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

SY27-2512-3

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 and 31D.

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 — Structured Field and Attribute Processing (SFAP) Data Stream Error Extensions
- Appendix D — Abbreviations

Fourth Edition (March 1981)

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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.

Reprint Courtesy Mine Safety Appliances Co.

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.

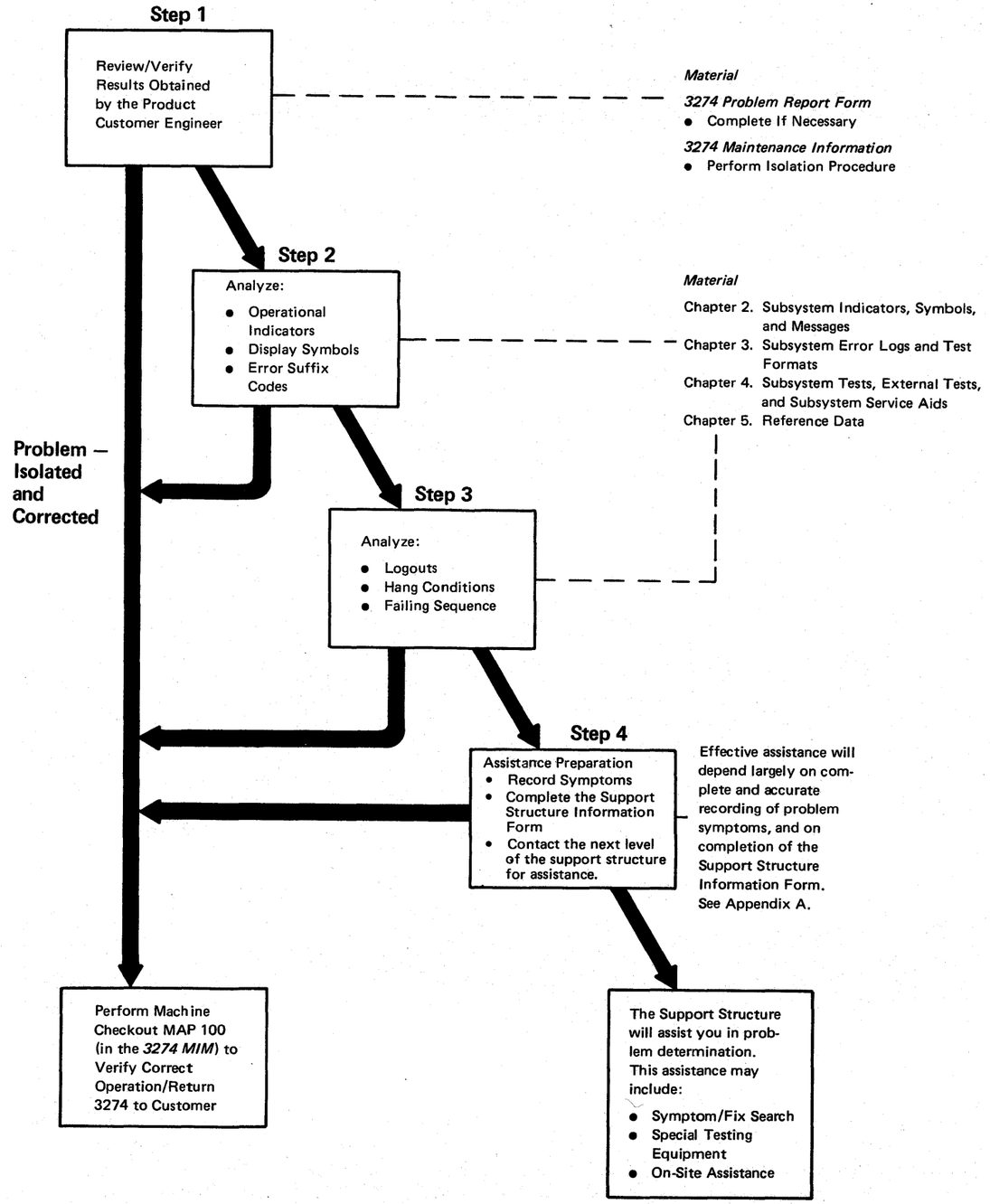


Figure 1-1. Support Customer Engineer Maintenance Approach

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. 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).

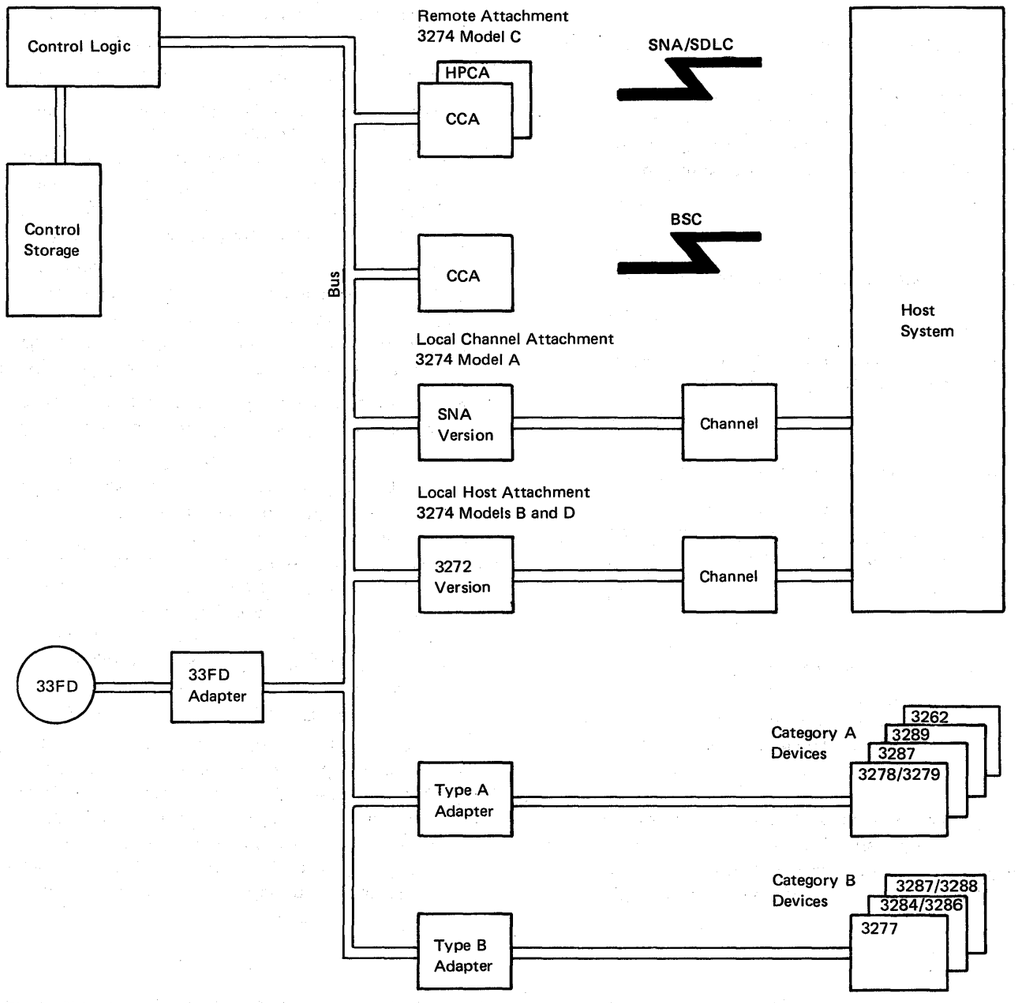


Figure 1-2. 3274 Subsystem Overview

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 33FD after IML tests 0000, 0001, and 0002 have been successfully completed. IML test 0002 verifies that the 33FD and the 33FD adapter are functionally operational. The data path, from origin to destination, is identified as follows:

- 33FD
- 33FD 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.

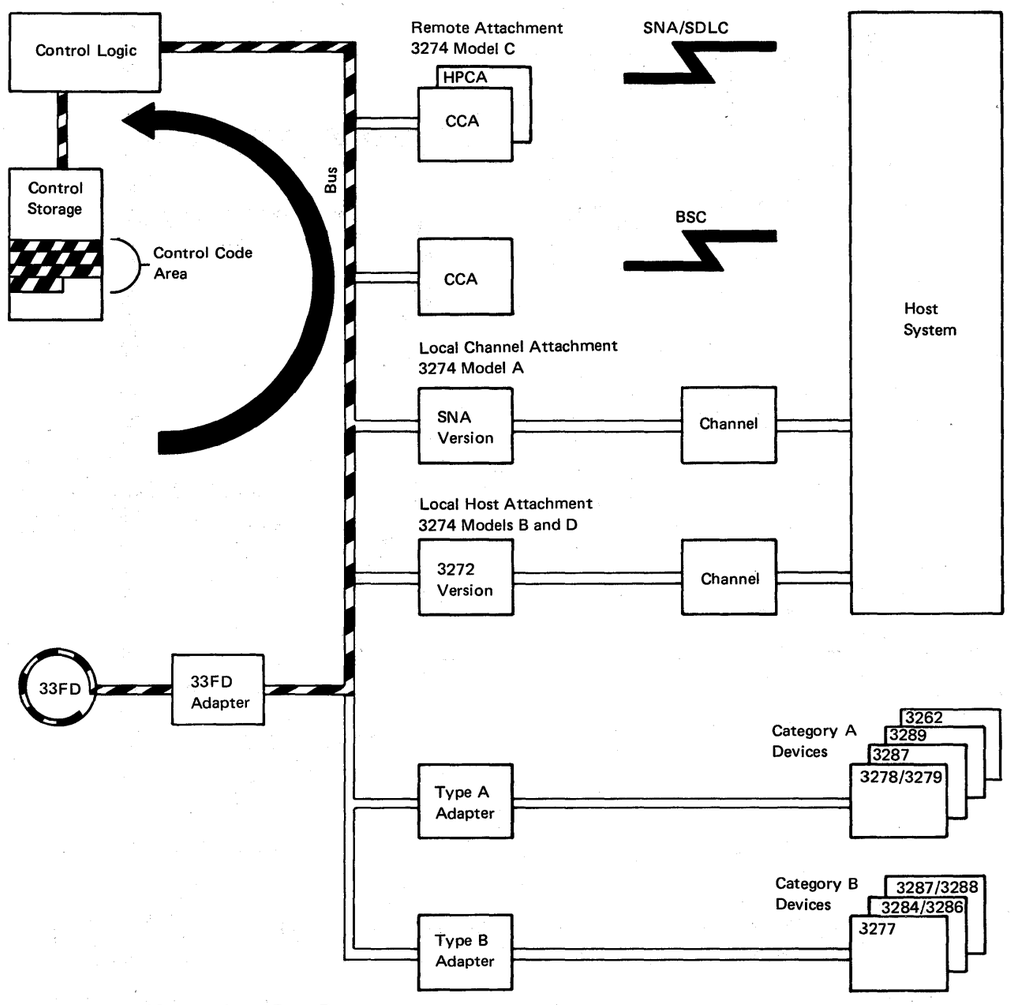


Figure 1-3. Initial Machine Load Data Flow

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)

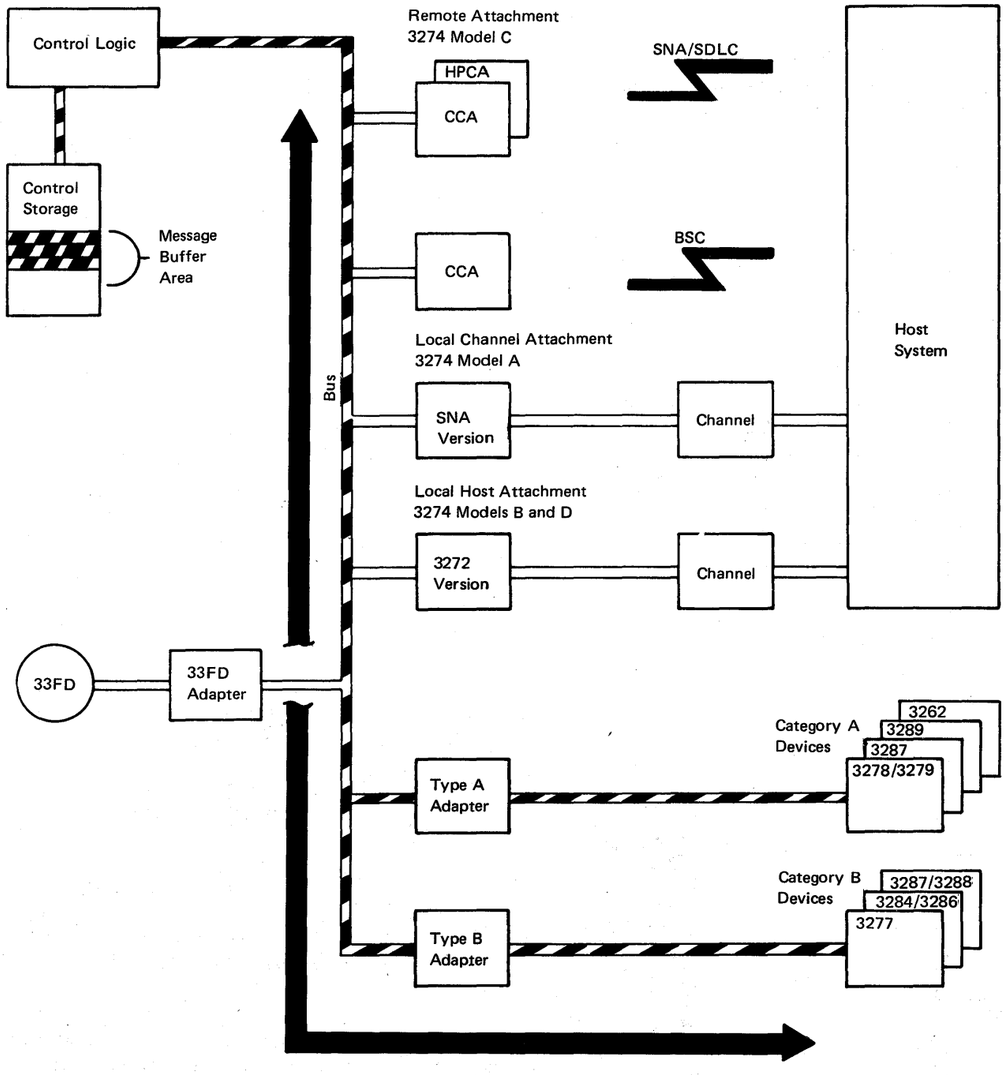


Figure 1-4. Message Data Flow between 3274 Control Unit and Devices

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)

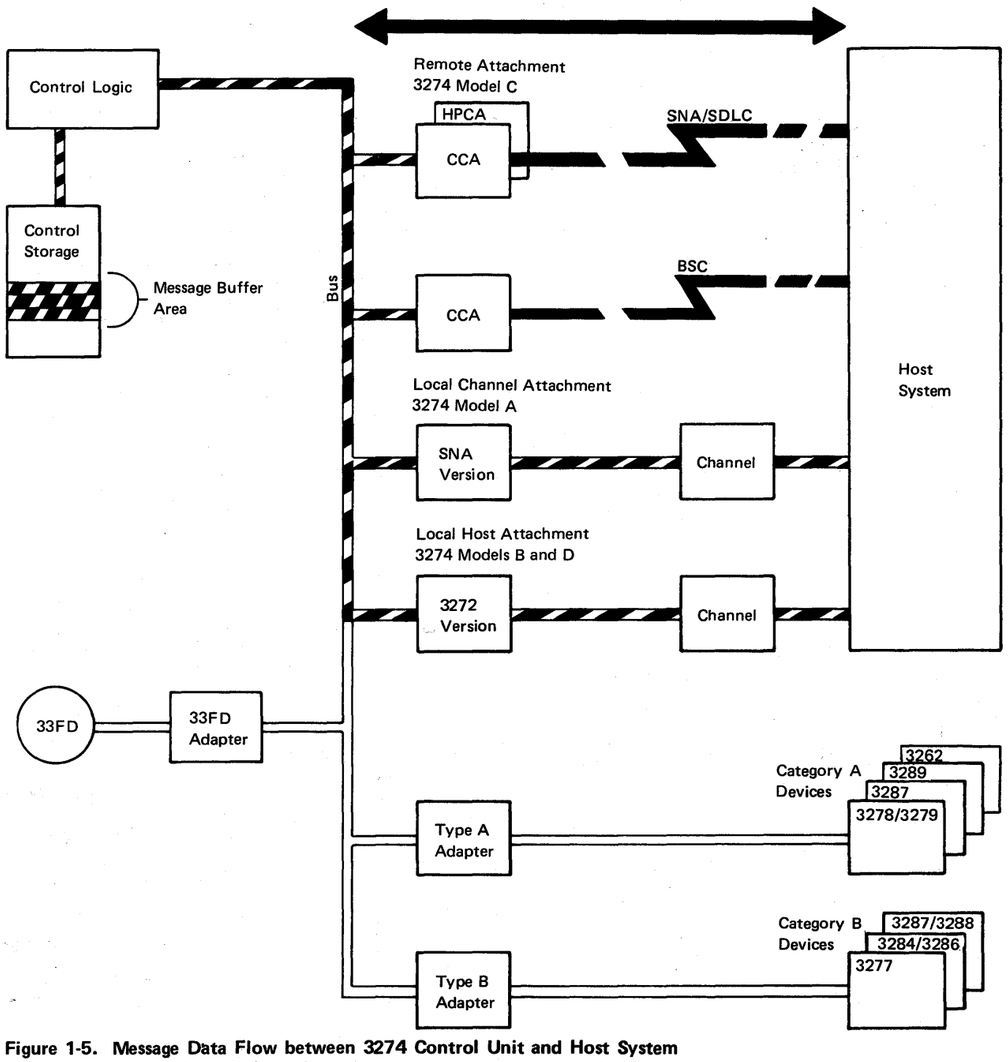


Figure 1-5. Message Data Flow between 3274 Control Unit and Host System

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

33FD

- 33FD adapter

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

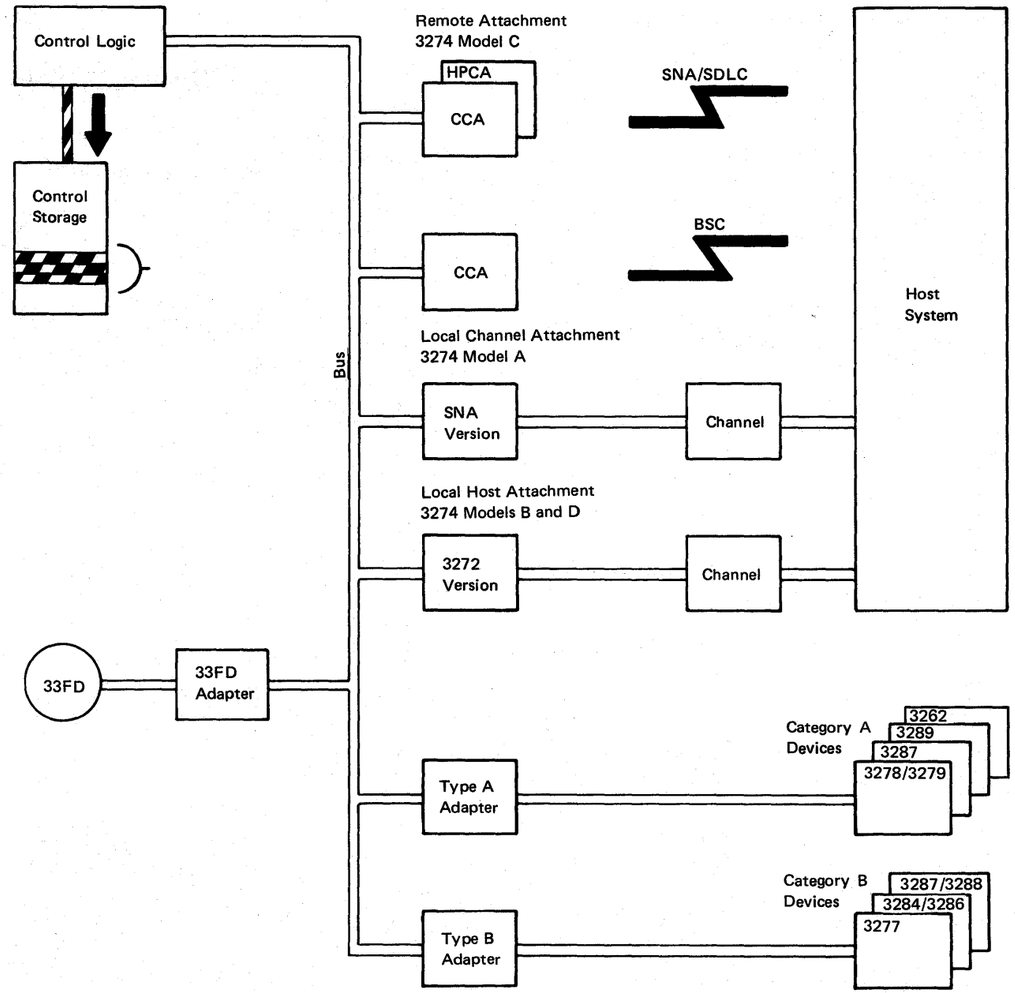


Figure 1-6. Status, Error, and Logic Data Flow

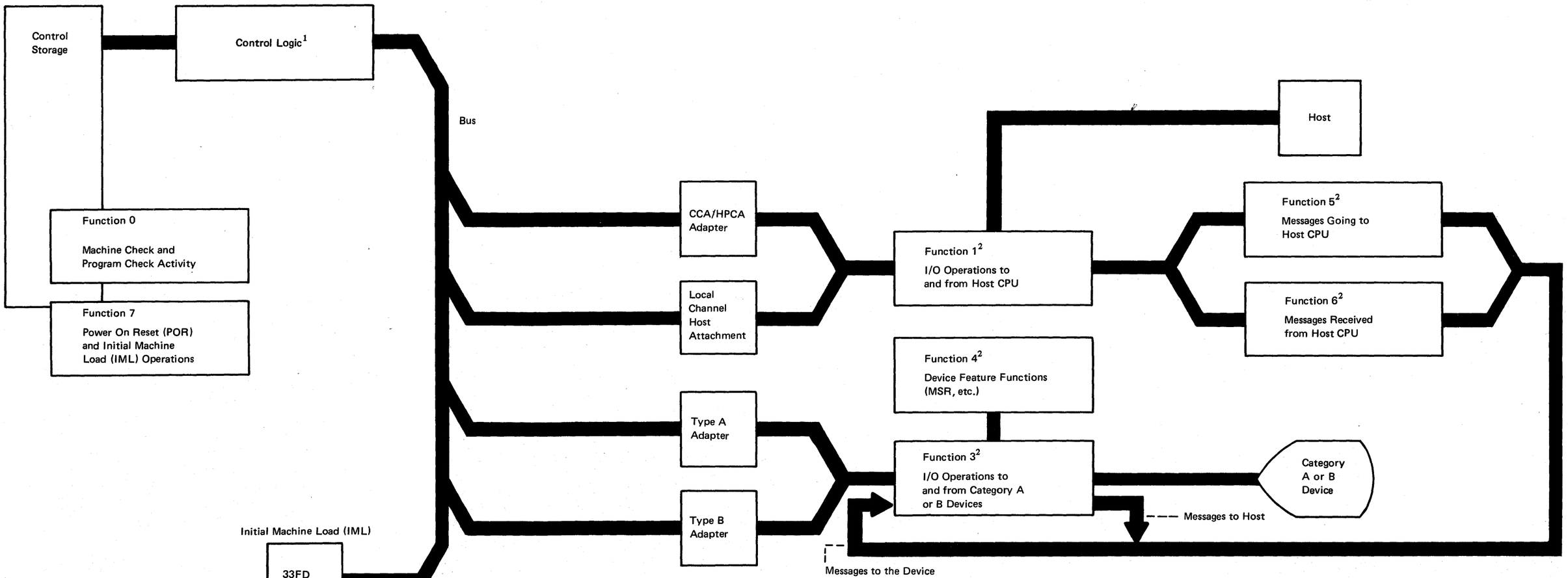
1.3 SUBSYSTEM FUNCTIONS

The following functions are provided by the 3274 subsystem:

Function	*Description*
0	Machine check/program check activity
1	I/O operations to and from the host CPU
2	33FD 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 subsystem functions are illustrated in Figure 1-7.

The functions of the 3274 may be grouped into six basic categories: (1) Power On Reset (POR) operations, (2) key-tracking (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 Subystem Functions

1.3.1 Control Unit Power-On Reset

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.

To Control Logic

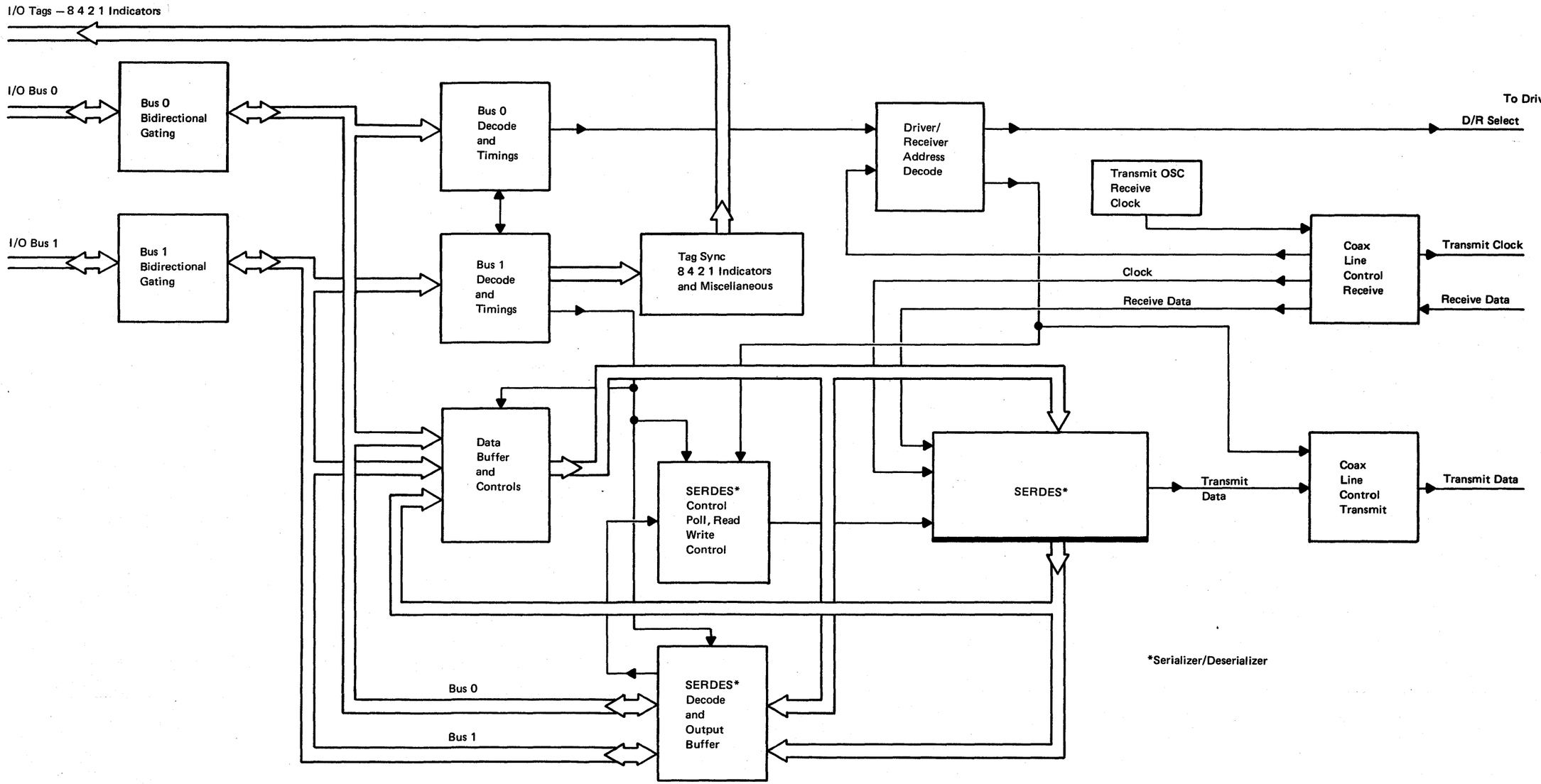


Figure 1-8. Keystroke Handling, Type A Adapter

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.)

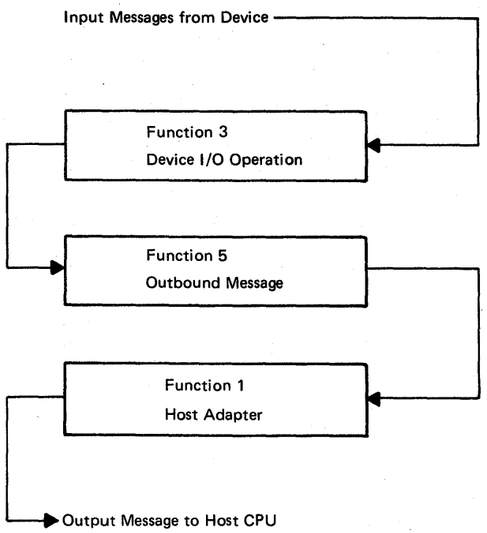


Figure 1-9. Inbound Messages

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.)

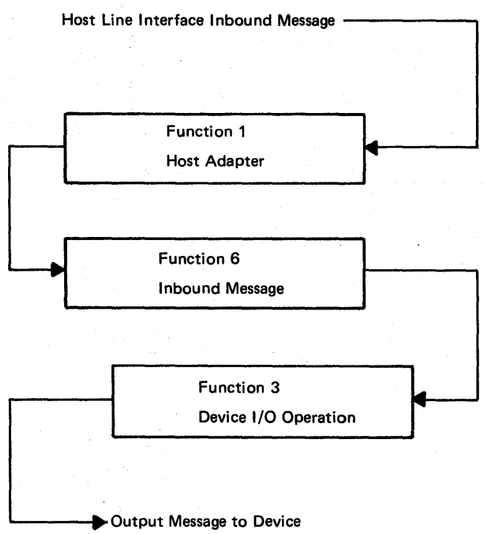


Figure 1-10. Outbound Messages

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 33FD operation (function 2) are both pending, the 3274 control logic performs function 0 followed by function 2.

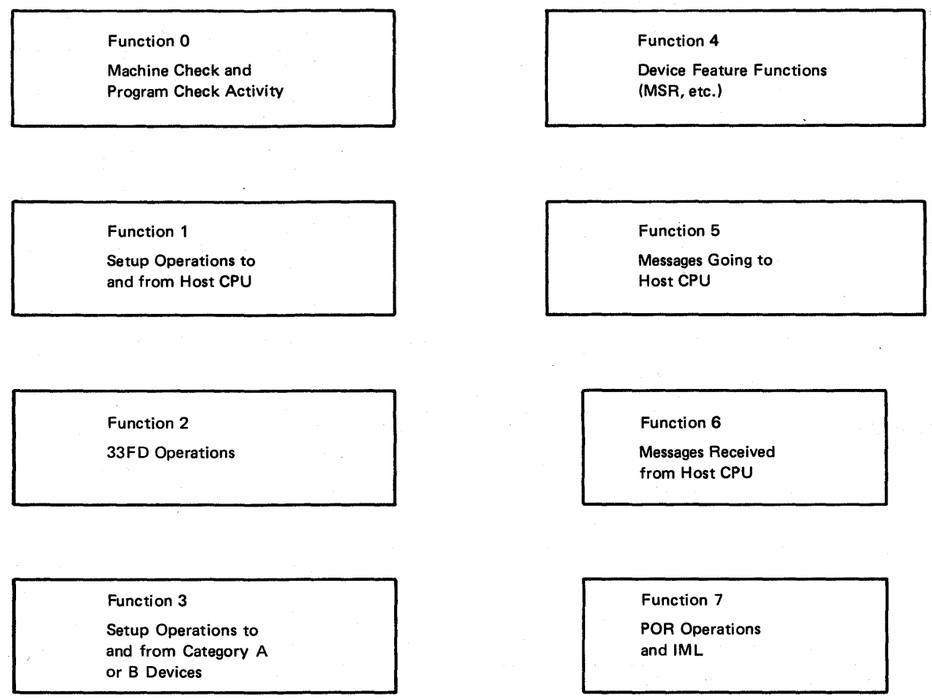
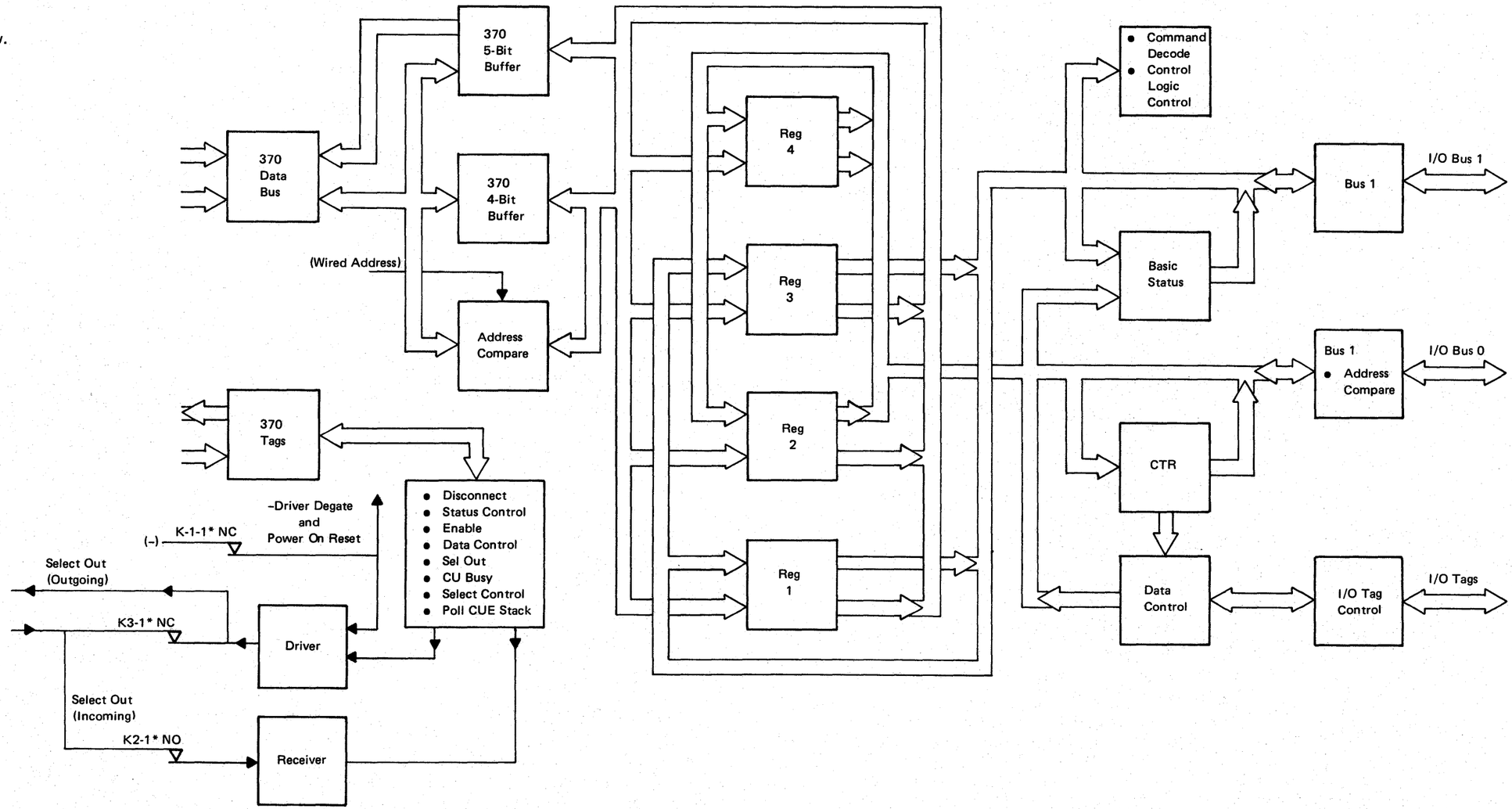


Figure 1-11. 3274 Subsystem Functional Priorities

1.3.8 Local Channel Data Flow

Figure 1-12 illustrates local channel data flow.



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

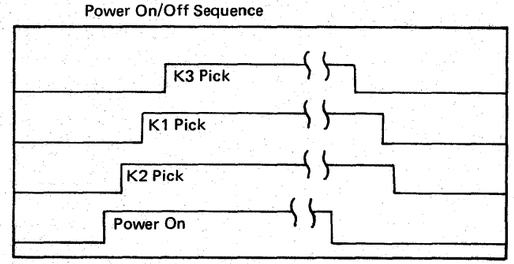


Figure 1-12. Local Channel Attachment Data Flow

1.3.9 Type A Adapter Coax Data Path

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

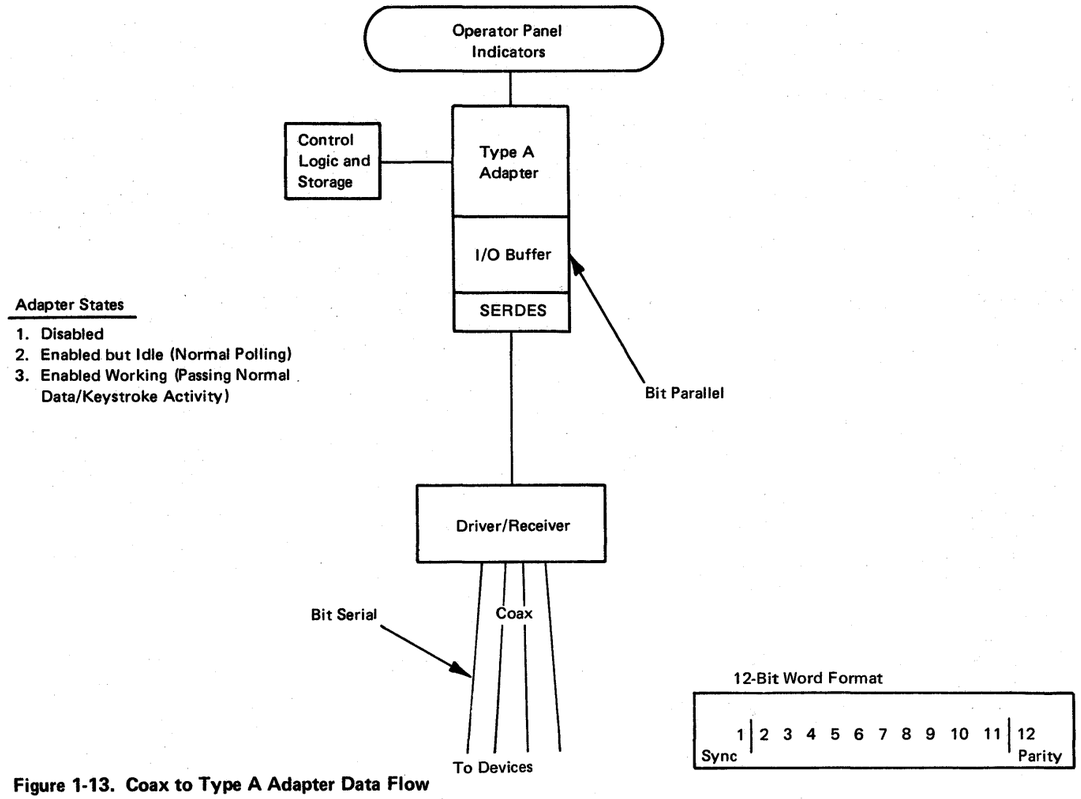


Figure 1-13. Coax to Type A Adapter Data Flow

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 3278 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 3278 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. 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 33FD drive or the 01A2 feature board.

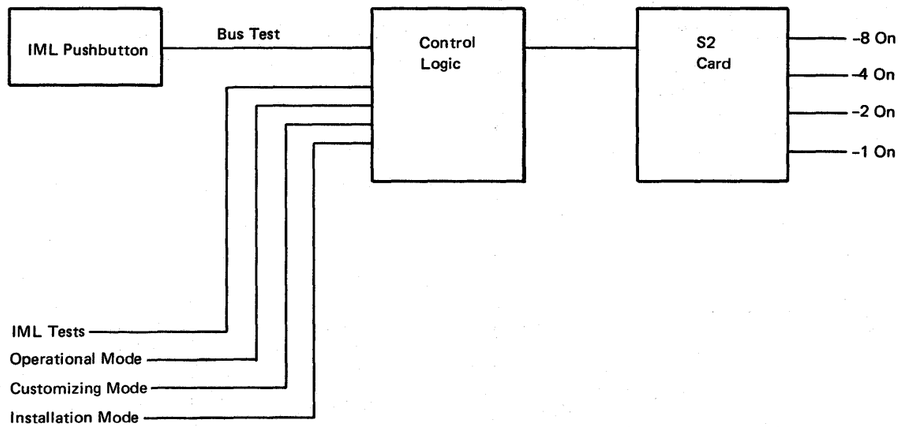


Figure 2-1. 8 4 2 1 Indicator Control Logic

2.4 ONLINE/OFFLINE INDICATOR AND SWITCH FOR MODELS A, B, AND D

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):

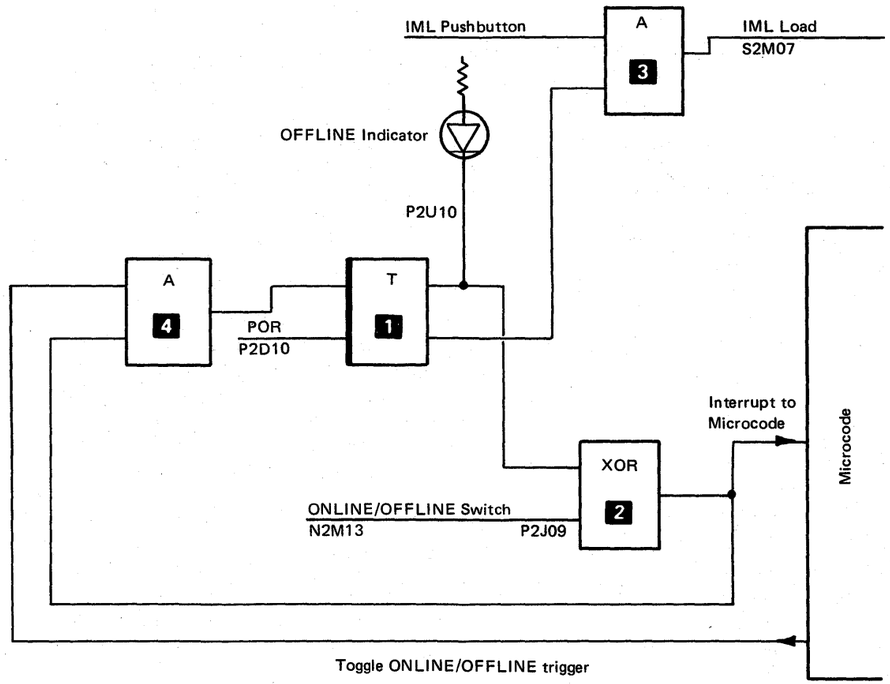
- An exclusive OR function **2** gives output because the trigger **1** and the Online/Offline switch do *not* agree.
- The output is interpreted as a request for change in the state of the trigger **1**.
- A function is, in turn, sent and interpreted to toggle the trigger **1**.
- Toggling the trigger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



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

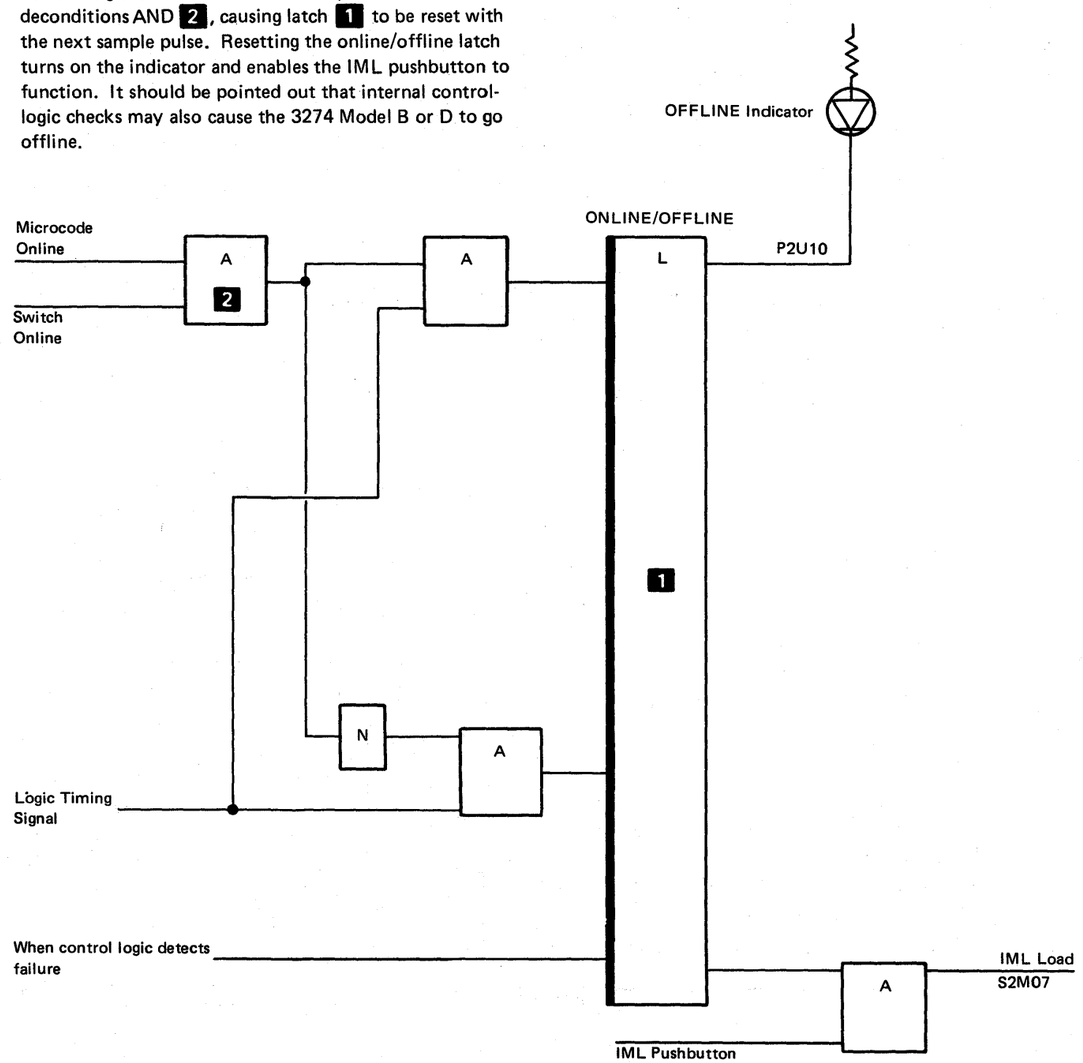


Figure 2-3. ONLINE/OFFLINE Control Logic, Models B and D

2.5 OPERATOR INFORMATION AREA LAYOUT

The operator information area consists of five key fields located below the 3278/3279 status line. These five fields are not displayed on any Category B device (3277). The fields are (1) Readiness and System Connection, (2) Do Not Enter, (3) Reminders, (4) Shifts and Modes, and (5) Printer Status. The field lengths are shown in Figure 2-4.

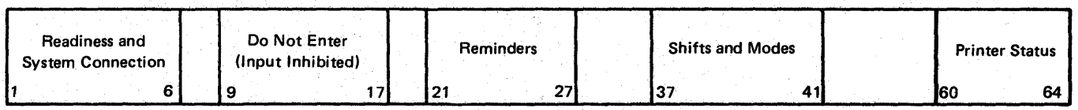


Figure 2-4. Operator Information Area Layout

2.5.1 Readiness and System Connection Symbols

The first six positions of the status line are allocated to Subsystem Ready, Host Ready, Application Ready, and Test. See Figure 2-5.

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 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.
8	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,* GA27-2839.

Figure 2-5. Readiness and System Connection Symbols (Locations 1 through 6)

2.5.2 Do Not Enter (Input Inhibited) Symbols

The symbols shown in Figure 2-6 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 2-6. 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 nnn	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.
X +?	Accent Plus What	These symbols indicate that an invalid dead key/character combination was entered (Canadian French keyboard only). RESET should be pressed to restore the keyboard, and a valid dead key/character combination should be entered. Valid combinations are as follows: ` à À è È ù Ù ´ é É ^ â Â ê Ê î Î ô Ô û Û ¨ ë Ë ï Ï ü Ü ç Ç ¸
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.

Symbol	Name	Explanation
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.

Figure 2-6. Do-Not-Enter Symbols (Locations 9 through 17)

2.5.3 Communication Reminder Symbol

The communication reminder (Figure 2-7) 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.

2.5.4 Shifts and Modes Symbols

There are three shifts and modes symbols (Figure 2-8). 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.)

2.5.5 Printer Status Messages

Printer status (Figure 2-9) 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.

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.
▭+▯	Reserved	This symbol is reserved for future use and should be ignored if it is displayed.

Figure 2-7. Reminders (Locations 21 through 27)

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.
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.
S0	Base Character Set	The base character set is addressed for a displayable character when the operator presses a character key.
▬	Extended Color	The color of the symbol is the color that will be used to display the next character at the keyboard.
⊙	Default Color	Green or white
a	Underlined	Character highlighting by underscore.
a	Blinking	Character highlighting by blinking on and off at regular intervals.
a	Reversed	Character highlighting by reversing the light intensity between the character and its background.
🯅	Operator Select	The current extended color attribute was selected by the operator.
►►	Field Inherit	The current extended color 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 2-8. Shifts and Modes (Locations 37 through 41)

Symbol	Name	Explanation
▭–▭__	Assign Printer	When changing the printer IDENT, the two numbers entered (✖ ✖) 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 2-9. Printer Status (Locations 60 through 64)

2.5.6 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.

2.5.7 Program Check Numbers

Program check numbers follow immediately after the program check symbol (P R O G). 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.

2.5.8 Communication Check Numbers

Communication check numbers follow immediately after the communication check symbol (↯). 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.

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:

- 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 another Category A display as specified by you when you entered the Test 0 format message.

- 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 attachment, 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 Type A adapters.

  A2/1 — Displays log of the Type B adapters, Encrypt/Decrypt adapter.

  A3/1 — Displays log of the configured terminal and summary counters.

- 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) 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 (except summary).

- Test 6 — Displays key information in device control blocks.

  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.

3.2 TEST 0: COMMUNICATION PATH TEST AND 3278 DISPLAY TEST

3.2.1 Description

Test 0 performs the following functions:

- Transmits a test pattern from the control unit to the display from which you requested Test 0.
- Transmits a test pattern from the control unit to another Category A display 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 an 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 *IBM 3278 Display Station Maintenance Information* manual (SY27-2510) and *3274 Control Unit Maintenance Information* manual (SY27-2530) to run the 3278 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 counter information that can be displayed on any working 3278/3279 while that 3278/3279 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.

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 error events. For example, in BSC operation when an NAK is received (associated with a severe error condition), it is logged with associated event data and counted. This event data should be the last error information examined. 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 four types of device logs are available when using Test 1, it is necessary to determine what type of device (3278, 3277, Category A printer, Category B printer) 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.

- Line 2 –

  0000 0000

  This line displays the most current low-order digits of 200, 300, 400, and 500 series nnn numbers. If there are no errors generating nnn numbers, 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.

  *A 2%% nn code will appear as EE in the error log.

- Line 3 –

  0000 0000 0000

  This line displays the statistical counter information associated with this device. 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

3278/3279 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

3277 Log

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

Type A Printer Log

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

Type 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

3278/3279 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.

Type A Printer Detail

Counter	Meaning
01	Coax timeouts – See 3278/3279 log detail.
02	Coax parity error – See 3278/3279 log detail.
03	Normal power off – See 3278/3279 log detail.
04	Device checks – See 3278/3279 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.

Type B Device Log

Counter	Meaning
01	Coax timeouts – See 3278/3279 log detail.
02	Coax parity error – See 3278/3279 log detail.
03	Normal power off–See 3278/3279 log detail.
04	Device checks – See 3278/3279 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

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
NNFF	CCCC	SSSS	SSSS	SSSS	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.

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:

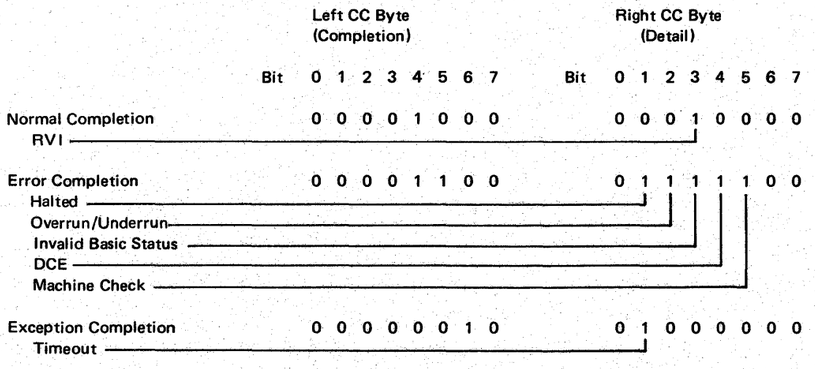
A0/1
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

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.

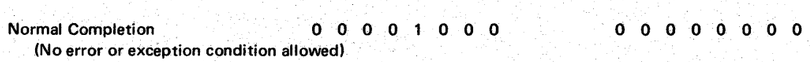
Figure 3-2. CCA BSC Operation Attempted Chart (Code FF)

Operation Attempted

00 Enable/Set Mode



01 Hardware Sense

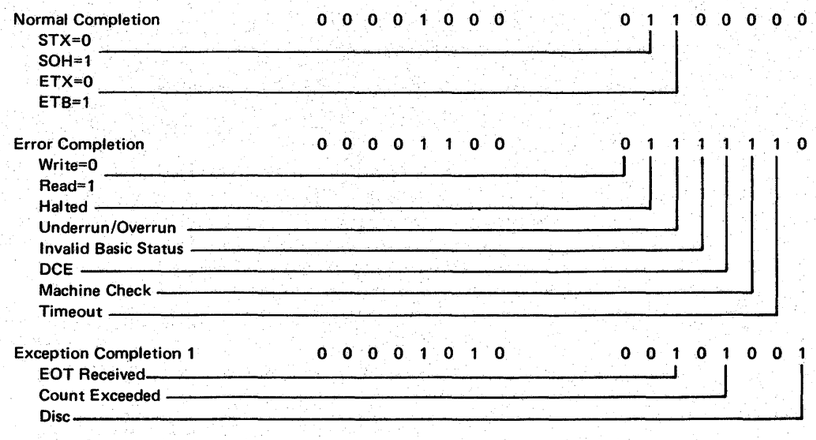


02 SOH/ETX Conversational Response

03 Read Normal

06 SOH/ETX Nonconversational

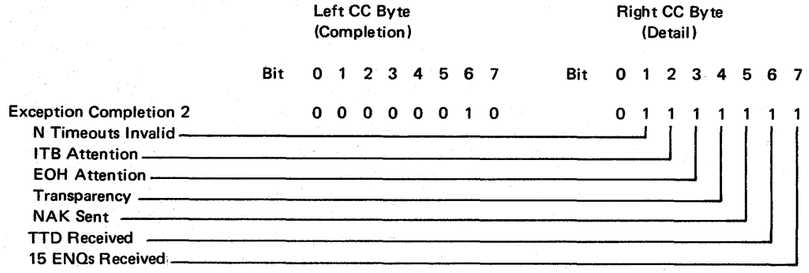
07 Read and Respond RVI



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)

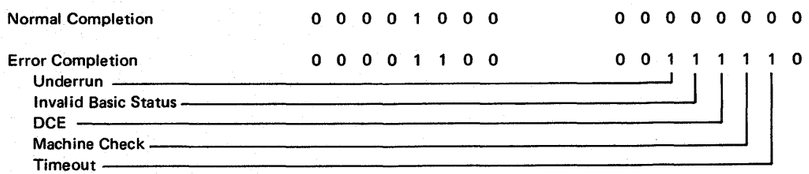
Operation Attempted



0A SOH/ETB Conversational Response

0E SOH/ETB Nonconversational

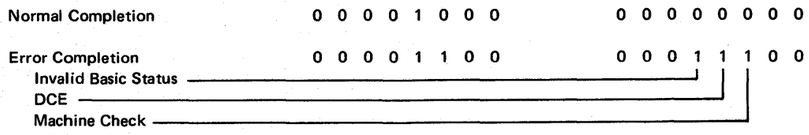
10 Write EOT



(Exception completion not valid for Write EOT)

12 STX/ETX Conversational Response

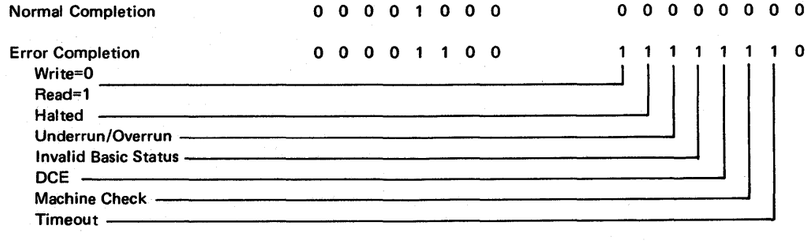
14 Disable



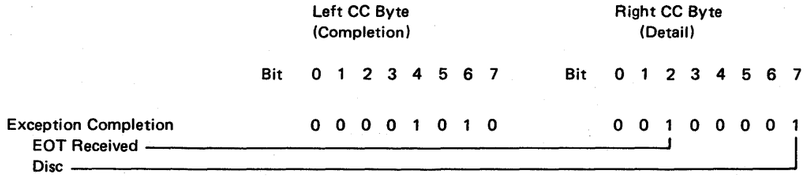
(Exception completion not valid for Disable)

16 STX/ETX Nonconversational

18 Write WACK



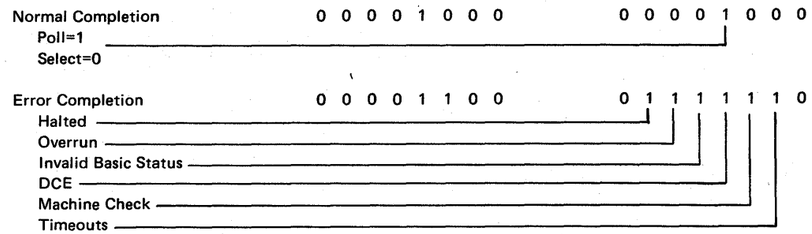
Operation Attempted



1A STX/ETB Conversational Response

1E STX/ETB Nonconversational

40 Monitor Line



46 SOH/ETX Expect Conversational Response

56 STX/ETX Expect Conversational Response

FF codes 02 through 56 listed above use the following completion/detail.

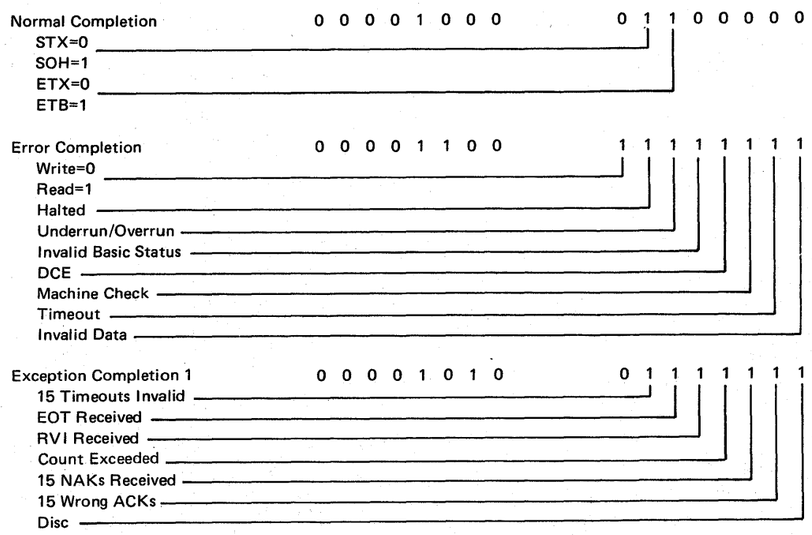
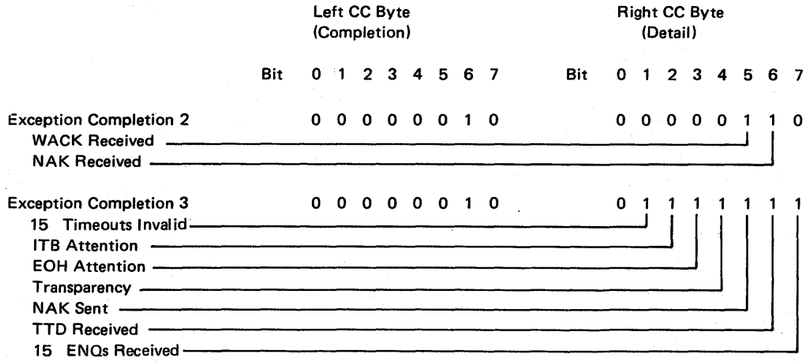


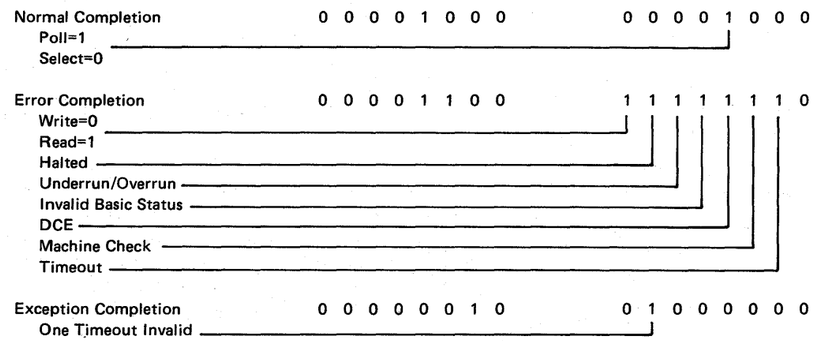
Figure 3-3 (Part 2 of 2). CCA BSC Operation Ending Chart (Code CCCC)

Operation Attempted



58 Monitor Line Respond WACK

FF Codes 44 through 58 use the following completion detail.



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 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 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
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
```

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
00 Open																
Normal Completion	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
Ring Indicate																
Error Completion	0	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0
Invalid Status																
DCE Error																
Machine Check																
Exception Completion 1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
Ring-Indicate Timeout																
Exception Completion 2 (Open Halted)	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Read/Write																
Write Complete	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	0	1	1	0	1	0	0
Invalid Basic Status																
DCE Error																
Write Timeout																
Machine Check																
Read Intermediate Complete	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1
XID Received																
Link Test																
Nonproductive Timeout (Receive Overrun for HPCA)																
Lost Data																
Secondary Busy																
Read MSG Available																
Poll Received																
Exception	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1
SNRM Received																
Disconnect Received																
Write Retry																
Idle Timeout																
Overrun																
Underrun																
Connection Problem																
Dump Message																

Figure 3-6. CCA/HPCA SDLC 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
Write Complete and Read Intermediate	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0
Lost Data																
Read MSG Available																
Exception Completion 4 (Halted Write Only)	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
04 Close																
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	0	1	0	0	1	0	0
Invalid Basic Status																
DCE Error																
Machine Check																

(Exception completion condition not allowed)

05 Adapter Prewrap

09 Adapter Wrap

0D Modem Wrap

FF Codes 05 through 0D are not logged.

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 = Type B device operation
01 = Type A device operation
11 = Type 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				RR		CC		SSSS				LL		ZZ		XXXX ~ XXXX	
Byte	0	0	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	~	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 Type A Adapter Log

This device adapter log format is returned to the requesting 3278 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 Type B Adapter Log

This device adapter log format is returned to the requesting 3278 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 – Centurion NN number.

SS – Centurion status associated with error NN.

- Line 3 – Three bytes are displayed, which identify machine check, adapter overrun, and unconfigured device interrupt.

```
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

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. Type 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. Type 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, 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:

```
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.

3.4 TEST 2: DISPLAY CONFIGURATION INFORMATION

Test 2 displays the configuration table residing on the system diskette. The configuration table data is the result of the user customizing the feature diskette and writing the configuration data from storage to the system diskette. Test 2 is displayed by entering Test mode by means of the ALT and TEST keys and then keying in slash (/), two (2), and ENTER. You may page from one display to another by pressing the ENTER key.

The bytes displayed are labeled by position number. The following format shows the configuration bytes labeled.

Page 1

```
0001 0203 0405 0607 0809 0A0B 0C0D 0E0F
0000 0000 0000 0000 0000 0000 0000 0000

1011 1213 1415 1617 1819 1A1B 1C1D 1E1F
0000 0000 0000 0000 0000 0000 0000 0000

2021 2223 2425 2627 2829 2A2B 2C2D 2E2F
0000 0000 0000 0000 0000 0000 0000 0000

3031 3233 3435 3637 3839 3A3B 3C3D 3E3F
0000 0000 0000 0000 0000 0000 0000 0000
```

Page 2

```
4041 4243 4445 4647 4849 4A4B 4C4D 4E4F
0000 0000 0000 0000 0000 0000 0000 0000

5051 5253 5455 5657 5859 5A5B 5C5D 5E5F
0000 0000 0000 0000 0000 0000 0000 0000

6061 6263 6465 6667 6869 6A6B 6C6D 6E6F
0000 0000 0000 0000 0000 0000 0000 0000

7071 7273 7475 7677 7879 7A7B 7C7D 7E7F
0000 0000 0000 0000 0000 0000 0000 0000
```

The subsystem configuration for your machine can be determined from Figure 3-14.

Byte ID	Description
00	**Diskette Type** D4 Feature E2 System D3 Language D9 RPQ Diskette
01	**Feature Level** } See bytes 70-75
02	**System Level** } See bytes 70-75
03	**Language Level** } See bytes 70-75
04	**Interface Adapter** 01 LCA (Model 1A) 02 LHA (Model 1B) 04 HPCA/CCA (Model 1C) 08 SLHA (Model 1D) 41 LCA (Models 21A, 31A) 42 LHA (Model 21B) 44 HPCA/CCA (Models 21C, 31C) 48 SLHA (Models 21D, 31D) 84 Model 51C
05	**Channel Address (Model A)**
06	**Internal Flag** 00 Not Model A 01 Model A
07	**Line Code** 01 EBCDIC 02 ASCII
08	**Line Control** 01 BSC 02 SDLC
09	**BSC Poll Address** XX[1]
0A	**BSC/SDLC Select Address** XX[1]
0B	**Communication Adapter** 01 CCA 02 HPCA 04 Encrypt/Decrypt 10 Printer polled from host
0C	**Remote Attachment** 01 Wrappable Modem 02 DDS Adapter 04 X.21 Leased 08 Greater than 1200-bps Integrated Modem 10 X.21 Switched 20 Loop (Model 51C only) 40 EMI Switched 80 1200-bps Integrated Modem Nonswitched (Model 51C only)

[1] XX = 2 hexadecimal digits

Figure 3-14 (Part 1 of 2). Subsystem Configuration

Byte ID	Description
0D	**TP Options** 01 Omit Answer Tone 02 Point to Point 04 Half-Speed 08 Select Standby 10 Special Request to Send[2] 20 Nonswitched Line 40 NRZI 80 WT DCE Sw Network

Legend for Bytes 0E–12

XX MXX VX CX,X,X,X XXX L/RXX

- XX — Configuration Byte Value
- MXX — Model No. All Models
- VX — Volume No. (1,2,3)
- CX,X,X,X — Card No. (1,2,3,4)
- XXX — Card Type
- L/RXX — Card Location (All models except 51C, 52C)

Byte ID	Description				
0E	**Control Storage Base**				
	04	M1X	V0	C1	3(32R) F2
0F	**Control Storage Addition**				
	02	M1X	V0	C2	2(16) E2
	04	M1X	V0	C3	4(32) E2
10	**Control Storage Addition**				
	02	M1X	V0	C3	2(16) D2
11	**Control Storage Addition**				
	04	M1X	V1	C1	4(32) C2
12	**Control Storage Addition**				
	02	M1X	V1	C2	2(16) B2

Byte ID	Description
13	**Storage Extension** 01 Not Installed 02 Installed 82 Installed
14	**Reserved**
15	**Optional Code Select** 01 3289 Text Print Control 02 Between Bracket Sharing 40 1063 Auto Entry Magnetic Slot Reader 80 1063 Magnetic Slot Reader
16	**Optional Code Select** 01 SCS Printer Support *not* present 02 Host Loadable PAM *not* present 04 Local Copy *not* present 10 Magnetic Slot Reader *not* present
17	**Type B Dr/Rcvr** 00 None 01 1st Card 02 2nd Card 03 3rd Card 04 4th Card
18	**Type A Dr/Rcvr** 00 None 02 1st Card 04 2nd Card 06 3rd Card 08 4th Card
19	**Total Category B Terminals** XX[1]
1A	**Total Category A Terminals** XX[1]
1B	**Total All Terminals** XX[1]
1C	**Reserved (Model 51C only)**
1D	**EBCDIC BSC CU ID** XX[1]
1E	**Language Code** See the *3274 Planning, Setup, and Customizing Guide,* GA27-2827
1F	**Extended Function Store Response (1st two digits)**
20	**'A' DCB Count Response** XX[1]
21	**Total DCB Count** XX[1]
22	**Print Authorization Matrix Entry Count** XX[1]
23	**Keyboards** 01 Typewriter 02 Data Entry 04 Data Entry II 08 APL 10 Text
24	**Extended DCB Count**
25	**Attribute Select Typewriter Keyboard** 01 Color Heads Present 02 P Heads Present
26	**Attribute Select Control Unit Options** 01 SFAP (EDS) Present 02 Decompression Present
27	**Reserved**
28	**Validation Number**
29	**Validation Number**
2A ↓ 30	**Reserved**
3D ↓ 3F	**Reserved (Model 51C only)**
40	**Reserved**
41	**Reserved (Model 51C only)**

Byte ID	Description
42 ↓ 51	**Patch ID Values**
52	**Number of RPQs Installed**
54 ↓ 58	**Part Number and EC Level of 1st RPQ Installed (7-digit PN, 3-digit EC Level)**
59 ↓ 5D	**Part Number and EC Level of 2nd RPQ Installed (7-digit PN, 3-digit EC Level)**
5E ↓ 62	**Part Number and EC Level of 3rd RPQ Installed (7-digit PN, 3-digit EC Level)**
63	**Reserved**
03 ↓ 05	**Reserved**
67 ↓ 6F	**Reserved**
66	**Physical Unit Identification Number**
70	**Feature Diskette Level and Suffix**
71	
72	**System Diskette Level and Suffix**
73	
74	**Language Diskette Level and Suffix**
75	
76	**EC Level and Suffix Level of 1st RPQ Installed**
77	
78	**EC Level and Suffix Level of 2nd RPQ Installed**
79	
7A	**EC Level and Suffix Level of 3rd RPQ Installed**
7B	
7C	**Magnetic Responses** 00 None 01 Numeric (3277-compatible) 02 Alphameric (auto entry for nondisplay data) 03 Alphameric (auto entry for all data)
7D	**Attribute Select Typewriter Keyboard (PS, Extended Highlighting, Color)** 00 No Attribute Select Typewriter Keyboards being Used. 01 Attribute Select Typewriter Keyboards without the Numeric Lock Feature. 02 Attribute Select Typewriter Keyboards with the Numeric Lock Feature (4690).

[1] XX = 2 hexadecimal digits.
[2] Active from STX to EOT for BSC, 4-wire, multipoint.

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

3.5 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 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:

- 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:

(Machine configured for 32 devices)

- Line 1 01234567890123456789012345678901
- Line 2 10111111111011111111111111011001
- Line 3 ddddddddddd—ddddddddddddpdpdpdpd
- Line 4 ....|.....:.|.....|. ....*...
- Line 5 ....:..... *.......
- Line 6 ++++++++++ ++++++++++ ++++ +++
- Line 7
- Line 8 0000 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

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).

3.6 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.

3.7 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 is always returned the same as input 00-31/6 for each display. The second line of each display will indicate the beginning byte ID of that display. 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 X-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.

3.7.1 Test 6 Byte Identification

Figure 3-15 identifies the bytes of the DCB displays.

First Display

XX/6 — Returned as input 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 input

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 input

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 input

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 Byte ID Chart

3.7.2 DCB Bit Definitions

Bytes not defined in Figure 3-16 are not used. 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.

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

Display Model	1	2	3	4	5
Bit					
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
	5-7	Reserved for engineering use
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	4E	Host printer available for local copy
Bits 0-7	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	0	Model 5 wide screen
(Category A	1	Model 5 wide screen
devices)	2	480-character format
	3	Reserved for engineering use
	4	Inhibit display video
	5	Blank cursor
	6	Cursor reverse
	7	Cursor blink
Byte 25	3	APL mode
	4	APL attached
Byte 26		Row length
Byte 27		Indicator row length
Byte 29		AID Code
Byte 31	00	2K
Bits 0–7	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

Location	Bit	Meaning If Bit Is Turned On
Byte 6A	0	Shift/Numeric Lock key still depressed
(Category A	1	ALPHA key depressed
devices)	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
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 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

3.8 TEST 7: DYNAMIC CONVERGENCE (COLOR)

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

3.9 TEST 8: PS, HIGHLIGHTING, AND COLOR

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

3.10 3277 PATH TEST AND TEST REQUEST KEY

3.10.1 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.

3.10.2 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.

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

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.

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	33FD failure — 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 33FD 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 33FD disk drive (check A1Z2 cable). 4. Defective diskette.
0011	Type A Adapter failure — 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 — 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 3278 display is powered on at port A0, additional failure information will be displayed on the screen.
0110	Host Adapter Failure — A flashing display of this code indicates the host adapter/attachment test failed. Failure could be caused by the following, in addition to defective cards: (1) range addressing does not agree with customizing, (2) model specified wrong when customized, (3) system diskette not for this machine, or (4) problem on the host interface has disabled the adapter.
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 3278 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
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	33FD Error — This flashing code is displayed whenever a 33FD problem has been detected *after* the initial 33FD test. This failure can also be caused by invalid tracks or data on the diskette.

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

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 Wrappable 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
	1000	Carrier not present
	1111	Carrier is present
6. Return TEST/OPERATE switch to OPERATE position.		

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 C with Greater than 1200-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 A1D2 card will also flash each time the test is run successfully.

If the test fails, the failing card is indicated in the A1D2 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 A1D2 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	D2, G2, C4
	000	On or flashing	D2, G2, C4
	111	On or flashing	D2, G2, C4
	100	On	C2, G2, D2
	010	On	G2, D2
	001	On	D2, G2, C4
1 = On 0 = Off			

Figure 4-8. A1D2 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	D2, G2, F2, C4
	0000	On or flashing	D2, G2, C4
	1111	On or flashing	D2, F2, G2, C4
	1000	On	C2, G2, D2
	0100	On	F2, D2, G2
	0010	On	G2, F2, D2
	0001	On	D2, F2, G2, C4
1 = On 1 = Off			

Figure 4-9. A1D2 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	E2, G2, F2, D2, C4
	0000	On or flashing	E2, G2, C2, C4
	1111	On or flashing	E2, D2, F2, G2, C4
	1000	On	D2, F2, E2
	0100	On	F2, D2, E2, G2
	0010	On	G2, E2, F2, D2
	0001	On	E2, F2, G2, D2
	0000	On	C2, G3, E2, D2
1 = On 0 = Off			

Figure 4-10. A1D2 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	D99-3700C	T3700LTE
Link Level 0	D99-3705A	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 scoping points for the Model C are identified as follows:

EIA Interface Lines

Carrier Detect	A1Q2S04
Req to Send	A1Q2S10
Clr to Send	A1Q2S12
Data Set Rdy	A1Q2S13
Transmit Data	A1Q2U04
Receive Clock	A1Q2U10
Transmit Clock	A1Q2U11
Data Trmnl Rdy	A1Q2U12
Receive Data	A1Q2U13

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

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

Bus Interface Lines

Bus Out Bit 0	A1N2U12
Bit 1	A1N2S12
Bit 2	A1N2U13
Bit 3	A1N2U06
Bit 4	A1N2S07
Bit 5	A1N2U07
Bit 6	A1N2S08
Bit 7	A1N2U05
Bit p	A1N2S05

Tag Interface Lines

Hold Out	A1N2G12
Suppress Out	A1N2G13
Op Out	A1N2J13
Service Out	A1N2M08
Address Out	A1N2M09
Command Out	A1N2P09
Select Out	A1N2P10

4.6.3 Isolate Feature Board 01A-A2

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.

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.
2. Replace the feature diskette with the customized system diskette. Do *not* press IML. Within 1 minute, the 8 4 2 1 indicator code will be flashing 1110.
3. Replace the system diskette 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.
   - 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.
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. 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
1	One or more of the first 10 characters is incorrect; reenter response.
2	One or more of the 11th to 17th characters, including the space, is incorrect; reenter response.
3	The diskette level is wrong; use the correct diskette.
11	An invalid response has been entered (too many characters, value too high or too low, wrong character, reenter response.
12	An entry other than A, B, or C was entered in response to sequence 151; reenter response.
13	The response has too few characters; reenter response.
14	The numerical sum of the responses to sequence numbers 111 and 112 is greater than 32; verify, and reenter responses(s).
21	An unacceptable change was made during modification (sequence 999); recheck entries, and correct.
22	If the response to sequence number 321 is 1, the responses to sequence numbers 121 and 131 must be 02 and 1, respectively. If the response to sequence number 321 is 0, the response to sequence number 121 must not be 02.
23	One or more responses are not compatible with the response to sequence number 331; verify, and correct response(s).
24	The responses to sequence numbers 131, 132, and 133 are 0's (at least one must be a 1); verify, and correct response(s).
80	Invalid characters were entered; reenter response.
81	All patch areas are in use.
82	The patch ID number (header) already exists; use a new header.
83	The update number does not match the number in the configuration table; verify, and reenter response.
84	An attempt was made to delete a patch that does not exist.
86	The call line did not contain the correct data length.
87	Patch information was not entered. Sequence number 013 must have at least one patch before 48 is entered.
89	The number of lines entered does not agree with the count specified in the header line.
99	All entries are acceptable, but the entry for sequence number 900 has not been changed to 1.

Figure 4-18. Operator Codes

4.6.5 Dump Procedure

The 3274 Dump Diskette is to be used when the System Support Center requests a 3274 subsystem dump. The 3274 Subsystem Dump Procedure should be performed by the customer engineer, but, for intermittent problems, it can be performed by the customer.

1. For a 3274 Model A, B, or D, set the Power/Interface rotary switch to the Local/Offline position and check to see that the Local/Offline indicator is on. If the indicator fails to come on, momentarily ground the appropriate pins as indicated in the following list to force this condition:

3274 Model	Pin Number
A	01A1-P2D10
B	01A1-Q2B07
D	01A1-Q2G05

Note: *The customer does not have direct access to these pins. If the CE expects the customer to encounter this condition, he must temporarily install a special grounding switch (PN 5718026) into the customer access area. For a 3274 Model C, this step is not applicable; go directly to step 2.*

2. Replace the system diskette with the dump diskette.
3. While holding the Alt IML Address switch in position 1, momentarily press and release the IML switch; then release the Alt IML Address switch.
4. After a few minutes of operation, the 8 4 2 1 indicator lights will change to a flashing 1011 code. When this condition occurs, replace the dump diskette with the system diskette. Do *not* press IML.
5. After the system diskette is inserted, the 8 4 2 1 indicator lights will first change to a steady 0000 code and, after approximately 10 seconds, to a flashing 1001 code. When this condition occurs, replace the system diskette with the dump diskette. Do *not* press IML.
6. When the 8 4 2 1 indicator lights change to a steady 1111 code, the dump procedure is completed. When this condition occurs, replace the dump diskette with the system diskette and perform a normal IML to restore the subsystem for customer operation.

Note: *Follow this procedure exactly, using only the dump diskette and the system diskette at the specified steps. If the wrong diskette was used, retry the procedure, starting at step 1.*

After the dump procedure has been completed, place the dump diskette between protective sheets of cardboard. Insert the diskette and your return label with your return address and other pertinent data into the return envelope. Send the complete package to the requesting System Support Center.

Note: *If, at any time during the execution of this procedure, the 8 4 2 1 indicator lights display a steady 1100 code, an unrecoverable diskette drive error has occurred. If this condition occurs, retry the procedure, starting at step 1.*

The 1100 error code will also appear if you are trying to perform a dump when no data exists in the 3274 storage. This could occur when you attempt a dump immediately after turning on the 3274 (prior to the initial IML).

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 length 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.

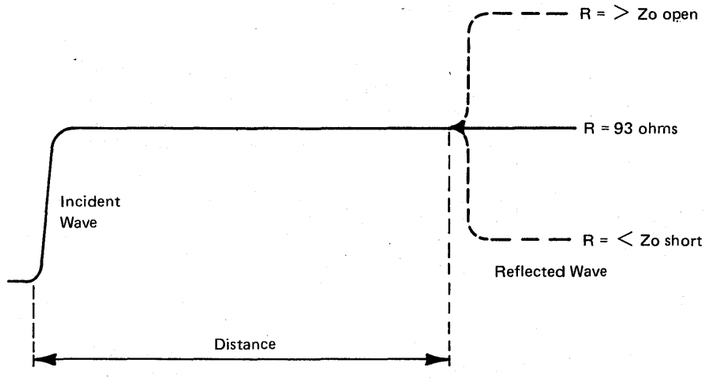


Figure 4-19. Incident and Reflected Waves

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.

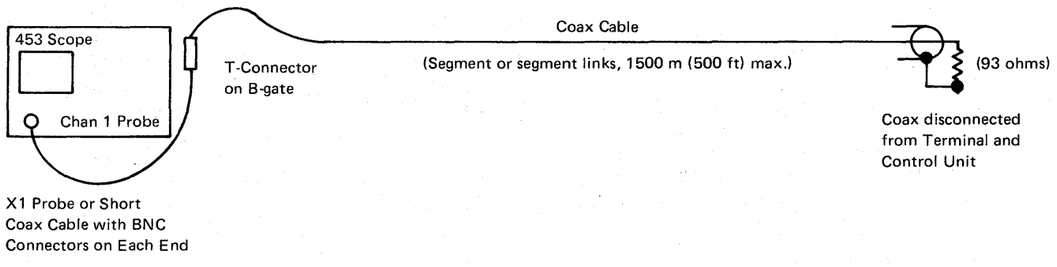


Figure 4-20. Scope Setup

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.

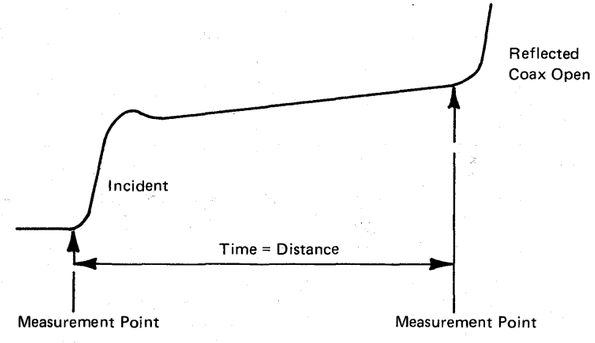
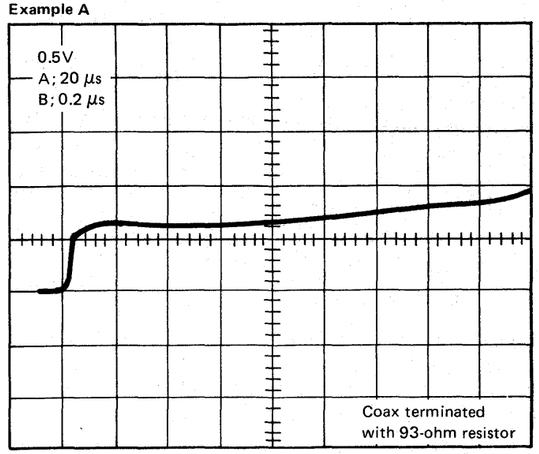


Figure 4-21. Measurement Points

Example A

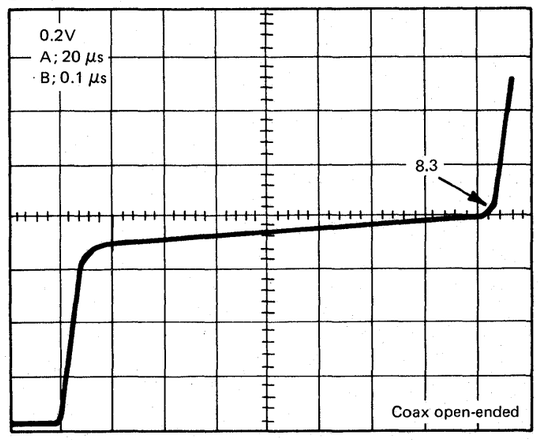


This is an illustration of a good, no-fault coax cable that is 190 m (624 ft.) long. A gradual sloping and overshoot of rise time is normal.

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

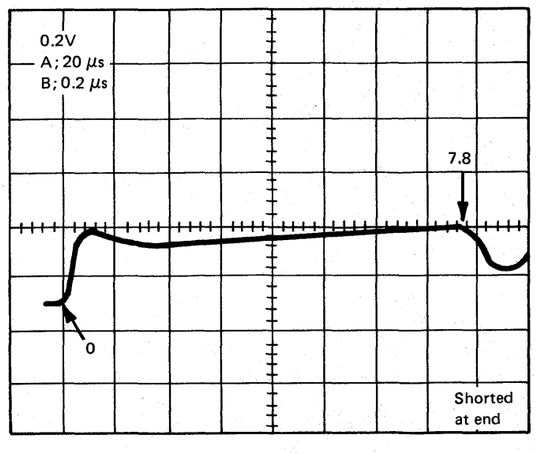


101 m (332 ft) of good coax cable, 8.3 divisions long. (This is an effective method to measure the length of the cable.)

8.3 x 40 = 332 ft or
8.3 x 12.2 = 101 m

Rising slope is normal.

Example C



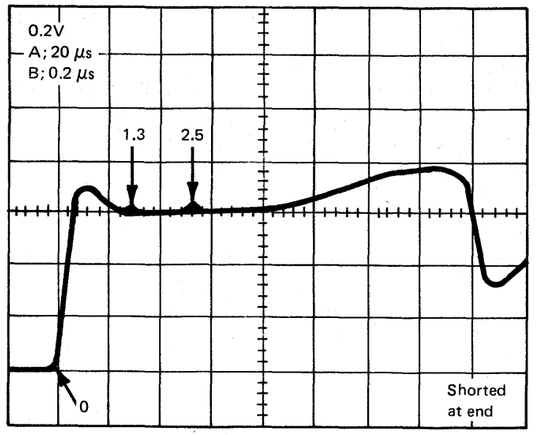
The same cable as Example A now shorted at end to show downward reflection and length.

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

Example D

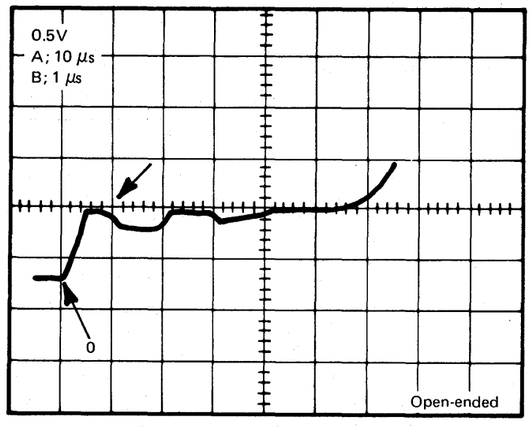


Same as Example C, now with higher vertical gain (0.2V/div).

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.

Example E

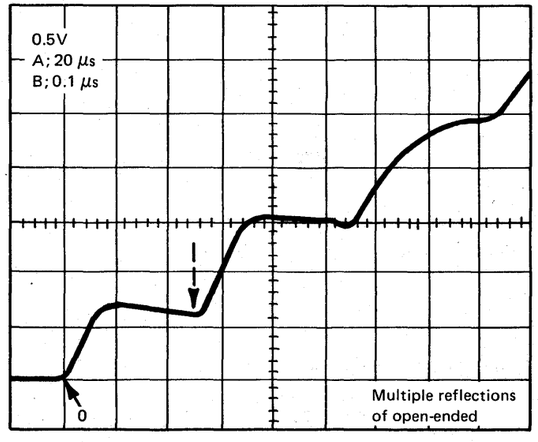


This 2400-ft cable has a 100-ohm short to shield at the 400-ft point (see arrow).

Total cable length 6 x 400 = 2400 ft

Fault point 1 x 400 = 400 ft

Example F



Improper setup of scope.

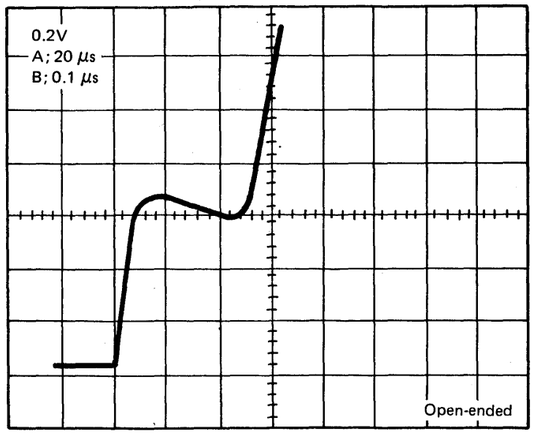
Multiple reflections, 30.5m (100 ft) of good cable with open end.

Improper scope display due to wrong vertical gain setting, .5V/div.

Only the first reflection is significant and should be magnified.

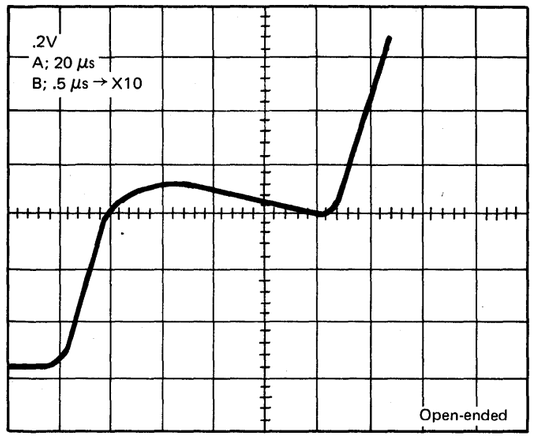
See Example G.

Example G



Same as Example F, now with scope set to higher vertical gain, 0.2V.

Example H



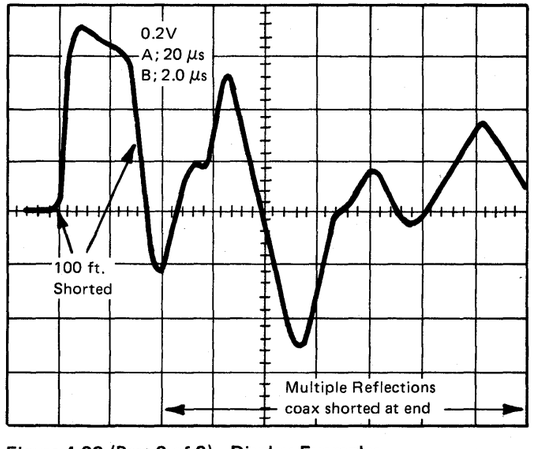
Same as Example G, but magnified with X10.

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.

Figure 4-22 (Part 2 of 2). Display Examples

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 B and D	3274C	
	EBCDIC (Hex)	EBCDIC (Hex)	Graphic
Copy[1]	NA	F7	7
Erase All Unprotected	0F	6F	?
Erase/Write	05	F5	5
Erase/Write Alternate[2]	0D	7E	=
Read Buffer	02	F2	2
Read Modified	06	F6	6
Read Modified All[3]	NA	6E	:
Write	01	F1	1
No Operation	03	NA	NA
Select	0B	NA	NA
Sense	04	NA	NA

[1] Applicable to 3271 and to 3274 Model C (BSC).
[2] Applicable to 3274.
[3] Applicable to 3274 Models A and C (SNA/SDLC).

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 Select (Models B and D Only)

The Select command transfers the contents of the addressed device buffer to the CU buffer.

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.

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.

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) (3262, 3287, 3288, and 3289 Printers)

Valid Forms Feed (FF) orders are executed by the 3287, 3288, and 3289 Printers 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 Suppress Index (SI) (3288)

The 3288 Printer, when equipped with the Text Print special feature, honors the Suppress Index (SI) order code. The SI order causes printing of two or more lines of data at the same paper position. The SI order is transferred as part of the data stream from the application program and is stored in the printer buffer as data.

5.3.13 Carriage Return (CR) (3262, 3287 with 3274/3276 Attachment, and 3289 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.

5.4 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.

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]
Erase Unprotected to Address (EUA)	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

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 | 00 01 10 11 | 00 01 10 11 | 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 | 00 01 10 11 | 00 01 10 11 | 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), and NUL (hex 00) 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 3262, 3278, 3279, 3287, and 3289 Terminals

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. 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.

Figure 5-5. United States ASCII I/O Interface Code for 3274 Control Unit and Attached 3262, 3278, 3279, 3287, and 3289 Terminals

•	1	Printout Format		Start Print	Sound Alarm	Kybd Restore	Reset MDT Bits
0	1	2	3	4	5	6	7

*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 the 3262, 3287 and 3289 Printers only.

Figure 5-7. Function of Write Control Character (WCC) Bits

•	1	Printout Format		Start Print	Sound Alarm	Type of Data to be Copied	
0	1	2	3	4	5	6	7

*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 the 3262, 3287, and 3289 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/Nondetectable.
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	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, 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.)

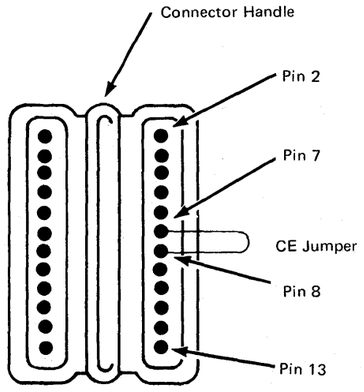


Figure 5-13. 3278 Top-Card Connector CE Jumper (Three Base Cards)

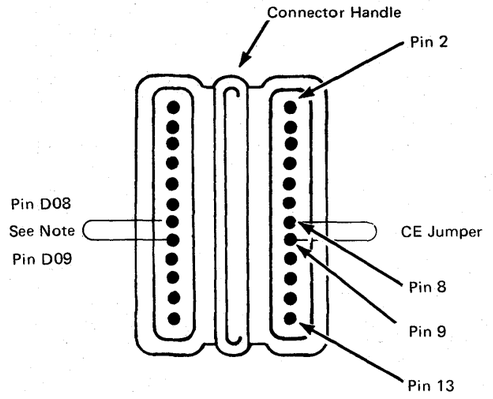


Figure 5-14. 3278 Top-Card Connector CE Jumper (Two Base Cards)

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.

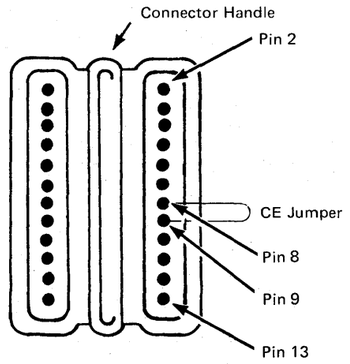
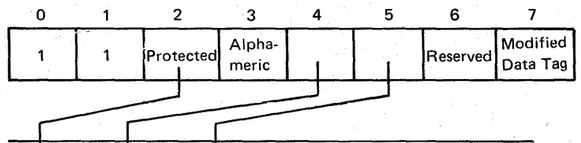


Figure 5-15. 3279 Top-Card Connector CE Jumper



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 by the 3274 and 3276 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 A, B, AND D

Figures 5-20 through 5-23 give the events, in sequence, that occur during selector channel operations. The Channel column includes 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 A, B, and D.

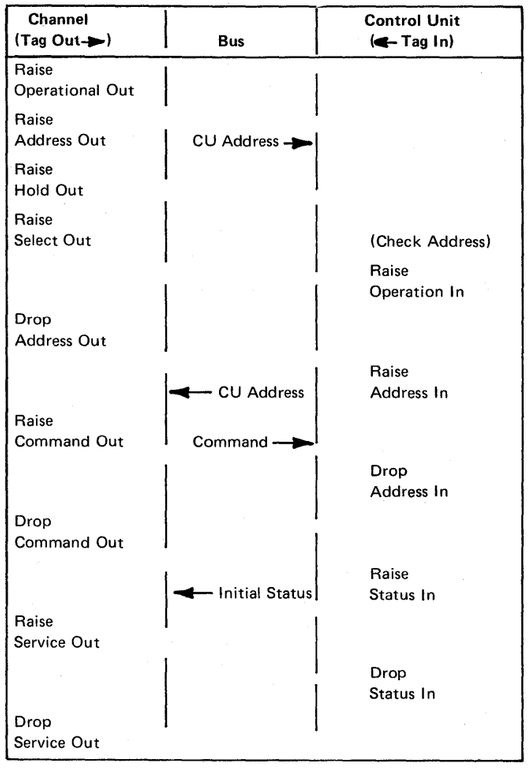


Figure 5-20. Initial Selection

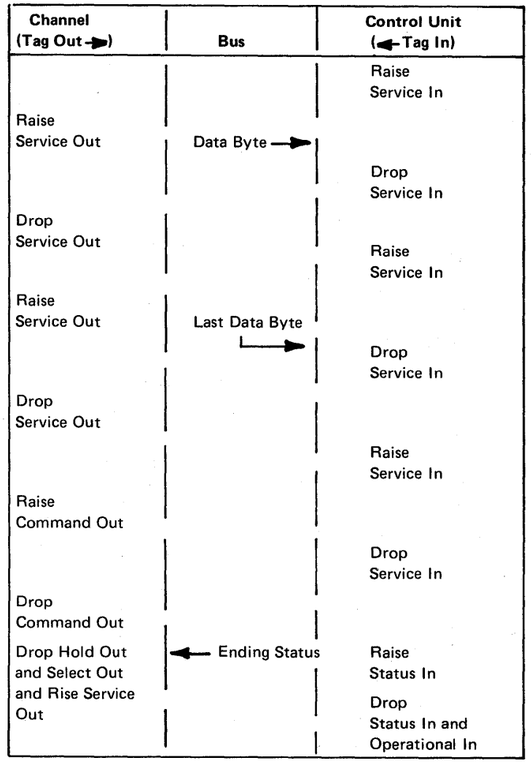


Figure 5-21. Write—After Selection with Write Command

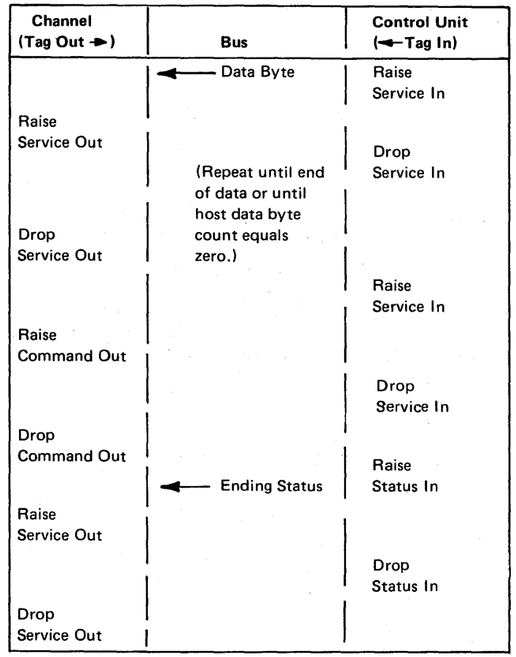


Figure 5-22. Read—After Selection with Read Command

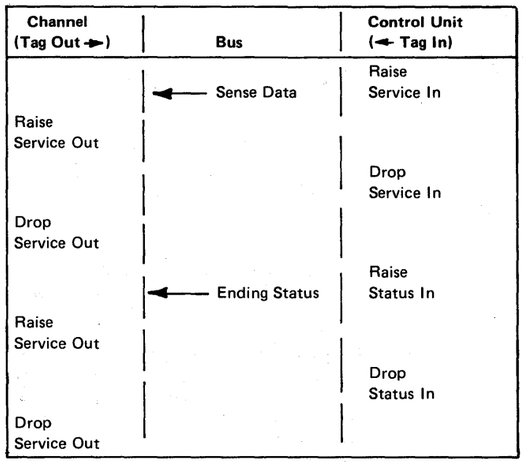


Figure 5-23. Sense—After Selection with Sense Command (Issued in Response to Unit Check Status)

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 3277 attached to a 3272, or a 3277 or 3278 attached to a 3274. Set as result of certain keyboard, selector pen, or card reader activity at 3277 or 3278 (see Figure 5-11). Program should respond by issuing a Read Modified command (chained from a Select command if multiplexer channel) to the 3277 or 3278 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 3272 or 3274-B has received an 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 3272 or 3274-B has detected bad parity on any command or data byte received from the channel.
3	Equipment Check (EC)	Set if: (1) the 3272 or 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 EC 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 3272 or 3274-B or a device has detected bad parity on data transferred internally or between the 3272 or 3274-B and a device during command operations, (2) a 3277 or 3278 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 3272 or 3274-B has detected a timeout condition. (The addressed device fails to perform a specified operation or respond to the 3272 within a specified period of time.)
7	Operation Check (OC)	Set when the 3272 or 3274-B has received a valid command or order that it cannot execute, as follows: 1. SBA, 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, Erase/Write, or Erase/Write Alternate command.
CE, DE[1,2] (0C)		X	X		Sent at end of data stream on a Read Buffer, Read Modified, or Sense command or when channel byte count goes to zero on a Read Modified or Read Buffer command.
CE, DE, UC[2] (0E)	BOC (20)	X	X	10	The control unit detected a parity error on a character in data stream of a Write or Erase/Write command.
CE, DE, UC[1,2] (0E)	DC, US (0C)	X	X	1	Addressed device detected a parity or cursor check during a Write, Read Buffer, or Read Modified 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, Erase/Write Alternate, or Erase/Write command.
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 Buffer or Read Modified 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 command. 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 control unit received an invalid buffer address in data stream of a Write, Erase/Write, or Erase/Write Alternate command, or 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".
CE, DE, UE[1,2] (0D)		X	X	9	The control unit attempted to perform a Read Buffer, Read Modified, Write, Erase/Write, or Erase/Write Alternate 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.

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.
DE (04)		X	X		The control unit-to-device buffer transfer is completed on a Write, Erase/Write, or Erase/Write Alternate 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". The 3272 OnLine/OffLine switch is thrown from OffLine to OnLine. This causes each "available" device to present a Device End to the channel.
A, DE (84)		X			The 3272 OnLine/OffLine switch is thrown from OffLine to OnLine and an attention-generating action (e.g., program access key has been depressed) was performed by the operator.
A, UC (82)	EC (10)	X	X	5	An idle 3272 polled a device twice and detected a "transmit" parity check each time on the data in the device reply.
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)	DC, US (0C)	X	X	4 or 8	A device on a 3272 changes from "not available" to "available" or from "not ready" to "ready" and has detected a parity check or cursor check in its buffer or a printer detected parity check while printing.
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, Erase/Write, or Erase/Write Alternate 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 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 Select, Write, Erase/Write, Erase/Write Alternate, or Erase All Unprotected command.
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.
DE, UC (06)	CC (02)	X	X	10	The addressed device failed to respond in a specified period of time to a Select, Write, Erase/Write, Erase/Write Alternate, or Erase All Unprotected command, 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 or 3276). 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.

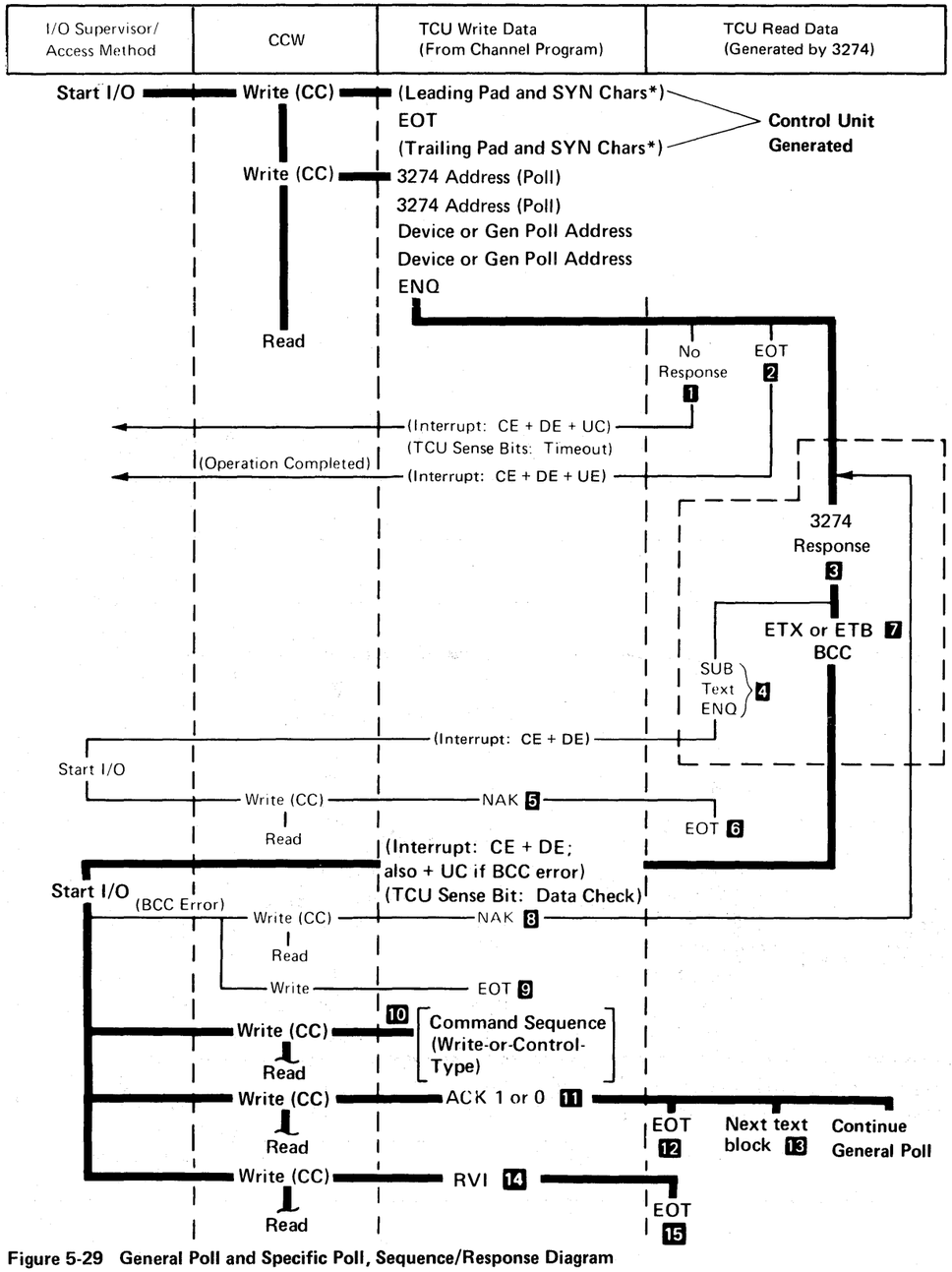


Figure 5-29 General Poll and Specific Poll, Sequence/Response Diagram

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. 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.

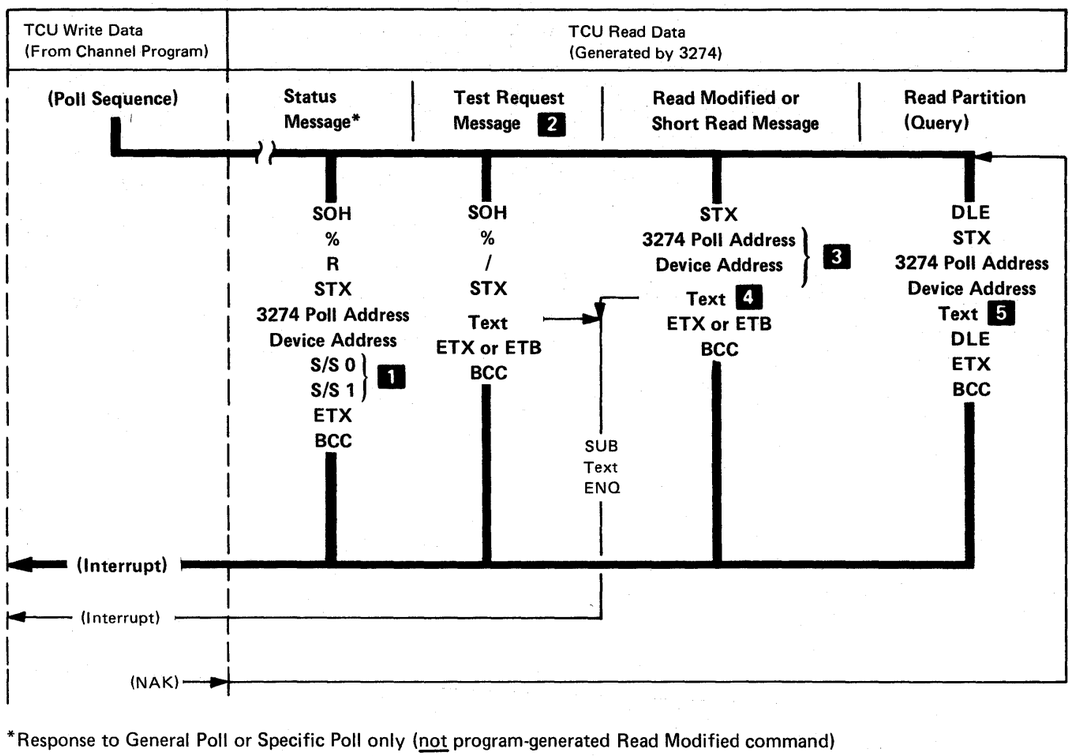
    Normal termination of a General Poll.
13. The second and all succeeding text blocks are framed as the first except they do not include the 3274/device address sequence.
14. RVI to terminate polling sequence.
15. Termination of polling sequence on receipt of RVI.

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)

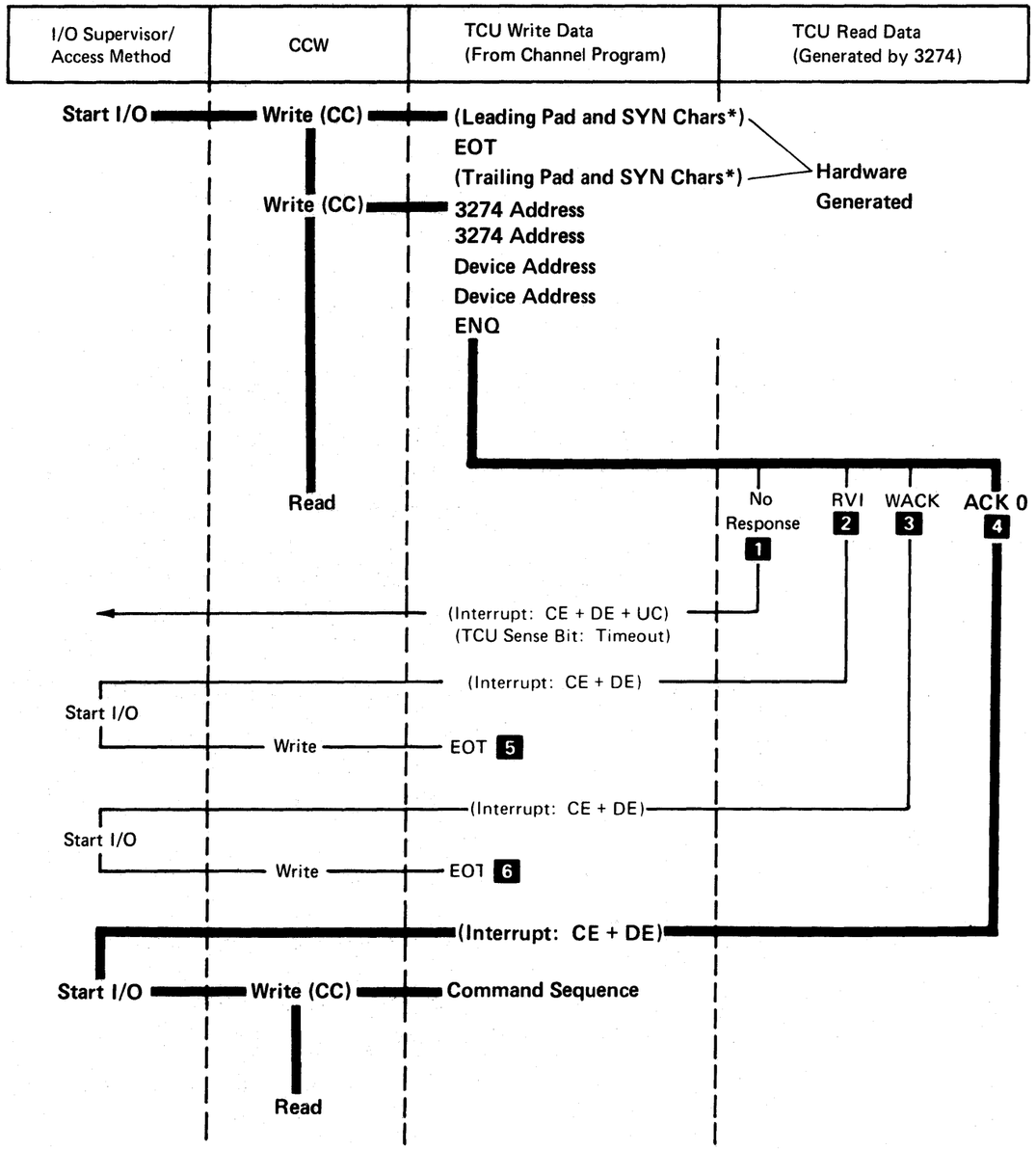
Figure 5-30. 3274 Message Response to Polling or Read Modified Command

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 3278 or 3279 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.

LEGEND:

(Interrupt) = 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)

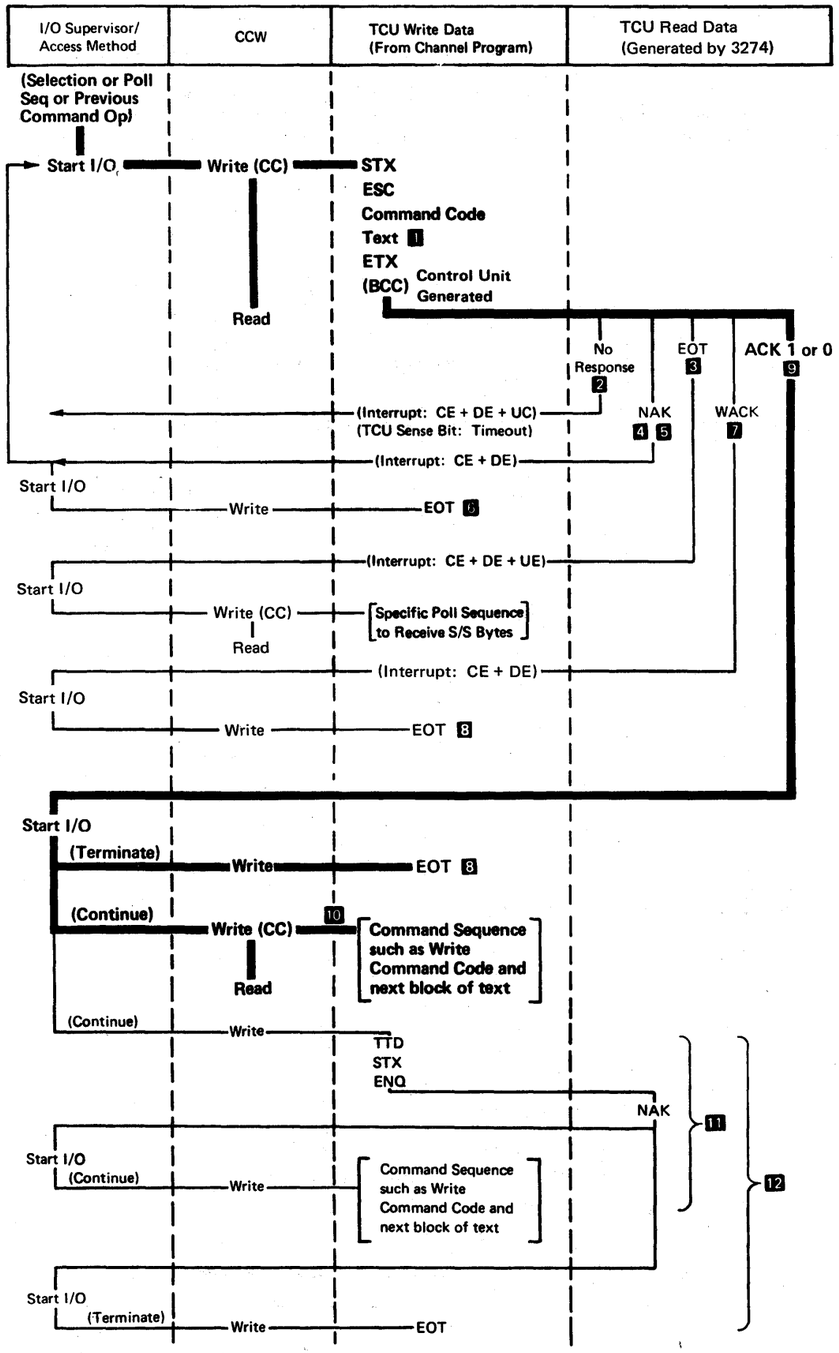


Figure 5-32. Write-Type and Control-Type Commands, Sequence/Response Diagram

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).

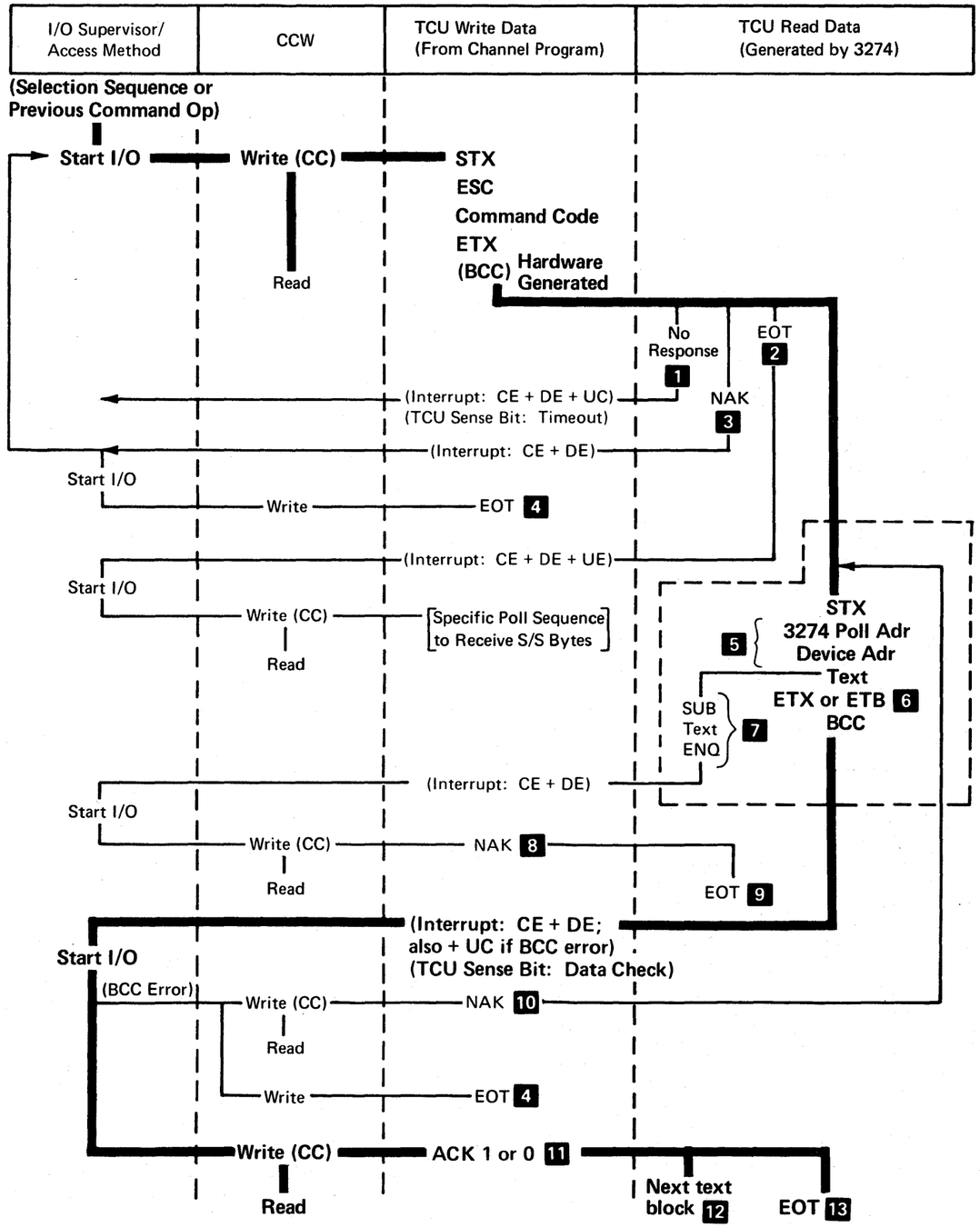


Figure 5-33. Read-Type Command, Sequence/Response Diagram

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	*Transmission Check (TC)* — Not used by the 3274.
	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	*Control Check (CC)* — This bit is not used by the 3274.
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 Control Check, Intervention Required, Data Check, Device Busy, or Data Check with Unit Specify to indicate that the errors that set these sense bits were detected while the 3271 was executing an operation with the "from" device during a Copy command. 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. CC — Not used for the 3274. IR — The addressed device is unavailable. DC, EC (either or both) — Not used for the 3274. 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 — Not used for the 3274. DC, US — An operation to a terminal was unsuccessful. The terminal was disabled and DC US returned to the host. On subsequent r[illegible]y by the host, IR will be returned to the host. CC — Not used for the [illegible]74. DB, US — The addressed device is busy. The message is accepted but not stored in the 3274 buffer. The command is aborted. DE, DB, US — Not used for the 3274.

Figure 5-35. Remote Error Status and Sense Responses, BSC

Device Response	Command	S/S Explanation
EOT	Copy Command	CC, OC — Not used for the 3274. 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. DC, OC — Not used for the 3274. 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. IR, EC, US — Not used for the 3274.
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. DC, EC (either or both) — Not used by the 3274. 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 dufing a printout. DC, US, DE — A parity error is detected at printer. CC (Specific Poll only) — Not used by the 3274.
	Specific Poll	CC — Not used by the 3274. 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		13
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
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
IR, EC, US	C4 D8	44 51				P	P		NA

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

NA — Not Applicable
D — Display (3277, 3278)
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 3278 buffer error or an error occurring on a transfer between the 3276 and 3278 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 nonrecoverable error. Follow supplementary procedure A.

Programming Note: *A cursor check in the 3284 is indistinguishable from a data check that occurred in the 3271 or 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. Indicates that the 3275 detected a BCC error during text transmission from the TCU. Follow procedure 2 if the failing command is a Write command with a data stream of more than one byte or if it is in a chain of commands and one of the previous commands in the chain is a Write command without an SBA order immediately following the WCC character. In all other cases, follow supplementary procedure D. If, after the recommended procedure has been tried six times, the problem is not corrected, follow supplementary procedure A.
13. 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)

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)

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

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.

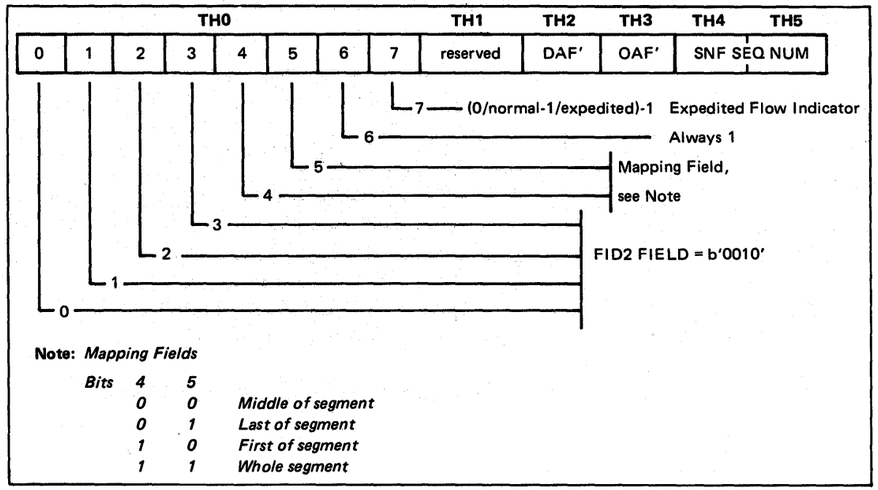


Figure 5-49. Transmission Header Format

5.11.4 Request/Response Header

The format of the request/response header is shown in Figure 5-50.

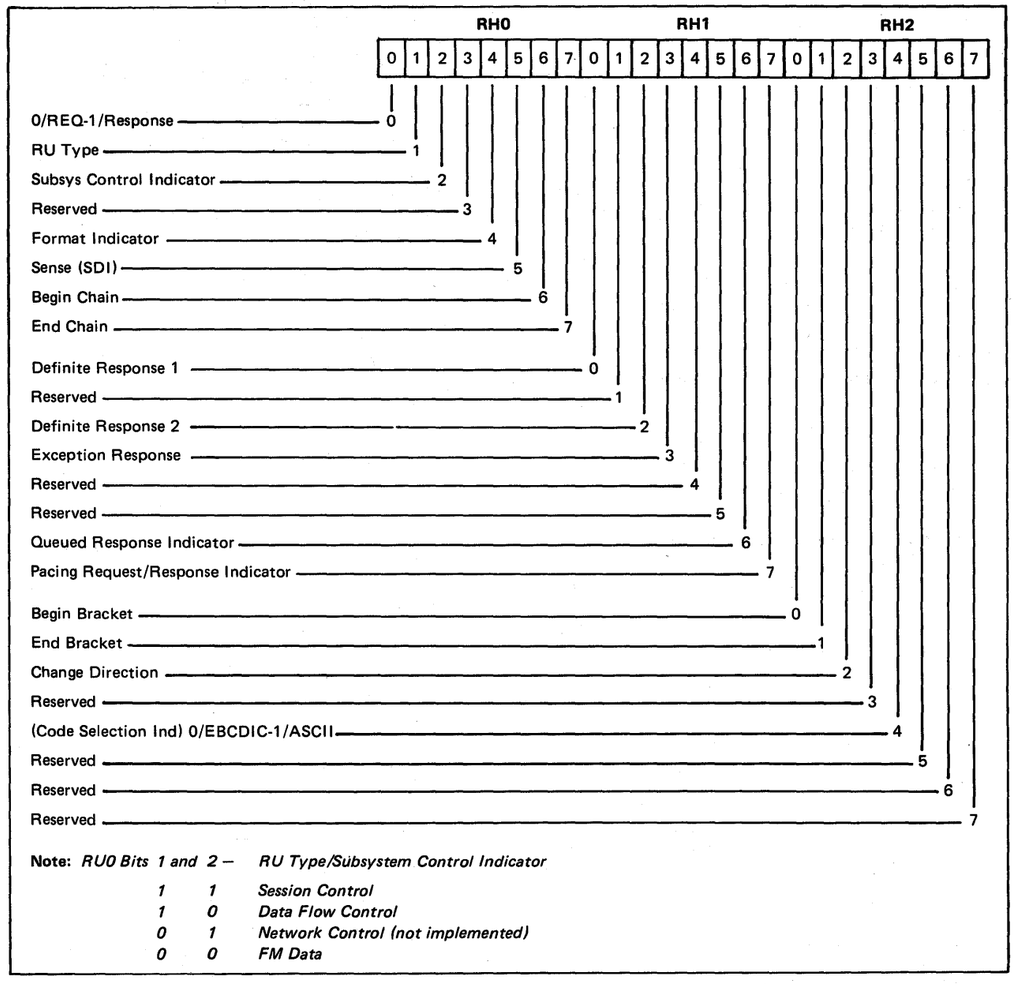


Figure 5-50. Request/Response Header Format

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 – Printer 3289 (LYNX), 3287 (BAHIA-Feature only)
- LU2 – Display 3278 (D)
- LU3 – Printers ANR – 3284, 3286, 3288
  NDS – 3289, 3287

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.

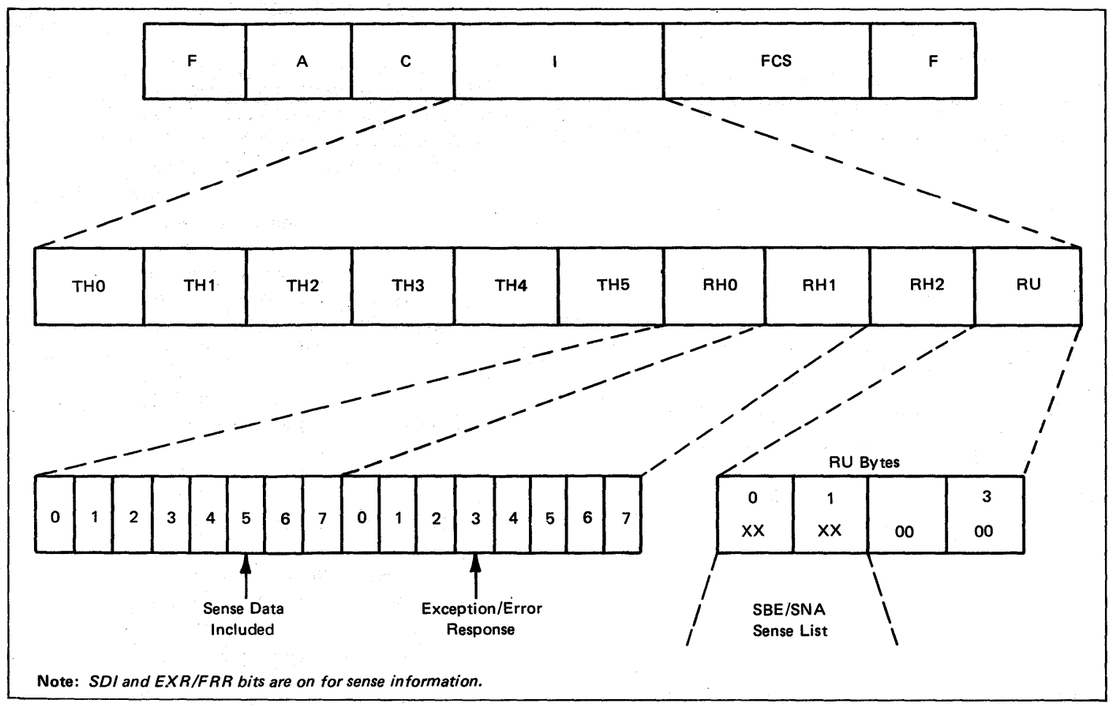
	Frame	Address	Control	TH	RH	RU	BCC	Frame
SNRM	7E	C1	93				277A	7E
RR	7E	C1	11				3DDD	7E
ACTPU	7E	C1	00	2F0000000001	6B8000	110101050000000001	02B9	7E
RR	7E	C1	11				3DDD	7E
ACTLU	7E	C1	22	2F0002000001	6B8000	0D0101	126B	7E
RR	7E	C1	31				3FFC	7E
Bind	7E	C1	44	2F0002010001	6B8000	31010303B1A03080 0001858700000200 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'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 • 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.

Sense Byte One	Description
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.

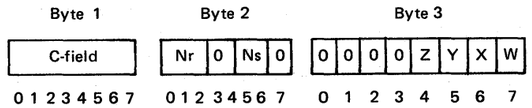
For LU type 2, if the 3274 finds the subsidiary device has been configured from Local or Shared mode to System mode, LUSTAT X'0001B000' will be sent if an LUSTAT is owed. The next outbound request will be rejected with the proper sense code.

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.

5.13 SWITCHES AND CONTROLS

Figure 5-50 explains the switches and controls.

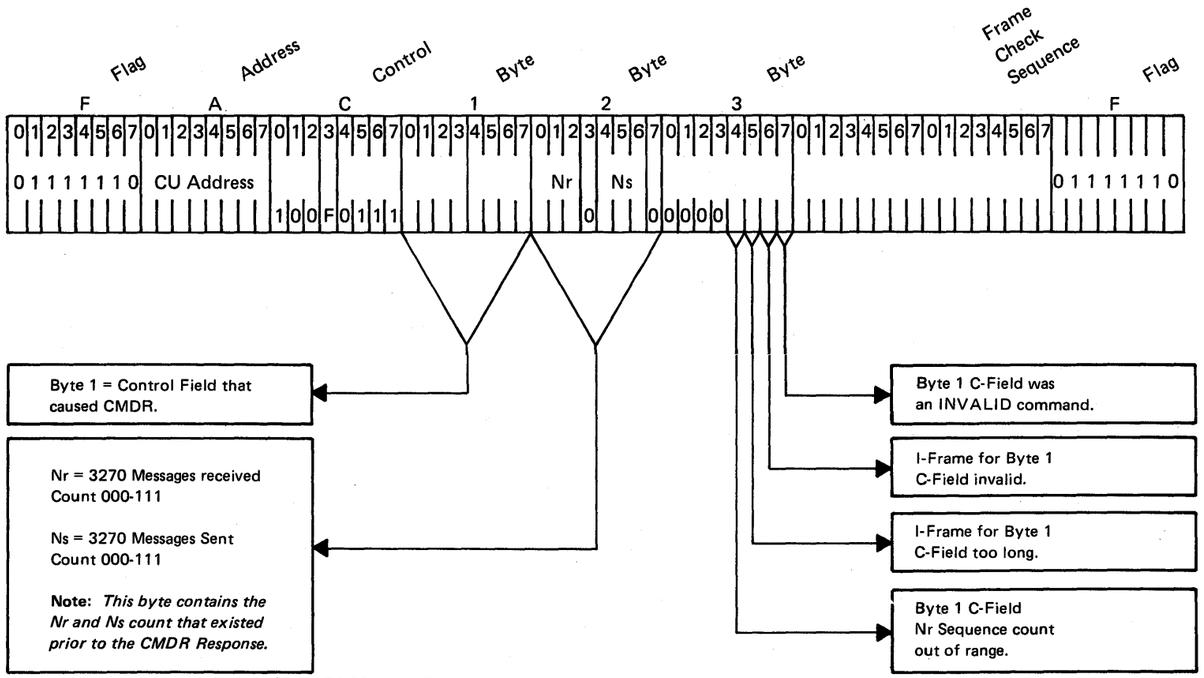


Figure 5-54. Command Reject (CMDR) Message Format

5.13 SWITCHES AND CONTROLS

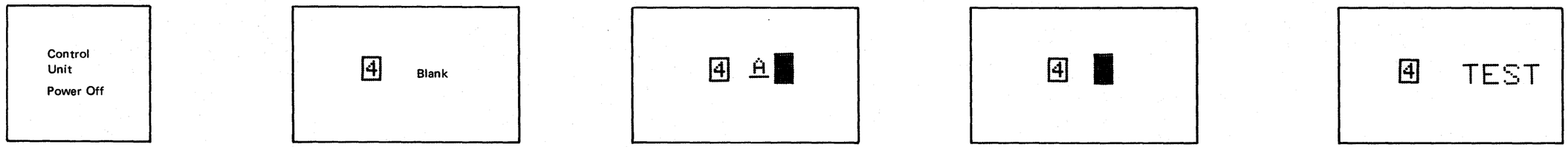
Figure 5-55 explains the switches and controls.

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.



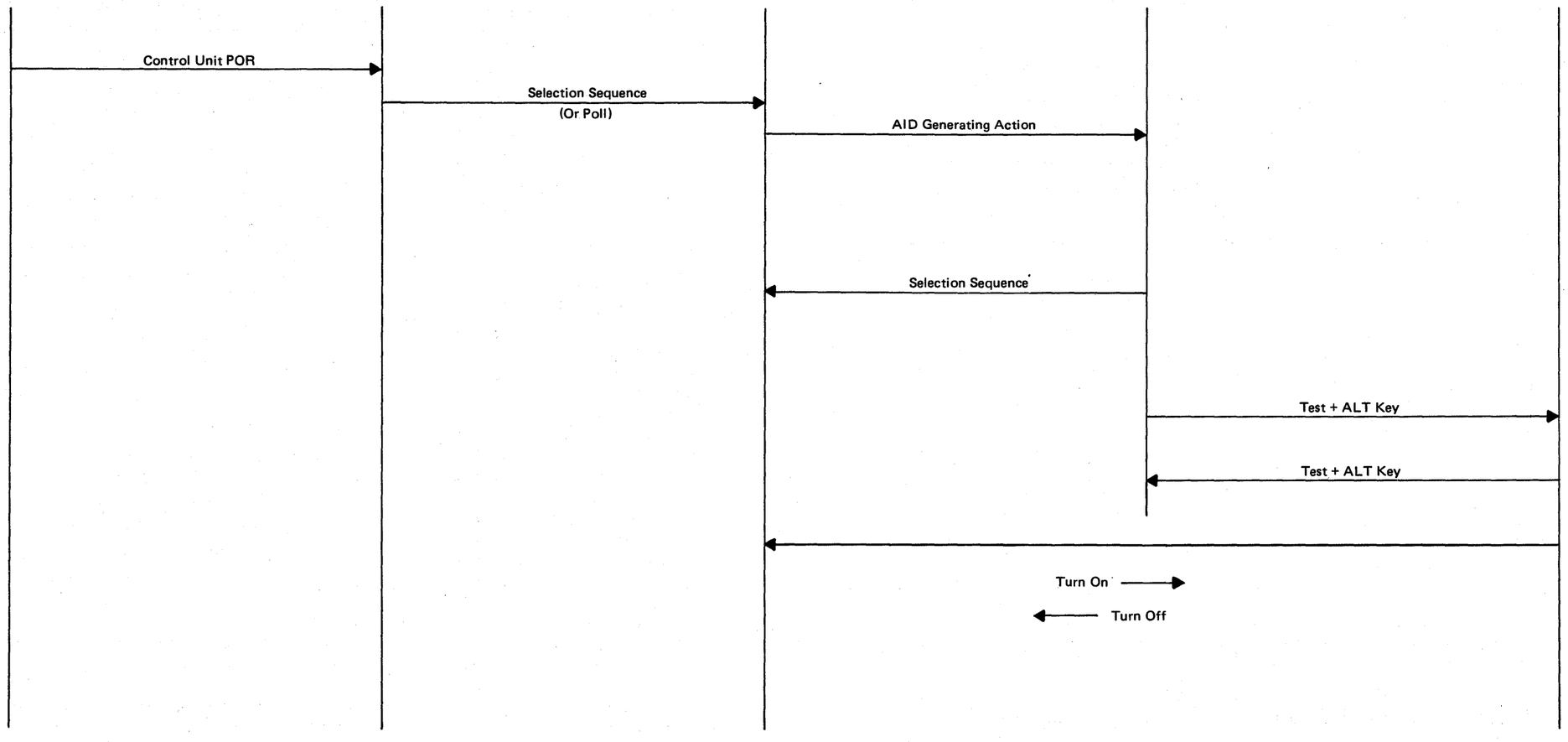


Figure 5-56. BSC Readiness Symbols

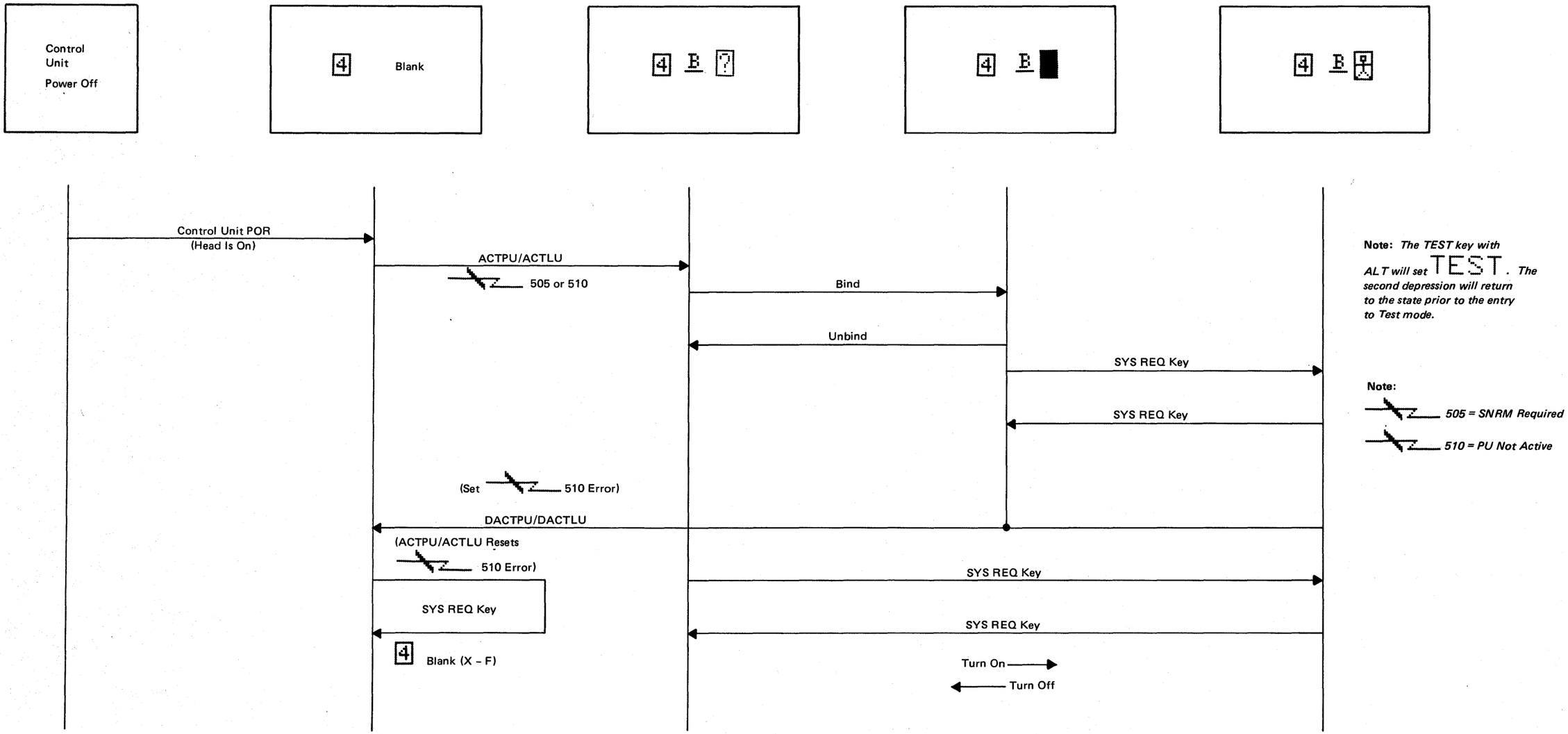


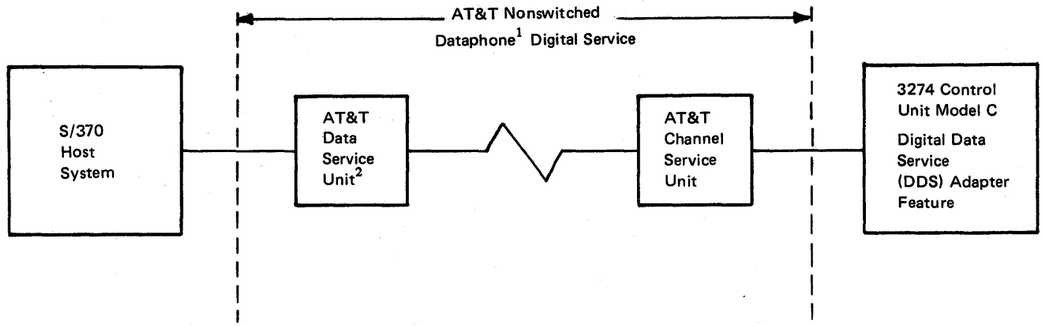
Figure 5-57. SNA Readiness Symbols

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 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.

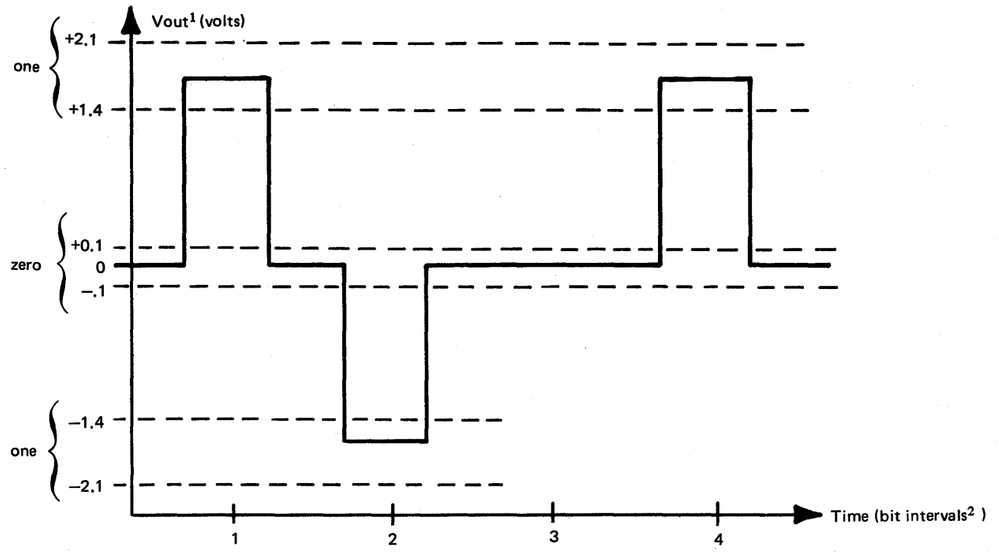


[1]Trademark of American Telephone and Telegraph Co.

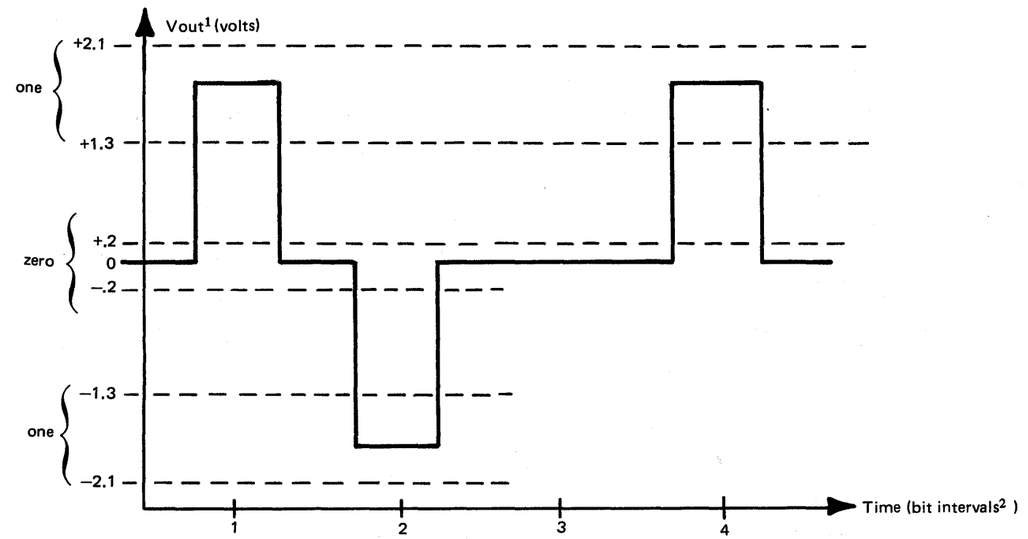
[2]Or equivalent

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 3274-1C, 21C, 31C 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 A1Q2 in 3274-1C/21C and 31C only		EIA*DDS Adapter/V.35/*X.21/**Greater than 1200-bps Location A1P2 in 3274-1C/21C and 31C only 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 _____ Total number of displays _____

Number by IBM machine type:

3277-1 _____ 3278-1 _____

3277-2 _____ 3278-2 _____

3278-3 _____

3278-4 _____

Total number of printers _____

Number by IBM type:

3284-1 _____ 3286-1 _____ 3287-1 _____ 3288-2 _____

3284-2 _____ 3286-2 _____ 3287-2 _____ 3289-1 _____

3284-3 _____ 3289-2 _____

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

The 3-digit error codes (nnn) are displayed in the operator information area on the display and follow the Machine Check (✕ ⌧), Program Check (✕ PROG), and Communication Check (✕ ⟷) 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

For example, a Communication Check symbol followed by an nnn code of 532 (✕ ⟷ 532) indicates that the BSC line is idle.

This appendix lists the nnn 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 (✕ ⌧ 202)
- Probable cause and action to be performed
- Sense information
- Application features associated with the error condition

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	–	–	–	X	–	• 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	✕ ⊘ 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	✕ ⊘ 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	✕ ⊘ 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	✕ ⊘ 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	✕ ⊘ 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	✕ ⊘ 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	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	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	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	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	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	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	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	✕ 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	✕ 226 or ✕ 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				✕ 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				✕ 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	✕ 234	• Device POR	• Replace ECSA card in 3278/3279			
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
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

*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
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
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 All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
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	✕ 2%%	• Reset key • Retry operation	• Machine features do not match configuration • Feature logic error	–	–	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	–	✕ 310	• IML	• CCA	–	–	CCA - BSC
311	CCA Invalid Status • Invalid basic status bit combination has been received from the CCA • Adapter disabled	1001		–	–	X	–	✕ 311	• IML	• CCA	–	–	CCA - BSC
320	CCA Machine Check (SDLC) • Recovery attempts have failed • Adapter is disabled	1001	–	–	–	X		✕ 320	• IML	• CCA	–	–	CCA-SDLC
321	CCA Invalid Status (SDLC) • Invalid status has been received from the CCA • Adapter is disabled	1001		–	–	X		✕ 321	• IML	• CCA	–	–	CCA-SDLC
330	HPCA Machine Check • Recovery attempts have failed • Adapter is disabled	1001	–	–	–	X		✕ 330	• IML	• HPCA	–	–	HPCA-SDLC
331	HPCA Invalid Status • Invalid status has been received from the HPCA • Adapter is disabled	1001		–	–	X		✕ 331	• IML	• HPCA	–	–	HPCA-SDLC
340	LCA Unrecoverable Machine Check • An LCA adapter machine has occurred • Retry has failed • Adapter is disabled • LCA issues 'disconnect in'			–	–	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 All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
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
381	Unrecoverable Control Logic Error • Host communications disabled	0010	A3/1	–	–	X		381	• IML	• Control logic • Storage • Microcode	–	–	All Models
390	Storage Parity Error • Unrecoverable storage parity error • Host communications disabled	0001 *or* 0011 through 0111	–	–		X		390	• IML	• Control logic • Storage • See MIM Figure 2-8 for storage card	–	–	All Models

*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
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		✖ 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	✖ PROG 402	• Host recovery • Reset key • Retry operation	• Host has sent invalid order parameters	1005	Op Ck	Models A, C-BSC/SDLC, 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	✖ 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/SDLC, 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	✖ 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/SDLC, and D
405	Invalid Copy Command • BSC generates an operation check		nn/1	–	–	–	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
410	RU Length Error • RU greater than 1536 • Program check • Host-sent RU larger than control unit can support		nn/1	–	–	–	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	✖ PROG 411	• Reset key • Retry operation	• Host software	1002	–	Models A and C-SDLC
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	✖ PROG 412	• Reset key • Retry operation	• Host software	1002		Models A and C-SDLC
413	Function Not Supported • Crypto verification (CRV) received but no crypto session has been established • See 401, Note 1	–	nn/1	–			X	✖ PROG 413	• Reset key • Retry operation	• Host software • Procedural error	1003	–	Model C-SDLC 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
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	✕ PROG 414	• Reset key • Retry operation • Inform host programmer • Non-Encrypt/ Decrypt operations may be run	• Host software • Procedural error	1001	–	Model C-SDLC Encrypt/ Decrypt
420	Exception Response Not Allowed • SNA program check	–	nn/1	–			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-SDLC
421	Definite Response Not Allowed • SNA program check	–	nn/1	–			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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-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 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-SDLC
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-SDLC
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-SDLC Encrypt/ Decrypt
440	Session Limit Exceeded • SNA program check	–	nn/1	–	–			none	• Reset key • Retry operation • Inform host programmer • Non-Encrypt/Decrypt operations may be run	• Host software	0805	–	Models A and C-SDLC
441	Bracket Bid Reject Not Ready to Receive (RTR) Returned or Receiver in Transmit • SNA program check	–	nn/1	–	–			none	• Reset key • Retry operation • Inform host programmer	• Host software	0813 or 081B	– –	Models A and C-SDLC
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-SDLC
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-SDLC
444	Session Already Bound • SNA program check	–	nn/1	–	–			none	• Device POR	• Host software • The requested function is already active	0815	–	Models A and C-SDLC
445	ACTLU Not Sent (cold start or Error Recovery Procedure)	–	nn/1	–	–		X	✖ PROG 445	• Device POR	• Host software	0821	–	Models A and C-SDLC

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	
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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-SDLC
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-SDLC 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 PROG 458	• 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-SDLC 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-SDLC
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
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-SDLC
499	Exception Request • SNA program check • No SNA sense returned	–	nn/1	–	–		X	X PROG499	• Reset key • Retry operation • Inform host programmer	• Host software	–	–	Models A and 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	
501	• 3274 Model C – Data Set Ready Line Dropped	–	A0/1	– (SDLC) 9 (BSC)		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	–	–	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
505	• 3274 Model C Disconnected from Network	–	–	–		X		✕ ↘z 505	• SNRM required from network	• Normal state after IML or disconnect has been received	–	–	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
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

*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
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
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
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
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	–	–	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	
521	Idle Timeout • No activity on line for last 20 seconds (no flags received)	–	A0/1	2	–	X	–	✕ ↘z521	• 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 reestablishing communication with host • Status is posted after 20 Write entries, 20 ROLs, 20 CRs, 20 XIDs, or 20 NSAs	–	A0/1	6	–	X	–	✕ ↘z525	• Host recovery	• Communications problem between host and control unit	–	–	Model C-SDLC
528	Command Reject • All PUs and LUs are deactivated		A0/1	9	–	X	–	✕ ↘z528	• 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	–	✕ ↘z529	• Host recovery • SNRM required	• DCE error other than the loss of DSR (NNN501) or loss of CTS (NNN502). • Run wrap test • 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	–	✕ ↘z530	• Host recovery • SNRM required	• DSR is ok • CTS may have dropped during transmission or clocking signal is not available from modem • Run wrap test • 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	↘z531	• 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 All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
532	BSC Line Idle • Adapter detected seven successive 3-second intervals without SYN characters on the line while in ADPREP mode (monitor line for poll or selection sequence)		A0/1	–	–	X	–	✕ 532	• Host recovery • Reset by valid poll or selection sequence	• No host data being received • Run wrap test • Verify communications network operation	–	–	Model C-BSC
533	ENQ Received • CCA was overrun during a read operation and data was lost when ENQ received. The control unit will retransmit its last response. The host should retransmit the message that was lost, *or* • ENQ character received while adapter was waiting for STX or SOH (entire message lost) • Retransmit last response • Host will retransmit last message		A0/1	3	–	–	X	533	• Host recovery • Retransmit last message	• Communication error • CCA • Run wrap test	–	–	Model C-BSC
534	Control Unit Sent 15 ENQs • Host did not return an ACK for last transmitted text block • Adapter sent 15 ENQs to attempt to solicit an ACK with no response • EOT sent to host, *or* • The control unit has acknowledged a selection sequence and has not seen a syn (pad syn) for 45 seconds. • Adapter continues to monitor for a synchronization		A0/1	4	–	X	–	✕ 534	• Host recovery • A valid poll or selection will reset symbol • Retry operation	• Host failed to respond • Communications failure • Run wrap test	–	–	Model C-BSC
535	15 NAKs Received • Text block failed to reach host after 15 attempts • EOT is sent to host • Control unit enters ADPREP mode (line monitor for poll or selection)	–	A0/1	5	–	X	–	✕ 535	• Host recovery • Valid poll or selection will reset symbol • Retry operation	• Communications failure between host and control unit. • Verify communications network operation • Run wrap test	–	–	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 All	Displayed on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
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	–	✕ 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
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

*Where nn = port ID = 00 - 31

nnn Code	Error Description	Operational Indicators	Test No. for Log*	Counter Incremented	Log Only	Display on All	Display on One	Indicator Displayed	Recovery	Probable Cause/ Action	Sense Codes SNA	Sense Codes Non SNA	Applicable Features
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
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 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	~~X~~ 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

*Where nn = port ID = 00 - 31

Appendix C. Structured Field and Attribute Processing (SFAP) Data Stream Error Extensions

Bytes 170-174 of the extended device control block (DCB) are used as a log area for additional information. This complements the PROG 4nn numbers displayed when the error is detected. Bytes X'170, 171' contain the displacement in hexadecimal to the byte in the Write Structured Field that was found to be in error. (The WSF command equals byte 1.) Bytes X'172, 173' contain the displacement into the particular structured field where the error was detected. Byte X'174' contains the SF type of the SF that contained the error.

Figure C-1 correlated the SFAP 4nn numbers, the values found in XDCB X'172-174', the SNA sense code, and a description of the error. OP check is the sense set for BSC in all cases.

Bytes 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 (four characters); AA is the coax port number in question (00-31). (If the device being used for the test is the port in question, /6 (two characters) 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 hexadecimal).

XXXX = The hexadecimal representation of the portion of the control block currently being displayed.

Press the PA1 key five times: line 2 should change to 40, 80, C0, 10, and then to 14. (The last two values drop the low-order digit and really represent X'100' and X'140'.) X'170'-'174' are the first five bytes on line 6.

4nn	DCB–'X' 172	174	Sense	Error Description
470	----	--	1003	An unsupported order was decoded in the data stream.
471	0003	XX	1003	Unsupported structured field type.
471	----	--	1003	Advanced Data Stream (WSF) sent to a device without an ECSA feature.
471	0007	06	1005	Out-of-range access to PSS (RAM out of range).
471	000A	06	1005	Invalid LW-value for Load PSS.
	000B	06	1005	Invalid LH-value for Load PSS.
471	000C	06	1003	Section ID not supported (byte 11 not equal to 0).
471	0001	XX	1005	Invalid-length structured field.
471	XXXX	XX	1005	Invalid-partition ID.
471	0005	09	1003	Invalid mode in Set Reply mode.
471	0005	01	1003	Invalid operation in read partition (not query).
471	0005	06	1003	Alias out of legal range.
471	0006	06	1005	Invalid EBCDIC code point.
471	000D	06	1003	Byte 12, bits 0-4, 7 = 0
471	0002	06	OpChk	>3K Uncompressed PS data (BSC only)
471	XXXX	XX	1005	Invalid reserved bits.
472	----	--	0871	Read partition structured field state error. Improper sequence from host.
473	0007	06	084C	ECSA present, but PSS RAM addressed not physically present.
473	000D	06	084C	Color plane – invalid.
474	----	--	1003	No extended DCB configured for this device.
475	----	--	1001	WCC has Start Print bit set, but not last structured field.

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 customizing), the DCB display procedure (described above) will inhibit the keyboard with the minus function indicator on the fourth depression of the PA1 or ENTER key. If the device does not have an ECSA feature, Test 8 (Enter test mode, type in /8, hit enter) will inhibit the keyboard with a wrong number indicator. This is also true if SFAP microcode is not configured. If microcode is not configured, the above nnn numbers will not appear.*

Figure C-1. SFAP Error Relationships

Appendix D. Abbreviations

A

ACK. Positive acknowledgement.

ACTLU. Activate logical unit.

ACTPU. Activate physical unit.

AID. Attention identification.

APL. A programming language.

ASCII. American Standard Code for Information Interchange.

B

B. Busy

BB. Begin bracket.

BCC. Block check character.

BOC. Bus out check.

BSC. Binary synchronous communication.

BTDAT. Buffered teleprocessing diagnostic analyzer and tester.

BTU. Basic transmission unit.

C

C. Control field.

CAW. Channel address word.

CC. Control check.

CCA. Common communications adapter.

CCC. Copy control character.

CCITT. Consultative Committee on International Telephone and Telegraph.

CCW. Channel control word.

CD. Change direction.

CDS. Configuration data set.

CE. Channel end.

CMDR. Command reject.

CPU. Central processing unit.

CR. Command reject; carriage return.

CRC. Cyclic redundancy check.

CRV. Crypto verification.

CSE. Control storage expansion.

CSU. Channel service unit; customer setup.

CSW. Channel status word.

CTS. Clear to Send (CCITT 106).

CU. Control unit.

CUE. Control unit end.

D

DACTLU. Deactivate logical unit.

DACTPU. Deactivate physical unit.

DB. Device busy.

DC. Device check.

DCA. Device cluster adapter.

DCB. Device control block.

DCE. Data communication equipment.

DDS. Digital Data Service.

DE. Device end.

DFC. Data flow control.

DISC. Disconnect.

DLC. Data length check.

DLE. Data link escape.

DM. Disconnect mode.

D/R. Driver/receiver.

DSR. Data Set Ready (CCITT 107).

DUP. Duplicate.

E

EAU. Erase all unprotected.

EB. End brackets.

EBCDIC. Extended binary-coded-decimal interchange code.

EC. 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.

EOI. End of inquiry.

EOR. End of record.

EOT. End of transmission.

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 pattern.

FCS. Frame check sequence.

FF. Forms feed.

FI. Format indicator.

FM. Field mark; function management.

FRMR. Frame reject.

FRU. Field replaceable unit.

G

GP. General poll.

H

HEX. Hexadecimal.

HPCA. High-performance communications adapter.

HVPS. High-voltage power supply.

I

I. Information (format).

IC. Insert cursor.

IML. Initial machine load.

I/O. Input/output.

Ind. Indicator.

IR. Intervention required.

ITB. Intermediate transmission block.

L

LCA. Local channel attachment (Model A).

LCID. Local character set identifier.

LED. Light-emitting diode.

LF. Line feed.

LHA. Local host attachment (Model B).

LIC. Last in chain.

LRC. Longitudinal redundancy check.

LU. Logical unit.

LUSTAT. Logical unit status.

LVPS. Low-voltage power supply.

M

MCM. Maintenance concepts manual.

MDT. Modified data tag.

MES. Miscellaneous equipment specification.

MHS. Magnetic hand scanner.

MIM. Maintenance information manual.

MSG. Message.

MSR. Magnetic slot reader.

N

NA. Not applicable.

NAK. Negative acknowledgement.

NCCF. Network Communications Control Facility.

NCP. Network control program.

NDM. Normal disconnected mode.

NI. Not initialized.

NL. New line.

NOP. No operation.

Nr. Next sequence number expected to arrive.

NRM. Normal response mode.

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.

O

OAF. Origin address field.

OC. Operation check.

OLT. Online test.

P

P. Printed; protected.

PC. Printed circuit.

PCM. Parity check modifier.

P/F. Poll/final bit.

PIU. Path information unit.

PLU. Primary logic unit.

POR. Power on reset.

PS. Programmed symbol.

PT. Program tab.

PU. Physical unit.

R

RA. Repeat to address.

Rd Mod. Read modified.

RECFMS. Record formatted maintenance statistics.

Req. Request.

REQMS. Request maintenance facility.

RH. Request/response header.

RIM. Request initialization.

RLSD. Received Line Signal Detector (CCITT 109).

RNR. Request not ready.

ROL. Request online status.

RQI. Request initialization.

RR. Receive ready.

RSOR. Read start old receive.

RSP. Response.

RTR. Ready to receive.

RTS. Request to send.

RU. Request/response unit.

RVI. Reverse interruption.

S

S. Sequenced (format).

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 (Model D).

SLU. Secondary logic unit.

SM. Status modifier.

SNA. Systems network architecture.

SNRM. Set normal response mode.

SOH. Start of heading.

SP. Space; specific poll.

SSC. Subsystem support center.

SSCP. System services control point.

STX. Start of text.

SYN. Synchronous idle.

T

TC. Transmission check.

TH. Transmission header.

TP. Teleprocessing.

TPLM. Teleprocessing line monitor.

TTD. Temporary text delay.

U

UA. Unnumbered acknowledge.

UC. Unit check.

UCW. Unit control word.

UE. Unit exception.

UI. Unnumbered informational.

US. Unit specify.

W

WACK. Wait before transmit.

WCC. Write control character.

WSF. Write structured field.

X

XID. Exchange station identification.

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