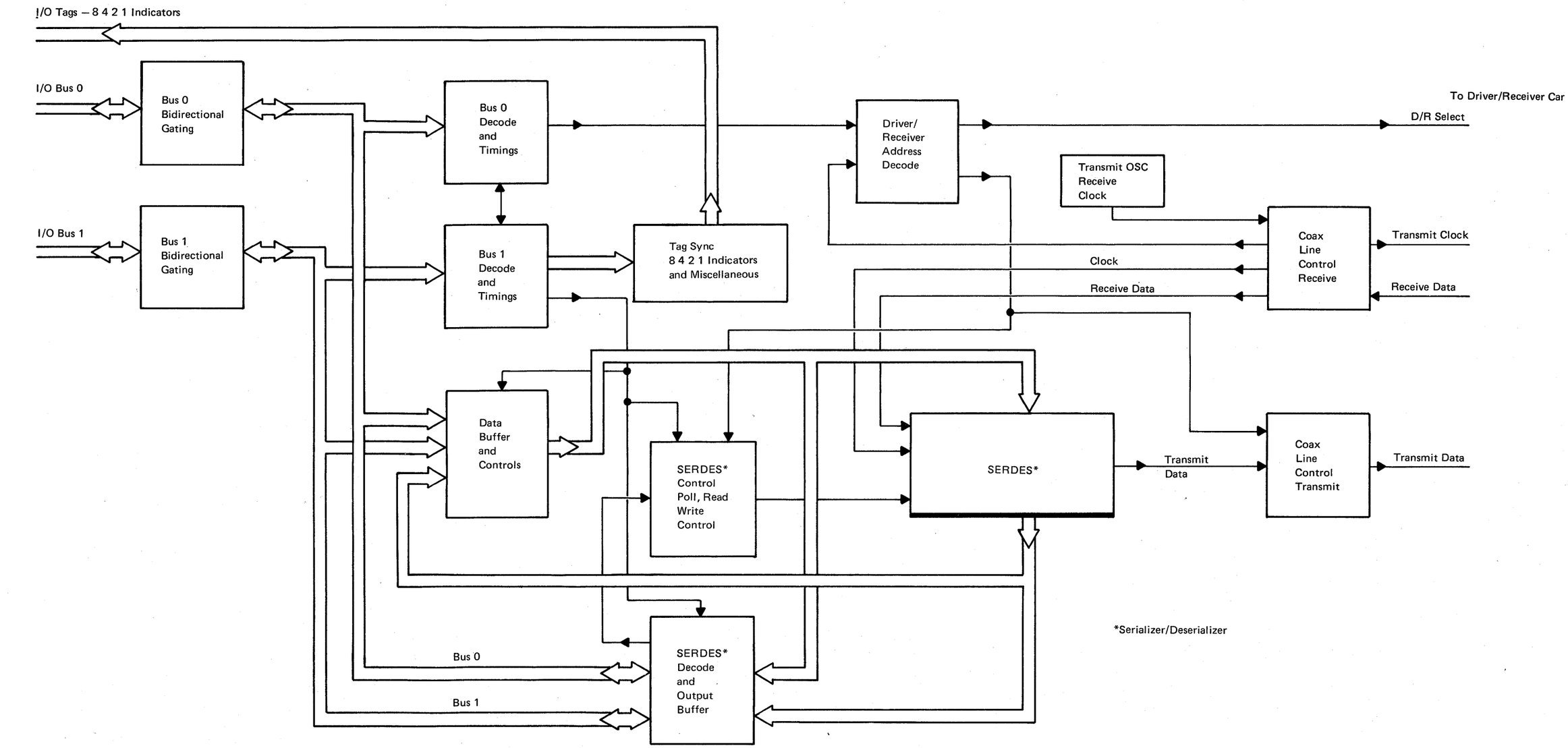


Figure 1-8. Keystroke Handling, Type A Adapter (without 3299)

1.3.3 Sending to Host

Data from Category A devices is queued via function 3 into various buffer formats, depending on the type of host attachment used, by the device control code. The data is then handled, again in queued buffer formats, by the data stream control code. The host processing control code then forwards the appropriate data from another queued buffer to the host. (See Figure 1-9.)

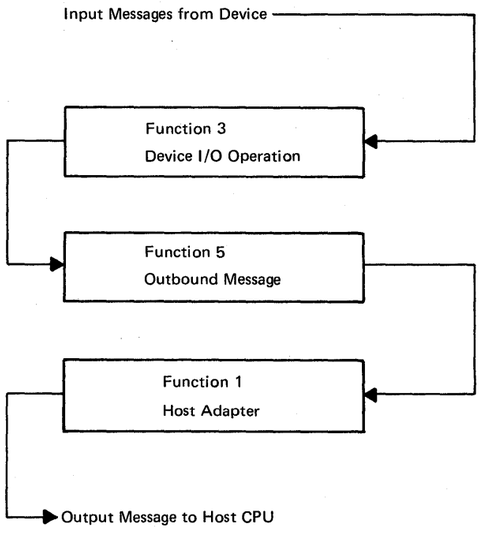


Figure 1-9. Inbound Messages

1.3.4 Receiving from Host

Data from the host is queued via function 1 into common transmit/receive buffers of various formats, depending on the type of host attachment used, by the host processing control code. The data is then handled in queued buffer formats by the data stream control code. The device control code then forwards the data to the device. (See Figure 1-10.)

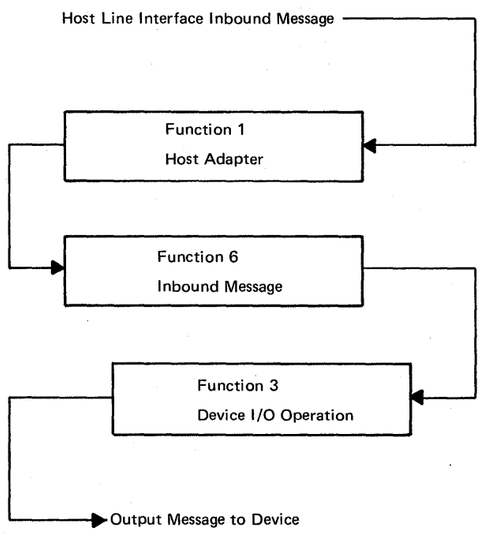


Figure 1-10. Outbound Messages

1.3.5 Error Handling and Logging

Error handling and logging is performed by the control logic and storage. Log statistics and information are available for each device and host adapter by means of test procedures.

1.3.6 Internal Testing

All internal tests are performed by the control logic, and indicators are provided for test results. Host support is not required for internal testing.

1.3.7 Function Priority

The priority scheme used by the 3274 subsystem is illustrated in Figure 1-11. Function 0 has the highest priority, and function 7 has the lowest priority. For example, if a machine check (function 0) and a diskette drive operation (function 2) are both pending, the 3274 control logic performs function 0 followed by function 2.

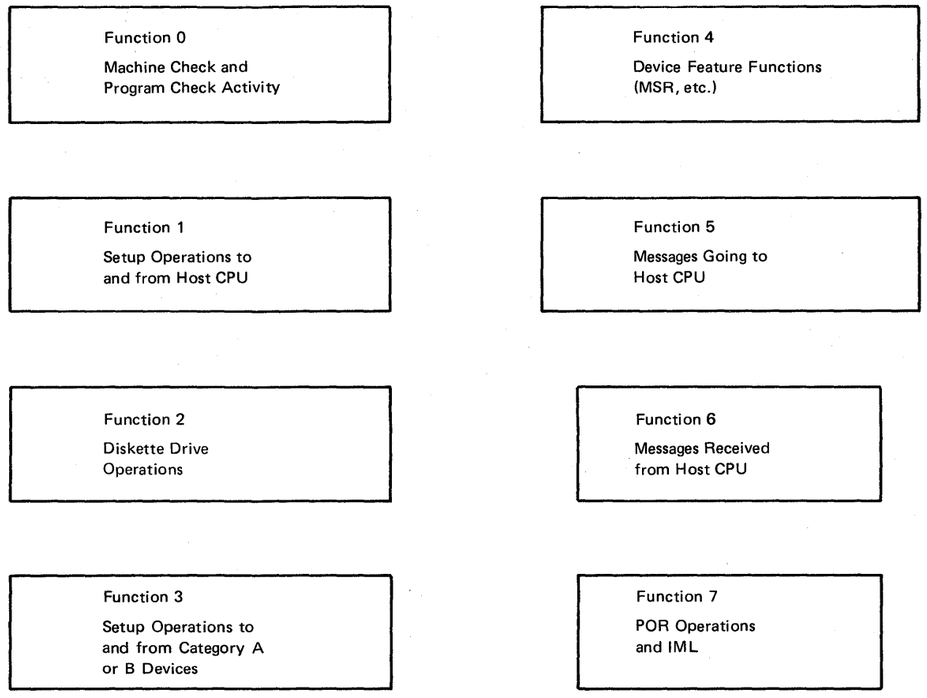
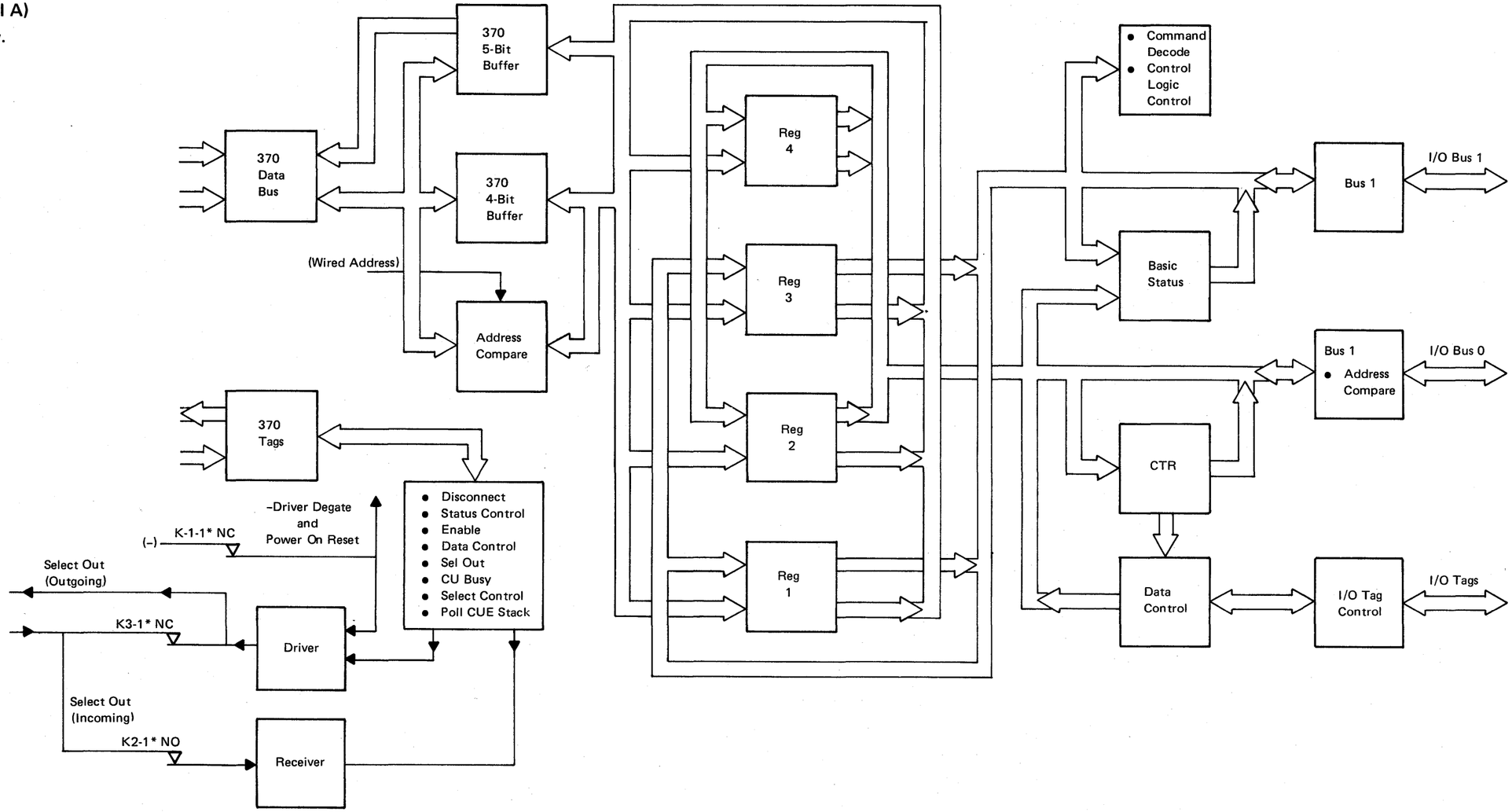


Figure 1-11. 3274 Subsystem Functional Priorities

1.3.8 Local Channel Data Flow (Model A)

Figure 1-12 illustrates local channel data flow.



*Relay Control for Select Out (on the A1N2 card)
Power On/Off Sequence

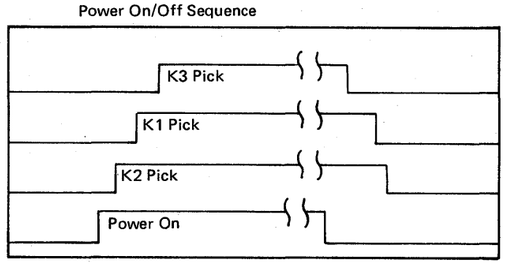
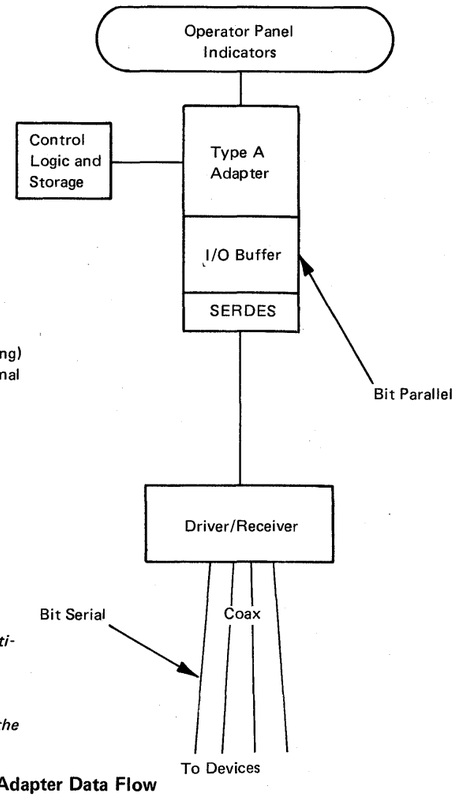


Figure 1-12. Local Channel Attachment Data Flow

1.3.9 Type A Adapter Coax Data Path

Figure 1-13 illustrates the bit path from the coax to the Type A adapter.



Adapter States

1. Disabled
2. Enabled but Idle (Normal Polling)
3. Enabled Working (Passing Normal Data/Keystroke Activity)

Note: *When a 3299 Terminal Multiplexer is attached (TM Type A Adapter) the Driver/Receiver is modified and a single coax cable connects the Type A adapter and the 3299 unit.*

Figure 1-13. Coax to Type A Adapter Data Flow

1.4 SUPPORTING PUBLICATIONS

Additional information relating to the IBM 3274 Control Unit, Models A, B, C, and D is presented in *IBM 3270 Information Display System Library Users Guide,* GA23-0058.

Chapter 2. Subsystem Indicators, Symbols, and Messages

2.1 INTRODUCTION

This chapter provides information concerning the operator panel indicators and the display symbols and messages used to convey error and subsystem status conditions to the user and to the customer engineer. The operator panel indicators include the 8 4 2 1 indicators, the DC ON indicator, and the ONLINE/OFFLINE indicator (3274 Models A, B, and D only).

The subsystem symbols and messages displayed on the status line include the Readiness and System Connection symbols, Do Not Enter messages, Communication Reminders, Shifts and Modes symbols, Printer Status messages, and Machine, Program, and Communication Check numbers. The functional details of each item are described.

2.2 8 4 2 1 INDICATORS

The four indicators labeled 8 4 2 1 (Figure 2-1) are located on the operator panel. They are activated by the control logic to serve as prompting, progress, and/or success/failure indicators during the following operations:

- *IML Bus Test:* All four indicators are turned on by the IML pushbutton via the control logic and the Type A adapter card (01A1S2) if there is no activity on the internal logic bus.
- *IML Tests:* As the test routines are run, the control logic turns on and turns off each of the four indicators. A failure condition is indicated by a constant or flashing code displayed in the 8 4 2 1 indicators. The success of a given test is indicated by the 8 4 2 1 indicators progressing to the next hexadecimal value.
- *Operational Mode:* During online operations with the host CPU, the 8 4 2 1 indicators are turned on by the control logic when an error condition is detected by the control logic. Hexadecimal values are used to indicate the most likely failing component. If additional errors are detected the control logic writes over the prior indication with the new hexadecimal value. The indicators turned on by the control logic may represent recoverable errors or nonrecoverable errors. The error remains displayed in the 8 4 2 1 indicators until the machine is powered off or until the IML pushbutton is pressed.
- *Customizing Mode:* During customizing, the 8 4 2 1 indicators display the type of customizing operation in progress, as well as serving as progress and procedural-failure indicators. They also prompt the user to change diskettes during customizing and notify the user when customizing is completed.
- *Installation Mode:* During initial installation, the 8 4 2 1 indicators are used to indicate a successful test run after initial machine power-on has occurred. They are also used to show the state of the local channel interface when attempting to run online tests (OLTs) during initial installation.

2.3 DC ON INDICATOR

The DC ON indicator is located on the operator panel PC board. It is turned on by +5 Vdc from fuse F1 (20A circuit) on the LVPS PC board via the Z1 cable to the operator panel. On the 41X models, +5 Vdc to the board is not fused; the only fuses are for +5 Vdc to the file and -5 Vdc to the board. Loss of +5 Vdc at the 01A1 logic board will turn off the indicator. This indicator is *not* related to the POR circuit and does not indicate the status of +5 Vdc to the diskette drive or the 01A2 feature board.

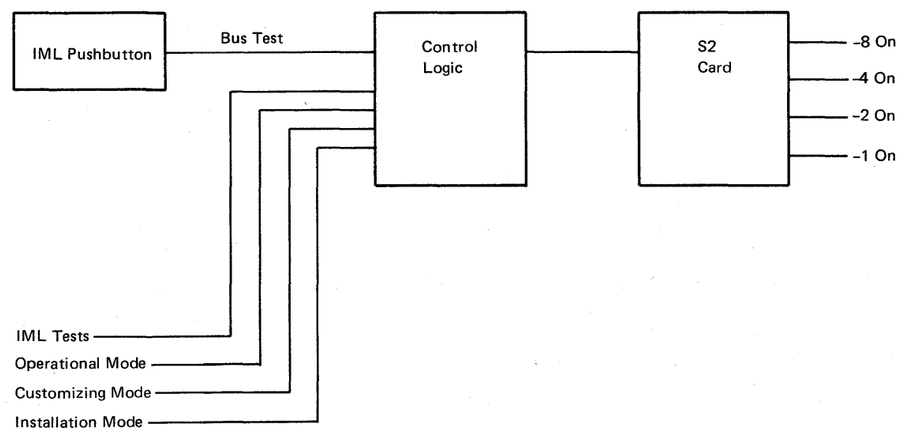


Figure 2-1. 8 4 2 1 Indicator Control Logic

2.4 ONLINE/OFFLINE INDICATOR AND SWITCH FOR MODELS A, B, AND D (EXCEPT MODELS 41A AND 41D. REFER TO MAINTENANCE INFORMATION MANUAL (MIM) SY27-2554 FOR MODELS 41A AND 41D.

A description of the switch and indicator function for Models A, B, and D follows. There are no rotary switches on the Model C units.

2.4.1 Model A

Positioning the Power/Interface rotary switch to ONLINE causes the following (Figure 2-2):

- An exclusive OR function **2** gives output because the trigger **1** and the Online/Offline switch do *not* agree.
- The output is interpreted as a request for change in the state of the trigger **1**.
- A function is, in turn, sent and interpreted to toggle the trigger **1**.
- Toggling the trigger **1** causes the OFFLINE indicator to turn off and deactivates the IML pushbutton.

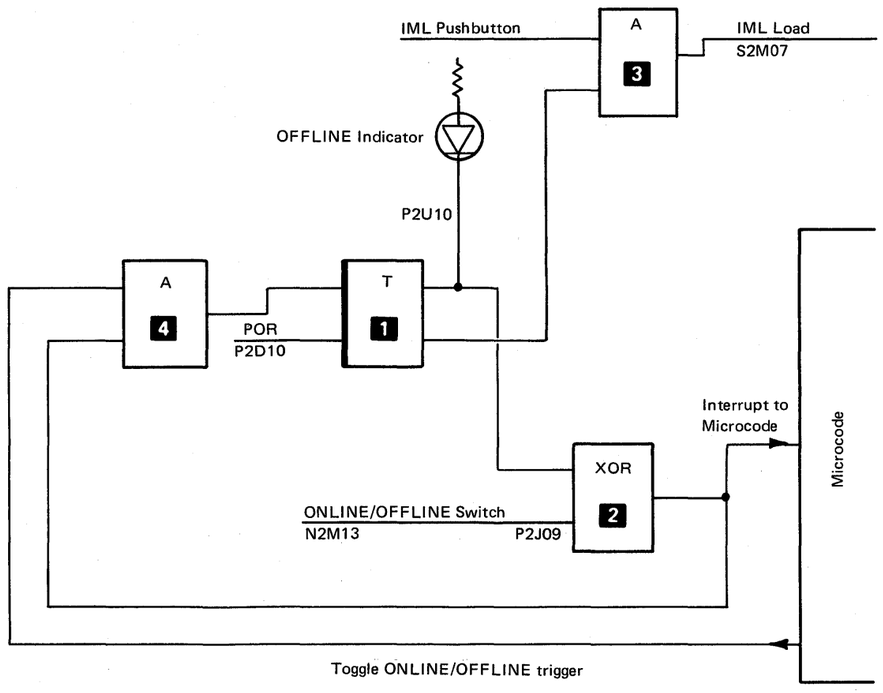
Positioning the Power/Interface rotary switch to OFFLINE causes the same operation; this time, however, toggling the trigger **1** to the opposite state turns *on* the OFFLINE indicator and enables the IML pushbutton to function.

Use one of the following procedures to force the 3274 offline:

1. If the 3274 will not go offline (the OFFLINE indicator will not come on), request that the host CPU be stopped. Power the 3274 off, and restart the host CPU.
2. Momentarily ground the pin:

   Model A: A1-P2D10

Note: *Even though these paragraphs* do not *apply to Models 41A and 41D, do not perform the grounding procedure on Models 41A and 41D.*



Notes:
1. *If latch and switch do not agree, interrupt microcode.*
2. *Only accept toggle control code if latch and switch agree.*

Figure 2-2. ONLINE/OFFLINE Control Logic, Model A

2.4.2 Models B and D

Positioning the Power/Interface rotary switch to ONLINE causes the following (Figure 2-3):

- Switch Online and Microcode Online condition AND **2**, which is sampled by a sync pulse to set online latch **1**.
- Setting the online latch turns off the OFFLINE indicator and deactivates the IML pushbutton.

Positioning the Power/Interface rotary switch to OFFLINE deconditions AND **2**, causing latch **1** to be reset with the next sample pulse. Resetting the online/offline latch turns on the indicator and enables the IML pushbutton to function. It should be pointed out that internal control-logic checks may also cause the 3274 Model B or D to go offline.

Use one of the following procedures to force the 3274 offline:

1. If the 3274 will not go offline (the OFFLINE indicator will not come on), request that the host CPU be stopped. Power the 3274 off, and restart the host CPU.
2. Momentarily ground the pin:

   Model B: A1-Q2B07
   Model D: A1-Q2G05

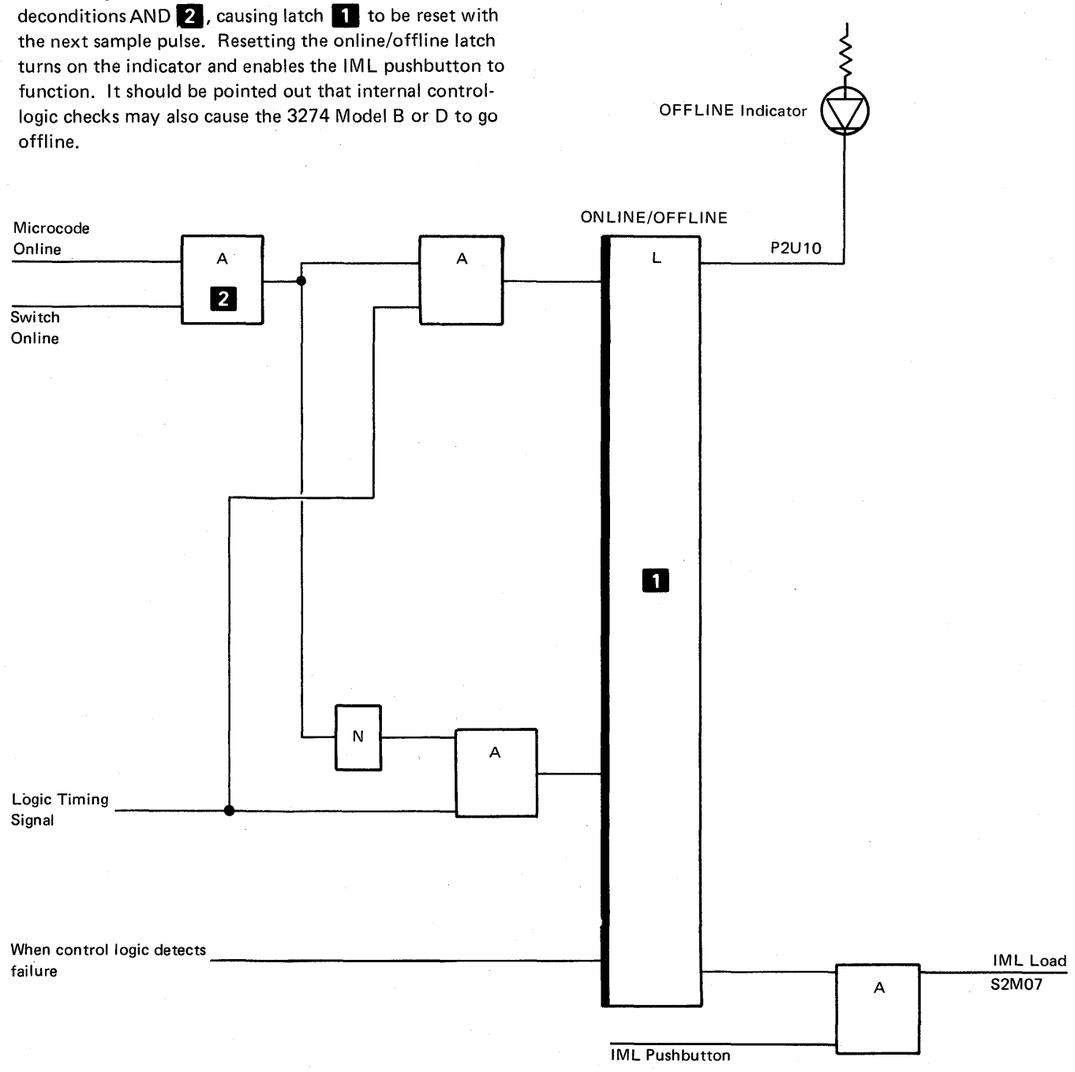


Figure 2-3. ONLINE/OFFLINE Control Logic, Models B and D

2.5 OPERATOR INFORMATION AREA LAYOUT

The operator information area consists of individual fields located below the 3178/3278/3279 status line. These fields are not displayed on any category B device (3277). The field names and lengths are shown in figures 2-4 and 2-5.

Note: *If you are operating a device other than a 3178, 3278, or 3279 and a symbol is displayed other than the symbols defined in the following figures, consult documentation for that specific device.*

Note: *The X.25 indicators defined in this chapter will* not *be displayed in the Operation Information Area of the 3290 or other variable function devices.*

Readiness and System Connection		Do Not Enter (Input Inhibited)		Reminders		Shifts and Modes		Printer Status
1 7		9 17		21 27		32 41		60 64

Figure 2-4. Operator Information Area Layout (without Extended Data Stream)

Readiness and System Connection	Do Not Enter Input Inhibited	Reminders	Programmed Symbols	Shifts & Modes	Extended Higlighting	Extended Color	Insert Mode	Printer Status
1 7	9 17	21 27	31 34	36 44	46 47	49 50	52	60 64

Figure 2-5. Operator Information Area Layout (with Extended Data Stream)

2.5.1 Readiness and System Connection Symbols

The first seven positions of the status line are allocated to Subsystem Ready, Host Ready, Application Ready, and Test. See Figure 2-6.

Symbol	Name	Explanation
4	3274 Ready	1 of the operator information area when the 3274 4 Control Unit to which the display is attached is ready (functional) and the display is ready.
A B	Online A Online B	The Online A and Online B symbols govern transactions with the host system. Certain keyboard functions and the meaning of some operator information area symbols differ depending upon which set of rules is applicable. Online A. The control unit is connected to the system under A rules. The A symbol appears in remote systems using BSC protocol, in locally attached systems that use 3274 Models B and D. It is turned on by receipt of the following commands: Write, Erase/Write, Erase All Unprotected, Copy, Read Modified, and Read Buffer. The A symbol is turned off when 1. An operator action causes host communication. 2. The display station is turned off. 3. The Normal/Test switch is placed in Test, or the TEST key is pressed to place the 3274 in the Test mode. Online B. The control unit is connected to the system under B rules. The B symbol appears in systems that use SNA protocol. It is turned on by completion of an ACTPU/ACTLU command sequence, and is turned off by execution of DACTPU or DACTLU, including an internal DACTPU sequence, and when the Normal/Test switch is placed in Test or the TEST key is pressed.
■	My Job	The display station is connected to the operator's application program. This symbol is displayed in position 3. This symbol appears in systems that use BSC or SNA protocol, or in systems that use 3274 Models B and D. In systems using BSC or the 3274 Models B and D, it is turned on with the A symbol, and is turned off when power is removed, and when the Normal/Test switch is placed in Test. When using SNA protocol, it is turned on when the operator's application session owns the screen.
人	System Operator	This symbol is used with SNA protocol and indicates that the system operator (SSCP Control Program) session owns the display screen. Except for the ENTER key, the Program Attention keys are not functional when this symbol is displayed.
?	Unowned	The display station is connected to the system (using SNA only), but not to the operator's application program or to the system operator (control program). The SYS REQ key is used if LOGON is required. This symbol is displayed in position 3.
TEST	Test	The display station is in Test mode. Test mode is initiated or terminated by pressing the TEST key while holding the ALT key. TEST is displayed in positions 3 through 6. Test procedures are described in the *IBM 3270 Information Display System: 3278 Display Station Problem Determination Guide,* for the specific display attached.
N (appears in column 7)	In-use indicator (X.25 only)	Data transfer is taking place between the 3274 control unit and the host. The In-use indicator is displayed on all attached 3178, 3278, and 3279 displays, when the control unit has entered the X.25 data transfer state. The X.25 disconnect key ()DISC) is the only key honored in the data transfer state. Pressing the)DISC key disconnects the line and causes the "Disconnect In Process" indicator to be displayed followed by the "Call Ready" indicator when the disconnect process is complete. Both Disconnect in Process and Call Ready are "Reminders" that are defined later in this section.

Figure 2-6. Readiness and System Connection Symbols (Locations 1 through 7)

2.5.2 Do Not Enter (Input Inhibited) Symbols

The symbols shown in Figure 2-7 appear in positions 9 through 17 of the operator information area. Most of these symbols indicate an operator error. However, there are three categories of Do Not Enter symbols that are directly related to hardware or program failures: machine checks (X), program checks (X PROG), and communication checks (X). Each of these symbols is accompanied by a 3-digit code that further defines the error. The codes are defined in paragraphs 2.5.6, 2.5.7, and 2.5.8.

All the Do Not Enter symbols are shown in Figure 2-7. All the symbols contain an X in position 9 (do not enter), combined with other symbols in positions 11 through 17, which define why input is disabled. The keyboard does not lock, but a change in state of the keyboard clicker (on-to-off or off-to-on) indicates that the keyboard is disabled. The following symbols are arranged in descending order of assigned priority. In case of multiple conditions, the higher-priority symbol is displayed.

Symbol	Name	Explanation
X	Security Key	The security key is turned off, and no operator input can be accepted. When the key is turned on, this symbol disappears, but any other preexisting "do not enter" condition may then be displayed.
X nn	Machine Check	The display station is not working properly. The symbol is accompanied by up to three digits, nnn (3278), which define the probable cause of the problem. Recovery procedures depend upon the type of error.
X 2%%	Unavailable	The control unit is not equipped to handle a feature that has been invoked. RESET should be pressed and another action initiated. (See Appendix B.)
X nnn	Communication Check	A communication link error was detected and data cannot be sent. The RESET key should be pressed. This symbol is accompanied by up to three digits, nnn (3278), which define the probable cause of the problem. The communication reminder symbol is displayed as long as the condition exists.
X PROGnnn	Program Check	A programming error was detected in the data received by the control unit. RESET should be pressed, and the operation should be retried. This symbol is accompanied by up to three digits which define the probable cause of the problem.
X ?+	Questionable Card	The wrong magnetic stripe card was used with the MSR. RESET should be pressed, and the correct MSR card should be used.
X X	Operator Unauthorized	The operator has attempted to perform an unauthorized function. RESET should be pressed to restore the keyboard. The printer status area (locations 60 through 64) should be checked for printer assignment. If the Operator Unauthorized symbol was displayed after the print key or IDENT key was pressed, a printer is not assigned. (If the Printer Assignment symbol is displayed in the printer status area, there is an error in the authorization matrix.) If the Operator Unauthorized symbol was displayed after the IDENT key was pressed and two numbers were entered, the operator is not authorized to use the printer. Also this X X symbol will be displayed instead of a printer status symbol if no device has been powered-on, on an authorized printer port since the 3274 was IML'ed.
X ´+? X `+? X ^+? X ¨+? X ¸+?	Accent Plus What	These symbols indicate that an invalid dead key/character combination was entered (Keyboards for languages requiring accents only). RESET should be pressed to restore the keyboard, and a valid dead key/character combination should be entered.
X ←→	Go Elsewhere	An action has been attempted that is invalid for the display screen location. RESET should be pressed, and either the cursor should be moved or some other action should be taken.
X	Message Received	A message from the control operator was received and rejected. RESET should be pressed to restore the keyboard. The operator may view the message by pressing SYS REQ or may defer viewing of the message until a later time.
X SYSTEM	System Lock	The system has disabled the keyboard following an entry. The operator should look for a message and then press RESET to restore the keyboard.
X ?+	What (Try Again)	The last input was not accepted. The screen should be rechecked, and the operation should be retried as follows: 1. Do not key while the X is displayed. 2. If ALT, or a shift key, was used, press the key again; then press RESET and retry the operation. 3. If ALT, or a shift key, was not used, press RESET and retry the operation.
X	Printer Not Working	The printer assigned to the display station is not functioning. If this symbol appears after the Print key has been pressed, the print request is canceled, and the DEV CNCL key should be pressed to restore the keyboard. If the Printer Failure symbol is displayed in the printer status areas, the printer stopped during the last print operation. DEV CNCL should be pressed to restore the keyboard and to instruct the control unit to stop monitoring the operations of the printer that stopped.
X	Printer Busy	The printer assigned to the display station is busy. If the Printer Printing symbol is displayed in the printer status area, the printer is printing. The operator may wait for the printer operation to complete, or he may press the DEV CNCL key. If the print key was used, it may be possible to select another printer.
X	Printer Very Busy	This symbol means the same as Device Busy, except that more time than usual is anticipated before the print request is accepted.
X	Time	Time is required for the system to perform a function.
X -S	Minus Symbol	The symbol you keyed is not available. The RESET key should be pressed to restore the keyboard.
X -f	Minus Function	A currently unavailable function was requested. RESET should be pressed to restore the keyboard.
X -f	Minus Function	Operator Unauthorized.
X >	More Than	An attempt was made to enter more information into a field than can be entered. RESET should be pressed to restore the keyboard, and the operation should be retried and the entry corrected.
X #?	What Number	A numeral was entered that is unacceptable at the display screen location. RESET should be pressed to restore the keyboard, and the correct entry should be made.
X NUM	Numeric	A nonnumeric entry was made at a display screen location reserved for numeric information. RESET should be pressed to restore the keyboard, and the operation should be retried.
X-	Operator Communication Check (X.25 only)	The operator has requested an X.25 Function that is currently prohibited. See Appendix C.

Figure 2-7. Do-Not-Enter Symbols (Locations 9 through 17)

2.5.3 Communication Reminder Symbol

The communication reminder (Figure 2-8) is turned on and broadcast to all active Category A displays when the 3274 detects a failure in the local or remote communication path to the host system. The reminder will remain on until the failure condition has been cleared and the 3274 detects the cleared condition. When the reminder is broadcast to all displays, all retry activity has stopped. When a Bisynchronous line error has been detected, the original contents of the screen are restored. The reminder then remains on the screen of the display affected until cleared by host-system recovery activity.

Symbol	Name	Explanation
nnn	Communication Reminder	The communication link connecting the control unit to the system is not functioning. This symbol is displayed with the Communication Check symbol.
XCCDD (See Note)	X.25 Communication reminder with cause and diagnostic codes	The Communication Link is not functioning for reason indicated by XCCDD (defined in Note below).
	Reserved	This symbol is reserved for future use and should be ignored if it is displayed.
:ss.s	Response Time Monitor Indicator	Response Time Monitor Last Transaction Time; rounded to nearest 10th second.
mm:ss	Response Time Monitor Indicator	Response Time Monitor Last Transaction Time; rounded to nearest second.
:	Response Time Monitor Indicator	Response Time Monitor Last Transaction Time indicator when local display not enabled.
	Call Ready (X.25 only)	The 3274 is in Ready State. Dial operations or an incoming call may be accepted.
XCCDD (See Note)	X.25 call ready with cause and diagnostic codes	A call has been placed but the connection has not been completed for the reason indicated by XCCDD (defined in Note below).
# ?	Dial-In (X.25 only)	The "DIAL" key has been pressed and the control unit is waiting for the operator to key in the dial digits. ## is displayed at the other terminals connected to the same control unit as the originating terminal.
	Outgoing Call in Process (X.25 only)	The "Enter" key has been pressed after keying in the "dial" digits.
	Incoming Call in Process (X.25 only)	The 3274 has been addressed by the network and is processing an incoming call. When the connection is completed the "Incoming Call in Process" indicator is turned off and the "In-use" indicator (N) is displayed in location 7.
	Disconnect in Process (X.25 only)	The ▶DISC* key has been pressed or a disconnect command or a timeout condition caused the connection to be broken.
599	Local (X.25 only)	The ▶LOCAL* key has been pressed. The control unit is offline to the network. Incoming and outgoing calls are inhibited. The control unit can be restored to "ready" state by pressing the ▶Comm* key.

*This is the X.25 modified key on the display keyboard.

Note: XCCDD are defined as follows:

X This field may have the following values and meanings:
- P = The 3274 received a clear packet.
- Q = The 3274 received a reset packet.
- R = The 3274 received a restart packet.
- L = The 3274 sent a clear packet.
- M = The 3274 sent a reset packet.
- N = The 3274 sent a restart packet.

CC = Cause code (Figure 2-14) received when X = P, Q, or R.
= Diagnostic code modifier (Figure 2-13) when X = L. The diagnostic code modifier is supplied by the 3274 to give additional problem determination information about why the 3274 rejected an incoming call. This modifier is displayed and logged but is not included in the clear packet sent by the 3274.

DD = Diagnostic code (Figures 2-15, 2-16) sent or received.

Figure 2-8. Reminders (Locations 21 through 27)

2.5.4 Programmed Symbols

The symbol set indicators, (Figure 2-9) locations 31 through 33, show the symbol set that will be addressed for a displayable character or symbol in response to the next character entered at the keyboard. A supplementary indicator in location 34 is present if the application program allows the operator to select a PS character attribute for character positions in the current field.

2.5.5 Shifts and Modes Symbols

There are three shifts and modes symbols (Figure 2-10). The Upshift key may be used to determine if the Type A adapter is still polling a display internally when the remainder of the keyboard may be locked up. (The adapter is disabled if the arrow (⇧) will not display.)

2.5.6 Extended Highlighting

The Extended Highlighting indicator (Figure 2-11) in location 46 shows how the next character entered at the keyboard will be highlighted on the display screen; any symbol in locations 46 confirms that the operator is allowed to select an extended highlighting character attribute for character positions in the current field. A supplementary indicator in location 47 is present when the application program allows the operator to select an extended highlighting character attribute.

Symbol	Name	Explanation
S0	Base character set	The base character set is addressed for a displayable character when the operator presses a character key.
PSA through PSF	Symbol set A through symbol set F	The EBCDIC code for characters entered at the keyboard will be used to address the indicated symbol set for a displayable character.
Supplementary Indicator:		
🯅		The current character set or symbol set was selected by the operator.
⏩		The current character set or symbol set is determined by the extended field attribute; either (1) operator selection is allowed, but no selection has been made, or (2) the operator has selected field inherit.

Figure 2-9. Programmed Symbols (Locations 31 through 34)

Symbol	Name	Explanation
APL	APL Mode	
TEXT	Text Mode	
NUM	Numeric	The keyboard is in numeric shifts, which allows use of the 0 through 9 keys and the (.), (—), and DUP keys only.
⇧	Upshift	The keyboard is in Upshift.
^	Insert	The keyboard is in Insert mode. A character may be inserted at the cursor location. Characters beyond the cursor position move to make room for the inserted characters.
▶		The X.25 extension key has been pressed and the X.25 modifier keys on the display keyboard are enabled for use. And/or the Response Time Monitor Last Transaction Time.

Figure 2-10. Shifts and Modes (Locations 36 through 44 and Location 52)—with Extended Data Stream. (Locations 32 through 41)—without Extended Data Stream

Symbol	Name	Explanation
None		No extended highlighting
a	Reverse Video	Character highlighting by reversing the light intensity between the character and its background.
a	Blink	Character highlighting by blinking on and off at regular intervals.
a	Underscore	Character highlighting by underscore.
Supplementary Indicator		
⏩		The current character set or symbol set is determined by the extended field attribute; either (1) operator selection is allowed, but no selection has been made, or (2) the operator has selected field inherit.

Figure 2-11. Extended Highlighting (Locations 46 and 44)

2.5.7 Printer Status Messages

Printer status (Figure 2-12) messages are displayed in the operator information area layout whenever a printer has been assigned to a display requiring the use of a printer. Refer to the *3270 Information Display System: 3274 Control Unit Description and Programming Guide,* GA23-0061 for detailed information regarding printer assignments, classes, and matrix structures.

2.5.8 Machine Check Numbers

Machine check numbers follow immediately after the machine check symbol (␦). They are divided into the following categories: Category A device and adapter errors, Category B device and adapter errors, host attachment and adapter errors, and control logic errors. The 200 series nnn machine check numbers are used for the devices and their respective adapter failures, and the 300 series nnn machine check numbers are used for host and control logic failures. For detailed descriptions, see Appendix B.

2.5.9 Program Check Numbers

Program check numbers follow immediately after the program check symbol (PROG). Program checks are divided into three categories: SNA protocol errors, print matrix definition errors, and data stream errors. Some program check numbers are not displayed at the device, but are logged in the event log for that device. For detailed descriptions, see Appendix B.

2.5.10 Communication Check Numbers

Communication check numbers follow immediately after the communication check symbol (⟋z_). A communication check number may represent an interruption of the communications path between a local channel attached 3274 or a remote teleprocessing attached 3274. The communication check number may also represent a normal communication path condition and not a hardware failure (for example, 532=BSC line idle). The communication check numbers are directly related to the type of host adapter being used. The meaning of the nnn number may change from adapter to adapter. All communication check nnn numbers are listed in Appendix B.

Symbol	Name	Explanation
□–□__	Assign Printer	When changing the printer IDENT, the two numbers entered (X X) appear in the printer authorization matrix.
□–□nn	Printer Assignment	The display station is authorized to use printer number nn. Individual printers may be assigned 01 through 31. Printer "class" is designated by 70 through 80.
□–■nn	Printer Printing	The printer identified by nn is printing.
□–◣nn	Printer Failure	The printer identified by nn has stopped while printing.
□–□??	What Printer	The printer IDENT has changed. Pressing the IDENT key causes display of a new printer assignment.
(Nothing Displayed)		If the display is attached to a 3274 (4 displayed in location 1), printing cannot take place.

Figure 2-12. Printer Status (Locations 60 through 64)

Diagnostic Code Modifier	Reason
00	No additional information is provided. See Diagnostic Code.
01	Calling DTE address is expected but none is included.
02	Calling DTE address does not match customized value.
03	Facilities other than RPOA are included when customizing indicates that none is expected.
04	Reserved
05*	Packet facility is included but is not customized.
06	Incoming CUG does not match customized value.
07	Call requests reverse charging but function is not customized.
08	Call requests reverse charging not requested but function is not customized.
09*	Call included window size facility but window size facility is not customized.
10	CID is to be validated but none is included in Call Request packet.
11	CID is included but does not match customized value.
12	Protocol ID is not included.
13	Protocol ID is incorrect.
14	CUG facility is customized but is not included in Call Request packet.
15	Call includes throughput class facility but function is not customized.
16	Reserved
17	Call does not include reverse charging facility when customization indicates that it should.

*Customized = either customized value or value entered via Dial screen.

Note: *These modifiers show up on X.25 Communication Check only — Do not appear in CLEAR REQUEST packets.*

Figure 2-13. Diagnostic Code Modifiers

Clear Indication Packet	Hex Code
DTE originated*	00
Number busy	01
Out of order	09
Remote procedure error	11
Reverse charging acceptance not subscribed	19
Incompatible destination	21
Fast select acceptance not subscribed	29
Invalid facility request	03
Access barred	0B
Local procedure error	13
Network congestion	05
Not obtainable	0D
RPOA out of order	15
Reset Indication Packet	
DTE originated*	00
Out of order†	01
Remote procedure error	03
Local procedure error	05
Network congestion	07
Remote DTE operational†	09
Network operational†	0F
Incompatible destination	11
Restart Indication Packet	
Local procedure error	01
Network congestion	03
Network operational	07

Note: *These codes may not apply nor be common to all networks.*

*When the cause field is X'00', the diagnostic code field has been passed through the network from the remote DTE's original Clear Request, Reset Request, or Restart Request packet. The diagnostic code is then as listed in Figure 2-16 provided the remote DTE is an IBM (SNA) DTE.

†Applicable to permanent virtual circuits only.

Figure 2-14. Cause Codes (Use Field Received from the DCE)

Diagnostic Code Field	Hex Code
No additional information	00
Invalid P(S)	01
Invalid P(R)	02
Packet type invalid — general	10
For state: R1	11
R2	12
R3	13
P1	14
P2	15
P3	16
P4	17
P5	18
P6	19
P7	1A
D1	1B
D2	1C
D3	1D
Packet not allowed — general	20
Unidentifiable	21
Call on one-way logical channel	22
Invalid packet type on PVC	23
Packet on unassigned logical channel	24
Reject not subscribed to	25
Packet too short	26
Packet too long	27
Invalid GFI	28
Restart with non-zero GFI	29
Packet type incompatible with facility	2A
Unauthorized interrupt confirmation	2B
Unauthorized interrupt	2C
Timer expired — general	30
Incoming call	31
Clear indication	32
Reset indication	33
Restart indication	34
Call setup problem — general	40
Facility code not allowed	41
Facility parameter not allowed	42
Invalid called-address	43
Invalid calling-address	44
Call clearing problem — general	50
Non-zero address lengths field	51
Non-zero facility lengths field	52

Note: *These codes may not apply nor be common to all networks.*

Figure 2-15. Diagnostic Code Fields Received from the DCE

Diagnostic Code Field	Hex Code	Diagnostic Code Field	Hex Code
Normal initialization or termination	00	Packet not allowed	A0
Invalid LLC type	0C	Invalid M-bit packet sequence	A1
		Invalid packet type received	A2
Invalid packet type — general	10	Invalid packet on PVC	A3
		Unassigned logical channel number	A4
For state: R1	11	Diagnostic packet received	A5
R2	12	Packet too short	A6
R3	13	Packet too long	A7
P1	14	Invalid GFI	A8
P2	15	Not identifiable	A9
P3	16	Not supported	AA
P4	17	Invalid P(S)	AB
P5	18	Invalid P(R)	AC
P6	19	Invalid 'D' bit received	AD
P7	1A	Invalid 'Q' bit received	AE
D1	1B		
D2	1C	CAC-specific codes	
D3	1D		
		Termination pending	C1
DCE timer expired — general	20	Channel inoperative	C2
		Unauthorized interrupt confirmation	C3
Incoming call	21	Unauthorized interrupt request	C4
Clear indication	22	PVC resource not available	C5
Reset indication	23		
Restart indication	24	Resources — general	D0
DTE timer expired — general	30	Buffers depleted	D1
		PIU too long	D2
Call request	31		
Clear request	32	Local procedure error — general	E0
Reset request	33		
Restart request	34	Packet received with LC not equal to 0	E1
		Restart or Diagnostic packet received with LC not equal to 0	E2
QLLC error — general	50	Incoming call received on wrong LC	E3
Undefined C-field	51	Facility not subscribed	E4
Unexpected C-field	52	Invalid packet for LC equal to 0	E5
Missing I-field	53	Facility parameters not supported	E6
Undefined I-field	54	Facility not supported	E7
I-field too long	55	Unexpected calling DTE	E8
QFRMR received	56	Invalid 'D' bit request	E9
Invalid QLLC header	57	Reset indication on virtual call	EA
Data received in non-data state	58	Invalid protocol identifier	EB
Timeout condition	59	Connection identifier mismatch	EC
PSH error — general	60	Remote procedure error — general	F0
Sequence error	61		
PS header too short	62		
PSH format invalid	63		
Command undefined	64		
Invalid PSH protocol	65		
Data received in non-data state	66		
Timeout condition	69		

Figure 2-16. Diagnostic Code Fields Generated by an IBM (SNA) DTE

Chapter 3. Subsystem Error Logs and Test Formats

3.1 INTRODUCTION

There are six basic formats for entry into the subsystem log and test facility. This concurrent test facility provides path tests between the control unit and attached devices, device error statistics, device adapter error statistics, host adapter error logs and statistics, control logic error statistics, configuration and EC data, display of the status of all configured devices, reset capability of statistical error counters, and device control block displays for all configured devices. The use of the ALT and TEST keys is necessary to enter Test mode. The concurrent test facility is available only after Test mode is entered. Following are the concurrent test and log facilities:

Note: *These tests cannot be invoked from a 3290.*

- Test 0 — Checks the communication path between the 3274 and its attached devices. Also provides functional testing of Category A devices (displays 3278 and 3279) and four-color override switch function on a 3279.

  /0 — Transmits a test pattern from the control unit to the display from which you requested Test 0.

  00 to 31/0 — Transmits a test pattern from the control unit to the specified Category A display.

- Test 1 — Displays error statistics for displays, printers, adapters, and control logic.

  00 to 31/1 — Displays log of any device from 00 to 31.

  A0/1 — Displays the host adapter/attachment log formats: CCA BSC, CCA SDLC, HPCA, LCA attachments, and LHA or SLHA attachment. Only the format for the host adapter installed in your machine is displayed in response to this request.

  A1/1 — Displays log of the Category A adapters.

  A2/1 — Displays log of the Category B adapters, Encrypt/Decrypt adapter and Disk adapter.

  A3/1 — Displays control logic error logs.

- Test A4/1 — Display Response Time Monitor Log

  A4/1 entered on a 3178, 3278, or 3279 terminal, displays the RTM log.

  A5/1 — Displays error correcting code (ECC) counters. (Configuration Support C only.)

- Test 2 — Displays configuration information.

  /2 — For first (hex) 40 bytes.

  (Enter key only) — For second 40 bytes.

- Test 3 — Displays the status (off, on, disabled, unavailable) of all configured devices and summary errors.

  /3 — Status of ports and summary error counters.

- Test 4 — Reset logs.

  XX/4 — Resets specified log counter. XX has same meaning as Test 1 for example, A3/4 means reset control logic error logs.

- Test 6 — Displays key information in device control blocks. Can also display all Logical Terminal extensions for each DCB (if any).

  00 to 31/6 — For first (hex) 40 bytes. You may page from one page to the next by pressing the ENTER key. Paging beyond display 0C will result in a locked keyboard and X-f displayed on the status line. For extended DCB, paging is extended for displays 10, 14, 18, and 1C.

- Test 7 — Color Convergence.

- Test 8 — Programmed Symbols, Highlighting, and Color Test.

- Test /A — Generate Alert (SNA — CS "C" and "D" only)

  When /A is entered on a 3178, 3278, or 3279 terminal by an authorized operator a screen is presented on the invoking display. From 1 to 20 predefined panels may be selected via this screen.

- Test B — Display Host Device Addresses - /B — Displays for each port on the controller, the port number, whether the port is available or unavailable, and the primary address associated with the port.

- Test/D — Request 3290 Dump

  XX/D may be entered from a 3178, 3278, or 3279 terminal to obtain a dump for any 3290 (XX = port number) that is attached to the same 3274 control unit that the display from which the dump is being requested is attached to.

3.2 TEST 0: COMMUNICATION PATH TEST AND 3278 DISPLAY TEST

3.2.1 Description

Test 0 performs the following functions:

- Transmits a test patterm from the control unit to the display from which you requested Test 0.
- Transmits a test pattern from the control unit to the specified Category A display (except 3290) as specified by you when you entered the Test 0 format message.
- Functionally tests the following using the test pattern transmitted by the control unit to the Category A display specified by you: (1) high-intensity function (3278 only), (2) nondisplay function, (3) various key functions, (4) selector–pen function, (5) MSR function, and (6) audible-alarm function.
- Executes communication path test to Category B display (3277).
- Executes communication path test to Category A or B printers.
- Four-color function and override switch (3279 only).

A request for Test 0 will be executed to any Category A display except under the following conditions:

- If the device requested is in a SNA session, the test pattern function is not performed. Do Not Enter minus function indication is returned.
- If the device has the Wait indicator on and is attached to a Model B or is busy executing a command that requires asynchronous ending status (Op Complete), Do Not Enter minus function indication is returned.

This test, if requested for a Category B display (3277) or Type A or B printer, only checks the continuity of the coax communication path. Success or failure of this test is displayed on the requesting Category A display as follows:

- The test message you entered followed by a: +, -, or 0.
  + = Test successful or path OK.
  - = Test failed, device disabled because of error
  0 = Test not run, device powered off.

If no device is specified when the test is requested, an automatic default to the requesting device occurs.

3.2.2 Procedure for Requesting Test 0

- Press and hold ALT; then press TEST to enter Test mode.
- Ensure the cursor is at location zero (0). Enter the following: (1) the device number you wish to test, using any 2-digit number from 00 to 31, (2) a slash, and (3) a zero. Press the ENTER key.
- If you are testing a Category A display, the following pattern will appear on the screen if the test is successful:

```
TEST: 3274;NN
?SEL PEN        SEL PEN
     &SEL PEN )   SEL PEN
     DISPLAY  INSERT CK
```

  NN = The port number of the terminal that requested the test

- For a color description see the *3274 Problem Determination Guide,* GA27-2850, for device specific characteristics of this test.
- Use the appropriate *Display Station Maintenance Information* manual and *3274 Control Unit Maintenance Information* manual (SY27-2530) to run the functional tests with the above test pattern.
- To exit Test mode, press and hold ALT and then press TEST.
- An entry of slash (/) only automatically defaults to Test 0 on the requesting display.

3.3 TEST 1: OVERVIEW

Test 1 is a variety of device and adapter error log and statistical display counter information that can be displayed on any working Category A display while that display is in Test mode. By using a 2-digit prefix to the entry slash (/)1, specific device log or adapter log information can be retrieved. The formats for entering a Test 1 request are as follows:

- 00 to 31/1 — Displays log of any device from 00 to 31.
- A0/1 — Displays the host adapter/attachment log formats: CCA BSC, CCA SDLC, HPCA, LCA attachment, and SLHA and LHA attachment. Only the format for the host adapter installed in your machine is displayed in response to this request.
- A1/1 — Displays log of the Type A adapters.
- A2/1 — Displays log of the Type B and Encrypt/Decrypt adapters.
- A3/1 — Displays control logic error log.
- A5/1 — Displays ECC counts. (Configuration Support C only.) **Note:** *A5/4 resets all ECC counts for all volumes.*

The error information contained in the above logs resides in the 3274 storage. The general format of all logs reflects (1) the most recent error *event* information and (2) statistical counters that reflect the type of errors occurring. The event log may be a combination of significant information that will differ in content from adapter to adapter as well as in format. The statistical counters record errors using hexadecimal values. The maximum value for any counter is hex 'ff'.

The terms used in the log descriptions are defined as follows:

Machine Check — The CCA hardware has detected an error, and the failing operation is retried. If the retry is successful, the error is transparent. If the retry fails, the CCA is disabled and the machine check is logged. See nnn code 310 in Appendix B.

Invalid Status — The control logic has detected an unexpected or invalid combination of bit settings in the CCA Status Register. See nnn code 311 in Appendix B.

DCE – The control logic has detected the loss of Data Set Ready (DSR) from the modem. See nnn code 501 in Appendix B.

Timeout

Read Operation – This bit indicates that 3 seconds has elapsed without receipt of an Syn, ETX, or ETB.

Write Operation – See nnn code 530 in Appendix B.

Overrun

CCA – The 3274 was not ready to receive a byte of data from the device.

HPCA – Either the cycle-share buffers were full or the 3274 did not allow the adapter to cycle-share.

Underrun – The 3274 was not ready to transmit a byte of data at the time the transmission line was ready to receive it.

Enq Received – An enquiry character has been received by the 3274.

NAK Sent – A Negative Acknowledgment has been sent.

NAK Received – A Negative Acknowledgment has been received.

15 NAKs Received – 15 Negative Acknowledgments have been received.

15 NAKs Ack – 15 Negative Acknowledgments have been sent.

N Timeouts Invalid – N = number of invalid timeouts that have occurred.

15 Timeouts Invalid – 15 invalid timeouts have occurred.

Count Exceeded – The byte count has been exceeded.

RI – Ring Indicator (not used)

RVI RCVD – A reverse interrupt was received instead of ACK 0/ACK 1.

ITB ATTN – An ITB character was received.

EOH ATTN – An STX character was received signifying the End of Header.

XPRNCY – The receive operation has entered the transparent mode.

Poll/Select – This bit, when 1, indicates that this station has been polled. When this bit is 0, this station has to be selected.

3.3.1 Test 1 Device Logs

Perform the following steps before consulting the log:

1. If any 8 4 2 1 indicators are set, refer to the *MIM* for the failing FRU.
2. If a 3nn or 5nn code is displayed, refer to Appendix B for problem determination information. These codes can be found in the device logs.

If the above steps do not provide sufficient information for problem determination, then the log may be of assistance. The log statistical counters indicate the state of the interface (how many errors of a certain classification), and the event data provides error status on the interface for certain severe error events. This event data should be the last error information examined, since the control logic normally examines the appropriate error data and sets the nnn code to the appropriate value.

The device logs should be accessed whenever a specific device is suspected of experiencing intermittent or difficult-to-define errors. These errors may or may not be generating nnn numbers on the failing device. (Not all nnn numbers are displayed.) Since several types of device logs are available when using Test 1, it is necessary to determine what type of device (Category A or Category B) is attached to the device port number (00-31) for which you are requesting log information. The format for all device logs requested using Test 1 is as follows:

- Line 1 –

  01/1

  This line is returned exactly as you entered your request. Example: You entered 01/1, and the first line of the display sent back to you should be 01/1.

  For Configuration Support D, release level 63 and later release levels, Line 1 is extended as follows:

  01/1 TTTT II MMM PP SSSSSSS RRR EEEEEEEEEEEEEEE

  TTTT – This field represents the device type; it is numeric, right-justified, and padded with zeros.

  II – This byte represents additional identification for the user.

  Bits 0–3 0001 - hardware or microcode
  1110 - customer programmable
  Bits 4–7 0001 - non-IBM product
  1001 - IBM product

  MMM – This field represents the model number; it is alphanumeric, right justified, and padded with zeros.

  PP – This field represents the plant of manufacture (origin); it is alphanumeric.

  SSSSSSS – This field represents the serial number; it is alphanumeric, right justified, and padded with zeros.

  RRR – This field represents the program release level; it is alphanumeric, right justified, and padded with zeros.

  EE...EE – This field (16 bytes) represents information specific to the device; it is alphanumeric.

- Line 2 –

  0000 0000

  This line displays the most current two low order digits of the 200 (22), 300 (33), 400 (44), and 500 (55) series NNN numbers detected by the 3274; the two low order digits of the 600 (66) and 700 (77) series numbers detected by the 3290, in addition to the 3290 qualifier (QQ). The last byte (00) is not used.

  Note: Specific 3290 documentation should be consulted to obtain a description of the 600/700 NNN numbers and the device qualifier.

  If there are no errors generating nnn numbers, and it is not a 3290, the second line of this display will appear as follows:

  0000 0000

  If error information had been recorded, the second line of this display could appear as follows:

  0400 0032

  04 = The most current 200 series error, in this example, 204, which is a device check.*
  00 = No 300 series errors are recorded.
  00 = No 400 series errors are recorded.
  32 = The most current 500 series error, in this example, 532, which is BSC line idle.

  The 200 numbers appear in the leftmost position and progress to the 500 numbers in the rightmost position.

  If 3290 error information has been recorded, the second line of the display could appear as follows:

  0088 0034 0100 0200

  00 = No 200 series errors.
  88 = Most current 300 series error (388).
  00 = No 400 series errors.
  34 = Most current 500 series error (534).
  01 = A 600 series error (601).
  00 = No 700 series errors.
  02 = Qualifier.
  00 = Not used.

  *A 2%% (customization error) nnn code will appear as 2EE in the error log.

- Line 3–

  XXXX XXXX XXXX YYYY YYYY

  This line displays the statistical counter information associated with this device. The XX bytes are displayed for all devices and represent eight counters, designated 01 though 08. The YY bytes represent four counters, designated 09 through 12. These four counters are displayed for 3290 units only. Consult specific documentation for a description of the YY bytes (counters 09 through 12).

  If no errors are recorded for this device, the counters will display as follows:

  0000 0000 0000

  The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position used is counter number 06. The value in each counter is given in hexadecimal. If errors were being recorded for this device, the display for line 3 would appear as follows:

  02FF 1A00 0013 0000

  Counter number 01 = 02 hex = 02 errors total
  Counter number 02 = FF hex = 255 errors (maximum)*
  Counter number 03 = 1A hex = 26 power-off total
  Counter number 04 = 00 hex = no errors
  Counter number 05 = 00 hex = no errors
  Counter number 06 = 13 hex = 19 errors total

  *All counters increment to FF and remain at FF until reset.

All counters for line 3 function in this manner. The counter numbers are assigned specific meanings according to the type of device log being requested. (See Figure 3-1.)

Following is a device log as it would appear for an intermittently failing 3278 display on control unit port A17.

17/1
1200 0000
0000 001C 0000

If the log for this device is broken down, there is a record in the nnn number field showing that a 212 (invalid scan code received) error is the most recent 200 series error and that no other nnn errors are recorded. Counter number 04 has a value of 1C recorded, indicating that 28 device checks were pointing to this display as the source of failure. Repair activity can now be attempted at the display level. Control-unit failure is not suspected.

3.3.2 Test 1 Host Adapter Logs

The host adapter logs should be accessed whenever a problem is suspected to be intermittently causing host communication failures, host adapter failures, or other spurious or difficult-to-define failures. When a host adapter log is requested, the format will always be A0/1. The display sent from the control unit in response to this request will depend on the type of host adapter installed in your 3274.

The display for each host adapter is slightly different. The display returned in response to an A0/1 request is covered in detail in subsequent sections; in general, however, all displays appear as follows:

- Line 1 – A0/1
- Line 2 – Event data is displayed
- Line 3 – This line displays the statistical counters associated with each host adapter

The host adapter logs can provide detailed information pertaining to the following questions: (1) What was the nnn number at the time of the last failure? (2) What was the operation being attempted at the time of the last failure? (3) How was that operation completed? (4) Why was that operation completed that way? (5) What is the frequency of this type of failure? If these questions are answered with the use of the information stored in the host adapter logs, remedial or repair activity can be attempted.

3.3.3 Test 1 Common Communications Adapter (CCA) Log for BSC

This host attachment log format is returned to the requesting 3278 in response to an A0/1 entry. The format detail is as follows:

- Line 1 – Returned the same as input, A0/1.
- Line 2 – Twenty-four bytes are displayed on this line, but only 10 are used. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

Byte 1							Byte 24
0000	0000	0000	0000	0000	0000	0000	0000
NNFF	CCCC	SSSS	SSSS	SSSS	XXXX	XXXX	XXXX

NN. This code represents the two low-order digits of any 500 series nnn number in almost all cases. However, if NN equals zero (00) and the bytes labeled FF and CCCC are *not* zeros, then the entire log information does not pertain to a 500 series communication check and is to be considered machine-check data.

FF. This byte represents the type of operation being attempted at the time of the failure. See Figure 3-2 when FF is to be used.

CCCC. These two bytes indicate how the attempted operation ended. See Figure 3-3 to determine whether the operation was completed (1) normally, (2) with exception, or (3) with error.

SSSS. These five bytes contain sense information recorded at the time of the failure. After you have examined NN, FF, and CCCC, the SSSS bytes should give you some indication as to why the nnn code was generated and why the operation attempted was not completed normally.

XXXX. Not used.

- Line 3 – This line displays the statistical counter information associated with this adapter. If no errors are recorded for this adapter, the counters display as follows:

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position *used* is counter number 10. The remaining positions are not used. The value in each counter is given in hexadecimal. The maximum value for any counter is FF.
Each counter is assigned a specific meaning, as follows:

Counter	Meaning	nnn Code*
01	NAK sent	531
02	NAK received (see below)	
03	ENQ received (see below)	533
04	Timeout invalid (15 ENQs sent)	534
05	15 NAKs received	535
06	15 Wrong ACKs (ACK 0 instead of ACK 1, etc.)	536
07	Underruns/overruns (see below)	
08	Write timeout	530
09	DCE error	501
10	Number of Available Buffers Exceeded (see below)	

*See Appendix B.

The following descriptions of conditions will help you analyze the logs:

02 NAK Received – When an NAK is received in response to a block of transmitted text, the counter is incremented. The adapter attempts to recover by retransmitting the block of text (see counter 05 and nnn code 535).

03 ENQ Received – The counter is incremented if an ENQ is received within the text stream or when associated with a 3-second timeout. See NAK sent.

07 Underrun/Overrun
These conditions are detected by the CCA hardware and are described as follows:

- Underrun – Underrun occurs when the CCA is being clocked to put another byte (to be sent) on the communication line when the byte has not been provided by the control unit.
- Overrun – This condition occurs when the CCA has received a byte of data but cannot place it in the input register because the control unit has not processed the previous byte received (input register is full).
- Recovery Process
  - If the error occurs at the beginning of the transmission (during PADs or SYNs), the transmission will be restarted.
  - If the error occurs elsewhere in the transmission, the transmission will stop and the control unit will wait 3 seconds and then send an ENQ. If the host sends the previous ACK, the entire message will be transmitted.
  - If the error occurs on a receive operation, the remaining incoming data will be ignored and the control unit will wait for the host to send an ENQ. When the ENQ is received, the previous ACK will be returned and the host will retransmit the block of text.

Category A Display Log

Counter	Meaning
01	Coax timeouts
02	Coax parity errors
03	Power off
04	Device checks
05	Error status base machine
06	Error status features

Category A Printer Log

Counter	Meaning
01	Coax timeouts
02	Coax parity errors
03	Power off
04	Device checks
05	Error status
06	Equipment checks

Category B Display Log

Counter	Meaning
01	Coax timeouts
02	Coax parity errors
03	Power off
04	Device checks
05	Not applicable
06	Not applicable

Category B Printer Log

Counter	Meaning
01	Coax timeouts
02	Coax parity errors
03	Power off
04	Device checks
05	Sync or equipment checks
06	Disabled or equipment checks

Category A Log Detail

Counter	Meaning
01	Coax timeouts – This counter is incremented when the 3274 sends data or commands to the device and does not receive a response in a predetermined period of time. **Note:** *Use the nnn code logged for the device for further analysis.*
02	Coax parity error – This counter is incremented when the 3274 detects a parity error in a 12-bit byte received from the device.
03	Normal power off – This counter indicates the number of times the device failed to respond to a poll retry sequence (device powered off). Counter 1 or 2 is incremented on the first failure to receive a poll sequence response; 32 successive poll sequence retries by the DCA then follow. If all retries are unsuccessful, the control logic assumes that the device is powered off and then increments counter 3.
04	Device checks – The device has detected an error and has returned device check status to the 3274. See nnn code 204.
05	Error status base machine – Error status has been returned that indicates a device failure.
06	Error status features – An invalid response or error response has been received from a feature device.

Category A Printer Detail

Counter	Meaning
01	Coax timeouts – See Category A log detail.
02	Coax parity error – See Category A log detail.
03	Normal power off – See Category A log detail.
04	Device checks – See Category A log detail.
05	Error status – An error condition has been detected by the 3274, or error status has been received indicating a device failure.
06	Equipment check – The printer has reported an unrecoverable error to the 3274.

Category B Log Detail

Counter	Meaning
01	Coax timeouts – See Category A log detail.
02	Coax parity error – See Category A log detail.
03	Normal power off – See Category A log detail.
04	Device checks – See Category A log detail.
05	Sync or equipment check – The printer has returned sense information that indicates an equipment check while printing. See nnn code 276 in Appendix B.
06	Disabled and equipment check – The printer has posted an equipment check and is in a not-ready condition. See nnn code 275 in Appendix B.

Figure 3-1. Summary of Counter Definitions by Device Log Type

10 Number of Available Buffers Exceeded – This condition is not considered a communication check. It results from a data stream that the 3274 cannot handle. A sense/status of the operation check and EOT will be sent to the host.

A complete log display for this adapter would appear as follows:

```
A0/1
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

FF Code	Operation Attempted	Description
00	Enable/Set Mode	Initializes the CCA for the customizing options specified. When the adapter is enabled, it will assume a Receive Monitor mode.
01	Sense Hardware	Provides current status of the hardware portions of the adapter.
02	SOH/ETX Conversational Response	Used to respond to a received Text/Header format with a Text/Header format transmission in place of a positive acknowledgment; for example, on a Read Modified command from the host.
03	Read Normal	Causes the adapter to transmit the appropriate acknowledgment (ACK 0/1) and turns the line around to receive.
07	Read-Respond RVI	Transmits an RVI in place of the ACK 0/1 and turns the line around to read.
0A	SOH/ETB Conversational Response	Used to respond to a received Text/Header format with a Text/Header format transmission in place of a positive acknowledgment (error occurred during the processing of a Read Modified command).
0E	SOH/ETB Nonconversational	Transmits a Text/Header format to the host in response to a poll (Test Request message).
10	Write EOT	Initiates an EOT control sequence.
12	STX/ETX Conversational Response	Used to respond to a received Text/Header format with a Text/Header format transmission in place of a positive acknowledgment; for example, when a Read Modified command is received from the host.
18	Write WACK	Initiates a WACK control sequence; for example, during a print operation.
1A	STX/ETB Conversational Response	Used to respond to a Receive Text/Header format with a Text/Header format transmission in place of a positive acknowledgment; for example, on a Read Modified command sent from the host.
1E	STX/ETB Nonconversational Mode	Transmits a Text/Header format to the host in response to a poll; for example, an Enter Key operation.
40	Monitor Line	The adapter will monitor for receipt of its station address in a polling or selection sequence.
44	Monitor-Response EOT	Initiates an EOT control sequence and then a return to Monitor mode; for example, when no action is required on a poll sequence.
46	SOH/ETX Expect Conversational Response	Permits a conversational response to be received in response to a transmitted Text/Header format; for example, on a Status (DE) to the host.
56	STX/ETX Expect Conversational Response	Permits a conversational response to be received in response to a transmitted Text/Header format; for example, on an Enter Key operation.
58	Monitor Line-Respond WACK	Initiates a WACK control sequence and then a return to Monitor mode; for example, when the device is busy or when a selection sequence is in process.

Figure 3-2. CCA BSC Operation Attempted Chart (Code FF)

Operation Attempted

00 Enable/Set Mode

	Left CC Byte (Completion)								Right CC Byte (Detail)							
Bit	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Normal Completion	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
RVI																
Error Completion	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0	0
Halted																
Overrun/Underrun																
Invalid Basic Status																
DCE																
Machine Check																
Exception Completion	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Timeout																

01 Hardware Sense

Normal Completion	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
(No error or exception condition allowed)																

02 SOH/ETX Conversational Response

03 Read Normal

06 SOH/ETX Nonconversational

07 Read and Respond RVI

Normal Completion	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0
STX=0																
SOH=1																
ETX=0																
ETB=1																
Error Completion	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	0
Write=0																
Read=1																
Halted																
Underrun/Overrun																
Invalid Basic Status																
DCE																
Machine Check																
Timeout																
Exception Completion 1	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1
EOT Received																
Count Exceeded																
Disc																

Note: *Bits shown as 0 are not used unless specified otherwise.*

Figure 3-3 (Part 1 of 2). CCA BSC Operation Ending Chart (Code CCCC)

Operation Attempted

	Left CC Byte (Completion)								Right CC Byte (Detail)							
Bit	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Exception Completion 2	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1
N Timeouts Invalid																
ITB Attention																
EOH Attention																
Transparency																
NAK Sent																
TTD Received																
15 ENQs Received																

0A SOH/ETB Conversational Response

0E SOH/ETB Nonconversational

10 Write EOT

Normal Completion	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Error Completion	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	0
Underrun																
Invalid Basic Status																
DCE																
Machine Check																
Timeout																

(Exception completion not valid for Write EOT)

12 STX/ETX Conversational Response

14 Disable

Normal Completion	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Error Completion	0	0	0	0	1	1	0	0	0	0	0	1	1	1	0	0
Invalid Basic Status																
DCE																
Machine Check																

(Exception completion not valid for Disable)

16 STX/ETX Nonconversational

18 Write WACK

Normal Completion	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Error Completion	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	0
Write=0																
Read=1																
Halted																
Underrun/Overrun																
Invalid Basic Status																
DCE																
Machine Check																
Timeout																

Operation Attempted

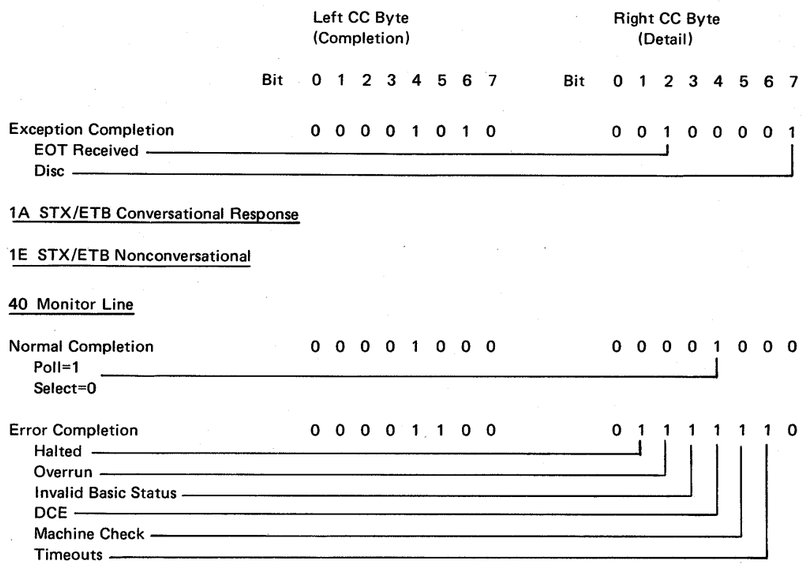
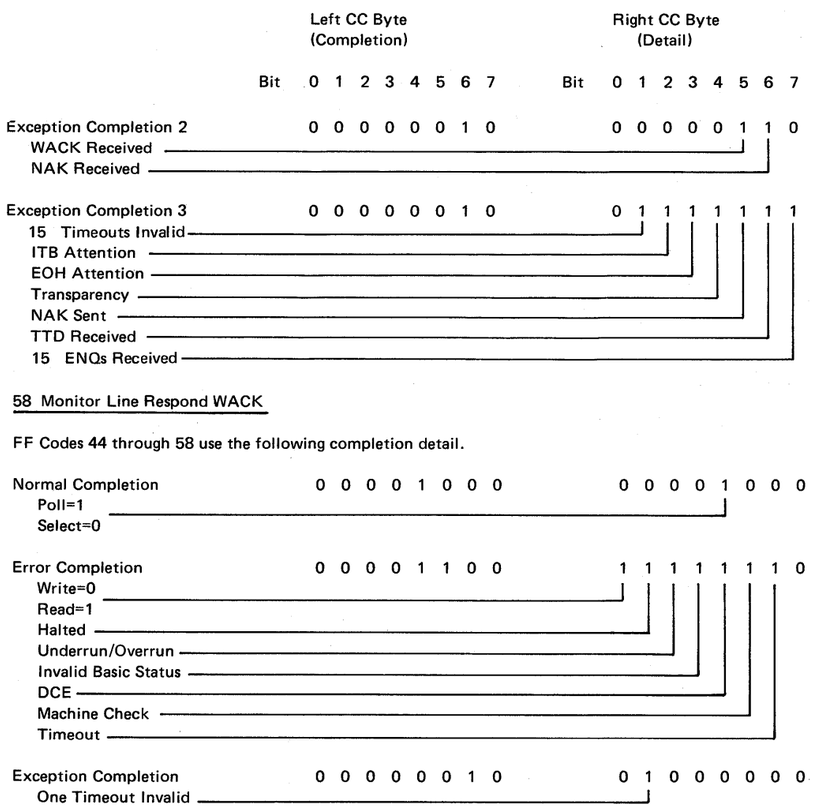


Figure 3-3 (Part 2 of 2). CCA BSC Operation Ending Chart (Code CCCC)

Operation Attempted



Note: *Bits shown as 0 are not used unless specified otherwise.*

Figure 3-4 explains the sense-byte breakdown for CCA BSC. These conditions are logged only for nnn codes 311, 501, 530, 535, and 536, and the last error condition of that type.

Line 2 – NNFF CCCC SSSS SSSS SSSS
0102 0304 0506

SS bytes are labeled from left to right SS01, SS02, SS03, etc.

Location	Bit	Meaning If Bit Is Turned On (1)
Byte SS01		Ignore
Byte SS02	0	Input Request
	1	Output Request
	2	DCE Interrupt
	3	Timer Interrupt
	4	Exception
	5	Machine Check/Prog Check
	6	Enable/Disable
	7	Interrupt Request
Byte SS03	0	Data Set Ready
	1	Clear to Send
	2	Recv Line Signal Det
	3	Ring Ind
	4	DSR Transition
	5	Reserved
	6	RLSD Transition
	7	CTS Transition
Byte SS04	0	DTR/CDSTL
	1	Request to Send
	2	Wrap
	3	Test
	4	Select Standby
	5	Select Half-Speed
	6	New Sync
	7	DCE Interrupt Disable
Byte SS05	0	Overrun
	1	Underrun
	2	Receive Clk Running[1]
	3	SDLC Invalid Seq
	4	SDLC Frame
	5	Invalid Character[1]
	6	Break Byte Detected[1]
	7	Adapter in Sync
Byte SS06	0	Receive Mode
	1	Transmit Mode
	2	Inhibit Zero Insertion
	3	Mode Select[2]
	4	Mode Select [2]
	5	+ Code Length
	6	+ Code Length
	7	NRZI

[1] Should always be zero

[2] 00 = Auto +00 = 8 bit
01 = EBCDIC 01 = 6 bit
10 = ASCII 10 = 7 bit
11 = SDLC 11 = 5 bit

Figure 3-4. Sense Byte Breakdown Chart for CCA BSC (Code SSSS)

3.3.4 Test 1 Common Communications Adapter (CCA) Log and High-Performance Communications Adapter (HPCA) Log for SDLC

This host adapter log format is identical for both adapters and is returned to the requesting Category A display in response to an A0/1 entry. The format detail is as follows:

- Line 1 – Returned the same as input, A0/1.

- Line 2 – Twenty-four bytes are displayed on this line, but only 11 are used. Information is stored and displayed only in line 2 for specific error conditions. These conditions are associated with nnn codes 501, 502, 529, 530, and 321 (see Appendix B for details). Code 321 will be indicated in this line as NN=00, and the remainder of line 2 will be not equal to 0. Each byte is assigned a specific meaning. See the following example for byte identification:

Byte 1 Byte 24

0000 0000 0000 0000 0000 0000 0000 0000 0000
NNFF CCCC SSSS SSSS SSSS SSSS XXXX XXXX

NN – This code represents the two low-order digits of any 500 series nnn number in almost all cases.

FF – This byte represents the type of operation being attempted at the time of the failure. See Figure 3-5 when FF is to be used.

FF Code	Operation Attempted	Description
00	Open	Initializes the communication adapter and associated control blocks.
01	Sense	Issued by the control logic to the communication adapter to determine the current status of the adapter hardware.
02	Write	Transmit or receive data to/from the primary station. A read is implied (any FF code) and is indicated by an exception completion with Read Message Available (bit 6 of the right CC byte) set.
04	Close	Terminates communications on the SDLC line and disables the communication adapter from generating interrupts.

Figure 3-5. CCA/HPCA SDLC Operation Attempted Chart (Code FF)

CCCC – These two bytes indicate how the attempted operation ended. See Figure 3-6 to determine whether the operation was completed (1) normally, (2) with error, or (3) with exception.

SSSS – These six CCA and 17 HPCA bytes contain sense information recorded at the time of the failure. After NN, FF, and CCCC are examined, the SSSS bytes should give some indication as to why the nnn code was generated and why the operation attempted was not completed normally.

XXXX – All bytes labeled XXXX are not used in the CCA and should be ignored for the HPCA, since these bytes contain secondary levels of information not associated with the problem.

- Line 3 – This line displays the statistical counter information associated with these adapters. If no errors are recorded for these adapters, the counters will display as follows:

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position *used* is counter number 12. The remaining positions are not used. The value in each counter is given in hexadecimal. The maximum value for any counter is FF.

Each counter is assigned a specific meaning, as follows:

Counter	Meaning	nnn Code*
01	Nonproductive Timeout	520
02	Idle Timeout	521
03	Write Retry	
04	Overrun	
05	Underrun	
06	Connection Problem	525
07	FCS Error	
08	Primary Abort	
09	Command Reject	528
10	DCE Error	529
11	Write Timeout	530
12	Count Exceeded	519
13	Secondary Busy	

*See Appendix B for a description of the nnn codes listed.

The error-to-nnn-code-and-counter relationship is shown below:

Error	nnn Code*	Counter
DCE Error	529	10
Machine Check		
CCA	320	–
HPCA	330	–
Invalid Status		
CCA	321	–
HPCA	331	–
Write Timeout	530	11
Nonproductive Timeout		01
Idle Timeout	521	02
Overrun	–	04
Underrun	–	04
Connect Problem	525	06
Secondary Busy	–	13
Write Retry	–	03
FCS Error	–	07
Primary Abort	–	08
Command Reject	528	09
Lost Data	519	11

*See Appendix B for a description of the nnn codes listed. The following descriptions of conditions will help you analyze the logs:

- *Read Message Available* – Indicates than an I-frame has been received and is destined to a physical or logical unit.
- *Link Test* – Used in conjunction with the Read Message Available bit. When both bits are on (1), it indicates that the I-frame received is a test message.
- *Poll Request* – This bit indicates that a valid poll has been received from the host.
- *SNRM Received* – A Set Normal Response Mode sequence has been received from the host. An existing session will be terminated and a new session may be established.
- *Underrun* – The 3274 Control Unit was not ready to transmit a byte of data at the time the transmission was ready to receive.
- *Connection Problem* – 20 consecutive occurrences of any of the following: ROL, FRMR, XID, NSA.
- *FCS Error* – The 3274 Control Unit detected an SDLC frame with an invalid block check character (BCC) or a frame-check sequence.
- *Primary Abort* – The 3274 detected an abort message from the primary station.
- *Lost Data* – An I-frame received by the 3274 was larger than the allocated buffer.
- *Write Timeout* – A transmission of data took longer than expected and is suspected to be a result of a hardware function.

Dump Message – Addition status is contained in the register space that will indicate one of the following:

- FCS Error
- Primary Abort
- N (r) Sequence Error
- Wrong Length Message (same as lost data)
- Data with a command
- Invalid SDLC command

Secondary Busy – An RNR response has been sent to the primary station because the 3274 does not have sufficient buffers (receive).

Nonproductive Timeout – No valid SDLC frame has been received by the 3274 that contains either a valid FCS or a valid address for a period of 20 seconds.

XID Received – A valid XID was received from the primary station. The 3274 will go to normal disconnect mode (NDM) of operation.

Disconnect Received – A valid SDLC frame containing a Disconnect command was received from the primary station. The 3274 will go to normal disconnect mode (NDM) of operation.

Write Retry – A previously transmitted I-frame was not received by the host. The 3274 will transmit the same I-frame again.

Idle Line Timeout – No valid flag characters have been detected on the host link for 20 seconds.

Ring Indicate Timeout – A switched connection has not been detected in a 3-second period.

Ring Indicate – A switched connection has been made.

Invalid Basic Status – An adapter hardware register contained data that was not meaningful.

DCE Error – A modem problem has been detected.

Overrun

- CCA – The 3274 was not ready to receive a byte of data from the device.
- HPCA – Either the cycle share buffers were full or the 3274 did not allow the adapter to cycle-share.

A complete log display for this adapter would appear as shown below:

```
A0/1
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

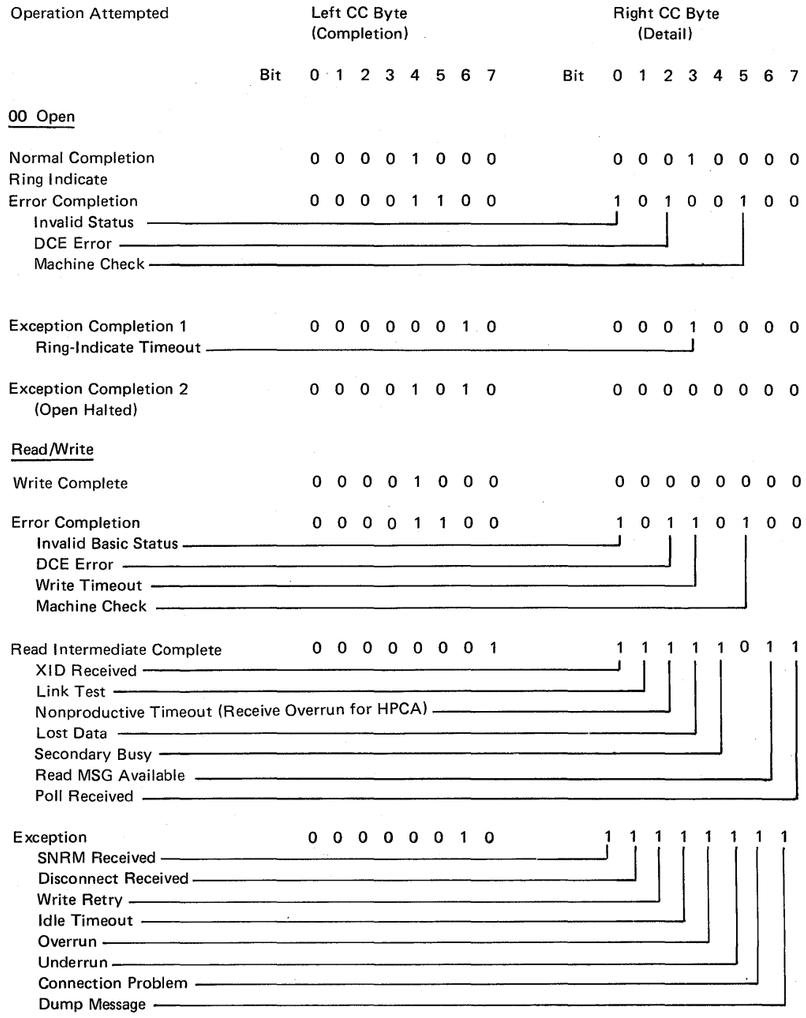
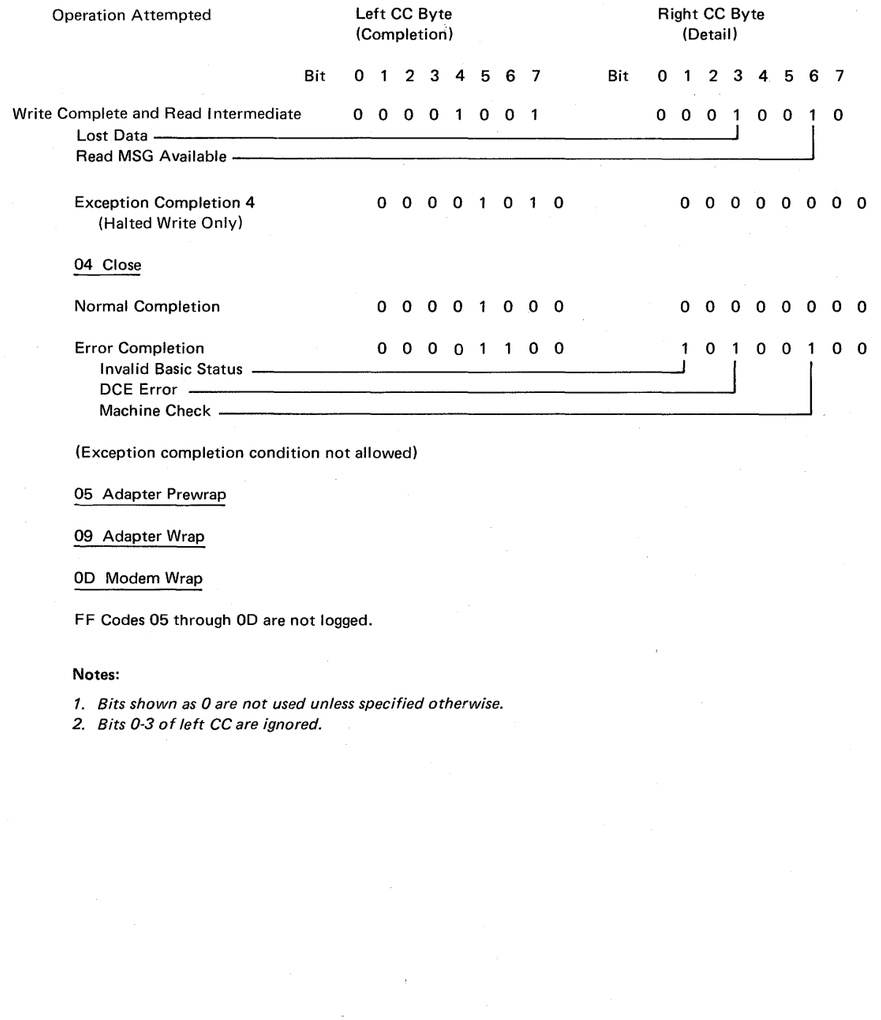


Figure 3-6. CCA/HPCA SDLC Operation Ending Chart (Code CCCC)



Notes:

1. *Bits shown as 0 are not used unless specified otherwise.*
2. *Bits 0-3 of left CC are ignored.*

Figure 3-7 explains the sense-byte breakdown for CCA/HPCA SDLC.

Line 2 – NNFF CCCC SSSS SSSS SSSS SSSS
0102 0304 0506 0708
SS bytes are labeled from left to right SS01, SS02, SS03, etc.

Location	Bit	Meaning If Bit Is Turned On (1)		Location	Bit	Meaning If Bit Is Turned On (1)		Location	Bit	Meaning If Bit Is Turned On (1)	
		CCA	HPCA			CCA	HPCA			CCA	HPCA
SS01	0	See Figure 3-4	Cycle Share Halt	SS07	0	Not Used	Timer	SS13	0	Not Used	1
	1	See Figure 3-4	Transmit EOL		1	Not Used	Timer		1	Not Used	0
	2	See Figure 3-4	Receive Control Entry		2	Not Used	DSR		2	Not Used	Ptr Reg
	3	See Figure 3-4	Modem/Timer		3	Not Used	CTS		3	Not Used	Ptr Reg
	4	See Figure 3-4	Exception		4	Not Used	DSR Transition		4	Not Used	Ptr Reg
	5	See Figure 3-4	Machine Check		5	Not Used	Ring Transition		5	Not Used	Ptr Reg
	6	See Figure 3-4	Enabled		6	Not Used	RLSD Transition		6	Not Used	X
	7	See Figure 3-4	Interrupt Request		7	Not Used	CTS Transition		7	Not Used	0
SS02	0	See Figure 3-4	Receive Mode	SS08	0	Not Used	Wrap	SS14	0	Not Used	1
	1	See Figure 3-4	Ping Valid		1	Not Used	T3/T4 Test		1	Not Used	0
	2	See Figure 3-4	Pong Valid		2	Not Used	New Sync		2	Not Used	Ptr Reg 0
	3	See Figure 3-4	Not used		3	Not Used	Tx New Sync		3	Not Used	Ptr Reg 1
	4	See Figure 3-4	Specific Address Valid		4	Not Used	Diagnostic Clock		4	Not Used	Ptr Reg 2
	5	See Figure 3-4	Group Address Valid		5	Not Used	Diagnostic Timer Control		5	Not Used	Ptr Reg 3
	6	See Figure 3-4	Interrupt on Cont Flags		6	Not Used	RSLD		6	Not Used	Ptr Reg 4
	7	See Figure 3-4	Enable 15 Ones		7	Not Used	Ring		7	Not Used	0
SS03	0	See Figure 3-4	Invalid Seq/Address	SS09	0	Not Used	Not Used	SS15	0	Not Used	Valid Entry
	1	See Figure 3-4	Byte Overrun		1	Not Used	Not Used		1	Not Used	Invalid Sequence
	2	See Figure 3-4	Receive Control Entry		2	Not Used	Ptr Reg 0		2	Not Used	FCS Valid
	3	See Figure 3-4	15 Ones		3	Not Used	Ptr Reg 1		3	Not Used	Pong Entry
	4	See Figure 3-4	Control Overrun		4	Not Used	Ptr Reg 2		4	Not Used	Byte Overrun
	5	See Figure 3-4	Traffic		5	Not Used	Ptr Reg 3		5	Not Used	Buffer Overrun
	6	See Figure 3-4	Receive Cycle Share Halt		6	Not Used	Not Used		6	Not Used	Flag Received
	7	See Figure 3-4	Address in Sync		7	Not Used	0		7	Not Used	Count 256
SS04	0	See Figure 3-4	Transmit Mode	SS10	0	Not Used	Not Used	SS16	0	Not Used	Count 128
	1	See Figure 3-4	Control Valid		1	Not Used	Not Used		1	Not Used	Count 64
	2	See Figure 3-4	NRZI		2	Not Used	Ptr Reg 0		2	Not Used	Count 32
	3	See Figure 3-4	Load Serializer		3	Not Used	Ptr Reg 1		3	Not Used	Count 16
	4	See Figure 3-4	Flag		4	Not Used	Ptr Reg 2		4	Not Used	Count 8
	5	See Figure 3-4	Continuous Character		5	Not Used	Ptr Reg 3		5	Not Used	Count 4
	6	See Figure 3-4	FCS Seq and Flag		6	Not Used	Ptr Reg 4		6	Not Used	Count 2
	7	See Figure 3-4	Inhibit Zero Insertion		7	Not Used	0		7	Not Used	Count 1
SS05	0	See Figure 3-4	Reserved	SS11	0	Not Used	Data Chain	SS17	0	Not Used	Count 256
	1	See Figure 3-4	Reserved		1	Not Used	Frame Chain		1	Not Used	Count 128
	2	See Figure 3-4	Reserved		2	Not Used	Pad Insert		2	Not Used	Count 64
	3	See Figure 3-4	Reserved		3	Not Used	FTA		3	Not Used	Count 32
	4	See Figure 3-4	Reserved		4	Not Used	Xmit Turnoff		4	Not Used	Count 16
	5	See Figure 3-4	Reserved		5	Not Used	0		5	Not Used	Count 8
	6	See Figure 3-4	Transmit Cycle Share Halt		6	Not Used	0		6	Not Used	Count 4
	7	See Figure 3-4	Byte Underrun		7	Not Used	Count 256		7	Not Used	Count 2
SS06	0	Not used	DTR	SS12	0	Not Used	Count 128				
	1	Receive Seq Count	RTS		1	Not Used	Count 64				
	2	Not used	Select Standby		2	Not Used	Count 32				
	3	Not used	Data Rate Select		3	Not Used	Count 16				
	4	Not used	Local Test		4	Not Used	Count 8				
	5	Send Seq Count	Disable Ring		5	Not Used	Count 4				
	6	Not used	Disable RLSD		6	Not Used	Count 2				
	7	Not used	Disable CTS		7	Not Used	Count 1				

Figure 3-7. Sense Byte Breakdown Chart for CCA/HPCA SDLC (Code SSSS)

3.3.5 Test 1 Local Channel Attachment (Model A) Log

This host adapter log format is returned in response to an A0/1 entry. The format detail is as follows:

- Line 1 – Returned the same as input, A0/1.
- Line 2 – Twenty-four bytes are displayed on this line, but only 10 are currently used. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

Byte 1 Byte 24

```
0000  0000  0000  0000  0000  0000  ) )  0000
NNFF  SSSS  BBBB  TTTT  CCEE  XXXX  ( (  XXXX
```

NN – This code represents the two low-order digits of any 500 series nnn number in all cases.

FF – This byte represents the type of operation being attempted at the time of the failure. See Figure 3-8 when FF is to be used.

SSSS – These bytes represent the last sense data sent to the host CPU.

BBBB – These two bytes represent the number of bytes received on the last Host Write command.

TTTT – These bytes represent additional adapter status information. See Figure 3-8.

CC – This byte represents the latest counter.

EE – This byte represents extended adapter information. See Figure 3-8.

There are no completion/error bytes for the LCA.

- Line 3 – This line displays the statistical counter information associated with this adapter.

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position *used* is counter number 16. The remaining positions are not used. The value in each counter is given in hexadecimal. The maximum value for any counter is FF. If any counter is incremented to its maximum value (FF), it will remain there until reset.

Each counter is assigned a specific meaning, as follows:

Counter	Meaning	nnn Code*
01	Command Reject/Not Initialized	540
02	Command Reject	541
03	Not Initialized	505
04	Bus Out Check (Parity 2)	543
05	Bus Out Check (Parity 1 and 2)	544
06	Equipment Check (Parity 1)	545
07	Equipment Check (Parity 1 Modifier)	546
08	Equipment Check (Parity 2)	547
09	Equipment Check, Control Logic Machine Check	548
10	Data Check	549
11	Data Check, Length Check	550
12	Connect Received/Already Connected	512
13	Disconnect When PU Was Active	511
14	RU Length Error	410/411
15	Connect Error (Connect Rejected)	514
16	RSOR Received	

*See Appendix B for a description of the nnn code listed.

A complete log display for this adapter would appear as shown below:

```
A0/1
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

FF Code	Operation Attempted	Description
00	Initialize LCA (open)	Initializes the control blocks, parameters, and buffers needed by the LCA to support host communication.
XX	Implied Read (any value)	
02	Write	Prepares the data and necessary controls to transfer data to the host.
03	Buffer Available	Used to signal the host that buffers are available.
04	Close (Disable Adapter Interface)	The control code will disable the host interface in the LCA.
05	Write Modified	Writes with Buffer Available
06	Purge Write Request	Purges outstanding Write requests.

Location	Bit	Meaning If Bit Is Turned On (1)
Left SS Byte[1]	0	Command Reject
	1	Intervention Required
	2	Bus Out Check
	3	Equipment Check
	4	Data Check
	5	Not Used
	6	Not Initialized
	7	Not Used
Right SS Byte [1]	0	Data Length Check
	1	Data Reject (not used)
	2	Not Used
	3	Not Used
	4	Parity Check Modifier
	5	Parity Check 1
	6	Parity Check 2
	7	Control Logic Machine Check
Left TT Byte	0	Command Accepted
	1	S/370 Status Accepted
	2	Chaining Indicated
	3	Stop
	4	Chaining Canceled
	5	Counter = 0
	6	S/370 Interface Disconnect
	7	Outstanding Status
Right TT Byte	0	Parity Check 1 (control unit parity check)
	1	Parity Check 2 (channel parity check)
	2	370 Interface Disabled
	3	S/370 Status Pending
	4	Adapter Busy
	5	Machine Check
	6	Control Logic Enable/Disable
	7	Interrupt Request in Adapter
EE Byte	0	S/370 System Reset
	1	Stacked Status
	2	S/370 Enable/Disable
	3	Selective Reset
	4	Queue Error
	5	Data Abort
	6	Reserved
	7	Reserved

[1] See Figures 5-39 and 5-41 (Chapter 5).

Figure 3-8. 3274 Model A Attachment Information Breakdown Chart

3.3.6 Test 1 Local Host Attachment (Models B and D)

3.3.6.1 Model B

This host adapter log format is returned in response to an A0/1 entry. The format detail is as follows:

- Line 1 — Returned the same as input, A0/1.
- Line 2 — Twenty-four bytes are displayed on this line, but only seven are currently used. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

Byte 1				Byte 24
0000	0000	0000	0000	0000 ( ) 0000
NNXX	SSBB	RRHH	FFFF	XXXX ( ) XXXX

NN — This code represents the two low-order digits of any 300 series nnn number. The NN byte will be 00 if the FF byte is 0A.

XX — Not Used.

SS — This byte represents the adapter sense recorded at the time of the failure.

BB — The next byte to the right of SS is labeled BB. This byte represents the adapter basic status recorded at the time of the failure. See Figure 3-9 for SS and BB byte meanings.

RR — This byte represents the operation attempted at the time of the failure. See Figure 3-9 for RR byte meanings.

HH — This byte represents the hardware state of the adapter at the time of the failure. See Figure 3-10 for HH byte meanings.

FF — Engineering use (internal).

- Line 3 — This line displays the statistical counter information associated with this adapter. If no errors are recorded for this adapter, the counters will display as follows:

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position *used* is counter number 05. The remaining positions are not used. The value in each counter is given in hexadecimal. The maximum value for any counter is FF.

Byte	Bit	Meaning If Bit Is Turned On	Description
SS	0	Command Reject	
	1	Intervention Required	
	2	Bus Out Check	
	3	Equipment Check	
	4	Data Check	
	5	Unit Specify	
	6	Control Check	
	7	Operation Check	
BB	0	Signal Device End	Causes the LHA to raise interrupt to the host. Set to 1 by control logic and reset to 0 by the adapter when the device status for that device is updated from busy to available.
	1	Signal Device Busy	Causes the LHA device status table to be updated to device busy.
	2	Channel Active	Set to 1 by the LHA during initial selection when the channel interface broadcasts the device address to LHA. Reset to 0 when the control logic signals an operation completed.
	3	Metering In	Causes the CPU meter to run (printer printing). This bit is always on during a print operation.
	4	End Sequence	Set to 1 by the LHA to indicate the end of a Start I/O CCW sequence from the channel.
	5	Adapter Machine Check	A hardware error was detected during an I/O operation between the adapter and the controller.
	6	Online	Allows the LHA (when set to 1) to go online to the channel. **Note:** *The Power/Interface switch must be set to the Online position.*
	7	Interrupt Request	Identifies the adapter as having raised Interrupt Request to the channel.

RR Code	Byte Definition Operation Attempted
00	Start Sequence
02	Fetch Device Buffer
04	Transfer Buffer to Device
06	Not used
08	End Sequence
0A	Record Status and Sense
0C	Selective Reset-Unit
0E	System Reset
1A	Local Host Attachment Available

Figure 3-9. 3274 Model B Operation Attempted Chart (Code RR)

Each counter is assigned a specific meaning, as follows:

Counter	Meaning	nnn Code*
01	Bus Out Check	551
02	Invalid Sense	351
03	Adapter Device Table Parity Error	355
04	Cycle Share Machine Check	356
05	Recoverable I/O Error (not cycle-share)	

*See Appendix B for a description.

A complete log display for this adapter would appear as shown below:

A0/1
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

Description	Bit	Meaning If Bit Is Turned On
HH Byte	0	Mode of operation*
	1	Mode of operation*
	2	Not used
	3	1 = Large screen size, 0 = Small
	4	Reserved
	5	Not used
	6	WCC only
	7	Not used

* 10 = Category B device operation
01 = Category A device operation
11 = Category B/Katakana device operation
00 = 3272 device type operation

Figure 3-10. HH Byte Definitions

3.3.6.2 Model D

This host adapter log format is returned in response to an A0/1 entry. The format detail is as follows:

- Line 1 — Same as returned by an input of A0/1.
- Line 2 — Twenty-four bytes are displayed on this line, but only 10 are currently used.

	NN		DD		AAAA				RRCC		SSSS				LLZZ				XXXX		~XXXX	
Byte	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1			2	2		
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0		

Where:

NN represents the two low-order digits of any 300 series nnn code.

DD contains the device (port) address selected at the time of error.

AAAA contains the status received from the adapter.

RR is the request code presented by the adapter to the control logic.

CC is the command code received from the adapter.

SSSS contains the sense and status sent to the host.

LL contains error log data.

ZZ contains the metering-in count, which is the number of printers that have device end (print complete pending).

XX is for engineering use (internal).

(A detailed description of these bytes follows the line 3 description.)

- Line 3 — This line contains statistical counter information associated with the adapter. If no errors are recorded, the counters will be zero. The counters are not identified (numbered) when displayed. The leftmost 2-digit positions represent counter 1, the next 2-digit positions represent counter 2, and so on. The value of each counter is represented in hexadecimal and can contain a maximum count of FF. The counters do not wrap.

  Each counter is assigned a specific recording function, as follows:

Counter	Meaning	Comments*
01	Command Rejects	nnn Code 401
02	Operation Checks	nnn Code 402, 404, 406
03	Adapter Detected Data Checks	nnn Code 364
04	Bus Out Check	nnn Code 551
05	Cycle Share Error	nnn Code 362
06	Unexpected Adapter Requests	

*See Appendix B.

Following is a detailed description of the line 2 bytes:

Byte	Bit	Meaning If Bit Is Turned On
AAAA (bytes 3 and 4)	0	Channel Stop — The SLHA detected a channel stop before all the data was transferred to the host. (The host CCW byte count did not allow a full transfer.)
	1	Chaining Indicated — The SLHA detected that the channel is performing a Command Chaining CCW operation.
	2	Odd Byte Transferred — The SLHA transferred an odd number of bytes to the control unit as a result of a Write CCW operation.
	3	0
	4	0
	5	0
	6	0
	7	0

Byte	Bit	Meaning If Bit Is Turned On
	8	Request in Progress — An SLHA request is pending (RR byte) for processing by the control logic.
	9	Allow Online — The control logic has requested the SLHA to go online.
	10	Quiet Control — The control logic has asynchronous status to present to the channels.
	11	Metering In — Causes the CPU meter to run. Metering In is set on while any attached printer is printing (busy) and is turned off when all printing operations are finished.
	12	Online — The SLHA is online (bit 9 is set, the Online/Offline switch is in the Online position, and there is no channel activity).
	13	Adapter Machine Check — The adapter has detected a machine check during cycle-sharing operations (see counter 5).
	14	Interrupts Enabled — The SLHA is allowed to interrupt (via bit 15) the control unit.
	15	Interrupt Request — The SLHA has raised Interrupt Request to the control unit.

Byte	Byte Value	Meaning of Byte Value
RR (byte 5)	0	Diagnostic Channel Response (Bring up test only — should not be active during normal operations).
	2	Waiting for Channel End — The control logic has detected a device error during a Read CCW operation and has requested control at the conclusion of the data transfer in order to record the error status.
	4	End Sequence — The adapter has encountered the end of a CCW chain (end sequence will follow the last command-loaded request).
	6	Waiting for Device End — The SLHA has transferred the last block of data to the control unit for a channel write operation and is waiting for the control logic to signal device end.
	8	Adapter Offline — The adapter has just been put in an offline state (see nnn code 501 in Appendix B).
	C	Adapter Online — The SLHA has gone in the online state.
	10	Clear for Interrupts — The SLHA is ready for the control logic to present asynchronous status (the channel is quiet).
	12	System Reset — The SLHA has detected a System Reset condition on the channel (see nnn code 505 in Appendix B).
	14	Command Loaded — The SLHA has received a CCW command from the channel.
	16	Selective Reset — An interface disconnect or Halt I/O condition from the channel has been detected by the SLHA (see nnn code 503 in Appendix B).
	18	Data List Stop — The SLHA has just transmitted (Read CCW) or received (Write CCW) a block of data and is notifying the control logic of this condition.

Byte	Byte Value	Meaning of Byte Value
CC (byte 6)	01	Write
	02	Read Buffer
	03	No-op
	04	Sense
	05	Erase/Write
	06	Read Modified
	0B	Select RM (Read Modified)
	0D	Erase/Write Alternate
	0F	Erase All Unprotected
	11	Write Structured Field
	1B	Select RB (Read Buffer)
	2B	Select RMP (Read Modified from Position)
	3B	Select RBP (Read Buffer from Position)
	4B	Select Write
	E4	Sense ID

Byte	Bit	Meaning If Bit Is Turned On
SSSS (bytes 7 and 8) Byte 7	0	Command Reject
	1	Intervention Required
	2	Bus Out Check
	3	Equipment Check
	4	Data Check
	5	Unit Specify
	6	Control Check
	7	Operation Check
Byte 8	0	Attention
	1	Status Modifier
	2	Control Unit End
	3	Busy
	4	Channel End
	5	Device End
	6	Unit Check
	7	Unit Exception
LL (byte 9)	0	Command Reject
	1	Intervention Required
	2	Bus Out Check
	3	0
	4	Data Check
	5	0
	6	0
	7	0

3.3.7 Test 1 Device Adapter Logs

There are two types of device adapter log. The log for Category A devices is accessed by using an A1/1 format. The information returned in the log consists of the last nnn number recorded, some basic adapter status information at the time of the failure, and statistical counters similar to the device error log counters. The log for Category B devices is accessed by using an A2/1 format. The information returned in the log consists of the last nnn number recorded, the operation being attempted at the time of the failure, and information in byte form as to how the operation ended. There are also statistical counters similar to the device error log counters. The above log information should be used to determine the type of error condition that is disabling either of these device adapters.

The logs can be used in the same manner as the host adapter logs to determine (1) what the frequency of error is, (2) what the adapter was doing at the time of error, (3) how the operation ended, etc.

3.3.8 Test 1 Category A Adapter Log

This device adapter log format is returned to the requesting Category A display in response to an A1/1 entry. The format detail is as follows:

- Line 1 — Returned the same as input, A1/1.
- Line 2 — Ten bytes are displayed on this line, but only three are currently used. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

```
0000  0000 0000  0000  0000
NNXX  SSSS XXXX  XXXX  XXXX
```

NN represents the two low-order digits of any 200 series nnn number. The nnn number may or may not be displayed on a 3287.

XX is not used.

SSSS represents the adapter status associated with the last failure. See Figure 3-11 for SS byte meanings.

- Line 3 — This line displays the statistical counter information associated with this adapter.

```
0000 0000 0000 0000 0000
```

The counters are not numbered when they are displayed. They are, however, assigned counter position numbers. The leftmost 2-digit position is counter number 01, and the rightmost counter position *used* is counter number 08. The remaining positions are not used. The value in each counter is given in hexadecimal. The maximum value for any counter is FF. If a counter is increased to its maximum value (FF), it will remain there until reset.

Each counter is assigned a specific meaning, as follows:

Counter	Meaning	nnn Code*
01	Status Q Entry Placed in Error Q	292
02	Unconfigured Device	293
03	Command Complete without an Operation in Process	294
04	Invalid Adapter Status	295
05	Lost Status due to 202 Error	296
06	Adapter Stepped and Restarted	297
07	Cycle Share Machine Check	298
08	Non Command Cycle Share Machine Check	299

*See Appendix B.

Byte	Bit	Meaning If Bit Is Turned On	Description
Left SS Byte	0	Counter Overflow	See nn code 202 in Appendix B.
	1	Read Timeout	The DCA expected data or a response from the device while executing a command sequence and did not receive it in a predetermined amount of time.
	2	Turnaround Error or Read Line Parity	The DCA detected a coax turnaround sequence error or a coax parity error while executing a command sequence.
	3	Read Data Byte Parity Error	The DCA detected a parity error in the data transmitted by the device.
	4	Stop Poll	The DCA is not polling.
	5	Timer	The DCA timer has fired. The timer is of 1 to 4 seconds' duration and is used primarily to check for a hung device.
	6	Error Q Entry	The DCA has detected error status while communicating with or from an attached device and has stored this information in the Error Q in the 3274.
	7	Not used	
Right SS Byte	0	Extended Status Data	The DCA has set information in extension (left SS byte) status.
	1	Command Completed	The DCA has completed a command sequence with a device.
	2	Adapter Active	The DCA is active performing an operation.
	3	Keystroke or Status Q Entry	The DCA has polled a device, has received a keystroke or status, and has placed the data in a Q in the 3274.
	4	Not used	
	5	Machine Check	The DCA has detected an error in itself or on the I/O bus.
	6	Enable/ Disable	The DCA is enabled for operation.
	7	Interrupt Request	The DCA has caused an interrupt request.

Figure 3-11. Sense (SS) Byte Definitions

3.3.9 Test 1 Category B Adapter Log

This device adapter log format is returned to the requesting display in response to an A2/1 entry. The format detail is as follows:

- Line 1 – Returned the same as input, A2/1.
- Line 2 – Ten bytes are displayed on this line, but only four are currently used. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

```
0000  0000  0000  0000  0000
NNFF  CCCC  XXXX  XXXX  KKSS
```

NN – This code represents the two low-order digits of any 200 series nnn number. The nnn number may or may not be displayed on a 3278.

FF – This represents the operation being attempted at the time of the failure. See Figure 3-12 to determine the type of operation in progress at the time of failure.

CCCC – These two bytes indicate how the operation attempted ended. See Figure 3-13 for this information.

XX – Not applicable

KK – Encrypt/Decrypt NN number.

SS – Encrypt/Decrypt status associated with error NN.

- Line 3 – Ten bytes are displayed and identify the count of machine check, adapter overrun, unconfigured device interrupts and Encrypt/Decrypt error.

```
0000  0000  0000  0000  0000
MMAA  UUXX  XXXX  XXXX  PPEE
```

MM Machine Check – An adapter machine check was encountered on an adapter I/O operation. If recovery is not successful, an nnn code of 270 is logged (see Appendix B).

AA Adapter Overrun – An adapter request for service was not honored by the control unit within the required period of time. If recovery is not successful, an nnn code of 272 is logged (see Appendix B).

UU Unconfigured Device Interrupt – An interrupt was received from a device (coax port address) for which a DCB has not been configured.

XX – Not applicable

PP – Encryption Key Parity Errors

EE – Encryption Adapter Errors

Test 1 – Type B Adapter Log
(Configuration Support C, D, and T only)

This is an expanded version of Test A2/1 that includes the DISK and RTM functions.

The device adapter log format is returned to the invoking display in response to the operator entering, A2/1.

The displayed screen is formatted as follows:

- Line 1 – Returned the same as input, A2/1
- Line 2 – 16 bytes are displayed. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

```
NNFF CCCC XXXX XXXX KKSS MMRR EEEE TTZZ
```

NN = Two low order digits of any 200 or 300 series NNN numbers.

FF = Operation being attempted at the time of the failure (See Figure 3-9).

CCCC = Completion code (See Figure 2-10).

XX = Four bytes used only for Model 52C – Volume 3 storage parity errors. Each byte refers to a specific card (1, 2, 3, and 4 respectively).

KK = Encrypt/Decrypt NN number (2 low-order digits).

SS = Encrypt/Decrypt status associated with error NN.

MM = Disk adapter machine check NN number (2 low-order digits).

RR = Disk adapter function request issued (see Disk adapter function request chart).

EEEE = Disk adapter completion code (see Disk adapter operation completion chart).

TT = Response Time Monitor – machine check NN number (2 low-order digits).

ZZ = Response Time Monitor – status associated with NN error number.

- Line 3 – Displays the statistical counter information associated with the adapters. If no errors are recorded the counters will be displayed as follows:

```
0000 0000 0000 0000 0000 0000 0000 0000
```

The counters are not numbered when they are displayed. However, they are assigned counter position numbers. The leftmost two-digit position is counter number 01. The rightmost position is counter number 16. The value in each counter is given in hexadecimal. The maximum value for any counter is FF.

Each counter is assigned a specific meaning, as follows:

Counter	Meaning
01	Type B adapter cycle steal machine checks
02	Type B adapter overruns
03	Type B adapter unconfigured device interrupts (PCM only)
04	Spare
05–08	Model 52C character font storage cards
09	Encrypt/Decrypt Key parity error
10	Encrypt/Decrypt Control Logic error
11	Disk adapter hardware errors
12	Disk media errors
13	Unrecoverable disk overrun errors
14	Spare
15	RTM adapter errors
16	Spare

FF Code	Operation Attempted
00	Initialize (Enable and Start Idle Poll)
1F	Read Full Buffer without Start Idle Poll
21	Specific Poll without Start Idle Poll
23	Start Idle Poll
26	Write Full Buffer without Start Idle Poll

Figure 3-12. Category B Adapter Operation Attempted Chart (Code FF)

Location	Bit	Meaning If Bit Is Turned On (1)
Left CC Byte	0	Retry Count[1]
	1	Retry Count[1]
	2	Retry Count[1]
	3	Retry Count[1]
	4	Complete—Operation terminated
	5	Error (Unrecoverable error encountered) (See Right CC Byte for detail)
	6	Exception (An attention was received before the idle poll could be stopped to perform the operation—valid only if Attention is on also)
	7	Attention
Right CC Byte	0	Overrun
	1	Parity Error on Serial Interface
	2	Device Not Available
	3	Busy
	4	Adapter Disabled
	5	Machine Check
	6	Idle Poll On
	7	Invalid Operation Attempted

[1] Number of times current operation retried

Figure 3-13. Category B Adapter Operation Ending Chart (Code CCCC)

3.3.10 Control Logic Error Log

The control logic error log format is returned to the requesting 3278 in response to an A3/1 entry. The format detail is as follows:

- Line 1 – Returned the same as input, A3/1.
- Line 2 – Eight bytes are displayed on this line. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification:

```
0000  0000  0000  00
CCPP  MMRR  HHDD  AAXX
```

Where:

CC represents the number of cycle-share I/O errors encountered. The count is incremented when a cycle-share error occurs. The counter will not wrap (increments to FF and then stops). For detailed log information on the associated adapter, see Adapter Logs A0/1–A2/1.

PP is the count of storage parity errors encountered for which recovery was successful. The counter will not wrap (increments to FF and then stops).

MM represents the control logic machine checks encountered for which recovery was successful. The counter will not wrap (increments to FF and then stops).

RR is a reserved byte.

HH is a machine check threshold counter for the host adapter. The count is incremented when an adapter I/O machine check occurs. The counter will not wrap (steps to FF and then stops).

DD represents the Type A adapter machine check threshold counter. It increments in the same manner as HH.

AA represents the Type B adapter machine check threshold counter. It increments in the same manner as HH and DD.

XX is used as the Encrypt/Decrypt adapter machine check counter. This counter increments in the same manner as HH.

- Line 3 – There is no line 3 assigned to this log; however, a third line might be displayed if this log was entered from another log display.

This is an expanded version of Test A3/1 that includes the DISK and RTM functions.

The control logic log format is returned to the invoking display in response to the operator entering, A3/1.

The displayed screen is formatted as follows:

- Line 1 — Returned the same as input, A3/1
- Line 2 — 16 bytes are displayed. The individual bytes are not labeled when displayed. Each byte is assigned a specific meaning. See the following example for byte identification.

CCPP MMRR HHDD AAXX YYZZ

CC = Number of cycle share I/O errors
PP = Storage parity error count
MM = Number of Control logic machine checks with successful recovery.
RR = Reserved
HH = Host adapter machine check count
DD = Type A adapter machine check count
AA = Type B adapter machine check count
XX = Encrypt/Decrypt adapter machine check count
YY = Disk adapter machine check count
ZZ = Response Time Monitor machine check count

- Line 3 — There is no line 3 assigned to this log. However, a third line may be displayed if you have entered this log from another log display.

3.3.11 Display Response Time Monitor Data (A4/1)

With Configuration Supports C and D, when the 3274 has been customized for local display of the RTM log or the host has enabled this function the A4/1 Test allows an operator to display the RTM log on authorized Category A displays (except devices like the 3290). After entering TEST MODE, by pressing the TEST key switch, entering A4/1 results in the following to be displayed:

A4/1 (Same as input) @ = 000

@	DEF	CTR#1	BDY#1	CTR#2	BDY#2	CTR#3	BDY#3	CTR#4	BDY#4	OV
00	1	10	0.5	11,415	1.0	316	5.0	21	1:00.0	6
01p	1	0	0.5	0	1.0	0	5.0	0	1:00.0	0
02 ?	1	651	0.5	0	1.0	0	5.0	0	1:00.0	14,458
03	*2	215	0.5	512	1.0	56	5.0	0	1:00.0	1
04i	1	31	1.0	11	2.0	4,371	5.0	4	10.0	2
05	1	0	0.5	0	1.0	0	5.0	0	1:00.0	0
06–	*3	1	1.0	61	2.0	4	3.0	0	4.0	45
07	1	1,415	0.5	890	1.0	323	5.0	0	1:00.0	1,381

Note: *The example shows representative information for the first eight logical terminals. If the 3274 is not customized for RTM when A4/1 is entered,* ✖ ⅄# ? *is displayed in the Operator Information Area of the screen. Each time the ENTER (or PA1) key is pressed, the next group of eight terminals is displayed. The heading, @ = XXX, in the top center of the display corresponds to the first logical terminal number in the group currently being displayed (000, 008, etc.).*

CTR = counter
BDY = boundary
@ = device or logical terminal
OV = overflow
p = printer (No statistics are kept for printers)
i = pass-through device
– = never powered on (No statistics are kept)
* = parameter set by host
? = RTM disabled by host for this device
DEF = response time definition
1 = time to first character on screen
2 = time to keyboard usable by the operator
3 = time to CD (Change Direction) /EB (End Bracket)

CTR#1 = first counter (response time = 0 up to BDY#1 value)
BDY#1 = first boundary in minutes and seconds
CTR#2 = second counter (response time greater than BDY#1 up to BDY#2 value)
BDY#2 = second boundary in minutes and seconds
CTR#3 = third counter (response time greater than BDY#2 up to BDY#3 value)
BDY#3 = third boundary in minutes and seconds
CTR#4 = fourth counter (response time greater than BDY#3 up to BDY#4 value)
BDY#4 = fourth boundary in minutes and seconds
OV = overflow (response exceeds last boundary value)

Note *that the displayed boundaries are rounded to the nearest tenth of a second.*

3.3.12 Reset Response Time Monitor (A4/4) (Only when RTM is configured with no host support.)

The operator at an authorized display can reset the RTM logs of all configured devices. All log information is reset except the customized boundaries, the customized RTM definitions and pending Transaction status. While in TEST Mode, entering A4/4 generates RTM log reset. When the reset is complete a plus sign (+) appears immediately to the right of A4/4 (A4/4+) in the upper left corner of the screen. The reset logs are not displayed.

If the 3274 is not customized for RTM when A4/4 is entered, ✖ ⅄# ? is displayed in the Operator Information Area of the screen.

Note that the RTM logs can also be reset at any time during their display. The screen is first cleared by pressing the CLEAR key; the cursor is displayed in the upper-left corner of the screen, and the operator then enters A4/4. When the reset is complete the plus sign (+) appears to the immediate right (A4/4+).

3.3.13 Test A5/1: Microcode Error Correcting (ECC) Data (All Configuration Support Levels except T; for CS-D, only where it applies.)

The A5/1 Test displays the volume, starting address of each segment and the ECC counts for each segment. A volume total of ECC counts is calculated and displayed. The display for each volume follows:

```
A5/1
X YYYY
AAAA AAAA AAAA ..... AAAA
CCCC CCCC CCCC ..... CCCC
```

where

X = Volume Indicator
YYYY = Total ECC Error Count in Volume
AAAA = Starting Address of Each Segment in Volume (up to 16 for 64K)
CCCC = ECC Count (number of recovered memory failures) of each segment

Pressing the ENTER or PA1 key pages the ECC Data through each volume until all configured volumes have been displayed. If the key is pressed again, the Do Not Enter-minus function appears.

The A5/4 test will reset all ECC counts for all volumes.

3.4 X.25 A0/1 TEST

The following describes the format of the Host Adapter error log. The error log is displayed by entering an A0/1 Test request message.

```
LINE 1   A0/1
LINE 2   NN00  0000  SSSS  SSSS  SSSS  SSSS  RRRR  RRRR  RRRR  RRRR
LINE 3   XXXX  XXXX  XXXX  XXXX  XXXX  XXXX  XXXX  XXXX  XXXX  XXXX
LINE 4   RSRT  RSTR  CLRT  CLRX  CLRR  LARC  TARC  DICD  RCM1  RCM2  DIAG  DIAL
LINE 5   CCCC  CCCC  CCCC  CCCC  CCCC  CCCC  CCCC  . . . .  (30 bytes displayed)
LINE 6
LINE 7   LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL
LINE 8   LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL
LINE 9   LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL  LLLL
LINE 10  CCCC  CCCC  CCCC  CCCC  CCCC  CCCC  CCCC  CCCC
```

Line 1: Name of test.

Line 2, where:

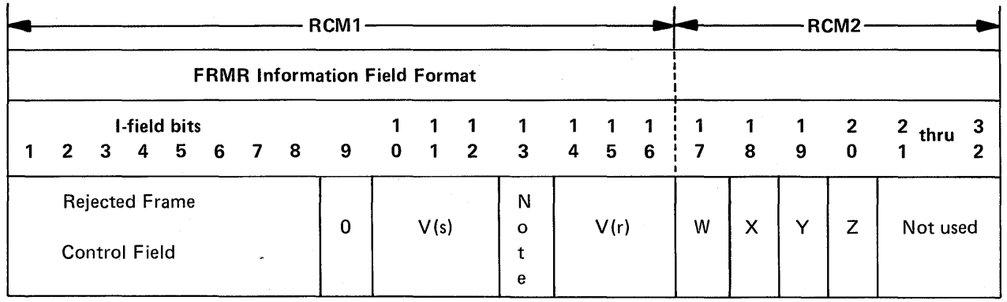
- NN = Communication Reminder 5NN that is associated with the error
- 00 = Always zero for X.25
- SS = Adapter sense bytes (identical to first eight bytes of HPCA sense)
- RR = Reserved

Line 3: HPCA counters. These are 1-byte counters in which XX represents the value counted in hexadecimal. The counter values range from 00—FF and do not wrap.

HPCA Ctr	Map via CAC adapter return code (ARC)
1	Reserved
2	Reserved
3	Reserved
4	Reserved
5	Reserved
6	Re-tries exceeded maximum limit
7	Reserved
8	Reserved
9	FRMR transmitted
10	DCE hardware error
11	Write timeout
12	Invalid status
13	Adapter Machine Check
14	Reserved

Line 4, where:

- RSRT = cause and diagnostic codes for last restart packet transmitted by the 3274.
- RSTR = cause and diagnostic codes for last restart packet received by the 3274.
- CLRT = Diagnostic code modifier and diagnostic codes for last clear or reset packet transmitted by the 3274.
- CLRX = Extension for cause and diagnostic codes for last clear or reset packet sent by 3274.
- CLRR = cause and diagnostic codes for last clear or reset packet received by the 3274.
- LARC = Reserved for Engineering use.
- TARC = Last bad termination ARC (NNN=539).
  - 0AC0 SABM Received
  - 0AC6 Unexpected UA Received
  - 0AC7 N(s) Not Sequencing
  - 8AC1 FRMR Received
  - 8AC2 FRMR Sent
- DICD = Reason code for last packet discarded event. Refer to Figure 2-14 in Chapter 2 of this manual.
- RCM1 = Reason code modifier for additional information on a FRMR sent or received.
- RCM2 = Reason code modifier for additional information on a FRMR sent or received.



- Rejected frame control field is the control field of the received frame that caused the (text deleted) frame reject.
- Vs is the current value of Vs at the station reporting the rejection condition (bit 10 = low order bit).
- Vr is the current value of Vr at the station reporting the rejection condition (bit 14 = low order bit).
- 'W=1' indicates that the control field received and returned in bits 1 through 8 was considered invalid or not implemented.
- 'X=1' indicates that the control field received and returned in bits 1 through 8 was considered invalid because the frame contained an information field which is not permitted or is an S or U-frame with incorrect length. 'W=1' is required in conjunction with this bit.
- 'Y=1' indicates that the information field received exceeded the maximum established capacity of the station reporting the rejection condition.
- 'Z=1' indicates that the control field received and returned in bits 1 through 8 contained an invalid Nr.

Note: *(Text deleted) Bit 13 is set to: '1' if the frame rejected was a response; or, '0' if the frame rejected was a command.*

DIAG+
DIAL = Information field from the last Diagnostic packet received by the 3274.

Line 5: X.25 Auxiliary counters. These are 1-byte counters in which XX represents the value counted in hexadecimal. The counter values range from 00—FF and do not wrap.

Aux Ctr	Value
Link Level	
1	SABM received
2	FRMR received
3	DISC received
4	DCE not available
5	Unexpected UA received
6	Send sequence number not sequencing
7	Restart sent
8	Restart received
9	Reserved
10	Reserved
11	Reserved
Circuit Level	
12	Reset packets sent
13	Reset packets received
14	Clear packets sent
15	Clear packets received
16	Call timeouts
17	Call-connected truncated
18	Call parameter changes
19	Packets discarded
20	Packet timeouts
21	Contacts received
22	Discontacts received
23	Channel inoperative or no channel available
24	Channel in invalid state
25	Diagnostic packets received
26—30	Reserved

Line 6 is a blank line.

Line 7–10: X.25 Statistical counters. These are half-word counters where,

LLLL = Counters for link-level events (8 per line)
RRRR = Reserved
CCCC = Counters for circuit-level events (8 per line)

The values of the LLLL and CCCC counters range from 0000–FFFF and do not wrap.

Line 7: Link-level events

Diag Ctr	Value
1	I-frames sent
2	I-frames received
3	RR-frames sent
4	RR-frames received
5	RNR-frames sent
6	RNR-frames received
7	REJ-frames sent
8	REJ-frames received

Line 8: Link-level events (cont.)

Diag Ctr	Value
9	Re-tries on transmit
10	FCS errors on receive
11	Receive errors
12	CS underruns
13	Receive-buffer overruns
14	Receive control-block overruns
15	Aborts
16	CS overruns

Line 9: Link-level events (cont.)

Diag Ctr	Value
17	Receive timeouts
18	Reserved
19	Call attempts
20	Call completions
21–24	Reserved

Line 10: Circuit-level events

Diag Ctr	Value
25	Data packets sent
26	Data packets received
27	RR packets sent
28	RR packets received
29	Reserved
30	RNR packets received
31	Interrupt packets sent
32	Interrupt packets received

3.4.1 X.25 Counters

Following is a list of the counters associated specifically with the X.25 function. They include HPCA counters, X.25 Auxiliary counters (both link level and circuit level), and X.25 Statistical counters (both link level and circuit level). They are listed by counter number; counters not listed are reserved.

Note: *CCDD = cause and diagnostic codes*

3.4.1.1 HPCA Counters

Counter 6 RE-TRIES EXCEEDED LIMIT: A link level error condition exists that has not been cleared by re-tries. The link and circuit have been stopped and a restart attempted.

Counter 9 FRMR TRANSMITTED: An FRMR has been sent by the 3274 due to an error in a received I-frame. A DISC has been sent. The link and circuit have been stopped and a restart attempted (nnn = 539).

Counter 10 DCE HARDWARE ERROR: Data Set Ready (nnn = 501) or Clear-to-Send (nnn = 502) from the DCE have been interrupted, or another DCE abnormal condition (nnn = 529) was detected. The link and circuit have been stopped and a restart attempted.

Counter 11 WRITE TIMEOUT: Clocking from the DCE has been interrupted. The link and circuit have been stopped and a restart attempted (nnn = 530).

Counter 12 INVALID STATUS: A 3274 communications adapter problem has been encountered (nnn = 331).

Counter 13 ADAPTER MACHINE CHECK: A 3274 communications adapter problem has been encountered (nnn = 330).

3.4.1.2 X.25 Auxiliary Counters (Link-Level)

Counter 1 SABM RECEIVED: A valid SABM link-level command was received from the DCE after normal initiation sequences. The 3274 has sent a DISC and terminated the link (nnn = 539).

Counter 2 FRMR RECEIVED: An FRMR has been received. A DISC has been sent. The link and circuit have been stopped and a restart attempted (nnn = 539).

Counter 3 DISC RECEIVED: A DISC has been received. A UA response has been sent. The link and circuit have been stopped and a restart attempted (nnn = 504).

Counter 4 DCE NOT AVAILABLE: A DM has been received in response to a SABM, indicating that the DCE is not ready to communicate. A restart is attempted (nnn = 517).

Counter 5 UNEXPECTED UA: A UA response has been received. A DISC has been sent. The link and circuit have been stopped and a restart attempted (nnn = 539).

Counter 6 SEND SEQUENCE NUMBER NOT SEQUENCING: Multiple I-frames have been received with the same send sequence number. The link and circuit have been stopped and a restart attempted (nnn = 539).

Counter 7 RESTART SENT: A restart packet has been sent due to an error. The link and circuit have been stopped and restarted. Analyze the diagnostic code in the event log to determine the cause. X.25 Communication Check Reminder indicator (R CCDD) is displayed.

Counter 8 RESTART RECEIVED: A packet-level restart has been received. The link and circuit have been stopped and a restart attempted. Analyze the cause and diagnostic codes in the event log to determine the cause. X.25 Communication Check Reminder indicator (N CCDD) is displayed.

3.4.1.3. X.25 Auxiliary Counters (Circuit-Level)

Counter 12 RESET SENT: A reset packet has been sent due to an error. The circuit has been stopped and restarted. Analyze the diagnostic code in the event log to determine the cause. X.25 Communication Check Reminder indicator (M CCDD) is displayed.

Counter 13 RESET RECEIVED: A reset packet has been received. The circuit has been stopped. Analyze the cause and diagnostic codes in the event log to determine the cause. X.25 Communication Check Reminder indicator (Q CCDD) is displayed.

Counter 14 CLEAR SENT: A clear packet has been sent due to an error. The circuit has been stopped and restarted. Analyze the diagnostic code in the event log to determine the cause. X.25 Communication Check Reminder indicator (L CCDD) is displayed.

Counter 15 CLEAR RECEIVED: A clear packet has been received. The circuit has been stopped. Analyze the cause and diagnostic codes in the event log to determine the cause. X.25 Communication Check Reminder indicator (P CCDD) is displayed.

Counter 16 CALL TIMEOUT: The response to a Call Request packet has not been received within the time specified. An attempt is made to restart the circuit (nnn = 537).

Counter 17 CALL CONNECT TRUNCATED: A Call Request packet has been received which is larger than the buffer reserved for the packet.

Counter 18 CALL PARAMETER CHANGE: This condition is posted on completion of an open circuit for an SVC if the flow control negotiation parameters received in the Call Connected packet are different from those entered during customizing or via the Dial screen.

Counter 19 PACKET DISCARDED: A packet has been discarded. Analyze the diagnostic code field in the event log to determine the reason.

Counter 20 PACKET LEVEL TIMEOUT: 200 seconds have elapsed without receiving a response to a clear, reset, or restart packet. The circuit and link have been stopped (nnn = 538).

Counter 21 CONTACT RECEIVED: A LLC Contact packet has been received.

Counter 22 DISCONTACT RECEIVED: A LLC Discontact packet has been received (nnn = 504).

Counter 23 CHANNEL INOPERATIVE: The PVC channel is inoperative due to a timeout. The circuit is stopped (nnn = 513), *or* NO CHANNEL AVAILABLE: No channel is available for the outgoing call (nnn = 513).

Counter 24 CHANNEL IN INVALID STATE: An Incoming Call packet has been received and the 3274 was not in the proper state. The circuit is stopped (nnn = 513).

Counter 25 DIAGNOSTIC PACKET RECEIVED: A Diagnostic packet was received. Analyze the diagnostic code and explanation field in the event log to determine the cause.

3.4.1.4 X.25 Statistical Counters (Link-Level)

Counter 1 I-FRAMES SENT: The number of I-frames sent by the 3274.

Counter 2 I-FRAMES RECEIVED: The number of I-frames received by the 3274.

Counter 3 RR-FRAMES SENT: The number of RR-frames sent by the 3274.

Counter 4 RR-FRAMES RECEIVED: The number of RR-frames received by the 3274.

Counter 5 RNR-FRAMES SENT: The number of RNR-frames sent by the 3274.

Counter 6 RNR-FRAMES RECEIVED: The number of RNR-frames received by the 3274.

Counter 7 REJ-FRAMES SENT: The number of REJ-frames sent by the 3274.

Counter 8 REJ-FRAMES RECEIVED: The number of REJ-frames received by the 3274.

Counter 9 RETRIES ON TRANSMIT: The number of I-frames that had to be retransmitted by the 3274 due to Nr mismatches.

Counter 10 FCS ERRORS ON RECEIVE: The number of I-frames received by the 3274 Frame Check Sequence errors.

Counter 11 RECEIVE ERRORS: The number of receive errors detected by the 3274.

Counter 12 CYCLE STEAL UNDERRUNS: The number of cycle underruns detected by the 3274. This is an internal exception condition and is re-tried by the 3274.

Counter 13 RECEIVE BUFFER OVERRUNS: The number of receive buffer overruns detected by the 3274. This is an internal exception condition and is re-tried by the 3274.

Counter 14 RECEIVE CONTROL BLOCK OVERRUNS: The number of receive control block overruns detected by the 3274. This is an internal exception condition and is re-tried by the 3274.

Counter 15 ABORTS: The number of ABORTS detected by the 3274.

Counter 16 CS OVERRUNS: The number of CS overruns detected by the 3274. This is an internal exception condition and is re-tried by the 3274.

Counter 17 RECEIVE TIMEOUTS: A valid frame has not been received within the time specified. The link and circuit have been stopped and a restart attempted (nnn = 520).

Counter 19 CALL ATTEMPTS: The number of call attempts counted by the 3274.

Counter 20 CALL COMPLETIONS: The number of call completions counted by the 3274.

3.4.1.5 X.25 Statistical Counters (Circuit-Level)

Counter 25 DATA PACKETS SENT: The number of data packets sent by the 3274.

Counter 26 DATA PACKETS RECEIVED: The number of data packets received by the 3274.

Counter 27 RR PACKETS SENT: The number of RR packets sent by the 3274.

Counter 28 RR PACKETS RECEIVED: The number of RR packets received by the 3274.

Counter 30 RNR PACKETS RECEIVED: The number of RNR packets received by the 3274.

Counter 31 INTERRUPT PACKETS SENT: The number of interrupt packets sent by the 3274.

Counter 32 INTERRUPT PACKETS RECEIVED: The number of interrupt packets received by 3274.

3.5 TEST 2: DISPLAY CONFIGURATION INFORMATION

The configuration data obtained from TEST 2 results from customizing the Feature Diskette and the subsequent writing of the configuration data to the System Diskette or Load Diskette. The following tables (Figure 3-14) describe the more commonly required information in the order that the information appears on the display. Also included is an indication of the customization question associated with the particular data. (The customizing process is described in the *3274 Control Unit Planning, Setup, and Customizing Guide,* GA27-2827.)

The format of the configuration data charts is as follows:

Column 1 Information provided — the definition of the data at the location indicated in Column 2.

Column 2 Location — Describes the location in hexadecimal of the desired data.

Column 3 Setting — Describes the pertinent bit settings or hexadecimal values.

Column 4 Meaning — Describes the meaning of the particular bit settings or describes the contents of the data location.

Column 5 Page/Line/Byte — This information will help you to find the byte under discussion.

- Page indicates the value that should appear in display line 2 if you are in the proper block of configuration data for the byte in question.
- Line indicates which line of the four lines of data being displayed contains the byte you are looking for.
- Byte is the displacement of the byte in question from the start of the line. There are 16 bytes (00 to 0F hex) per line.

Column 6 Customizing Question — Indicates which customizing question, number and the value that caused the results.

When, in Test mode, the /2 is typed in (starting at location 0 on the display) and the Enter Key is depressed, a display similar to the following example will appear on the display. Lines 3-6 each represent 16 bytes of data, displayed in hex.

```
Line 1 /2
Line 2 00
Line 3 E245 4540 0400 0001  0140  6001  0021  040F
Line 4 0004 0402 0001 1304  0410  1020  0040  0199
Line 5 2020 041F 1003 0300  2027  FC8E  EF0C  0F01
Line 6 2004 7700 8242 FFFE  A55A  0100  003F  0000
```

By pressing the enter key, the next X'40' (64 decimal) bytes of the Configuration Table will be displayed. Line 2 indicates the starting location of the first byte displayed. (The last (0) digit is dropped.)

```
Line 1  /2
Line 2  04
Line 3  4000 0000 0000 0000 0000 0000 0000 0000
Line 4  0000 0100 9808 7151 2500 0000 0000 0000
Line 5  0000 0000 0000 0000 0000 0000 0000 0000
Line 6  9900 9900 0000 4000 0000 0000 0003 017F
```

The amount of Configuration Data displayed depends on the Configuration Support Level of the 3274 Microcode that is installed. In all cases, the Enter Key will 'page' to the next X'40' bytes (64 decimal), if more information is available to be displayed. If there is no more information to be displayed, pressing the Enter Key will cause the Keyboard to be inhibited. (X-f will be displayed in operator information area.) Line 2 will serve as an indication of location of the first byte displayed on Line 3. For example, if Line 2 contains a 08 the location in the table of the first byte displayed on Line 3 is X'80'.

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question	
Disk, Type Identifier	00	E2 E6	System Load	00/3/00	N/A	
Diskette Level ID's	01 02 03	nn nn nn	Feature System Language	00/3/01 00/3/02 00/3/03	N/A	
3274 Model Number and Communications Adapter Type	04	01 02 04 08 21 24 28 41 42 44 48	1A-LCA 1B-LHA 1C-CCA/HPCA 1D-SLHA 41A-LCA 41C-HPCA/CCA 41D-SLHA 21A-31A-LCA 21B-LHA 21C/31C-CCA/HPCA 21D/31D-SLHA	00/3/04	151	
3274-A Models	05	nn	3274 Channel Ad	00/3/05	201 = nn	
3274-C Models, Line Code	07	01 02	EBCDIC ASCII	00/3/07	321 = 0* 321 = 1*	
3274-C Models, Line Control Mode	08	01 02 06	BSC SDLC X.25	00/3/08	331 = 0 331 = 1 331 = 2	
3274-C Models, BSC Address	09	nn	3274 BSC Poll Address	00/3/09	Derived from 301 (location ID contains 301; value)	
3274-C Models, Selection Address Secondary Station Address	0A	nn	BSC SDLC X.25	00/3/0A	Derived from 301 (see Location ID 301's value) 302 = nn 302 = nn	
Miscellaneous Option Selections	0B	01 02 04 08 10	CCA HPCA Encrypt/Decrypt Requested screen to assign ports individually Printer Polled by Host	 00/3/0B 00/3/0B 	351 = 0 351 = 1 352 = 1 116 = 1 305 = 1	
3274-C Models, Remote Attachment Options	0C	00 01 02 04 08 10 20 40 80	CCITT V.35 or Exter. Modem Interface Wrappable Model DDSA Adapter X.21 Leased Integrated Modem > 1200 BPS I X.21 Switched MCL Loop EMI Integrated Modem 1200 BPS	 00/3/0C 	CS = A,B,C,T 343 = 0 311 = 1 343 = 1 343 = 2 343 = B 343 = 3 343 = A 343 = 4 343 = 5,6,7, 8,9	CS = D,P 343 = 00 311 = 1 343 = 1 343 = 02 343 = 11 343 = 03 343 = 10 343 = 04 343 = 05,06,07, 08,09

*Not on Configuration Support D

Figure 3-14 (Part 1 of 6). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
3274 Models, Comm. Options	0D	01	Omit answer tone		345 = 1
		02	Permanent RTS (4 wire point to point)		Value = 0 if 317 = 1 = 0 if 314 or 342 = 0
		04	Half Speed		318 = 1
		08	SNBU (Select Standby)		317 = 1
		10	Special RTS (BSC from selection till EOT	00/3/0D	Value = 0 if 314 = 0 and 342 = 1
		20	Leased Line		Value = 0 if 343 = 3, 4, or 6 = 0 if 343 = 0 and 317 = 1 Value = 1 all other cases
		40	NRZI		313 = 1
		80	WT DCE Switched Network		310 = 1
	Legend for Bytes 0E-12 XX M... Vx Cx XXX XX XX — Byte Value M... — Model # Vx — Volume #(0, 1, 2, 3) Cx — Card #(1, 2, 3, 4) XXX — Card Type XX — Card Location				
	Byte #				
	0E — Control Storage Base				
	04 M1X V0 C1 3(32R) F2			00/3/0E	113
	08 M21X V0 C1 64R F2				
	08 M31X V0 C1 64R F2				
	08 M41X V0 C1 64R E2				
	0F — Control Storage Addition				
	02 M1X V0 C2 2(16) E2			00/3/0F	113
	04 M1X V0 C2 4(32) E2				
	08 M31X V1 C1 64 E2				
	08 M41X V1 C1 64 D2				
	10 — Control Storage Addition				
	02 M1X V0 C3 2(16) D2			00/4/00	113
	11 — Control Storage Addition				
	04 M1X V1 C1 4(32) C2			00/4/01	113
	08 M31X V2 C1 64 C2				
	08 M41X V2 C1 64 D4				
	12 — Control Storage Addition			00/4/02	113
	02 M1X V1 C2 2(16) B2				
Storage Expansion	13	01	Not Installed	00/4/03	113/151
		02	Model 1X Processors		
		42	Models 41X Processors		
		82	Model 31X Processors		

Figure 3-14 (Part 2 of 5). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
Request to Send	14	01	RTS Installed	00/4/04	342 = 1
3274 Optional Features Selection	15	01	3289 Text Print Control		145 = 1 (except CS-D)
		02	Between Bracket Sharing	00/4/05	213 = 1
		04	Personal Computer	00/4/05	114 = 1
		08	Entry Assist		115 = 1
		40	1063 Auto Entry MSR		141 = D
		80	1063 MSR		141 = C or D
	16	01	No SCS Printer Support		211 = 0 (except CS-D)
		02	No Host Load PAM Support		143 = 0 (except CS-D)
		04	No Local Copy Support	00/4/06	147 = 0 (except CS-D)
		10	MSR Support Bit Set on (1) (no MSR)		141 = A
			Bit Set off (0) (MSR-Numeric)		141 = B
Type B Driver/ Receiver	17	01 02 03 04	1 Card 2 Cards 3 Cards 4 Cards	00/4/07	111
Type A Driver/Receiver	18	01 02 03 04	1 Card 2 Cards 3 Cards 4 Cards	00/4/08	112
Number of Category B Devices Installed	19	nn	Answer to Question 111	00/4/09	111 = nn
Number of Category A Devices Installed	1A	nn	Answer to Question 112	00/4/0A	112 = nn
Total number of Category A and Type B Devices Installed	1B	nn	111 + 112, Maximum of 32	00/4/0B	111, 112
Modem and Connection Options	1C	01	Loop Attach only High speed data rate	00/4/06	347 = 1
Control Unit Number	1D	nn	Answer to 301	00/4/0D	301 = nn
Language Code	1E	nn	Answer to 121	00/4/0E	121 = nn
Extended Function Store	1F	nn	First 2 digits of answer to 113	00/4/0F	113 = nnxx
Actual number of Type A Ports supported	20	nn	Number of Type A Device Control Blocks assigned by the 3274	00/5/00	Derived from 112 if 116 = 0 Derived from 117 if 116 = 1
Total number of Ports Supported	21	nn	Total number of Device Control Blocks assigned by the 3274	00/5/01	Derived from 112 + 111 if 116 = 0 Derived from 111 + 117 if 116 = 1 (To find the actual starting address for the first Type B Port subtract the value of Loc 20 from value of Loc 21.)

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
Print Authorization Matrix Entry Count	22	xx		00/5/02	022
Keyboard Types	23	01 02 04 08 10	Typewriter Data Entry Data Entry 11 APL Text	00/5/03	131 = 1 132 = 1 133 = 1 134 = 1 135 = 1 No question for Configuration Support D.
ECSA Adapter (configurations that support SFAP Data Stream Processing)	24	nn	Number of terminals with ECSA installed	00/5/04	163 = nn, except for CS-D, then this field is set by value in location 20 in this table.
SFAP Data Stream Support Options (Configurations that support SFAP Data Stream Processing)	25	01	Color Terminals	00/5/05	161 = 1
		02	PS Terminals Installed		164 = 1, For Configuration Support D 160 = 1
	26	01	SFAP Data Stream Supported	00/5/05	162 = 1, For Configuration Support D 160 = 1
		02	Decompression Supported		165 = 1
Validation Number	28-29	Last 2 Characters of Cust. Question #001	Validation number printed on label of feature and system diskettes	00/5/08-09	001
Number of automatic redial attempts allowed	3E	nn 00 thru 09	X.25	00/6/0E	451
Diskette zapped Indicator	40	Not 0	Non zero value indicates Diskette has been "zapped" with a fix	04/3/00	N/A
1200 bps Integrated Modem	41	00 80 40 20 10 08	Not Installed Feat. 5500 Feat. 5501 Feat. 5502 Feat. 5507 Feat. 5508	04/3/01	 343 = 5 343 = 6 343 = 7 343 = 8 343 = 9
Patch ID's	42-51		Each 1 byte field contains a patch ID. 00 indicates no patch.	04/3/02 to 04/4/01	011, 012, 013
Number of RPQ Diskette Installed	52	nn	Number input in Question 031 (0-3)	04/4/02	031 = nn

Figure 3-14 (Part 2 of 6). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
For configuration support below "D" only RPQ Information For each field at the right, the 10 decimal digits are broken down as follows: The first 3 digits represent the last 3 digits of of the RPQ number. The last seven digits represent the media assembly bill of materials assigned by manufacturing. Example: RPQ 8K0 980, media assembly bill of materials 5675103 would display as: 9805 6751 03. For configuration support "D" and above: Last 4 digits of RPQ number, followed by a 6 digit number.	54-58 59-5D 5E-62	See explanation at left	RPQ #1 RPQ #2 RPQ #3	04/4/04-08 04/4/09-0D 04/4/0E to 04/5/02	N/A
Feature Diskette Expected Suffix	63	XX	From Feature Diskette	04/5/03	N/A
System Diskette Expected Suffix	64	XX	From System Diskette	04/5/04	N/A
Language Diskette Expected Suffix	65	XX	From Language Diskette	04/5/05	N/A
Software ECC	66	40	ECC Function Configured	04/5/06	Internal Customization Procedure (except CS-D)
		20	ECC RAS Function Configured		
Physical Unit ID Number	67-69	XX XX XX	1st Nibble of XID 2nd Nibble of XID 3rd Nibble of XID	04/5/07-09	215
3290 Configured Support	6A	80	3290 Support Configured	04/5/0A	171 = 1
		40	Transfer of Operational Load Module to Load Diskette		N/A
		20	3290 Dump Complete		N/A
		10	Multiple Interactive Screen Support		Question 171 for CS-T or 117 for CS-D
		08	Information Display Panel (Load Diskette not Required)		170 = 2
Diskette Copied Using Copy Utility	6B	C3	Set by Disk Copy Utility	04/5/0B	N/A
X.25 Non-Standard Window Size	6E	01-07 01-11	Range for Modulo 8 Range for Modulo 128	04/5/0E	435

Figure 3-14 (Part 3 of 6). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Bytes	Customization Question
Modifiable Keyboard Selection	6F	01 02 04	Modifiable typewriter Modifiable APL Modifiable Data Entry 1	04/5/0F	136 = 1XX 136 = X1X 136 = XX1
EC Levels	70,71	nn nn	Feature Diskette Level and Suffix	04/6/00, 01	N/A
Note: *All EC Levels are expressed as release level and A suffix. For example Release 43.1 will display as 4301.*	72, 73	nn nn	System Diskette Level and Suffix	04/6/02, 03	
	74, 75	nn nn	Language Diskette Level and Suffix	04/6/04, 05	
RPQ Information	76	0XXXXXXX	RPQ1 If the high order bit of the first byte = 0 this byte contains RPQ EC Level.	04/6/06	N/A
Note: *The configuration Support Flags at the right indicate the 3274 Configuration Support Level for which the RPQ was released. Any mismatch between this setting and the Microcode Configuration Support Level (appears on the system disk) should be validated with your IBM Sales Representative for proper support.*		1XXXXXXX	If the high order bit of the first byte = 1 the byte listed has the meaning listed below and the second byte 77 = 00.		
		C000	Configuration Support D		
		8800	Configuration Support T		
		8400	Configuration Support C		
		8200	Configuration Support B		
		8100	Configuration Support A		
	77	nn	If high order bit of byte 76 = 0 RPQ1 Level Suffix	04/6/07	
	78	xx	RPQ2 (same as byte 76)	04/6/08	
	79	nn	RPQ2 Level Suffix	04/6/09	
	7A	xx	RPQ3 (same as byte 76)	04/6/0A	
	7B	nn	RPQ3 Level Suffix	04/6/0B	
Magnetic Reader Type	7C	00	None	04/6/0C	141 = A
		01	Numeric 3270 Compatible		141 = B
		02	Alphameric (Auto Entry for non-display data)		141 = C
		03	Alphameric (Auto Entry for all data)		141 = D
Attribute select keyboards (only valid for configuration Support SFAP Data Stream Processing	7D	00	No attribute select keyboards supported	04/6/0D	166 = A
		01	Attribute Select keyboards — w/o numeric lock.		
		02	Attribute select keyboards with numeric lock.		166 = C
Alert Function Requested	8A	00	No Alert Function	08/3/0A	Question 22 = 0
		01	Alert Without Test Alert Capability		Question 22 = 1
		02	Alert With Test Alert on Port 0 Only		Question 220 = 2
		03	Alert with Test Alert On All Ports		Question 220 = 3
X.25 Non-Standard Packet Size	8B (high order nibble	0 1 1 3	64 Byte Packet 128 Byte Packet 256 Byte Packet 512 Byte Packet	08/3/0A	434 = 0 434 = 1 434 = 2 434 = 3
Modifiable Keypad Overlay	8B (low order nibble)	0 1 2	Default Modifiable Keypad Data Entry 1 Modifiable Keypad PF Keys Modifiable Keypad	08/3/0B	138 = 0 138 = 1 138 = 2

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
Load Diskette	90	xx	Load Diskette EC Number	08/4/00	N/A
EC + Suffix Number	91	xx	Load Diskette Suffix Number	08/4/01	N/A
3290 RPQ ID Number	92-96	XXXXXXXXX	Ten digits	08/4/02-06	N/A
MIS Definition (Configuration Support T only)	97	xx	First port with MIS	08/4/07	171
	98	xx	Number of ports with two Logical Terminals	08/4/08	171
	99	xx	Number of ports with three Logical Terminals	08/4/09	171
	9A	xx	Number of ports with four Logical Terminals	08/4/0A	171
	9B	xx	Number of ports with five Logical Terminals	08/4/0B	171
3290 RPQ Options	9C-9D	xxxx	Defined by 3290	08/4/0C-0D	N/A
Modifiable Keyboard Selection	9E	00 01 02 04 08	No keyboard Keyboard A Keyboard B Keyboard C Keyboard D	08/5/0E	137 = 0000 137 = 1XXX 137 = X1XX 137 = XX1X 137 = XXX1
3290 Features and Functions	9F	80	Enable 3290 Local Copy	08/4/0F	Question 173 1XXX XXXX
		40	Auto Form Feed before Local Copy		X1XX XXXX
		20	Auto Form Feed after Local Copy		XX1X XXXX
Physical and Logical Devices	A1	XX	Number of Physical and Logical devices defined on the 3274	08/5/01	171 + 112 for CS-T 111 + 117 for CS-D
Number of MIS	A2	XX	Number of logical Terminal Extensions	08/5/02	171 for CS-T 111 + 117 for CS-D
3290 Keypad Selection	A3	00	Default Keypad (based on national language)	08/5/03	139 = 0
		01	24-Key Numeric Keypad		139 = 1
		02	24-Key Numeric Keypad with Comma on Key 4		139 = 2
		03	24-Key Numeric Keypad with Decimal Point on Key 4		139 = 3
		07	Program Function Keypad		139 = 7
Optional Code Selection	A4	80 40 20	Clear Key Unsupported Control Codes Clicker Option	08/5/04	125; 1XXX XXXX 125; X1XX XXXX 125; XX1X XXXX

Figure 3-14. (Part 4 of 6). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
X.25 Incoming Call Options	A6	XXXX XXX1 XXXX XX1X XXXX X1XX XXXX 1XXX XXX1 XXXX X11X XXXX 00 01 10 11 1XXX XXXX	Bit 7 — Reserved Negotiate throughput Class Validate CID on Incoming Packets Negotiate window size Negotiate packet size If bit positions designated 11 equal: Don't accept calls with reverse charge facility Accept calls w/reverse charge facility = reverse charge requested Accept calls with reverse charge facility NOT requested Accept calls w/reverse charge facility and either reverse charge requested or NOT reverse charge accepted Validate calling DTE address	08/5/06	420
X.25 Outgoing Call Options	A7	XXXX XXX1 XXXX XX1X XXXX X1XX XXXX 1XXX XXX1 XXXX X11X XXXX 00 01 10 11 1XXX XXXX	Bit 7 — Reserved Include throughput class facility in Call Request packet Include CID in the call user data field of call user packet Include window size facility field in call request packet Include packet size facility field in call request packet If bit positions designated 11 equal: Don't include reverse call facility in call request packet Request reverse charge via reverse charge facility Request NO reverse charge via reverse charge facility field Invalid Supply Calling DTE address in call request packet	08/5/07	421
X.25 Negotiate Packet Size	A8 (high order nibble)	0 1 2 3	64 Byte Packet 128 Byte Packet 256 Byte Packet 512 Byte Packet	08/5/08	430 = 0 430 = 1 430 = 2 430 = 3
X.25 Packet Sequence Numbering	A8 (low order nibble)	0 1	Modulo 8 Modulo 128	08/5/08	431 = 0 431 = 1
X.25 Negotiate Window Size	A9	01-07 01-11	Range for Modulo 8 Range for Modulo 128	08/5/09	432

Figure 3-14 (Part 5 of 6). Subsystem Configuration

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
X.25 Throughput Class	AA (high order nibble)	3 4 5 6 7 8 9 A B C	75 bps 150 bps 300 bps 600 bps 1200 bps 2400 bps 4800 bps 9600 bps 19200 bps 48000 bps	08/5/0A	440 = 3 440 = 4 440 = 5 440 = 6 440 = 7 440 = 8 440 = 9 440 = A 440 = B 440 = C
X.25 K-Maximum Out	AA (low order nibble)	1-7	Maximum number of link level I-frames that the 3274 will transmit prior to waiting for acknowledgment	08/5/0A	433 = n
Closed User Group	AB	00-99	Include closed user group facility in outgoing call request packet	08/5/0B	441
X.25 Recognized Private Operating Agency (RPOA)	AC-AD	0000 thru 9999	Used to select intermediate network to be used between two public networks	08/5/0C 08/5/0D	442 = nnnn
X.25 Keyboard Support	AE	XXXX XX1X 0 1 XXXX X1XX 0 1 XXXX 1XXX 0 1 XX11 XXXX 00 01 10 11 11XX XXXX 00 01 10 11	If bit position designated 1 equals: Take appropriate action — DISC (SVC) or LOCAL (PVC) key off only if no LU's active DISC (SVC) or LOCAL (PVC) key (disconnect or local mode) If bit position designated 1 equals: Display all fields on Dial Screen Display only HNAD on Dial Screen If bit position designated 1 equals: X.25 keys supported on Port 0 only X.25 keys supported on all ports If bit positions designated 1 equal: X.25 LOCAL and COMM keys are not supported on 3274 X.25 LOCAL and COMM keys are supported on Port 0 X.25 LOCAL and COMM keys are supported per XXXX 1XXX bit above Invalid If bit positions designated 1 equal: X.25 DISC key *not* supported on 3274 X.25 DISC key supported on Port 0 X.25 DISC key supported per XXXX 1XXX bit above Invalid	08/5/0E	443
X.25 Network Type	AF	00 02	CCITT Recommended network that has announced IBM support X.25 connection is UKPSS or TELENET	08/5/0F	400 = 00 400 = 02

Information Provided	Location	Hex Dig./Bit Setting	Meaning	Page/ Line/ Byte	Customization Question
RPQ Parameter List	B0-BF	16X 'FF'	Specific information is supplied with the RPQ.	08/6/00-0F	033
Type A Port Assignment Table	C0-CF	16 Hex Bytes	32 hex digits are displayed, one for each possible port	0C/3/00-0F	112 = 00 116 = 1 117 = Port-by-port assignment (Configuration Support "D" only)
Response Time Monitor Support	D0	00	Not Configured	0C/4/00	127 (X = 0)
		01	Configured - No Host Support Display from Port 0 only		127 (X = 1)
		02	Configured - No Host Support Display from all Ports		127 (X = 2)
		03	Configured - Host Support No Subsystem Display (SNA only)		127 (X = 3)
		04	Configured - Host Support Display from Port 0 only (SNA only)		127 (X = 4)
		05	Configured - Host Support Display from all Ports (SNA only)		127 (X = 5)
Response Time Monitor Definition	D1	00	Not Defined		127 (Y = 0)
		01	Host Attention Key to First Character on Screen		127 (Y = 1)
		02	Host Attention Key to Keyboard Usable		127 (Y = 2)
		03	Host Attention Key to Change Direction or End Bracket (SNA only)		127 (Y = 3)
Response Time Monitor	D2-D3	Minutes, Seconds, Tenths of Seconds, mm/ss/s	First Time Boundary	0C/4/02-03	128 B1 (Line 2)
	D4-D5		Second Time Boundary	0C/4/04-05	128 B2 (Line 3)
	D6-D7		Third Time Boundary	0C/4/06-07	128 B3 (Line 4)
	D8-D9		Fourth Time Boundary	0C/4/08-09	128 B4 (Line 5)
Response Time Monitor Options (**Note:** D0 above must equal 3, 4, or 5 for this field to be displayed)	DA	80	Response Time Monitor Enabled	0C/4/0A	128 F1 (Line 1) 1XXX XXXX
		40	Unsolicited on Session End		128 F1 (Line 1) X1XX XXXX
		20	Unsolicited on Counter Overflow		128 F1 (Line 1) XX1X XXXX
		10	RTM Alerts Enabled		128 F1 (Line 1) XXX1 XXXX
X.25 Logical Link Control	DB (high order nibble)	0 1	PSH QLLC	0C/4/0B	403 = 0 403 = 1
X.25 Circuit Type	DB (low order nibble)	1 2 4 8	Permanent Virtual Circuit Incoming Call only Outgoing Call only Two-Way Call	0C/4/0B	401 = 1 401 = 2 401 = 3 401 = 4
X.25 Host DTE Network Address (HNAD)	DC-E3		15 packed decimal digits or spaces (16th position always set to F)	0C/4/0C through 0C/5/03	410 - digits (0 - 9, blanks or nulls)
X.25 3274 DTE Network Address (LNAD)	E4-EB		15 packed decimal digits or spaces (16th position always set to F)	0C/5/04 through 0C/5/0B	411 - digits (0 - 9, blanks or nulls)
X.25 Logical Channel ID	EC-ED	0000-0FFF	Channel ID for the circuit specified in byte DB (low order nibble) earlier in this table	0C/5/0C and 0C/5/0D	402 input = 0000 thru 4095
X.25 Link Level Transmit Timeout (Tp)	EE-EF	0000-2540	Number of one/tenth second intervals	0C/5/0E and 0C/5/0F	450 - Input example: 30 seconds = 300 x 0.1, value entered = 300

Figure 3-14 (Part 6 of 6). Subsystem Configuration

3.6 TEST 3: DISPLAY THE STATUS OF ALL CONFIGURED TERMINALS AND DISPLAY THE CONTROL UNIT SUMMARY COUNTERS

Test 3 is invoked after the ALT and TEST keys are used to enter Test mode. An entry of /3 from any functioning 3278 or similar display, and then an ENTER, will display one of the following formats on the screen (the actual format may vary depending on how many devices have been configured):

Example 1 (Configuration Support A):

- Line 1 – 0123456789012345 6789
- Line 2 – 1111111111111111 110-
- Line 3 – 0000 0000 0000 0000 0000

Line 1 displays all the Category A devices, starting from the leftmost position. The digits correspond to the low-order digit of the coax port address. Therefore, port A0 = position number 0 and port A15 = position number 15. The Category B devices are separated from the Category A devices by a space. Therefore, port B0 = position number 16 in the log and port B03 = position number 19.

Line 2 displays the status (1 = on, 0 = off, and - = disabled) of each configured device.

Line 3 displays statistical counter information in summary form of control-unit-detected machine checks, communication checks, program checks, and SDLC test commands. The values are displayed in hexadecimal. The counters are two-byte counters numbered from left to right starting at counter number 01. See the following example for counter meanings:

Counter	Meaning
0102	Summary of all machine checks
0304	Summary of all communication checks
0506	Summary of all program checks
0708	SDLC test commands received
0910	SDLC test commands sent
	(Maximum counter values are FFFF)

Use the associated error logs (device/adapter) to further define the summary counters. The maximum value of the counters is FFFF. If a counter is incremented to the maximum value, it will remain there until reset by an IML or A3/4 test.

Example 2 (Configuration Support A, B, C, D):

(Machine configured for 32 devices)

- Line 1 01234567890123456789012345678901
- Line 2 101X11111110111111111111 11011001
- Line 3 ddd ddddddd–ddddddddddd pdpdpdpd
- Line 4 ... .|....:.|....|. ....*...
- Line 5 ... .:..... *.......
- Line 6 +++ ++++++ ++++++++++ ++++ +++
- Line 7
- Line 8 000 0001 0000 0000 0000

Line 1 shows coax port addresses (0-31). In this example, the 3274 is configured for 32 devices (24 Category A and 8 Category B devices). Category A devices are always shown first.

Line 2 shows the status of each device, where:

1 = Device powered on
0 = Device recognized as powered off
- = Device recognized as disabled because of control-unit-detected errors
x = indicates that the port is unavailable. The corresponding position in lines 3, 4, 5, 6, and 8 is blank. (Configuration Support D and above.)

Line 3 shows the type of device attached, where:

d = Display
p = Printer
i = Other
– = Never initialized

Line 4 shows a summary of coax errors, where:

. = No errors
: = 1-9 errors
| = 10-19 errors
* = 20 or more errors

Line 5 shows a summary of device errors, where:

. = No errors
: = 1-9 errors
| = 10-19 errors
* = 20 or more errors

Line 6 shows a summary of sessions bound (this line will appear only for SNA attachments), where:

+ = Session bound
blank = not session bound

Line 8 consists of control unit statistical summaries. (Refer to Line 3 of example 1).

3.7 X.25 /3 TEST

The /3 Test is modified as follows to inform the user of the currently-connected host address and the in-session status of the display stations.

Example of /3 Test Screen:

```
Line
1   01234567890123456789012345678901
2   101110-11110111011111000  11111100
3   ddddddddddddddddi i  pp  d dd ppp   TYP
4   ................:......|  ........  COAX
5   ......*...:............   ........  DEV
6   +  ++  +     +          +         +  LU
7                                       ## ⟶ 555 8001212 459
8
9   0000 0010 0002 0015 0012
```

Line 1: 01234567890123456789012345678901

Where the digits represent the low order digit of the coax port address attached in the configuration. Type A adapter ports and Type B adapter ports are separated by two blank characters. (This example shows 24 Type A ports and 8 Type B ports)

Line 2: 1, 0, or a – under each position in line 1.

Where 1 = Device powered on
0 = Device powered off or not attached
– = Device disabled because an error was detected at the control unit

Line 3: p, d, i, or a under each position

Where p = Printer
d = Display
i = distributed-function device (e.g., 3290 Information Panel)
= port never powered on
TYP indicates device type

Line 4 & 5: (.), (:), (|), or a (*) under each character position
( ) Surround the character in question.

Where . = 0 errors
: = 1-9 errors
| = 10-19 errors
* = Over 20 errors
COAX (Line 4) indicates coax errors
DEV (Line 5) indicates device errors

Line 6: + or a space under each position in line 1.

Where + = The device is in session with the host.

a space = The device is not in session with the host.

Display 2 characters 'LU' after spacing 4 columns to the right of the session indication in this line.

Line 7: This line is omitted for PVC.
This line displays one of the three following variations for SVC:

(15 characters)
→_____ indicates outgoing call performed. The 15 characters are the Host DTE address.

(15 characters)
←_____ indicates incoming call in session. The 15 characters are the Host DTE address.

← indicates incoming call performed. No calling (Host) DTE address was provided in the Call Request packet.

The intent of Line 7 is to allow the user to tell what host the 3274 Control Unit is currently connected to (if Call Ready is displayed) or was connected to (if Call Ready is not displayed).

Line 8: This is a blank line.

Line 9: PPPP CCCC SSSS RRRR XXXX

Where,

PPPP = Summary count of control unit-detected product checks (Machine Checks)
CCCC = Summary count of Communication Checks
SSSS = Summary count of SNA errors (Program Checks
RRRR = Summary count of XTEST Packets received
XXXX = Summary count of XTEST Packets transmitted

3.8 TEST 4: RESET ANY TEST 1 LOG

Test 4 provides the capability of resetting any device adapter, device, host adapter, or control logic log. By using the ALT and TEST keys, you may enter Test mode. Test 4 may now be used as shown below:

- 00 to 31/4 — Resets the device log for the device specified to all zeros (0)
- A0/4 — Resets the host adapter log to all zeros (0).
- A1/4 — Resets the Type A adapter log to all zeros (0).
- A2/4 — Resets the Type B encrypt adapter log to all zeros (0).
- A3/4 — Resets the control logic log to all zeros (0). Also resets the LEDs.

Test 4 may be used to track intermittent failures without re-IML or powering off the machine to clear the error logs.

3.9 TEST 5 REGISTER PAGE DISPLAY

This utility function provides for the display of register space. The format of the display will be:

Line 1 AA/5 (same as input)
Line 2 PP
Line 3 XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 4 XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 5 XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 6 XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX

where: PP = The register page (in hex) currently being displayed on Line 3 (PP+1) on line 4, etc.)
XXXX = Hex representation of the register page

PA1 or the Enter Key may be used to page through register space four register pages at a time. Line 2 will be updated to show the starting page (in hex) of the register pages currently being displayed. Paging beyond the limit of register space is prohibited by input/minus function.

Valid address input (if entered on line 1) is ignored.

3.10 TEST 6: DEVICE CONTROL BLOCK DISPLAY

The device control block (DCB) contains common subsystem information pertaining to all terminals, device and host adapter information, and limited device-feature information. The Test 6 display represents the most current information regarding a specific device. The DCB should be checked when it is necessary to determine specific device parameters such as, (1) Is the device configured as a display or printer? (2) Is the display screen size correctly specified? (3) Is an MDT bit set? (4) The status of keyboard for this device and so on.

To invoke Test 6, you must first enter Test mode by means of the ALT and TEST keys. The DCB for any device from 00 to 31 may be displayed by keying the device number followed by a slash (/), the number 6, followed by an ENTER key. Each DCB consists of four displays of 64 bytes each. The individual bytes are not labeled. There are six lines to each display. The first line displays the test request as entered. The second line of each display will indicate the beginning byte ID of that display. 00, 04, 08, and 0C for the DCB; 10, 14, 18, and 1C if an extended DCB is present. See Figure 3-15 for details. You may page from one display to the next by pressing the ENTER key. Paging beyond display 0C will result in a locked keyboard and ✖-f displayed on the status line. See Figure 3-16 for DCB interpretation. When Extended DCBs are configured, there are four more blocks to examine.

If a DCB, and an Extended DCB indicate that a 3290 is configured as a display, pressing ENTER will cause individual screens for each Logical Terminal (LT) to be displayed a maximum of five LT's. Each LT will display one line of ten halfwords of hex information, defining the LT. After the last DCB/Extended DCB is displayed, the test sequence flow is as follows:

Press ENTER
  LT 0 displayed
Press ENTER
  LT 1 displayed
Press ENTER
  LT 2 displayed
Press ENTER
  LT 3 displayed
Press ENTER
  LT 4 displayed

If ENTER is pressed beyond the last configured LT, ✖-f is displayed, and the keyboard is locked.

3.10.1 Test 6 Byte Identification

Figure 3-14 identifies the bytes of the DCB displays.

First Display

XX/6 — Returned as entered XX = Any device
000 — ID of the first address of this display

ID only	0 1	2 3	4 5	6 7	8 9	A B	C D	E F	— ID only, not displayed
000	0000	0000	0000	0000	0000	0000	0000	0000	
010	0000	0000	0000	0000	0000	0000	0000	0000	
020	0000	0000	0000	0000	0000	0000	0000	0000	
030	0000	0000	0000	0000	0000	0000	0000	0000	Byte 3F

Second Display

XX/6 — Returned as entered
040 — ID of the first address of this display

040	0000	0000	0000	0000	0000	0000	0000	0000	
050	0000	0000	0000	0000	0000	0000	0000	0000	
060	0000	0000	0000	0000	0000	0000	0000	0000	
070	0000	0000	0000	0000	0000	0000	0000	0000	Byte 7F

Third Display

XX/6 — Returned as entered
080 — ID of the first address of this display

080	0000	0000	0000	0000	0000	0000	0000	0000	
090	0000	0000	0000	0000	0000	0000	0000	0000	
0A0	0000	0000	0000	0000	0000	0000	0000	0000	
0B0	0000	0000	0000	0000	0000	0000	0000	0000	Byte BF

Fourth Display

XX/6 — Returned as entered
0C0 — ID of the first address of this display

0C0	0000	0000	0000	0000	0000	0000	0000	0000	
0D0	0000	0000	0000	0000	0000	0000	0000	0000	
0E0	0000	0000	0000	0000	0000	0000	0000	0000	
0F0	0000	0000	0000	0000	0000	0000	0000	0000	Byte FF

Figure 3-15. Test 6 ID Byte Chart

3.10.2 DCB Bit Definitions (Figure 3-16)

Bits defined as "Reserved for engineering use" may contain zeros or ones. They should be disregarded unless otherwise directed by the next level of the support structure. Bits are assumed to be set to b'1' unless otherwise noted.

Bytes 02, 03, and 04 indicate functions supported by the controller and reported as available by the device. See bytes 25, 95, 96, and 97 for functions identified by the device.

Location	Bit	Meaning If Bit Is Turned On
Byte 02	0	See Figure A
	1	
	2	
	3	See Figure B
	4	
	5	Keyboard is attached
	6	This is a Type B device
	7	Numeric Lock feature is present

Display Model / Bit	1	2	3	4	5
0	0	0	0	1	1
1	0	1	1	1	1
2	1	0	1	1	0

Figure A

Bit	Data Entry KB	Printer	Typewriter, APL, Text-keyboard
3	0	1	0
4	1	1	0

Figure B

Location	Bit	Meaning If Bit Is Turned On
Byte 03	0	Katakana keyboard is attached
	1	SCS feature on Type A adapter printer
	2	Text keyboard
	3	3289 Text feature
	4	APL keyboard
	5	Extended function keyboard
	6-7	Reserved
Byte 04 (Category A Devices)	0	Not used
	1	Security keylock present
	2	Selector pen attached
	3	Reserved for engineering use
	4	MSR/MHS attached
	5	Reserved for engineering use
	6	Reserved for engineering use
	7	ECS (APL/Text)
Byte 04 (Category B Devices)	0	Device busy
	1	Buffer parity
	2	Indeterminate write errors
	3	Inhibit start idle poll
	4	Buffer size (0=480, 1=1920)
	5	DAU issued
	6	Start print
	7	Format bits
Byte 05 (Category A Devices)	3	Convergence (3279)
Byte 06	0	DCB busy
	1	Subsystem ready (DCB initialized)
	2	Nondisplay
	3	Op Complete pending from device
	4	Linkage stacked
	5	Stacked status/keystroke/error present
	6	Numeric Lock field
	7	Reserved for engineering use
Byte 07	0	Protected field or attribute character
	1	ECS buffer updated
	2	Print ID entry mode
	3	Reserved for engineering use
	4	MDT bit not set
	5	Do not enter
	6	Reserved for engineering use
	7	Insert mode
Byte 08	0	No indicators to write or erase (Category B displays and printers, Category A printers)
	1	Test mode
	2	Alpha shift (not Katakana shift)
	3	Reserved for engineering use
	4	Text indicator
	5	Upshift indicator
	6	Katakana shift
	7	APL indicator
Byte 09	0	Online indicator
	1	System-wait condition
	2	Hard-lock condition
	3	Keyboard in use by operator
	4	DCB scheduled for function 6 — waiting (BSC)
	5	DCB scheduled for function 5 — waiting (BSC)
	6	Reserved for engineering use
	7	OK for function to be suspended
Byte 0B	0	Reserved for engineering use
	1	Reserved for engineering use
	2	Reserved for engineering use
	3	Local copy (display to printer) in progress
	4	Alternate screen size
	5	Attributes not valid
	6	Monocase switch active in device
	7	Reserved for engineering use
Byte 0C	0	Printer messages queued — local copy
	1	Reserved for engineering use
	2	Local copy malfunction has occurred
	3	Go elsewhere
	4	Minus Function
	5	MSR/MHS — wrong card
	6	Message pending
	7	Message reminder
Byte 0D	0	Printer printing — local copy
	1	If display has printer assigned for local copy
	2	Printer matrix changed (associated with this display)
Byte 0E	0	Invalid dead key (language 06 only)
	1	2NN machine check
	2	Communication check
	3	Program check
	4	Security key off
	5	3NN machine check
	6	Too much (keystroke-MSR)
	7	Operator not authorized
Byte 0F	0	Not enough
	1	Wrong number
	2	Numeric shift
	3	Operator retry
	4	Local-copy failure while printer printing (printer failure)
	5	Device busy doing local copy
	6	Reserved for engineering use
	7	System lock (X System)
Byte 10	0	Communication check reminder
	1	My Job indicator
	2	System Operator indicator
	3	Unowned indicator
	4	Not enabled (not online)
	5	Reserved for engineering use
	6	Reserved for engineering use
	7	Minus Symbol indicator (WT only)
Byte 13 Bits 0—7	20	Request search
	22	Erase input (active partition only)
	24	Erase unprotected to address
	26	Reset MDTs
	28	Clear buffer
	2A	Erase partition
	2C	Write head control register
	2E	Inhibit keyboard
	30	Write indicator
	32	Erase indicator
	34	Write machine check
	36	Write communication check
	38	Write application program check
	3A	Power terminal off
	3C	Terminal reset
	3E	Reset keyboard
	40	End of Type B buffer transfer
	44	Clear programmable character set
	46	Command queue execution
	48	Image execute command Q and suspend L5
	4A	Image execute command Q and suspend L6
	4C	Start print

Figure 3-16 (Part 1 of 2). DCB Bit Definition Chart

Location	Bit	Meaning If Bit Is Turned On
Byte 13 Bits 0-7	4E	Host printer available for local copy
	50	Local copy request
	52	Type B read buffer
	54	Type B write buffer
	56	Type B write buffer and sound alarm
	58	Type B sound alarm
	2E	Type B intermediate write (DSE)
	5A	Type B level 5 lock (PCM)
	5C	DCA printer abort request
	5D	DCA printer system status order
Bytes 14, 15		Cursor position (3278 only)[1]
Bytes 1A, 1B		First character position on display[1]
Bytes 1C, 1D		Last character position on display[1]
Byte 24 (Category A devices)	0	Model 5 wide screen
	1	Model 5 wide screen
	2	480-character format
	3	Reserved for engineering use
	4	Inhibit display video
	5	Blank cursor
	6	Cursor reverse
	7	Cursor blink
Byte 25 (only valid when SFAP feature installed)	0	
	1	
	2	ROS present
	3	APL switch in APL position
	4	APL feature present
	5, 6	00 No PS feature on device 01 2 PS feature on device 10 4 PS features on device 11 6 PS features on device
Byte 26		Row length
Byte 27		Indicator row length
Byte 29		AID Code
Byte 31 Bits 0–7	00	2K
	10	4K
	20	8K
Byte 34	0	SNA – printer allocated to local copy
	1	SNA – local copy printer allocated for host use.
	2	SNA – host request for local copy allocated printer
	3	Alternate row length indication
	4	Default row length indication
	5	Reserved for engineering use
	6	SNA – LU in ERP state
	7	SNA – host communication disabled (LU active)
Byte 35	0	Local copy printing (host-initiated)
	1	Local copy printer available (display only)
	2	Local copy (printer available for next message) SNA
	4	FM data received for display queued for local copy

Location	Bit	Meaning If Bit Is Turned On
Byte 3C	–	2nn
Byte 3D	–	3nn
Byte 3E	–	4nn
Byte 3F	–	5nn
Byte 46	0	Other function request
	1	Select pen for immediate detect field
	2	Required for Select Pen field
	3	Dup Key switch (auto tab)
	4	Reserved for engineering use
	5	Clicker enabled
	6	Print ID Entry mode
	7	Type B erase all unprotected
Byte 47	0	Disable cursor display
	1	Local copy buffer transfer in progress
	2	Second local copy requested
	5	Dead key sequence in process
	6	Local copy received IR
Byte 4E (Category A devices)	0–7	Attribute affecting field cursor (3278 only)
Byte 4E (Category B devices)	0	Device check
	1	Transmit check
	2	Information pending
	3	Not ready (printer only)
	5	Equipment check (printer only)
Byte 4F (Category A devices)	0–7	Current Extended Field Attribute (Configuration Support C only)
Byte 4F (Category B devices)	0	Device busy
	1	Buffer size (0=480, 1=1920)
	2	0 = display, 1 = printer
	3-7	Device address (type B adapter port number)
Bytes 50, 51		Present attribute address (3278 only)[1]
Bytes 52, 53		Next attribute address (3278 only)[1]
Byte 68	0	Printer equipment check/display disabled because of error
	1	Intervention required/security key off
	2	Printer busy processor abort
	3	Reserved for engineering use
	4	Print in process
	5	Start print pending
	6	Printer disabled
	7	Reserved for engineering use
Byte 6A (Category A devices)	0	Shift/Numeric Lock key still depressed
	1	ALPHA key depressed
	2	Alternate Shift key depressed
	3	Shift/Numeric Lock key in effect
	4	Left Shift key
	5	Right Shift key
	6	Katakana Shift key depressed
	7	In APL/Text shift

Location	Bit	Meaning If Bit Is Turned On
Byte 6B	0	Reserved for engineering use
	1	Local copy being printed
	2	Reserved for engineering use
	3	Local copy delayed indicator
	4	Printer in shared mode
	5	Printer in local mode
	6	Printer mode change
	7	Reserved for engineering use
Byte 70		Local copy printer ID
Byte 71		Local copy printer address
Bytes 76, 77		Printer DCB Devices 0–15, ones in this field are authorized to use this printer.
Bytes 78, 79		Printer DCB devices 16-31 (same as byte 76 and 77 description)
Bytes 7A, 7B		Printer class assignments (printer only) 1 in one or more bits (0–15) represents printer class assignments 70-85
Byte 94	0	1 = 3278 mode 0 = Native mode
	1	1 = Numeric lock 0 = No numeric lock
	2	1 = Keyboard functions have been redefined 0 = No modifiable keyboard - Keyboard functions have not be redefined
	3–7	Modifiable keyboard ID

	Bit 2 = 0	Bit 2 = 1
00000	Reserved	Reserved
00001	Typewriter	A
00010	Data Entry 1	B
00011	APL	C
00100	Reserved	D
00101 through 11111	Reserved	Reserved

Byte 95 (Display)		Display features identified to the controller by the device:
	0, 1, 2, 3	0000 – Reserved 0001 – APL keyboard/Numeric Lock 0010 – Text keyboard/Numeric Lock 0011 – Typewriter keyboard/Numeric Lock 0100 – Typewriter Attribute Select keyboard/Numeric Lock 0101 – APL keyboard 0110 – Text keyboard 0111 – APL Attribute Select keyboard 1000 – Data Entry 2 keyboard/Numeric Lock 1001 – Data Entry 1 keyboard/Numeric Lock 1010 – Typewriter Keyboard 1011 – Reserved 1100 – Data Entry 2 keyboard 1101 – Data Entry 1 keyboard 1110 – Typewriter 1111 – No keyboard

Location	Bit	Meaning If Bit Is Turned On
Byte 95 (Display) (Cont'd)	4, 5, 6	001 – Model 1 010 – Model 2 011 – Model 3 100 – Reserved 101 – Reserved 110 – Model 5 111 – Model 4
	7	0 – Indicates display byte
Byte 95 (Printer)		Printer features identified to the controller by the device:
	0	ECS feature present
	1	APL feature present
	2	Reserved
	3	Reserved
	4, 5, 6	001 – Model 1 010 – Model 2 011 – Model 3 100 – Reserved 101 – Reserved 110 – Model 5 111 – Model 4
	7	1 – Indicates Printer Byte
Byte 96 (Display)	1	Security key
	2	Selector Light Pen
	4	Magnetic Slot Reader
	7	ECS Adapter
Byte 97	3	Color
Byte A2		WCC save area
Byte B4 (Model C, BSC)		0 = Device End posting required 5 = Error on BSC copy command
Byte B4 (Model B)		WCC from host
Byte B6 (Model BSC)		Pending device status
Byte B9 (Model C, BSC)		Line address this device
Byte BA		5 = Dual Case 6 = Mono Case
Bytes DC-DD		Default screen size
Bytes DE-DF		All screen size

[1] When using this byte on Category A devices, subtract hex 50 from the cursor position. This will give you the current I/O interface code (if Model 1, subtract X"40").

Figure 3-16 (Part 2 of 2). DCB Bit Definition Chart

3.11 /B TEST: DEVICE ADDRESS ASSIGNMENT TABLE

This test displays, for each port on the controller, the number of addressable terminals (physical and logical) associated with the port. The primary address for the port, and the range of secondary addresses (if any) associated with the primary address. Category A and B adapters are shown.

This test requires 22 lines on the screen (there is no paging for additional data) and must be requested from a display device with 24 row screen capacity or greater.

The data for Category A adapter ports is presented in 4 groups, 8 ports to a group (A00 to A07, A08 to A15, . . .) with 4 lines required for each port, as follows:

Line 1:	A00	A01	A07
Line 2:	X	X	X
Line 3:	XX	XX	XX
Line 4:	XX-XX	XX-XX	XX-XX

Three more groups, A08 to A15, A16 to A23, and A24 to A31 follow.

Each line carries the following meaning:

Line 1 = port number
Line 2 = X = non-zero-port available; X = 0-port unavailable
Line 3 = primary address
Line 4 = range of secondary addresses (if any)

The data for Category B adapter ports is presented following the Category A presentation and consists of two lines displaying the data for all 16 possible Category B ports. The format is:

Line 1:	B00	B01	B02	B15
Line 2:	XX	XX	XX	XX

where:

Line 1 = port number
Line 2 = primary address

3.12 TEST 7: DYNAMIC CONVERGENCE (COLOR)

For a description of this test, see the *IBM 3279 Color Display Station Maintenance Information* manual, SY33-0069.

3.13 TEST 8. PS, HIGHLIGHTING, AND COLOR

For a description of this test, see the *IBM 3279 Color Display Station Maintenance Information* manual, SY33-0069.

3.14 /A TEST—OPERATOR ORIGINATED ALERTS (CONFIGURATION SUPPORT C AND D)

NPDA provides support for 20 product-unique screens that can be defined by the customer in the NPDA data base as part of the host SYSGEN process.

Via a customizing parameter, all operators on 3178s, 3278s and 3279s, the operator on port 0 only, or *no* operators may request an alert screen while in 3274 TEST mode. When properly filled in, the information on such a screen is transmitted as part of an alert Network Management Vector Transport (NMVT) inbound to the host.

Included in these alert RUs are the customer-specified user-action code, a 120-character (maximum length) test message, and up to three eight-digit qualifiers.

Once the alert is received by NPDA, the user-action code is mapped into one of the unique customer screens. The test message and qualifiers allow the operator to pass such things as a 3274 nnn code, a port number, telephone number, etc. as well as a text message up to the NPDA operator.

When an authorized display station operator enters TEST mode, types in /A, and presses ENTER or PAT key, the following panel is displayed.

```
/A@                                                                        @
XX@
---------------------------------------------------------------------------@
nnnnnnnnnn nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn
nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn@---------------------------------@
-----------------------------------------@                                 @
Q1@mmmmmmmmm@Q2mmmmmmmm@Q3@mmmmmmmm@
```

where, @ are attributes (not displayed).
/A@ indicates the alert screen ready for transmission when the ENTER key is pressed.
XX is a two-character field for the user-action code (01-20 decimal required).
nnnn.. is a 120-characters field filled with nulls for the text message (optional).
mmmm.. are three eight-character fields filled with nulls for the qualifiers (optional).

When the ENTER or PA1 key is pressed with the above panel, a check is performed to ensure that the user-action code (XX) is a number between 01 and 20 (decimal). If the number is between 01 and 20, the number is translated by the 3274 into the appropriate user-action code and an alert is sent. If an invalid user-action code is entered, X 웃#? is displayed in the Operator Information Area.

After an operator-generated alert is sent, the display screen is cleared to prevent accidental retransmission of the message. Only one *operator-generated* alert may be pending within the 3274 at one time. For example, several authorized display station operators may request an alert screen simultaneously. Once an operator fills his/her screen with the required user-action codes (an any optional text and qualifiers) and presses the ENTER key, that entry is queued for transmission provided there is no operator-generated alert already pending. If a second authorized operator attempts to enter an alert before the first operator-generated alert is transmitted to the host, the second operator's entry is inhibited, the screen is *not* cleared, and X-f is displayed in the Operator Information Area.

The second operator must press the RESET key and try again. If the first operator's screen has been transmitted and no other operator has entered an alert, the second operator's entry is honored.

Regardless of the upstream response, the screen is cleared. If a link-level error occurs, the hardware will attempt retransmission of the alert. If the data has been lost due to an error above the link level (DACTPU), the information may be lost without any error indication to the operator.

If an attempt is made to request an operator-generated alert screen from an authorized display station, X-f웃X is displayed in the Operator Information Area.

If other than the basic characters have been entered from the keyboard, X ?+ is displayed in the Operator Information Area.

If a communication check is detected, the Input Inhibited and Communication Reminder symbols, followed by a 5nn number, are displayed.

3.15 /D TEST – REQUEST 3290 DUMP

You may request a dump of the 3290 from a 3178, 3278, 3279 display. For example, after a 3290 has been down-stream loaded and a failing symptom is present, remove the "load" diskette from the 3274 and insert the 3274/3290 "dump" diskette (B/M 6849597). When the "load" diskette is removed from the 3274 a flashing 1111-0001 will appear in the 3274 LEDs. This is a normal indication and will stop when the "dump" diskette has initialized with no LEDs present – 0000. Then, at the display from which the dump is being requested, press the TEST key and enter:

XX/D

XX = The primary LU address (3274 Port) of the 3290.

For our example above, if the dump is for the 3290 on port 05 of the 3274, enter:

05/D

When the request is successfully received and the dump is in progress, a plus sign (+) will appear immediately adjacent to the D:

05/D+

While the dump is in progress and performing properly a flashing 1111-0101 will be displayed in the 3274 LEDs. After approximately 10 minutes, the dump should be complete and a solid 1111 will appear in the 3274 LEDs. Remove the "dump" diskette and insert the "load" diskette, then POR the intelligent device for which the dump was taken. The POR ensures a new down-stream load of the intelligent device. Refer to Chapter 4 for a step by step 3274 Subsystem Dump Procedure.

Note: *If you are requesting a matched - 3274/3290 set of dumps proceed as follows:*

1. Dump the 3274 following the 3274 Subsystem Dump Procedure described in Chapter 4.

then,

2. Perform the following steps in sequence:
   a. Disconnect the coaxial cable at the 3274 for each 3290 to be dumped.
   b. Ensure that the "load" diskette is inserted in the 3274.
   c. IML the 3274.
   d. Reconnect each coaxial cable that was disconnected in step A.
   e. Request a dump for each 3290, following the procedure described at the beginning of this section (1 dump per diskette).

3.16 3277 PATH TEST AND TEST REQUEST KEY

3.16.1 BSC or Local Host Attached

On 3277s attached to a BSC or local host attached 3274, the coax path from the device to the control unit can be verified by means of the Test Request key. Pressing the Test Request key will cause the control unit to attempt to turn on the System Available indicator on the 3277. A Test Request message will also be generated if the control unit is online to the host.

3.16.2 SNA Attached

On 3277s attached to an SNA-configured 3274, the coax path from the device to the control unit can be verified by means of the Test Request key twice. The first pressing of the key will cause the control unit to attempt to turn off the Do Not Enter indicator; the second will cause the control unit to attempt to turn on the System Available indicator. Operationally, this sequence is used to enter and exit 2-key sequence mode. Test Request followed by Clear is functionally equivalent to the Systems Request key on 3278s in SNA mode. Test Request followed by PA1 is the equivalent in function to the ATTN key on 3278s in SNA mode. Test Request followed by Test Request returns the 3277 to normal operation.

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Chapter 4. Subsystem Tests, External Tests, and Subsystem Service Aids

4.1 INTRODUCTION

Subsystem tests consist of the Bus and Lamp test and the IML tests. External tests consist of OLTs for Models A, B, C, and D.

4.2 INITIAL MACHINE LOAD (IML) TESTS 41X MODELS

Code	Description
0000	Control Logic failure — All four indicators not lit indicates a control logic failure. The test sequence will not proceed. The failure of any adapter can also cause this failure. Parity problems can also appear to be control-logic failures.
0001	Low Storage failure — A steady display of this code in the 8 4 2 1 Indicators indicates a failure in low storage.
0010	Diskette Drive — A flashing display of this code indicates the 33FD disk drive failed. A steady display of this code may be caused by any of the following: 1. Failure of the disk drive to come "ready." 2. A hung sequence (did not start) because of another adapter failure. (See A2 board bypass procedure, 4.6.4.) 3. Loss of ground to the disk drive (check A1Z2 cable). 4. Defective diskette.
0011	Type A Adapter failure (no display required) — A flashing display of this code indicates the test for this adapter not requiring a 3278 attached failed. A steady indication may indicate the sequence is hung (did not start). Any activity from a device that would normally disable the adapter will also cause this test to fail.
0100	Type A Adapter failure (display required) — A flashing display of this code indicates the tests for this adapter that require a 3278 attached failed. If a POR response was not detected from port A0, this test will automatically be bypassed. A failing display can also cause this test to fail.
0101	Storage Card failure — A flashing display of this code indicates the storage test failed. The failure could be caused by a defective storage card, failure of a component interfacing with storage (Extended Function Store feature), or incorrect customizing parameters. If a Category A display is powered on at port A0, additional failure information will be displayed on the screen.
Note: *For configuration support "D" and above, the additional storage information will be displayed at the 3274 (LED's) also. The flashing 0101 code will remain in the LED's for approximately 5 seconds and will alternate with a solid control storage code (displayed for approximately 3 seconds). Refer to the MIM definition of the code.*	
0110	Host Adapter failure — A flashing display of this code indicates the host adapter/attachment test failed. If a display is powered on at port A0, additional failure indications will be displayed on the screen. Failure could be caused by the following, in addition to defective cards. (1) range addressing (jumper) does not agree with customizing additional failure indication 0001. (2) model specified wrong when customized, (3) system diskette not for this machine, or (4) problem on the host interface has disabled the adapter. For Configuration Support "D" and above additional information will be displayed in the 3274 LEDs. The flashing 0101 code will remain in the LEDs for approximately 5 seconds and will alternate with a solid failure indicator that will be displayed for approximately 3 seconds. Refer to the Maintenance Information Manual (SY27-2513) for interpretation of the card error code.
0111	Modem Wrap failure — A flashing display of this code indicates the Modem Wrap/DDS Adapter test failed. The wrap test is run only if a wrappable modem was specified at customizing time. If a display is powered on at port A0, additional information concerning the failure is available on the screen. Data displayed is as follows: 0111 016 — Modem failed to set Clear to Send 0111 013 — General modem failure *For Configuration Support "D" and above, additional information that is displayed at port A0 is also displayed in the 3274 LEDs. This is done by alternating the flashing 0111 code with the solid failure indication code as described in the Maintenance Information Manual (SY27-2513).*
1000	Type B Adapter failure — A flashing display of this code indicates the Type B Adapter test has failed. The test looks for the first Type B display powered on and attempts to do an Erase-Write-Erase operation. The cursor is left in the lower right portion of the screen. Any Type B device failure that would disable the adapter would cause this test to fail.
1001	Encrypt/Decrypt Adapter failure — A flashing display of this code indicates that the Encrypt/Decrypt Adapter test has failed.
1010	Diskette Drive Error — This flashing code is displayed whenever a diskette drive problem has been detected *after* the initial diskette drive test. This failure can also be caused by invalid tracks or data on the diskette.
1101	Uncustomized system diskette
1110	Insufficient storage
1111	Operational code failed to load
1001 — 1110	Alternating. This code indicates that the 3274 does not have the required minimum storage.
1001 — 1010	Alternating. This code indicates that the customized system diskette is not correct for this 3274 model. For Configuration Support D and later configuration support levels. For configuration supports earlier than Support D the Configuration Support Level is incompatible with the 3274 model.
1011	Response Time Monitor Error
Note: *At least one complete IML test sequence is required to initialize control storage. Bypassing IML by using either ALT 1 or ALT 2 mode does not perform this initialization function; it is therefore possible that invalid parity may exist after initial power on if normal IML has been bypassed.*	

Figure 4-1. IML Test Error Indications

Note: *IML test code descriptions and card locations are defined in the 41X Maintenance Manual, SY27-2554 in MAP C30.*

Initiating a normal IML (ALT switch not pressed and system diskette installed) invokes a sequence of hardware tests before operational code is loaded. When the IML pushbutton is pressed, a hardware Bus and Lamp test is performed. When the IML pushbutton is released, the diagnostic sequence begins and the error indications described in Figure 4-1 may be displayed.

4.2.1 ALT 1 IML Mode

Pressing the IML pushbutton while holding the ALT switch in the ALT 1 position bypasses the normal IML test sequences and causes the unit code to be loaded directly. This will enable the user to bypass a failing test sequence (for example, a defective Type B adapter). In this case, the control unit is operational except for the Type B adapter. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-2 for an ALT 1 IML sequence.

Step	Code	Meaning
1. ALT 1 and IML pressed	1111	Bus and Lamp test OK
2. ALT 1 and IML released	0000	Initiate Unit Code loading
3. Wait	1111	Unit Code loading
4. Begin normal operation	0000	Unit Code loaded

A hang condition at either step 3 or step 4 usually indicates a defective system diskette or a configuration error.

Figure 4-2. ALT 1 IML Sequence

4.2.2 ALT 2 IML Mode, Model C with Wrappable Modem (Test/Operate Switch in Operate Position)

Pressing the IML pushbutton while holding the ALT switch in the ALT 2 position invokes an extended Modem Wrap test. Some types of modems require manual intervention to set up for wrap testing. The test checks the transmission path (Transmit and Receive Data lines) to and from the modem. Modem clocking is required to run this test successfully, and a missing or defective modem clock will result in a failure indication (flashing 0111). The intent of this test is *not* to test the modem. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-3 for this ALT 2 sequence.

4.2.3 ALT 2 IML Mode, Model C without Wrapable Modem (Test/Operate Switch in Test Position)

Pressing the IML pusbhutton while holding the ALT switch in the ALT 2 position invokes an extended Modem Wrap test. When a nonwrappable modem is being used, the EIA test cable Test/Operate switch should be in the TEST position. This test checks the transmission path (Transmit and Receive Data lines) to and from the Test/Operate switch at the end of the cable. The test cable must be attached to the modem, and the modem must provide clocking or a failure indication of 0111 (flashing) will result. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-4 for this ALT 2 sequence.

A normal IML is required to begin normal operation. When this test is run in ALT 2 mode, there is no 3278 display of failing indications (0111 013, etc.). See paragraphs 5.4.3 and 5.4.4 of the *3274 MIM*, for additional information on the Wrap Test without Modem, and DDS Adapter Wrap Test.

Step	Code	Meaning
1. ALT 2 and IML pressed	1111	Bus and Lamp test OK
2. ALT 2 and IML released	0000	Begin Modem Wrap test
3. Wait	0110	Communication Adapter Test running
	0110	Flashing — Communication Adapter Test failure
4. Wait	0111	Prewrap, Adapter Wrap, and Modem Wrap tests are running
	0111	Flashing — Modem Wrap test has failed
5. End Test — A normal IML required to begin normal operation	1000	Successful test — Carrier not present after completion of test
	1111	Successful test — Carrier is present after completion of test

When this test is run in ALT 2 mode, the 3278 does not display the 8 4 2 1 indications.

Figure 4-3. ALT 2 IML Sequence, Model C with Wrappable Modem

Step	Code	Meaning
1. ALT 2 and IML pressed	1111	Bus and Lamp test OK
2. ALT 2 and IML released	0000	Begin Modem Wrap test
3. Wait	0110	Communication Adapter Test running
	0110	Flashing – Communication Adapter Test failure
4. Wait	0111	Prewrap, Adapter Wrap, and Modem Wrap tests are running
	0111	Flashing – Modem Wrap test has failed
5. End Test	1000	Successful test
6. Return TEST/ OPERATE switch to OPERATE position.	1000	Successful test
	1000	Carrier not present

Figure 4-4. ALT 2 IML Sequence, Model C without Wrappable Modem

4.2.4 ALT 2 IML Mode, Model A Local Channel Attachment

ALT 2 IML Mode enables the 3274 interface to run Routine 1 of OLTs from the host CPU before the 3274 is customized. To enter the ALT 2 IML Mode, press the IML pushbutton while holding the ALT switch in the ALT 2 position. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-5 for the ALT 2 sequence.

Step	Code	Meaning
1. ALT 2 and IML pressed	1111	Bus and Lamp test OK
2. ALT 2 and IML released	0000	Start sequence
3. Wait until code appears	0010	Verifies this is a 3274 Model A
4. Turn Power/ Interface switch to LOCAL/ON-LINE	0100	System interface is now enabled
5. Routine 1 of OLTs can now be run		
6. A normal IML is required to return to normal operations		

Figure 4-5. ALT 2 IML Sequence, Model A Local Channel Attachment

4.2.5 ALT 2 IML Mode, Model B Local Host Attachment

ALT 2 IML Mode enables the 3274 interface to run Routine 1 of OLTs from the host CPU before the 3274 is customized. To enter the ALT 2 IML Mode, press the IML pushbutton while holding the ALT switch in the ALT 2 position. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-6 for this ALT 2 sequence.

Step	Code	Meaning
1. ALT 2 and IML pressed	1111	Bus and Lamp test OK
2. ALT 2 and IML released	0000	Start sequence
3. Wait until code appears	0001	Verifies this is a 3274 Model 1B
4. Turn Power/ Interface switch to LOCAL/ON-LINE	0011	System interface is now enabled
5. Routine 1 of OLTs can now be run		
6. A normal IML is required to return to normal operations		

Figure 4-6. ALT 2 IML Sequence, Model B Local Host Attachment

4.2.6 ALT 2 IML Mode, Model D Local Host Attachment

ALT 2 IML Mode enables the 3274 interface to run Routine 1 of OLTs from the host CPU before the 3274 is customized. To enter the ALT 2 IML Mode, press the IML pushbutton while holding the ALT switch in the ALT 2 position. The Bus and Lamp test functions the same as during a normal IML. See Figure 4-7 for this ALT 2 sequence.

Step	Code	Meaning
1. ALT 2 and IML pressed	1111	Bus and Lamp test OK
2. ALT 2 and IML released	0000	Start sequence
3. Wait until code appears	0101	Verifies this is a 3274 Model D
4. Turn Power/ Interface switch to LOCAL/ON-LINE	0110	System interface is now enabled
5. Routine 1 of OLTs can now be run		
6. A normal IML is required to return to normal operations		

Figure 4-7. ALT 2 IML Sequence, Model D Local Host Attachment

4.2.7 ALT 2 IML Mode, Modem Self-Test for Model 31C Only With 2400-, 4800-, 9600-bps Integrated Modem

Pressing and holding the ALT IML Address switch in position 2 causes the modem self-test to be initiated and repeated about every 4 seconds until the switch is released. Releasing the switch should return the modem to Operate mode, regardless of the test results.

While the test is being run, the TEST light on the operator panel is lit. If the test is successful, the Data Quality-Good indicator on the operator panel will flash each time the test is run. The indicators on the A2B2 card will also flash each time the test is run successfully.

If the test fails, the failing card is indicated in the A2B2 card indicators. Figures 4-8 through 4-10 show the meanings of the indicators. Cards indicated as failing are replaced in order of probability. If multiple A2B2 card indicators are displayed, replace all cards indicated.

Flashing Indicator	Steady Indicator	Operator Panel Poor Indicator	Failing Card
1111		Off	Test successful No failure
111		On or flashing	B2, E2, A4
	000	On or flashing	B2, E2, A4
	111	On or flashing	B2, E2, A4
	100	On	B2, E2, A4
	010	On	E2, B2
	001	On	B2, E2, A4
1 = On 0 = Off			

Figure 4-8. A2B2 Card Indicator for 2400-bps Integrated Modem.

Flashing Indicator	Steady Indicator	Operator Panel Poor Indicator	Failing Card
1111		Off	Test successful No failure
1111		On or flashing	B2, E2, D2, A4
	0000	On or flashing	B2, E2, A4
	1111	On or flashing	B2, D2, E2, A4
	1000	On	A2, E2, B2
	0100	On	D2, B2, E2
	0010	On	E2, D2, B2
	0001	On	B2, D2, E2, A4
1 = On 0 = Off			

Figure 4-9. A2B2 Card Indicator for 4800-bps Integrated Modem.

Flashing Indicator	Steady Indicator	Operator Panel Poor Indicator	Failing Card
1111		Off	Test successful No failure
1111		On or flashing	C2, E2, D2 B2, A4
	0000	On or flashing	C2, E2, A2, A4
	1111	On or flashing	C2, B2, D2 E2, A4
	1000	On	B2, C2, D2
	0100	On	D2, B2, C2, E2
	0010	On	E2, C2, D2, B2
	0001	On	C2, D2, E2, B2
	0000	On	A2, E2, C2, B2
1 = On 0 = Off			

Figure 4-10. A2B2 Card Indicator for 9600-bps Integrated Modem.

4.3 LOCAL MODEL A DISPLAY SYSTEM ONLINE TESTS (T3274B)

4.3.1 Purpose

This OLT provides testing for the 3274 Model A display system local channel attachment and supplements the testing that is performed during the IML sequence of the 3274 Model A. For additional information, see *OLTs User's Guide,* D99-3274D.

Prior to invocation of the OLT, the 3274 must complete its IML sequence; that is, the 3274 operational resident code is in control and ready for I/O operations with the host.

4.3.2 Applicable Executive Control Programs

These OLTs are compatible with the following control programs at the levels indicated or higher:

DOS/VS OLTEP	33
OS/VS1 OLTEP	6
OS/VS2 SVS OLTEP	1.7
OS/VS2 MVS OLTEP	3.7
TCAM TOTE	10
OLTSEP	9.0
OS OLTEP	21.8
DOS OLTEP	26

4.3.3 Composite Error Message Description

Figure 4-11 shows an example of a maximum configuration of error message content, with an explanation of each item.

Item	Content
1	T3274B — v1 RTN nn DEV/LN ccuu ECAec REFNUN yyzzz
2	PLINK ID = X3274ss-v1
3	Test and failure description (can be a total of 8 lines)
4	CCW01 command address flags count CAW address
5	CCWnn command address flags count
6	XPTD CSW1 XX last ccwaddr+8 status count
7	RCVD CSW1 X0 last ccwaddr+8 status count
8	XPTD CSW2 XX last ccwaddr+8 status count
9	RCVD CSW2 X0 last ccwaddr+8 status count
10	XPTD CC condition code RCVD CC condition code
11	XPTD SNS sense data
12	RCVD SNS sense data
13	XPTD DATA expected data
14	RCVD DATA received data
15	WRTN DATA write data
16	Test messages (can be up to 9 lines)

Item — Explanation

1 This is the standard header line provided by OLT(s) EP:

T3274B	ID of 3274 Model A OLT root module
v1	Version and level of root module
nn	Decimal value of routine number
ccuu	Address of 3274 Model A control unit
ec	FE announcement letter number describing a required change
yyzzz	Hexadecimal equivalent of routine number and error ID within that routine

2

X3274ss	ID of active test module during error
v1	Version and level of test module

Note: *A PLINK ID of XXXXXXXXXX means no plink module was active when the error occurred.*

3 These lines provide the name of the test and the failure description. These lines are printed in all error messages.

4-5 These lines define the CCWs and CAW which were issued at the time of error. These lines are printed in all error messages.

6-7 These lines contain the hexadecimal data for the expected and received CSWs. These lines are printed in all error messages except for timeout of the I/O event.

8-9 These lines contain the hexadecimal data for the expected and received CSWs for the second interrupt (if there is one). These lines are printed only when the expected and received CSWs are not equal to zeros.

10 The expected and received condition codes. This line is printed only when the expected and received CCs are not equal.

11-12 These lines contain the hexadecimal data for the expected and received sense data (if any). These lines are printed only when the expected and received SNSs are not equal. The sense bits are defined below.

Byte 0	Byte 1
Bit 0 command reject	Bit 0 data length check
1 intervention required	1 data reject
2 bus out check	2 this bit is not assigned
3 equipment check	3 this bit is not assigned
4 data check	4 parity check modifier
5 overrun (bit not used)	5 parity check number 1
6 not initialized	6 parity check number 2
7 this bit is not assigned	7 cycle steal machine check

13-14 Lines 13 and 14 contain the hexadecimal data for the expected and received data (if any). These lines are printed in all error messages where the failing routine executed a read type command.

15 The hexadecimal write data (if any). These lines are printed in all error messages where the failing routine executed a write type command.

16 These lines may be used to provide additional messages for the error printout.

Figure 4-11. Example of Maximum Configuration of Error Message Content, Model A

4.3.4 OLT Routines

Figure 4-12 lists the T3274B online test routines. Included are the Kingston control number, the module identification, the routine numbers, and the titles.

K No.	Module ID	Routine Number Decimal	Hex	Title
K685	X3274AA	1	01	Test No Op Control Command
K686	X3274AB	2	02	Test Sense ID Command
K687	X3274AC	3	03	Test Vary Activate Sequence
K688	X3274AD	4	04	Test Vary Deactivate Sequence

Figure 4-12. T3274B OLT Routines

4.3.5 CDS Card Format, Model A

Figure 4-13 shows the CDS card format for the local 3274 Model A display system online tests.

Card Column	Equivalent CDS Byte	Content
1	—	Leave blank
2-4	—	CDS
5-9	—	Leave blank
10-17	0-3	Channel, control unit device address
18-21	4-5	Leave blank
22-23	6	40 = class code
24-25	7	F2 = type code
26-35	8-11	Leave blank
36	—	Slash (/) — End of CDS

Figure 4-13. CDS Card Format, Model A

4.4 LOCAL MODELS B AND D DISPLAY SYSTEM ONLINE

4.4.1 Purpose

This OLT provides testing for the 3274 Models B and D display system local host attachment. This OLT supplements the testing that is performed during the IML sequence. For additional information, see *OLTs User's Guide,* D99-3274A.

Prior to invocation of the OLT, the 3274 must complete its IML sequence; that is, the 3274 operational resident code is in control and ready for I/O operations with the host.

4.4.2 Applicable Executive Control Programs

These OLTs are compatible with the following control programs at the levels indicated or higher:

DOS/VS OLTEP	33
OS/VS1 OLTEP	6
OS/VS2 SVS OLTEP	1.7
OS/VS2 MVS OLTEP	3.7
TCAM TOTE	10
VTAM TOLTEP	2.0
OLTSEP	9.0
OS OLTEP	21.8
DOS OLTEP	26

4.4.3 Composite Error Message Description

Figure 4-14 shows an example of a maximum configuration of error message content, with an explanation of each item.

Item	Content
1	T3274A — v1 RTN nn DEV/LN ccuu ECAec REFNUM yyzzz
2	PLINK ID = U3274ss-v1
3	Test and failure description (can be a total of 8 lines)
4	CCW01 command address flags count CAW address
5	CCWnn command address flags count
6	XPTD CSW1 XX last ccwaddr+8 status count
7	RCVD CSW1 X0 last ccwaddr+8 status count
8	XPTD CSW2 XX last ccwaddr+8 status count
9	RCVD CSW2 X0 last ccwaddr+8 status count
10	XPTD CC condition code RCVD CC condition code
11	XPTD SNS sense data
12	RCVD SNS sense data
13	XPTD DATA expected data
14	RCVD DATA received data
15	WRTN DATA write data
16	Test messages (can be up to 9 lines)

Item	Explanation
1	This is the standard header line provided by OLT(s) EP: T3274A — ID of 3274 Model B OLT root module v1 — Version and level of root module nn — Decimal value of routine number ccuu — Address of test terminal ec — FE announcement letter number describing a required change yyzzz — Hexadecimal equivalent of routine number and error ID within that routine
2	U3274ss — ID of active test module during error v1 — Version and level of test module **Note:** *A PLINK ID of XXXXXXXXXX means no plink was active when the errror occurred (e.g., error during cleanup).*
3	These lines provide the name of the test and the failure description. These lines are printed in all error messages.
4-5	These lines define the CCWs and CAW which were issued at the time of error. These lines are printed in all error messages.
6-7	These lines contain the hexadecimal data for the expected and received CSWs. These lines are printed in all error messages except for timeout of I/O event.
8-9	These lines contain the hexadecimal data for the expected and received CSWs for the second interrupt (if there is one). These lines are printed only when the expected and received CSWs are not equal to zeros.
10	The expected and received condition codes. This line is printed only when the expected and received CCs are not equal.
11-12	These lines contain the hexadecimal data for the expected and received sense data (if any). These lines are printed only when the expected and received SNSs are not equal.
13-14	These lines contain the hexadecimal data for the expected and received data (if any). These lines are printed in all error messages where the failing routine executed a read type command.
15	The hexadecimal write data (if any). These lines are printed in all error messages where the failing routine executed a write type command.
16	These lines may be used to provide additional messages for the error printout.

Figure 4-14. Example of Maximum Configuration of Error Message Content, Model B

4.4.4 OLT Routines

Figure 4-15 lists the T3274A online test routines. Included are the Kingston control number, the module identification, the routine numbers, and the titles.

K No.	Module ID	Routine Number Decimal	Hex	Title
K661	U3274AA	1	01	Test No Op Control Command
K662	U3274AB	2	02	Test Valid Commands for Acceptance
K663	U3274AC	3	03	Test Invalid Commands and Sense Command Operation
K665	U3274AE	5	05	Test Sense ID Command
K668	U3274AH	8	08	Test Chained Commands
K671	U3274AK	11	0B	Test Unchained Commands
K674	U3274AN	14	0E	Test Write Command with a Set Buffer Address Order to an Invalid Address

Figure 4-15. T3274A OLT Routines

4.4.5 CDS Card Format, Models B and D

Figure 4-16 shows the CDS card format for the local 3274 Models B and D display system online tests.

Card Column	Equivalent CDS Byte	Content
1	—	Leave blank
2-4	—	CDS
5-9	—	Leave blank
10-17	0-3	Channel, control unit device address
18-19	4	Blank or 00 = Model B 80 = Model D
20-21	5	Must be 00
22-23	6	10 = class code
24-25	7	10 = type code
26-35	8-11	Leave blank
36	—	Slash (/) — End of CDS

Figure 4-16. CDS Card Format, Models B and D

4.5 MODEL C DISPLAY SYSTEM ONLINE TESTS

4.5.1 Purpose

These OLTs provide path testing for the 3274 Model C display system host attachment downline from a 270X or a 370X.

Prior to invocation of the OLT, the 3274 must complete its IML sequence; that is, the 3274 operational resident code is in control and ready for I/O operations with the host.

4.5.2 Applicable Executive Control Programs

These OLTs are compatible with the following control programs at the levels indicated or higher:

DOS/VS OLTEP	33
OS/VS1 OLTEP	6
OS/VS2 SVS OLTEP	1.7
OS/VS2 MVS OLTEP	3.7
TCAM TOTE	10
OLTSEP	9.0
OS OLTEP	21.8
DOS OLTEP	26

4.5.3 Model C Online Tests

See Figure 4-17 to determine the OLT to be used for a specific configuration.

Configuration	OLT User's Guide	OLT
3274 Model C BSC operating with a 270X, or a 370X with the Emulator Program (EP).	D99-3274B	R3274A
3274 Model C BSC operating with a 270X, 370X EP, or a 370X NCP. R3274B requires that the 3700 Series Diagnostics be cataloged at the host. It is suggested that R3274A be used when operating with a 270X , or 370X EP.	D99-3274-C D99-3700A	R3274B
3274 Model C SDLC operating with a 370X NCP. Use the following Link Level Tests:		
Link Level 1 Link Level 0	D99-3700C D99-3705A	T3700LTE T3705

Figure 4-17. 3274 Model C Online Tests

4.6 SERVICEABILITY AIDS

The following procedures are intended to supplement problem determination and troubleshooting techniques. Monitoring procedures for interface lines, coax checking procedures, and patching procedures are some of the aids provided.

4.6.1 Monitoring of EIA Interface Lines (Model C)

The EIA interface lines and associated jumper points for the Model C are identified as follows:

EIA Interface Lines	For All Models Except 41C	For Model 41C
Carrier Detect	A1Q2S04	A1L2S04
Req to Send	A1Q2S10	A1L2S10
Clr to Send	A1Q2S12	A1L2S12
Data Set Rdy	A1Q2S13	A1L2S13
Transmit Data	A1Q2U04	A1L2U04
Receive Clock	A1Q2U10	A1L2U10
Transmit Clock	A1Q2U11	A1L2U11
Data Trmnl Rdy	A1Q2U12	A1L2U12
Receive Data	A1Q2U13	A1L2U13

LEDs

8 = S2U06
4 = S2U05
2 = S2U13
1 = S2S12

4.6.2 Monitoring of Bus/Tag Interface Lines (Models A, B, and D)

The channel interface lines and associated jumper points for the Models A, B, and D are identified as follows:

Bus Interface Lines	For All Models Except 41A and 41D	For Models 41A and 41D
Bus Out Bit 0	A1N2U12	A1J2U12
Bit 1	A1N2S12	A1J2S12
Bit 2	A1N2U13	A1J2U13
Bit 3	A1N2U06	A1J2U06
Bit 4	A1N2S07	A1J2S07
Bit 5	A1N2U07	A1J2U07
Bit 6	A1N2S08	A1J2S08
Bit 7	A1N2U05	A1J2U05
Bit p	A1N2S05	A1J2S05

Tag Interface Lines

Hold Out	A1N2G12	A1J2G12
Suppress Out	A1N2G13	A1J2G13
Op Out	A1N2J13	A1J2J13
Service Out	A1N2M08	A1J2M08
Address Out	A1N2M09	A1J2M09
Command Out	A1N2P09	A1J2P09
Select Out	A1N2P10	A1J2P10

LEDs

8 = S2U06
4 = S2U05
2 = S2U13
1 = S2S12

4.6.3 Isolate Feature Board 01A-A2 (Not 41X Models)

It may be desired at times to isolate the A2 feature board during troubleshooting and continue to run IML. Use the following procedure to isolate the board:

1. Power off.
2. Remove board crossover cables at 01A-A1Y5 and A1Y6.
3. Lower the logic gate, and raise the secondary power supply.
4. Use an SLT jumper wire to connect A1R1B11 to A1R1E11.
5. Troubleshooting can now continue with the A2 board isolated. (IML will fail with a flashing 1000 with the A2 board removed from logic.)
6. Remove the jumper, and replace the crossover cables when the problem has been resolved.

4.6.4 Diskette Patching Procedure

This procedure is to be used by the support customer engineer, at the direction of the next level of the support structure.

Note: *Diskette patching is an emergency procedure only. It should be used only when time will not permit waiting for an update diskette from the Raleigh distribution center.*

Before the patching procedure can be performed, the patch header information and the patch coding must be obtained from the next level of the support structure.

Use the steps listed below to perform the diskette patching procedure. If, while performing steps 4 and 5, you want to cancel what you have done and start again, enter FF and press the ENTER key. This will bring you back to step 3. If you enter an unacceptable response, the operator code in the upper center of the display will alert you to the problem. Figure 4-18 gives the meanings of the operator codes. If an operator code (80–89) is displayed, verify your entry and retry the operation.

The 8 4 2 1 codes also provide a guide to your progress in the patching procedure.

1. Insert the feature diskette. While holding the Alt IML Address switch in position 1, press and release the IML button; then release the Alt IML Address switch. Within 2 minutes, the 8 4 2 1 indicator code will be flashing 1011 if Configuration Support – A, B, or C is installed, and 0101 if Configuration Support D or T is installed.
2. Replace the feature diskette with the customized system diskette or load diskette if 3290's are attached. Do *not* press IML. Within 1 minute, the 8 4 2 1 indicator code will be a flashing 1110.
3. Replace the system diskette or load diskette if 3290's are attached, with the feature diskette used in step 1. Do *not* press IML. Within 1 minute, the 8 4 2 1 indicator code will be a steady 0001. If you are using a 3279, the color convergence pattern will be displayed on the display screen. To bypass this pattern, hold down the ALT key, press and release the TEST key, and release the ALT key. Sequence number 001 will be displayed on the display screen. Continue with step 4.

   If you want to converge the 3279, follow the instructions in the "Color Convergence Procedure" in the *IBM 3270 Information Display System 3274 Control Unit Planning, Setup and Customizing Guide,* GA27-2827.
4. When sequence number 001 appears in the upper-left corner of the display screen:
   - Key in the following characters:

     1234567890ABCDEF
   - Press the spacebar once.
   - Key in the two-digit Validation Number shown on the system diskette label or on the load diskette label if a 3290 is attached.
   - Press ENTER.
5. When sequence number 011 appears, enter 1 and press ENTER.
6. When sequence number 012 appears, enter the patch header information, and press ENTER.
7. When sequence number 013 appears, enter the patch information one line at a time. Press ENTER after each line. After all lines of the patch have been entered, enter 49 and press ENTER.
8. Sequence number 011 will appear again. If you have another patch to enter, enter 1, press ENTER, and go to step 7.

   If you do not have another patch to enter, enter 0, press ENTER, and go to step 9.
9. At this time, either sequence number 021 is displayed (meaning that no printer authorization matrix has been defined), or the defined matrix is displayed.

   If sequence number 021 is displayed, key in 0 and press ENTER.

   If a matrix is displayed, move the cursor to the entry for 901, change it to a 1, and press ENTER.
10. When sequence number 031 appears, enter the number of RPQ diskettes being used (0, 1, 2, or 3), and press ENTER.

    Note: *A non-zero entry will result in the display of sequence number 032. At this point enter the RPQ Parameter List, if there is one. For more information on sequence 032 refer to the* 3274 Customizing Guide, *GA23-0065 or the* 3274 Planning, Setup and Customizing Guide, *GA27-2827.*
11. When sequence number 999 appears, move the cursor to the entry for 900, change it to a 1, and press ENTER.
12. Within 2 minutes, the 8 4 2 1 indicator code on the 3274 Control Unit will be flashing one of the following:

    1100 – Replace the feature diskette with the RPQ diskette. Do *not* press IML. After the RPQ diskette is inserted, the code will change to 0111 within 30 seconds. If additional RPQ diskettes are required, the indicator code will again flash 1100. Repeat the procedure for each additional RPQ diskette. Do *not* press IML. When the RPQ diskette procedure is completed, the indicator code will be flashing 1110. Reinsert the feature diskette. Do *not* press IML. Within 2 minutes, the 8 4 2 1 indicator code will flash 1011 or 1101.

    1011 – Replace the feature diskette with the system diskette. *Do not* press IML. Within 20 minutes the indicator code will change to 1111 or 0011.

    0011 – Replace the system diskette with the load diskette. *Do not* press IML. Within five minutes the indicator will change to 1111.

    1111 – The patch procedure is now complete, and a normal startup can be initiated.

    1101 – Replace the feature diskette with the language diskette. Do *not* press IML. Within 30 seconds, the indicator code will change to 0111 and then to flashing 1011 within 1 minute. When the indicator code is flashing 1011, replace the language diskette with the system diskette. Do *not* press IML. Within 20 minutes, the indicator code will change to 1111. The patch procedure is now complete and a normal startup can be initiated.

Code	Meaning	Action
01	One or more of the first 10 characters are incorrect.	Enter the correct response.
02	One or more of the 11th to 17th characters, including the space, are incorrect.	Enter the correct response.
03	1. One of the last two characters entered in response to sequence number 001 is incorrect, or, 2. The diskette release level is not the same as the documentation level.	1. Enter the correct response. 2. Restart after matching diskette and documentation levels.
*11	An invalid response has been entered (too many characters, value too high or too low, wrong character, etc.).	Enter the correct response.
*12	A character other than A, B, C, D, E, 1, 2, 3, or 4 has been entered in response to sequence number 151 (3274 Model Designation).	Enter the correct response.
*13	The response entered, has too few characters.	Enter the correct response.
*14	1. The numeric total of the responses entered for sequence numbers 111 (Number of Category B Terminals) and 112 (Number of Category A Terminals) is greater than 12 (Model 51C) or 16 (Model 61C). 2. The response to sequence number 163 (Extended Character Set Adapter) is greater than the response to sequence number 112 (Number of Category A Terminals).	1. Enter the correct response. 2. Change the response for sequence number 163 to the same value as, or a value less than the response to sequence number 112.
*21	An unacceptable change was made during the modify sequence (number 999).	Recheck the entries and correct them.
*22	Something was specified in the configuration that is not compatible with the character set specified in sequence number 321. If the EBCDIC character set (321 = 0) was specified, sequence number 121 must not be "02". If the ASCII character set (321 = 1) was specified: 121 must be "02" 131 must be "1" 132, 133, 134 and 135 must be "0" 162, 163, 164 and 165 must be "0" 166 must be "A"	Verify and enter the correct responses.
*23	One or more of the responses entered are not compatible with the response to sequence number 331 (BSC or SDLC Protocol).	Verify and enter the correct responses.
*24	1. All responses to sequence numbers 131 through 135 (keyboard types) were 0's (at least one must be 1, or 2. The response to sequence number 113 (Extended Function Store) was something other than 0000 or A000. The response indicates that the Extended Function Store feature is installed in this 3274 when in fact, the feature is not installed.	1. Verify and enter the correct response. 2. Verify and enter the correct response.
*25	1. If this response is to sequence number 133 (Data Entry Keypunch Layout Keyboard), the Katakana language (121 = 17) was specified with a Data Entry Keypunch Layout Keyboard (133 = 1). The Data Entry Keypunch Layout Keyboard cannot be specified with the Katakana language.	1. Verify and enter the correct response.
*25 (cont.)	2. If this response is to sequence number 113 (Extended Function Store), the 3274 has less storage than indicated in the response to sequence number 113. 3. A language other than 01 (U.S. English) was specified to sequence number 121 and Text (135 = 1). Text cannot be specified with languages other than U.S. English.	2. Report the problem. 3 Verify and enter the correct response.
*26	There is not enough storage to support all the features that have been selected.	Report the problem and verify that the storage specified in response to sequence number 113 is correct (the storage requirements for the features selected may have to be recalculated.
*27	1. The Portuguese language (121 = 18) was specified and is not allowed with this configuration. 2. SFAP (162 = 1) was specified with a language that is not allowed with SFAP (121 = 02, 08, 10, 13, 20, 26 or 27). 3. Entry Assist was specified (115 = 1) and a language that is not allowed with Entry Assist (121 = 2, 6, 8, 10, 11, 12, 13, 17, 20, 26) was also specified. 4. A language was specified that is not allowed with a 3290 Information Panel (121 = 02, 06, 08, 09, 10, 13, 20, 26, or 27).	1. Specify Portuguese — Alternate (127 = 28). 2. Verify and enter the correct responses. 3. Verify and enter the correct response. 4. Verify and enter the correct response.
*28	The responses to sequence numbers 113 (Extended Function Store) and 151 (3274 Model Designation) are incompatible.	Verify and enter the correct response.
29	1. An Attribute Select Keyboard (166 = B or C) has been specified but a Typewriter Keyboard (131 = 1) or an APL Keyboard (132 = 1) has not been specified.	Either change 166 to "A" or change 131 and/or 134 to "1".
30	1. A starting address for Multiple Interactive Screens (sequence number 171) has been specified, but logical terminal addresses have not been specified. 2. Logical terminal addresses for Multiple Interactive Screens have been specified but a starting address has not been specified.	Review instructions for defining Multiple Interactive Screens and enter the correct response.
31	An invalid starting address for Multiple Interactive Screens has been specified.	Specify a starting address that is not port A0, but is low enough to allow for the required number of terminals.
32	More logical terminals than this system will allow have been specified.	If using BSC or a 3274 — Model D, specify no more than 32 logical terminals. If using SDLC or 3274 Model A, specify no more than 128 logical terminals.
33	Zero has been specified to sequence number 170, but non-zero responses to sequence numbers 139 or 171, 173, 175, or 176 were specified.	Either specify 1 to sequence number 170 or zeros to sequence numbers 139 or 171, 173, 175, or 176.
34	In response to sequence number 111, a Category B device was specified, but a 3290 was specified for sequence number 170. Category B devices are not allowed with 3290 terminals.	Verify and enter the correct responses.

*If any entry is unacceptable, the entry for sequence number 900 is changed back to 0 (zero) and the unacceptable value is intensified.

Figure 4-18 (Part 1 of 3). Operator Codes

Code	Meaning	Action
35	The responses specified for sequence numbers 343, 151 and 331 are incompatible. Compatible responses are: **Sequence Number** **343 / 151 / 331** 00 / 31C, 41C, 51C, 61C / 0 or 1 01 / 31C, 41C, 51C, 61C / 0 or 1 02 / 31C, 41C, 51C, 61C / 1 03 / 51C, 61C / 1 04 / 51C, 61C / 1 05 / 51C / 0 or 1 06 / 51C / 1 07 / 51C / 1 08 / 51C / 0 or 1 09 / 51C / 0 or 1 10 / 51C, 61C / 1 11 / 31C, 51C / 0 or 1	Verify and enter the correct responses.
36	A non-zero response for sequence number 139 and a zero response for sequence number 170 were specified. 170 must be 1 for 139 to be non-zero.	Verify responses to sequence numbers 139 and 170, then enter the correct responses.
37	1. Decompression (165 = 1) was specified, but SFAP (160 = 1) was not specified. 2. Attribute Select Keyboard (166 = B or C) was specified, but SFAP (160 = 1) was not specified.	1. Verify and enter the correct responses. 2. Verify and enter the correct responses.
41	The X.25 Network Type (response 400) selected during the customizing procedure is invalid.	Check Network Type values and reenter a valid response to 400.
42	The Incoming Call Options selected (response 420), included 'Validate Host DTE Address' but the address was not entered in response to 410.	Either respond to question 410 with the host address or do not include 'Validate DTE Host Address' in response to 420.
43	1. The Circuit Type selected (response 401) requires a host address (response 410). 2. The Outgoing Call Options selected (response 421) included, 'Validate 3274 DTE Address' but the address was not entered in response to 411. 3. The response to 'Outgoing Call Options' (421) was invalid.	1. Either change the response to 401 (Circuit Type) or provide a host DTE address (410). 2. Either change the response to 421 or enter the address for question 411. 3. Check 'Outgoing Call Options' and reenter a valid response to 421.
44	Negotiate Window Size (response 432) or Non-Standard Window Size (response 435) conflicts with Packet Sequence Numbering (response 431).	Check responses to 431, 432 and 435: If 431 response = 0, then 432/435 response must = 01–07 (2 digits). If 431 response = 0, then 432/435 response must = 01–07 (2 digits).
45	Circuit Type (response 401) invalid.	Verify Circuit Type values and respecify response to 401.
46	X.25 Keyboard Support (response 443) invalid.	Verify Circuit Type values and respecify response to 401.
47	No CID Password initialized (response 452) but CID required for call options (responses 420 and/or 421).	Either respecify call options to remove CID requirement or enter CID Password in response to question 452.
50	The response that was entered for 116 is incompatible with the response that was entered for 112. when: 116 = 0, 112 = 0 116 = 1, 112 = 0	Verify responses to sequence numbers 112 and 116, then enter the correct responses.
51	1. If the response to 151 was 51C, only the first 8 ports may have non-zero entries. 2. If the response to 151 was 61C and (111 = 00), only the 1st 16 ports may have non-zero entries. 3. If the response to 151 was 61C and (117 = 00) only the 1st 8 ports may have non-zero entries. 4. The highest port configured does not allow for the Category B devices specified (sequence number 111).	1. Set highlighted entries (sequence number 117) to zero or change the response to sequence number 151. 2. Set highlighted entries (sequence number 117) to zero or change the response to sequence number 151 or change the response to sequence number 111. 3. Set highlighted entries (sequence number 117) to zero or change the response to sequence number 151 or change the response to sequence number 111. 4. Set highlighted entries (sequence number 117) to zero or change the response to number 111.
52	Highlighted entries (sequence number 117) have invalid responses: if 170 = 0, valid response =0/1. if 170 = 1, valid responses = 0–5.	Set the highlighted entries to a value within the allowed range.
53	One or more MIS devices have been specified and the total number of device addresses allowed for the configured system has been exceeded.	Remove one or more devices (MIS or non-MIS).

Figure 4-18 (Part 2 of 3). Operator Codes

Code	Meaning	Action
60	Both response fields to customization sequence number 127 (RTM) are not zero or are not non-zero. Both must be zero or both must be non-zero.	Verify values and re-enter responses to customization sequence number 127.
61	The response to customization sequence number 127 indicates Host supported responses and the system is non-SNA. Host supported responses require a SNA system.	Verify values and re-enter responses to customization sequence number 127.
62	The boundaries specified for RTM are not valid. Either the maximum time allowed (27:18.3) has been exceeded or the seconds field is greater than 59.	Verify RTM values and respecify boundaries on the post-modify panel (customization sequence number 128) to comply with acceptable limits.
63	The time specified for the first boundary of RTM is 00:00.0. This is not allowed unless all entries are 00:00.0.	Verify RTM values and respecify boundaries on the post-modify panel (customization sequence number 128) as required.
64	The RTM boundaries have 00:00.0 embedded between two non-zero boundaries.	Verify RTM values and respecify boundaries on the post-modify panel (customization sequence number 128) as required.
65	The RTM boundaries are not in ascending order.	Verify RTM values and respecify boundaries on the post-modify panel (customization sequence number 128) as required.
66	The maximum RTM boundary (27:18.3) is followed by a non-zero (00:00.1) value.	Verify RTM values and respecify boundaries on the post-modify panel (customization sequence number 128) as required.
**99	All RTM entries are acceptable, but the entry to customization sequence number 900, 901, 904, or 907 on the post-modify panel has not been changed to a 1.	Change the entry for sequence number to a 1.
80	One or more incorrect characters were entered.	Enter the correct response.
81	All patch areas are in use.	
82	The patch ID number (header) already exists.	Obtain new patch ID number.
83	The EC or Suffix level of the patch does not match the configuration table.	Verify data.
84	An attempt was made to delete a patch that does not exist.	Verify data.
85	The line entered does not have correct data length.	Verify data and retry.
86	The call line had invalid data in it.	Enter the correct response.
87	A portion of the patch data was not entered. Sequence number 013 must be responded to with at least one line beginning with the numeral '1'.	Enter the correct response to 013 and then retry the '49'.
89	The number of lines entered does not agree with the count specified in the header line.	Verify data.
90	All entries are acceptable but the entry for sequence number 900 has not been changed to '1'.	Change entry for sequence number 900 to '1'.

Note: *If an operator code (80 thru 89) occurs after verification and retry, follow local procedures for reporting the problem.*

**Applies when Operator Code 99 appears while customizing RTM.

Figure 4-18 (Part 3 of 3). Operator Codes

4.6.5 Subsystem Dump Procedure

The 3274 Dump Diskette (B/M #6849597) is to be used after normal maintenance package procedures fail to identify a problem. The dump procedure can be performed by the customer or by the customer engineer.

The same type dump diskette (B/M #6849597) is used to dump a 3290 unit. The procedure for requesting a 3290 dump is described in Chapter 3 –**/D: Request 3290 Dump.**

This procedure should be performed when the 3274 Control Unit has reached the point where the dump is desired.

Note: *This procedure must be followed exactly as shown, using only the Dump and System diskettes as specified in the procedure, or if a 3290 is configured and has been down-stream loaded, use only the 'dump' diskette and 'load' diskette or ('system' diskette that was used to generate the 'load' diskette) as specified in this procedure. If the wrong diskette is used retry the procedure, starting at Step 1.*

Procedure

1. For any 3274 C models, go directly to Step 3.

   For any 3274 A, B, or D models, set the rotary switch, on the center of the operator's panel, to the Local/ Offline position.
2. Check to see that the Local/Offline indicator is on. If the indicator is not on, the condition must be forced by momentarily grounding the appropriate pin as indicated in the following list:

Model	Pin Number
1A, 21A, 31A	01A1 - P2D10
1B, 21B	01A1 - Q2B07
1D, 21D, 31D	01A1 - Q2G05
41A	No Jumper required. Alt 1 1ML in step 4 automatically forces offline.
41D	No Jumper required. Alt 1 1ML in step 4 automatically forces offline.

Note: *The customer does not have access to these pins. If the customer is to perform this procedure, the CE must install a temporary grounding switch (P/N 5718026) in the customer access area, or if a 3290 is configured, the Load diskette or (System diskette that was used to generate the Load diskette).*

3. Replace the System Diskette with the Dump Diskette.
4. While holding the Alt IML Address switch in position 1, press and release the IML switch and then release the Alt IML Address switch.
5. In approximately two minutes, the 8 4 2 1 indicator lights will change to a flashing 1011 code. When this occurs, replace the Dump diskette with the System diskette or Load diskette used in Step 3. Do *not* press the IML switch.

   Note: *If the 8 4 2 1 indicator lights do not perform as specified in any step of this procedure, follow the instructions listed in the attached table of Dump Diskette Error Codes.*
6. After the System diskette or Load diskette is inserted, the 8 4 2 1 indicator lights will change to a steady 0000 code and then, in about 10 seconds, to a flashing 1001 code. When this occurs, replace the System diskette or Load diskette with the Dump diskette. Do *not* press the IML switch.
7. The dump procedure is complete when the 8 4 2 1 indicator lights change to a steady 1111 code.
8. When the procedure is completed, replace the Dump diskette with the System diskette or Load diskette if 3290's are attached, and press the IML switch to restore customer operation.
9. Place the Dump diskette between protective sheets of cardboard. Insert this package, your filled-out return address label, the filled-out "3274 Control Unit Problem Report Form," and any other pertinent data into the return envelope. Send the sealed envelope to the requesting System Support Center.

Dump Diskette Error Codes

Flashing Code	Cause	Action
1100	Diskette read error	Retry procedure from Step 1.
1101	Diskette write error	Retry procedure from Step 1.
0001	Parity error	Do not retry. Write 0001 on Dump diskette label and go to Step 9.
1111-1100	Diskette read error	Do not retry. Write 1111-1100 on Dump diskette label and go to Step 9.
1111-1101	Diskette write error	Do not retry. Write 1111-1101 on Dump diskette label and go to Step 9.
1111-0111	Internal error	Do not retry. Write 1111-0111 on Dump diskette label and go to Step 9.

Dump Print Program – B/M #4759525

The CE uses the Dump Print Program to print the contents of a 3274 dump diskette. The dump can then be analyzed by using the Dump Analysis Document. The 'DAD' interrogates key areas of the dump to determine if a hardware problem exists. If it is determined that there is no hardware problem the CE is instructed to follow the normal support structure for further problem determination.

Dump Analysis Document (DAD) – Included in B/M #4759525

Using the (DAD), key areas of the 3274 dump can be analyzed to determine whether or not a hardware problem exists. If it is determined that a hardware problem does exist, the user is instructed to follow the normal support structure for further problem determination.

The 3274 Dump Analysis Document is not intended to replace or be used instead of the Base 3274 Maintenance Package. It is designed to enhance the package by guiding the CE through a 3274 Dump to isolate the source of a problem that the basic procedures has failed to identify.

4.6.6 Backup System Diskette Generation

See the *3274 Control Unit: Planning, Setup, and Customizing Guide,* GA27-2827, for details.

4.6.7 Display Customizing Responses

See the *3274 Control Unit: Planning, Setup, and Customizing Guide,* GA27-2827, for details.

4.6.8 Coax Cables (h and 1)

These cables must be procured, installed and maintained by the customer. Cable h is for indoor installation only; cable 1 is for outdoor installation, although it is approved for indoor use as well.

4.6.8.1 Cable h (Indoor)

Presently, the only approved cable bears the commerical designation RG62A/U. Cables may be purchased from IBM or from a customer-selected source. Bulk cables may be ordered from IBM by specifying IBM PN 323921 and the lehgth on a miscellaneous equipment specification (MES) form. Preassembled cables may be purchased from IBM by specifying IBM PN 2577672 and the length on the MES form.

For fabricating cables, two BNC-type connectors are needed: IBM PN 1836444 or equivalent. These two connectors can be ordered in a kit from IBM by specifying "Connector Group (indoor type), IBM PN 1836418" on the MES form. Instructions for assembling BNC-type connectors on bulk cable are given in *Assembly of Coaxial Cable and Accessories for Attachment to IBM Products,* GA27-2805.

4.6.8.2 Cable 1 (Outdoor)

Cable 1 is a RG62A/U modified for outdoor/underground installation. This cable is suitable for indoor and outdoor installation and for direct burial. Cable may be purchased from IBM or from a source selected by the customer.

Bulk cable may be ordered from IBM by specifying IBM PN 5252750 and the length on a miscellaneous equipment specification (MES) form. Preassembled cables may be purchased from IBM by specifying IBM PN 1833108 and the length on the MES form.

For fabricating cables, two BNC-type connectors are needed, IBM PN 1836447 or equivalent outdoor type. These two connectors may be obtained in a kit from IBM by specifying "Connector Group (outdoor type); IBM PN 1836419" on the MES form. Instructions for assembling BNC-type connectors on bulk cable are given in *Assembly of Coaxial Cable and Accessories for Attachment to IBM Products,* GA27-2805.

4.6.8.3 Coax Cable Splicing

Do not cut and splice cables; instead, use a quick-disconnect adapter, IBM PN 5252643, or commerical adapter, Amphenol Corp. part UG-914/U. A maximum of 13 connections is allowed in any given cable run. The adapter and the attached cable connectors must be covered with 127 mm (5 inches) of shrink tubing, 19,05 mm (0.75 inches) expanded diameter, to prevent accidental grounding of splice. This adapter and connecting jacks should be waterproofed for applications requiring this type of installation.

4.6.9 Coax Testing with Scope

This procedure describes how to test any length of coax cable—in segments of up to 1500 m (5,000 ft)— with a Tektronix 453 oscilloscope, or equivalent. For additional information on coax testing, refer to the *Oscilloscope Measurement Procedure for Twisted and Coax Cables,* S226-3913.

Note: *Since the communication lines are the customer's responsibility, the following practice should be observed:*

- *Use this procedure only after (1) all product maintenance procedures have been followed, (2) a communication line problem is suspected, and (3) the customer indicates he cannot locate the line problem.*
- *Do not use the procedure for the express purpose of checking the quality of the wiring work done by customer personnel or by a contractor.*

4.6.9.1 Testing for Discontinuities

This test consists of looking for impedances attached to the communication line that are different from the characteristic impedance of the line, Zo (93 ohms). This is done by sending a wave front (leading edge of square wave) down the line and looking for energy that is reflected by any point that differs from the characteristic impedance.

The "B" gate" out pulse is the square wave that is applied to the coax line; it travels down the line at about 80% of the speed of light, depending upon the isolation material used in the cable. If no impedance impairment is present on the line, the wave front travels down the line until the termination is reached, and all the energy contained in the wave front is absorbed in the termination.

Zo of the cables and the termination can vary, however, in which case not all the energy contained in the wavefront is absorbed. The energy not absorbed is reflected back toward the sending end. Viewing the sending end with the oscilloscope allows display of both the transmitted wave (incident wave) and the reflected wave. Figure 4-19 shows examples of possible reflections for different terminations.

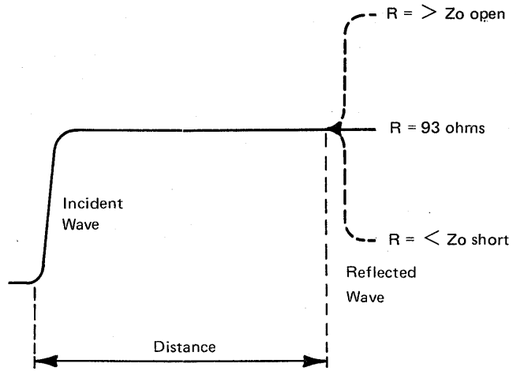


Figure 4-19. Incident and Reflected Waves

The reflected wave is delayed by the time it takes for the incident wave to travel to and return from the termination. The delay is called *propagation delay* and is expressed as a percentage of the speed electronic waves travel in a specific type of cable (usually 60-80%) as compared with the speed that they travel in open air—the speed of light (100%).

If the propagation delay of the cable is known, the scope can be calibrated to meters or feet per division, and the distance to a mismatch—shorts, opens, etc.—in the cable can thus be determined:

The speed of light is 300,000 km/sec, or 30 cm/nanosec, or 0.984 ft/nanosec. Propagation delay in a coax cable is about 1.25 ns/ft. The DC resistance is 44 ohms/1000 ft.

4.6.9.2 Setup and Test Procedures

4.6.9.2.1 Parts: X1 probe (or short piece of coax with BNC connector on each end).

1 resistor equal to Zo of cable (93 ohms)
1 BNC T (PN 1650789)
1 probe-tip-to-BNC adapter (PN 453199) (not needed if short coax is used as input from T-connector to scope input)

4.6.9.2.2 Scope Hookup: Make the connections shown in Figure 4-20.

4.6.9.2.3 Initial Scope Settings:

Mode:	ch1
Volt/div:	0.2 V (initial)
Input:	AC
A triggering level:	fully counterclockwise
A sweep length:	full
Horiz. display:	delayed sweep B
B sweep mode:	B starts after delay time
A sweep mode:	auto trigger
Delay time multiplier dial:	fully clockwise (9.5)

A and B time division initial setting:

A: 10 μsec
B: 0.1 μsec (pull to unlock)

4.6.9.2.4 Test Procedures

1. Consider the cable length:
   - Up to 100 m (300 ft)—use the initial scope setup.
   - Up to 1500 m (5000 ft)—use B time division up to 2.0 μsec.
   - Longer than 1500 m (5000 ft)—measure in segments not exceeding 1500 m.
   - Shorter than 20 m (60 ft)—use the X10 time base. This distance represents only about two horizontal divisions to the center of the screen. Switch to X10 magnifier. B time can now be set to .2 or .5, and speed can be considered 0.02 and 0.05.
2. Use the following conversion table to determine distances.

B-sweep setting (μsec)

	(Meter/Div)	(Feet/Div)
0.1	12.2	40
0.2	24.4	80
0.5	61	200
1.0	122	400
2.0	244	800

3. Use the following measurement techniques and become familiar with Figure 4-22 to gain understanding of what you may see displayed:
   - Measure from the point where the reflected pulse starts to change (Figure 4-21). (Rise time degrades with cable-length increase.)
   - Lower the volts/div, and use Vertical Position knob to position waveform.
   - Identify the end of a cable by opening and shorting the cable end.
   - After finding mismatches, measure as closely as possible to the fault. Measuring from both ends of the cable enhances fault location; because of cable loss, major faults at long distances can appear as minor faults close to the test point.

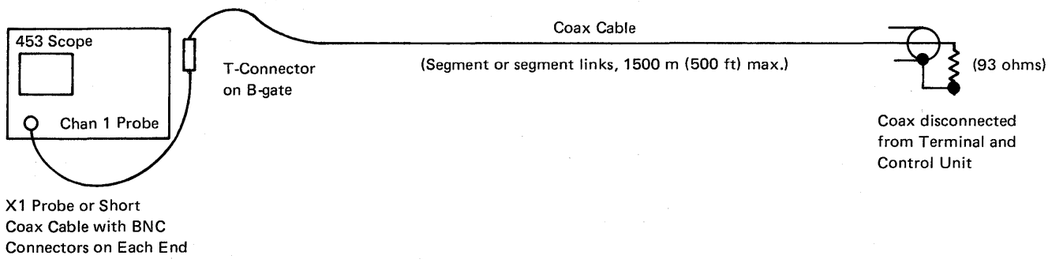


Figure 4-20. Scope Setup

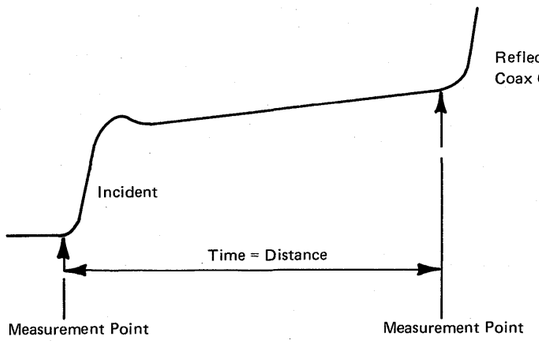
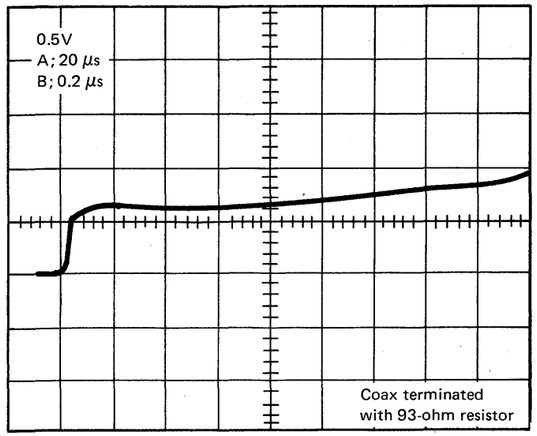


Figure 4-21. Measurement Points

Example A

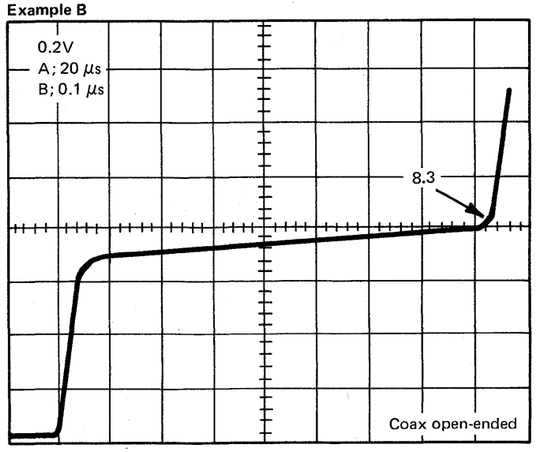


This is an illustration of a good, no-fault coax cable that is 190 m (624 ft.) long. A gradual sloping and overshoot of rise time is normal.

Impedance Zo Checking

This 93-ohm cable is terminated at the end with a 93-ohm resistor. The straight line after 7.8 divisions shows that the characteristic impedance of this cable is close to 93 ohms.

Example B

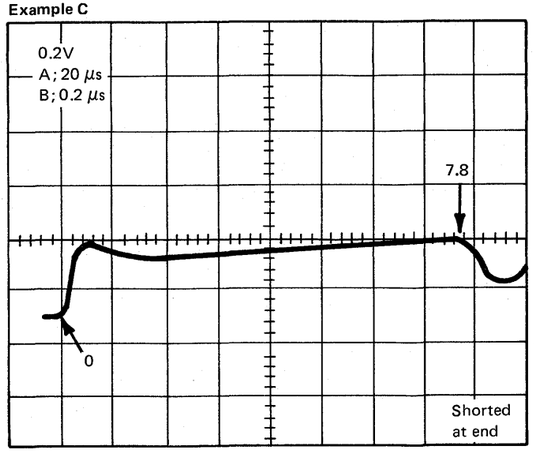


101 m (332 ft) of good coax cable, 8.3 divisions long. (This is an effective method to measure the length of the cable.)

8.3 x 40 = 332 ft or
8.3 x 12.2 = 101 m

Rising slope is normal.

Example C



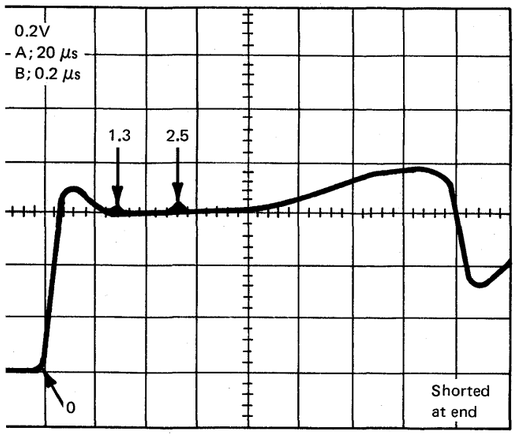
The same cable as Example A now shorted at end to show downward reflection and length.

Length of sweep is 7.8 divisions (see arrows).

B setting = 0.2 μsec or 80 ft/div
7.8 x 80 = 190 m (624 ft)

Figure 4-22 (Part 1 of 2). Display Examples

xample D

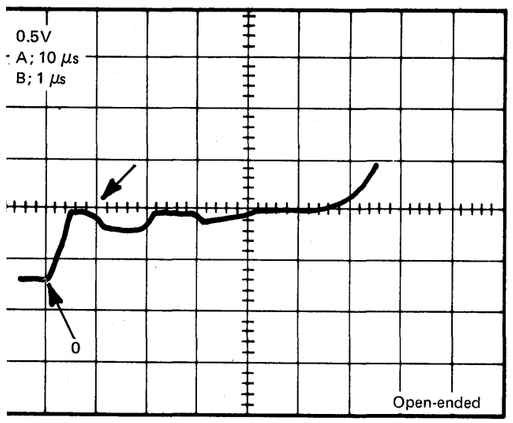


Same as Example C, now with higher vertical gain (0.2V/div).

Arrow points to start. Note the two wrinkles at 1.3 and 2.5 divisions from start; they represent very small mismatches from BNC connection, at 32 and 61 m (104 and 200 ft) from start.

A reflection deviation of greater than 10% of the incident wave usually indicates an undesirable impedance change and should be corrected.

xample E

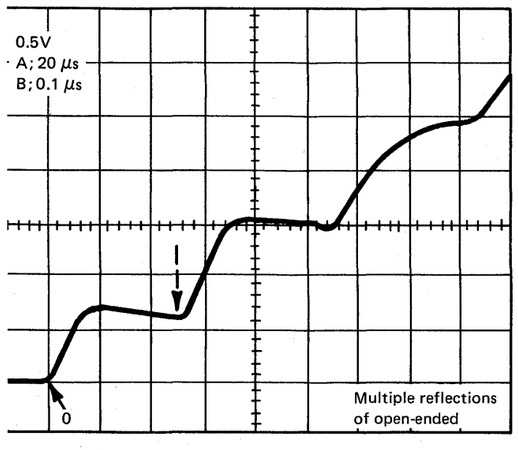


This 2400-ft cable has a 100-ohm short to shield at the 400-ft point (see arrow).

Total cable length 6 x 400 = 2400 ft

Fault point 1 x 400 = 400 ft

xample F



Improper setup of scope.

Multiple reflections, 30.5m (100 ft) of good cable with open end.

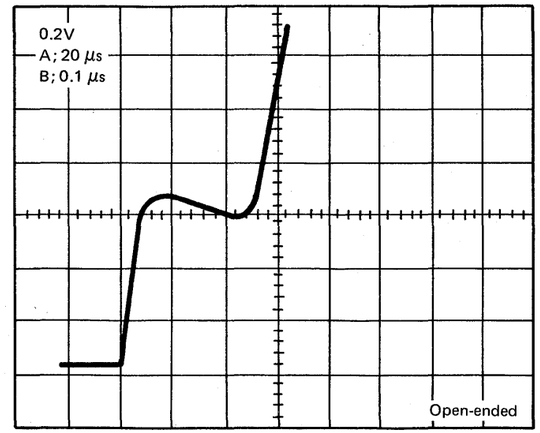
Improper scope display due to wrong vertical gain setting, .5V/div.

Only the first reflection is significant and should be magnified.

See Example G.

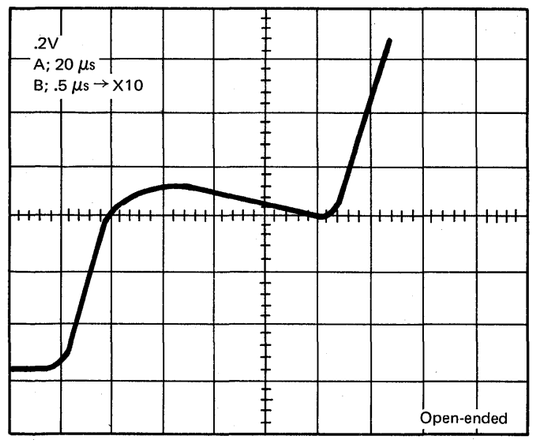
igure 4-22 (Part 2 of 2). Display Examples

Example G



Same as Example F, now with scope set to higher vertical gain, 0.2V.

Example H



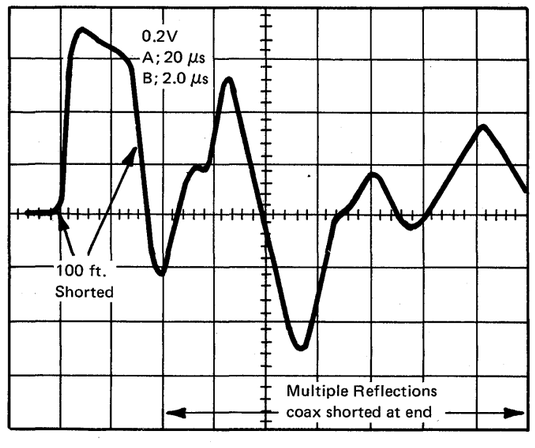
Same as Example G, but magnified with X10.

This is the first reflection section of Example G.

A smooth cable 5.2 division long (as opposed to 2.6 div on Example A) with overshoot.

5.2 x 20 = 104 ft.

Example J



Improper setup of scope

Multiple reflections due to wrong, slow B group setting.

Same 30.5 m (100 ft) as in Examples F, G and H.

Only the first reflection is significant; the normal, multiple reflections of the test pulse should be cancelled out on the display by using a B time that will display the first reflection only, using the whole screen or as great a portion of the screen as possible. See Example H.

Chapter 5. Reference Data

5.1 INTRODUCTION

This chapter provides the following information as an aid to maintenance:

Command summary
Order summary
Various codes
Sequence/response diagrams
Status and sense byte descriptions
Switches and controls

5.2 CONTROL UNIT COMMAND SUMMARY

See Figure 5-1 for control unit command codes.

Command	3274-1B, -1D	3274-1A, -1C,		
	EBCDIC Hex	EBCDIC Hex	ASCII Hex	Graphic
Copy[1]	NA	F7	37	7
Erase All Unprotected	0F	6F	3F	?
Erase/Write	05	F5	35	5
Erase/Write Alternate	0D	7E	3D	=
Read Buffer	02	F2	32	2
Read Modified	06	F6	36	6
Read Modified All	NA	6E	3E	:
Write	01	F1	31	1
No Operation	03	NA	NA	NA
Select[2]	0B	NA	NA	NA
Select RM[3]	0B	NA	NA	NA
Select RB[3]	1B	NA	NA	NA
Select RMP[3]	2B	NA	NA	NA
Select RBP[3]	3B	NA	NA	NA
Select WRT[3]	4B	NA	NA	NA
Sense	04	NA	NA	NA
Sense ID	E4	NA	NA	NA
Write Structured Field[3]	11	NA	NA	NA
Write Structured Field	NA	F3	NA	NA

[1] Applicable to 3274 Model C (BSC).
[2] Applicable to 3274 Model 1B
[3] Applicable to 3274 Model 1D.

Figure 5-1. Command Codes

5.2.1 Write

The Write Command:

1. Transfers the contents of the addressed device buffer to the control unit (CU) storage buffer.
2. Performs the operation specified by the write control character (WCC).
3. Enters data in any portion of the CU storage buffer (without erasing or modifying portions of the buffer in which a change is not required).
4. Allows execution of various order sequences within the data stream.
5. Transfers the updated CU buffer to the device buffer.

5.2.2 Erase/Write

The Erase/Write command:

1. Clears the CU buffer to nulls.
2. Performs operations specified by the WCC.
3. Stores new data characters provided by the program.
4. Allows execution of various order sequences within the data stream.
5. Transfers the updated CU buffer to the device buffer.

5.2.3 Erase/Write Alternate

The Erase/Write Alternate command:

1. Switches the device to alternate character capacity.
2. Performs normal erase/write operation.

5.2.4 Erase All Unprotected

The Erase All Unprotected command:

1. Clears all unprotected alphameric characters to nulls, resets modified data tag (MDT) bits of all unprotected fields to 0, restores the keyboard, resets the attention identifier (AID), and repositions the cursor to the first character location in the first unprotected field in the buffer.
2. Is performed at the device and has no data stream.

5.2.5 Read Buffer

1. The Read Buffer command transfers the contents of the addressed device buffer to the CU buffer.
2. Data stream transferred to the host includes the AID character, the cursor address, and the contents of all device buffer locations (both protected and unprotected). These include attribute and alphameric characters (including nulls), starting at a specific location and continuing to the end of the buffer, unless the channel byte count goes to zero before the last location is reached.

5.2.6 Read Modified

Receipt of a Read Modified command (or a Poll when an AID is pending) generates one of three data streams, depending on the AID code present. Their descriptions follow.

5.2.6.1 Read Modified Read

1. The Read Modified Read command transfers the contents of the addressed device buffer to the CU buffer.
2. Data stream transferred to the host includes the AID character, the cursor address, and all fields in which the MDT bit has been set. The data stream for each modified field contains the SBA order, the buffer address of the attribute character plus 1, and all alphameric characters (with nulls suppressed).
3. The command is issued by the program or as a result of an ENTER, PF key, selector-pen attention, or operator identification card read-in operation.

5.2.6.2 Short Read Read

1. The Short Read Read command permits the display operator to communicate with the host program without sending modified data characters. This action is initiated when the display operator presses CLEAR, CANCEL, or a PA key.
2. A read-modified operation is performed, but only the unique AID character, to identify the key pressed, is sent to the host program.

5.2.6.3 Test Request Read [Models B, C (BSC), and D]

1. A read-modified operation is performed if the TEST REQ or the SYS REQ (BSC only) key has been pressed at a device.
2. A Test Request Read heading is generated by the control unit. The sequence is: SOH % / STX.
3. If the device buffer is unformatted, all alphameric data in the buffer is included in the data stream (nulls are suppressed). If the device buffer is formatted, only fields that have the MDT bit set will be included in the data stream following the Test Request Read heading.

5.2.7 Read Modified All (SNA Only)

1. The Read Modified All command is sent only by the primary logical unit (host application).
2. A read-modified operation is performed, and all modified fields in the selected device are sent to the host, regardless of the AID byte generated.

5.2.8 No Operation (Models B and D Only)

1. The No Operation command performs no functional operation at the CU.
2. Interface operation only.

5.2.9 Write Structured Field

The Write Structured Field command is used to transmit data in structured field format.

The WSF instruction provides the mechanism for:

1. Loading symbol definition data into a specified terminal's storage.
2. Querying a terminal as to its characteristics.
3. Specifying the type of inbound transmission desired.
4. Allowing/disallowing operator selection of color, extended highlighting, and symbol set attributes for keyed data.

The WSF command must be the first item in any structured field transmission.

5.2.10 Sense (Models B and D Only)

1. The Sense command is issued by the program in response to unit-check status.
2. Interface operation only.
3. Transfers one byte of sense data from the CU to main storage.

5.2.11 Copy [Model C (BSC)]

1. The Copy command transfers the contents of one device buffer to another device buffer via the CU buffer.
2. The device whose contents are transferred is called the *from* device.
3. The receiving device is called the *to* device.
4. The *to* device is selected in the addressing sequence.
5. Two bytes always follow the command byte: (1) the copy control character (CCC) and (2) the address of the *from* device.
6. The CCC performs a function similar to that of the WCC in the Write and Erase/Write commands.
7. The *from* device buffer can be *locked* (incapable of being copied) by storing a protected alphameric attribute character in buffer address 0.
8. The addressed device (that is, the *to* device) may also be specified as the *from* device. This permits trouble-shooting the Copy command with a single device.

Select Read Modified (RM) Command (3274-1D)

Select RM is an immediate command that is executed only by the 3274-1D. It is used in place of the Select command (used by the 3274-1B) when a read-modified operation is to be executed.

Select Read Buffer (RB) Command (3274-1D)

Select RB is an immediate command that is executed only by the 3274-1D. It replaces the Select command used by the 3274-1B when a read-buffer operation is to be executed.

Select Read Modified from Position (RMP) Command (3274-1D)

Select RMP is an immediate command that is executed only by the 3274-1D. The 3274-1D executes a select RMP command by recording the read-modified condition and returning Device End.

Select Read Buffer from Position (RBP) Command (3274-1D)

Select RBP is an immediate command that is executed only by the 3274-1D. The 3274-1D executes a Select RBP command by recording the read-buffer condition and returning Device End.

Select WRT Command (3274-1D)

Select WRT is an immediate command that is executed only by the 3274-1D. The 3274-1D executes a Select WRT command by returning Device End to the host. If the chained command following the Select WRT is not a Write command, CE, DE, UC, OC will be sent to the host.

Sense ID Command (3274-1B, -1D)

Sense ID is valid only for the 3274 Models 1B and 1D. This command requests data transfer to the host. Four bytes of data are sent as follows:

	Model 1B	Model 1D
Byte 0	FF	FF
Bytes 1, 2	3274	3274
Byte 3	1B	1D

Sense ID is honored when the 3274 Model 1B or 1D is in one of the following states:

- Power on
- IML completed
- Online
- Not busy
- No outstanding status to be presented.

5.3 CONTROL UNIT ORDER SUMMARY

See Figure 5-2 for control unit order codes.

5.3.1 Set Buffer Address (SBA)

The Set Buffer Address (SBA) order loads data, starting at the address immediately following the SBA character.
The format is: SBA, address, address.

5.3.2 Start Field (SF)

The Start Field (SF) order specifies the next character as an attribute character.
The format is: SF, attribute character.

5.3.3 Insert Cursor (IC)

The Insert Cursor (IC) order changes the address in the CU buffer and thus repositions the cursor on the display screen. Because the CU buffer address is not advanced when the IC order is loaded in the CU buffer, the next byte is stored at the cursor address.
The format is: IC.

5.3.4 Repeat to Address (RA)

The Repeat to Address (RA) order loads a single character repeatedly, starting at the current CU buffer address and continuing to, *but not including,* the address specified in the order sequence. The cursor is not affected.
The format is: RA, address, address, character.

5.3.5 Erase Unprotected to Address (EUA)

The Erase Unprotected to Address (EUA) order deletes all unprotected-field characters beginning with the character at the current address to, *but not including,* the character at the address specified in the order sequence. If the address specified in the order sequence equals the *current address,* wraparound occurs, and all unprotected characters are deleted. The attribute characters defining the unprotected fields are not deleted.
The format is: EUA, address, address.

5.3.6 Program Tab (PT)

The Program Tab (PT) order advances the CU buffer address to that of the character position immediately following the next attribute character that defines an unprotected field. The cursor is unaffected, and no wraparound occurs. The search begins at the current buffer address. The final result depends on one of three conditions:

1. When PT immediately follows a data character within an unprotected field, all remaining characters within that field are replaced by nulls.
2. When PT immediately follows a WCC or an order sequence, no nulls are inserted.
3. When the current buffer address contains an attribute character that defines an unprotected field, the CU buffer address is simply advanced one character location.

The format is: PT.

Order Sequence / Order	Byte 1 (Order Code) EBCDIC (Hex)	Byte 1 (Order Code) ASCII (Hex)	Byte 2	Byte 3	Byte 4
Start Field (SF)	1D	1D	Attribute Character[1]		
Set Buffer Address (SBA)	11	11	1st Address Byte[3]	2nd Address Byte[3]	
Insert Cursor (IC)	13	13			
Program Tab (PT)	05	09			
Repeat to Address (RA)	3C	14	1st Address Byte[3]	2nd Address Byte[3]	Character to be Repeated[2]
Start Field Extended (SFE) Erase Unprotected to Address (EUA) Modify Field (MF) Set Attribute (SA)	12	12	1st Address Byte[3]	2nd Address Byte[3]	

[1] Figure 5-12 shows coding of this byte.
[2] Figures 5-3, 5-4, 5-5, and 5-19 show coding of this byte.
[3] The *IBM 3270 Information Display System: 3274 Control Unit Description and Programmer's Guide,* GA23-0061, lists the two-byte code for each possible address. To be a valid address:
a. If the Erase/Write Alternate command is not used, the maximum address is 479 for 3278 Model 1 displays or 1919 for 3277 Model 2 and 3278 Models 2, 3, and 4.
b. If the Erase/Write Alternate command is used, the alternate buffer size is specified by the model or bind parameter (959, 1919, 2559, or 3439).

Figure 5-2. Buffer Control Orders and Order Codes

5.3.7 New Line (NL)

When included in the data stream addressed to a printer, the New Line (NL) order initiates a carrier return/line feed (CR/LF) operation by the printer. That is, the platen is advanced one line and the print mechanism is returned to the first print position of the new line. If this order is included in the data stream addressed to a display, the NL order is displayed as the number 5 (space 5 for Katakana), but does not cause action in the CU or display. In any case, it is stored in the CU buffer as the number 5 (space 5 for Katakana).
The format is: NL.

5.3.8 End of Message (EM)

The End of Message (EM) order must be included at the end of a message addressed to a printer to notify it when to stop printing. If the EM order is not included at the end of the printer message, the printer will print out the contents of the complete printer buffer (either 480 or 1920 characters). If this order is included in the data stream addressed to a display, the EM order is displayed as the number 9 (space 9 for Katakana), but does not cause action in the CU or display. In any case, it is stored in the CU buffer as the number 9 (space 9 for Katakana).
The format is: EM.

5.3.9 Duplicate (DUP)

The Duplicate (DUP) order informs the program that the DUP key was pressed by the display station operator. Its actual function is determined by the CPU program. The DUP order is displayed as an asterisk (*) with overscore. It is stored in the CU buffer, but does not cause action in the CU.
The format is: DUP.

5.3.10 Field Mark (FM)

The Field Mark (FM) order informs the CPU program that the FM key was pressed by the display operator. It indicates the end of a field to the program. The FM order is displayed as a semicolon (;) with overscore. It is stored in the CU buffer, but does not cause action in the CU.
The format is: FM.

5.3.11 Forms Feed (FF) (Category A and 3288 Printers)

Valid Forms Feed (FF) orders are executed by all Category A printers and by the 3288 printer during printouts, both with and without a line-length format specified. (The FF order is described in the section "Page Length Control/VFC Operations," in the *IBM 3270 Information Display System: 3274 Control Unit Description and Programming Guide,* GA23-0061. When a valid FF order is encountered in the first print position of a line, with the Page Length

Control/VFC feature installed, the print form indexes to a predetermined print line on the next form.

5.3.12 Carriage Return (CR) (Category A Printers)

When the Carriage Return (CR) order code is found in the data stream, the next print position will be the leftmost character position on the current print line. CR orders are not executed when they occur in nonprint fields, and when the printer format bits in the WCC indicate a line length (40, 64, or 80 characters). In both cases, the CR order is printed as a space character.

5.3.13 Structured Field and Attribute Processing Orders

5.3.13.1 Start Field Extended (SFE)

This order is used to define the start of a field and to assign Color, Extended Highlighting, and Programmed Symbol attributes to a field.

The format is:

SFE, number of type/value pairs, type-value type-value . . . type-value

5.3.13.2 Modify Field (MF)

This order is used to selectively change field; Color, Extended Highlighting, and Programmed Symbol attributes at the current buffer address. The current buffer address be that of a field attribute byte. Only the attribute bytes specified in the order are changed.

The format is:

MF, number of type/value pairs, type-value type-value . . . type value

5.3.13.3 Set Attribute (SA)

This order is used to change the; Color, Extended Highlighting, or the Programmed Symbol attributes applicable to the character at the current buffer address, or to set these attribute types to their default value.

The format is:

SA, type-value

For more information on Command Codes, Orders, and Attribute types and values, refer to the Description and Programmer's Guide (GA23-0061).

5.4 I/O INTERFACE CODES

The I/O interface codes for the 3274 Control Unit are illustrated in Figures 5-3 through 5-12, and 5-19.

Bits 4567	Hex 1	00				01				10				11			
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL				SP	&	—						(	)	AA	0
0001	1							/		a	j	–		A	J		1
0010	2									b	k	s		B	K	S	2
0011	3									c	l	t		C	L	T	3
0100	4									d	m	u		D	M	U	4
0101	5		NL							e	n	v		E	N	V	5
0110	6									f	o	w		F	O	W	6
0111	7									g	p	x		G	P	X	7
1000	8									h	q	y		H	Q	Y	8
1001	9		EM							i	r	z		I	R	Z	9
1010	A					¢	!	6A	:								
1011	B					.	$	,	#								
1100	C	FF	DUP			<	•	%	@								
1101	D					(	)	_	'								
1110	E		FM			+	;	>	=								
1111	F					|	¬	?	"								

Bits 0,1 — 00 01 10 11
Bits 2,3 — 00 01 10 11
Hex 0 — 0 1 2 3 4 5 6 7 8 9 A B C D E F

Notes:

1. Character code assignments other than those shown within all outlined areas of this chart are undefined. If an undefined character code is programmed, the character that will be displayed is not specified. The character displayed by the 3277 or 3275 for a given undefined character code may be different for other devices. IBM reserves the right to change at any time the character displayed for an undefined character code.
2. Lowercase alphabetic characters (shown within the dotted outlined area) are converted to uppercase by the display station or printer and displayed or printed as uppercase characters, unless the terminal has Dual Case capability.

Legend:

= Stored as a lowercase symbol. Displayed on Mono Case display only. Blank on Dual Case display. Cannot be entered from keyboard

6A or AA = Stored as Hex code shown. Nondisplayed on Mono and Dual Case displays.

Figure 5-3. United States EBCDIC I/O Interface Code for 3274 Control Unit and Attached 3277 Display Stations

Bits 4567	Hex 1	00				01				10				11			
		00	01	10	11	00	01	10	11	00	01	10	11	00	01	10	11
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL				SP	&	-						{	}	\	0
0001	1							/		a	j	~		A	J		1
0010	2									b	k	s		B	K	S	2
0011	3									c	l	t		C	L	T	3
0100	4									d	m	u		D	M	U	4
0101	5		NL							e	n	v		E	N	V	5
0110	6									f	o	w		F	O	W	6
0111	7									g	p	x		G	P	X	7
1000	8									h	q	y		H	Q	Y	8
1001	9		EM						`	i	r	z		I	R	Z	9
1010	A					¢	!	¦	:								
1011	B					.	$	,	#								
1100	C	FF	DUP			<	•	%	@								
1101	D	CR				(	)	_	'								
1110	E		FM			+	;	>	=								
1111	F					|	¬	?	"				SI				

Bits 0,1 — 00 01 10 11
Bits 2,3 — 00 01 10 11
Hex 0 — 0 1 2 3 4 5 6 7 8 9 A B C D E F

Notes:

1. Character code assignments other than those shown within all outlined areas of this chart are undefined. If an undefined character code is programmed, the character that will be displayed or printed is a hyphen. The character displayed by the 3276 or 3278 for a given undefined character code may be different for other devices. IBM reserves the right to change at any time the character displayed for an undefined character code.
2. NL (hex 15), EM (hex 19), FF (hex 0C), NUL (hex 00) and CR (hex 0D) are not displayed or printed. The DUP (hex 1C) and FM (hex 1E) control characters on Dual Case featured terminals are displayed as $\overline{*}$ and $\overline{;}$ respectively, and are printed as * and ;.
3. Dup (hex 1C) and FM (hex 1E) control characters on Mono Case terminals are displayed as * and ; respectively, and are printed as * and ;.

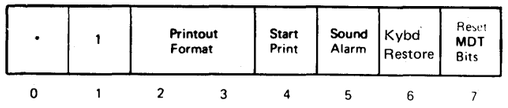
Figure 5-4. United States EBCDIC I/O Interface Code for 3274 Control Unit and Attached Category A Devices

Bits 4321	Hex 1	000	001	010	011	100	101	110	111	← Bits 7, 6, 5
	↓	0	1	2	3	4	5	6	7	← Hex 0
0000	0	NUL		SP	0	@	P	`	p	
0001	1			!	1	A	Q	a	q	
0010	2			"	2	B	R	b	r	
0011	3			#	3	C	S	c	s	
0100	4			$	4	D	T	d	t	
0101	5		NL	%	5	E	U	e	u	
0110	6			&	6	F	V	f	v	
0111	7			'	7	G	W	g	w	
1000	8			(	8	H	X	h	x	
1001	9		EM	)	9	I	Y	i	y	
1010	A			*	:	J	Z	j	z	
1011	B			+	;	K	[	k	{	
1100	C	FF	DUP	,	<	L	\	l	|	
1101	D	CR		–	=	M	]	m	}	
1110	E		FM	.	>	N	^	n	~	
1111	F			/	?	O	_	o		

Notes:

1. *Character code assignments other than those shown within all outlined areas of this chart are undefined. If an undefined character code is programmed, the character that will be displayed is not specified. IBM reserves the right to change at any time the character displayed for an undefined character code.*
2. *Lowercase alphabetic characters (shown within the dotted outlined area) are converted to uppercase by the display station or printer and displayed or printed as uppercase characters, unless the terminal has Dual Case capability.*

Figure 5-5. United States ASCII I/O Interface Code for 3274 Control Unit and Attached Category A Devices



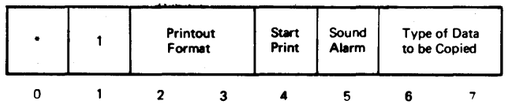
*Determined by the configuration of bits 2-7. See Figure 5-19.

Figure 5-6. Format of Write Control Character (WCC) Byte

Bit	Explanation
0	Determined by the contents of bits 2-7 as shown in Figure 5-19.
1	Reserved (must be a 1).
2,3	Define the printout format, as follows: = 00 – The NL, EM, and CR* orders in the data stream determine print line length. Provides a 132-print position line when the orders are not present. = 01 – Specifies 40-character print line. = 10 – Specifies 64-character print line. = 11 – Specifies 80-character print line.
4	Start Printer bit. When set to 1, initiates a printout operation at completion of the write operation.
5	The Sound Alarm bit. When set to 1, sounds the audible alarm at the selected device at the end of the operation if that device has an audible alarm.
6	The Keyboard Restore bit. When set to 1, restores operation of the keyboard by resetting the INPUT INHIBITED indicator on 3275 and 3277 displays, and the System Lock or Wait symbol on 3276 and 3278 displays. It also resets the AID byte at the termination of the I/O command.
7	Reset MDT bits. When set to 1, all MDT bits in the selected devices' existing buffer data are reset before any data is written or orders are executed.

*The CR order is applicable to Category A Printers only.

Figure 5-7. Function of Write Control Character (WCC) Bits



*Determined by the configuration of bits 2-7. See Figure 5-19.

Figure 5-8. Format of Copy Control Character (CCC) Byte

Bit	Explanation
0	Determined by the contents of bits 2-7 as shown in Figure 5-19.
1	Must be a 1.
2, 3	Define the printout format as follows: = 00 – The NL, EM, and CR* orders in the data stream determine print line length. Provides a 132-print position line when the orders are not present. = 01 – Specifies 40-character print line. = 10 – Specifies 64-character print line. = 11 – Specifies 80-character print line.
4	The Start Printer bit. When set to 1, initiates a printout operation at the "to" device after buffer transfers are completed.
5	The Sound Alarm bit. When set to 1, sounds the audible alarm at the "to" device after buffer transfers are completed if that device has an audible alarm.
6, 7	Define the type of data to be copied as follows: = 00 – Only attribute characters are copied. = 01 – Attribute characters and unprotected alphameric fields (including nulls) are copied. Nulls are transferred for the alphameric characters not copied from the protected fields. = 10 – All attribute characters and protected alphameric fields (including nulls) are copied. Nulls are transferred for the alphameric characters not copied from the unprotected fields. = 11 – The entire contents of the storage buffer (including nulls) are copied.

Note: *A CCC and address byte must always follow the command code; if they do not, the control unit aborts the command and generates error status.*

*The CR order is applicable to Category A Printers only.

Figure 5-9. Function of Copy Control Character (CCC) Bits

To / From	3277-1 480	3277-2 1920	3276/8-1 960	3276/8-1 480	3276/8-2 1920	3276/8-3 2560	3276/8-3 1920	3276/8-4 3440	3276/8-4 1920	
3277-1 480	o	•	v	o	•	•	•	•	•	
3277-2 1920	–	o	–	–	o	v	o	v	o	
3276/8-1 960	–	•	o	A	•	•	•	•	•	
3276/8-1 480	o	•	v	o	•	•	•	•	•	
3276/8-2 1920	–	o	–	–	o	v	o	v	o	
3276/8-3 2560	–	–	–	–	–	o	A	•	A	(See Note)
3276/8-3 1920	–	o	–	–	o	v	o	v	o	
3276/8-4 3440	–	–	–	–	–	–	–	o	A	
3276/8-4 1920	–	o	–	–	o	v	o	v	o	

Legend:

o Transfer allowed, no change in screen state required.
– Transfer not allowed, Operation Check returned to host.
• Transfer allowed, no change in screen state (appearance on "from" and "to" device may differ).
A Transfer allowed, screen state changes to alternate size.
v Transfer allowed, screen state changes to default size.

Note: *The 3440 screen does not have a 2560 mode. Therefore, the screen size is set to 3440.*

Figure 5-10. Buffer Transfers for 3274 Model C (BSC) Copy Command Operation

AID, Model B	Hex Character (EBCDIC)	Hex Character (ASCII)	Graphic Character	Read Modified Command Operation	Resultant Transfer to CPU
No AID generated (Display or Display Station)	60	2D	–	Rd Mod (Unsolicited Read or Read Modified from Host)	If performing a remote polling operation, no read operation occurs; otherwise, field addresses and text in the modified fields are transferred.
No AID generated (Printer)	E8	59	Y	Rd Mod	
ENTER key and & (Selector Pen Attention)	7D	27	'	Rd Mod	AID code and cursor address, followed by an SBA order, attribute address +1, and text for each modified field. Nulls are suppressed.
PF 1 key	F1	31	1	Rd Mod	
PF 2 key	F2	32	2	Rd Mod	
PF 3 key	F3	33	3	Rd Mod	
PF 4 key	F4	34	4	Rd Mod	
PF 5 key	F5	35	5	Rd Mod	
PF 6 key	F6	36	6	Rd Mod	
PF 7 key	F7	37	7	Rd Mod	
PF 8 key	F8	38	8	Rd Mod	
PF 9 key	F9	39	9	Rd Mod	
PF 10 key	7A	3A	:	Rd Mod	
PF 11 key	7B (See Note.)	23	#	Rd Mod	
PF 12 key	7C (See Note.)	40	@	Rd Mod	
PF 13 key	C1	41	A	Rd Mod	
PF 14 key	C2	42	B	Rd Mod	
PF 15 key	C3	43	C	Rd Mod	
PF 16 key	C4	44	D	Rd Mod	
PF 17 key	C5	45	E	Rd Mod	
PF 18 key	C6	46	F	Rd Mod	
PF 19 key	C7	47	G	Rd Mod	
PF 20 key	C8	48	H	Rd Mod	
PF 21 key	C9	49	I	Rd Mod	
PF 22 key	4A	5B	¢	Rd Mod	
PF 23 key	4B	2E	.	Rd Mod	
PF 24 key	4C	3C	<	Rd Mod	
Card Reader	E6	57	W	Rd Mod	
Alphameric MSR/MHS	E7	58	X	Rd Mod	
Selector Pen Attention space null	7E	3D	=	Rd Mod	AID code, cursor address, and field addresses only; no data.
PA 1 key	6C	25	%	Short Rd	AID code only.
PA 2 (CNCL) key	6E	3E	>	Short Rd	
PA 3 key	6B	2C	,	Short Rd	
CLEAR key	6D	5F	–	Short Rd	
TEST REQ and SYS REQ keys	F0	30	0	Tst Req Rd	A test request message. AID transferred on Read Buffer only.

Note: *Graphic characters for the United States I/O interface codes are shown. If a World Trade I/O interface code is used, refer to the* IBM 3270 Information Display System: Character Set Reference *manual, GA27-2837, for possible graphic character differences.*

Figure 5-11. Attention ID (AID) Configurations

ATTRIBUTE CHARACTER BIT DEFINITIONS FOR 3278s AND 3279s

Attribute	X	X	U/P	A/N	I/SPD	0	MDT
EBCDIC Bits	0	1	2	3	4	5	6	7

EBCDIC

Bit 0, 1	= XX	Determined by contents of bits 2-7.
Bit 2*	= 0	Unprotected data.
Bit 2*	= 1	Protected data — Auto lock.
Bit 2, 3	= 1, 1	Auto skip.
Bit 3	= 0	Alphameric data.
Bit 3	= 1	Numeric data — Auto shift.
Bit 4, 5*	= 0, 0	Normal intensity/Nondetectable.
Bit 4, 5*	= 0, 1	Normal intensity/Selector-Pen-Detectable.
Bit 4, 5*	= 1, 0	High intensity/Selector-Pen-Detectable.
Bit 4, 5*	= 1,1	Nondisplay/Nonprint/Nondectable.
Bit 6	= 0	Reserved. Must be zero.
Bit 7	= 0	Field data not tagged as modified.
Bit 7	= 1	Field data tagged as modified.

*See Figure 5-16 for 3279 specifics.

Attribute							Bits			
Prot	A/N Auto Skip	MDT On	High Intens	Sel Pen Det	Non-disp PRT	23	4567	Hex	Graphic Display
U						00	0000	40	
U		Y				00	0001	C1	
U				Y		00	0100	C4	
U		Y		Y		00	0101	C5	
U			H	Y		00	1000	C8	
U		Y	H	Y		00	1001	C9	
U					Y	00	1100	4C	
U		Y			Y	00	1101	4D	
U	N					01	0000	50	
U	N	Y				01	0001	D1	
U	N			Y		01	0100	D4	
U	N	Y		Y		01	0101	D5	
U	N		H	Y		01	1000	D8	
U	N	Y	H	Y		01	1001	D9	
U	N				Y	01	1100	5C	
U	N	Y			Y	01	1101	5D	
P						10	0000	60	
P		Y				10	0001	61	
P				Y		10	0100	E4	
P		Y		Y		10	0101	E5	
P			H	Y		10	1000	E8	
P		Y	H	Y		10	1001	E9	
P						10	1100	6C	
P		Y			Y	10	1101	6D	
P	S					11	0000	F0	
P	S	Y				11	0001	F1	
P	S			Y		11	0100	F4	
P	S	Y		Y		11	0101	F5	
P	S		H	Y		11	1000	F8	
P	S	Y	H	Y		11	1001	F9	
P	S				Y	11	1100	7C	
P	S	Y			Y	11	1101	7D	

H = High
N = Numeric
P = Protected
S = Auto Skip
U = Unprotected
Y = Yes

Figure 5-12. Attribute Character Bits

5.4.1 Examining 3278 Attributes and Modified Data Tags

To examine data on a 3278 for proper attributes and the setting or resetting of modified data tags (MDTs), use the following procedure. On D-type 3278 displays, use step 1 only; on M-type 3278 displays, use steps 1-6:

1. Place the CE jumper, as shown in Figure 5-13, on the A-gate top-card connector that connects card F2 to card G2 on the A-gate with three base cards, or card F4 to card G4 on the A-gate with two base cards (Figure 5-14).
2. When data you wish to examine is displayed on the screen, put the mono/dual switch (A/Aa) in the Aa position and place the cursor in an area before the field in question. Use normal cursor move keys unless input inhibit or other condition prevents this (See step 4 if you cannot move the cursor as directed.)
3. Place the Normal/Test switch in the TEST position. (The CE jumper on the A-gate will inhibit POR and test pattern generation, forcing test mode 3—display of the device regen buffer.)
4. If you are unable to move the cursor to the proper area in step 2, use test mode 3. Press Reset, then the E key and 0 key; press Reset, then the U key and / key; press Reset, then the D key 19 times. This places the cursor in position 1 on the screen. You may continue with the D key to read; or press Reset, then the E key, and press 1 through 7 to select another 256-byte block of data.
5. When the cursor is in an area before the field in question, press Reset and the D key; then continue Read by use of the typamatic function of the D key until you reach the desired field.
6. The status area (the first character of the operator information area) will contain the graphic equivalent of the attribute or data character each time the D key is pressed, and it can be examined to check that the attribute/MDT is correct. (See Figure 5-12.)

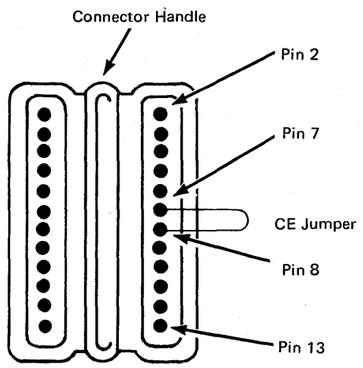


Figure 5-13. 3278 Top-Card Connector CE Jumper (Three Base Cards)

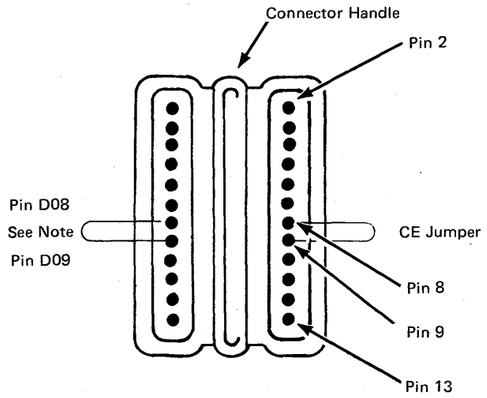


Figure 5-14. 3278 Top-Card Connector CE Jumper (Two Base Cards)

Note: *There is no top-card connector if the selector pin card is not installed. Use card shroud Pin D08 to D09.*

5.4.2 Examining 3279 Attributes and Modified Data Tags

To examine data in the 3279 refresh buffer (not the ECS buffer) for proper attributes and the setting or resetting of modified data tags (MDTs), use the following procedure:

1. Place the CE jumper as shown in Figure 5-15.
2. Position the cursor at the location where the attribute is to be displayed.
3. Place the Normal/Test switch in the TEST position. Nulls will display as ⊙ and attributes will be blank. Note that base white and red change to red and white, respectively.
4. Press CONTROL D. The character, or attribute, at the cursor position is copied into the first position of the operator information area and the cursor advances.
5. Refer to Figure 5-16 to determine if the attributes are being interpreted correctly by the hardware.

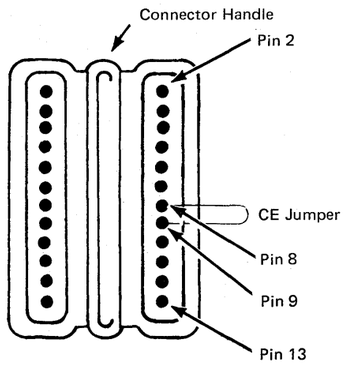
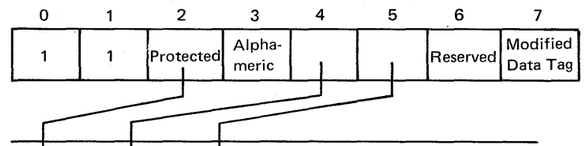


Figure 5-15. 3279 Top-Card Connector CE Jumper



2	4	5	Color of Field	Sel Pen Detectable
0	0	0	GREEN	NO
1	0	0	BLUE	NO
0	0	1	GREEN	YES
1	0	1	BLUE	YES
0	1	0	RED	YES
1	1	0	WHITE	YES
0	1	1	Non Display	NO
1	1	1	Non Display	NO

Figure 5-16. 3279 Base Field Attributes

EXTENDED FIELD AND CHARACTER ATTRIBUTES

- 3274 is customized to include the extended data stream (EDS) function
- Attached devices have the Extended Character Set Adapter (ECSA) feature

ECSA Buffer	Extended Field Attribute	Character attributes
	Attribute Character	Alphameric characters

Internal extended field and character attribute bit assignments are summarized below:

Bit	Field Description
0, 1	Extended Highlighting 00 = Normal mode (revert to extended field if character attribute) 01 = Blink 10 = Reverse video 11 = Underline
2, 3, 4	Color 000 = Default to base color (revert to extended field if character attribute) 001 = Blue 010 = Red 011 = Pink 100 = Green 101 = Turquoise 110 = Yellow 111 = White
5, 6, 7	Program Symbol selection 000 = Base character generator (revert to extended field if character attribute) 001 = APL/Text character generator 010 = PS A 011 = PS B 100 = PS C 101 = PS D 110 = PS E 111 = PS F

Figure 5-17. Extended Field and Character Attributes

X	1	U/P	A/N	D/SPD	Reserved	MDT
0	1	2	3	4 5	6	7

EBCDIC Bit	Field Description
0	- Value determined by contents of bits 2–7.
1	- Must be a 1.
2	- 0 = Unprotected - 1 = Protected
3	- 0 = Alphameric 1 = Numeric (causes automatic upshift of data entry keyboard) **Note:** *Bits 2 and 3 equal to 11 causes an automatic skip. See text.*
4 & 5	- 00 = Display/not selector-pen-detectable 01 = Display/selector-pen-detectable 10 = Intensified display/selector-pen-detectable 11 = Nondisplay, nonprint, nondetectable
6	- Reserved. Must always be 0.
7	- Modified Data Tag (MDT); identifies modified fields during Read Modified command operations. 0 = Field has not been modified 1 = Field has been modified by the operator. Can also be set by program in data stream.

Notes:

1. *Bits 0 and 1 are not decoded when received by the 3270. When characters are being transferred to the CPU, bit 1 is a 1 and bit 0 is set, depending upon the character being transferred. All attribute characters are part of the defined character set. The default option (bits 2 through 7 all set to 0) results in an unprotected, alphameric, displayed, nondetectable field.*
2. *To examine data for proper attributes and the setting or resetting of modified data tags (MDTs) use the following procedure:*
   a. *Jumper J2M13 or H2D07 to Gnd (D08). 3277s with APL Text should also jumper K2B07 to Gnd (attribute byte of "6D" will not be displayed).*
   b. *Attribute and nondisplay fields will now be displayed and can be compared with Figure 5-19.*
   c. *Remove the jumpers when completed.*

Figure 5-18. Attribute Character Bit Assignments for 3277s

Bits 2–7	Graphic	EBCDIC	ASCII
00 0000	SP	40	20
00 0001	A	C1	41
00 0010	B	C2	42
00 0011	C	C3	43
00 0100	D	C4	44
00 0101	E	C5	45
00 0110	F	C6	46
00 0111	G	C7	47
00 1000	H	C8	48
00 1001	I	C9	49
00 1010	¢ , [	4A	5B
00 1011	.	4B	2E
00 1100	<	4C	3C
00 1101	(	4D	28
00 1110	+	4E	2B
00 1111	|, !	4F	21
01 0000	&	50	26
01 0001	J	D1	4A
01 0010	K	D2	4B
01 0011	L	D3	4C
01 0100	M	D4	4D
01 0101	N	D5	4E
01 0110	O	D6	4F
01 0111	P	D7	50
01 1000	Q	D8	51
01 1001	R	D9	52
01 1010	!,]	5A	5D
01 1011	$	5B	24
01 1100	*	5C	2A
01 1101	)	5D	29
01 1110	;	5E	3B
01 1111	¬ , ^	5F	5E

Bits 2–7	Graphic	EBCDIC	ASCII
10 0000	-	60	2D
10 0001	/	61	2F
10 0010	S	E2	53
10 0011	T	E3	54
10 0100	U	E4	55
10 0101	V	E5	56
10 0110	W	E6	57
10 0111	X	E7	58
10 1000	Y	E8	59
10 1001	Z	E9	5A
10 1010	¦ (EBCDIC)	6A	C
10 1011	,	6B	2C
10 1100	%	6C	25
10 1101	_	6D	5F
10 1110	>	6E	3E
10 1111	?	6F	3F
11 0000	0	F0	30
11 0001	1	F1	31
11 0010	2	F2	32
11 0011	3	F3	33
11 0100	4	F4	34
11 0101	5	F5	35
11 0110	6	F6	36
11 0111	7	F7	37
11 1000	8	F8	38
11 1001	9	F9	39
11 1010	:	7A	3A
11 1011	#	7B	23
11 1100	@	7C	40
11 1101	'	7D	27
11 1110	=	7E	3D
11 1111	"	7F	22

Note: *The following characters are used as attribute, AID, write control (WCC), copy control (CCC), CU and device address, and buffer address. They are also used as status and sense, except when operating in BSC. When any character is received by the CU, only the low-order 6 bits are used. When any of these characters is transmitted to the program, the CU assigns the appropriate EBCDIC code. If transmission is in ASCII, the CU translates the EBCDIC code to ASCII code prior to transmission.*

For example, to use this table to determine the hex code transmitted for an attribute character, first determine the values of bits 2–7. Select this bit configuration in the table under "Bits 2–7". The hex code that will be transmitted (either in EBCDIC or ASCII) is to the right of the bit configuration.

Use this table also to determine equivalent EBCDIC and ASCII hex codes and their associated graphic characters.

Graphic characters for the United States I/O interface codes are shown. If a World Trade I/O interface code is used, refer to the IBM 3270 Information Display System: Character Set Reference *manual, GA27-2837, for possible graphic character differences.*

Figure 5-19. Control Character I/O Codes

5.5 SEQUENCE/RESPONSE DIAGRAMS, MODELS B AND D

Figures 5-20 through 5-23 give the events, in sequence, that occur during selector channel operations. The Channel column indicates Tag Out lines from the host (360 or 370). The Bus column includes Data on the Bus Out lines from the host and Data on the Bus In lines from the control unit (Model B). The Control Unit column includes Tag In lines from Models B and D. Numbers indicate sequence.

Channel (Tag Out →)	Bus	Control Unit (← Tag In)
1 – Raise Operational Out		
3 – Raise Address Out	2 – CU Address →	
4 – Raise Hold Out		
5 – Raise Select Out		6 – (Check Address)
		7 – Raise Operation In
8 – Drop Address Out		
		10 – Raise Address In
	9 – CU Address ←	
12 – Raise Command Out	11 – Command →	
		13 – Drop Address In
14 – Drop Command Out		
		16 – Raise Status In
	15 – Initial Status ←	
17 – Raise Service Out		
		18 – Drop Status In
19 – Drop Service Out		

Figure 5-20. Initial Selection

Channel (Tag Out →)	Bus	Control Unit (← Tag In)
		1 – Raise Service In
3 – Raise Service Out	2 – Data Byte* →	
		4 – Drop Service In
5 – Drop Service Out		
		6 – Raise Service In
8 – Raise Service Out	7 – Last Data Byte →	
		9 – Drop Service In
10 – Drop Service Out		
		11 – Raise Service In
12 – Raise Command Out		
		13 – Drop Service In
14 – Drop Command Out		
	15 – Ending Channel Status ←	16 – Raise Status In
17 – Raise Service Out		18 – Drop Status In
19 – Drop Service Out		20 – Raise Status In
	21 – Ending Device Status ←	
22 – Drop Hold Out and Select Out and Raise Service Out		23 – Drop Status In and Operational In

*The first data byte after the command is the Write Control character (WCC). See Figures 5-19 and 5-7.

Figure 5-21. Write–After Selection with Write Command

Channel (Tag Out →)	Bus	Control Unit (← Tag In)
	1 – Data Byte ←	2 – Raise Service In
3 – Raise Service Out		
	6 – Repeat until end of data or until host data byte count equals zero.)	4 – Drop Service In
5 – Drop Service Out		
		7 – Raise Service In
8 – Raise Command Out		
		9 – Drop Service In
10 – Drop Command Out		
	11 – Ending Status ←	12 – Raise Status In
13 – Raise Service Out		
		14 – Drop Status In
15 – Drop Service Out		
16 – Drop Hold Out and Select Out		17 – Drop Operational In

Figure 5-22. Read–After Selection with Read Command

Channel (Tag Out →)	Bus	Control Unit (← Tag In)
	1 – Sense Data ←	2 – Raise Service In
3 – Raise Service Out		
		4 – Drop Service In
5 – Drop Service Out		
	6 – Ending Status ←	7 – Raise Status In
8 – Raise Service Out		
		9 – Drop Status In
10 – Drop Service Out		
11 – Drop Hold Out and Select Out		12 – Drop Operational In

Figure 5-23. Sense–After Selection with Sense Command (Issued in Response to Unit Check Status)

5.6 STATUS AND SENSE BYTE DEFINITIONS

5.6.1 Description

Figures 5-24 through 5-28 give the 3274 Control Unit sense and status byte definitions.

Bit	Name	Condition
0	Attention (A)	Indicates a request for service from a device attached to a 3274. Set as result of certain keyboard, selector pen, or card reader activity (see Figure 5-11). Program should respond by issuing a Read Modified command (chained from a Select command if multiplexer channel) to the device requesting attention. Attention bit is also set with Unit Check bit as result of asynchronously detected equipment malfunction; in this case, program should respond by issuing a Sense command.
1	Status Modifier (SM)	Is set, with Busy bit, in initial status byte to indicate that there is pending status for a device other than the one selected.
2	Control Unit End (CUE)	Is set following a busy condition, after pending status is cleared or when control unit is no longer busy, to indicate that control unit is now not busy and is free to accept a new command.
3	Busy (B)	Is set alone in initial status byte when addressed device is busy because it is performing a print operation or an Erase All Unprotected command. Set with SM when addressed control unit is busy. When the channel addresses a device other than the one that is busy and control unit is not busy, addressed device becomes selected and the command is honored. Busy bit is also set with pending status if addressed device has such status; if pending status is for a device other than the one addressed, Status Modifier bit is also set.
4	Channel End (CE)	Indicates channel data transfer operations are completed. Is set alone (1) in initial status for Select or Erase All Unprotected command, or (2) as ending status for Write, Erase/Write, or Erase/Write Alternate command; in all cases, Device End status is sent asynchronously when device operations (command execution or control unit-to-device buffer transfer) are completed. Is set with Device End, to indicate that control unit and device operations (except printing) are completed (1) in initial status for No Operation command, (2) in ending status for Read Buffer, Read Modified, or Sense command, or (3) asynchronously if only Channel End status was pending and the device operation is completed before the channel accepts status. Is set with Device End and Unit Exception in initial status for Read or Write command if addressed device is busy executing another command.
5	Device End (DE)	Indicates that control unit and device have completed all command operations and are free to execute another command. Is set (1) in initial status for No Operation command, (2) in ending status for Read Buffer, Read Modified, or Sense command, and (3) in asynchronous status for Write, Erase/Write, Erase/Write Alternate, Select, or Erase All Unprotected command.
6	Unit Check (UC)	Is set when an irregular program or equipment condition is detected by control unit or the device. Program should always respond to Unit Check status by issuing a Sense command for further definition of condition.
7	Unit Exception (UE)	Is set in ending status (synchronous or asynchronous) when control unit has attempted to execute a command but has found, after initial status was returned, that addressed device was busy.

Figure 5-24. Status Byte Bit Assignments for 3274 Models B and D

Bit	Name	Significance
0	Command Reject (CR)	Set if the 3274-B has received and invalid command; the valid commands are listed in Figure 5-10.
1	Intervention Required (IR)	Set if a command, other than Sense, was addressed to a device that is unavailable or is in the "not ready" condition.
2	Bus Out Check (BOC)	Set if the 3274-B has detected bad parity on any command or data byte received from the channel.
3	Equipment Check (EC)	Set if: (1) the 3274-B has asynchronously detected a parity check on data received from a device in response to an internal poll for attention status (the internal poll is tried twice before CE is set), (2) a printer error occurs. If this is a device-detected condition, Unit Specify is also set.
4	Data Check (DC)	Set if: (1) the 3274-B or a device has detected bad parity on data transferred internally or between the 3274-B and a device during command operations, (2) a display has detected a cursor check, or (3) a device has detected a buffer check. If this is a device-detected condition, Unit Specify is also set.
5	Unit Specify (US)	Set if the sense bits resulted from a device-detected error.
6	Control Check (CC)	Set when the 3274-B has detected a timeout condition. (The addressed device fails to perform a specified operation or respond within a specific period of time.)
7	Operation Check (OC)	Set when the 3274-B has received a valid command or order that it cannot execute, as follows: 1. SRB, RA, or EUA order specifies an invalid buffer address. 2. Write data stream ends before all required bytes of SBA, RA, EUA, or SF order sequence are received. 3. Write, Erase/Write, or Erase/Write Alternate with Start Print bit set in WCC is chained to the next command; the print operation is suppressed.

Figure 5-25. Sense Bit Description

Status[1] (Hex)	Sense (Hex)	Display	Printer	Error Recovery Procedure	Condition
All Zeros (00)		X	X		Normal status for any command other than No Operation, Select, or Erase All Unprotected.
CE (08)		X	X		Normal status for a Select or Erase All Unprotected command.
CE, DE (0C)		X	X		Normal status for a No Operation command.
UC (02)	BOC (20)	X	X	1	A parity check was detected on the command byte.
UC (02)	IR (40)	X	X	2	A command other than Sense was addressed to a device that the control unit has recorded as "unavailable" or "not ready."
UC (02)	CR (80)	X	X	3	An invalid command was issued to control unit.
B (10)		X	X		Response to a command addressed to a device which is being serviced by the control unit or which is completing a previously issued command.
B, SM (50)		X	X		Response to a command addressed to a device other than device whose status is pending or device being serviced by the control unit.

[1] If an SIOF is executed by the channel, unchained initial status becomes ending status.

Figure 5-26. Initial Status and Sense Conditions for 3274 Models B and D

Status (Hex)	Sense (Hex)	Display	Printer	Error Recovery Procedure	Condition
CE[1] (08)		X	X		Sent at end of data stream on a Write Type command.
CE, DE[1,2] (0C)		X	X		Sent at end of data stream on a Read Type or Sense command or when channel byte count goes to a zero on a Type Read command.
CE, DE, UC[2] (0E)	BOC (20)	X	X	10	The control unit detected a parity error on a character in data stream or a Write Type command.
CE, DE, UC[1,2] (0E)	DC, US (0C)	X	X	1	Addressed device detected a parity or cursor check during a Write or Read Type command. Also, the 3274 has disabled the device due to error (UC, IR is reported on the retry since the device requires a Power On Reset to be reenabled).
CE, DE, UC[1,2] (0E)	DC (08)	X	X	1	The control unit detected a cursor or parity check during receipt of data stream on a Write Type command.[3]
CE, DE, UC[1,2] (0E)	DC (08)	X	X	10	The control unit detected a cursor, or parity check during transmission of data stream on a Read Type command.
CE, DE, UC[1,2] (0E)	CC (02)	X	X	10	Addressed device failed to respond in a specified period of time to an Erase/Write, or Erase/Write Alternate command or an unchained Read Buffer, Read Modified, or Write structured field command or the device security key was in the off position. When attached to a 3274 Model B, the addressed device was found to be in Test mode or assigned as a local copy device (UC, IR will be reported on a subsequent operation.
CE, DE, UC[1] (0E)	OC (01)	X	X	3	The 3274 B received an invalid buffer address in data stream of a Write, Erase/Write, or Erase/Write Alternate command, or data stream, or a data stream ended before providing all characters required for an SBA, RA, SF, or EUA order on a Write, Erase/Write, or Erase/Write Alternate command. Also, when the 3274 B receives a write type command with a WCC = X'88". 3274 D units only: an incorrect select command chain sequence was received. An invalid structured field in the data field of WSF.
CE, DE, UE[1,2] (0D)		X	X	9	The control unit attempted to perform a Read or Write Type command but found, after returning initial status, that the addressed device was "busy".

[1] If this status is stacked by the channel, CUE could be generated and combined with it before the stacked status is accepted by the channel.
[2] Occurs if a Start I/O Fast Release (SIOF) is executed by the channel for Select, Erase All Unprotected, or No Operation.
[3] A 3274 D unit updates the device buffer as it processes the data stream. A 3274 B unit does not change the device buffer until after the total data stream has been processed.

Figure 5-27. Ending Status and Sense Conditions for 3274 Models B and D

Status[1] (Hex)	Sense (Hex)	Display	Printer	Error Recovery Procedure	Condition
A (80)		X			An attention-generating action (e.g., program access key has been depressed) was performed by the operator, or a WSF query was issued to 3274 Model D.
DE (04)		X	X		The control unit-to-device buffer transfer is completed on a Write Type command which did not start a printer. The device becomes "not busy" after completing an Erase All Unprotected command or the printer becomes "not busy" after completing a printout. The device-to-control unit buffer transfer is completed on a Select command. A device changes from "not available" to "available" or from "not ready" to "ready". A device becomes "not busy" after having previously sent Unit Exception when the control unit attempted to execute a command with the device when it was "busy".
A, UC (82)	DC, US (0C)	X	X	1	An idle device detected a parity check or cursor check in its buffer or, an idle device on a 3274 has been disabled due to control-unit-detected errors (UC, IR will be reported on the next retry since the device requires a Power On reset).
A, DE, UC (86)	IR (40)		X	6	The addressed printer became Not Ready (out of paper or cover open) before completion of a print operation.
DE, UC (06)	IR (40)		X	6	A command attempting to start a printer found it Not Ready.
A, DE, UC (86)	IR, EC, US (54)		X	6	A printer became mechanically disabled during a printout and an automatic recovery was not successful, the printer CARRIAGE MOTOR POWER switch was off, or the switch fuse was blown.
DE, UC (06)	IR, EC, US (54)		X	6	A command attempted to start a print operation, but the printer CARRIAGE MOTOR POWER switch is turned off.
A, DE, UC (86)	EC, US (14)		X	7	A printer character generator of sync check error occurred or the printer became mechanically disabled during printout, but restored itself.
DE, UC (06)	DC (08)	X	X	10	During a Select or Write Type command the control unit (1) detected a parity or cursor error, or (2) detected a parity check on data received from the addressed device in response to an internal poll during a command.
DE, UC (06)	DC (08)	X	X	1	During a Write Type command, the control unit (1) detected a parity or cursor error, or (2) detected a parity check on data received from the addressed device in response to an internal poll during a command.
DE, UC (06)	DC, US (0C)	X	X	1	The addressed device detected a parity or cursor check while executing a Write Type or Erase All Unprotected command. Also the control unit may disable the devices because of error (UC, IR is reported on the retry since the device requires a power on reset to be re-enabled).
DE, UC (06)	OC (01)	X	X	3	A Write, Erase/Write, or Erase/Write Alternate command, containing a WCC with a Start Print bit, is chained to a subsequent command. The 3274 D received an incorrect select command chain sequence; an invalid structured field in the data stream of WSF is suspected. The 3274 D received an invalid buffer address in the data stream of a Write Type command, or the data stream ended before providing all characters required for an SBA, RA, or ELLA order on a Write Type command. A portion of the device buffer may have been changed.
DE, UC (06)	CC (02)	X	X	10	The addressed device failed to respond in a specified period of time to a Select, Write Type, or Erase All Unprotected command, or the device's security key was in the off position, a display was in Test mode, or a printer was assigned as a local copy device. (UC, IR will be reported on a subsequent operation.)
DE, UE (05)		X		9	The control unit attempted to perform a Select or Erase All Unprotected command, but found, after returning initial status, that the addressed device was busy.
CUE (20)		X	X		The control unit had been addressed while busy, but is now not busy and is free to accept a new command.

[1] If this asynchronous status is stacked by the channel, an asynchronous CUE could be generated and combined with it before the stacked status is accepted by the channel.

Figure 5-28. Asynchronous Status and Sense Conditions for 3274 Models B and D

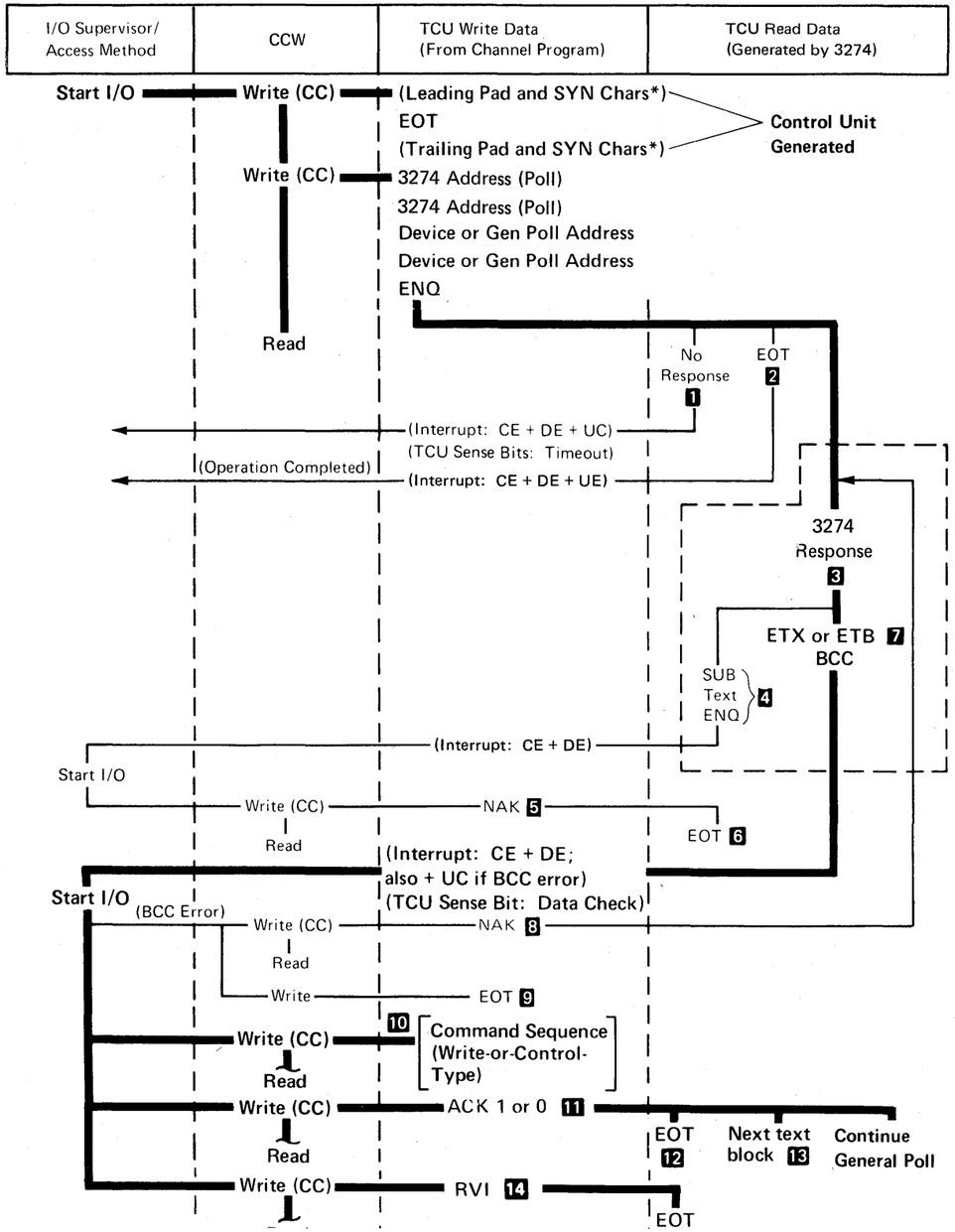
5.6.2 Error Recovery Procedures

The recovery procedures referred to in the Error Recovery Procedure column of Figures 5-26, 5-27, and 5-28 are as follows:

1. Reconstruct the entire buffer image and retry the failing chain of commands. The sequence of commands used to reconstruct this image should start with an Erase/Write command (or Erase/Write Alternate on a 3274). If, after two retries, the problem is not corrected, follow procedure 4.
2. The error indicates the device is "unavailable." Request and wait for operator intervention to "ready" the device; then, upon receipt of DE status, retry the chain of commands.
3. A nonrecoverable program error has occurred. Examine the data stream to locate the problem.
4. Request maintenance for the device that is giving trouble. After the repair, reconstruct the buffer image, starting with an Erase/Write command (or Erase/Write Alternate).
5. Record the error for future reference, and continue with the program. This error occurred while the control unit was "idle" and is not indicative of a data error.
6. The error indicates the printer is out of paper, has the cover open, or has a disabled print mechanism. Request operator intervention to "ready" the printer; then, upon receipt of DE status, retry the print operation by issuing a Write command with the proper WCC and no data stream. (There is no data error; the data is still intact in the device buffer and can be reused.) If this procedure is unsuccessful, follow procedure 1.
7. The error occurred during a printout and indicates either a character generator or sync check error or a disabled print mechanism. There is no buffer data error. The proper error recovery procedure is application-dependent since the user may or may not want a new printout. Because the buffer contents are still good, procedure 6 may be followed.
8. A data error occurred at the device during a printout. This indicates a data error at the device; procedure 1 should be followed.
9. A device is busy but the control unit was not informed of this in time to respond with Busy status in the Initial Status byte. A DE status will be generated asynchronously when the device becomes not busy. After the DE is received, retry the chain of commands that was being executed when the Unit Exception (UE) status was received.
10. Retry the failing chain of commands. If, after two retries, the problem is not corrected, follow procedure 4.

5.7 SEQUENCE/RESPONSE DIAGRAMS, MODEL C, BSC

Figures 5-29 through 5-33 provide the sequences and responses that occur during online BSC operation of the 3274 Model C.



Notes:

1. The 3274 will fail to respond to the addressing or polling sequence, causing a TCU timeout, for any of the following reasons:
   - The 3274 is "unavailable" (has power off, is "offline", or is not attached).
   - Any character in the polling sequence is invalid.
   - The characters in the polling sequence are out of order.
   - The polling sequence is incomplete (less than seven characters).
   - The 3274 address is incorrect in the write data stream.
   - The addressed 3274 was left selected from the previous transmission.
2. There is no I/O pending or pending status. For General Poll, the CU sends EOT only after polling all devices.
3. The device response is a function of the kind of device and its status. Types of responses include Text, Status, and Test Request messages.

   For General Poll, the search for a response starts at some random device address and continues sequentially (as long as ACKs are received in response to text transmissions) until all devices are given the opportunity to respond.
4. Upon detection of an internal parity check or a cursor check, the 3274 (1) substitutes the SUB character for the character in error, (2) records Data Check status, and (3) transmits an ENQ in place of ETX (or ETB) and BCC at the end of the text block. The general poll process is stopped.
5. Mandatory program response to a text block terminated in ENQ.
6. Terminates the operation. The nature of the error (parity or cursor check) does not warrant a retry. This response indicates that status and sense information is stored.
7. ETB is used to frame each block of a blocked text message, except the last block. ETX is used to frame the last block of a blocked text message.
8. BCC error has been detected. The program issues NAK to cause the 3274 to repeat its last transmission.
9. Response issued by the program to terminate the operation if the TCU is unsuccessful in receiving a valid BCC following "n" attempts by the 3274 to transmit the message. This response does not cause the 3274 to reset its sense/status information. Therefore, the same status message will be transmitted if a Specific Poll is immediately issued to the same device.
10. This transmission must be a write or control-type command sequence. A read-type command would violate BSC standards on Limited Conversational mode.

    For General Poll, this transmission stops the polling operation. The General Poll must be reinitiated to ensure receipt of all pending device messages.
11. Positive acknowledgment. The text block has been successfully received by the TCU. The program issues ACK 1 in response to the first and all odd-numbered text blocks and issues ACK 0 in response to the second and all even-numbered text blocks.
12. Normal termination of a Specific Poll.

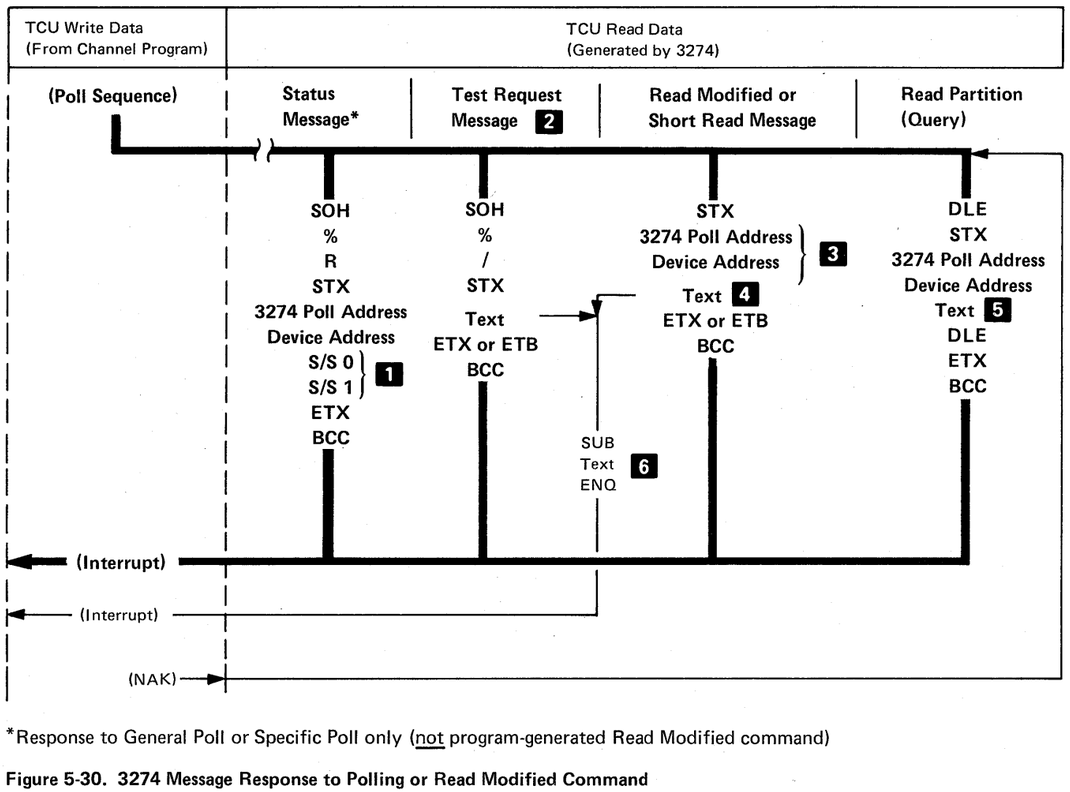
    Normal termination of a General Poll.
13. The second and all succeeding text blocks are framed as the first except they do not include the 3274/device address sequence.
14. RVI to terminate polling sequence.
15. Termination of polling sequence on receipt of RVI.

LEGEND:

(CC) = Chain Command (CC) Flag in CCW is set to 1.

(Interrupt) = TCU-generated interrupt (CE = Channel End, DE = Device End, UE = Unit Exception, UC = Unit Check).

*Only the critical framing characters (sync pattern and pad) are shown. All other framing characters are also hardware-generated as required. See SL *General Information - Binary Synchronous Communications,* GA27-3004, for a complete description.



*Response to General Poll or Specific Poll only (not program-generated Read Modified command)

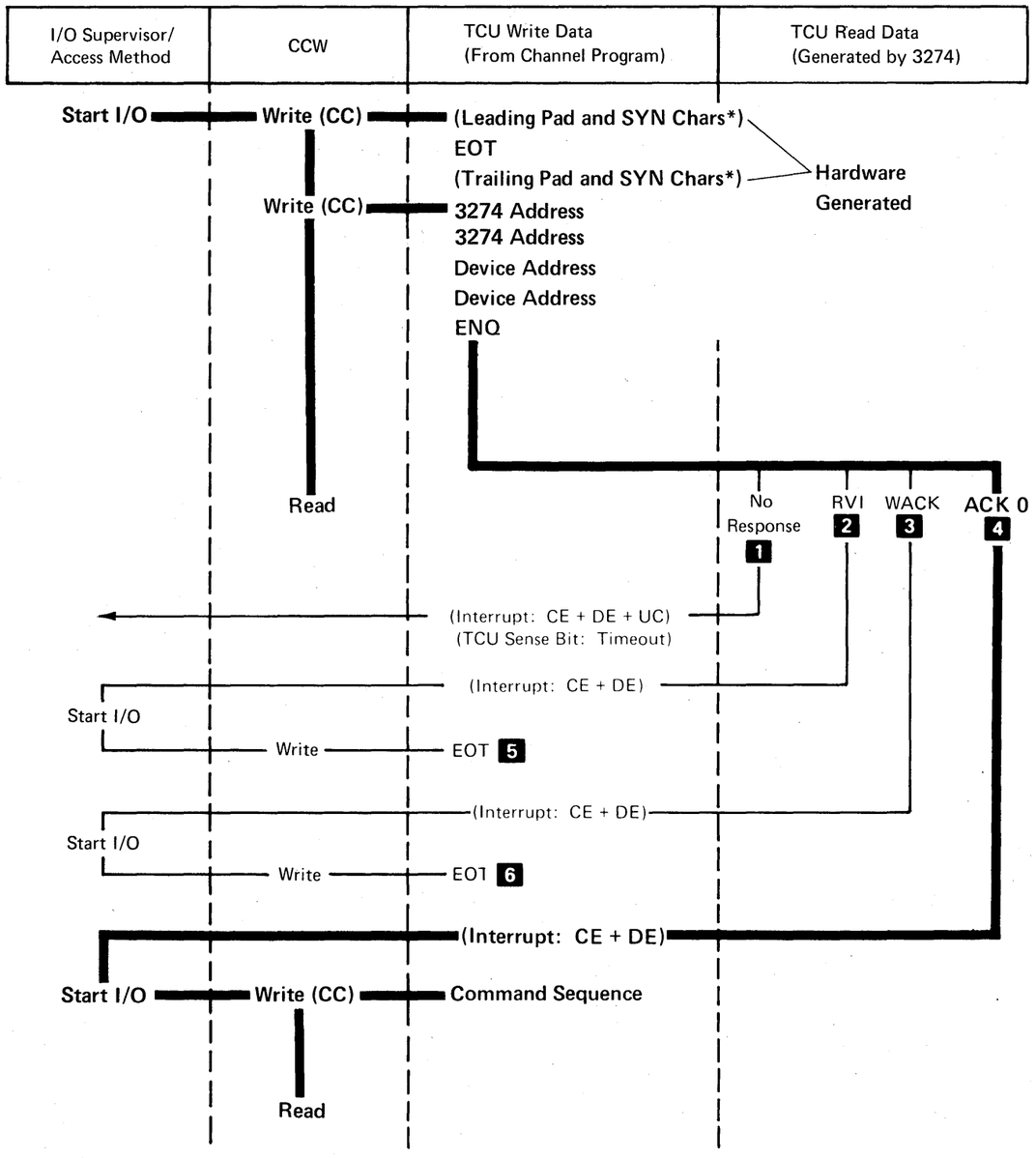
Figure 5-30. 3274 Message Response to Polling or Read Modified Command

Notes:

1. A status message response is issued to a General or Specific Poll if (1) the 3274 has pending status (General Poll ignores Device Busy and device "unavailable" and, if the 3274 continues polling of next device), or (2) if error status develops during execution of the poll.
2. A Test Request Message response is issued to a General or Specific Poll if a TEST REQ key is pressed at the keyboard of a polled 3277, or if a SYS REQ key is pressed at a Category A display attached to a 3274.
3. This address is included only in the first block of a blocked text message.
4. The text portion of this message is the result of either a Read Modified or Short Read operation by the 3274.
5. The text portion of this message is the result of a Read Partition (Query) structured field function.
6. Inbound abort error occurred on device after first block sent to host.

LEGEND:

(Interrrupt) = TCU-generated interrupt.



*Only the critical framing characters (sync pattern and pad) are shown. All other framing characters are also hardware-generated as required. See SL *General Information — Binary Synchronous Communications,* GA27-3004, for a complete description.

Figure 5-31. Selection Addressing, Sequence/Response Diagram

Notes:

1 The 3274 will fail to respond to the addressing or polling sequence causing a TCU timeout, for any of the following reasons:

- The 3274 is "unavailable" (has power off, is "offline," or is not attached).
- Any character in the polling sequence is invalid.
- The characters in the polling sequence are out of order.
- The polling sequence is incomplete (less than seven characters).
- The 3274 address is incorrect in the write data stream.
- The addressed 3274 was left selected from the previous transmission.

2 The addressed device has pending status (excluding Device Busy or Device End).

3 The addressed 3274 is busy. No S/S information is stored. An RVI response takes precedence over a WACK response.

4 The address has been successfully received and no status is pending.

5 Termination of attempted addressing sequence:

Availability of valid status and sense information cannot be ensured unless a Specific Poll is issued to the responding device as the next addressing sequence issued to this 3274.

6 Termination of attempted addressing sequence.

LEGEND:

(CC) = Chain Command (CC) Flag in CCW is set to 1.

(Interrupt) = TCU-Generated interrupt (CE = Channel End, DE = Device End, and UC = Unit Check)

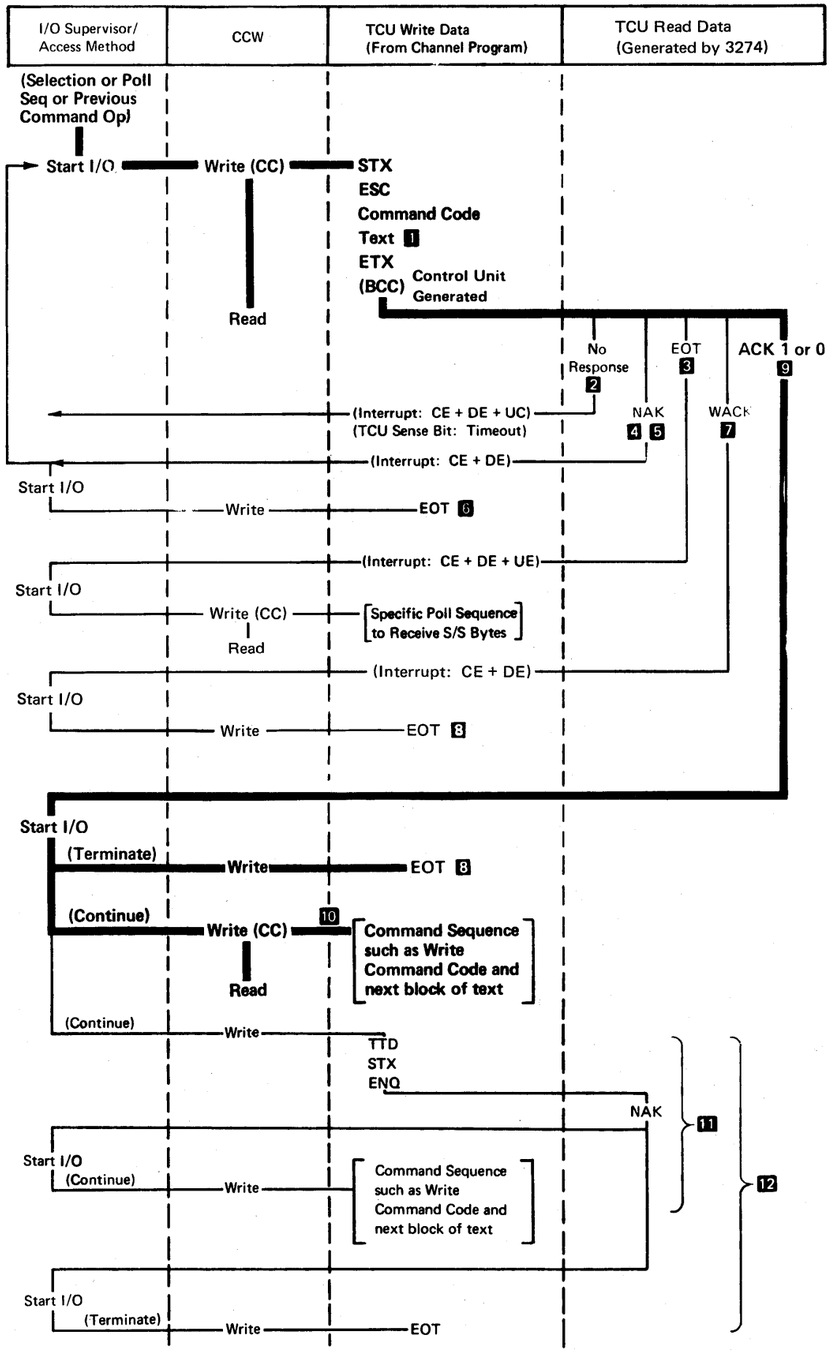


Figure 5-32. Write-Type and Control-Type Commands, Sequence/Response Diagram

Notes:

1. No text is transmitted on an EAU command transmission.
2. Command transmission was not successfully received because of invalid framing (STX missing). Causes a timeout at TCU.
3. The control unit is unable to perform the operation indicated in the command transmission because of a busy/unavailable/not ready device or one of the following:
   a. receipt of an illegal command/order sequence,
   b. failure to decode a valid command.
   c. an I/O interface "overrun",
   d. a parity/cursor check,
   e. an illegal buffer address, or
   f. a locked buffer.

   In the case of the Copy command, the "from" device is busy or has locked buffer, or CCC is missing.

   The EOT response to a command transmission indicates that status information is stored in the control unit. To ensure retrieval of valid status, the program must issue a Specific Poll (addressing the device that was selected when EOT was generated) as the next addressing sequence to this control unit. Successful completion of a Specific Poll addressed to the responsing device, a device selection addressed to any other device on the same control unit, or a General Poll addressed to the same control unit, is required to restart the internal control unit device polling operation.
4. If a transmission problem causes both a 3274-detected check condition and a BCC error, the BCC error takes precedence over all other check conditions, and a NAK is transmitted to the TCU.
5. BCC error or missing ETX has been detected. The NAK response requests the program to repeat its last transmission.
6. Response issued by the program to terminate the operation if the 3274 is unsuccessful in receiving a valid BCC following "n" attempts by the program to transmit the message.
7. If the Start Printer bit is set in the WCC or CCC, a WACK response indicates that the text transmission was successfully received, but that the printer is now busy and an additional chained command cannot be accepted.

   If any of the conditions cited in Note 3 prevail, the EOT response takes precedence over the WACK response.
8. Normal termination of the operation by the program.
9. Command execution has been successfully completed.
10. Repeat the operation shown in this figure for the next command sequence.
11. Example of a Temporary Text Delay (TTD) sequence.
12. Example of terminating an operation using TTD (a forward abort sequence).

LEGEND:

(CC) = Chain Command (CC) Flag in CCW is set to 1.

(Interrupt) = TCU-generated interruption (CE = Channel End, DE = Device End, UE = Unit Exception, UC = Unit Check).

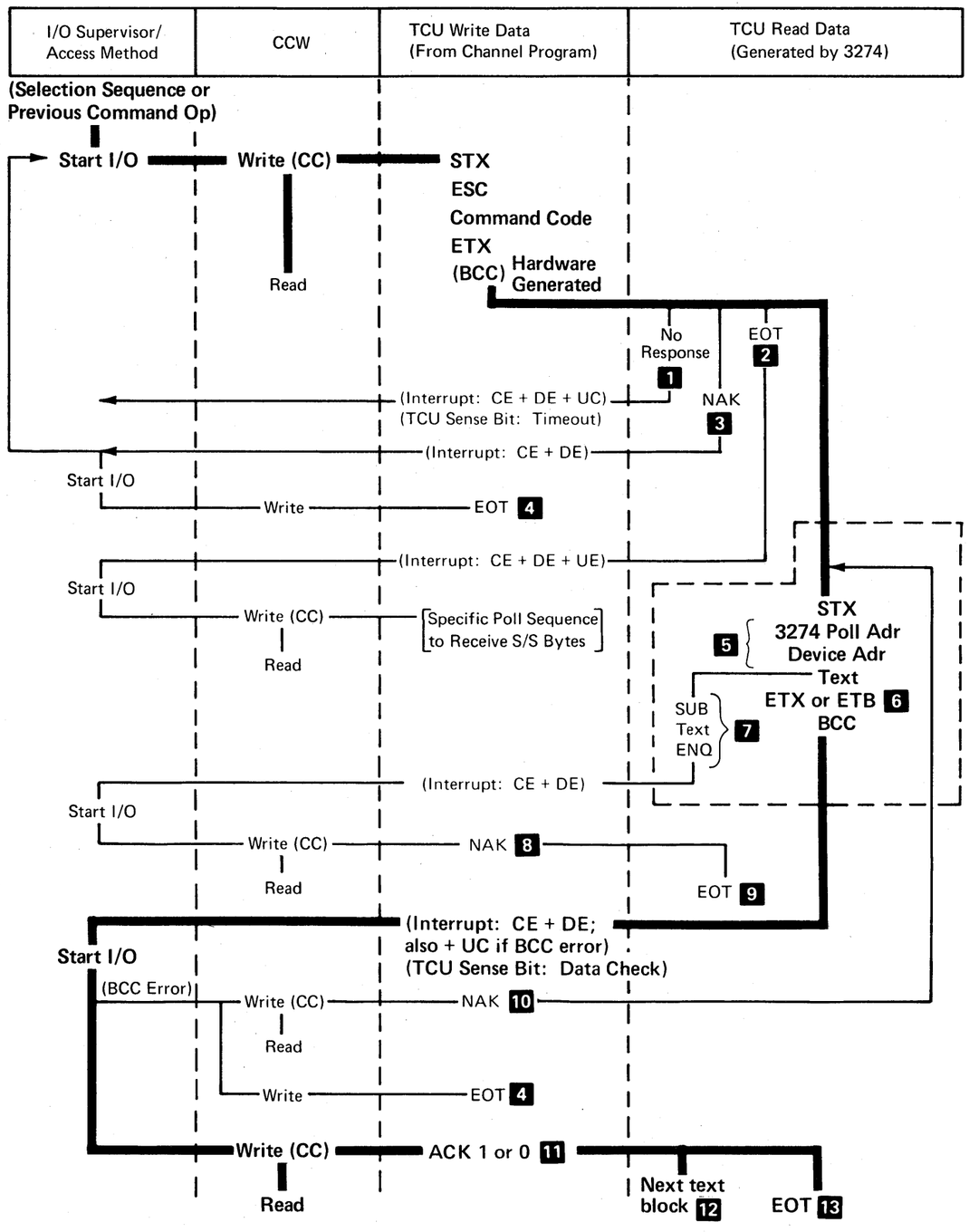


Figure 5-33. Read-Type Command, Sequence/Response Diagram

Notes:

1. Command transmission was not successfully received because of invalid framing (STX missing). Causes timeout at TCU.
2. The 3274 is unable to perform the operation indicated in the command transmission because of a busy/unavailable/not ready device or a 3274 detected check condition (receipt of an illegal command/order sequence, failure to decode a valid command, or an I/O interface "overrun"). The EOT response to a command transmission indicates that status information is stored in the 3274. To ensure retrieval of valid status, a Specific Poll must be issued to the device-responding EOT as the next addressing sequence issued to this 3274.
3. If a transmission problem causes both a 3274-detected check condition and a BCC error, the BCC error takes precedence over all other check conditions, and a NAK is transmitted to the TCU.
4. Response issued by the program to terminate the operation if the 3274 is unsuccessful in receiving a valid BCC following "n" attempts by the program to transmit the message.
5. This address sequence is included only in the first block of a blocked text message.
6. ETB is used to frame each block of a blocked text message, except for the last block. ETX is used to frame the last block of a blocked text message.
7. Upon detection of an internal parity check, the 3274 automatically substitutes the SUB character for the character in error. If a parity or cursor is detected, ENQ is transmitted in place of ETX (or ETB) and BCC at the end of the text block and appropriate status and sense information is stored. This is used by the 3274 if, after the first block has been transmitted, the transmission cannot be completed because of power being off at the terminal.
8. Mandatory program response to a text block terminated in ENQ.
9. Response to terminate the operation. The nature of the error (parity or cursor check) does not warrant a retry. This response indicates that appropriate status and sense information is stored. The status retrieval information included in Note 2 applies.
10. BCC error has been detected. The program issues NAK to cause the 3274 to repeat its last transmission.
11. Positive acknowledgment. The text block has been successfully received by the TCU. The program issues ACK 1 in response to the first and all odd-numbered text blocks and issues ACK 0 in response to the second and all even-numbered text blocks. This response to a text block terminated in ETX turns on the device SYSTEM AVAILABLE indicator.
12. The second and all succeeding text blocks are framed as the first except that they do not include the 3274/device address sequence.
13. Normal termination of the operation following transmission of the last text block.

LEGEND:

(CC) = Chain Command (CC) Flag in CCW is set to 1.

(Interrupt) = TCU-generated interrupt (CE = Channel End, DE = Device End, UE = Unit Exception, UC = Unit Check)

5.8 REMOTE STATUS AND SENSE BYTE DEFINITIONS, MODEL C, BSC

Figures 5-34 through 5-36 provide status and sense byte definitions, responses, conditions, and error recovery procedures for the 3274 Model C, BSC.

Bit No.	Bit Definition
	S/S Byte 0:
0	Dependent upon setting of bits 2-7.
1	Always a 1.
2	Reserved.
3	Reserved.
4	*Device Busy (DB)* — This bit indicates that the addressed device (except the 3278) is busy executing an operation or that a busy detection was previously made by a command or Specific Poll. The device is busy when it is executing an Erase All Unprotected command or a print operation, accepting data from the Operator Identification Card Reader, or performing various keyboard operations (Erase Input, Backtab, and Clear). This bit is set with Operation Check when a Copy command is received which specifies a "busy" device with its "from" address. This bit is set with Unit Specify when a command is addressed to a busy device. This can occur by chaining a command to a Write, Erase/Write, Erase/Write Alternate, or Copy command which started a Printer or by chaining a command to a Specific Poll addressed to a busy device. **Note:** DB is not returned for the 3278 when executing an Erase All Unprotected command, accepting data from the MSR, or performing Erase Input, Backtab, or Clear keyboard operations.
5	*Unit Specify (US)* — This bit is set if any S/S bit is set as a result of a device-detected error or if a command is addressed to a busy device.
6	*Device End (DE)* — This bit indicates that the addressed device has changed from unavailable to available and not ready to ready, or busy to not busy. This bit is included during a Specific or General Poll but is not considered pending status by a Selection Addressing sequence. If a Selection Addressing sequence detects that the addressed device has pending status and also detects one of the above status changes that warrants a Device End, then the Device End bit is set and preserved along with the other pending status, and an RVI response is made.
7	Reserved
	S/S Byte 1:
0	Dependent upon setting of bits 2-7.
1	Always a 1.
2	*Command Reject (CR)* — This bit is set upon receipt of an invalid 3270 command.
3	*Intervention Required (IR)* — This bit is set if: • A Copy command contains a "from" address in its data stream which specifies an unavailable device. • A command attempted to start a printer but found it not ready. The printout is suppressed. • The 3274 receives a Selection Addressing Sequence or a Specific Poll sequence for a device which is unavailable or which became not ready during a printout. A General Poll sequence does not respond to the unavailable/not ready indication and proceeds to determine the state of the next device. • The 3274 receives a command for a device which has been logged as unavailable or not ready.
4	*Equipment Check (EC)* — This bit indicates a printer character generator or sync check error occurred, the printer became mechanically disabled, or a 3274-detected bad parity from the device.
5	*Data Check (DC)* — This bit indicates the detection of a parity check in a device buffer or a 3274 operation to a device was unsuccessful (i.e., the device was disabled with DC returned to the host; IR will be returned on subsequent retry by the host).
6	Reserved
7	*Operation Check (OC)* — This bit, when set alone, indicates one of the following: • Receipt of an illegal buffer address or of an incomplete order sequence on a Write, Erase/Write, or Erase/Write Alternate command. • The device did not receive a CCC or a "from" address on a Copy command. • Receipt of an invalid command sequence. (ESC is not received in the second data character position of the sequence.) • An I/O Interface "overrun". This occurs if the internal buffering capability is exceeded. This bit is set with Unit Specify to indicate that the "from" address on a Copy command specified a device with a "locked" buffer (the device data is secure).

Figure 5-34. Remote Status and Sense Byte Definitions, BSC

Device Response	Command	S/S Explanation
RVI	Selection	Outstanding Status — Pending information from a previous operation with the same device. (If the addressed device is busy, WACK is sent to the TCU instead of RVI, and no S/S bit is set.) **Note:** A Selection Addressing sequence does not recognize a Device End as pending status. If there is no other pending status, it resets this bit and proceeds with the selection. If the addressed device has other pending status, Device End remains set with it, and the RVI response is made as usual. IR — The addressed device is unavailable. DE, EC, US — A character generator or syn check error has occurred, or the printer was mechanically disabled but the condition has been corrected. DE, EC, US is not sent by the 3287 or 3289. DE, IR — The addressed printer is out of paper, its power has been turned off, or its cover is open. DE, IR, EC, US — The addressed printer is mechanically disabled and cannot recover. DE, DC, US — A parity error is detected at the printer. DC, US — An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On Subsequent retry by the host, IR will be returned to the host.
EOT	Read Commands	CR — Invalid 3270 command is received. OC — Invalid command sequence (ESC is not in the second data character position), or data follows the command in the data stream received at the device. DB, US — The addressed device is busy. The command was chained to a Write, Erase/Write, Erase/Write Alternate, or Copy command which started a print, or it was chained to a Specific Poll. DB, US, DE — Not used for the 3274. IR — A command is addressed to an unavailable device. DC — The 3274 is unable to complete a Read command operation after the first block has been sent to the host, because either there was an error in the terminal or the terminal was powered off after the first block was sent. A SUB character and an ENQ character are placed in the buffer. When the TCU responds NAK, the 3274 responds EOT. DC, US — An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On subsequent retry by the host, IR will be returned to the host.
EOT	Write Commands	CR — An invalid or illegal 3270 command is received. OC — An invalid command sequence (ESC is not in the second data position), an illegal buffer address or an incomplete order sequence is received, or a data byte was sent to the device during the Write command before the operation required by the previous data byte was completed. DC, US — An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On subsequent retry by the host, IR will be returned to the host. DB, US — The addressed device is busy. The message is accepted but not stored in the 3274 buffer. The command is aborted.

Figure 5-35. Remote Error Status and Sense Responses, BSC

Device Response	Command	S/S Explanation
EOT	Copy Command	DB, OC — The "from" device is busy. (The device is busy executing an operation, a printout, reading data from the Operator Identification Card Reader, or performing a keyboard operation.) The Copy command is aborted. IR, OC — The "from" device is not available. OC, US — The "from" device has a locked buffer. OC — The data stream contains other than two bytes (the CCC and the "from" address). The command is aborted. OC — The "from" device buffer is larger than the "to" device buffer. OC — The buffer of the "from" device (has APL Text Feature) contains APL text characters (entered since an Erase/Write or Erase/Write alternate command or a Clear key operation) and the "to" device does not have the APL text feature. DC, OC, US — Set when "from" device detects an internal parity or cursor check. An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On subsequent retry by the host, IR will be returned to the host. DB, US — The addressed "to" device is busy. DB, US, OC — The addressed "to" device is also specified as the "from" device and is busy. DB, US, OC, DE — The addressed device becomes not busy before a specific poll is issued to retrieve the DB, US, OC status (described above).
EOT	Write, Erase/Write, Erase/Write Alternate, Copy Commands	IR — Addressed device is not available, or addressed printer is not ready.
EOT	Erase All Unprotected Command	OC — One or more data bytes followed the command (buffer overrun).
	Specific and General Poll	DE, IR, EC, US — An unrecoverable mechanical failure is detected at the printer. DE, EC, US — A character generator or sync check error or a mechanical failure is detected at a 3284/3286/3288 printer but then recovered from. DC, US — An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On subsequent retry by the host, IR will be returned to the host. DC — The 3274 is unable to complete a Read command operation after the first block has been sent to the host, because either there was an error in the terminal or the terminal was powered off after the first block was sent. A SUB character and an ENQ character are placed in the buffer. When the TCU responds NAK, the 3274 responds EOT. DE — The poll finds a device (1), previously recorded as busy, now not busy or, (2), previously recorded as unavailable *or* not ready, now available *and* ready. IR, DE — The poll finds a device, previously recorded as ready, available, and busy, now not ready and not busy, or the printer went not ready during a printout. DC, US, DE — A parity error is detected at printer.
	Specific Poll	DB — The addressed device is busy.
NAK	Read and Write Commands	NAK is transmitted by the 3274 when it detects a Block Control Character (BCC) error on the TCU transmission. A BCC error has priority over all other detectable error conditions. If, for example, a BCC error and a parity error are detected during the same command transmission, the parity error condition is reset, and a NAK response is set by the 3274.

Sense/ Status Bits	Detected during 3270 Operation: Hex EBCDIC	Hex ASCII	Selection Addressing Sequence	Specific Poll Sequence	General Poll Sequence	3270 Command	Transmitted in Response to: Specific Poll	General Poll	Error Recovery Procedure 3274
CR	40 60	20 2D				D, P	D, P		6
OC	40 C1	20 41				D, P	D, P		6
OC, US	C4 C1	44 41				D, P	D, P		12
IR	40 50	20 26	D, P	D, P		D, P	D, P		4
IR, OC	40 D1	20 4A				D, P	D, P		5
DC	40 C4	20 44	D, P	D, P	D, P	D, P	D, P	D, P	1
DC, US	C4 C4	44 44	D, P	D, P	D, P	D, P	D, P	D, P	2
DC, OC, US	C4 C5	44 45				D, P	D, P		3
DC, US, DE	C6 C4	46 44		P	P		P	P	8
IR, DE	C2 50	42 26		P	P		P	P	4
EC, US, DE	C6 C8	46 48		P	P		P	P	7†
IR, EC, US, DE	C6 D8	46 51		P	P		P	P	7
DB	C8 40	48 20	D, P	D, P			D, P		9
DB, US*	4C 40	3C 20				D, P	D, P		10
OC, DB*	C8 C1	48 41				D, P	D, P		11
DE	C2 40	42 20		D, P	D, P		D, P	D, P	None

Note: The attached device errors that are detected asynchronously do not cause a Sense bit to set until the device is polled for status during a Selection Addressing, Specific Poll, or General Poll sequence. Those error S/S bit combinations that contain DE were detected during a printout.

*The DB, US, and OC S/S bits will be combined if a Copy command is addressed to a busy "to" device and the command also specifies the "from" device the same as the "to" device.

†Occurs only if 3284, 3286, 3288 Printers are attached.

Legend:
D — Display (3178, 3277, 3278, 3279)
P — Printer

Figure 5-36. Remote 3270 BSC Status and Sense Conditions

5.8.1 Error Recovery Procedures, Model C, BSC

1. Execute a new address selection addressing sequence and retransmit the message, starting with the command sequence that was being executed when the error occurred. If, after two retries, the operation is not successful, this should be considered as a nonrecoverable error. Follow supplementary procedure B after two retries.
2. Reconstruct the entire device buffer if possible, and retry the failing chain of commands (within the BSC sequence of operations). The sequence of commands used to reconstruct the buffer should start with an Erase/Write or Erase/Write Alternate command. If the information in the screen buffer is such that it cannot, or need not, be reconstructed, the operation may still be retried. If an unrecoverable Category A display buffer error is detected, the entire buffer is cleared and the host system is informed of the error by receiving DC, US status but is not informed of the clear operation. If, after three retries, the operation is not successful, this should be considered as a non-recoverable error. Follow supplementary procedure A.

Programming Note: *A cursor check in the 3284 is indistinguishable from a second selection to a 3277 with a cursor check. A selection addressing sequence or poll sequence to another device on the same control unit should be attempted before flagging the control unit as inoperative. A successful sequence indicates that the CU is probably satisfactory, and the device requires manual intervention to reset it (for example, a 3277 with a nonrecoverable data check). An unsuccessful sequence indicates that the CU may be at fault and requires manual intervention to reset it.*

3. The error occurred during execution of a Copy command. Execute procedure 2, except that it is the buffer of the "from" device specified by the Copy command that should be reconstructed. After three retries, follow supplementary procedure B.
4. The error indicates that the printer is out of paper, has its cover open, or has a disabled print mechanism; or it indicates that the device is unavailable. Request (or wait for) either the display or system operator to ready the device. Then, retry the printout by issuing a Write command with the proper WCC and no data stream. (There is no data error, and the data is still intact in the device buffer and can be reused.) Or, follow procedure 2.
5. The error indicates that the "from" device specified by a Copy command is unavailable. Note that the device address associated with the error status and sense information does not indicate the device that actually required "readying." The device that requires the corrective action is the device specified by the "from" address in the Copy command. When the device is determined and made "ready," follow procedure 1.
6. The operation should be tried up to six times. Continued failure implies an application programming problem, which can be detected by analyzing the failing write data stream.
7. The error occurred during a printout operation and indicates either a character-generator error or a disabled print mechanism. There is no data error. The proper error recovery procedure is application-dependent since the user may or may not want a new printout. If a new printout is required, follow procedure 4.
8. A data error occurred in the device buffer during a printout, and procedure 2 should be followed.
9. A Specific Poll detected that the addressed device is busy. Periodically issue a Specific Poll to pick up the Device End sense/status bit sent by the device when it becomes not-ready (unless this status change is detected on a selection addressing sequence).
10. Indicates that a command was erroneously addressed to a busy device. Periodically issue a General or Specific Poll to pick up the Device End sense/status bit sent by the device when it becomes not busy. Then follow procedure 1.
11. Indicates that, in attempting to execute a Copy command, the "from" device was found to be busy. Follow procedure 1 when the "from" device becomes not busy. Note that the device address associated with the status and sense message is the address of the "to" device and not that of the busy "from" device. The "from" device will transmit Device End via a Specific or General Poll when it becomes not busy.
12. An attempt was made to execute a Copy command, but access to the "from" device data was not authorized. The device address associated with the error sense/status bits is that of the Copy "to" device.

5.8.2 Supplementary Procedures

A. Request maintenance for the device that is giving trouble. After repair, reconstruct the screen buffer image. The sequence of commands used to reconstruct this image should start with an Erase/Write command. Retry the failing chain of commands according to the procedure that referred you to this supplementary procedure.
B. The "from" device specified by the Copy command in the failing chain of commands (CCWs) is malfunctioning. The "from" device should be determined from the data-stream information, and maintenance should be requested for the device. After the repair, reconstruct the buffer image. The sequence of commands used to reconstruct this image should start with an Erase/Write command. Retry the failing chain of commands according to the procedure that referred you to this supplementary procedure.
C. Same as procedure 1, except a new selection addressing sequence is not performed, and this message is transmitted as part of the present device selection.
D. Same as procedure 1, except retransmit the entire failing chain of commands.

5.9 MODEL A, LOCAL ATTACHMENT (SNA VERSION)

The following information is given for the 3274 Model A:

- Commands
- Status and sense byte definitions
- Error-recovery procedures

5.9.1 Commands

Figure 5-37 gives the 3274 Model A command codes.

Command	Code
Write	01
Read	02
NOP	03
Sense	04
Control	05
Write Break	09
Write Start 0	31
Read Start 0	32
Write Start 1	51
Read Start 1	52
Restart Reset	93
Sense ID	E4

Figure 5-37. 3274 Model A Local Command Codes

5.9.1.1 Write Command

The Write command requests data transfer from the host. A minimum of four bytes, called the data count field, must be transmitted in a specific format:

- Bytes 0 and 1 must contain the total byte count of the record that is being transferred.
- Bytes 2 and 3 are undefined and not used.
- SNA data

5.9.1.2 Read Command

The Read command requests data transfer to the host. The format of the data is:

- Link Header* consisting of:
  - — Data count field (four bytes)
  - — Pad characters (n bytes)

  *The size of the link header is determined by the connect. (See 5.9.1.5.)
- SNA data

5.9.1.3 No Operation Command

This command does not transfer data. Ending status to this command does not reflect any change within the 3274 Model A. Normal System/370 use inserts NOP in a CCW string for possible later dynamic program modification, or as a stand-alone command for checking availability of the channel path to the control unit. In addition, the NOP command may be used as the ending command in the Read CCW, Write CCW, and Write-Read CCW sequences.

5.9.1.4 Sense Command

This command is normally issued after unit-check status has been presented to the host, and requests 2 bytes of sense data. The sense bits are predictable and meaningful only after presentation of unit-check status. The sense bits are retained for possible re-reading until a command other than Sense or NOP is accepted.

5.9.1.5 Control Command

The Control command provides two functions to the 3274 Model A: Connect and Disconnect

5.9.1.5.1 Connect Function: The host Physical Unit Services issues a Control command (05) to send initialization parameters to the Model A.

The data stream consists of the following 10 bytes:

Byte	0	1	2	3	4	5	6	7	8	9
Content	1	1	RSVD	FUNC CODE	No. of Host Buffers		Size of Host Buffers		S-P Link Header	

11 = '000A'X	— Total number of bytes
Reserved = '00'X	— Not used
Function Code = '01'X	— CONNECT function code
Number of Host Buffers	— The number of buffers contained in each host Read channel program. Used to determine the maximum number of basic transmission units (BTUs) that the 3274 Model A may send to the host with each Start I/O command.
Size of Host Buffers	— The total number of bytes the 3274 Model A may send with each Read CCW. The total length is the sum of the path information unit and S to P link header, including pad characters.
Secondary to Primary Link Header Size	— Specifies the total length of the S-P link header. This length consists of the 4-byte fixed portion of the link header plus "n" pad characters. All S to P PIUs are preceded by 4+n bytes.

The 3274 Model A determines that these parameters are acceptable when the size of the host buffer is large enough to accommodate the link header (LH), the pad, the transmission header (TH), the request header (RH), and at least 64 bytes of data (RU), and the host buffer is an even number of bytes.'

Rejection of the CONNECT function code will be a status of DE, UC, and Sense NI (not initialized) to the next command received by the control unit. Command Reject (CR) may also be set according to the type of command received.

Receipt of a Connect Function code while already connected will cause the 3274 Model A to reset the physical unit to active. A new ACTPU sequence is required.

5.9.1.5.2 Disconnect Function: The host Physical Unit Services issues a Control command (05) that sends to the 3274 Model A control unit a disconnect function. The NI sense bit will be set.

The contents of the 4-byte data stream are:

Byte	0	1	2	3
Content	1	1	Reserved	Function Code

11 = '0004'X — Total number of bytes
Reserved = '00'X — Not used
Function Code = '02'X — Disconnect function code

*The data stream can be larger than 4 bytes, but only 4 bytes are used and the rest are ignored. The number of bytes sent must agree with the length in the data count field.

5.9.1.6 Write Break Command

This command must be used as the last Write command in all Write CCW sequences. If only one write CCW is to be issued, it must be the Write Break command. This command includes all the functions shown for the Write command.

5.9.1.7 Write Start 0 Command

All data from the host is sent by a Write CCW sequence. A Write Start command initializes the sequence. No data is transferred for this command. It attempts to set the Write Start indicator, which is used as a reference for data sent from the host.

All data from the host in a chained command CCW string is under the envelope of a preceding Write Start 0 command. The data is considered valid, that is, no need for retransmission, when the control unit receives a Write Start 1 command. "New" data is transmitted only when the Write Start 1 command is accepted by the control unit.

Note that new data is transmitted when a Restart Reset immediately precedes a Write Start 0. The Write Start command attempts to change the Write Start indicator state. The indicator is not changed if the command is not accepted, or Unit Exception (UE) is part of the ending status.

5.9.1.8 Read Start 0 Command

All data is received by the host via a Read CCW sequence, which is initialized by a Read Start command. This sequence will be considered fully completed by the 3274 Model A upon receipt of a subsequent alternate Read Start command. New data is transmitted when a Restart Reset command immediately precedes a Read Start 0 command. No data is transferred for this command.

5.9.1.9 Write Start 1 Command

This command is similar to the Write Start 0 command. It attempts to change the Write Start indicator from the alternate setting of the Write Start 0 command. In other respects the two commands are the same.

Note that "old" data is retransmitted when a Restart Reset command immediately precedes a Write Start 1 command.

5.9.1.10 Read Start 1 Command

This command complements the Read Start 0 command.

Previous (old) data is retransmitted when this command follows a Restart Reset command.

5.9.1.11 Restart Reset Command

Data is not transferred with this command. Restart Reset is used to reset the 3274 Model A Read Start and Write Start indicators to logical zero. Previously transmitted data is subject to retry if the Restart Reset command is followed by a Read Start 1 command or a Write Start 1 command. (That is, improper usage may result in duplicate or lost data.) Ending status does not reflect the inability of the 3274 Model A to transfer data to/from the control unit.

5.9.1.12 Sense ID Command

This command requests data transfer to the host. Four bytes of data are sent as follows:

Byte 0 — FF
Byte 1, 2 — 3274
Byte 3 — Model A

The Sense ID command is honored when the 3274 Model A is in the following state:

- Power on
- IML completed
- Online
- Not busy
- No outstanding status to be presented

5.9.2 Status and Sense Definitions

Figures 5-38 and 5-39 define the status and sense bits, respectively.

Bit	Name
0	A — Attention
1	SM — Status Modifier
2	CUE — Control Unit End
3	B — Busy
4	CE — Channel End
5	DE — Device End
6	UC — Unit Check
7	UE — Unit Exception

Figure 5-38. Status Definitions

Bit	Name
0	CR — Command Reject
1	IR — Intervention Required (not used)
2	BOC — Bus Out Check
3	EC — Equipment Check
4	DC — Data Check
5	— — (not used)
6	NI — Not Initialized
7	— — (not used)
8	DLC — Data Length Check
9	DR — Data Reject (not used)
10	— — (not used)
11	— — (not used)
12	PCM — Parity Check Modifier
13	PC1 — Parity Check 1
14	PC2 — Parity Check 2
15	MC — Controller Machine Check

Figure 5-39. Sense Definitions

5.9.2.1 Status Bits

Figure 5-40 describes the status bit conditions.

Name	Condition
A	Indicates an inbound message has been readied by the 3274 Model A for transmission to the host. The host should respond by issuing a Read CCW sequence.
SM	Indicates to the host that the control unit is ready to receive data from the host or set in response to Write Break command, as a request for a Read. Also set with Busy (see below) when control unit is busy.
CUE	Is set following a busy condition, after pending status is cleared or when control unit is no longer busy, to indicate that 3274 Model A is now not busy and is free to accept a new command.
B	Is set in initial status byte with the status modifier (SM) when the addressed 3274 Model A is busy. The 3274 Model A uses this sequence when it cannot respond to the normal channel initiated selection sequence. See CUE above for the reset of the busy state.
CE	Indicates channel data transfer operations are completed. No error unless Unit Check (UC) is included.
DE	Indicates that the control unit is ready to receive a new command.
UC	Is set when an irregular program or equipment condition is detected by 3274 or the device. The program should always respond to Unit Check status by issuing a Sense command for further definition of condition.
UE	Indicates that no data is available for a successive (following) read.

Figure 5-40. Status Bit Conditions

5.9.2.2 Sense Bits

Figure 5-41 describes the sense bit conditions.

Name	Condition
CR	Set if the 3274 Model A has received an invalid command. It is also set if the Not Initialized bit is set and a Restart Reset, Read Start 0/1, Write Start 0/1, Read, Write, or Write Break command is received.
IR	Not used.
BOC	Set if the 3274 Model A has detected bad parity on any command or data byte received from the channel.
EC	Set in response to any command if a control unit parity check has occurred, or if a control unit I/O error has been detected during a Control, Read, Write, or Write Break command.
DC	Set in response to a Control, Write, or Write Break command along with data length check (DLC) (refer to DLC) or a Read command if the byte count specified in the host's Read command was not large enough to transfer all data associated with the control-unit buffer.
NI	Set when the 3274 Model A has not been initialized via an acceptable Connect function via a Control command.
DLC	Set in response to a Control, Write, or Write Break command if less than 4 bytes have not been transferred as the data count field or the count in the data count field does not equal the total byte count received.
PCM	See Ending Status and Sense Conditions below.
PC1	See Ending Status and Sense Conditions below.
PC2	See Ending Status and Sense Conditions below.
MC	Set with Equipment Check to indicate that an error occurred during cycle steal operations.

Figure 5-41. Sense Bit Conditions

5.9.2.2.1 Initial Status: Initial status is generated by the 3274 Model A in response to initial selection, by the channel, of the 3274 Model A. During the initial selection sequence, the status byte is sent to the channel after the 3274 Model A receives a command.

Figure 5-42 shows the possible initial status bit configurations.

An all-zero status byte is sent when a command is accepted for execution by the control unit.

Status[1]	Sense	ERP[2]	Condition
All Zeros			Normal status for all commands.
B, SM			Response to a command addressed to a 3274 Model A when the control unit cannot respond to a normal channel initiated selection sequence.

[1] If a Start I/O Fast Release (SIOF) is executed by the channel, unchained initial status becomes ending status.
[2] See paragraph 5.6.2.

Figure 5-42. Initial Status and Sense Conditions, 3274 Model A

5.9.2.2.2 Ending Status: When the control unit completes channel operations for a command, it sends an ending status byte to the channel, freeing the channel for other operations. This status byte always relates to the command operation that has been executed. The normal ending status byte for a read-type command or sense-type command will have only the channel-end and device-end bits set, indicating that the command has been executed. Normal ending status for a write-type command is channel-end alone. When the control unit-to-device buffer transfer is completed, ending the command operation, Device End status is sent to the channel as asynchronous status. Any error condition associated with the operation just executed will cause additional status bits to be set. Figure 5-43 shows the possible ending status bit configurations. Ending status causes an I/O interruption unless chaining is specified.

When the control unit has pending status, it attempts to gain selection of the channel asynchronously to pass this status. It is passed to the channel either when selection is accomplished or as initial status for the next command (with the Busy bit set), whichever occurs first.

Status (hex)	Sense (hex)	ERP[2]	Condition
CE (08)			Sent at end of data stream on a Control, Write, or Write Break command.
CE, DE[1] (0C)			Sent at end of data stream on all valid commands except Control, Write, Read, and Write Break.
CE, DE, UE[1] (0D)			Sent in response to: 1. A Control, Write, Write Break, or Write Start 0/1 command because of insufficient buffer space in the 3274 Model A at the time of the request. The command and its associated data transfer (if any) are rejected. 2. Read command if there is no new data available at this time for a subsequent Read in this CCW sequence. All available data has been transferred to the host. 3. Read Start 0/1 command if there is no data available for transfer to the host in response to this request.
CE, DE, UE, A[1] (8D)			Sent in response to: 1. A Control, Write, Write Break, or Write Start 0/1 command because of insufficient buffer space in the 3274 Model A at the time of the request. The command and its associated data transfer, if any, are rejected. In addition, a Read CCW sequence is requested. 2. Read Start 0/1 command as a warning. Its purpose is to notify the host that an unsolicited Read CCW sequence was issued. The command was rejected. However, data is available for transmission to the host. 3. Read command that all data for a block has been transmitted to the host, and therefore, a new Read CCW sequence is requested. Note that a new Read CCW sequence is necessary to release the 3274 Model A buffers for reuse.
CE, DE, UC (0E)	CR, NI (8200)	4	Send in response to a Restart Reset, Read Start 0/1, Write Start 0/1, Read, Write, or Write Break command if the 3274 Model A is not initialized.
CE, DE, UC (0E)	CR (8000)	1	An invalid command was issued to the 3274 Model A.
CE, DE, UC (0E)	NI (0200)	4	Sent in response to a NOP or Sense ID command if the 3274 Model A is not initialized.
CE, DE, UC (0E)	BOC, PC2 (2002)	1	The 3274 Model A detected a parity error at command time or on data transfer from the host.
CE, DE, UC (0E)	BOC, PC1, PC2 (2006)	1	The 3274 Model A detected a channel parity error during a Write command.
CE, DE, UC (0E)	EC, PC1 (1004)	1	The 3274 Model A detected a control unit parity error during a Write command.
CE, DE, UC (0E)	EC, PC1, PCM (100C)	1	The 3274 Model A detected a control unit parity error during a Read command.
CE, DE, UC (0E)	EC, PC2 (1002)	1	The 3274 Model A detected a channel parity error during a Read command.
CE, DE, UC (0E)	EC, MC (1001)	1	The 3274 Model A detected a cycle steal operation error during a Write or Read command.
CE, DE, UC (0E)	DC (0800)	1	The byte count specified in the host's Read command was not large enough to transfer all data associated with the 3274 Model A buffer.
CE, DE, UC (0E)	DC, DLC (0880)	1	Set in response to a Control, Write, or Write Break command if a minimum of 4 bytes have not been transferred or if the count in the data count field did not equal the total byte count received.

[1] If this status is stacked by the channel, CUE could be generated and combined with it before the stacked status is accepted by the channel.
[2] See paragraph 5.6.2.

Figure 5-43. Ending Status and Sense Conditions, 3274 Model A

5.9.2.2.3 Asynchronous Status: Asynchronous status reflects that (1) this is the second ending status for a Control, Read, Write, and Write Break command, indicating that all command-initiated operations are completed, (2) this is a request for the host to initiate a Read CCW sequence, (3) the 3274 Model A now has buffers available for a Write CCW sequence, or (4) the 3274 Model A is initialized or not initialized. Figure 5-44 shows the possible asynchronous status conditions.

Status[1]	Sense	ERP[2]	Condition
A			The 3274 Model A requests the host to initiate a Read CCW sequence.
DE			The 3274 Model A is ready to communicate with the host. In the case of a Control, Read, Write, and Write Break command this is normal ending status. For Control, Write, or Write Break, all data associated with the command has been transferred; transfer was terminated by the channel. For Read, all data available for this command has been transferred. However, more data is available for a subsequent Read. For a NOP command at the end of a Read CCW sequence, this is a special case and if this is seen by the host indicates incompatibility between the host and the 3274 Model A. The number of Read CCWs in the host is less than the number expected by the 3274 Model A as a result of the Connect function.
DE, SM, A			Indicates that the 3274 Model A requires a Read CCW sequence.
DE, UC	NI	4	The 3274 Model A has successfully enabled the interface to the host and the not-initialized bit is on.

[1] If this status is stacked by the channel, CU could be generated and combined with it before the stacked status is accepted by the channel.
[2] See paragraph 5.6.2.

Figure 5-44. Asynchronous Status and Sense Conditions, 3274 Model A

When an asynchronous status condition occurs, the control unit attempts to gain selection by the channel and passes this status to the channel when selection is accomplished. This status is called "pending" status until selection is accomplished. If the channel issues a command before retrieving this pending status, the pending status is returned, with the Busy bit set, in place of initial status for the command; in this case, the command is not executed.

Other conditions of multiple status can occur that are not covered here. These conditions can be caused by multiple error conditions occurring simultaneously.

5.9.3 Error Recovery Procedures

5.9.3.1 Model-A-Detected Errors

Error conditions detected by the 3274 Model A are indicated to the program by Unit Check status. The program must respond to this status by using a Sense command for further definition of the condition. If a Sense command is not performed and the sense conditions still exist, the 3274 Model A will not honor any other commands.

Device-detected errors are reported via SNA.

The recovery procedures referred to in the Error Recovery Procedure (ERP) column of Figures 5-42, 5-43, and 5-44 are as follows:

1. Issue a message containing the address of the channel and unit, the CSW, the sense data, and the CCW executed. If the first CCW of the chain is a valid Start command, begin retry from that point. If the failure is continuous, notify the operator.
2. A nonrecoverable program error has occurred. Examine the data stream to locate the problem.
3. No retry possible. Issue a message as in 1 above, and notify the operator.
4. An initializing control command is needed.

5.9.3.2 Channel-Detected Errors

Errors detected by the channel are indicated to the program by the channel status byte in the CSW. If the channel status byte indicates a channel control check, an interface control check, or a channel data check, the recommended error-recovery procedure is to retry the chain of commands. If the channel status byte indicates a channel program check, a protection check, or an incorrect length (should not occur), the recommended error-recovery procedure is to terminate the task. A program error has probably occurred.

5-10 SDLC SEQUENCE/RESPONSE DESCRIPTIONS

5.10.1 SDLC Transmission Frames

SDLC transmission frames are composed of a series of eight-bit binary-coded bytes which contain addressing, data, control, and checking information. Transmission between the controller and the 3274 unit takes place according to a predefined frame format which consists of the following sequence of bytes:

Flag (F) Sequence — 1 byte
Secondary Station Address (A) — 1 byte
Control (C) Field — 1 byte
Information (I) Field — up to 256 bytes of message data, preceded by header information
Frame Check Sequence (FCS) — 2 bytes
Flag (F) Sequence — 1 byte

Bit synchronization preceding transmission of an initial flag and following a line turnaround is achieved by transmission of 16 zero bits, after the clear-to-send signal is turned on and the NRZI encoder (when used) is enabled.

For a detailed description of the SDLC frame format, refer to *IBM Synchronous Data Link Control General Information,* GA27-3093. Support of the frame sequence, flag byte, Address byte, and Frame Check Sequence bytes conforms to the referenced document.

5.10.1.1 Response Modes

The 3274 unit functions in two link operating modes: normal response mode (NRM) and normal disconnect mode (NDM). In NRM, the 3274 can initiate transmission and raise the request-to-send signal only as a result of receiving a frame from the communications controller which contains the P bit set to 1. Single or multiple frames may be sent by the 3274. The last frame (or a single frame) transmitted by the 3274 in response to a command received with the P bit set to 1 must have the F bit set to 1. When the 3274 has completed a transmission, a new transmission cannot be initiated until a subsequent frame is received from the communications controller which contains the P bit set to 1. A response transmission initiated by the 3274, which requires acknowledgment from the communications controller, is repeated each time the communications controller polls until the acknowledgment is received. There is no limit to the number of transmissions. Responses that require acknowledgment from the communications controller are I-frames, CMDR, and RR when transmitted with the F bit set to 0, to report clearing of a busy condition.

When in NDM, the 3274 cannot accept or transmit I or supervisory (S) frames. Nonsequenced responses are not transmitted unless the 3274 is solicited to reply. Invalid or nonimplemented commands received in NDM cause the 3274 to transmit an ROL response at the next response opportunity. ROL can be retransmitted until an SNRM or DISC command is received. Command reject conditions are not present in NDM.

The following paragraphs describe the 3274 support of the Control and Information fields.

5.10.1.2 Control Field

The Control field designates the frames as Supervisory (S), Nonsequenced (NS), or Information (I).

5.10.1.2.1 Supervisory Commands: The 3274 supports only the Supervisory commands Receive Ready (RR) and Receive Not Ready (RNR).

The C-field formats are as follows:

RR	Nr	P/F	00	01
	012	3	45	67
RNR	Nr	P/F	00	01
	012	3	45	67

The 3274 will transmit RNR when the control unit cannot accept further data from the link.

When the reported RNR condition is cleared, the control unit will transmit an I-frame or RR with the F bit on after a frame with the P bit on is received.

If the 3274 has received an RNR, an I-frame will not be transmitted until an RR or I-frame with the poll bit on is received.

The transmission or receipt of an NS frame does not indicate the RNR condition has cleared.

5.10.1.2.2 Nonsequenced Commands and Responses: The Nonsequenced commands and responses listed in Figure 5-45 are supported by the 3274.

Command/Response	C-Field	Hex Code
Set Normal Response Mode (SNRM) Command	1 0 0 P 0 0 1 1 0 1 2 3 4 5 6 7	93
Disconnect (DISC) Command	0 1 0 P 0 0 1 1 0 1 2 3 4 5 6 7	53
Nonsequenced Acknowledgment (NSA) Response	0 1 1 F 0 0 1 1 0 1 2 3 4 5 6 7	73
Request Online (ROL) Response	0 0 0 F 1 1 1 1 0 1 2 3 4 5 6 7	1F
Command Reject (CMDR) Response	1 0 0 F 0 1 1 1 0 1 2 3 4 5 6 7	97
Test Command/Response	1 1 1 P/F 0 0 1 1 0 1 2 3 4 5 6 7	F3
Exchange Station ID Command/Response	1 0 1 P/F 1 1 1 1 0 1 2 3 4 5 6 7	

Figure 5-45. Nonsequenced Commands and Responses Supported by 3274

The SNRM command sets the 3274 in NRM. Receipt of SNRM causes the 3274 to deactivate the physical unit if it is in active state. The Online and Ownership symbols are turned off.

The DISC command sets the 3274 in NDM.

The NSA response is sent by the 3274 to acknowledge receipt and acceptance of the SNRM and DISC commands.

The Test command is used to initiate one round-trip transmission of test data in both NRM and NDM. The 3274 station will return the Test response without data if buffering is not available to hold the complete test data, or with data if buffering is available.

The Request on Line (ROL) response is sent by the 3274 in normal disconnect mode (NDM) to request online status. ROL is sent in response to any command except Test and XID. ROL is sent in response to the SNRM command when the 3274 cannot enter NRM.

The CMDR response is implemented by the 3274 as described in *IBM Synchronous Data Link Control General Information*, GA27-3093. The CMDR will be sent in response to any poll until an SNRM or DISC is received to reset the control unit.

The Exchange Station Identification (XID) command and response contains additional data beyond the C byte. The 3274 responds to the XID command in NRM or NDM, except when a CMDR condition exists, in which case the CMDR response takes precedence over XID. The request/response unit (RU) of the XID response consists of 48 bits, defined as follows:

Bits	Meaning
0–3	ID format B "0000'
4–7	PU type B"0010'
8–15	Self-description X"00'
16–27	X'017' (3274) and X'018' (3276)
28–47	ID number

The 3274 will send X'00000'.

5.10.1.2.3 Information (I) Frame: The Information frame is used to transmit message data. When transmitted, the I-frame contains a maximum of 256 bytes of RU message data preceded by six bytes of transmission header (RH).

5.10.2 Sequence Error Recovery Procedures

A sequence error occurs when the 3274 receives an I-frame with an incorrect Ns sequence count and valid FCS bytes. The 3274 does not accept the I-frame that caused the sequence error and rejects all following I-frames, until an I-frame is received which contains the correct Ns value, at which time the sequence error condition is reset.

The 3274 transmits I-frames in the sequence indicated by the last Nr count received, which may include retransmission of previously transmitted I-frames that have not been acknowledged.

All I-frames are transmitted in contiguous sequence according to the Ns value within the constraints of the modulo count.

5.10.2.1 Abort Function

The abort function is used by the communications controller or by the 3274 when a frame being transmitted is to be discarded. The abort function is performed by transmitting eight contiguous one bits without zero insertion at the earliest possible time following recognition of an abort situation. No FCS is transmitted. When, for example, the 3274 receives seven contiguous one bits, it discards the aborted frame. The 3274 employs the abort function when an equipment malfunction occurs that causes an erroneous transmission.

5.10.2.2 Timeout Controls

When the 3274 is attached point-to-point or multipoint and does not recognize any valid outbound frame for 20 to 25 seconds, a nonproductive timeout occurs. This timeout causes the 3274 to set the Communication Check symbol on all attached 3278s. The timer is reset to zero every time the 3274 detects a valid outbound frame. The Communication Check symbol is turned off when a valid frame is received by the station.

If a condition of no line activity is detected by the 3274 for 20 to 25 seconds, the Communication Check symbol is set on all attached 3278s. The indicator will be turned off when a valid frame is received.

5.10.3 Hexadecimal Notation and Frame Summary

Figure 5-46 shows the hexadecimal notation for SDLC commands and responses.

Nonsequenced Commands

	P	$\overline{P}$
SNRM	'93'	'83'
DISC	'53'	'43'
SIM	'17'	'07'
NSI	'13'	'03'
NSP	'33'	'23'
XID	'BF'	
TEST	'F3'	'E3'

Nonsequenced Responses

	F	$\overline{F}$
NSA	'73'	'63'
ROL	'1F'	'0F'
CMDR	'97'	'87'
RQI	'17'	'07'
NSI	'13'	'03'
XID	'BF'	
TEST	'F3'	'E3'

Supervisory Commands/Responses (See Legend)

RR	'_1'
RNR	'_5'
REJ	'_9'

Information Commands/Responses (See Legend)

Legend

Hexadecimal digit for "—"

Nr=	P/F	$\overline{P/F}$
0	1	0
1	3	2
2	5	4
3	7	6
4	9	8
5	B	A
6	D	C
7	F	E

Hexadecimal digit for ""*

Ns=	Hex
0	0
1	2
2	4
3	6
4	8
5	A
6	C
7	E

Note: *SDLC Name Changes*

To conform with HDLC the following names have been changed:

NSA to UA (Unnumbered Acknowledge)
CMDR to FRMR (Frame Reject)
ROL to DM (Disconnect Mode)
ROI to RIM (Request Initialization)
NSI to UI (Unnumbered Informational)

Figure 5-46. SDLC Commands and Responses in Hexadecimal Notation

5.11 SNA INFORMATION

5.11.1 Session Control

Session Control (SC) requests are sent from the host to establish and maintain a session with 3274. Session Control also provides facilities to clear data flowing within a session after a catastrophic error occurs and then to resynchronize the data flow after such an error. All Session Control commands supported by 3274 are transmitted on the expedited flow. The specific SC function is identified by the first byte of the Request Unit (RU). The SC functions supported by 3274 are listed in Figure 5-47.

Function	RU Byte	Support
Activate Physical Unit (ACTPU)	X'11'	Outbound
Deactivate Physical Unit (DACTPU)	X'12'	Outbound
Activate Logical Unit (ACTLU)	X'0D'	Outbound
Deactivate Logical Unit (DACTLU)	X'0E'	Outbound
Bind	X'31'	Outbound
Unbind	X'32'	Outbound
Clear	X'A1'	Outbound
Start Data Traffic (SDT)	X'A0'	Outbound
CRV (Crypto Verification)	X'C0'	Outbound
Notify	X'B1'	Inbound

Figure 5-47. Session Control Functions Supported by 3274

5.11.2 Data Flow Control

Data Flow Control (DFC) requests are passed between the application program and 3274 to provide control over session data flow. Data Flow Control functions are identified by the setting of the RU type bit to B'1' and the Subsystem Control bit to B'0'. The DFC requests listed in Figure 5-48 are supported by 3274.

Function	Flow	RU Byte	Support
Cancel	Normal	X'83'	Inbound/Outbound
Bid	Normal	X'C8'	Outbound
Chase	Normal	X'84'	Outbound
Signal	Expedited	X'C9'	Inbound/Outbound
SHUTD	Expedited	X'C0'	Outbound
SHUTC	Expedited	X'C1'	Inbound
LUSTAT	Normal	X'04'	Inbound
RTR	Normal	X'05'	Inbound (LU types 1, 3)

Figure 5-48. Data Flow Control Requests Supported by 3274

5.11.3 Transmission Header

The format of the transmission header is shown in Figure 5-49.

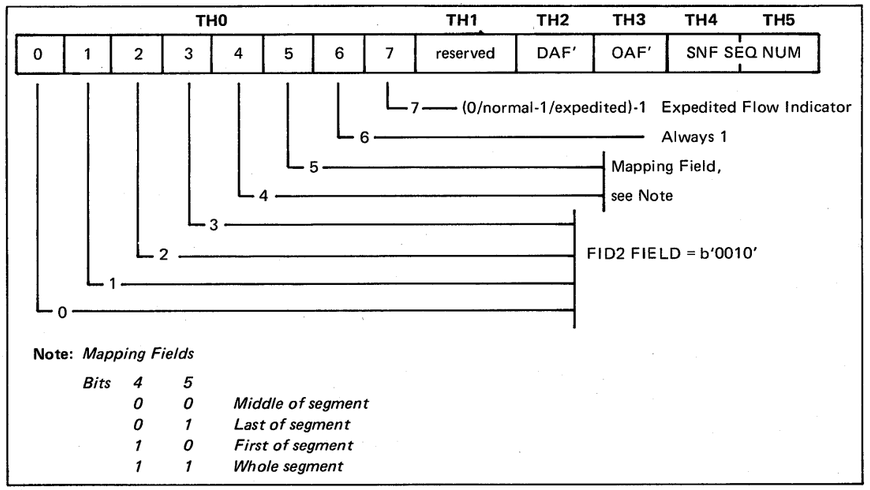


Figure 5-49. Transmission Header Format

5.11.4 Request/Response Header

The format of the request/response header is shown in Figure 5-50.

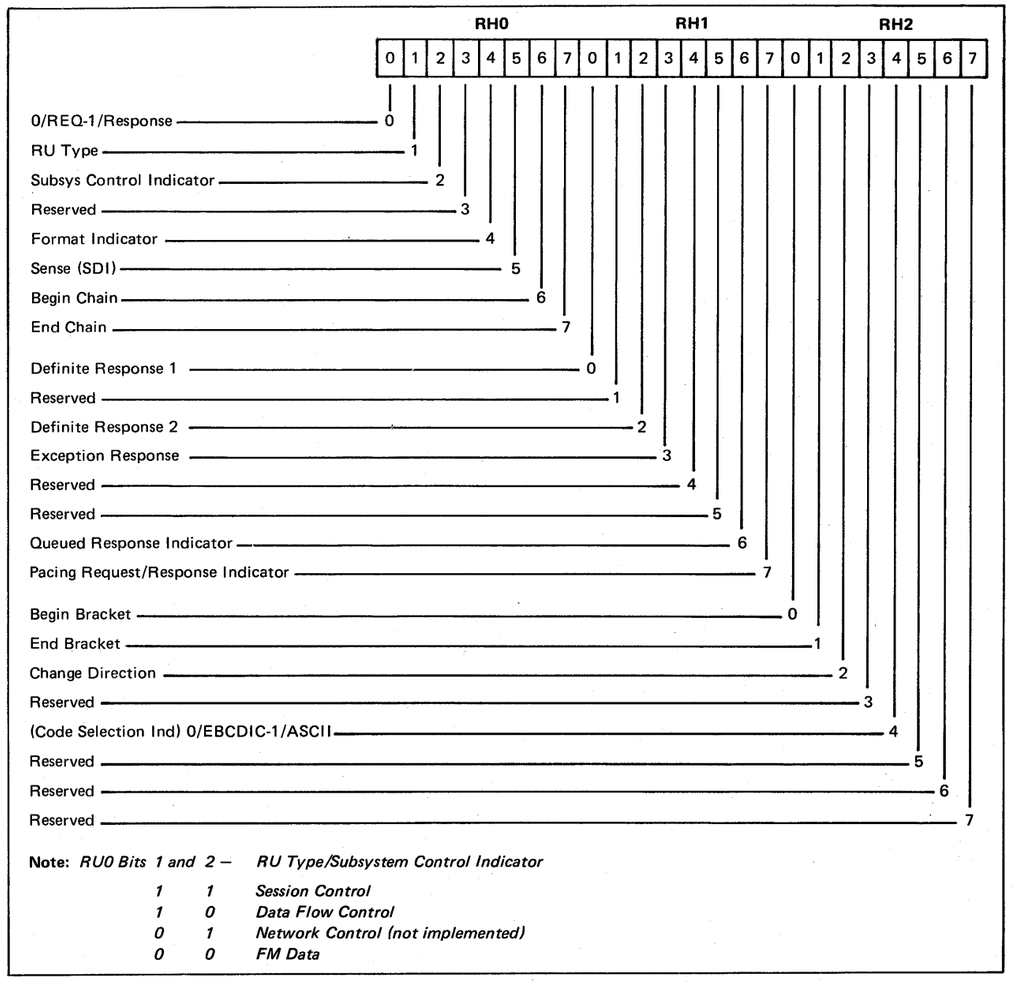


Figure 5-50. Request/Response Header Format

5.11.5 SNA Definitions

3274 — PU.T2

For all PIUs sent and received, the transmission header (TH) format is a FID2. (See Figure 5-49 for the layout for FID2 TH.)

3274 — FM Profile 3

Primary LU half-session and secondary LU half-session use delayed-control mode and immediate-response mode. These half-sessions support the following DFC functions:

- Cancel
- Signal
- LUSTAT (allowed secondary to primary only)
- Chase
- SHUTD
- SHUTC
- RSHUTD
- Bid and RTR (allowed only if brackets are used)

The FM usage fields defining the options for Profile 3 are:

- Chaining use (primary and secondary)
- Request mode selection (primary and secondary)
- Chain response protocol (primary and secondary)
- Compression indicator (primary and secondary)
- Send EB indicator (primary and secondary)
- FM header usage
- Brackets
- Bracket termination rule
- Alternate Code Set Allowed indicator
- Normal-flow send/receive mode
- Recovery responsibility
- First speaker (for bracket protocol)
- Contention resolution

3274 — TS Profile 3

Profile 3 specifies the following session rules:

- Primary — secondary normal flow is paced.
- Sequence numbers are used on normal flows.
- Clear and SDT are required.
- RQR and STSN may be used.

LU Types

- LU1 = Any Category A printer supporting SNA Character String (SCS) printer control.
- LU2 = Any Category A or B display type device.
- LU3 = Category A and B printers using 3270 data stream printer control (DSC, Data Stream Compatible Mode).

5.11.6 SDL/SNA Command to Start a Session

Figure 5-51 shows the SDLC/SNA commands required to initialize a session with LU2 (DAF of 2). Only the requests are shown, but the SDLC receive count has been updated whenever a line direction change occurs to account for a positive response from the secondary station.

It should be noted the requests/responses do not carry the SDLC poll/final bit. The lines, in all cases, are turned around by the RR (SDLC) command after every response/request.

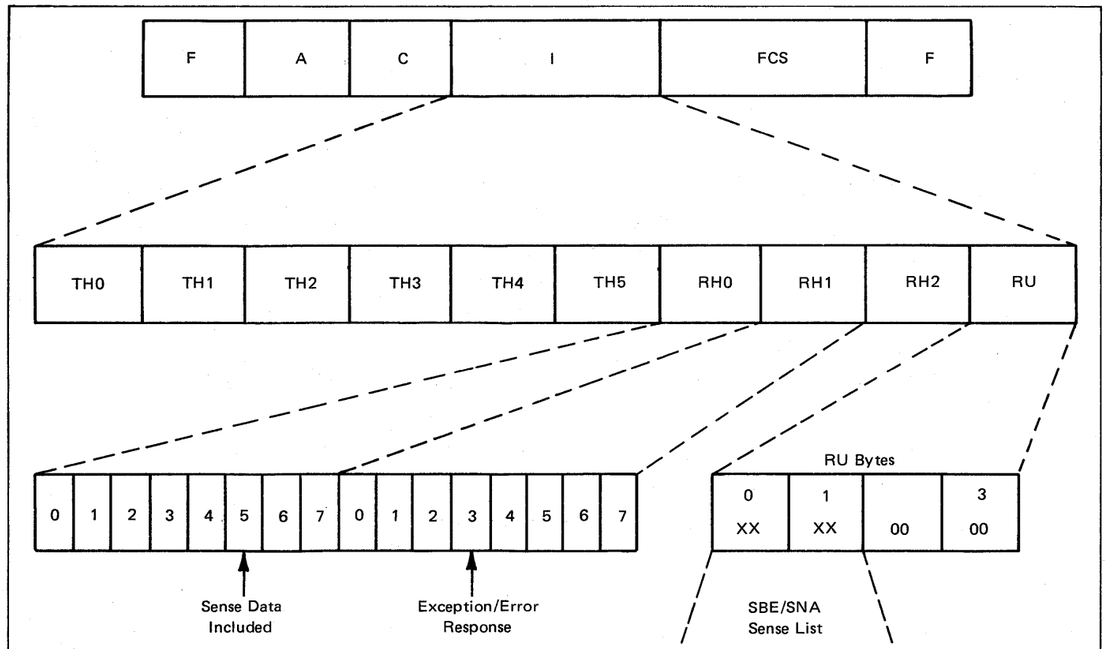
	Frame	Address	Control	TH	RH	RU	BCC	Frame
SNRM	7E	C1	93				277A	7E
RR	7E	C1	11				3DDD	7E
ACTPU	7E	C1	00	2F0000000001	6B8000	110101050000000001	02B9	7E
RR	7E	C1	11				3DDD	7E
ACTLU	7E	C1	22	2F0002000001	6B8000	0D0101	126B	7E
RR	7E	C1	31				3FFC	7E
Bind	7E	C1	44	2F0002010001	6B8000	31010303B1A03080 0001858700000200 0000000018501850 02000006F3C5B2B3 C5D900	94FF	7E
RR	7E	C1	51				399F	7E
Clear	7E	C1	66	2F0002010002	6B8000	A1	C62E	7E
RR	7E	C1	71				3BBE	7E
SDT	7E	C1	88	2F0001010001	6B8000	A0		
RR	7E	C1	91				3559	7E

Figure 5-51. SDLC/SNA Commands Required to Start Session with LU2

5.12 SDLC/SNA ERROR INFORMATION

5.12.1 Exception Response with Sense Data Included

The exception responses for SDLC/SNA are shown in Figure 5-52.



Note: *SDI and EXR/FRR bits are on for sense information.*

Figure 5-52. SDLC/SNA Exception Responses

5.12.2 SNA Sense Codes

Each major error code has modifiers for further description in sense byte 1. Following are the modifier codes supported and the controller or terminal condition causing the negative response to be returned.

Sense Byte One — **Description**

Path Error X'80'

X'04' — Unrecognized DAF'
Controller does not have a terminal adapter for the DAF address.

X'05' — NO SESSION
- A Bind has not been received or accepted by the 3274.
- A request other than Bind is sent to an SLU which has already accepted a Bind, and the OAF' is not X'00' or the OAF in the accepted Bind.

X'08' — PU NOT Active
The 3274 has not received or accepted an ACTPU, or a control condition caused an internally generated DACTPU.

X'09' — LU NOT Active
The 3274 has not received or accepted an ACTLU, or a control condition caused an internally generated DACTLU.

X'0F' — Invalid Address Combination
A request was addressed to the PU (DAF'=X'00'), and the OAF was not SSCP (OAF'=X'00').

RH Error X'40'

X'06' — Exception Response Not Allowed
LIC carried exception response when Bind specified definite response.

X'07' — Definite Response Not Allowed
LIC carried definite response when Bind specified exception response or ¬ LIC carried definite response.

X'0A' — No-Response Not Allowed
A chain element did not have DR1, DR2, or the exception bit set to 1.

X'0F' — Format Indicator Not Allowed
An FM request received by the 3274 indicated formatted header included.

State Error X'20'

X'01' — Sequence Number Error
The sequence number of the normal flow request did not match the number expected by the 3274.

X'02' — Chaining Error
Chain elements were out of protocol sequence.

X'03' — Bracket State Error
A Bracket state error occurred.

X'04' — Direction Error
A normal flow without begin bracket was received while the 3274 was in Send state.

X'05' — Data Traffic Reset
An FM or DFC request was received before an SDT was received or accepted.

Request Error X'10'

X'01' — WCC had start print set but was not last structured field.

X'02' — RU Length Error (Model A)
3274 link buffer overflow occurred.

Sense Byte One	Description
X'03'	Function Not Supported. • Unsupported Session Control Request • Unsupported Data Flow Control Request • SIGNAL Code is not X'00010000' • Network Control Request • FM Data Stream • Invalid Command – Data Following a Read, RM, RMA, or EAU command – For LU type 3, any Read, RM or RMA command.
X'05'	Parameter Error Invalid address following SBA, RA, or EUA order (SBA, RA, or EUA order without parameters), or SCS parameter error.
X'07'	Category Not Supported • An FMD request from the SSCP was received by a SLU which has an attached device without a keyboard. • An unsupported network service message received.
X'08'	Invalid FM Header • FM Header not understood. • FM Header not present.
Request Reject X'08'	
X'01'	Resource not Available • LU type 2, A printer is not allowed by the Authorization Matrix • For LU type 1 or 3, Bind reject because printer is authorized for Local mode only.
X'02'	Intervention Required (on principal device). • For LU type 2, security key is tuned off • For LU type 1 or 3, printer condition such as end of form, paper jam, printer cover up, or hold time out.
X'05'	Session Limit Exceeded A Bind was received whose OAF differs from the PLU already bound.
X'07'	Resource Not Available • Device unavailable for an indeterminate time. LUSTAT sent when available.
X'0A'	Permission Rejected Display or printer power is off. The SSCP will not be notified when the device powers on.
X'0C'	Procedure Not Supported • Invalid REQMS type.
X'11'	Break Sent on LU type 1 when the operator depresses the printer Hold Print key followed by Cancel key, if a chain has not completed printing.
X'13'	Bracket Bid Reject – (No RTR) Returned by LU type 2 to a BID or BID with Begin Bracket if the display has won contention and started a bracket.
X'14'	Bracket BID Reject • BID received while secondary device is in the In-Bracket State.
X'15'	Function Active Bind reject if the same OAF' already has an accepted Bind to the SLU.
X'1B'	Receiver in Transmit Mode • The SLU is Between Bracket but a data key has been depressed. • An FM message was received from the SSCP while the display was owned by the PLU-SLU session or is in Test mode. • An SSCP FM message is rejected if local copy is taking place while the SSCP-SLU session owns the display.
X'1C'	Request Not Executable The 3274 or 3276 has a nonrecoverable error.
X'21'	Invalid Session Parameters • Bind parameters do not match the 3274 Bind checks.
X'29'	Change Direction Required A 3270 read-type command was received without a Change Direction with an End Bracket.
X'2A'	Presentation Space Altered, Request Executed An LU type 2 3277 attached to a 3274 has a reset keyboard, and tried to enter while in receive state.
X'2B'	Presentation Space Integrity Lost • A temporary error has occurred; for example, parity check in device, • An operator has cleared the display by switching to SSCP-SLU session or Test mode and returned to PLU-SLU session.
X'2D'	SLU Busy • LU type 2 Display is owned by SSCP-SLU session or Test mode. • LU type 2 Display is busy doing an operator-initiated local copy. • LU type 2 3277 attached to 3274 is busy with a Back Tab.
X'2E'	Intervention Required at Subsidiary Device. For LU type 2, a printer being copied to from a host-initiated print has intervention-required type error. Refer X'0802'. Printer power off or not attached to the controller is included in this category.
X'2F'	Request Not Executable Because of LU Subsidiary Device. For LU type 2, a printer being copied to has a nonrecoverable error.
X'31'	LU Component Disconnected This response is returned if the device attached to the 3274 cannot be contacted by a device poll. This is due to device power off, cable detached from the controller port, or connecting cable broken.
X'43'	Required Function Manager Synchronization Not Supplied (3274) For LU type 2 or 3 chains having the print bit on, must be definite response or exception response chain must carry CD.
X'45'	Permission Rejected • Bind cannot be accepted; the secondary LU will notify (LUSTAT) SSCP when it can be accepted.
X'48'	Cryptographic Function Imperative • Cryptography facility malfunction.
X'4A'	Presentation Space Altered, Request Not Executed. Refer to X'2A'
X'4C'	Permanent Insufficient Resource • An error in processing. A query request was detected.
X'63'	LCID not found (Local Character Set Identifier).
X'71'	Read Partition State Error.

5.12.3 Logical Unit Status (LUSTAT)

LUSTAT provides a means for the SLU to report exception conditions or status when the SLU is not in Receive state (a negative response is used when the SLU is in Receive state). Following are the CD settings that accompany LUSTAT and the state changes, if any, that occur:

SLU State When LUSTAT Sent	CD Setting	State Change
BETB	CD may be set	None
ERP1	CD not set	None
Send	CD set for principal device	to Receive
	CD not set for subsidiary device	None

Inbound LUSTATs are sent with exception response by the 3274.

Programming Note: *An LUSTAT showing power off sent while in Send state carries CD. An LUSTAT that shows power on cannot be sent until the PLU causes an SLU state change to (S, *R).*

The 3274 will use the following status codes to send information to the PLU, on the PLU-SLU session.

Value	Explanation
X'0001Z000'*	Device now available; presentation space not destroyed.
X'00020000'	Device has received CD, but has no input mechanism.
X'081CZ000'*	Component Failure; Permanent Error.
X'082B0000'	Device available; presentation space integrity lost.
X'08310000'	Principal device is powered off or disconnected.
X'0801Z000'*	Printer has been removed from configured status.

*Where Z specifies whether the status refers to the principal or subsidiary device. (Refer to "SNA Printer Sessions" for a description of principal and subsidiary devices.) The value of Z is defined as follows:

LU type 1 Principal (printer)	Z = 0
LU type 2 Principal (display)	Z = D
LU type 2 Subsidiary (printer)	Z = B
LU type 3 Principal (printer)	Z = 0

The priority of these status codes, in low to high order, is assigned as:

X'0002', X'0001', X'082B', X'0831', X'0801', X'081C'

The 3274 will send the highest level of priority status when an opportunity allows its transmission.

Definition: (S, *R) = Send state, ERP1 state, or BETB state.

The upper section of Figure 5-53 shows the LUSTAT codes that are returned to clear the negative response condition listed in the left column. The lower section lists the LUSTAT codes that are used to report an SLU error condition instead of a negative response. The X's show the sessions that use the code points.

LUSTAT Returned

Negative Response Code	LU TYPE T1	T2	T3	SSCP
0802	00010000 082B0000 081C0000 08310000	0001D000 082B0000 081CD000 08310000	00010000 082B0000 081C0000 08310000	NA
0807	NA	0001B000 0801B000 081CB000 081CD000	NA	NA
082D	NA	0001D000 082B0000 081CD000	NA	NA
082E	NA	0001B000 0801B000 081CB000 081CD000	NA	NA
0831	082B0000 081C0000	082B0000 081CD000	082B0000 081C0000	NA NA

Sent By

LUSTAT	LU TYPE T1	T2	T3
SEND BETB ERP.1			
00020000	X	X	X
081C0000	X		X
081CB000		X	
081CD000		X	
082B0000	X	X	X
08310000	X	X	X
0801B000		X	

Figure 5-53. Summary Table of LUSTATs

The usages of LUSTAT are as follows:

For all LU types, when the 3274 has sent -RSP with X'0802' or X'082E' and this condition is reset, LUSTAT with X'0001P000' will be sent: Where the value P is X'0' for LU type 1 or 3, X'D' for LU type 2 principal (display), and X'B' for LU type 2 subsidiary device (printer).

If the presentation integrity is lost while an X'0802' condition exists, LUSTAT with X'082B0000' will be sent instead of X'0001P000' when the X'0802' condition is reset.

For LU type 2, when the 3274 SLU has sent -RSP with Secondary component not available (X'0807') and this condition is reset, LUSTAT with X'0001B000' will be sent.

For all LU types supported by the 3274, the LUSTAT X'00020000' will be sent when the 3274 accepts a Normal flow request carrying DC, but no input components (keyboard, lightpen, MSR, etc.) are attached to the device .

For all LU types, LUSTAT with X'082B0000' will be sent to the PLU when the 3274 SLU detects presentation integrity lost (for example, regeneration buffer parity error), and is in (S *R) state for the 3274.

For LU type 2, when the 3274 has sent -RSP (Device Busy) (X'082D') to a PLU request because of session ownership change from PLU to SSCP or TEST, LUSTAT with X'082B0000' will be sent to the PLU when returning to PLU-SLU session.

For LU type 2, when the -RSP (Device Busy) (X'082D') has been returned from the 3274 for a Back Tab busy condition, the LUSTAT X'0001D000' component now available to the PLU will be sent when the busy condition clears.

For LU type 2, when 3274 has sent -RSP (Device Busy) (X'082D') to a PLU because the SLU is busy executing a local copy, the 3274 sends LUSTAT X'0001D000' component now available to the PLU when the busy condition clears.

For all LU types, if a principal device is powered off or unplugged from the controller port and a session exists which is in (S, *R) state, LUSTAT X'08310000' will be sent to the PLU.

For all LU types, when a principal device has sent -RSP or LUSTAT X'0831000' and then power is restored, LUSTAT with X'082B0000' will be sent to the PLU.

For all LU types, if 3274 finds a permanent error in the principal device and is in (S, *R) state, LUSTAT with X'081CP000' will be sent to the PLU. The value of P is the same as defined in item 1.

For LU type 2, if the 3274 finds a permanent error in the subsidiary device and is in (S, *R) state, the worsening of the previous condition will not be reported. Instead, LUSTAT X'0001B000' will be sent, and the next outbound requests will be rejected with the proper sense code.

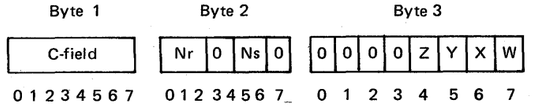
For LU type 2, if the 3274 finds the subsidiary device has been configured from Local or Shared mode to System mode, LUSTAT X'0001B000' will be sent if an LUSTAT is owed. The next outbound request will be rejected with the proper sense code.

Note: *An LUSTAT showing power off during send state carries CD. An LUSTAT showing power on cannot be sent until the PLU causes an SLU state change to (S, *R).*

5.12.4 Command Reject

The Command Reject (CMDR) response is sent by the 3270 control unit to report the following error conditions:

1. Receipt of a command code with valid BCC but which is an invalid command or a command not implemented for the 3270 CU.
2. Receipt of a frame with valid BCC that contains an I-field and a command which should not be sent with an I-field.
3. Receipt of an I-format frame with valid BCC which contains an illegal Nr count in the C-field.
4. Receipt of an I-format frame in which the information field is too large to be accommodated by the available buffer space in the 3270 CU.



Byte 1 is the C-field that caused the CMDR response. Byte 2 contains the Ns and Nr sequence counts that existed immediately prior to establishing the CMDR response. Byte 3 indicates the reason for the CMDR.

Bit W is set to 1 when the C-field returned in byte 1 represents an invalid or nonimplemented command.

Bit X is set to 1 when the C-field returned in byte 1 is considered invalid because the frame contained an information field not allowed with the command sent.

Bit Y is set to 1 when the information field associated with the valid and implemented C-field contained in byte 1 was too long for the available buffer space in the 3270 control unit. This condition never occurs when bit X is set.

Bit Z is set when the receive Nr sequence count contained in the C-Field in byte 1 is out of the range.

Figure 5-54 shows the CMDR message format.

5.12.5 Request Maintenance Statistics (REQMS) Command

The Request Maintenance Statistics (REQMS) command is sent by the SSCP to a 3274 when the Network Determination Aid Processor (NDAP) requests PU performance statistics. Four types of requests can be made, as follows:

- Type 1 — Link Test Statistics
- Type 2 — Summary Counters
- Type 3 — Communication Adapter Data Error Counts
- Type 5 — 3274 Configuration Information/3276 Machine Level Information

The state of the RESET/NO-RESET indicator in the REQMS request determines whether the log area where the transmitted maintenance statistics are stored is cleared.

An REQMS request that cannot be executed by the 3274 is rejected with a negative response; an accepted REQMS request receives a positive response and the requested statistics (formatted as RECFMS) as an inbound message.

5.12.5.1 Record Formatted Maintenance Statistics (RECFMS)

Record Formatted Maintenance Statistics (RECFMS) is sent by the 3274 to the SSCP in response to an REQMS command. (The 3274 will not send unsolicited RECFMS requests to the host.) The RECFMS maintenance statistics are recorded at the host by the Network Communications Control Facility (NCCF).

When the 3274 accepts an REQMS request, it transmits the maintenance statistics requested. If the REQMS specified "RESET," the error log area referenced by the REQMS is reset by the 3274 after the RECFMS is transmitted.

A description of RECFMS responses follows.

5.12.5.2 RECFMS Formats

The 3274 Control Unit can send the host system four types of RECFMS responses to an REQMS command.

Counters in type 1, 2, and 3 responses do not wrap when they exceed their maximum value; they maintain the maximum value.

The log areas are reset when:

- The 3274 is turned off (types 1, 2, and 3).
- The concurrent test, Error Log Erase, is executed for the 3274 CCA/HPCA Adapter (type 3 only).
- The execution of RECFMS is completed normally as the response to an REQMS with a "RESET" request (types 1, 2, and 3).

The formats of the four RECFMS responses are as follows:

- REQMS Request Type 1 — Link Test Statistics

  Bytes 14, 15 = Number of times the Test Command was received.
  Bytes 16, 17 = Number of times the Test response was transmitted.

- REQMS Request Type 2 — Summary Counters

  Byte 14 = Mask bits of the summary counters supported. All supported counters, including those containing zero count, are sent to the host by RECFMS.
  - Bit 0 = 1 = Machine Check.
  - Bit 1 = 1 = Communication Check.
  - Bit 2 = 1 = Program Check.
  - Bits 3–7 = Reserved.

  Bytes 15, 16 = Reserved.
  Bytes 17, 18 = Machine Check Summary Counter.
  Bytes 19, 20 = Communication Check Summary Counter.
  Bytes 21, 22 = Program Check Summary Counter.

- REQMS Request Type 3 — Communication Adapter Data Error Counts

  Byte 14 = Adapter Type.
  = X'01' = CCA Link Adapter.
  = X'02' = HPCA Link Adapter
  = X'03' — X'FF' = Reserved.

  Byte 15 = Mask bits of the Communication Adapter Error Counters supported. All supported counters, including those containing zero count, are sent to the host by RECFMS.
  - Bit 0 = 1 = Nonproductive Timeout.
  - Bit 1 = 1 = Idle Timeout.
  - Bit 2 = 1 = Write Retry.
  - Bit 3 = 1 = Overrun.
  - Bit 4 = 1 = Underrun.
  - Bit 5 = 1 = Connection Problem.
  - Bit 6 = 1 = FCS Error.
  - Bit 7 = 1 = Primary Abort.

  Byte 16 = Mask bits of the Communication Adapter Error Counters supported. All supported counters, including those containing zero count, are sent to the host by RECFMS.
  - Bit 0 = 1 = Command Reject.
  - Bit 1 = 1 = DCE Error.
  - Bit 2 = 1 = Write Timeout.
  - Bits 3–7 = Reserved.

  Byte 17 = Reserved.
  Byte 18 = Nonproductive Timeout Counter.
  Byte 19 = Idle Timeout Counter.
  Byte 20 = Write Retry Counter.
  Byte 21 = Overrun Counter.
  Byte 22 = Underrun Counter.
  Byte 23 = Connection Problem Counter.
  Byte 24 = FCS Error Counter.
  Byte 25 = Primary Abort Counter.
  Byte 26 = Command Reject Counter.
  Byte 27 = DCE Error Counter.
  Byte 28 = Write Timeout Counter.

- REQMS Request Type 5 — 3274 Configuration Information

  Byte 14 = Always X'00'.
  Bytes 15–30 = Installed Patch ID Values
  Byte 31 = Number of RPQs Installed on the 3274.
  Byte 32 = Reserved.
  Bytes 33–37 = RPQ 1 ID.
  Bytes 38–42 = RPQ 2 ID.
  Bytes 43–47 = RPQ 3 ID.
  Bytes 48–50 = Control Values for Suffix Numbers.
  Bytes 51–60 = Reserved.
  Byte 61 = Feature Disk Level.
  Byte 62 = Feature Disk Suffix.
  Byte 63 = System Disk Level.
  Byte 64 = System Disk Suffix.
  Byte 65 = Language Disk Level.
  Byte 66 = Language Disk Suffix.
  Byte 67 = RPQ 1 Disk Level.
  Byte 68 = RPQ 1 Disk Suffix.
  Byte 69 = RPQ 2 Disk Level.
  Byte 70 = RPQ 2 Disk Suffix.
  Byte 71 = RPQ 3 Disk Level.
  Byte 72 = RPQ 3 Disk Suffix.

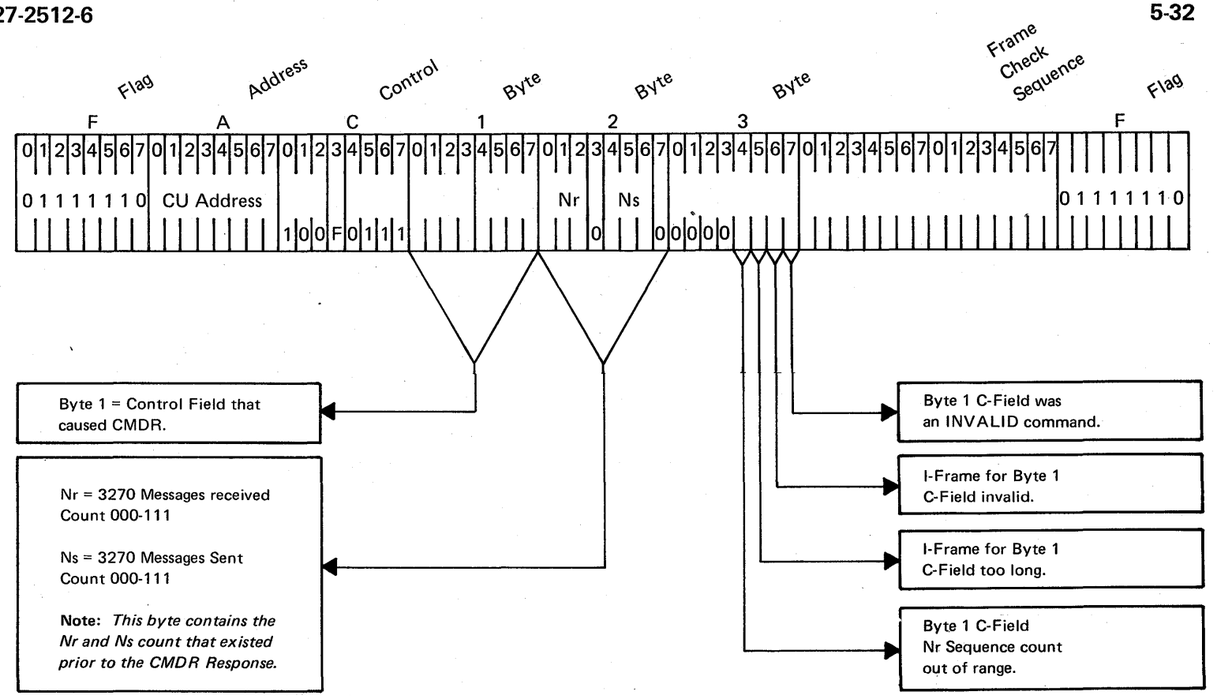


Figure 5-54. Command Reject (CMDR) Message Format

5.13 SWITCHES AND CONTROLS

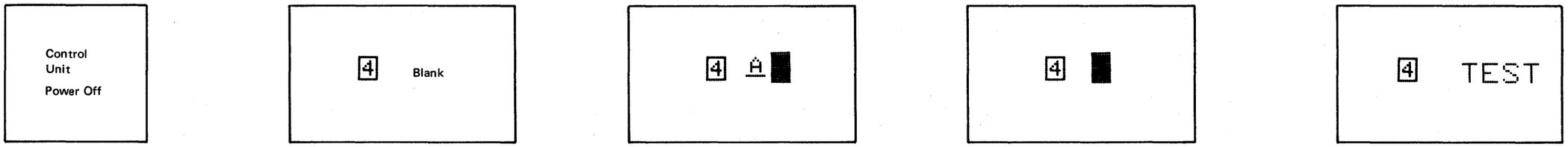
Figure 5-55 explains the switches and controls.

Indicator/Control	Explanation
Power Interface switch and On/Off switch (**I** = on; **O** = off) On Indicator	When locally attached to a host system, power for the 3274 can be applied and removed from the host processor (remote power control) or at the 3274 (local power control) by using the Power Interface switch as follows: 1. Remote power control. When the Power Interface switch is placed in the REMOTE/ONLINE position and the On/Off switch to On, power can be turned on or off at the host processor. 2. Local power control. To apply power, the Power/Interface switch is placed in the LOCAL/ONLINE position and the On/Off switch is placed in the On position. The On indicator lights. To remove power, the Power/Interface switch is placed in the LOCAL/OFFLINE position and the On/Off switch is set to OFF, after the LOCAL/OFFLINE indicator lights. When remotely attached to a host system, power is applied and removed at the 3274 by using the On/Off switch. (The Power/Interface switch is not installed.)
IML and Alt IML Address 1/2	The Initial Machine Load (IML) pushbutton and the Alternate (Alt) IML rocker switch are used to initiate manual IML operations at the 3274.
Caution: The Power Interface switch must be in the Local/Offline position and the Local/Offline indicator must be on.	
	Pressing and holding the IML pushbutton causes a basic test to be run. Releasing IML allows execution of the IML tests, followed by loading of the machine. (Total operation time is approximately 50 seconds.)
Caution: Pressing the IML pushbutton causes an interruption and temporarily disables all terminals attached to the 3274. If any attached terminals are in use, all terminal operators should be notified before proceeding.	
IML and Alt IML Address 1/2	Holding the Alt IML Address switch in position 1 while pressing and holding the IML pushbutton, loads the machine directly. This procedure should be followed only when the normal loading procedure fails and useful work can still be done. Holding the Alt IML Address switch in position 2 while pressing the IML pushbutton causes a communication link test to be run. The test is operable only when the Power/Interface switch is in the Remote position.

Figure 5-55. Switch and Control Explanation

5.14 BSC AND SNA READINESS SYMBOLS

Figures 5-56 and 5-57 show the readiness symbols associated with the BSC and SNA selection sequences, respectively.



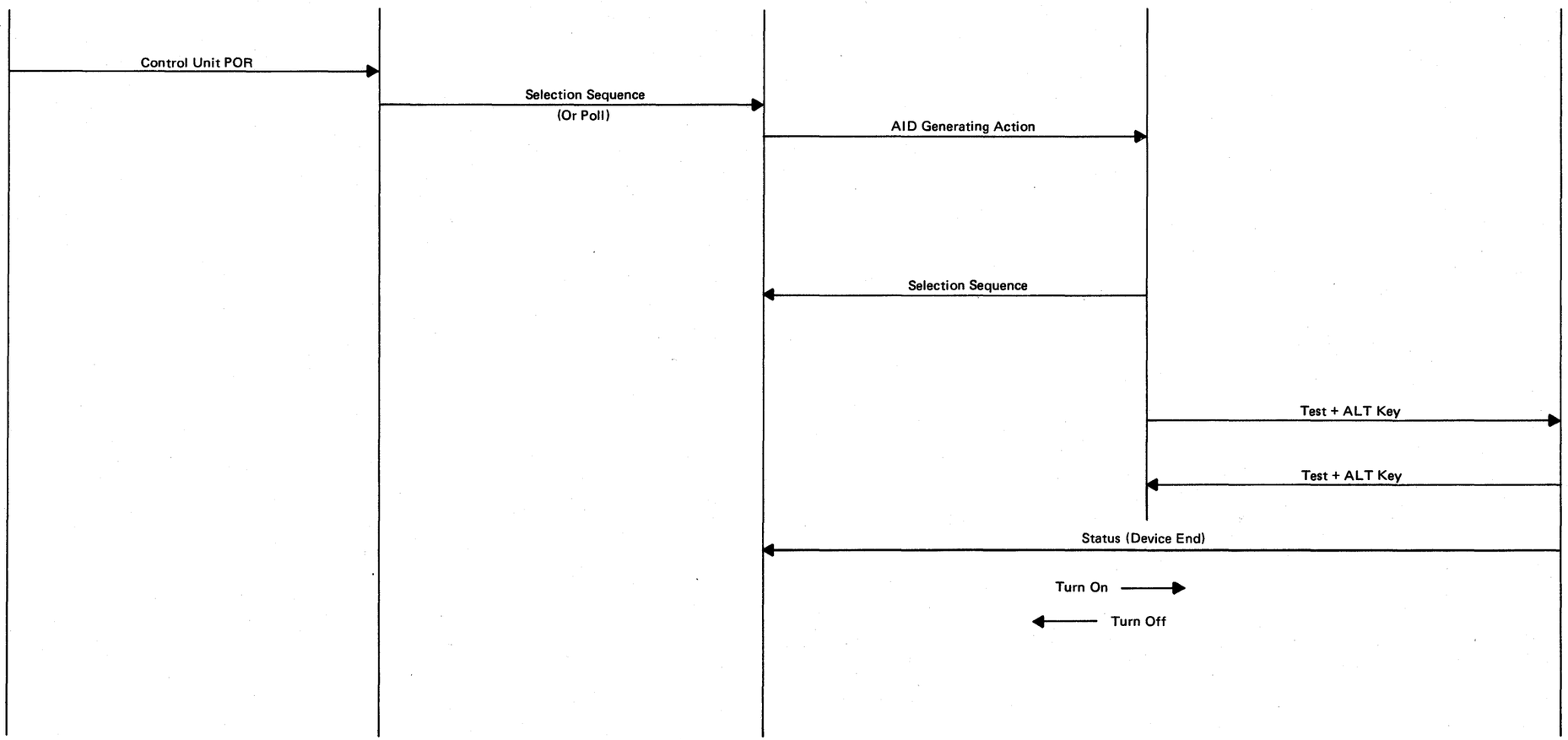


Figure 5-56. BSC Readiness Symbols

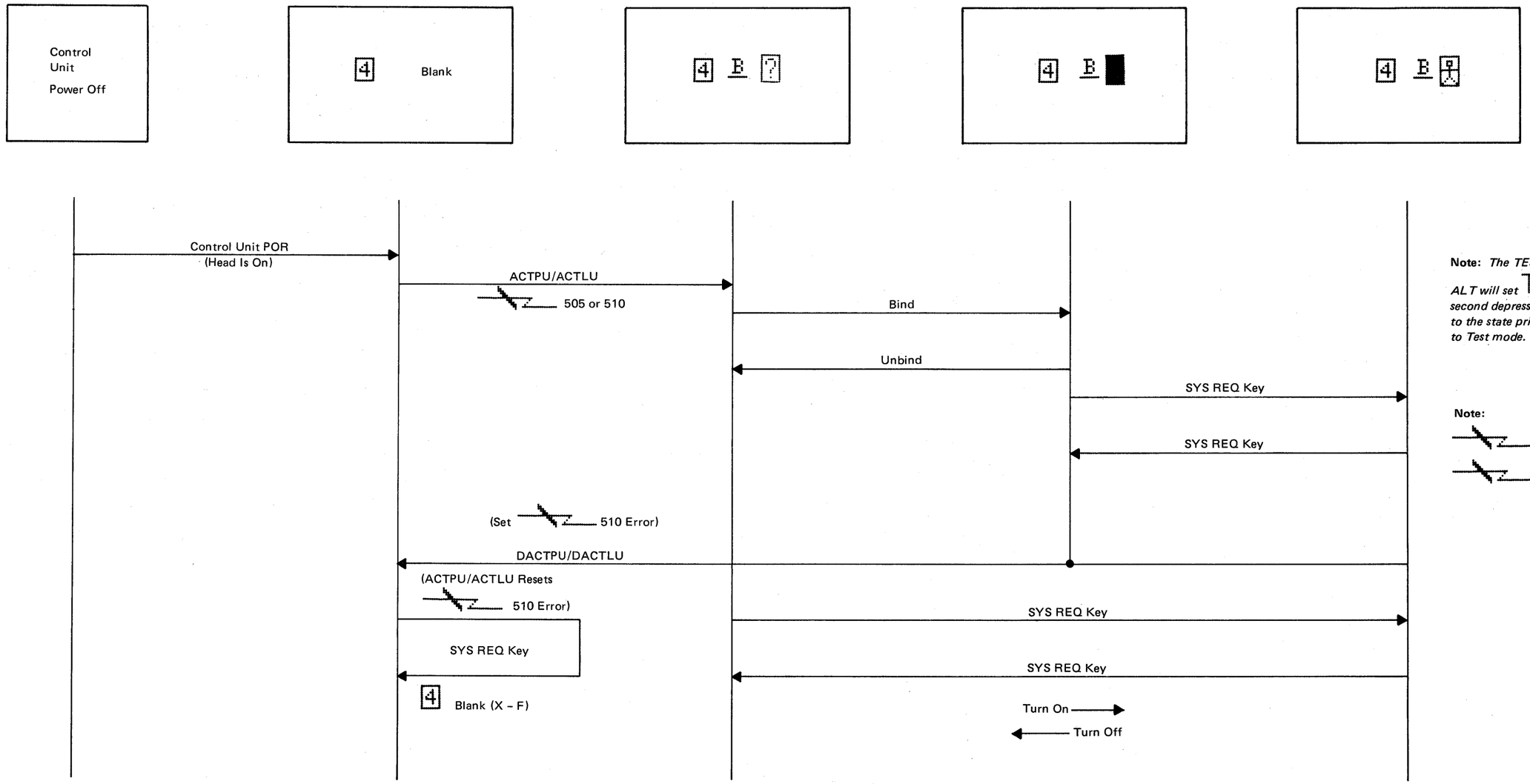


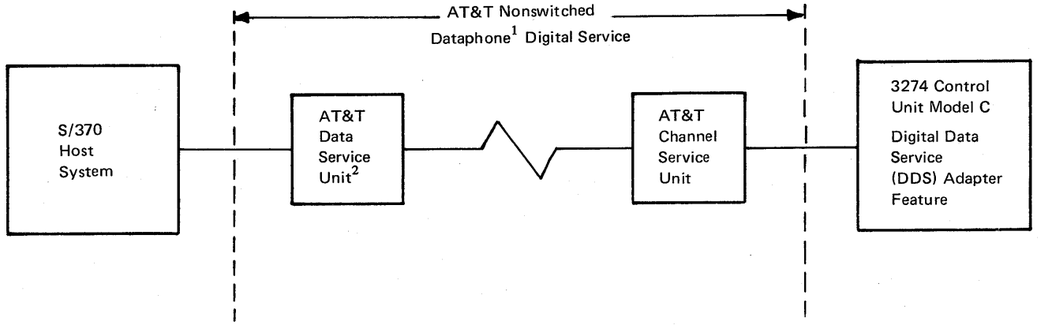
Figure 5-57. SNA Readiness Symbols

5.15. DIGITAL DATA SERVICE (DDS) ADAPTER

The Digital Data Service (DDS) Adapter provides for the connection of the 3274 Control Unit Model C to the AT&T nonswitched Dataphone[1] digital data service network. The DDS Adapter is an integrated adapter for BSC or SDLC data transmission at speeds of 2400, 4800, 9600, or 56,000 bps. Access to the DDS network is provided by the AT&T Channel Service Unit, which is the DDS network termination point at the customer site. See Figure 5-58.

The 3274 must have either the Common Communications Adapter (CCA) or the High-Performance Communications Adapter (HPCA) installed. (The HPCA is required for operation at 56,000 bps.) The DDS Adapter can be used in point-to-point or multipoint configurations. Wrap Test capability of the DDS Adapter allows testing of the adapter only, or the adapter and the communications cable. Figure 5-59 illustrates the digital data waveshapes.

[1]Trademark of American Telephone and Telegraph Co.

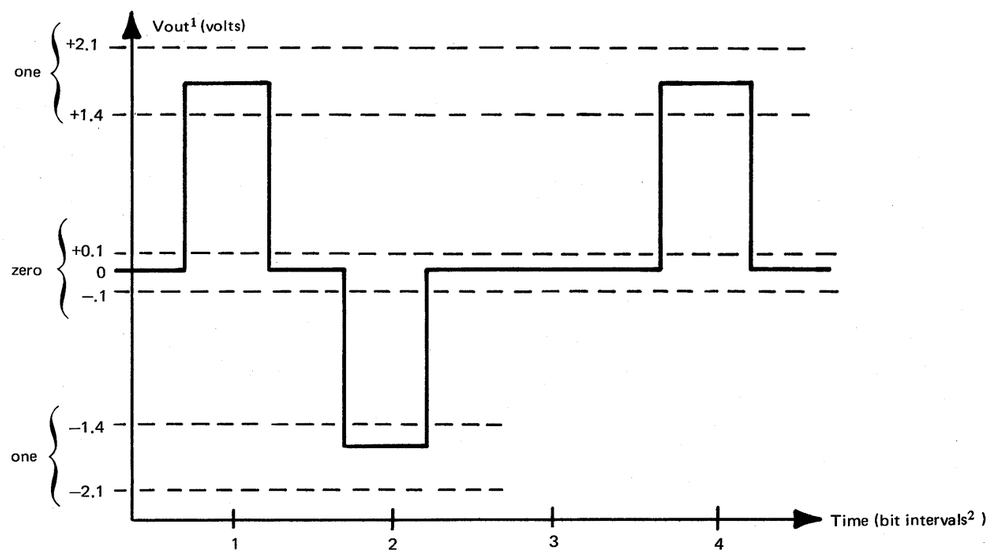


[1]Trademark of American Telephone and Telegraph Co.

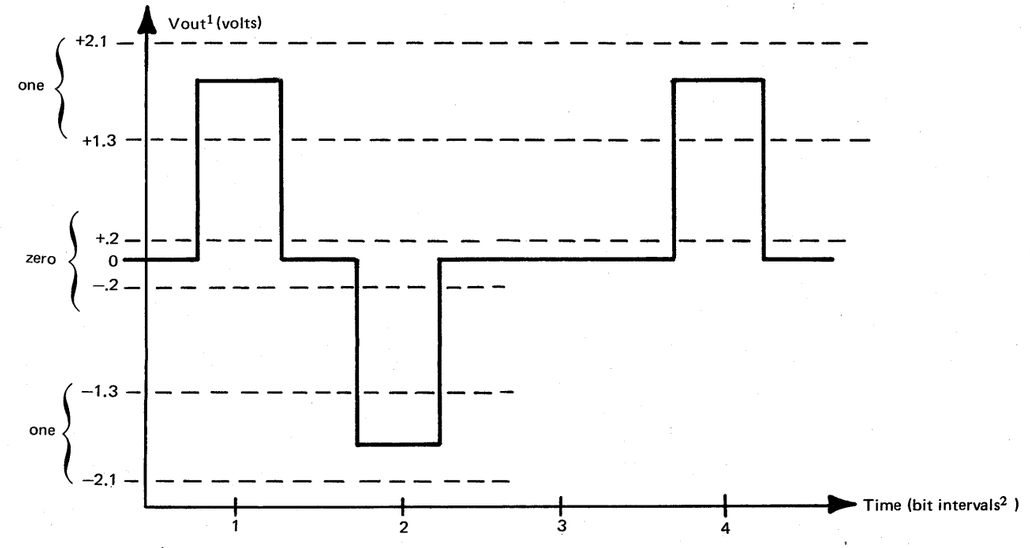
[2]Or equivalent

Figure 5-58. Connection of 3274 Control Unit Model C with DDS Adapter Feature

DDSA Output to Channel Service Unit



Channel Service Unit Input to DDSA



[1]Vout is a differential AC voltage across a 135-ohm resistance termination

[2]Bit interval = $\frac{1}{\text{bit rate(bps)}}$

Figure 5-59. Digital Data Waveshapes

Chapter 6. Tools and Test Equipment

6.1 INTRODUCTION

This chapter identifies and describes the specialized tools and test equipment that may be required for 3274 problem isolation.

These specialized pieces of test equipment are presently used with the 3274 Control Unit:

- Buffered Teleprocessing Diagnostic Analyzer and Tester (BTDAT)
- PT-2
- NU Data Tester, IBM PN 453637

6.2 BUFFERED TELEPROCESSING DIAGNOSTIC ANALYZER AND TESTER

The Buffered Teleprocessing Diagnostic Analyzer and Tester (BTDAT) was designed as a branch office teleprocessing (TP) specialist's tool. The purpose of this tool is to trap transmit data and/or receive data for analysis and to further use this data to exercise local or downline TP devices.

The BTDAT consists of two 32K bit memories and various registers and controls to allow data in and out of these buffers.

6.3 NU DATA TESTER

The NU Data Tester (IBM PN 453637) is used to monitor and isolate problems between data terminal equipment and data transmission equipment that follow the standards outlined in EIA Standard RS-232-c.

Seven EIA leads are displayed for continuous monitoring: transmit and receive data, data terminal ready, data set ready, request to send, clear to send, and carrier detected.

This tester connects in series with the EIA/CCITT data set cable and the 25-pin data set connector. The CE may then monitor, measure, or control the leads on the data set interface.

6.4 MAINTENANCE DEVICE

The maintenance device is used to transmit the contents of a dump diskette, over a communication facility, to the Subsystem Support Center (SSC). This device allows timely analysis of subsystem dumps by the SSC to assist in problem determination. The transmission procedure for diskettes is provided with the unit. Before using this device, contact the SSC or your support structure for assistance.

6.5 PT-2 ATTACHMENT TO NON-EIA INTERFACES

This procedure will allow attachment of a PT-2 to the Model C control units in such a way as to allow monitoring of transmit and receive data when a NON-EIA Interface is present.

1. Assemble PT-2 using TP Line Monitor (TPLM) Adapter.
2. Set optional probe switches on TPLM Adapter to the SLT/VTL (UP) position.
3. Attach optional probes as follows:

TPLM	Line Name
2	Xmit Data
3	Req to Send
4	Clear to Send
5	Xmit Clock
6	Rec. Data
7	Carrier Detect
8	Receive Clock
9	Data Set Ready

   The appropriate tab pins are shown in Figure 6-1.
4. Load TP Tool Program and enter appropriate responses to questions displayed.
   - Specify product clock
   - When running above 9600-bps (via V.35, X.21 or DDS Adapter features) it is necessary to use the High-Speed Monitor Function of the PT-2. Refer to PT-2 Line Monitor Manual, Section 6.

CCA/HPCA Location A1H2 in 3274-1C/21C and 31C only; A1L2 in 41C		EIA*DDS Adapter/V.35/*X.21/**Greater than 1200-bps Location A1G2 in 3274-1C/21C and 31C only; Location A1K2 in 41C Integrated Modem
U04	Xmit Data	D04
S10	Req to Send	D02
S12	Clear to Send	D13
U11	Xmit Clock	B07
U13	Rec Data	B10
S04	Carrier Detect	B12
U10	Receive Clock	B08
S13	Data Set Ready	B13
U12	Data Terminal Rdy	B02

*Can run only up to 9600-bps unless High-Speed Monitor Function

**For 3274-31C, Greater than 1200-bps Integrated Modem location is A2E2

Figure 6-1. TPLM Tab Pin Locations

Appendix A. Support Structure Information Form

CE Name _____ CE Telephone Number _____

Customer Name _____ Customer Telephone Number _____

Customer Number _____ Branch Office Number _____

Host System Type _____ Subsystem Type/Model _____

Incident Machine Type/Model _____

Serial Number _____ EC Level _____

Installed Microcode _____

Part Number _____ EC Level _____

REAs 1 _____ 2 _____ 3 _____ 4 _____

5 _____ 6 _____ 7 _____ 8 _____

If your subsystem is a local configuration, include the following information:

Control unit type/model _____

Channel type: Selector _____ Byte _____ Block _____

Channel cable length (max 200 ft) _____

Control unit position on channel (1-8) _____

Last unit on channel? Yes _____ No _____

If your subsystem is a remote configuration, include the following information:

Multiplexor type: 270x _____ 370x _____ OEM _____

Line type: Point to point _____ Multipoint _____ Switched _____

Number of wires: 2 _____ 4 _____

Modem type: IBM _____ OEM _____

Line speed (baud): 1200 _____ 2000 _____ 2400 _____ 4800 _____

7200 _____ 9600 _____ Other _____

Communications adapter type: CCA _____ HPCA _____ EIA _____

SLA _____ Other (specify) _____

Channel type: Selector _____ Byte _____ Block _____

Channel cable length (max 200 ft): _____

Control unit position on channel (1-8) _____

Control unit priority: High _____ Low _____

Multichannel switch: Yes _____ No _____

Number and Type of Attached Devices.

Number of ports _____. Number of 3299s attached _____

Total Number of Displays Attached _____.

Number of Displays by Type:

3277-1 _____	3278-1 _____	3279-S2A _____
3277-2 _____	3278-2 _____	3279-S2B _____
---	3278-3 _____	3279-S3G _____
3178-1 _____	3278-4 _____	3279-02X _____
3178-2 _____	3179 _____	3279-03X _____
	3180 _____	

Total Number of Printers Attached _____.

Number of Printers by Type:

3284-1 _____	3287-1 _____	3289-1 _____	3268-2 _____
3284-2 _____	3287-2 _____	3289-2 _____	4250 _____
3284-3 _____	3287-1C _____	---	5210-G01 _____
---	3287-2C _____	3230-2 _____	5210-G02 _____
3286-1 _____	---	---	
3286-2 _____	3288-2 _____	3262-3 _____	
		3262-13 _____	

Number of Variable Function devices by Type:

3290 _____

Number of Programmable Devices by Type:

5271 _____

Subsystem features.

Subsystem machine type/model _____

List appropriate features _____

_____

_____

_____

_____

Does subsystem machine have any RPQs? Yes_____ No _____

If yes, list RPQs _____

_____

_____

_____

If the incident machine and the subsystem machine are not one and the same, list the appropriate features and/or RPQs for the incident machine.

Incident machine type/model _____

Features _____

_____

_____

_____

Does the incident machine have RPQs? Yes_____ No_____

If yes, list the RPQs _____

_____

_____

_____

Host system program support information.

SCP type: OS_____ DOS _____ VS1 (SVS) _____ VS2 (MVS)_____ VM _____

APL _____ Other (specify) _____ Release level _____

Access method: BTAM_____ TCAM_____ TCAM-E _____ VTAM _____

GAM_____ Other (specify)_____ Version number _____

Application type: APLSV_____ CICS _____ CMS _____ TSO _____ IMS_____

MIS_____ Other (specify) _____ Version number _____

NCP type (370x only) _____ Release level _____

PEP type (270x only)_____ Release level _____

EP type (270x only)_____ Release level _____

General description of problem and the maintenance aids used.

Incident machine type/model _____

Give a brief description of problem: _____

_____

_____

Tools used: _____

_____

_____

_____

Appendix B. Models A, B, C, and D Error Codes

This appendix has three parts. Part 1 lists the error codes. Part 2 contains an expanded discussion of probable causes for selected error codes. Part 3 describes the error code/extended DCB log area relationship for selected error codes.

The 3-digit error codes (nnn) are displayed in the operator information area on the display and follow the Machine Check (X), Program Check (X PROG), and Communication Check (X) symbols. These codes further define the error conditions indicated by the error symbols.

The first digit of the nnn code indicates the type of error that occurred, as follows:

nnn Code	Type of Error
2XX, 3XX	Machine check
4XX	Program check
5XX	Communication check
6XX and 7XX	3290 nnn codes (not defined in this manual, refer to the *Customer Problem Analysis and Resolution Manual,* GA23-0125-0, for 3290 nnn codes).

For example, a Communication Check symbol followed by an nnn code of 532 (X 532) indicates that the BSC line is idle.

The error codes (nnn) are listed in numeric order with the following information to assist you in problem determination:

- Error description
- 8 4 2 1 indicator setting
- Test number used to retrieve the logout
- The error statistic counter that is incremented
- Where the code is displayed (one/all displays)
- Indication displayed in the operator information area on the display (X 202)
- Probable cause and action to be performed
- Sense information
- Application features associated with the error condition

Part 1. Error Codes

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
202	Interrupt Threshold Exceeded • Terminal with 202 error display caused keystroke/status buffer overflow • The terminal is disabled		nn/1	5	–	–	X	X 202	• POR device	• Internal terminal error (see device MIM)	081C	DC/US	Category A Terminal
203	Feature Bus Error • Feature-bus error at terminal		nn/1	6	–	–	X	X 203	• Reset key • Retry operation	• Terminal Feature circuitry failure (see device MIM)	–	–	Features
204	Device Check • Terminal-buffer parity error was detected • Control unit clears buffer • If recovery not successful, terminal is disabled		nn/1	4	–	–	X	X 204	• Reset key • Host recovery • POR device if disabled	• Terminal buffer parity error (see device MIM)	082B 081C	DC/US DC/US	Category A Terminal Category A Terminal
205	Unsupported Feature Address Attached • Feature is not supported with configuration selected at customizing time, *or* • Feature did not respond when the terminal was initialized		nn/1	–	–	–	X	X 205	• Reset key • Retry operation	• Verify customizing selected feature • Reminder is on if display can be used	–	–	Feature
206	Invalid Feature Response on Initialization • Invalid response from feature during initialization • Terminal remains enabled, *but* all features are disabled		nn/1	6	–	–	X	X 206	• Reset key • Retry operation	• Feature did not initialize properly (see device MIM) • **Reset key continues without features. POR required to use features.**	–	–	Feature
207	Lost Operation Completed • Control unit started an operation to terminal that required deferred ending status (Op Complete) • Over 1 second elapsed, and Op Complete not received • The terminal is disabled		nn/1	5	–	–	X	X 207	• POR device	• Terminal failure (see device MIM) • Loss of communication with device (Coax)	081C	DC/US	Category A Terminal
208	Invalid Operation Completed • Asynchronous Ending Status received when no operation requiring it was in process		nn/1	5	–		X	X 208	• Reset key • Retry operation	• Terminal error (see device MIM)	–	–	Category A Terminal

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
209	Command Queue Failed • A Cycle Sharing command or data queue failed in transmission • **Operation is retried, and counter is incremented** • If retry fails, terminal is disabled		nn/1	1 or 2	–		X	✕ 209	• POR Device	• CU to terminal communication failure (Coax)	081C	DC/US	Category A Terminal
210	Invalid Keyboard Attached • The ID of the terminal's keyboard does not match the types selected during customizing • No table is available for this keyboard type		nn/1	–	–		X	✕ 210	• Reset key • Retry operation	• Verify keyboard type selected in customizing	–	–	Type A Adapter Feature
211	Invalid Status Received • Invalid combination of status bits received from terminal • Keyboard is locked		nn/1	5	–		X	✕ 211	• Reset key • Retry operation	• Terminal error (see device MIM)	–	–	Category A Terminal
212	Invalid Scan Code Received • Invalid scan code was received from this terminal • Keyboard is locked		nn/1	–	–		X	✕ 212	• Reset key • Retry operation	• Terminal keyboard error • **Customizing error (see device MIM)**	–	–	Category A Terminal Keyboard
222	Invalid Selector Pen Status or Command Queue Failure • Illegal status received from selector pen *or* • Selector pen I/O operation failed after retry		nn/1	6	–		X	✕ 222	• Reset key • Retry operation	• Selector lightpen error (see device MIM)	–	–	Category A Terminal Lightpen
223	ECS Adapter Buffer Parity Error • Control unit clears buffer and notifies host • If clear does not eliminate parity check, the terminal is disabled		nn/1	6	–		X	✕ 223	• Host recovery • Reset key • POR device if disabled	• ECS adapter buffer (see device MIM)	082B 081C	DC/US DC/US	ECS Feature
224	Invalid MSR or MHS Status or Command Queue Failure • Illegal status received from Mag Stripe Reader *or* MHS • MSR or MHS I/O operation failed after retry		nn/1	6	–		X	✕ 224	• Reset key • Retry operation	• MSR (see device MIM) • MHS			Type A Terminal MSR or MHS Feature

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
225	ECS Adapter Status/Initialization Error • Device is disabled if not recoverable		nn/1	6	–		X	X 225	• Reset key • Device POR if disabled	• ECS adapter error (see device MIM)	081C	DC/US	Category A Terminal ECS
226/ 227	ECS Feature Command Queue Failure • A cycle sharing command/data operation failed in transmission • Operation is retried and counter is incremented • If retry fails, the terminal is disabled		nn/1	1 or 2	–		X	X 226 or X 227	• Device POR	• Transmission error while communicating with ECS Feature	081C	DC/US	Category A Terminal ECS Feature
228	Convergence Backup Storage Failure		nn/1	6				X 228	• Reset key • Retry operation	• Battery failure (see device MIM)	–	–	Models A,C, and D with Color
229	Convergence Feature Memory Failure		nn/1	6				X 229	• Reset key • Retry operation	• Convergence logic (see device MIM)	–	–	Models A,C, and D with Color
231	Printer Equipment Check • Printer reported an unrecoverable error to the control unit		nn/1	6		-	–	–	• See Printer PDG	• Printer error	081C	EC/IR/US	Type A Printer
234	Display has ECS Adapter but no Extended ROS		nn/1	–	–	–	X	X 234	• Device POR	• Replace ECSA card in 3278/3279			
235	Bad Status or Command Q Failure			6			X	X 235	• Device POR	• Port is Disabled	081C	DC/US	PC
236	Lost Op Code			6			X	X 236	• Device POR	• PC Software/Check PC Software	081C	DC/US	PC
237	Message Protocol Error			6			X	X 237	• Device POR	• PC Software/Check PC Software	081C	DC/US	PC
238	Inbound Message Exceeded Maximum Allowable Length			6			X	X 238	• Device POR	• PC Software/Check PC Software	081C	DC/US	PC
239	Invalid product information received from device		/1	–	–	–	X	X 239	• Device POR	• Device type error/Refer to device documentation	–	–	–
240 *	Sync Error Between 3290 and 3274 – Interface Disconnected		nn/1	6			X	X 240	• Device POR	• 3290 – 3274 Sync Error appears to be caused by 3290	081C	DC/US	3290
241	Sync Error Between 3290 and 3274 – Interface Disconnected		nn/1	6			X	X 241	• Device POR	• 3290 – 3274 Sync Error appears to be caused by 3274	081C	DC/US	3290

*There will also be a 6NN error number displayed at the 3290, and the last two digits of the 6NN error number will be recorded in the device error log. Refer to the 3290 documentation for a description of the 6NN error numbers.

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
242	Permanent Error — Interface Disabled		nn/1	5			X	X 242	• Device POR	• 3290/Refer to device maintenance documentation	081C	DC/US	3290
243	Time Exceeded for Reply (Lost Op-Complete) Interface Disabled		nn/1	5			X	X 243	• Device POR	• Excessively long data stream presented for 3290 processing, consequently, the 3274 did not receive required ending status (Op-Complete) from the 3290 within the allowed time	081C	DC/US	3290
245	Bad Status or Command Q Failure		nn/1	5 1 or 2	—	—	X	X 245	• Device POR	• Cable or device/Check cable connection; refer to device maintenance documentation	081C	DC/US	
246	Lost operation complete		nn/1	5	—	—	X	X 246	• Device POR	• Cable or device/Check cable; refer to device maintenance documentation	081C	DC/US	
247	Message Protocol Error		nn/1	6	—	—	X	X 247	• Device POR	• Cable or device/Check cable and cable connection; refer to device maintenance documentation	081C	DC/US	
263 thru 269	Refer to installed RPQ Documentation												
270	Unrecoverable Machine Check • The control unit detected an unrecoverable error from the Type B adapter • Type B adapter is disabled • Type A terminals are not affected	1010	A2/1	6	—	—	X	—	• IML	• Type B adapter logic	—	—	Type B Adapter
271	Adapter Disabled—Interrupt Threshold Exceeded • Category B device exceeded interrupt threshold value within 1 second • Type B adapter disabled • Type A terminals are not affected	1010	A2/1	—	X		—	—	• IML	• Type B device • Use /3 test to determine failing device as indicated by '—' on line 2 • Device log for failing device should indicate 279			Category B Terminal

*There will also be a 6NN error number displayed at the 3290, and the last two digits of the 6NN error number will be recorded in the device error log. Refer to the 3290 documentation for a description of the 6NN error numbers.

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
272	Unrecoverable Overrun • Type B adapter requested data and the request was not serviced within control unit cycle steal I/O time and recovery attempts were unsuccessful • Type B adapter disabled	1010	A2/1	2	X	–	–	–	• Host Recovery	• Type B adapter logic	082B	DC/US	Type B Adapter
273	Adapter Timeout • Type B adapter did not return I/O operation ending status within 2 seconds • Type B adapter is disabled • Type A adapter is unaffected	1010	A2/1	–	X	–	–	–	• IML	• Type B adapter logic	–	–	Category B Terminal
274	Solid Busy • An EAU command sent to the terminal, and Busy condition does not clear • Terminal is disabled because of error		nn/1	–	X	–	–	–	• POR device	• Type B device error	081C	DC/US	Category B Terminal
275	Equipment Check and Printer Not Ready • Printer has returned Sense of Equipment Check and Not Ready		nn/1	6	X	–	–	–	• See Printer PDG	• Printer error	081C	EC/IR/US	Category B Printer
276	Equipment Check – Printer • Printer has returned Sense of malfunction while printing • Print-buffer contents not affected		nn/1	5	X	–	–	–	• See Printer PDG	• Printer error	082B	EC/US	Category B Printer
277	Device Check • Device buffer parity error • Host error recovery should clear error • Device disabled if recovery is unsuccessful		nn/1	4	X	–	–	–	• Host recovery • POR device	• Type B device buffer	082B 081C	DC/US DC/US	Category B Terminal

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
278	Coax Parity • Parity error while communicating with device via coax • Device disabled if retry fails		nn/1	2	X	–	–	–	• Host recovery • POR device	• Coax • Device error • Type B D/R	081C	DC/US	Type B Adapter Category B Terminal
279	Interrupt Threshold Exceeded • Device exceeded interrupt threshold value • Type B adapter disabled	1010	nn/1	–	X	–	–	–	• IML	Device with nnn=279 in log caused adapter to be disabled • Type B device • Search device error log to determine failing device • Use /3 test also	081C	DC/US	Category B Terminal

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
292	Illegal Entry in Error Queue • Illegal combination of status in error queue for Type A adapter		A1/1	1	–	X	–	X 292	• Reset key • Retry operation	• Type A adapter	–	–	Type A Adapter
293	Unconfigured Port Address • Input received from a device address not in configuration table		A1/1	2	–	X	–	X 293	• Reset key • Retry operation	• Ensure that port address is included in customizing	–	–	Type A Adapter
294	Unexpected End Cycle Share • Control unit received End of Cycle Share when none was initiated		A1/1	3	–	X	–	X 294	• Reset key • Retry operation	• Type A adapter	–	–	Type A Adapter
295	Invalid DCA Status • Undefined combination of status bits received from Type A adapter		A1/1	4	–	X	–	X 295	• Reset key • Retry operation	• Type A adapter	–	–	Type A Adapter
296	Lost Status • Type A adapter keystroke/status buffers reached threshold (64CTR overflow) • Status was lost during an attempted restart		A1/1	5	–	X	–	X 296	• Reset key • Retry operation	• Type A adapter	–	–	Type A Adapter
297	Adapter Stopped and Was Restarted • The DCA stayed active for more than the allowed period of time. • The DCA was reset and successfully restarted		A1/1	6	–	–	–	—	• Reset key • Retry operation	• Type A adapter • Type A device	–	–	Type A Adapter
298	Command Queue Cycle Share Machine Check • Machine check during command queue cycle share operation • Operation is retried. If unsuccessful, coax port disabled		A1/1	7	–	X	–	X 298	• POR device	• Type A adapter • Type A device • Use device logs and /3 test to isolate	–	–	Type A Adapter
299	Non-Command Queue Cycle Share Machine Check • Cycle Share machine check when no command queue operation was in progress • CU cannot isolate failing port		A1/1	8	–	X	–	X 299	• Reset key • Retry operation	• Type A adapter			Type A Adapter

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
2%% (2EE)	Unsupported Feature Attached • Feature is not supported with configuration selected during customizing. • Feature did not respond when terminal was initialized. • Keyboard ID does not match control unit keyboard table.		nn/1 displays as NNN of 2EE in error log display	–	–		X	X 2%%	• Reset key • Retry operation	• Machine features do not match configuration • Feature logic error See Part 2.	–	–	Features
310	CCA Machine Check • Control logic to CCA operation error; if retry OK, is transparent to adapter control code • If recovery attempts are unsuccessful, the error is posted and the adapter is disabled	1001	–	–	–	X	–	X 310	• IML	• CCA	–	–	CCA - BSC
311	CCA Invalid Status • Invalid basic status bit combination has been received from the CCA • Adapter disabled	1001		–	–	X	–	X 311	• IML	• CCA	–	–	CCA - BSC
320	CCA Machine Check (SDLC) • Recovery attempts have failed • Adapter is disabled	1001	–	–	–	X		X 320	• IML	• CCA	–	–	CCA-SDLC
321	CCA Invalid Status (SDLC) • Invalid status has been received from the CCA • Adapter is disabled	1001		–	–	X		X 321	• IML	• CCA	–	–	CCA-SDLC

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Feature
330	HPCA Machine Check • Recovery attempts have failed. • Adapter is disabled.	1001 1001	–	–	–	X		X 330	• IML	• HPCA adapter	–	–	HPCA-SDLC
331	HPCA Invalid Status • Invalid status has been received from the HPCA. • Adapter is disabled.	1001		–	–	X		X 331	• IML	• HPCA adapter	–	–	HPCA-SDLC
332	HPCA Machine Check	1001	–	–	–	X	–	X 332	• IML	• HPCA adapter wrap failed. • Adapter is disabled	–	–	Loop
333	LSA Failure	–	–	–	–	X	–	X 333	• IML	• LSA failure (Wrap Test) • Adapter is disabled	–	–	Loop
334	CTS Transition or Shutoff	–	–	–	–	X		X 334 X 334	• IML	• LSA failure • Three shutoffs rec'd from the host • Adapter is disabled	–	–	Loop
335	DCE Error	–	–	–	–	X		X 335	• IML	• LSA failure • Adapter is disabled	–	–	Loop
336	LSC Error	–	–	–	–	X		X 336	• IML	• LSC failure (Wrap Test) • Connecting cable • Adapter is disabled	–	–	Loop
340	LCA Unrecoverable Machine Check • An LCA adapter machine has occurred • Retry has failed • Adapter is disabled • LCA issues 'disconnect in'			–	–	X		X 340	• IML	• LCA adapter	–	–	Model A

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
341	LCA Invalid Function Request • The LCA adapter has received an invalid request from control logic	1001	A0/1	–	–	X		✕ 341	• IML	• Control logic • LCA adapter • Microcode	–	–	Model A
342	LCA Open Error • LCA issues 'disconnect in'	1001	A0/1	–	–	X		✕ 342	• IML	• LCA adapter error	–	–	Model A
350	LHA Unrecoverable Machine Check • Adapter is disabled • LHA issues Disconnect In	1001	A0/1	–	–	X		✕ 350	• IML	• LHA adapter	–	–	Model B
351	LHA (B) Invalid Status or Sense • The LHA adapter has presented Invalid Status to the control logic • The adapter is disabled	1001	A0/1	2	–	X		✕ 351	• IML	• LHA adapter	–	–	Model B
352	LHA Invalid Request Code • LHA (B) adapter sent invalid request code • Adapter is disabled	1001	A0/1	–	–	X		✕ 352	• IML	• LHA adapter	–	–	Model B
353	LHA Invalid Device Address • LHA (B) adapter sent invalid address • Adapter is disabled	1001	A0/1	–	–	X		✕ 353	• IML	• LHA adapter	–	–	Model B
354	LHA Unrecoverable Machine Check During Initialization • LHA (B) adapter returned machine check during initialization • Recovery has failed • Adapter is disabled	1001	A0/1	–	–	X		✕ 354	• IML	• Check that address range jumpers match number of devices selected at customizing time • LHA adapter	–	–	Model B
355	Adapter I/O Parity Error • The 3274 Model B (adapter) detected a parity error when accessing its device table buffer • Adapter not disabled		A0/1	3	–		X	✕ 355	• Reset key • Retry operation	• LHA adapter	–	DC	Model B

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
356	Model B Adapter Cycle Share Machine Check • CU detected a cycle share machine check after retries exhausted • Adapter disabled		A0/1	4	–		X	356	• IML	• LHA adapter	–	DC	Model B
357	Adapter Lockout (LHA) • Adapter is locked out to controller attempts to present status • Adapter disabled	1001	A0/1	–		X		357	• IML	• LHA adapter	–	–	Model B
360	SLHA Unrecoverable Machine Check • Recovery has failed • Adapter is disabled	1001	A0/1	–	–	X		360	• IML	• SLHA adapter			Model D
361	SLHA Adapter has Presented Information or a Machine Check has Occurred • Adapter is disabled	1001	A0/1	–	–	X		361	• IML	• SLHA adapter	–	–	Model D
362	Model D Cycle Share Machine Check • Model 1D sense sent to host **Note:** *Counter incremented on all errors, NNN and operational indicators set if unrecoverable*	1001	A0/1	5	–		X	362	• Host recovery • Reset key to unlock keyboard	• SLHA adapter	–	DC	Model D
363	Model D Unrecoverable Machine Check • Adapter is disabled	1001	A0/1	–	–	X		363	• IML	• SLHA adapter	–	–	Model D
364	SLHA Adapter Parity Error • Parity error detected during an I/O transfer • Data check (sense) sent to host		A0/1	3			X	364	• Reset key • Host recovery • Retry operation	• SLHA adapter	–	DC	Model D

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
381	• Control Logic Error • Recoverable	–	nn/1	–	–		X	X ⊘ 381	• Device POR	• Invalid control logic command to device	–	–	All Models
	• Unrecoverable	0010	A3/1	–	–	X		X ⊘ 381	• IML	• Control logic • Storage • Microcode **Note:** *For printers, order reject on a load PS causes a machine check 381 non-recoverable error.*			
382	RTM Adapter Error	1011	A2/1	15			X	X ⊘ 382	• IML	• RTM Adapter	–	–	Models 31A, 31C, 31D, 41A, 41C
386	Overrun (Recovery Unsuccessful)		nn/1	13			X	X ⊘ 386	• Device POR	• Microcode problem suspected • Contact appropriate support structure • A 3274 dump may be needed	N/A	N/A	3290
387	Defective Diskette (Found on initialization)	1100/1111 (flashing)	nn/1	12		X		X ⊘ 387	• Reinsert or • Replace Diskette	• Diskette • Diskette drive • Diskette adapter	N/A	N/A	3290
388	Defective Diskette, Drive, or Adapter	1100/1111 (flashing)	nn/1	12			X	X ⊘ 388	• Reinsert or • Replace Diskette	• Diskette drive • Diskette adapter • Diskette	N/A	N/A	3290
389	Defective Diskette, Drive, or Adapter	1100	nn/1	11		X		X ⊘ 389	• IML	• Diskette adapter • Diskette drive • Diskette	N/A	N/A	3290

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
390	Storage Parity Error • Unrecoverable storage parity error • Host communications disabled	0001 *or* 0011 through 0111	–	–		X		X 390	• IML	• Control logic • Storage • See MIM Figure 2-8 for storage card	–	–	All Models
391	Control Logic Machine Check • Unrecoverable control logic error • Host communications disabled	0010 or 1101	–	–		X		X 391	• IML	• Control logic • Storage • Microcode	–	–	All Models
397	Encrypt/Decrypt Adapter Permanent Error • All attempts for recovery have been exhausted • Adapter disabled • Non-Encrypt/Decrypt operations may be run	1110	A3/1	8	–		X	X 397	• IML	• Encrypt/Decrypt logic	0848	–	Encrypt/ Decrypt
398	Encrypt/Decrypt Parity Error • Master key parity error • Retry attempts failed • Adapter is disabled • Non-Encrypt/Decrypt operations may be run		A2/1	9	–		X	X 398	• IML • Enter master key	• Weak or defective battery • Refer to master key entry and verification procedure	0848	–	Encrypt/ Decrypt
399	Encrypt/Decrypt Adapter Failure • Retry attempts failed • Adapter is disabled • Non-Encrypt/Decrypt operations may still be run		A2/1	10	–		X	X 399	• IML	• Encrypt/Decrypt logic	0848		Encrypt/ Decrypt

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
401	Command Reject • Invalid command received from host • See Note 1	–	A0/1	–	–	X		X PROG 401	• Host recovery • Reset key • Retry operation	• Host has sent invalid command	1003	Com Rej	All Models
402	Invalid Out-of-Range Buffer Address • SNA generates X'1005', parameter error • See Note 2	–	–	–	–		X	X PROG 402	• Host recovery • Reset key • Retry operation	• Host has sent invalid order parameters	1005	Op Ck	Models A, C-BSC/SNA, and D
403	Data after Read/Read Modified/Equ Invalid or Out of Range • Invalid or out-of-range data • SNA generates X'1003', Function Not Supported (see Note 1)		nn/1	–	–	–	X	X PROG 403	• Host recovery • Reset key • Retry operation	• Host has sent invalid data after RD, Rd Mod, EAU command	1003	Op Ck	Models A, C-BSC/SNA, and D
404	SBA/RA/EAU or SF Order without Valid Parameters • BSC generates a Sense Operation Check; SNA generates X'1005', Parameter Error (see Note 2)		nn/1	–	–	–	X	X PROG 404	• Host recovery • Reset key • Retry operation	• Host has sent an order (SBA, RA, EAU, or SF) without required data bytes	1005	Op Ck	Models A, C-BSC/SNA, and D
405	Invalid Copy Command • BSC generates an operation check		nn/1	–	–	–	X	X PROG 405	• Host recovery • Reset key • Retry operation	• Host has sent a copy command with invalid parameters	–	Op Ck	CCA-BSC

Notes:

1. *SNA generates code X'1003', function not supported:*
   - *Unsupported session control request*
   - *Unsupported data control request*
   - *Signal code not X'00010000'*
   - *Network control request*
   - *FM data stream*
   - *Invalid command: data after Read, RM, RMA, EAU*
   - *MF to non-field location*
2. *Parameter error – invalid address after SBA, RA, or EAU order (SBA, RA, EAU without parameters) or SCS parameter error*

   Invalid parameters following SA, SFE, and MF

*Where nn = port ID = 00-31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
406	Invalid Command Sequence • Invalid command sequence was detected		nn/1	–	–	–	X	✖ PROG 406	• Reset key • Retry operation	• A CCW was chained to a write CCW that had the start print bit set in the WCC	–	Op Ck	Models C-BSC and D
407	LHA Sent Operation Check • Invalid data stream from host		nn/1	–	–	–	X	✖ PROG 407	• Reset key • Retry operation	• Host send: a) SBA RA, or EAU with an invalid address b) a valid order without required data c) a write type command with start print bit chained to the next command d) a WCC with bit 1 off.	–	Op Ck	Model B
408	(BSC) Count Exceeded • Adapter read buffer unavailable • Sense/status set to OPCHECK and EOT sent to host		A0/1	10	–	–	X	✖ PROG 408	• Reset key • Retry operation	• 3274 unable to handle host data stream • Data stream has excessive program tab orders	–	Op Ck	Model C-BSC
409	Either if: 1a. The device to be copied from is a 3290 or 1b. The buffer to be copied is locked (protected) or if the extended attribute buffer is being used for other than control codes and: 2a. The device to be copied from is *not* a display or 2b. The device to be copied to is *not* a printer or 2c. The copy control character does not specify the entire contents of the storage buffer to be copied		–	–	–	–	X	✖ PROG 409	• Reset key	• Host Data Stream/Contact host support programmer	–	Op Ck	BSC

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
410	RU Length Error • RU greater than 1536 • Program check • Host-sent RU larger than control unit can support		nn/1	–	–	–	X	X PROG 410	• Reset key • Retry operation	• Host software	1002	–	Model A
411	RU Length Error • LU1 RU is greater than BIND specification		nn/1	–	–	–	X	X PROG 411	• Reset key • Retry operation	• Host software	1002	–	Models A and C-SNA
412	Short Record • Program check • A 'short' record was detected • Control unit sends SNA a negative response of X'1002', RU length error		nn/1	–	–	–	X	X PROG 412	• Reset key • Retry operation	• Host software	1002		Models A and C-SNA
413	Function Not Supported • Crypto verification (CRV) received but no crypto session has been established • See 401, Note 1	–	nn/1	–			X	X PROG 413	• Reset key • Retry operation	• Host software • Procedural error	1003	–	Model C-SNA Encrypt/ Decrypt
414	Encrypt/Decrypt Data Error • SNA program check • Invalid pad count or non-modulo-8 RU has been received during an Encrypt/Decrypt session		nn/1	–	–		X	X PROG 414	• Reset key • Retry operation • **Inform host programmer** • Non-Encrypt/ Decrypt operations may be run	• Host software • Procedural error	1001	–	Model C-SNA Encrypt/ Decrypt
420	Exception Response Not Allowed • SNA program check	–	nn/1	–			X	X PROG 420	• Reset key • Retry operation • **Inform host programmer**	• Host has sent invalid or incorrect data • LIC carried exception response when Bind specified definite response	4006	–	Models A and C-SNA
421	Definite Response Not Allowed • SNA program check	–	nn/1	–			X	X PROG 421	• Reset key • Retry operation • **Inform host programmer**	• Host has sent invalid or incorrect data • LIC carried definite response when Bind specified exception response	4007	–	Models A and C-SNA

*Where nn = port ID = 00-31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
422	No Response Not Allowed • Program check	–	nn/1	–			X	✕ PROG 422	• Reset key • Retry operation • Inform host programmer	• Host software	400A	–	Models A and C-SNA
423	FI (Format Indicator) Bit Not Allowed • Program check	–	nn/1	–			X	✕ PROG 423	• Reset key • Retry operation • Inform host programmer	• Host software	400F	–	Models A and C-SNA
430	Sequence Number Error • SNA program check	–	nn/1	–			X	✕ PROG 430	• Reset key • Retry operation • Inform host programmer	• Host software	2001	–	Models A and C-SNA
431	Chaining Error • SNA program check	–	nn/1	–	–		X	✕ PROG 431	• Reset key • Retry operation • Inform host programmer	• Host software • Error in the chain indicator sequence	2002	–	Models A and C-SNA
432	Bracket Error • SNA program check	–	nn/1	–	–		X	✕ PROG 432	• Reset key • Retry operation • Inform host programmer	• Host software • Brackets incorrectly used	2003	–	Models A and C-SNA

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
433	Data Traffic Reset • SNA program check	–	nn/1	–	–		X	✖ PROG 433	• Reset key • Retry operation • Inform host programmer	• Host software	2005	–	Models A and C-SNA
434	Half-Duplex Error (Direction Error) • SNA program check	–	nn/1	–	–		X	✖ PROG 434	• Reset key • Retry operation • Inform host programmer	• Host software • Normal Flow request was received by SNA while in half-duplex Send state	2004	–	Models A and C-SNA
439	Encrypt/Decrypt Protocol Violation • SNA program check		nn/1	–	–		X	✖ PROG 439	• Reset key • Retry operation • Inform host programmer • Non-Encrypt/Decrypt operations may be run	• Host software • An invalid CRV has been received	2009	–	Model C-SNA Encrypt/ Decrypt
440	Session Limit Exceeded • SNA program check	–	nn/1	–	X			none	• Reset key • Retry operation • Inform host programmer • Non-Encrypt/Decrypt operations may be run	• Host software	0805	–	Models A and C-SNA
441	Bracket Bid Reject Not Ready to Receive (RTR) Returned or Receiver in Transmit • SNA program check	–	nn/1	–	X			none	• Reset key • Retry operation • Inform host programmer	• Host software	0813 or 081B	– –	Models A and C-SNA
442	Request Not Executable • SNA program check • Function request cannot be executed because of a permanent hardware error	–	nn/1	–	–			✖ PROG 442	• Device POR	• Terminal error - refer to 2nn portion of /1 test	081C	–	Models A and C-SNA
443	Change Direction Required • SNA program check	–	nn/1	–	–		X	✖ PROG 443	• Device POR	• Host software • Request required a Normal Flow reply, but SNA in Receive state	0829	–	Models A and C-SNA
444	Session Already Bound • SNA program check	–	nn/1	–	X			none	• Device POR	• Host software • The requested function is already active	0815	–	Models A and C-SNA
445	ACTLU Not Sent (cold start or Error Recovery Procedure)	–	nn/1	–	–		X	✖ PROG 445	• Device POR	• Host software	0821	–	Models A and C-SNA

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
450	Bind Reject-Profile Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 450	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
451	Bind Reject-Primary Protocol Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 451	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
452	Bind Reject-Secondary Protocol Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 452	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
453	Bind Reject-Common Protocol Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 453	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
454	Bind Reject-Screen Size Spec. Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 454	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
455	Bind Reject-LU Profile Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 455	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
456	Bind Reject-LU1 Error • SNA program check: invalid session parameter	–	nn/1	–	–		X	X PROG 456	• Reset key • Retry operation • Inform host programmer	• Host software	0821	–	Models A and C-SNA
457	Bind Reject-Encrypt/Decrypt Parameter Error • SNA program check		nn/1	–	–		X	X PROG 457	• Reset key • Retry operation • Inform host programmer • Non-Encrypt/Decrypt operations may be run	• Host software • Bind specification for Encrypt/Decrypt had an error in byte 26 or 27, Encrypt/Decrypt was specified, and the Encrypt/Decrypt feature is not present, or a CRV was received in CRV invalid state.	0821	–	Model C-SNA Encrypt/ Decrypt

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
458	Bind Reject-Encrypt/Decrypt Test		nn/1	–	–		X	X PROG458	• Host recovery or • Control Unit key must be changed (the customer's security administrator should be notified) • Non-Encrypt/Decrypt operations may be run	• The test value (N) from the host does not match the one sent by the 3274 • There is a master key mismatch between the host and the 3274 • See Planning and Setup Guide	0821	–	Model C-SNA Encrypt/ Decrypt
460	Printer Authorization Matrix Error							X PROG460	• Reset key • Retry operation	• Invalid print matrix sent from host or Load Key hit at time when matrix not on screen			All Models
468	Printer Detected Error in LU1 Data Stream	–	nn/1	–	–		–		• See Printer PDG	• Host software		–	Models A and C-SNA
470	Unsupported Order	–	–	–			X	X PROG470	• Reset key • Retry operation • Application program error	• Host software error • Unsupported order decoded in SFAP data stream	100C	Op Ck	Models A, C, and D
471	SFAP (Structured Field and Attribute Processing) Data Stream Error	–	–	–			X	X PROG471	• Reset key • Retry operation • Application program error	• Host software error • Refer to App. C	1003 or 1005	Op Ck	Models A, C, and D
472	Read Partition Structured Field State Error	–	–	–			X	X PROG472	• Reset key • Retry operation • Application program error	• Host software error • Refer to App. C	0871	Op Ck	Models A, C, and D
473	PS Addressing Error	–	–	–			X	X PROG473	• Reset key • Retry operation • Application program error	• Host software error • Refer to App. C	084C	Op Ck	Models A, C, and D
474	No Extended DCB Configured for this Device	–	–	–			X	X PROG474	• SFAP data stream should not be sent to this device	• SFAP data stream send – no ext. DBC available	1003	Op Ck	Models A, C, and D
475	WCC has Start Print Bit Set but Not Last Structured Field	–	nn/1				X	X PROG	• Reset key • Retry operation • Application program error	• Host software	1001	Op Ck	Model D SNA BSC
476	Transmission Block Size Exceeded	–	nn/1	–	–	–	X	X PROG476	• Reset key • Retry Operation	• Check application program	N/A	Op Ck	3290
498	Negative Response Received • SNA program check • No SNA sense returned	–	nn/1	–	–		X	X PROG498	• Reset key • Retry operation • Inform host programmer	• Host software	–	–	Models A and C-SNA

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
499	Exception Request • SNA Program check • No SNA sense returned	–	nn/1	–	–		X	✕ PROG499	• Reset key • Retry operation • Inform host programmer	• Host software	–	–	Models A and C-SNA
501	• 3274 Model C – Data Set Ready Line Dropped	–	A0/1	– (SDLC) 9 (BSC) 10 OR (X.25) 11		X		✕ ↘z 501	• Indicator is reset when DSR is restored • Reset keyboard • Retry operation	• Missing DSR • Check data set • Check modem cable wrap switch	–	–	Model C-SDLC/BSC
	• 3274 Models A, B, and D Channel Not Online	–	–	–		X		✕ ↘z 501	• Set power/inter-switch to ONLINE position	• Power/Interface switch in OFFLINE position • Channel adapter • Channel/cables	–	–	Models A, B, and D
502	Clear to Send Not Present • Clear to send not present while request to send was on • Adapter indicates DCE error or write timeout • DSR is up		A0/1	– 10 OR (X.25) 11	–	X	–	✕ ↘z 502	• Reset key • Retry operation	• Check data set • Run wrap test • Check – 8.5 volts F4	–	–	Model C
503	Selective Reset • Selective reset sequence was received for this address • Keyboard is inhibited, Reset key required to clear		–	–	–	–	X	✕ ↘z 503	• Reset key • Retry operation	• The channel issued selective reset to clear an error condition • Use host error logs to determine error	–	–	Models B and D
504	Disconnect Received		A0/1 (X.25)	X.25 Counter 3	–	X	–	✕ ↘z 504	• The 3274 is attempting to re-open the link • If the problem persists, verify proper operation of the X.25 network	• DISC was received from the X.25 network • The 3274 has closed the link	–	–	Packet switched Network

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
505	• 3274 Model C Disconnected from Network	–	–	–		X		✕ ↘z 505	• SNRM required from network or contact required (X.25)	• Normal state after IML or disconnect has been received If 505 is displayed for a long time, notify the system operator	–	–	Model C
	• 3274 Model A Connection Required	–	–	–		X		✕ ↘z 505	• Connect is required from the host	• Could result from a connection problem (see nnn 525).	–	–	Model A
	• 3274 Models B and D – System Reset	–	–	–		X		✕ ↘z 505	• The first command from the host other than a TIO, Sense, or NOP will reset • AID generating keys will present attention status to channel if polling. Reset and retry.	• Normal state after IML. • A system reset was received from the channel	–	–	Model B or D
506	Waiting for DCE Ready	–	–	–	–	X	–	✕ ↘z 506	• None. This is normal startup. • If 506 is displayed for a long time, validate proper operation of the X.25 network.	• The 3274 is in the process of connecting to the X.25 network. • For PVC, the circuit and link have not yet been opened for traffic. • For SVC, the link has not yet been opened.	–	–	X.25
510	Physical Unit Not Active • The physical unit (SNA state) is not active	–	–	–	–	X	–	✕ ↘z 510	• Host issue ACTPU • Retry operation	• ACTPU is required from host • Check -8.5 volts Fuse 4	–	–	Models A and C-SDLC
511	Disconnect Received While PU Active • Exception condition • Physical unit is deactivated • Control unit set to Not Initialized	–	A0/1	13	–	X	–	✕ ↘z 511	• Connect required from host	• Host issued disconnect while PU was active	–	–	Model C
512	Connect Received and Already Connected • Exception condition • Physical unit is deactivated • Control unit set to not initialized	–	A0/1	12	–	X	–	✕ ↘z 512	• ACTPU is required from host	• Host sent connect when PU was already connected	–	–	Model A

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
513	Channel not available	–	A0/1	X.25 Counter 24	–	X	–	✕ ↘z 513	• If an outgoing call was being attempted, retry. • If no outgoing call was being attempted, wait for the network to retry. • If 513 is displayed for a long time, or if the number of retries is excessive, validate proper operation of the X.25 network.	• The X.25 was attempting to initiate an outgoing call and a CLEAR was received from the network. • There has been activity on the channel, normally on incoming calls (eg. CLEAR received) that has prohibited the 3274 from completing the connection (channel in invalid state).	–	–	X.25
514	Connect Error – Rejected	–	A0/1	15	–	X	–	✕ ↘z 514	• New connect with valid data required from host	• Host sent connect with: – Odd-number buffer length specified – Or the buffer size was not large enough for the link header, the TH, RH, and 64-byte RU.			Model A
517	DCE not available/open timeout	–	A0/1	X.25 Counter 4	–	X	–	✕ ↘z 517	• The 3274 is retrying. Wait. • If the problem persists, verify proper operation of the X.25 network.	• Disconnect mode (DM) was received from the X.25 network in response to a SABM (set asynchronous balanced mode) by the 3274 or the 3274 waited approximately 25 seconds while trying to connect to the DCE and no activity (Flags) were detected on the communications lines.	–	–	X.25
518	Segmenting Error • The terminal is closed and reopened • All physical and logical units are deactivated	–				X		✕ ↘z 518	• A SNRM is required from the host	• An SNA segment was received with improper sequencing in the TH MPF bits	–	–	Model C-SDLC

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
519	Count Exceeded/Wrong Length Message	–	A0/1	12	–	X	–	✕ ↘z 519	• Host recovery	• CCA: Host sent message received larger than control unit buffer. • HPCA: Host sent a message larger than CU buffer. Receive count will not be updated, causing retransmission by host • Improper buffer size specified in NCP.	Com Rej	–	Model C-SDLC
520	Nonproductive readout	–	A0/1	2	–	X	–	✕ ↘z 520	• Will reset by receipt of a valid frame or frame containing a poll.	• No host activity • Verify operational status of communications network	–	–	Model C-SDLC
520	Receive Timeout								• The 3274 is waiting for the X.25 network to recover or, if trying to open the link, is itself trying to recover. Wait. • If the problem persists, verify proper X.25 network operation.	• The 3274 has not received a valid frame from the X.25 network within the last 30 seconds.			X.25
521	Idle Timeout • No activity on line for last 20 seconds (no flags received)	–	A0/1	2	–	X	–	✕ ↘z 521	• Will reset by receipt of a valid frame or frame containing a poll	• No host activity • Verify operational status of communications network	–	–	Model C-SDLC
525	Connection Problem • Condition exists on lines that prevent establishing or re-establishing communication with host • Status is posted after 20 Write entries, 20 ROLs, 20 CRs, 20 XIDs, or 20 NSAs	–	A0/1	6	–	X	–	✕ ↘z 525	• Host recovery	• Communications problem between host and controls unit	–	–	Model C-SDLC

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
528	Command Reject • All PUs and LUs are deactivated		A0/1	9	–	X	–	✕ ↘z 528	• Host recovery • SNRM required • Inform host programmer	• Adapter received invalid Nr sequence count in an information or supervisory frame with good FCS, *or* • Received command with data that has no data field defined, *or* • Received an undefined or non-implemented command field in a frame with good FCS	–	–	Model C-SDLC
529	DCE Error • Unexpected communication error has occurred • Host adapter is disabled and Reenable is attempted		A0/1	10	–	X	–	✕ ↘z 529	• Host recovery • SNRM required or Contact (X.25)	• DCE error other than the loss of DSR (NNN501) or loss of CTS (NNN502). Problem could be in: 1) 3274 HPCA 2) DCE or 3) DCE cable • Run wrap test to check 3274 HPCA • Check modem	–	–	Model C-SDLC
530	Write Timeout • Microcode has issued a command to the CCA and after 1 second no acknowledgment has been received • In SDLC, host adapter is disabled and an attempt is made to reenable. • All PUs and LUs are deactivated		A0/1	11-HPCA CCA-SDLC 8-CCA-BSC	–	X	–	✕ ↘z 530	• Host recovery • SNRM required or Contact (X.25)	• DSR is ok • CTS may have dropped during transmission or clocking signal is not available from modem Problem could be in: 1) 3274 HPCA 2) DCE or 3) DCE cable • Run wrap test to check 3274 HPCA • Check modem	–	–	Model C
531	NAK Sent • The contents of the screen are restored to initial state on detection of the error.		A0/1	1	–	–	X	✕ ↘z 531	• Host recovery • Retransmit data • The Communications Reminder will be turned off upon successful retry from the host.	• Adapter detected BCC error on a received message block, *or* • During a read operation, 3 seconds have elapsed without receiving SYN, ETX, or ETB, *or* • A forward abort (ENQ in text) or TTD (STX ENQ) is received • Verify proper operation of the communications network	–	–	Model C-BSC

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
536	15 Wrong Acknowledge • Adapter received wrong ACK in response to text block transmission (ACK0 for ACK1, or vice versa), sent ENQ for repeat of ACK, and received wrong ACK 15 times • EOT is sent to host • Control unit enters ADPREP mode (line monitor for poll or selection)	–	A0/1	6	–	X	–	✕ ⅟z 536	• Host recovery • A valid poll or selection will reset symbol • Retry operation	• Host-to-control-unit communications error (dropped a complete record during transmission) • Host returns wrong ACK	–	–	Model C-BSC
537	Call Timeout	–	A0/1	X.25 Counter 17	–	X	–	✕ ⅟z 537	• The COMM key may be used to reset the nnn. • If in Call Ready state, the call may be retried, via a DIAL key sequence. • If the problem persists, verify proper operation of the X.25 network.	• The 3274 waited for a response to a call request packet and a timeout occurred.	–	–	X.25
538	Packet Timeout	–	A0/1	2	–	X	–	✕ ⅟z 538	• The 3274 is waiting for the X.25 network to recover or, if attempting to open the link, is itself trying to recover. Wait. • If the problem persists, verify proper operation of the X.25 network.	• A packet timeout occurred after the 3274 sent a clear, reset, or restart packet and no response was received from the X.25 network.	–	–	X.25
539	Bad Network Termination	–	A0/1	X.25 Counters 1, 2, 5, 6 and HPCA Counter 9	–	X	–	✕ ⅟z 539	• The 3274 is waiting for the X.25 network to recover or, if it is attempting to open the link, is itself trying to recover. Wait. • If the problem persists, verify proper operation of the X.25 network.	• The 3274 sent DISC due to: (1) SABM (set asynchronous balanced mode) command received when initialized. (2) FRMR (frame reject) received. (5) UA (unnumbered acknowledge) received. (6) Not sequencing. (9) FRMR sent.	–	–	X.25

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
540	Command Reject-Not Initialized • An invalid command sequence has been received		A0/1	1	X	–	–	–	• Host recovery • A connect is required • Retry operation	• Host sent a restart reset, read start, write start, read, write, or write break without a control command with a valid connect	8200		Model A
541	Command Reject • Any invalid command detected		A0/1	2	X	–	–	–	• Host recovery • Retry operation	• Host has sent an Invalid command	8000		Model A
543	Bus Out Check-Parity Check 2 • Bus out parity error was detected during a channel-selection operation		A0/1	4	X	–	–	–	• Host recovery • Retry operation	• Channel adapter logic • Internal channel cables (Z3-Z6 to tailgate) • Channel • Channel cables/terminators • Use host error logs	2002		Model A
544	Bus Out Check-Parity Check 1 and 2 • A bus out parity error was detected while the channel was transferring data to the control unit.		A0/1	5	X	–	–	–	• Host recovery • Retry operation	• Channel adapter logic • Internal channel cables (Z3-Z6 to tailgate) • Channel • Channel cables/terminators • Use host error logs	2006		Model A
545	Equipment Check-Parity Check 1 • A control unit parity error occurred during a host write operation or • A cycle-share I/O error has occurred during a host write	0001 or 0011-0111 (if not recoverable)	A0/1	6	X	–	–	–	• Host recovery • Retry operation	• LCA adapter logic	1004		Model A
546	Equipment Check-Parity Check 1 and Modify • A control unit parity error or a cycle steal I/O error has been detected during a host read operation	0001 or 0011-0111 (if not recoverable)	A0/1	7	X	–	–	–	• Host recovery • IML if recovery fails (operational indicators lit)	• LCA adapter • Storage parity error Use opcode indicators to isolate solid failures	100C		Model A
547	Equipment Check-Parity Check 2 • Adapter put bad parity data on channel during a read		A0/1	8	X	–	–	–	• Host recovery	• LCA adapter logic	1002	–	Model A

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Displayed on		Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes		Applicable Features
						All	One				SNA	Non SNA	
548	Equipment Check-Control Unit Machine Check • Error occurred during an adapter cycle-share operation	–	A0/1	9	X	–	–	–	• Host recovery	• LCA adapter logic	1001	–	Model A
549	Data Check	–	A0/1	10	X	–	–	–	• Host recovery • Retry operation • Inform host programmer	• Byte count specified in host Read command insufficient to handle all data in control unit buffer	0800	–	Model A
550	Data Check-Length Check • Set in response to Control, Write, Write Break commands	–	A0/1	11	X	–	–	–	• Host recovery • Retry operation • Inform host programmer	• Host sent fewer than four bytes as link header, *or* • First and second bytes of of the link header did not equal the total byte count received	0880	–	Model A
551	Bus Out Check • Adapter detected bad parity on any command or data byte received from the channel on Bus Out	–	A0/1	1			X	✕ ↘z 551	• Host recovery	• Channel adapter logic • Internal channel cables (Z3-Z6 to tailgate) • Channel • Channel cable/terminators • Use host error logs			Models B and D
566 thru 569	Refer to installed RPQ Documentation												
590	Control Unit (3274) No Longer Polling 3290	–	nn/1	1,2 (Coax Error Counters)	–	–	X	✕ ↘z 590	• Device POR	• Possible Coax Error	N/A	N/A	3290
6XX and 7XX	Refer to specific Distributed Function device Documentation												

*Where nn = port ID = 00 - 31

Part 2. Error Code 'Probable Cause' Notes

As an aid to problem determination, more detailed "Probable Cause" explanations for selected error messages are given in this part of Appendix B. The error code itself, e.g., 2%%, serves as the heading for the discussion.

2%%

The circumstances and times when the 2%% error indicator is displayed are:

1. 2%% is displayed when the display is powered on and a keyboard or feature mismatch exists.
2. 2%% is displayed when an attempt is made to use the Structured Field and Attribute Processing feature (Color, Programmed Symbols, Highlighting) or the APL/Text feature, and the feature itself, or a prerequisite feature, is not installed in the display.

Printers do not give a 2%% indication. When a feature mismatch exists (item 1 preceding), 2EE hex is stored in byte 3C hex of the Device Control Block (DCB) associated with the printer. The /6 test is used to display the control block.

Reasons and examples follow.

Keyboard Mismatch (Power-On Time)

2%% is displayed when:

Microcode support for the attached keyboard has not been configured, i.e., not been installed in the controller microcode via customization of the system diskette. As an example, typewriter keyboard support was configured (customization question 131) but the attached keyboard is a Data Entry keyboard.

Feature Mismatches (Power-On Time)

Microcode support for a feature installed in the display or printer has not been configured. Examples are:

- 2%% is displayed when a Magnetic Stripe Reader (MSR) feature is installed in the display but MSR microcode support (customization question 141) was not configured.
- 2EE is stored in byte 3C hex of the DCB associated with a printer when a feature such as APL/Text, Programmed Symbols, or Text Print is installed on the printer but the microcode support (customization questions 145, 162, 164, etc.) was not configured.
- 2%% is displayed when an Extended Character Set Adapter (ECSA) feature is installed in the device but neither APL (customization question 134) or Text (customization question 135) microcode support was configured. (**Note:** *Applicable only with microcode configurations that do not support Structured Field and Attribute Processing (SFAP).*)
- 2%% is displayed when any combination of Programmed Symbols features is installed in the display but no microcode support (customization question 164) was configured.
- 2%% is displayed when the attached display is a 3279 Color Display Station and color convergence microcode support (customization question 161) was not configured.
- 2%% is displayed or 2EE stored when the 3274 attempts to allocate an extended DCB to a device powering on, and none are available. The number of extended DCBs available is determined by the answer to customization question 163. The first device requiring an extended DCB that powers on after all the available DCBs have been allocated causes the 2%% or 2EE indication. Any display or printer equipped with the ECSA feature requires an extended DCB.

Refer to /6 test bytes 02, 03, 04, 95, and 96 hex and /2 test byte 23 hex for assistance in trouble shooting feature mismatches.

i.e.
DCB—Byte X'95'

Kyb	Kyb	Kyb	Kyb	Mod	Mod	Mod	0
0	1	2	3	4	5	6	7

For Example:

B'1110' (E) Typewriter B'0100' (4) Model 2

Providing there are no feature problems DCB Byte X'96' maps one for one into DCB Byte X'04'

Operational Mismatches (Attempted Use Time)

The controller microcode has been configured for the Structured Field and Attribute Processing feature or the APL/Text feature but the physical feature itself, or a prerequisite feature on which it depends, is not installed in the device. Examples are:

- 2%% is displayed when a PS set selection key is depressed and the PS feature is not present on the device.
- 2%% is displayed when an APL or Text key function is requested and no ECSA feature is installed in the device.
- 2%% is displayed when a Color selection key is depressed and the display is not a color display.
- 2%% is displayed when a Programmed Symbol, Color, or extended Highlighting selection key is depressed and the ECSA feature is not present on the device.
- 2%% is displayed when status is received from an invalid address on the device feature bus.

Part 3. Indicator Code—Log Area Correlation

Complementing the PROG 4nn indicator codes, bytes X'170'—X'174' of the extended DCB are used as a log area for additional information. The extended DCB is created during customization for devices supporting Structured Field and Attribute Processing (SFAP).

Bytes X'170', X'171' contain the displacement in hex to the byte in the Write Structured Field that was found to be in error. (The WSF command = byte 1.) Bytes X'172', X'173' contain the displacement into the particular structured field (SF) where the error was detected. Byte X'174' contains the SF type of the SF that contained the error.

Figure B-1 correlates the 4nn numbers, the values found in bytes X'172'—'174', the SNA sense code, and a description of the error. OP check is the sense set for local attachment (non-SNA) and BSC in all cases.

Bytes X'170'—'174' may be displayed in the following manner. Enter Test Mode by pressing the Alt and Test keys. Select the DCB in question by typing in AA/6; AA is the coax port number in question (00-31). (If the device being used for the test is the port in question, /6 will suffice.) Press the Enter key. The display should now contain:

```
Line 1  AA/6 (Same as input)
Line 2  00
Line 3  XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 4  XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 5  XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
Line 6  XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX
```

Where: 00 = The displacement from the start of the control block (in hex, the low-order digit is dropped) of the portion of the control block currently being displayed.

XXXX = Hex representation of the portion of the control block currently being displayed

Press the PA1 or Enter key five times. Line 2 should change to 04, 08, 0C, 10, and then 14. The low-order digit being dropped, the values are really X'40', X'80', X'C0', X'100', and X'140'. X'170'—'174' are the first 5 bytes on line 6.

Note: *Values exceeding X'0C' on line 2 appear only if an extended DCB (for this device) is present.*

4nn	Bytes X'172'–'174'	Sense	Error Description (See Note)
47,1	0003 XX	1003	Unsupported SF type
	XX = any value but 01, 06, 09, 0B, 0C, or 41		
471	———	1003	WSF command sent to a device without an ECSA feature
471	0004 06	1003	Invalid load format addressed to terminal PS storage
471	000A 06	1005	Invalid horizontal (X) value for LPS SF
	000B 06	1005	Invalid vertical (Y) value for LPS SF
471	000C 06	1003	Byte 11 is not equal to 0 in LPS SF
471	0001 XX	1005	Invalid length SF
	XX - 01, 06, 09, 0B, 0C, or 41		
471	0004 09	1005	Byte 3 not 0 in SRM SF
471	0005 09	1003	Invalid Mode in SRM SF
471	0005 01	1003	Byte 4 is not X'02' in Read Partition-Query SF
471	0005 06	1003	Symbol set ID out of legal range
471	0006 06	1005	Invalid EBCDIC code point
471	000D 06	1003	Bits 0–4 of Byte 12 in LPS SF not 0
471	0009 06	1003	Bits 3–7 of byte 8 in LPS not 0
471	0002 06	Op Chk	(BSC only) Greater than 3K of uncompressed LPS data received
471	0004 01	1003	Byte 3 not X'FF' in Read Partition-Query SF
473	0003 06	Op Chk	LPS sent to a device with feature 6 active on BSC attachment
473	0007 06	084C	ECSA present but addressed RWS in device not physically present
473	000D 06	084C	Color plane invalid

SF = Structured Field
LPS = Load Programmed Symbols
RWS = Read/Write Storage
SRM = Set Reply Mode

Note: *As part of overall SFAP problem determination, the usage of the following functions should be kept in mind. If the device in question does not have an extended DCB (not enough allocated during customization), the DCB display procedure (described above) inhibits the keyboard with the minus function indicator on the fourth pressing of the PA1 or Enter Key. If the device does not have an ECSA feature, Test 8 (Enter test mode, type in /8, press Enter) inhibits the keyboard with a wrong number indicator. However, if the APL/Text Feature is installed ESCA is installed as a pre-requisite. This is also true if SFAP is not configured. If SFAP is not configured, the above nnn numbers do not appear.*

Figure B-1. Indicator Code — Log Area Correlation

Appendix C. X.25 Adapter Feature

C.1 INTRODUCTION

The X.25 Adapter feature permits Models 1C, 31C, and 41C 3274 control units to attach to host systems via an X.25 network. IBM SNA-defined protocols are utilized. Since the SNA protocols used by the 3274 are identical to existing 3274 SNA attachments, they are not detailed here. Descriptions of these SNA protocols are briefly defined in Chapter 5 of this manual and are defined in more detail in other existing publications dedicated to SNA.

The International Telegraph and Telephone Consultative Committee (CCITT) Recommendation X.25 defines an interface between customer Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) to attach DTEs to Packet Switched Data Networks (PSDN).

The definition includes:

- Physical Level: The mechanical, electrical, functional, and procedural characteristics to activate, maintain, and deactivate physical communication links between DTEs and DCEs.
- Link Level: The link access procedure for the interchange of data across communication links between DTEs and DCEs.
- Packet Level: The packet formats and logical protocols for the exchange of control information and user data between DTEs and DCEs.

C.2 X.25 ELEMENTS

C.2.1 Physical Level

- X.21 leased circuit
- X.21 bis (V.24 or V.35) leased circuit
- EIA (CCITT)
- DDSA
- Transmission is NRZ with clocking externally supplied.
- Up to 9600 bps for all 3274 Models.

C.2.2 Link Level

- Link Access Procedure Balanced (LAPB)
- Modulo 8 Link Level Sequence Numbering

C.2.3 Packet Level

- Single Virtual Circuit (Switched or Permanent)
- Modulo 8 or 128 Packet Level Sequence Numbering
- Data packet sizes of 64, 128, 256, or 512 bytes
- Packet window sizes of 1 to 7 for modulo 8
- Packet window sizes of 1 to 11 for modulo 128

Logical Link Control

- Qualified Logical Link Control (QLLC) or,
- Physical Services Header (PSH)

C.3 HARDWARE/CONFIGURATION SUPPORT

C.3.1 Configuration Support

Two 3274 configurations support the X.25 function:

- Configuration Support D: When X.25 support is added to this microcode version, 256K of storage is required. Note that Configuration Support D requires the 2-sided diskette.
- Configuration Support P: This is a new microcode version that supports X.25 only. Configuration Support P requires 128K of storage and a 1-sided diskette.

C.3.2 Hardware Support

The following matrix defines the hardware support required by the 3274 models that are described in this manual. The high performance communications adapter (HPCA) is required in all cases.

3274 Mode	Configuration Support:		Upgradeable To:		
	P	D	2-Sided Diskette	128K	256K
1C	Yes	No	No	Feature	No
21C	No	No	*	*	*
31C	Yes	Yes	Feature	Base	Feature
41C	No	Yes	Base	N/A	Feature

*Requires conversion to Model 31C
N/A = Not applicable

C.3.2.1 Hardware Required

- HPCA Adapter P/N 6340976 at EC 344593A or higher

One of the following signal converter cards is required:

- EIA/CCITT P/N 5864668
- X.21T P/N 5864683
- DDSA P/N 8527032

C.3.2.2 Mutually-Exclusive Feature

X.25 support is mutually exclusive with the Encrypt/Decrypt feature (#3680).

C.4 TIMERS

The following timer values are supplied. The values are derived from the HPCA timers and have an accuracy of the stated value + - 20%.

Timer	Value (In Seconds)	5nn
Receive Timeout	30	520
Packet Timeout	200	538
Transmit Failure (Write Timeout)	36	530
Open Timeout	25.6	517
$Tp(T_1)/Np(N_2)$	Customer-specified values (customizing responses 450, 451)	506

C.5 THE X.25 NETWORK

When using X.25 protocols, the network includes the 3274; an operator at a 3278, 3279, or equivalent display station that is attached to the 3274; the X.25 network; a Network Interface Adapter, or equivalent; a Host CPU; an access method (such as VTAM); and host CPU application programs.

C.5.1 Virtual Circuits

A Permanent Virtual Circuit (PVC) may be thought of as a point-to-point SDLC leased line. A Switched Virtual Circuit (SVC) may be thought of as a point-to-point switched line.

C.5.2 Logical Channels

Each virtual circuit is assigned a Logical Channel Group Number (0–15) and a Logical Channel Number (1–255) by the Packet Switched Data Network (PSDN). These twc numbers comprise the Logical Channel Identifier (LCID). This LCID may be entered during customizing of the 3274.

The following Logical Channel types may exist:

- Permanent Channel – Used for a PVC dedicated to data transfer between a 3274 and a specific Host DTE.
- Outgoing Channel – Used for an SVC where only the 3274 can initiate a call.
- Incoming Channel – Used for an SVC where only a remote DTE can initiate a call.
- Two-Way Channel – Used for an SVC where either the 3274 or the remote DTE can initiate a call.

C.6 PACKET TYPES

The following describes each of the X.25 packet types supported by the 3274. The cause and diagnostic codes, mentioned in the Packet Type descriptions, are defined in Chapter 2, "Operator Information Area Layout" in this manual.

C.6.1 Call Request (SVC)

The Call Request packet is transmitted by the 3274 when an X.25 Dial operation is performed by the operator. This packet contains the called number and optional information to match the user's subscription. The optional information is based on customizing options or operator input.

C.6.2 Incoming Call (SVC)

The Incoming Call packet is received by the 3274 as a result of a remote DTE transmitting a Call Request packet. The 3274 examines the data in the packet (based on options selected during the customizing procedure) to ensure that it conforms to the information customized or as specified by the display operator via a Dial operation.

C.6.3 Call Accepted (SVC)

The Call Accepted packet is sent by the 3274 after an Incoming Call packet has been received that conforms to the network facilities specified.

C.6.4 Call Connected (SVC)

The Call Connected packet is received by the 3274 as confirmation that the remote DTE has accepted the 3274's Call Request. The circuit is now in the Data Ready state and SNA protocols may begin.

C.6.5 Clear Request (SVC)

The Clear Request packet is sent by the 3274 as a result of an X.25 Disconnect operation by the operator or the network (normal circuit termination) or as a result of certain errors detected by the 3274 or the network. Cause and diagnostic codes are included and, if caused by a 3274-detected error, the codes are logged and displayed to the operator.

C.6.6 Clear Indication (SVC)

The Clear Indication packet is received by the 3274 as a result of a normal clearing sequence or as a result of problems detected by the network or the remote DTE. The circuit is stopped, a Clear Configuration packet is sent, and non-zero cause and diagnostic codes are logged and displayed to the operator.

C.6.7 Clear Confirmation (SVC)

The Clear Confirmation packet is sent by the 3274 to acknowledge the receipt of a Clear Indication packet or may be received by the 3274 in a network response to a Clear Request packet.

C.6.8 Reset Request (PVC)

The Reset Request packet is sent when the 3274 detects certain X.25 errors. Cause and diagnostic codes are included, logged, and displayed to the operator. The 3274 then attempts to re-open the circuit. The Reset Request packet is not sent during normal PVC operation wherein the 3274 remains connected to the circuit/link until powered off. A Reset Request packet is sent as part of a LOCAL key operation when the circuit is connected, or upon detection of certain X.25 network error conditions. The SNA layers must be reactivated via QSM (SNRM), ACTPU, ACTLU sequence.

C.6.9 Reset Indication (PVC/SVC)

The Reset Indication packet is received by the 3274 as a result of problems detected by the network or the remote DTE. The circuit is stopped, the X.25 Communication Check indicator with cause and diagnostic codes are displayed, and the codes are logged. The SNA layers must be reactivated via QSM (SNRM), ACTPU, ACTLU sequence.

C.6.10 Reset Confirmation (PVC/SVC)

The Reset Confirmation packet is transmitted by the 3274 to acknowledge receipt of a Reset Indication packet or may be received by the 3274 in confirmation of a Reset Indication packet.

C.6.11 Restart Request (PVC/SVC)

The Restart Request packet is sent when the 3274 is closing the link because it has detected certain X.25 errors or when a LOCAL key has been accepted. It is also sent when an Open Link operation is performed. Open Link operations are performed when: (1) the 3274 is IML'ed, (2) LOCAL mode has been entered and the COMM key is pressed, or (3) the link has been closed due to an error condition. In this event, the 3274 immediately attempts to reopen the link. Cause and diagnostic codes are included and logged, and when due to error conditions, the codes and the Communication Reminder indicator are displayed.

C.6.12 Restart Indication (PVC/SVC)

When the Restart Indication packet is received, the 3274 responds with a Restart Confirmation packet, shuts down the link, notifies the operator by displaying an indicator with cause and diagnostic codes, and logs the error.

C.6.13 Restart Confirmation (PVC/SVC)

When the 3274 has sent a Restart Request packet as a result of attempting to initialize packet level operation, receipt of a Restart Confirmation packet signals the completion of initialization. The 3274 sends a Restart Confirmation packet whenever a Restart Indication packet is received from the DCE.

C.6.14 Data (PVC/SVC)

The Data packet is used to transmit and receive data once a circuit has been established.

C.6.15 Receiver Not Ready (PVC/SVC)

When the 3274 receives a Receiver Not Ready packet, the 3274 stops transmission until a Receiver Ready packet is received. The 3274 does not send a Receiver Not Ready packet.

C.6.16 Receiver Ready (PVC/SVC)

The Receiver Ready packet is sent by the 3274 in response to any packet that is received unless an outgoing Data packet is ready for transmission. Receipt of a Receiver Ready packet indicates that transmission by the 3274 may continue.

C.6.17 Diagnostic (PVC/SVC)

The Diagnostic packet contains diagnostic information and is received when a reset, clear, or restart packet is not appropriate. The cause and diagnostic information is logged and no further action is taken.

C.7 SWITCHED VIRTUAL CIRCUIT (SVC) DESCRIPTION

The X.25 SVC capability of the 3274 Control Unit permits the operator of an attached 3178, 3278, 3279, or compatible DCA-protocol-attached display station to connect the 3274 and its attached terminals to a remote host system via an X.25 packet switched data network. Note that this capability is not supported on distributed-function terminals (e.g., the 3290 Information Panel).

The functions necessary to connect the 3274 to the remote host are invoked by operator actions at the keyboard (and incoming calls). The status of the 3274 Control Unit with respect to the network is conveyed to the operator via indicators in the Operator Information Area of the display screen.

To support X.25 SVC functions, additional key functions and indicators are provided at the display. These key functions are a subset of the key functions defined for 3274 support of the X.21 Switched feature. The indicators (symbols in the display screen's Operator Information Area) are the same as those used for the X.21 Switched feature except that the indicators containing Call Progress signals in the X.21 Switched feature are redefined and expanded to contain cause and diagnostic (C&D) codes.

Note: *Operator Information Area Indicators and C&D codes are defined in Chapter 2, "Operator Information Area Layout", of this manual.*

C.7.1 Key Functions

- Extension key
- DIAL key
- DISC (disconnect) key
- LOCAL key
- COMM (communication) key
- LOAD MATRIX key

The device attached to port 0 normally has access to the full complement of X.25 Switched function keys. The LOAD MATRIX key function is assigned to port 0 only. The other keys may optionally be assigned to all ports or certain keys may be deleted, depending on how the 3274 was customized.

See Figure C-4, for details.

C.7.2 Indicators

The following indicators are displayed in the Reminder area of the Operator Information Area of the display screen:

- Call Ready
- Call Ready with cause and diagnostic (C&D) codes
- Dial In (dialing terminal)
- Dial In (other terminals, same control unit)
- Outgoing Call in Process
- Incoming Call in Process
- Disconnect in Process
- Local (Z 599)
- X.25 Communication Reminder

The following indicator is displayed in the Do Not Enter area:

- Operator Communication Check (✘ —ϟ— nnn)

The following indicator is displayed in the Readiness and System Connection area:

- In-Use (N)

The following indicator is displayed in the Shifts and Modes area:

- Extension mode (▶)

C.8 X.25 STATES

- Call Ready — Circuit is in the disconnected state. It is possible to attempt a connection.
- Local — Link and circuit are disconnected. It is impossible to perform a connecting operation.

- In-Use — Circuit is connected and ready for data.
- Incoming Call or Outgoing Call — Connection operation is in progress.
- Disconnection in Process — Disconnection operation is in progress.
- Error — Error states are displayed via the Machine Check and Communication Check indicators.

C.9 NORMAL OPERATING PROCEDURE

All the X.25 SVC operations are performed using the display station keyboard, screen, and Operator Information Area. The indicators that are displayed in the Operator Information Area and the layout of the area are defined in Chapter 2 of this manual.

Note: *Because there are not enough key positions to execute each X.25 Switched operation by a single keystroke, a key called the 'Extension' key is defined. To execute any of the X.25 function keys (and the LOAD MATRIX key), the sequence is: press and hold the ALT key (present on all keyboards), press the Extension key (>), release the ALT and Extension keys, and then press the desired X.25 function key. Except for this section, pressing the ALT and Extension keys is not mentioned in this manual. Thus, "press the DIAL key" means press the ALT and Extension keys and press the DIAL key.*

When using the X.25 function, the load-matrix-key function is moved from position 38 to position 15.

The X.25 function keys and positions are:

- DIAL key (position 4)
- LOCAL key (position 5)
- COMM (Communication) key (position 6)
- DISC (Disconnect) key (position 8)
- Load Matrix Key (Load Host Print Matrix; port 0 only) (position 15)

Key layout is defined later in this Appendix.

Indicators to show X.25 states are displayed in the Reminder area of the Operator Information Area. The Input-Inhibited indicator (X) is displayed per normal 3274 function. The In-Use indicator (N) is displayed in location 7 of the Readiness and System Connection area. Chapter 2 in this manual, "Operator Information Area Layout", defines the indicators used by the X.25 function.

X.25 state indicators disappear while a Communication Check Reminder indicator is displayed.

The Operator Communication Check indicator has a higher priority than the Communication Check indicator and a lower priority than the Machine Check indicator.

C.9.1 Call Ready

- After power is on and the link is operational, the Call Ready indicator is displayed.
- The DIAL key, LOCAL key, or an Incoming Call is accepted when the Call Ready indicator is displayed.

C.9.2 Dialing

When the DIAL key is pressed in Call Ready state, the Dial indicator replaces the Call Ready indicator. The DIAL key initiates keyboard reset and clear functions simultaneously. The reset function restores the keyboard, repositions the cursor to home, reverts to the base character set, and restores all input-inhibit conditions except:

- Wait
- Device Busy
- Device Very Busy
- Device Not Functional
- Security Key

If the keyboard is not reset, the DIAL key performs no function and Extension mode is exited.

The Dial screen is displayed. (See "Dial Mode Screen Description", later in this Appendix for definition of the Dial screen.) The appropriate information is entered by the operator.

After keying in the information, the ENTER key is pressed. If the data is successfully validated by the 3274, the data entered by the operator is stored, a Call Request packet is assembled and transmitted by the 3274, and the Outgoing Call in Process indicator replaces the Dial indicator.

If the ENTER key has not been pressed, or if the entered data was not valid, the information stored by the last successful DIAL/ENTER key operation may be retrieved by pressing the DIAL key again. When Dial mode has been entered by a display station, an attempted entry of Dial mode at any other display station is inhibited and the Operator Communication Check indicator is displayed.

When in Dial mode, the DISC key on other terminals operates normally.

Dial mode operations are shown in Figure C-1.

Pressing the CLEAR key while in Dial mode causes the input fields on the screen to be restored from the previously stored values. Since there is no connection with a host application, no AID-generating operation is attempted.

When the RAS/0 Test is directed to a terminal in Dial mode, Dial mode is reset, Call Ready mode is set, the terminal enters Test mode and the test is executed.

Action Taken	Dialing Terminal	Other Terminals
DIAL key	Accepted. Display Dial screen with saved parameters. —z_#?	Rejected. X*—z_ —z_##
LOCAL key	Accepted. (See Note.) —z_599	Rejected. X*—z_ —z_##
COMM key	Ignored. —z_#?	Ignored. —z_##
DISC key	Accepted. (See Note.) —z_	Accepted. (See Note.) —z_
TEST key	Accepted. Abort Dial In. TEST	Accepted. TEST —z_##
ENTER key	Validate input. If OK, accept ENTER key, update parameters, initiate outgoing call. (See Note.) →z_ If not OK, X *#? →z_	Rejected. X -f —z_##
CLEAR key	Accepted. Restore Dial-In. —z_#?	Accepted. Clear screen. —z_##
PA, PF, ATTN, SYS REQ keys	Rejected. X -f —z_#?	Rejected. X -f —z_##

Note: *This indicator is broadcast to all powered terminals.*

Figure C-1. Control Unit/Terminal Responses in Dial-In State

C.9.3 Data Ready

When the circuit is connected, the Outgoing Call in Process indicator is reset and the In-Use indicator is displayed in the Operator Information Area.

C.9.4 Disconnection

The DISC key is pressed whenever the operator wants to disconnect the circuit. If there are SNA sessions active (bound), the 3274 may have been customized so that the first disconnect sequence results in the display of the Operator Communication Check indicator. This serves as a reminder that there are sessions active.

If the DISC key sequence is re-initiated with no intervening RESET key action, the 3274 initiates a disconnection from the circuit by sending the appropriate Clear Request packet. If the RESET key is used to reset the input-inhibited condition, the entire sequence is reset and the next DISC key operation is also inhibited. DISC keys pressed when no sessions are active initiate an immediate disconnection.

A customizing option is provided that allows the DISC key to immediately initiate a disconnection regardless of the status of the LU sessions.

Also, any Clear Indication packet received by the 3274 initiates a circuit disconnection and causes the 3274 to send a Clear Confirmation packet. The cause and diagnostic codes from the Clear Indication packet are displayed in the Operator Information Area.

The Disconnect in Process state is entered when the DISC key operation is accepted, when a QDISC packet is received, or when the station is closed due to detected SNA-level errors.

The Call Ready indicator replaces the Disconnect in Process indicator when the line is successfully disconnected. If not in Dial mode, the screen is unchanged. If in Dial mode, the dialing terminal's screen is cleared and Disconnect in Process state is entered. Sessions are reset if they exist, and all session-related indicators, including Online, Ownership, System, Wait, etc., are reset.

The In-Use indicator is turned off when disconnection is complete. A new Call Request packet is required to re-establish the connection.

C.9.5 Cause and Diagnostic Indicators

Cause and Diagnostic indicators are displayed in the Operator Information Area to aid in user problem determination for abnormal disconnection. They are displayed with the Call Ready indicator when cause and/or diagnostic codes are received by or transmitted from the 3274 due to an error condition. They are not displayed when the 3274 operator causes a normal disconnect via the DISC key function. Cause and diagnostic codes are also displayed with the X.25 Communication Reminder indicator and indicate the cause and diagnostic codes from a restart packet transmitted by or received from the 3274.

Note: *These codes are the CCITT-recommended, and IBM-architected, codes. However, these codes may not apply, nor be common to, all networks. The codes and indicators are defined in Chapter 2, "Operator Information Area Layout", of this manual.*

C.9.6 Incoming Call

Incoming Call Request packets are accepted in Call Ready state and the Incoming Call in Process indicator is displayed. This indicator is reset when the circuit is connected.

C.9.7 Local Mode

In Local mode, incoming calls and all outgoing requests are rejected. The 3274 is disconnected from the link.

The LOCAL key is accepted in the Call Ready state and the Local Mode indicator is displayed on all the display station screens.

The COMM key is pressed to reset Local mode. The Call Ready state is entered and the link is initialized.

C.9.8 Exceptional Case Handling

The operator should take action as follows:

1. Call Ready indicator with C&D codes or X.25 Communication Reminder.

   For a dial request, this indicator means the request has failed with the network reason specified by the C&D codes. In all cases, the operator should consult the appropriate manual which suggests a recovery action for each C&D code.

2. Communication Reminder indicator while in X.25 SVC mode.

   An operator can re-try the call if appropriate, and can determine the state of the connection by the In-Use indicator. If the In-Use indicator is not displayed, the COMM key can be used to reset the Communication Reminder indicator. X.25 keys that are allowed in a particular X.25 state (that is, do not result in display of the Operator Communication Check indicator) reset the Communication Reminder indicator. If the error persists, the problem determination procedures identified by the particular nnn number should be followed. Refer to Appendix B of this manual for a listing of nnn numbers.

3. Machine Check while in X.25 SVC Mode.

   This means an error was detected in the 3274 subsystem. The same action as for the base 3274 should be followed.

   No unique Machine Check numbers are generated.

C.10 X.25 SVC STATES AND KEY OPERATION

This section defines how to treat a key when it is pressed in X.25 SVC-specific states.

Figure C-2 summarizes this section.

In this section, keys other than the following are called "Other" keys.

- DIAL, LOCAL, DISC, and COMM keys
- AID keys(*)
- TEST key
- SYS REQ key(**)

* The ATTN key is treated in the same way as the AID keys in this section.

** The SYS REQ key is treated as in the base machine.

	OPERATION		
Status	**DIAL Key Pressed**	**ENTER Key Pressed (Dial In complete)**	**DISC Key Pressed**
Call Ready	Accepted. *1	Accepted.	Ignored.
Call Ready with C&D Codes	Accepted. *1	Accepted.	Accepted. *2
Outgoing Call In Process	Rejected.	Rejected.	Accepted.
Incoming Call in Process	Rejected.	Rejected.	Accepted.
Data Ready	Rejected.	Rejected.	Accepted.
Disconnect in Process	Rejected.	Rejected.	Ignored.
Local	Rejected. 599	Rejected. 599	Rejected. 599
X.25 Communication Reminder	Rejected. XCCDD	Rejected. XCCDD	Rejected. XCCDD

*1 See Figure C-1 for indicators displayed by Dialing terminal and Other terminals.
*2 Reset cause and diagnostic (C&D) codes.

Figure C-2 (Part 1 of 4). Key Operations during X.25 States

Status	OPERATION LOCAL Key Pressed	AID Key Pressed	COMM Key Pressed *4
Call Ready	Accepted. 599	Rejected. -f	Ignored.
Call Ready with C&D Codes	Accepted. 599	Rejected. -f XCCDD	Accepted. *5
Outgoing Call in Process	Rejected.	Rejected. -f	Ignored.
Incoming Call in Process	Rejected.	Rejected. -f	Ignored.
Data Ready	Rejected.	Same as base machine.	Ignored.
Disconnect in Process	Rejected.	Rejected. -f	Ignored.
Local	Ignored. 599	Rejected. -f 599	Accepted. 506
X.25 Communication Reminder	Accepted. 599	Rejected. -f XCCDD	Rejected. XCCDD

*4 Reset Operator Communication Check indicator.
*5 Reset C&D codes.

Figure C-2 (Part 2 of 4). Key Operations during X.25 States

Status	OPERATION Extension Key Pressed	TEST Key Pressed	PA, PF, ATTN or SYS REQ Key Pressed	DATA Keys, LOCAL Key, or CLEAR Key Pressed
Extension	Exit Extension mode.	Exit Extension mode. ?	Exit Extension mode. ?	Exit Extension mode. ?
Dial	Accepted. ▶	Abort Dial In.* TEST	Rejected.* -f ?or	Accepted.* ? or
Test	-f TEST	Exit Test mode.	-f TEST	Accepted. TEST

▶ = Extension

* See Figure C-1 for indicators displayed by Dialing terminal and Other terminals.

Figure C-2 (Part 3 of 4). Key Operations during X.25 States

STATUS	OPERATION: Extension Key Pressed	TEST Key Pressed	PA Key Pressed	PF Key Pressed	ATTN Key Pressed	SYS REQ Key Pressed	DATA Key Pressed	LOCAL Key Pressed	CLEAR Key Pressed
Print ID	Abort Print ID. ▶	Abort Print ID. TEST	Abort Print ID. X ?+	Abort Print ID. X ?+	Abort Print ID. X -f	Abort Print ID. Accepted.	*Not* Aborted. Data Key = Numeric: Printer Status ⊏⊐ ⠿ – – Alpha: Printer Status ⊏⊐ ALPHA – –	*Not* Aborted. Accepted.	Abort Print ID. X ?+
Dead-key operation in process	Abort Dead key. ▶	Abort Dead key. TEST	See Note X 犬`+?	See Note X 犬`+?	Accepted.	Accepted.	a,e,i,o,u Accepted *Not* a,e,i,o,u X 犬´+? See Note	Accepted.	See Note X 犬`+?
X.25 Communication Reminder	Accepted. ▶	Enter Test mode. TEST	X-f⌐z_XCCDD	X-f⌐z_XCCDD	X-f⌐z_XCCDD	X-f ⌐z_XCCDD	Accepted.	X犬—z_	Accepted.

▶ = Extension

See Figure C-1 for indicators displayed by Dialing terminal and Other terminals.

Note: *Accent symbols shown (`) may be any valid accent symbols. For example: ´, ^, etc.*

Figure C-2 (Part 4 of 4). Key Operations during X.25 States

C.11 INDICATORS

C.11.1 Call Ready

While the Call Ready indicator is displayed:

- DIAL, LOCAL, TEST, and "Other" keys are accepted.
- DISC and COMM keys are ignored.
- AID keys are rejected with 'X -f' indicator.

If the C&D codes are displayed with the Call Ready indicator:

- DISC and COMM keys clear the C&D codes and all the "Other" keys are treated in the same way as above.

C.11.2 Dial In

While the Dial-In indicator is displayed:

C.11.2.1 At Dial-Originating Station:

- DIAL, LOCAL, DISC, TEST*, ENTER, and "Other" keys are accepted.
- COMM key is ignored.
- AID keys (except ENTER and CLEAR) are rejected with 'X -f' indicator.

*TEST key aborts the Dial-In mode.

C.11.2.2 At Other Stations:

- DIAL and LOCAL keys are rejected with Operator Communication Check indicator.
- DISC key is accepted.
- COMM key is ignored.
- TEST key and "Other" keys are accepted.
- AID keys are rejected with 'X -f' indicator.

C.11.3 Outgoing Call in Process

While Outgoing Call in Process indicator is displayed:

- DISC, TEST, and "Other" keys are accepted.
- DIAL and LOCAL keys are rejected with Operator Communication Check indicator.
- COMM key is ignored.
- AID keys are rejected with 'X -f' indicator.

C.11.4 Incoming Call in Process

While Incoming Call in Process indicator is displayed:

- DISC, TEST, and "Other" keys are accepted.
- DIAL and LOCAL keys are rejected with Operator Communication Check indicator.
- COMM key is ignored.
- AID keys are rejected with 'X -f' indicator.

C.11.5 Data Ready (In-Use)

The In-Use indicator is displayed in location 7. No indicator is displayed in Reminder area when the virtual circuit connection with the X.25 network has been established.

- AID, TEST, DISC, and "Other" keys are accepted.
- DIAL and LOCAL keys are rejected with Operator Communication Check indicator.
- COMM key is ignored.

C.11.6 Disconnect In Process

While Disconnect in Process indicator is displayed:

- TEST and "Other" keys are accepted.
- DISC and COMM keys are ignored.
- DIAL and LOCAL keys are rejected with Operator Communication Check indicator.
- AID keys are rejected with 'X -f' indicator.

C.11.7 Local

Communication Reminder indicator with the number of '599' is displayed in Local mode, and

- COMM, TEST, and "Other" keys are accepted.
- LOCAL key is ignored.
- DISC and DIAL keys are rejected with Operator Communication Check indicator.
- AID keys are rejected with 'X -f' indicator.

C.11.8 X.25 Communication Reminder Indicator

The X.25 Communication Reminder indicator is displayed when the link is closed due to the transmission or receipt of a restart packet.

In SVC applications, it is replaced with the Call Ready indicator with C&D codes when the link has been successfully opened. While the Communication Reminder indicator is displayed, all X.25 keys, except LOCAL, are rejected with the Operator Communication Check indicator displayed. The LOCAL key puts the 3274 in Local mode.

In PVC connections, the indicator is displayed until the circuit is successfully re-opened.

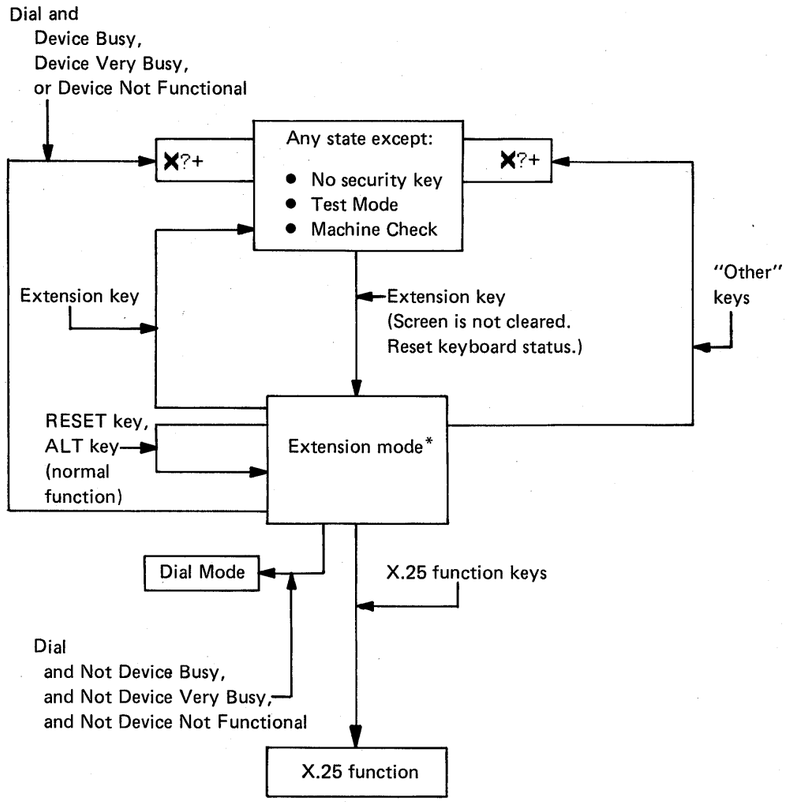
C.12 EXTENSION KEY

C.12.1 Extension Mode

Extension mode is defined to create additional key functions for X.25 Switched operation on the keyboards of the 3178, 3278, 3279, and other compatible DCA-protocol-attached display stations.

1. Extension mode is entered at any time, except during Test mode, a Machine Check, or a no-security-key condition, by pressing the Extension key.
2. '>' is displayed in the Shifts and Modes area of the Operator Information Area while in Extension mode.
3. Pressing the Extension key while in Extension mode resets Extension mode.
4. The RESET key operates normally in Extension mode but does not reset Extension mode.
5. The ALT key is treated as a NOP (ignored).
6. While in Extension mode at an authorized display station, if any key other than the X.25 function keys, LOAD MATRIX key, or key #14 (to display the Last Transaction Time indicator), the ALT key, or the RESET key is pressed, the Re-try indicator is displayed and Extension mode is reset.
7. When RAS/0 Test is directed to a terminal in Extension mode, Extension mode is reset, the terminal enters Test mode, and the test is executed.
8. When Extension mode is exited, the shift indicators are restored to the state they were in before the depression of the Extension key.
9. Depression of the Extension key is ignored when the terminal is attached to a 3274 port that is not configured to support the Extension key function.

Figure C-3 summarizes Extension mode.



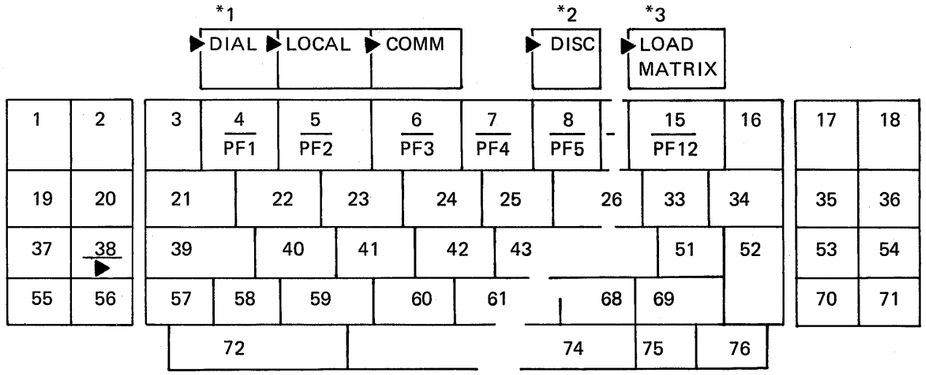
*Indicate '>' in the shift status field of the Operator Information Area.

Figure C-3. Extension Mode Definition

C.12.2 Extension Key and X.25 Function Keys

Figure C-4 defines key positions for the Extension key and the X.25 function keys.

Note: *These key functions are available on DCA-attached terminals only. They are not available on distributed-function terminals (e.g., the 3290 Information Panel).*



▶ Label (decal) on keyface identifies Extension key.

*1 Each of these labels (decals) is applied by the customer to the display station keyboard. The labels are applied as shown next to the key that assumes the corresponding X.25 function following depression of the Extension key.

*2 The DISC key is separated from the other keys by at least one key space to avoid being pressed in error.

*3 The LOAD MATRIX key function is avalable only at a display station attached to port 0 of the 3274 Control Unit.

Figure C-4. Extension Key and X.25 Function Keys

C.13 DIAL MODE SCREEN DESCRIPTION

Figure C-5 shows the layout of the display screen when Dial mode is entered. The screen displays the dial number and the other facility control fields set to the defaults as selected during customizing (or as previously overridden by the operator via a previous Dial operation).

Any values that require change can be updated by the operator. When the screen contains the correct values, the ENTER key is pressed to initiate appropriate action by the 3274.

A customizing option is provided to either display HNAD only or to display all fields shown below on the Dial screen. The default is to display HNAD only.

The cursor is initially positioned in the first character location of the HNAD input field.

```
HNAD = @123 123 789    @


CID   = @32740000@
NPKT  = @1@
NWND  = @09@
RPOA  = @1898@
CUG   = @32@
QLLC  = @1@
TCLS  = @9@
DPKT  = @1@
DWND  = @02@
OOPT  = @000000000@
IOPT  = @000000000@
I/O   = @0@
```

Where: @ @ delineates an entry field. Rest of screen is protected.

Entry is validated. If number or value is invalid, Input-Inhibited and Wrong Number indicators are displayed and the cursor is positioned in the first character location of the invalid field.

Figure C-5. Dial Mode Display Layout

Definition of the input fields shown above follows:

HNAD
- This 15 character field contains the Host Network (DTE) Address.
- The initial value of this field is set during the customizing procedure (Question 410).

Note: *A customizing option is provided to inhibit display of the following fields, thereby presenting HNAD only to the operator. Only HNAD is the default.*

CID
- This field contains the CID (connection identifier or network password).
- Input is validated to be 0-9, A-F, blank, or nulls.
- The value in this field maybe preset during the customizing procedure (Question 452).
- For security, this is a non-display field.

NPKT
- This field contains the packet size to be negotiated toward.
- The value of this field is preset during the customizing procedure (Question 430).

NWND
- This field contains the window size to be negotiated toward.
- The value of this field is preset during the customizing procedure (Question 432).

RPOA
- This field contains the recognized private operating agency (RPOA) facility ID and is used to select the intermediate network that is to be used between two public networks.
- RPOA may be preset during the customizing procedure (Question 442).

CUG
- This field allows the closed user group (CUG) facility to be included in an outgoing Call Request packet.
- CUG may be preset during the customizing procedure (Question 441).

QLLC
- This field defines whether QLLC (Qualified Logical Link Control) or PSH (Physical Service Header) logical link control protocols are used. QLLC is to be used by all "new" IBM products with integrated X.25 support. PSH support will allow the 3274 to communicate with "old" X.25 equipment, namely that equipment attaching to the network via the Network Interface Adapter (NIA) box.
  0 = PSH
  1 = QLLC
- Logical link control may be preset during the customizing procedure (Question 403).

TCLS
- This field defines the Throughput Class value which the 3274 is to use in throughput class negotiation.
- TCLS may be preset during the customizing procedure (Question 440).

DPKT
- This field contains the default packet size.
- The value of this field is preset during the customizing procedure (Question 434).

DWND
- This field contains the default window size.
- The value of this field is preset during the customizing procedure (Question 435).

OOPT
- This field allows the operator to override the outgoing call options (Question 421) selected during the customizing procedure.
- If the circuit type (Question 401) specified during customizing is, incoming call only, this field is not displayed.

IOPT
- This field allows the operator to override the incoming call options (Question 420) selected during the customizing procedure.
- If the circuit type (Question 401) specified during customizing is, outgoing call only, this field is not displayed.

I/O
- If the circuit type (Question 401) specified during customizing was two-way call, this input field allows the user to indicate whether the information on the dial screen should be used (when the ENTER key is pressed) to: (1) initiate an outgoing call (value = 0), or (2) only store the (changed) values either to allow an incoming call or as future reference for an outgoing call (value = 1).
- If the circuit type (Question 401) specified during customizing is incoming call only or outgoing call only, this field is not displayed.

C.14 PERMANENT VIRTUAL CIRCUIT (PVC) DESCRIPTION

C.14.1 PVC Indicators

An additional indicator is required to convey the network or 3274-supplied cause and diagnostic codes that accompany reset or restart packets. These codes provide the reason for the link being closed. This indicator is called the X.25 Communication Reminder. When a PVC circuit has been connected, the In-Use indicator is displayed in the Operator Information Area.

Note: *The Operator Information Area, cause codes and diagnostic codes are described in Chapter 2, "Operator Information Area Layout", in this manual.*

C.14.2 PVC Keys

Only two of the keys defined earlier in this appendix, "X.25 SVC States and Key Operations", are provided for PVC connections. They are the LOCAL and COMM keys. Optionally, the function of these keys may be deleted from the 3274 via customizing.

C.14.2.1 LOCAL Key

The LOCAL key allows a display operator to disconnect the 3274 from the X.25 link. When the LOCAL key is pressed, the 3274 determines if there are any SNA sessions active. The 3274 may have been customized so that if there are no sessions active, the 3274 will immediately initiate a close-link sequence. If there are SNA sessions active, the Operator Communication Check and Input Inhibited indicators are displayed. If the LOCAL key is pressed a second time with no intervening RESET key depression, the close-link sequence is initiated. If the RESET key is pressed to restore the keyboard, two consecutive LOCAL key sequences are required. A customizing option is provided that allows the first depression of the LOCAL key to always perform the close-link sequence. The initiation of a close-link sequence displays the Local indicator.

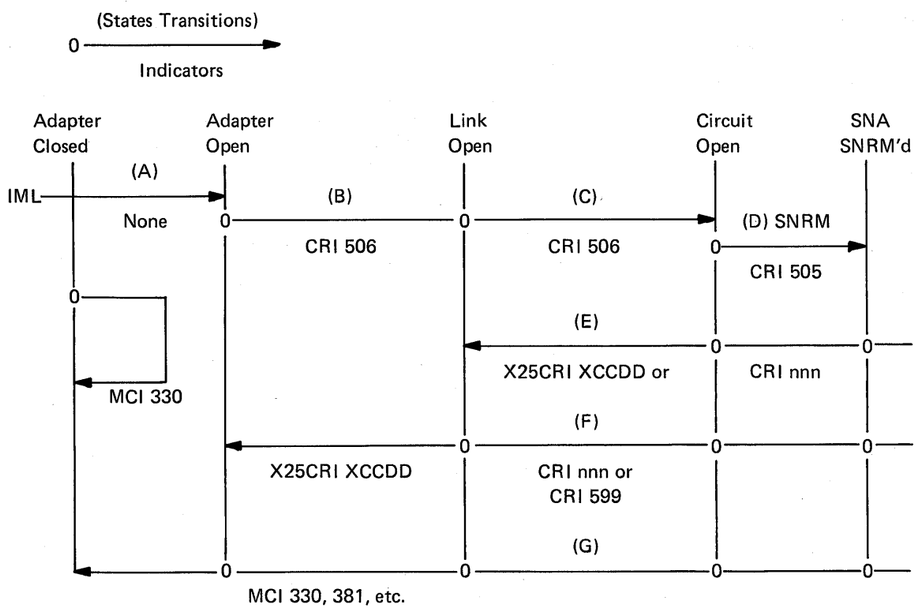
C.14.2.2 COMM Key

Pressing the COMM key when in LOCAL mode causes the 3274 to display ~~Nz~~ 506 (which could be displayed for only a split second and therefore not be seen) and try to reopen the link and circuit. When not in local mode, the COMM key is ignored.

C.15 SUMMARY OF STATES AND INDICATORS

C.15.1 Primary Virtual Circuit

Figure C-6 provides a summary of PVC States and Indicators.

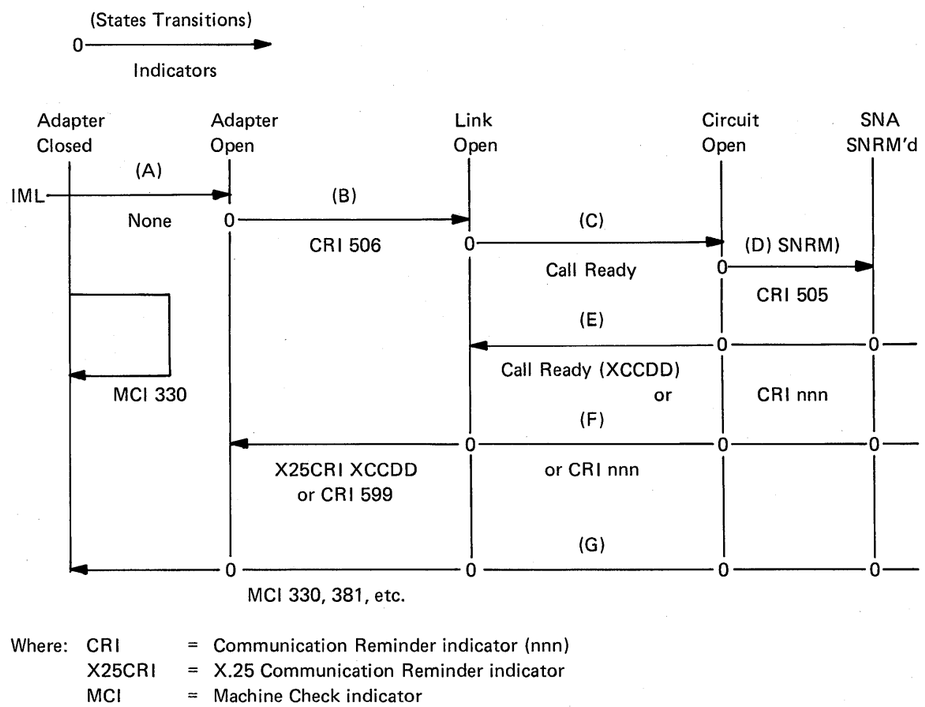


Where: CRI = Communication Reminder indicator (nnn)
X25CRI = X.25 Communication Reminder indicator
MCI = Machine Check indicator
SNRM = set normal response mode

Figure C-6. PVC States and Indicators

C.15.2 Switched Virtual Circuit

Figure C-7 provides a summary of SVC States and Indicators.



Where: CRI = Communication Reminder indicator (nnn)
X25CRI = X.25 Communication Reminder indicator
MCI = Machine Check indicator
Call Ready = Call Ready indicator with C&D codes (XCCDD) when C&D codes are not 0
SNRM = set normal response mode

Figure C-7. SVC States and Indicators

List of Abbreviations

A

ACK. Positive acknowledgement.

ACTLU. Active logical unit.

ACTPU. Active physical unit.

AID. Attention Identification.

ALT. Alternate.

APL. A programming language.

ARC. Adapter return code.

ASCII. American Standard Code for Information Interchange.

ATT. Attention.

B

B. Busy.

BB. Begin bracket.

BCC. Block check character.

BOC. Bus out check.

bps. Bits per second.

BSC. Binary synchronous communications.

BTDAT. Buffered Teleprocessing Diagnostic Analyzer and Tester.

BTU. Basic transmission unit.

C

C. Control field.

C&D. Cause and diagnostic (codes).

CAC. Common adapter code.

CAW. Channel address word.

CC. Control check; chain command.

CCA. Common communications adapter.

CCITT. The International Telegraph and Telephone Consultive Committee.

CCW. Channel control word.

CD. Change direction.

CDS. Configuration data set.

CID. Connection identifier.

CE. Channel end.

CMDR. Command reject.

CNM. Communication network management.

COAX. Coaxial (cable).

COMM. Communication.

CPS. Call progress signal.

CPU. Central processing unit.

CR. Command reject; carriage return.

CRC. Cyclic redundancy check.

CRV. Cryptography verification.

CSE. Control storage expansion.

CSU. Channel service unit; customer setup.

CSW. Channel status word.

CTR. Counter.

CTS. Clear to send (CCITT 106).

CU. Control unit.

CUE. Control unit end.

CUG. Closed user group.

D

DACTLU. Deactivate logical unit.

DACTPU. Deactivate physical unit.

DB. Device busy.

DC. Device check; data check.

DCA. Device cluster adapter.

DCB. Device control block.

DCE. Data communication equipment.

DDSA. Digital Data Service Adapter.

DE. Device end.

DEV. Device.

DFC. Data flow control.

DISC. Disconnect.

DLC. Data length check.

DLE. Data link escape.

DM. Disconnect mode.

DPKT. Default packet (size).

D/R. Driver/receiver.

DSR. Data set ready (CCITT 107).

DTE. Data terminal equipment.

DUP. Duplicate.

DWND. Default window (size).

E

EAU. Erase all unprotected.

EB. End brackets.

EBCDIC. Extended binary coded decimal interchange code.

EC. Engineering change; equipment check.

ECS. Extended character set.

ECSA. Extended character set adapter.

EDS. Extended data stream.

EFCA. Extended field and character attribute.

EIA. Electronic Industries Association.

EM. End of message.

ENQ. Enquiry.

EOF. End of field.

EP. Emulator program.

ERP. Error recovery procedure.

ESC. Escape.

ETB. End of transmission block.

ETX. End of text.

EUA. Erase unprotected to address.

EX. Exception (response).

F

F. SDLC flag sequence.

FCS. Frame check sequence.

FF. Forms feed.

FI. Format indicator.

FM. Field mark; function management.

FMRR. Frame reject.

FRU. Field replaceable unit.

G

GFI. General format identifier.

GP. General poll.

H

HEX. Hexadecimal.

HDLC. High-level data link control.

HNAD. Host network (DTE) address.

HPCA. High-performance communications adapter.

HVPS. High-voltage power supply.

I

I. Information (format).

IC. Insert cursor.

ID. Identification; identifier.

I/O. Input/output.

IML. Initial machine load.

IOPT. Incoming call option.

Ind. Indicator.

IR. Intervention required.

ITB. End of intermediate transmission block.

K

KANA. Katakana.

L

LABE. Link access procedure balanced.

LC. Logical channel.

LCA. Local channel attachment (Model 1A).

LCID. Local character set identifier; logical channel identifier.

LED. Light-emitting diode.

LF. Line feed.

LHA. Local host attachment (Model 1B).

LIC. Last in chain.

LLC. Logical link control.

LNAD. Local network address.

LRC. Longitudinal redundancy check.

LU. Logical unit.

LUSTAT. Logical unit status.

LVPS. Low-voltage power supply.

M

MAP. Maintenance analysis procedure.

MCM. Maintenance Concepts Manual.

MDT. Modified data tag.

MEM. Memory.

MES. Miscellaneous Equipment Specifications.

MHS. Magnetic hand scanner.

MIM. Maintenance Information Manual.

MSR. Magnetic slot reader.

N

NA. Not applicable.

NAK. Negative acknowledgement.

NCCF. Network communications facility.

NCP. Network control program.

NDM. Normal disconnect mode.

NI. Not initialized.

NIA. Network Interface Adapter.

NL. New line.

NOLLC. No logical link control.

NOP. No operation.

NPDA. Network problem determination application.

NPKT. Negotiated packet (size).

Nr. Next sequence number expected to arrive.

NRM. Normal response mode.

NRZ. Non-return-to-zero (recording).

NRZI. Zero-complemented differential coding (non-return-to-zero inverted).

Ns. Transmitter's sequence number.

NS. Nonsequenced format (C-field).

NSA. Nonsequenced acknowledgement.

NSI. Nonsequenced information.

NUL. Null.

NUM. Numeric.

NWND. Negotiated window (size).

O

OAF. Origin address field.

OC. Operation check.

OLT. Online test.

OOPT. Outgoing call option.

P

P. Printer; protected.

PA. Program access.

PCKT. Packet.

P/F. Poll/final bit.

PF. Program function.

PCM. Plug-compatible mode.

PIU. Path information unit.

POR. Power on reset.

PS. Physical services; Programmed Symbol.

PSDN. Packet switched data network.

PSH. Physical Services Header.

PSWD. Password.

PT. Program tab.

PU. Physical unit.

PVC. Permanent virtual circuit.

Q

QFRMR. Qualified frame reject response.

QLLC. Qualified Logical Link Control.

QSM. Qualified set mode.

R

RA. Repeat to address.

Rd Mod. Read modified.

RECFMS. Record formatted maintenance statistics.

Req. Request.

REQMS. Request maintenance statistics.

RH. Request/response header.

RI. Ring indicator.

RLSD. Received Line Signal Detector (CCITT 109).

RNR. Receive not ready.

ROL. Request online status.

RPOA. Recognized private operating agency.

RQI. Request initialization.

RR. Receive ready.

RSOR. Read Start Old Receive.

RSP. Response.

RTM. Response Time Monitor.

RTS. Request to send.

RU. Request/response unit.

RVI. Reverse interruption.

S

S. Sequenced (format).

SA. Switched adapter.

SABM. Set asynchronous balance mode (command).

SARM. Set asynchronous response mode.

SBA. Set buffer address.

SC. Session control.

SDLC. Synchronous data link control.

SDT. Start data traffic.

SERDES. Serializer/Deserializer.

SF. Start field.

SFAP. Structured field and attribute processing.

SI. Suppress index.

SIM. Set initialization mode.

SIOF. Start I/O Fast Release.

SLHA. Simplified local host attachment.

SLU. Secondary logic unit.

SM. Status modifier.

SNA. Systems network architecture.

SNRM. Set normal response mode.

SOH. Start of heading.

SP. Space; specific poll.

SRM. Set Reply Mode.

SSC. Subsystem Support Center.

SSCP. System services control point.

STX. Start of text.

SVC. Switched virtual circuit.

SYN. Synchronous idle.

SYS REQ. System request.

T

TC. Transmission check.

TCLS. Throughput class.

TH. Transmission header.

TP. Teleprocessing.

TPLM. TP line monitor.

TTD. Temporary text delay.

U

UA. Unnumbered acknowledge.

UC. Unit check.

UCW. Unit control word.

UE. Unit exception.

UI. Unnumbered informational.

UKPSS. United Kingdom Packet Switching Service.

US. Unit specify.

V

VTAM. Virtual telecommunications access method.

W

WACK. Wait before transmit.

WCC. Write control character.

WNDO. Window.

WSF. Write Structured Field.

X

XID. Exchange station identification.

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Maintenance Concepts

Order No. SY27-2512-6

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Maintenance Concepts

This Technical Newsletter provides replacement pages for the subject publication. The pages to be inserted and removed are:

3-1 – 3-4	A-1, A-2
3-21, 3-22	B-3 – B-6.1
3-27, 3-28	B-15 – B-16.1
	B-29

A change to the text or to an illustration is indicated by a vertical line to the left of the change.

Summary of Changes

Information supporting Display Stations with Modifiable Keyboards has been added.

Note: Please file this cover letter at the back of the manual to provide a record of changes.

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