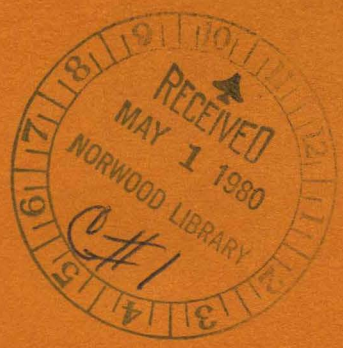
GA18-2042-2
File No. S360/S370/S3-09

Systems

IBM 3270 Information Display System System Problem Determination for 3276 Control Unit Display Stations



IBM

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IBM 3270 Information Display System System Problem Determination for 3276 Control Unit Display Stations

Third Edition (February 1980)

Changes are periodically made to the information herein; before using this publication, refer to the latest *System/360 Bibliography,* GA22-6822 or *System/370 Bibliography,* GC20-0001, for the editions that are applicable and current.

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Preface

The information contained in this publication is intended to assist customer personnel who are responsible for coordinating problem determination activities on the IBM 3270 Information Display System.

Scope

For the purposes of this publication, the IBM 3270 Information Display System consists of an IBM 3276 Control Unit Display Station, with its attached IBM 3278 Display Stations, IBM 3279 Color Display Stations and IBM 3287 or 3289 Printers.

Problem determination procedures for an IBM 3270 Information Display System that consists of an IBM 3274 Control Unit with its attached terminals are described in the *IBM 3270 Information Display System: System Problem Determination for 3274 Control Units,* GA27-2871.

Problem determination procedures for the IBM 3271 and 3272 Control Units, IBM 3275 and 3277 Display Stations, and IBM 3284, 3286, and 3288 Printers are described in the *IBM 3270 Information Display System: Problem Determination Guide,* GA27-2750, and are purposely omitted from this publication.

This publication is not intended to replace the problem determination guides (PDGs) supplied with each unit of the 3270 Information Display System, but is intended to supplement them by listing and coordinating the use of the problem determination facilities provided for the 3270 Information Display System.

Related Publications

When appropriate, this publication refers to the unit PDGs, as well as other publications. The publications that may be required (depending upon your system configuration) are:

IBM 3270 Information Display System: System Problem Determination for 3274 Control Units, GA27-2871

IBM 3270 Information Display System: 3276 Control Unit Display Stations, Problem Determination Guide, GA18-2014

IBM 3278 Display Station Problem Determination Guide, GA27-2839

IBM 3279 Color Display Station Problem Determination Guide, GA33-3051

IBM 3287 Printer Models 1 and 2 Problem Determination Guide, GA27-3151

IBM 3287 Printer Models 1C and 2C Problem Determination Guide, GA27-3231

IBM 3289 Printer Problem Determination Guide, GA27-3141

IBM 3270 Information Display System: Component Description, GA27-2749

IBM 3270 Information Display System: 3276 Control Unit Display Station Planning and Setup Guide, GA18-2041

3270 Facility Error Recognition System (FERS) Service Aid Description, G229-7031

OS/VS Display Exception Monitoring Facility (DEMF) User's Guide, GC34-2003

Network Problem Determination Application: Terminal Use, SC34-2013

DOS/CICS User's Guide, G229-7030

OS/CICS User's Guide, G229-7029

Contents

Figures

Chapter 1. Introduction

Problem determination procedures are performed by customer personnel to determine the probable location and cause of any problem that may appear on the IBM 3270 Information Display System. When the probable location and cause of the problem have been determined, the customer can then decide the following:

- Is assistance required to resolve the problem?
- Of whom should assistance be requested?
- Where is assistance required?
- Can useful work be accomplished while awaiting assistance?
- Should assistance be scheduled on a deferred basis?

Problem Determination Coordination

Although the individual problem determination guides (PDGs) supplied with each unit of the 3270 Information Display System are useful for isolating a problem to those units or for eliminating those units as the probable source of the problem, the problem determination activities should be coordinated on a system basis. A System Problem Determination Guide is provided in Chapter 3 of this publication to assist in this coordination.

It is recommended that problem determination procedures performed on the 3270 Information Display System be coordinated by designated personnel who are familier with the problem determination concepts contained in this publication, with the problem determination facilities available on your system, and with the configuration of your system.

Problem Determination Facilities

To assist the customer in performing problem determination procedures on the 3270 Information Display System and its associated communication facilities, certain facilities have been provided. These facilities are briefly described in Chapter 4 of this publication, with a reference to the appropriate publication for further details.

Among the problem determination facilities that may be available at the host system are the Display Exception Monitoring Facility (DEMF), the Facility Error Recognition System (FERS), and the Network Problem Determination Application (NPDA). DEMF, FERS, and NPDA are network problem determination facilities, which are also briefly described in Chapter 4.

Chapter 2. Problem Determination Overview

Although a problem can occur at any point within the system, it is most likely to become apparent at one or more of the IBM 3270 terminals (3276, 3278, 3279, 3287, or 3289). To determine the probable location of the problem within the system, you must be familiar with the configuration of your system.

Figure 2-1 shows possible system configurations and defines system levels at which problem determination may be performed. These levels are listed below in ascending sequence, starting with the lowest level:

1. The 3270 terminal level.
2. The 3270 Information Display System level, which, for problem determination purposes, amounts to the control unit level.
3. The communication facility level. Although some tests may be initiated from the control unit or the host system, problem determination at this level should be coordinated at the host system.
4. The host system level, which may have problem determination facilities that are applicable to all lower levels.
5. The attachment of the 3276 to the IBM 3791 Communication Controller is a special case. In some cases the 3790 Communication System may be treated as the host system, and in others as a transparent link to the host system.

To expedite problem determination, when a problem is detected at one level of the system, the problem should be reported to the coordinator at the next higher level. To minimize the impact on the system, problem determination should be done at the lowest level consistent with the symptoms.

If DEMF, FERS, or NPDA is available on your host system, it might be advantageous to use that facility to determine the level at which to address yourself to the problem before attempting local problem determination procedures. The following procedure, however, is designed for most cases and starts at the terminal level.

Typical Approach

Determine which terminal types are affected by the problem. If display stations (3276, 3278, or 3279) are affected, determine the following:

1. Do the display stations affected work properly when in offline mode? For a quick check, see if a cursor and a horizontal line across the screen are displayed.
2. Can the display stations affected be made ready with respect to the control unit? For a quick check, see if a 5 is displayed in the Operator Information Area.
3. Are the display stations experiencing Machine Checks (X nn displayed in the Operator Information Area)?
4. Are the display stations logically connected to the host system (A or B displayed in the Operator Information Area)?
5. Are the display stations experiencing Program Checks (X PROG nn displayed in the Operator Information Area)?
6. Are the display stations experiencing Communications Checks (X nn) or Communication Reminders (nn displayed in the Operator Information Area)?
7. Are the 3279 Color Display Stations experiencing color problems?

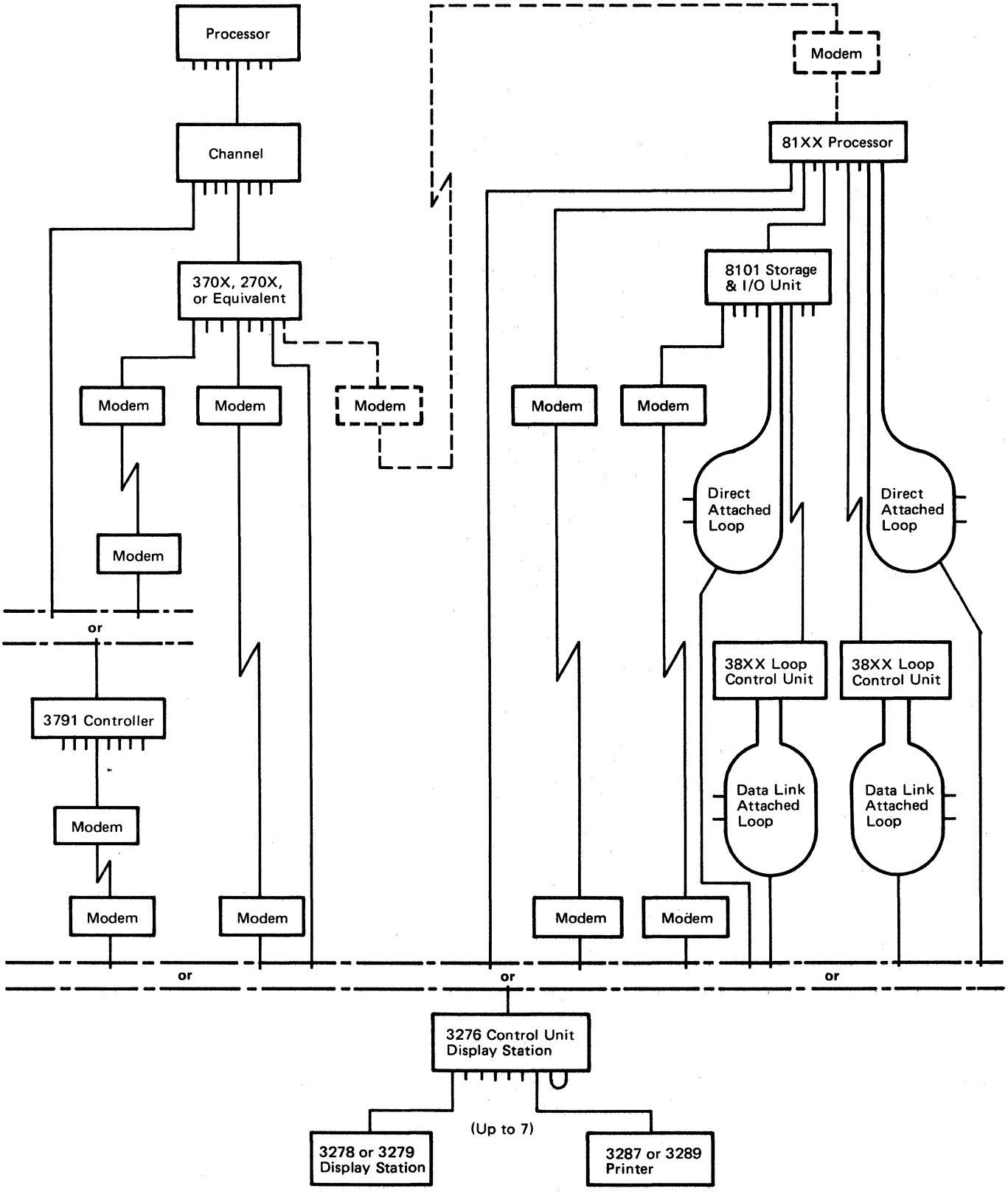


Figure 2-1. Possible System Configurations

If printers (3287 or 3289) are affected, determine the following:

1. Have the printers been enabled by the control unit?
2. Have the printers received an initial message from the control unit?
3. Are the printers being polled by the control unit?

In each of the preceding cases, it may be necessary to determine if more than one terminal attached to the same control unit is affected by the problem. If only one terminal is affected, it may be necessary to exchange device cables to determine if the control unit, device cable, or terminal is at fault.

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

If the problem is not determined by the procedures in Chapter 3, the control unit problem determination procedure should be performed before assistance is requested.

Actions

While performing problem determination procedures at any system level, you may be asked to perform some of the following actions:

- Observe the symptoms
- Retry the operation
- Initiate and run tests, as requested
- Record symptoms and test results
- Report the results of problem determination, as prescribed by your management
- Request assistance, as required

In addition to the preceding actions, at certain system levels you may be asked to perform other actions, unique to that level. At the terminal or control unit level, you may be asked to swap device cables (see Figure 2-1).

At the control unit level, you may be asked to test modems and to check cable connections at the modems. At the host system level, actions may be required to support problem determination on any part of the system, including the 3270 Information Display System and its communication facilities. As regards the 3270 Information Display System, host-system action may be required when a program check or communication check is detected at a 3270 terminal.

Chapter 3. System Problem Determination Guide

Start here

- **Was the problem reported at a display station (3276, 3278, or 3279)?**

YES — NO

- **Was the problem reported at a 3287 Printer?**

YES — NO

The problem was reported at a 3289 Printer.

Go to (L), page 3-12.

Go to (H), page 3-9.

- **Is a cursor displayed at the failing display station?**

YES — NO

Go to (C), page 3-4.

- **Is a horizontal line displayed across the screen at the failing display station?**

YES — NO

Go to (C), page 3-4.

Press the upshift (⇧) key at a failing display station (if possible).

- **Is ⇧ displayed in the Operator Information Area?**

YES — NO

Set the Normal/Test switch to the Test position, then to the Normal position.

- **Is displayed in the left portion of the Operator Information Area?**

YES — NO

The display station is apparently not ready with respect to the control unit. Verify the symptoms on other failing display stations by operating the Normal/Test switch to the Test position, then back to the Normal position.

- **Is more than one display station (attached to the same control unit) failing with the same symptom?**

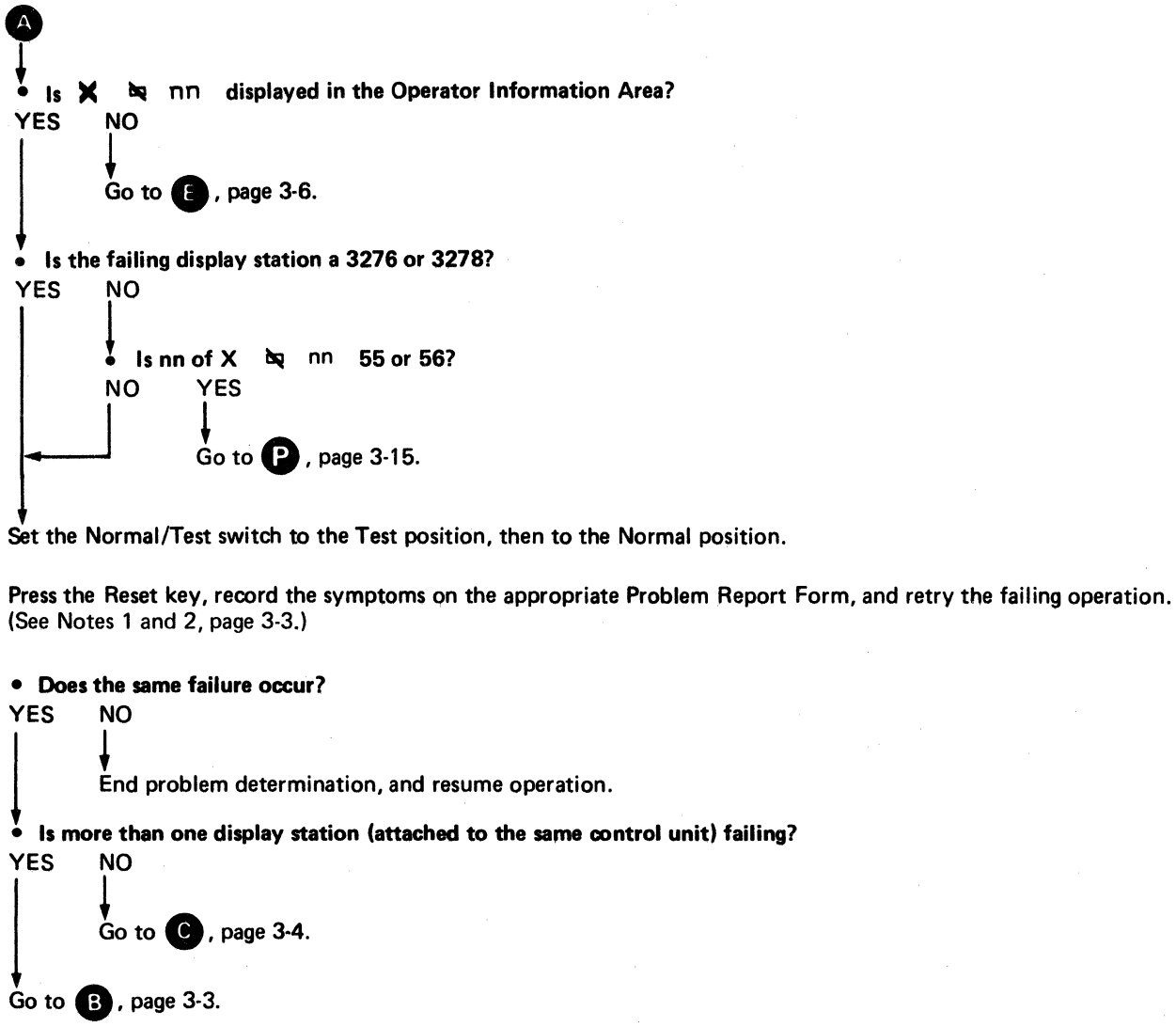
YES — NO

Go to (C), page 3-4.

Go to (B) page 3-3.

Go to (A), page 3-2.

Check Display Station Operation with Control Unit



B

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

If device cables have been exchanged at the control unit ports and/or at the terminals, return them to their original connections.

- If display stations were reconnected, set the Normal/Test switch to the Test position, then to the Normal position, at all reconnected display stations.
- If the terminals affected were printers, press Reset and Test at 3287 Printers or press Reset at 3289 Printers.

Perform problem determination on the control unit, using the *3276 Problem Determination Guide.*

Notes:

1. *If the failing terminal is a 3276 Control Unit Display Station, turning the 3276 off and then on or operating the Subsystem Test switch affects all terminals attached to the 3276 (see below Subsystem Test Procedure). Monitor the Other Unit Operable light to determine if other attached terminals are using the 3276 before turning the 3276 off or switching the Subsystem Test switch.*

   Subsystem Test Procedure

   Before starting this test, notify system operations for concurrence. For Direct Attachment, the power of the facilities to which the external cable is attached should be on (This is especially true when clocking is supplied from the facilities).

   a. *Ensure that the switches in the OP Panel drawer are set properly.*
   b. *If OPER/TEST switch (on the external cable) is provided, turn the switch to TEST.*
      If an external modem is connected, turn the power on.
      Make sure the external cable is securely connected.
   c. *Press Test Subsystem switch (in OP Panel drawer) and release; Test light will come on. If it never comes on, or it is blinking during the first 20 seconds of the test, call service representative.*
   d. *Wait about 30 seconds.*
      If test light remains on, record the problem, including all indications, and call the service representative.
      If test light goes off or starts blinking, the problem is probably in the external modem or communication facility.
   e. *If OPER/TEST switch (on the external cable) is provided, return the switch to OPER before retrying normal operation.*
      If test light is still blinking, the problem is probably in the external modem or communication facility.

2. *Turning any terminal or control unit off and then on or initializing a control unit may affect its connection to the host system. It may be necessary to reestablish the connection to the host system or to log on to the host system when performing a reset, retry, and recovery operation.*

C

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

If device cables have been exchanged at the control unit ports and/or at the terminals, return them to their original connections.

If display stations were reconnected, set the Normal/Test switch to the Test position, then to the Normal position, at all reconnected display stations.

Perform problem determination on the failing display station, using the Problem Determination Guide for that display station *(3276 PDG, 3278 PDG, or 3279 PDG).*

Press the Reset key, and retry the failing operation. (See Notes 1 and 2, page 3-3.)

- **Has the problem been determined to be in the display station?**

YES NO

Exchange the device cable from the failing display station with the device cable from a known working display station *at the control unit ports.*

Set the Normal/Test switch to the Test position, then to the Normal position, at both display stations.

Press the Reset key, and retry the failing operation. (See Notes 1 and 2, page 3-3.)

- **Does the same display station fail?**

YES NO

Go to B, page 3-3.

Go to D, page 3-5.

Report the problem and resume operation.

(D)

Probable device cable or display station problem.

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

Return the device cables to their original control unit ports.

Set the Normal/Test switch to the Test position, then to the Normal position, at both display stations.

- **Is it possible to exchange the device cable at the failing display station with the device cable at a known working display station** *at the terminal end* **of the cables?**

YES NO

Probable device cable or display station problem.

Ensure that all device cables are connected to their original connectors at both ends.

Report the problem.

Exchange device cables *at the terminal ends.*

Set the Normal/Test switch to the Test position, then to the Normal position, at both display stations.

Press the Reset key, and retry the failing operation. (See Notes 1 and 2, page 3-3.)

- **Does the same display station fail?**

YES NO

Probable device cable failure.

Return the device cables to their original connections.

Set the Normal/Test switch to the Test position, then to the Normal position, at both display stations.

Request assistance from the personnel responsible for device cables.

Probable display station failure.

Return the device cables to their original connections.

Set the Normal/Test switch to the Test position, then to the Normal position, at both display stations.

Report the problem.

Check Logical Connection between Display Station and Host System

(E)

- **Is A or B displayed to the right of the ⧉ in the Operator Information Area?**

YES NO

Inform the host system operator of the problem.

- **Is the host system operating without error and communicating with the failing 3270 Information Display System?**

YES NO

When the host problem has been resolved, resume operation.

- **Is X PROG nn displayed in the Operator Information Area?**

YES NO

Go to (F), page 3-7.

Press the Reset key, record the symptoms on the appropriate Problem Report Form, and retry the failing operation. (See Notes 1 and 2, page 3-3.)

- **Does the operation still fail?**

YES NO

End problem determination, and resume operation.

Probable data stream problem from the host system.

Record the sequences of the last keystrokes before the problem, if applicable.

Report the problem to the host system support programmer for additional problem determination and recovery.

(F)

• **Is ✕ →z← nn displayed in the Operator Information Area?**

YES — NO

• **Is more than one display station (attached to the same control unit) failing?**

YES — NO

• **Is the failing Display Station a 3279?**

YES — NO

Go to (C), page 3-4.

Go to (Q), page 3-16.

Go to (B), page 3-3.

Press the Reset key, record the symptoms on the appropriate Problem Report Form, and retry the failing operation. (See Notes 1 and 2, page 3-3.)

• **Does the operation still fail?**

YES — NO

End problem determination, and resume operation.

Perform problem determination in the control unit PDG that relates to communication check (✕ →z←) problems. Refer to the Communication Section in the *3276 PDG.* (See Notes 1 and 2, page 3-3.)

• **Is the problem determined to be in the control unit?**

YES — NO

Probable communication facility problem.

• **Is the host system on and operating without error?**

YES — NO

When the host system problem is resolved, resume operation.

Go to (G), page 3-8.

Go to (B), page 3-3.

G

- **Is the Facility Error Recognition System (FERS), the Display Exception Monitoring Facility (DEMF), or the Network Problem Determination Application (NPDA) available?**

YES NO

Ensure that problem determination has been performed at the 3270 Information Display System (control unit, display station, and printer).

- **Was the problem isolated to the 3270 Display System?**

YES NO

Report the problem to the host system operator for additional problem determination.

Record the problem on the proper report form.

Analyze the problem, using the following FERS, DEMF, or NPDA facilities:

- Configuration data
- Communication link statistics
- Communication line statistics
- Sense data
- Status data

For details, see the *3270 Facility Error Recognition System (FERS) Service Aid Description,* G229-7031, *OS/VS Display Exception Monitoring Facility (DEMF) User's Guide,* GC34-2003, *or Network Problem Determination Application (NPDA): Terminal Use,* SC34-2013.

(H)

- **Is the CHECK light on?**

YES NO

Ensure that the control unit is on and the device cable is connected to the control unit and to the printer.

- **Is the CU SIGNAL light on?**

YES NO

Either the control unit is not polling the printer or there is a device cable problem.

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

If there is a known working printer attached to the control unit, exchange the device cable to the working printer with the device cable to the failing printer *at the control unit ports.*

At the failing printer:

1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

- **Is the CU SIGNAL light on after the internal tests run?**

YES NO

Go to (K), page 3-11.

Go to (B), page 3-3.

At the failing printer:

1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

- **Is the READY light on after the internal tests run?**

YES NO

Go to (J), page 3-10.

Go to (I), page 3-10.

Perform problem determination on the failing printer, using the *3287 Problem Determination Guide.*

(J) (M) (I)

To print out the PCIA storage area:

1. Press and hold the Test switch.
2. Press and release the Form Feed switch.
3. Release the Test switch.

- **Does AA3276AA print out for storage addresses 004A through 004D?**

YES NO

Go to (J), this page.

The printer is connected to, is enabled by, and has received a message from the control unit.

- **Is a printer failing during a host-initiated print operation?**

YES NO

The printer is failing during a local copy operation.
Request assistance at the control unit location.

Report the problem to the host system operator.

Perform problem determination on the failing printer, using the *3289* or *3287 Problem Determination Guide.*

- **Was the problem determined?**

YES NO

Perform problem determination on the control unit, using the *3276 Problem Determination Guide.*

- **Was the problem determined?**

YES NO

Request assistance.

Resume operation.

Request assistance if required.

(K)

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

Return device cables to their original control unit ports.

At the reconnected printers:
1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

- **Is it possible to exchange the device cable at the failing printer with the device cable at a known working printer** *at the printer end* **of the cable?**

YES — NO

NO:
Probable cable or printer problem.

Report the problem.

YES:
Exchange the device cable from the failing printer with the device cable from a known working printer *at the printer end* of the cable.

At the failing printer:
1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

- **Is the CU SIGNAL light on after the internal tests run?**

YES — NO

NO:
Probable 3287 Printer problem.

Return the device cables to their original connections.

At the reconnected printers:
1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

Report the problem, and request assistance.

YES:
Probable device cable problem.

Return the device cables to their original connections.

At the reconnected printers:
1. Press and hold the Test switch.
2. Press and release the Reset switch.
3. Release the Test switch.

Request assistance from the personnel responsible for device cables.

(L)

- **Is the CHECK light on?**

YES NO

- **Is the READY light on?**

YES NO

Press the Enable Print switch.

Press the Reset switch.

- **Is the READY light on after the internal tests have run?**

YES NO

- **Is there another 3289 Printer, attached to the same control unit, that is working properly?**

YES NO

Go to (J), page 3-10.

Go to (N), page 3-13.

Print "Short Memory" via the Print Dump Routine, as follows:

1. Press the Hold Print switch.
2. Set Selector switch to 70.
3. Press the Code switch.

- **Does AA3276AA print out for storage addresses 004A through 004D?**

YES NO

- **Is there another 3289 Printer, attached to the same control unit, that is working properly?**

YES NO

Go to (J), page 3-10.

Go to (N), page 3-13.

Go to (M), page 3-10.

Perform problem determination on the failing printer, using the *3289 Problem Determination Guide.*

(N)

Caution: Do not connect or disconnect device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

Exchange the device cable from the failing printer with the device cable from a known working printer *at the control unit ports*.

At the failing printer:
1. Press the Enable Print switch.
2. Press the Reset switch.

- **Is the READY light on after the internal tests run?**

YES

NO

Device cable or printer problem.

Return the device cables to their original control unit ports.

At both reconnected printers:
1. Press the Enable Print switch.
2. Press the Reset switch.

- **Is it possible to exchange the device cable at the failing printer with the device cable at a known working printer** *at the terminal end* **of the cables?**

YES

NO

Probable device cable or printer problem.

Report the problem, and request assistance.

Go to (O), page 3-14.

Go to (B), page 3-3.

O

Exchange the device cable at the failing printer with the device cable from a known working printer *at the printer end* of the cable.

At the failing printer:
1. Press the Enable Print switch.
2. Press the Reset switch.

- **Is the READY light on after the internal tests have run?**

YES

NO

Probable printer problem.

Return the device cables to their original connections.

At both reconnected printers:
1. Press the Enable Print switch.
2. Press the Reset switch.

Report the problem, and request assistance.

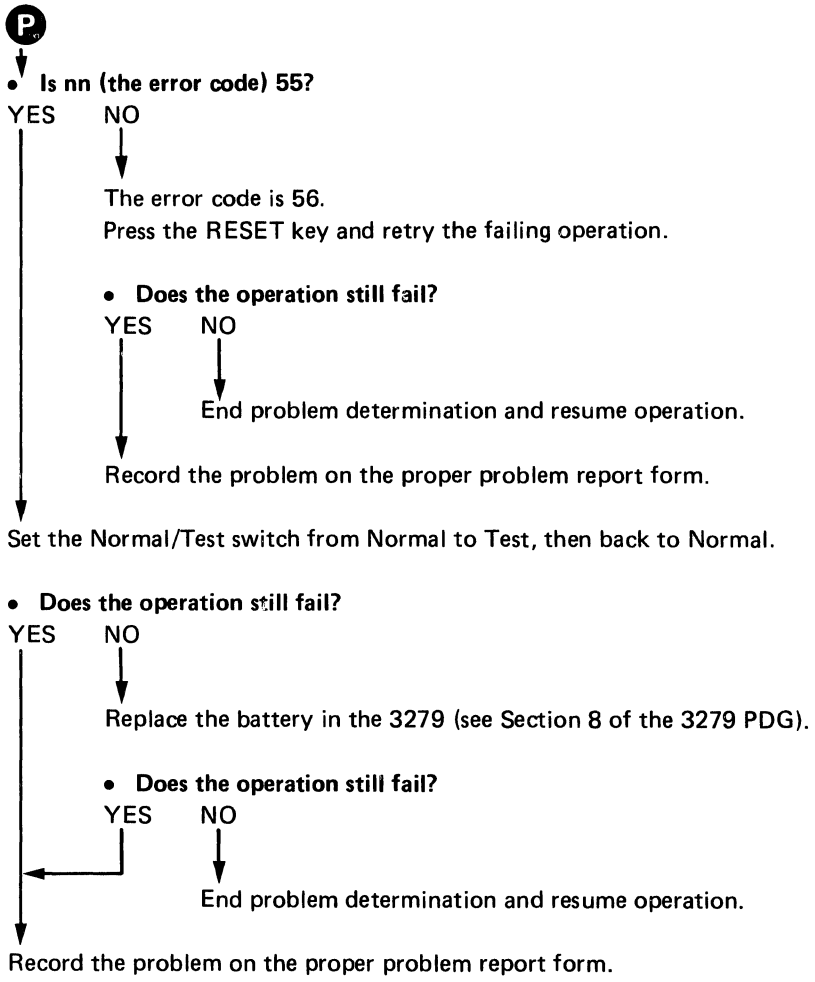
Probable device cable problem.

Return the device cables to their original connections.

At both reconnected printers:
1. Press the Enable Print switch.
2. Press the Reset switch.

Request assistance from the personnel responsible for device cables.

Check the 3279 for Color Convergence Machine Error.



Q

- **Is the problem with the color of the symbols or characters?**

YES NO

Go to C , page 3-4.

Set the Normal/Test switch from Normal to Test, then back to Normal.

- Does the problem remain?

YES NO

End problem determination and resume operation.

- Does the white symbol/cursor show traces of the base colors (red, green, and blue)?

YES NO

Go to C , page 3-4.

Perform the Color Convergence procedure (see Section 6 of the 3279 PDG).

- Have the same symptons occurred on previous power-on?

YES NO

End problem determination and resume operation.

Change the battery (see Section 8 of the 3279 PDG).
Retry the Color Convergence procedure (see Section 6 of the 3279 PDG).

- Does the problem still remain?

YES NO

End problem determination and resume operation.

Go to C , page 3-4.

Chapter 4. Problem Determination Facilities Overview

Each level of the system has associated problem determination facilities that are used to isolate 3270 type failures within the system. Some of these facilities are used concurrently with the operation of other system elements at that level and require only the dedicated resource being tested. An example of these facilities is the concurrent test contained in the 3270 control units, which is required to test the features of the 3278 Display Station. Other facilities are used offline and require dedicated use of all the resources affected. An example of these facilities is the basic assurance test contained in the 3270 control units. The facilities are listed by the 3270 unit and system level to which they apply.

IBM 3278 Display Station

The IBM 3278 Display Station and its keyboard can be tested offline from the control unit. The facilities are:

- A display character check of the character set. Analysis of this test can determine if the proper characters are interpreted in the 3278 and if every character position on the display screen is usable.
- A keyboard check that displays a character representative of each keyboard key, except the RESET (control) key, that is pressed.
- Lights that indicate the readiness status of the 3278.
- Controls that determine if the status is on/off or test and that control the display screen brightness of the 3278. The selector light-pen can be tested via online concurrent tests from the control unit.

See the *IBM 3278 Display Station Problem Determination Guide,* GA27-2839, for details on the use of these facilities.

IBM 3279 Color Display Station

The IBM 3279 Color Display Station and its keyboard can be tested offline from the control unit. The facilities are:

- A display character check of the character set. Analysis of this test can determine if the proper characters are interpreted in the 3279, and if every character position on the display screen is usable.
- A keyboard check that displays a character representative of each keyboard key, except the RESET (control) key, that is pressed.
- Lights that indicate the readiness status of the 3279.
- Controls that determine if the status is on/off or test, and that control the display screen brightness of the 3279. The selector light pen and displayed colors can be tested via online concurrent tests from the control unit.

See the *IBM 3279 Color Display Station Problem Determination Guide,* GA33-3051, for detail on the use of these facilities.

IBM 3287 Printer and IBM 3289 Line Printer

The problem determination facilities in the IBM 3287 Printer and the IBM 3289 Line Printer are basically the same. The details concerning the operation of these facilities are contained in the *IBM 3287 Models 1 and 2 Printer Problem Determination Guide,* GA27-3151, *IBM 3287 Printer Models 1C and 2C Problem Determination Guide,* GA27-3231, and *IBM 3289 Printer Problem Determination Guide,* GA27-3141.

The facilities are:

- Lights that indicate the readiness status, error check status, test status, and control unit connection status of the printer.
- Lights that define the conditions causing the error status, and the operational status of the printer.
- Switches that control the on/off status, test status, and buffer print status of the printer.
- Tests that automatically test the printer and initialize it for operation.

IBM 3276 Control Unit Display Station

The IBM 3276 Control Unit Display Station serves as a stand-alone display station or as the control unit nucleus of a 3270 Information Display System. The problem determination facilities must therefore provide for both display station and control unit problem determination.

The use of the problem determination facilities for the display station section of the 3276 is described in Part I of the *3276 Problem Determination Guide*. These facilities are similar to those for the 3278 Display Station.

The use of the problem determination facilities for the control unit section of the 3276 is described in Part II of the *3276 Problem Determination Guide*. Use of these facilities may affect the entire 3270 Information Display System. Therefore, these facilities should be used only when the control unit is suspected of failing.

The 3276 Display Station portions of the problem determination facilities, exclusive of the control unit section, are:

- Lights that indicate the readiness status of the display station.
- A switch that controls the Normal/Test status of the display station. Test status permits the problem determination of the display station offline from the control unit.
- A display character check of the character set. This test does not require the use of the keyboard. Its purpose is to determine if the proper characters are interpreted, internal to the 3276 display portion, and if every character position is displayable on the screen.
- A keyboard check that displays a character representative of each keyboard key (except the RESET key) that is pressed.
- A control that is used to determine the presence of a display image and to vary the brightness of the image.

The detailed use of these facilities is described in Part I of the *IBM 3276 Control Unit Display Station Problem Determination Guide*, GA18-2014.

The problem determination facilities for the 3276 Control Unit section are:

- Lights that indicate the readiness status, and the test status of the control unit.
- Switches that control the on/off status and the control unit test status.
- Basic assurance tests that test the basic operation of the control unit. These tests are run automatically, when the 3276 is turned on, or manually, by pressing the Test Subsystem switch.

The detailed use of these facilities is also described in Part II of the *IBM 3276 Control Unit Display Station Problem Determination Guide*, GA18-2014.

IBM 3270 Information Display System

For the purposes of this publication, the IBM 3270 Information Display System consists of the 3276 Control Unit Display Station and its attached IBM 3278 Display Stations, IBM 3279 Color Display Stations, 3287 Printers, and 3289 Printers.

Facilities exist in the control unit to determine if the problem is internal or external to the 3270 Information Display System. If the problem appears to be internal to the 3270 Information Display System, these facilities are also used to determine which unit, within the 3270 Information Display System, is the probable cause of the problem.

The facilities are as follows:

- Concurrent tests are available that test the path from the control unit to the attached terminals and provide a test pattern which allows testing the 3278 Display Station and the 3279 Color Display Station features.

  These tests can be initiated from any display station with a keyboard, to itself or to any other display station within the 3270 Information Display System, concurrently with the normal operation of the 3270 Information Display System. Caution should be exercised when testing another terminal to ensure that the terminal to be tested is available for test.

- A test is available that displays the trouble status of all attached terminals within the 3270 Information Display System. (See Appendix A.) This test can be initiated from a 3276, 3278, or 3279 Keyboard and is run concurrently with other 3270 Information Display System operations.
- A test message is available at the 3287 or 3289 Printer immediately after the printer is turned on (provided the control unit is on). To minimize the overprinting of usable information when the printer is functioning online, this message can be printed only when the printer is in test status.
- The physical locations for attaching the device cables to the control unit are readily accessible. The connectors contained in this area do not require the use of tools or special equipment to connect or disconnect. See the *IBM 3270 Information Display System: 3276 Control Unit Display Station Planning and Setup Guide,* GA18-2041. This permits the interchanging of device cables at the ports to determine if the problem exists in the terminal or in the control unit.

  Caution: Do not connect or disconnect the device cables during an electrical storm. Before cables are connected or disconnected, verify that the attached terminals are not being used.

- Interface wrap tests are available for testing the link when the 3276 is remotely attached. This test interrupts the operation of all attached terminals; therefore, it should be performed only when the entire 3270 Information Display System is apparently failing or when symptoms indicate that the problem is in the communication facility, external to the 3270 Information Display System.
- Three check condition symbols (, , and PROG) and their respective numeric codes are displayed in the Operator Information Area of the 3276 Control Unit Display Station, 3278 Display Station, and 3279 Color Display Station. The symbol is used to define the major problem category, and the numeric code is used to further define the problem. See Appendix B for the significance of these symbols and codes.
- There are also functional symbols that indicate the readiness status, the host attachment status, and operator activity, displayed in the Operator Information Area of the 3276 Control Unit Display Station.

- The 3276 Control Unit Display Station has lights that indicate if the problem is probably internal or external to the control unit.

The Host System

The host system consists of one of the following.

- The processor unit, the channel, and the communication controller or transmission control unit. Communication facilities connect the host system to attached 3276.
- 81xx Processor Unit and/or 8101 Storage and I/O Unit. Loops or communication lines connect the 81xx and/or 8101 to attached 3276.

An example of possible system configurations is illustrated in Figure 2-1.

A facility may reside in the host system that can be used for problem determination to the suspected Information Display System. This facility can be initiated from the suspected 3270 Information Display System or from other elements of the same system.

- The 3270 Information Display System error statistics and transmission line error statistics are logged at the host system through the Facility Error Recognition System (FERS) facility. The retrieval of this data through the FERS facility permits problem determination to the suspected 3270 Information Display System.

  When a nonrecoverable error occurs, it is logged at the host system. The data is retrieved through the display stations and can be displayed in various formats, as follows:

  - A summary of errors by nonswitched line or line groups
  - A summary of errors by 3270 control unit on the specified line
  - A summary of errors by attached terminal on the specified 3270 control unit and a count of 3270 control unit errors, not related to any terminal
  - A summary of errors on a specified terminal in chronological order
  - Additional data describing an error
  - Channel status word (CSW) and/or sense bit combinations

  See the *3270 Facility Error Recognition System (FERS) Service Aid Description.* G229-7031, the *DOS/CICS User's Guide,* G229-7030, and the *OS/CICS User's Guide,* G229-7029, for configuration, implementation, and operation information.
- Display Exception Monitoring Facility (DEMF) is a problem determination tool that is used in isolating problems within a communications network. The process progressively points to each most probable failing component (a line, a control unit, or a terminal). User-oriented images of permanent error counts for all lines, selected lines, control units, and terminals are helpful in determining the location of the problem. Exceptional status conditions, and their interpretations, are provided at the terminal level to aid in determining the most probable cuase of the problem.

  This data is presented as:

  - Error counts for remote or local 3270 control units
  - Error counts for all 3270 control units for the specified line, and/or all line for the specified line
  - Error counts, by attached terminal, for the specified 3270 control unit
  - A status description, in chronological order, of specific line or terminal errors
  - An explanation of the selected error for the terminal
  - A list of possible causes for various combinations of 3270 sense and status conditions

Refer to the *OS/VS Display Exception Monitoring Facility User's Guide,* GC34-2003, for details concerning the required software configuration, communication facility, and operating procedures.

- The Network Problem Determination Application (NPDA) is a problem determination tool to help the user locate failing network components by collecting and interpreting records of errors detected within a communications network. The NPDA user has access, via the terminal, to the accumulated error data and statistics.

  This data is presented as:

  - Error counts associated with communications controllers; BSC, Start-Stop, and SDLC lines; control units; and terminals in the network.
  - Specific data, an interpretation, and a probable cause associated with each error collected.

  Refer to the *Network Problem Determination Application: Terminal Use,* SC34-2013, for details.

If DEMF, FERS, or NPDA is available in your system, it can be accessed by any 3270 terminal. An operator can request data about his own terminal or about any other terminal in the network. An operator can ask for a specific terminal's error data or step through the higher levels (for example, line, control unit) of error information before narrowing the search to a suspected terminal. Either DEMF, FERS, or NPDA could be all that is required for problem determination.

Appendix A. Status Summary Display

Status Summary Display is a concurrent-test facility that displays the availability status of each terminal relative to a specific control unit.

The test is invoked from any IBM 3276 Control Unit Display Station, IBM 3278 Display Station, or IBM 3279 Color Display Station with keyboard by the following sequence:

1. Press the ALT and TEST keys.
2. Type in /3.
3. Press the ENTER key.

The response image displayed is:

Line 1: 0 1 2 3 4 5 6 7
Line 2: 1, 0, or a – (under each position in line 1)
Line 3: PPPP CCCC SSSS RRRR XXXX

Where:

Line 1 = Device port address
Line 2 = Device status per address
1 = Device powered on with no control-unit-detected error
0 = Device powered off, device not connected, or terminal adapter not installed in control unit
– = Service disabled because of control-unit-detected error
Line 3 = Summary Count of the following:
PPPP = Product check
CCCC = Communication check
SSSS = SNA error
RRRR = TEST commands received
XXXX = TEST responses transmitted

Note: *Line 3 is not displayed when the 3276 is working in BSC mode.*

Appendix B. Status Indicators and Recoveries

This appendix lists the error status indications that may be displayed in the Operator Information Area of the 3276, 3278, and 3279 display screens. Also specified are the probable causes of problems (in "Probable Cause" column), what effect the problem has (in "Effect" column), and what action the operator should take (in "Recovery" column).

An indication consists of a symbol and a numeric code, as shown in the "Indicator" column of Figure B-1, and is described as follows:

✖ PROG nn Program Check.
This symbol is displayed when a programming error is detected in the data received by the control unit.

✖ —∿z_ nn Communication Check.
A communication reminder symbol (—∿z_ nn) is displayed when a communication link error is detected; it indicates that data cannot be sent. The reminder is automatically cleared when the error condition is removed. If the operator attempts to communicate with the host while a communication reminder is being displayed, the communication check (✖ —∿z_ nn) condition occurs. To clear the check condition, the operator must press the RESET key.

✖ ⧉ nn Machine Check.
This symbol is displayed when the problem is located in the display station.

The numeric codes consist of two digits, if the display unit is attached to the 3276. (When the display unit is attached to the 3276, the ⧉ symbol, displayed in the Readiness location of the Operator Information Area.) These codes and their meanings are subject to change.

Note: *When the recovery action requires the Test Subsystem test, the Test/Operate switch of the modem cable connector, if present, should be set to Test.*

Error Code	Indicator	Probable Cause	Effect	Recovery
11 (SDLC)	Sys Chk Light Program Chk: (X PROG 11)	3276 received a negative response from host.	Log error code. Display error indication at affected display station. Display error indication at all display stations in SSCP-PU session.	System Check light is turned off when 3276 receives any I-frame, valid PIU, or an SNRM. Press RESET to reset Program Check symbol. Wait for host error recovery if ✖ (?) is indicated. If problem persists and 3276 is in Encrypt/Decrypt session, log off and then log on.
12 (BSC)	Sys Chk Light Program Chk: (X PROG 12)	Invalid command received; host programming problem in write data stream.	Log error code. Display error indication at affected display station. Set BSC Sense: CR. Send EOT. Go to Control mode.	Receipt of poll or selection with 3276 address resets System Check light. Press RESET to reset Program Check symbol. Call host-suport programmer if problem persists.
13 (BSC)	Sys Chk Light Program Chk: (X PROG 13)	Invalid buffer address received or incomplete order sequence in Write, Erase/Write, or Erase/Write Alternate command received.	Log error code. Display error indication at affected display station. Set BSC Sense: OC. Send EOT. Go to Control mode.	
14 (BSC)	Sys Chk Light Program Chk: (X PROG 14)	Invalid Copy command received.		
15 (BSC)	Sys Chk Light Program Chk: (X PROG 15)	Invalid command sequence.		
16 (BSC)	Sys Chk Light Program Chk: (X PROG 16)	Line buffer overflow, or invalid 3276 and 3278 model combination.		
10 (SDLC)	Sys Chk Light Program Chk: (X PROG 21-87)	See last part of this figure.		
20 (BSC)	Sys Chk Light Comm Reminder: (+Z 20)	3276 has sent a NAK because: • Block character checking error was detected, or • Three seconds elapsed during a read operation without receiving Syn, ETX, or ETB.	Log error code. Display error indication at affected display station. Replace display image with image displayed before receive operation began.	Host recovery (Host should retransmit the last transmission). Receipt of poll, selection, or data resets System Check light and Communication Reminder symbol. If switched network, redial: if SNBU is installed, use it. If error persists, call service representative.
22 (BSC)	Sys Chk Light Comm Reminder: (+Z 22)	No SYN characters received for about 21 seconds while monitoring selection or polling.	Log error code. Display error indication at all display stations. Continue to monitor the line.	Verify the operational status of the communication network. Host recovery. Receipt of poll or selection with 3276 address resets System Check light and Communication Reminder symbol.
22 (SDLC)	Sys Chk Light Comm Reminder: (+Z 22)	No flags received for about 24 to 32 seconds, and the host communication adapter has not been in Sync during this period. Loop: No indication is displayed.	Log error code. Display error indication at all display stations.	Verify the operational status of the communication network. Host recovery. Receipt of valid frame resets System Check light and Communication Reminder symbol.

Figure B-1 (Part 1 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
23 (BSC)	Sys Chk Light Comm Reminder: (+Z 23)	Fifteen 3-second timeouts occurred when the host expected the 3276 to send a text block as a response to a read-type command; 3276 component or host facility problem.	Log error code. Display error indication at all display stations. Go to control mode.	Host recovery. Receipt of poll or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, press Test Subsystem; if test succeeds, call host operator; if test fails, call service representative.
24 (BSC)	Sys Chk Light Comm Reminder: (+Z 24)	Fifteen 3-second timeouts occurred when PAD, SYN, and data were not received after sending ACK or RVI.	Log error code. Display error indication at all display stations. Continue operation.	Receipt of data, or receipt of poll or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, press Test Subsystem; if test succeeds, call host operator; if test fails, call service representative.
25 (SDLC)	Sys Chk Light Comm Reminder: (+Z 25)	Something in the link is preventing establishment or reestablishment of communication; 20 Write retries, ROLs command rejects, NASs, or XIDs were affected. Loop: Fifteen Write retries or command rejects were affected.	Log error code. Display error indication at all display stations.	Verify the operational status of the communication network Host recovery. System Check light and Communication Reminder symbol are reset when an SNRM or a DISC is received or when write operation is completed. If problem persists, preee Test Subsystem; if test succeeds, call host operator; if test fails, call service representative.
26 (BSC)	Sys Chk Light Comm Reminder: (+Z 26)	Fifteen continuous wrong ACKs received and 3-second timeout occurred after receiving 15th wrong ACK.	Log error code. Display error indication at all display stations. Go to Control mode.	Host recovery. Receipt of poll or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, call host operator.
27 (BSC)	Sys Chk Light Comm Reminder: (+Z 27)	Fifteen continuous NAKs received for transmitted/retransmitted text.		Receipt of poll or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, press Test Subsystem; if test succeeds, call host operator; if test fails, call service representative.
29 (SDLC)	Sys Chk Light Comm Reminder: (+Z 29)	Command reject caused by: a. Detection of an NR sequence erorr. b. Receipt of a command that has no data field defined. c. Receipt of an invalid command. d. Too much data (more than 256 bytes of message data, preceded by header information) is carried.	Log error code. Display error indication at all display stations.	Host recovery. Receipt of valid SNRM or DISC command from host resets System Check light and Communication Reminder symbol. If problem persists, call host-support programmer.

Figure B-1 (Part 2 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
31 (SDLC Loop)	Sys Chk Light Comm Reminder: (+Z 31)	Loop Adapter (LA) did not receive carrier signal for more than 4 seconds.	Log error code. Display erorr indication at all display stations. Runs CCA and LA Wrap test. If test is successful, starts loop test.	Automatically recovered when carrier signal becomes on. If error persists, call host operator.
33 (BSC and SDLC)	Sys Chk Light Comm Reminder: (+Z 33)	Data communication equipment error detected by host communication adapter. **Note:** *Switching the Oper/Test switch on the communication cable connector from Oper to Test may cause this code to be generated.*	Log error code. Display error indication at all display stations. BSC: Go to control mode. (unless it is power-on time). SDLC: Go to line monitor mode.	Check modem. Host recovery. BSC: Receipt of poll or selection resets System Check light and Communication Reminder symbol. SDLC: Receipt of valid SDLC frame resets System Check light and Communication Reminder symbol. If problem persists, press Test Subsystem; if test succeeds, problem is probably in modem or communication facility; if test fails, call service representative.
34 (BSC and SDLC)	Sys Chk Light Comm Reminder: (+Z 34)	Timeout occurred during write operation. Problem is in modem, host communication adapter, or EIA.		
35 (BSC)	Sys Chk Light Comm Reminder: (+Z 35)	Fifteen 3-second timeouts occurred with no response received for the transmitted text to the host. 3276 component or host facility problem, or host is busy.	Log error code. Display error indication at all display stations. Continue operation.	Receipt of response, poll, or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, call host operator. If host is operating correctly, press Test Subsystem; if test succeeds, problem is probably in external modem or communication facility; if test fails, call service representative.

Figure B-1 (Part 3 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
36 (BSC)	Sys Chk Ligh Comm Reminder: (+Z 36)	Fifteen continuous ACK0s received instead of ACK1s, or vice versa. (Wrong ACK-ENQ exchange.)	Log erorr code. Display error indication at all display stations. Continue operation.	Receipt of valid response, poll, or selection with 3276 address resets System Check light and Communication Reminder symbol. If problem persists, call host operator.
41 (Keyboard)	Mach Chk: (X ↘ 41)	Internal malfunction.	Log error code. Display error indication at affected display station.	Press RESET, and retry operation.
42 (Keyboard)	Retry: (X?+42)	Keystroke lost because of temporary system overload. Keying was attempted when device was busy or not functioning. Conflicting operations were attempted simultaneosly; for example, the CLEAR key was pressed during selector light-pen operation.		(If ALT or Alpha was struck just prior to error, restrike to remove keyboard from ALT or Alpha shift status before pressing RESET.) Press RESET, and retry the operation.
43 (Feature)	Mach Chk: (X ↘ 43)	Internal malfunction.		Press RESET, and retry operation.
44 (Feature)	Mach Chk: (X ↘ 44)			
45 (Feature)	Retry: (X?+45)	No response/receive parity error from MSR or MHS read command.		
55 (Feature)	Mach Chk light Mach Chk: (X ↘ 55)	Battery in the 3279 is discharged, or internal malfunction.	Log error code. Display error indication at affected 3279 display station.	At affected 3279 display station, press RESET. Set Normal/Test switch from Normal to Test, then back to Normal. If no indication displayed, replace battery in 3279. If indication displayed, call service representative.
56 (Feature)	Mach Chk light Mach Chk: (X ↘ 56)	Internal malfunction.	Log error code. Display error indication at affected 3279 display station.	At affected 3279 display station, press RESET. If operation can be continued, continue operation. If operation can not be continued, call service representative.
59	Mach Chk Light Mach Chk: (X ↘ 59)	No master key is loaded or bad parity in master key of Encrypt/Decrypt feature.	Log error code. Display error indication at affected display station. Disable Encrypt/Decrypt function if RESET is pressed.	Load master key. If failure occurs again, check the battery, and replace it if necessary.
60 (Feature)	Mach Chk: (X ↘ 60)	Internal malfunction.	Log error code. Display error indication at affected display station. Disable MSR/MHS function.	Press RESET, and retry operation.
61 (Feature)	Mach Chk: (X ↘ 61)		Log error code. Disable selector light-pen feature. Display error indication at affected display station.	Set Normal/Test switch from Normal to Test, then back to Normal. If test fails or error occurs again, call service representative.

Figure B-1 (Part 4 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
63	Mach Chk Light Mach Chk: (X ⇆ 63)	Error in Encrypt/Decrypt function.	Log error code. Display error indication at affected display station. Disable Encrypt/Decrypt function if RESET is pressed.	Press and release Test Subsystem. If test fails or error occurs again, call service representative.
65 (Feature)	Mach Chk (X ⇆ 65)	Internal malfunction	Log error code. Disable display or printer. Display error indication at affected display station (No error indication at printer.) Set sense/status: BSC : DC/US SNA: 081C	At 3276/3278, set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). At 3287: 1. Press and hold Test switch. 2. Press and release RESET switch. 3. Release Test switch. or switch 3287 power off, then on.
66 (Feature)	Mach Chk: (X ⇆ 66)	Internal malfunction	Log error code. Display error indication at affected display station. Set sense/status: BSC : DC/US SNA: 082B-081C Disable display if errors exceed threshold of 7. Set sense/status: BSC : IR SNA: 081C	Press RESET. At 3276/3287, set Normal/Test switch to Test, then back to Normal (or switch power off, then on).
69 (Display or Printer)	Mach Chk: (X ⇆ 69)	Internal malfunction.	Log error code. Display error indication at affected display station. Disable display or printer. Set sense/status: BSC : DC/US SNA: 081C	At 3276/3278, set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). At 3287: 1. Press and hold Test switch. 2. Press and release RESET switch. 3. Release Test switch. or switch 3287 power off, then on. At 3289, Press RESET. If test fails or error occurs again, call service representative.
70 (Display or Printer)	Mach Chk: (X ⇆ 70)		Log error code. Display error indication at affected display station (display may not be successful because of display failure). Disable display or printer. Set sense/status. BSC : IR SNA: 081C	
71 (Display or Printer)	Mach Chk: (X ⇆ 71)		Log error code. Display error indication at affected display station. Disable display or printer. Set sense/status: BSC : DC/US SNA: 081C	
72 (Display or Printer)	Mach Chk: (X ⇆ 72)			Set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). If test fails or error occurs again, call service representative.

Figure B-1 (Part 5 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
73 (Display or Printer)	Mach Chk: (X ≠ 73)	Internal malfunction.	Log error code. Display error indication at affected display station. Disable display or printer. Set sense/status: BSC : DC/US SNA : 081C	At 3276/3278, set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). At 3287: 1. Press and hold Test switch. 2. Press and release RESET switch. 3. Release Test switch. or switch 3287 power off, then on. At 3289, Press RESET. If test fails or if error occurs again, call service representative.
		Wrong configuration: 3276 Model 1 has a 3278 Model 4 in subsystem.		Disconnect 3278 Model 4.
74 (Fea-(ture)	Mach Chk: (X ≠ 74)	Internal malfunction.	Log error code. Display error indication at affected display station (no error indication if it is a printer). Disable display (or printer). Set sense/status: BSC : DC/US or IR SNA : 081C	Set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). At 3287: 1. Press and hold Test switch. 2. Press and release RESET switch. 3. Release Test switch. or switch 3287 power off, then on. At 3289, press RESET. If test fails or error occurs again, call service representative.
75 (MC)	Mach Chk Light Mach Chk: (X ≠ 75)	Internal malfunction.	Log error code. Display error indication at affected display station. Disable terminal. Set sense/status BSC : DC/US or IR SNA: 081C	Press and release Test Subsystem. If test fails or error occurs again, call service representative.
76 (MC)	Mach Chk Light Mach Chk: (X ≠ 76)		Log error code. Display error indication at affected display station. Disable terminal. Set sense/status BSC : DC/US or IR SNA: 081C Poll is not issued, and power on reset (POR) from terminals cannot be received.	
77 (Display)	Mach Chk: (X ≠ 77)		Log error code. Clear display. Display error indication at affected display station. Set sense/status BSC : DC/US SNA: 082B Disable display if errors exceed threshold of 7. Set sense/status. BSC : IR SNA: 081C	Set Normal/Test switch from Normal to Test, then back to Normal (or switch power off, then on). If test fails or error occurs again call service representative.

Figure B-1 (Part 6 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
78 (Disp or Printer)	Mach Chk Light Mach Chk: (X ≠ 78)	Internal malfunction.	Log error code. Display error indication at affected display station. (no error indication at printer). Disable terminal. Set sense/status BSC : DC/US or IR SNA: 081C	Press and release Test/Subsystem. If test fails or error occurs again, call service representative.
79 (BSC or SDLC)	Mach Chk Light Mach Chk: (X ≠ 79)		Log error code. Display error indication at all display stations. Turn off Line Ready ($\overline{OK}$). Stop machine.	
81 (SDLC)	Mach Chk Light Mach Chk: (X ≠ 81)			
82 (MC)	Mach Chk Light Mach Chk: (X ≠ 82)	Error in Encrypt/Decrypt function.	Log error code. Display error indication at affected display station. Disable Encrypt/Decrypt function if RESET is pressed.	
83 (MC)	Mach Chk Light Mach Chk: (X ≠ 83)			
85 (BSC or SDLC)	Mach Chk Light Mach Chk: (X ≠ 85)	Internal malfunction	Log error code. Display error indication at all display stations. Turn off Line Ready ($\overline{OK}$). Stop machine.	Press and release Test Subsystem If test fails, or error occurs again, call service representative.
86 (SDLC) Loop	Mach Chk Light Mach Chk: (X ≠ 86)			
87 (BSC and SDLC)	Mach Chk Light Mach Chk: (X ≠ 87)	Data communication equipment malfunction		Press and release Test Subsystem. Perform host recovery if required. If test fails or error occurs again, call service representative.
88 (BSC and SDLC)	Mach Chk Light Mach Chk: (X ≠ 88)	Internal malfunction of communication adapter		
89 (MC)	Mach Chk Light Mach Chk: (X ≠ 89)	Internal malfunction	Log error code. Display error indication at all display stations. Turn off Line Ready ($\overline{OK}$) and Other Unit Operable (□—▱) lights. Stop machine.	
90 (MC)	Mach Chk Light Mach Chk: (X ≠ 90)			
91 (MC)	Mach Chk Mach Chk: (X ≠ 91)			

Figure B-1 (Part 7 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
92-99 (MC)	Mach Chk Light Mach Chk: (X ↹ 92-99)	Internal malfunction	Log error code. Display error indication and failing FRU at all display stations. Turn off Line Ready ($\overline{OK}$) and Other Unit Operable (□–□) lights.	Press and release Test Subsystem. Perform host recovery if required. If test fails or error occurs again, call service representative.

Figure B-1 (Part 8 of 9). Status Indicators and Recoveries

Error Code	Indicator	Probable Cause	Effect	Recovery
10 (SDLC)	Sys Chk Light Program Chk: (X PROG 21-87)	21: EXR from upstream node. 22: Invalid OAF for PU (sense bits 800F). 23: PU Not Active (sense bits 8008). 24: Unrecognized DAF (sense bits 8004). 25: Segmenting Error. 26: LU is not active (sense bits 8009). 27: No LU-LU session (sense bits 8005). 28: Invalid ACTPU parameter (sense bits 0821). 29: REQMS (NCCF) error (sense bits 080C, 0815, 1003, 1007). 30: Data Traffic Reset state (sense bits 2005). 31: Sequence number error (sense bits 2001). 32: FM data chaining error (sense bits 2002). 33: Normal flow DFC in INC state (sense bits 2002). 34: BB is not found on FM data request (sense bits 2003). 35: DFC carries EB in BETB (sense bits 2003). 40: Invalid 3270 command (sense bits 1003). 41: Data follows READ type command (sense bits 1003). 42: Nonsupported SNA command (sense bits 1003). 43: Control Function carries Null RU (sense bits 1003). 44: Invalid Signal request code (sense bits 1003). 50: ORDER with invalid buffer address (sense bits 1005). 51: Incomplete order sequence (sense bits 1005). 59: FI bit in RH0 is not supported (sense bits 400F). 60: CD in RH2 is required (sense bits 0829). 61: Exception Mode is not allowed for copy (sense bits 0843). 68: Invalid ACTLU parameter (sense bits 0821). 69: Second BIND is received from current PLU (sense bits 0815). 70: Session limit exceeded (sense bits 0805). 71: Bind RU is incomplete (sense bits 0821). 72: Invalid support level (RU1-3) (sense bits 0821). 73: Invalid PLU protocol (RU4) (sense bits 0821). 74: Invalid SLU protocol (RU5) (sense bits 0821). 75: Invalid common protocol (RU6, 7) (sense bits 0821). 76: Too small RU length (RU10) (sense bits 0821). 77: Too large buffer size (RU9, 11) (sense bits 0821). 78: Invalid LU type (RU14) (sense bits 0821). 79: Invalid screen size (RU20-24) (sense bits 0821). 80: Encrypt/Decrypt is not supported; (RU26) (sense bits 0821). 82: Encrypt/Decrypt Session Parameter error (sense bits 0821). 85: Encrypt/Decrypt State error (sense bits 2009). 86: Encrypt/Decrypt CRV failure (sense bits 0821). 87: Encrypt/Decrypt RU Data error (sense bits 1001).	Log error code. Display error indication at affected display station; if it cannot be displayed there, display it at all other display stations. Set sense bits XXXX (as indicated in adjacent column). BIND parameter error	Press RESET. Await recovery from host. 40: If 3276 is in Encrypt/Decrypt session, log off and then log on. 86: Verify the master key value. 87: Log off and then log on.

Figure B-1 (Part 9 of 9). Status Indicators and Recoveries

Glossary of Terms and Abbreviations

A

ACK. A positive acknowledgment.

ACT PU. Activate physical unit.

B

BB. Begin bracket.

BCC. Block check character.

BETB. Between bracket.

BOC. Bus out check.

BSC. Binary synchronous communications.

C

CCA. Common communications adapter.

CD. Change direction.

channel. A hardware device that connects the CPU and main storage with the I/O control units.

communication facilities. Anything used or available for use in furnishing data communication service.

communication line. Any medium, such as a wire or a telephone circuit, that connects a remote station with a computer.

communication link. The physical means of connecting one location to another for the purpose of transmitting and receiving data.

communications controller. A type of communication control unit whose operations are controlled by a program stored and executed in the unit.

concurrent test. A test that can be run within the same time interval that is used for other work.

control unit (CU). A device without programmable storage that controls input/output operations at one or more devices.

control unit port. As used in this publication, the device cable connection point at a control unit.

CPU. Central processing unit.

CR. Command reject.

CS. Current state.

CSW. Channel status word.

CTS. Clear to send.

CU. Control unit.

D

DAF. Destination address field.

DDSA. Digital Data Service Adapter

DEMF. Display Exception Monitoring Facility.

DFC. Data flow control.

DISC. Disconnect.

DSR. Data set ready.

E

EAU. Erase all unprotected.

EB. End bracket.

EIA. Electronic Industries Association.

ENQ. Enquiry.

EOT. End of transmission.

ETB. End of transmission block.

ETX. End of text.

E/W. Erase/write.

EWA. Erase write alternate.

EXR. Exception request .

F

FERS. Facility Error Recognition System.

FI. Format indicator.

FM. Field mark.

H

HPCA. High-Performance Communication Adapter.

I

INC. In chain (state).

I/O. Input/output

L

LA. Loop Adapter

LIC. Last in chain.

local copy operation. An operation that copies the contents of the buffer from one display station or printer to another display station or printer attached to the same control unit.

logged. Recorded.

LOGON. A request by or on behalf of a terminal to be connected to an application program.

LU. Logical unit.

M

modem. A modulator-demodulator.

modulator-demodulator (modem). A device that modulates and demodulates signals transmitted over communication facilities (sometimes called a *data set*).

MPF. Mapping field.

N

NAK. A negative acknowledgment.

NCCF. Network Communications Control Facility.

NCP. Network control program.

No RTR. Not ready to receive.

nonswitched line. A connection between a remote terminal and a computer that does not have to be established by dialing.

NPDA. Network Problem Determination Application.

NR/NS. A receive sequence count/send sequence count.

NSA. Nonsequenced acknowledgment.

O

OAF. Origin address field.

OC. Operation check.

Operator Information Area. The area on a display screen, below the horizontal line, used to display operator information.

P

PAD. Pad characters, generated to ensure complete transmission or reception of the first and last significant characters of each transmission.

PDG. Problem Determination Guide.

PIU. Path information unit.

PLU. Primary logical unit.

port, control unit. As used in this publication, the device cable connection point at a control unit.

PU. Physical unit.

R

RA. Repeat to address.

Rd. Read.

Rd Mod. Read modified.

RH. Request/response header.

ROL. Request online.

REQMS. Request maintenance statistics.

RTR. Ready to receive.

RU. Request response unit.

S

SBA. Set buffer address.

SDLC. Synchronous data link control.

SF. Start field.

SLU. Secondary logical unit.

SNA. Systems network architecture.

SNBU. Switched network backup.

SNRM. Set normal response mode.

STX. Start of text.

SYN. Synchronous idle.

T

TCU. Transmission control unit.

TH. Transmission header.

TIO. Test I/O.

transmission control unit (TCU). An input/output control unit that addresses messages to and receives messages from a number of remote terminals.

W

WCC. Write control character.

X

XID. Exchange station identification.

Index

IBM 3270 Information Display System
System Problem Determination for
3276 Control Unit Display Stations

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