297-2121-225
VINTAGE 01.02
STANDARD

DIGITAL SWITCHING SYSTEMS

DMS*-100 FAMILY DATAPATH*

3270 NETWORK SWITCHED ACCESS

INSTALLATION AND MAINTENANCE

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* DMS and DATAPATH are trademarks of Northern Telecom.

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CHAPTER 1

INTRODUCTION TO 3270 NETWORK SWITCHED ACCESS

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PRACTICE APPLICATION

The information contained in this Practice applies to offices having Batch Change Supplement release BCS 18 software.

It also applies to offices having a BCS release greater than 18, unless reissued. The application of all Northern Telecom Practice (NTP) editions with respect to a given BCS release is given in 297-1001-001, Master Index of Practices.

SOFTWARE IDENTIFICATION

Datapath 3270 Network Switched Access features are contained in the software package NTX250AA.

CAPABILITIES

3270 Network Switched Access provides a means for connecting IBM* 3270-type terminals to cluster control units using single twisted-pair wiring.

3270 Network Switched Access requires two units: a Control Unit Interface (CUIF) and a Terminal Interface (TIF). The CUIF connects to the IBM control unit. The TIF connects to the IBM terminal.

3270 Network Switched Access:

* reduces coaxial (coax) cable length requirements

* uses twisted-pair connections to extend the allowable separation distance between the terminal and the control unit.

* provides switched access to different IBM mainframes or non-switched access to specific IBM mainframes

* provides a single, unified wiring plan, and maintains integrity by using single twisted-pair wiring

* provides IBM control unit port sharing

* allows for easier and simpler moves and changes of equipment

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*IBM is a trademark of International Business Machines.

0 CONFIGURATION

0 3270 Network Switched Access can be configured for two kinds of 0 operation:

0 * switched
0 * non-switched

0 Both configurations allow the reduction of coax cable, yet main- 0 tain flexibility in the design of the network of terminals.

0 Switched Configuration

0 The switched configuration (as shown in Figure 1.1 on page 1-3) 0 connects the display terminals and control units through a 0 DMS-100 Family switch.

0 Using 3270 Network Switched Access in a switched configuration 0 means that the number of installed terminals does not have to 0 match the number of ports on the IBM control unit. The exact 0 ratio of terminals to ports is determined for each installation, 0 depending on local requirements and usage patterns.

0 A terminal can have access to any mainframe with a port connected 0 via a CUIF to the DMS-100 Family switch.

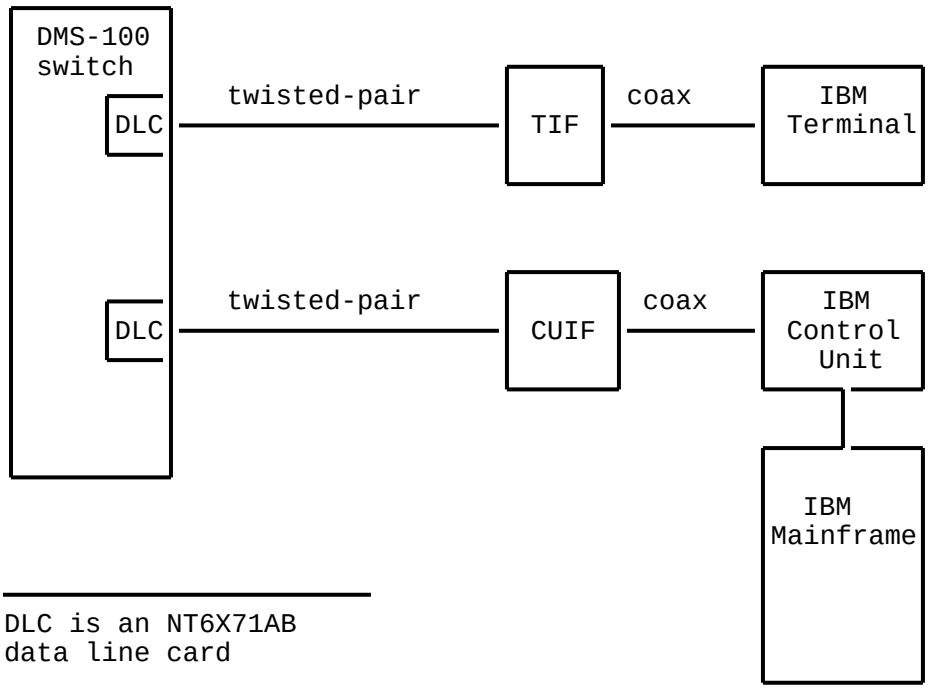

Figure 1.1 Switched Configuration

Non-switched Configuration

The non-switched configuration (also known as back-to-back), as shown in Figure 1.2 on page 1-4, connects the display terminal and control unit directly.

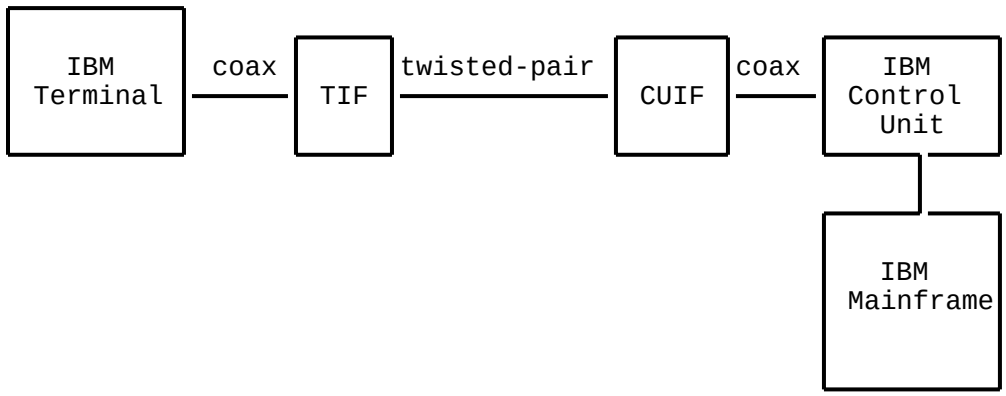

Figure 1.2 Non-switched Configuration

APPLICATIONS

The 3270 Network Switched Access CUIF is compatible with the IBM 3174, 3274, and 3276 control units.

The 3270 Network Switched Access TIF is compatible with a variety of IBM and IBM-type terminals in normal applications. The following list provides some examples:

* IBM 3178 monochrome
* IBM 3179 color display
* IBM 3180 display station (with 3274 control unit)
* IBM 3191/3192 display station
* IBM 3270 PC (control unit terminal mode)
* IBM 3278 models 2, 3, 4, and 5 (monochrome)
* IBM 3279 color display without convergence
* IBM PC AT and XT with IRMA (up/downloading is not supported)
* Beehive ATL-178
* Memorex 2178

3270 Network Switched Access supports the following features, available on these terminals:

* extended character set (extended attribute buffer) (programmable symbols not supported)

* APL/text

* audible alarm

* all supported keyboard types

* selector light pen

* security keylock

Note: 3270 Network Switched Access does not support IBM printers, or color convergence.

When 3270 Network Switched Access is used in a switched configuration, the Datapath keyboard dialing feature is available. The following additional features can be added:

DMS-100

* automatic line

* automatic dial

* ring again

* data-port hunting

* speed dialing

* idle time out

* maintenance from the central office

The datapath keyboard dialing feature is useful if the user needs access to multiple locations or multiple applications from the terminal, and for infrequent users who do not need to be continuously connected to a control unit. It is also useful for system maintenance and troubleshooting.

The automatic line feature automatically connects the user with a predetermined destination. The terminating location's directory number is entered at the DMS-100 Family switch using Service Orders. It can represent a line on the same switch or a line on another switch. The directory number can be up to 15 digits long.

Note: When this feature is used, all other call setup features are disabled.

The automatic dial feature lets the user program one frequently dialed directory number so that it can be automatically dialed using the auto dial keyboard sequence.

The ring again feature is used when the CUIF the user has called is busy. The system monitors the called CUIF and alerts the user when the busy CUIF becomes idle. Ring again only applies if the originating and terminating units are served by the same DMS-100 Family switch, and are both in the same customer group.

The data port hunting feature lets the user dial one directory number to gain access to one of several available control unit ports. The DMS-100 Family switch hunts for the first available data port.

The speed dialing feature lets the user program a list of directory numbers. Each number can then be dialed using a one- or two-digit code. Two types of speed dialing lists are available:

* a short list of up to 10 directory numbers for which 1-digit codes are used

* an individual list of up to 30, 50, or 70 directory numbers for which 2-digit codes are used

* a group list of up to 30, 50, or 70 directory numbers for which 2-digit codes are used

The operating company determines the type of speed dialing available to the TIF user when the associated data line card (DLC) line equipment number (LEN) is datafilled.

The idle time out feature is used to automatically take down a data call if the data line remains idle for a predetermined period of time. The idle time is determined by the operating company when the associated DLC LEN is datafilled. The idle time out feature is available in markets where profile downloading is available.

The central office based maintenance feature allows remote diagnostics to be performed on the TIF and the CUIF from the central office.

REFERENCES

The following documents will provide you with additional information on the datapath products and some of the installation procedures:

297-1001-001	Master Index of Practices
297-1001-100	System Description
297-1001-114	Operational Measurements (OM)
297-1001-320	Operational Measurements Reference Manual
297-1001-451	Common Customer Data Schema
297-1001-455	The Office Parameters Reference Manual
297-2101-451	Local Customer Data Schema
297-2101-516	Line Maintenance Reference Manual
297-2121-182	Line Engineering Rules

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CHAPTER 2

EQUIPMENT DESCRIPTION AND SPECIFICATIONS

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This chapter provides descriptions and specifications for the following equipment:

- Control Unit Interface Shelf (NT4X25BS)
- Control Unit Interface (NT4X25AM)
- Terminal Interface (NT4X25AL)
- Cabling

CONTROL UNIT INTERFACE SHELF - DESCRIPTION

The Control Unit Interface (CUIF) shelf (NT4X25BS) is a standard 48.26 cm (19 in) wide rack-mount unit that houses up to 16 circuit packs. The front of the shelf has a safety bar that secures the CUIFs in place (see Figure 2.1).

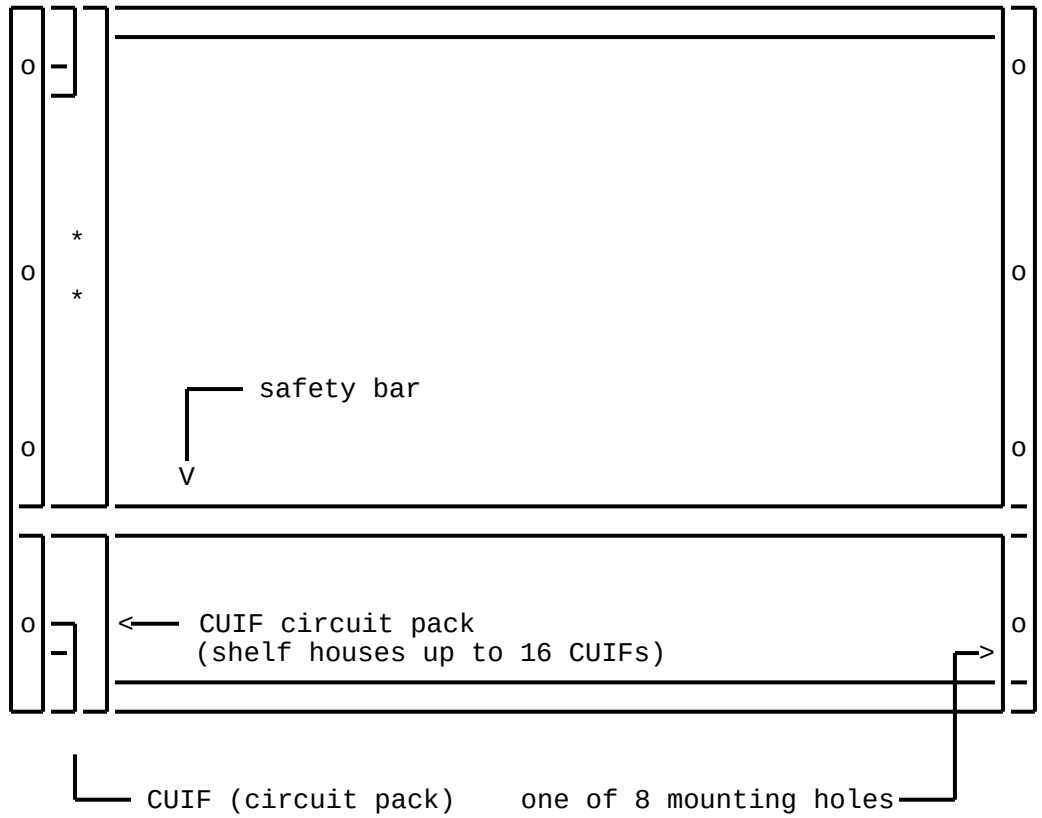

Figure 2.1 Control Unit Interface Shelf - Front View

The shelf has eight pre-drilled mounting holes, four on each side. The dimensions of the holes are shown in Figure 2.2 on page 2-2.

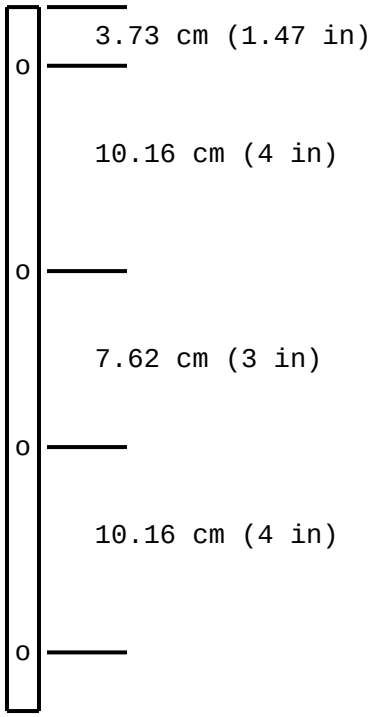

Figure 2.2 CUIF Shelf - Mounting Hole Dimensions

A power supply (NT part # AO320852, CPC code NPS50422-10L3) mounted on the rear of the shelf provides power for the circuit packs. The AC power cord connects to a receptacle on the rear of the shelf. The shelf has an ON/OFF switch to control the power, and a 7 A fuse to protect against overload.

There are 16 BNC connectors on the rear of the shelf that provide the connections from the CUIFs to the IBM control units. A 50-pin Amphenol connector provides the interface to the data lines (see Figure 2.3 on page 2-3).

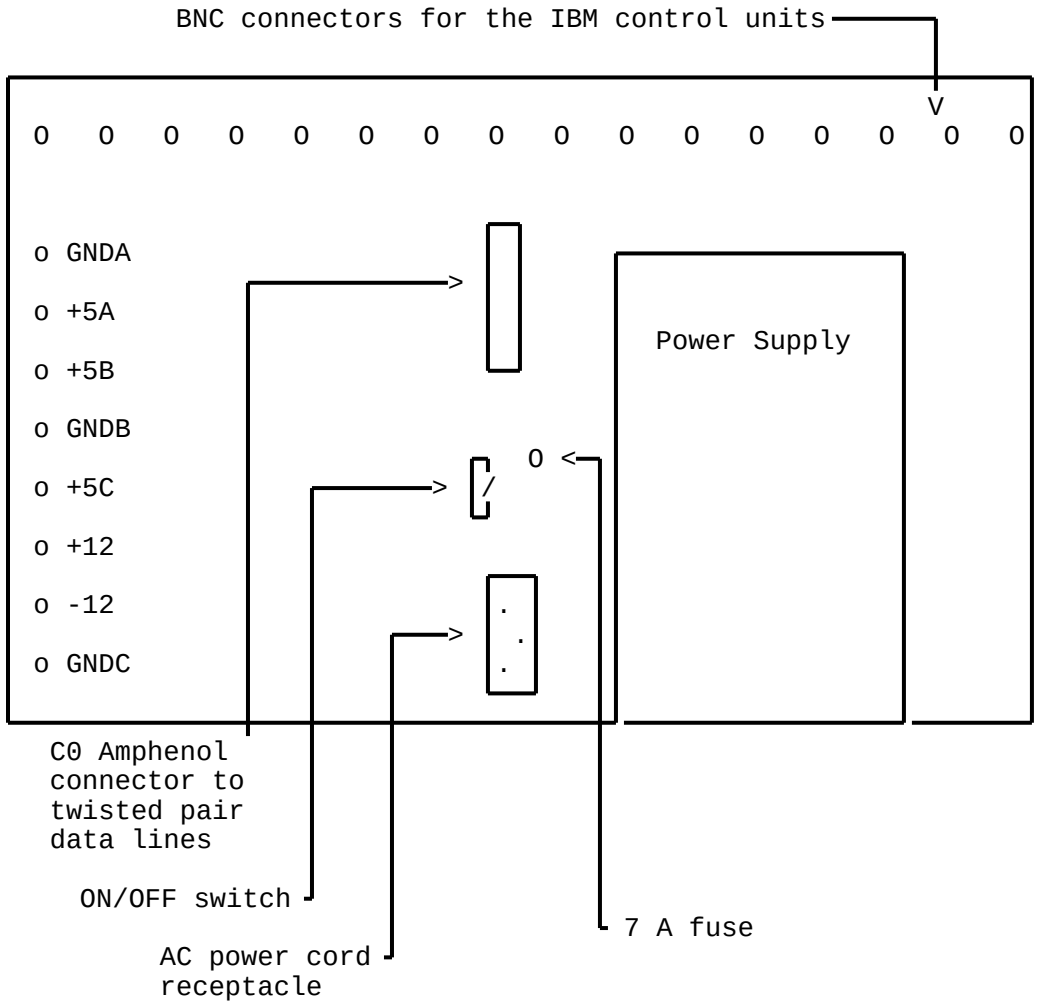

Figure 2.3 Control Unit Interface Shelf - Rear View

SHELF - SPECIFICATIONS

Mechanical Specifications

Size:	50.8 cm long x 48.3 cm wide x 35.6 cm high (20 in x 19 in x 14 in)

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Weight:	22 kg (48.5 lbs)
Connectors:	16 BNC connectors
	1 female Amphenol (AMP2-102935-8) connector
	1 power cord connection
Color:	grey

Electrical Specifications

Inputs:	110 V ac nominal (92 - 130 V ac) 60 Hz 4.0 A
Outputs:	+5 V 50 A
	+12 V 5 A
	-12 V 5 A
Fuse:	7 A
Minimum Loading Requirements:	5 A (2 CUIF circuit packs)

Environmental Specifications

Operating Temperature:	0 to 50^0 C (32 to 122^0 F)
Storage Temperature:	-40 to 70^0 C (-40 to 158^0 F)
Relative Humidity:	(operating) 95% at 40^0 C (104^0 F)

The maximum differential air temperature rise within the shelf is 15 C^0 (27 F^0)

Regulatory Compliance

EMI:	FCC Part 15 Class A
Interconnect:	CS-03 Issue 6

The shelf is Canadian Standards Association (CSA) approved and Underwriters' Laboratories (UL) listed.

CONTROL UNIT INTERFACE - DESCRIPTION

The CUIF (NT4X25AM) is a circuit pack that connects the IBM control unit to the twisted-pair data line (see Figure 2.4).

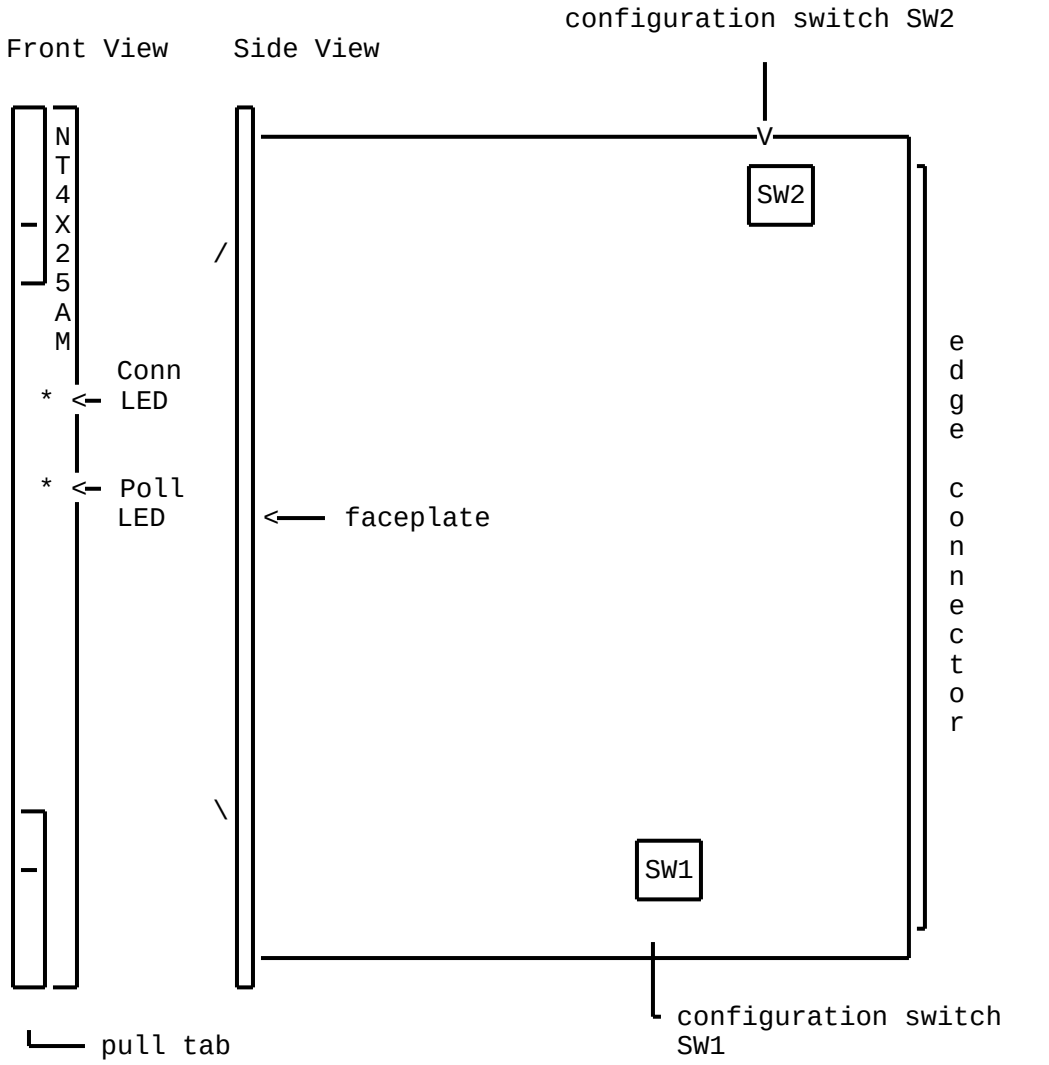

Figure 2.4 CUIF Circuit Pack - Front and Side View

The front of the CUIF has two status LEDs:

- Conn
- Poll

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These LEDs indicate the status of the CUIF connection, data session, synchronization, and self-test.

Each time the CUIF is powered-up the integrity of the hardware is tested. For a detailed explanation of the self-test and failure reporting, see Control Unit Interface Circuit Pack Self-Test on page 6-1.

Pull tabs on the faceplate allow for easy insertion and removal of the CUIF from the shelf.

There are two DIP switches on the circuit pack. They are used to configure the CUIF for either switched or non-switched operation (SW1 and SW2 in Figure 2.4 on page 2-5).

CONTROL UNIT INTERFACE - SPECIFICATIONS

Mechanical Specifications

Size:	25.4 cm long x 30.5 cm high (10 in x 12 in)
Connectors:	card edge connectors

Electrical Specifications

Inputs:	+5 V dc 2.5 A
	+12 V dc 0.1 A
	-12 V dc 0.1 A
ESD (faceplate only):	20 kV with no call drop
	25 kV with no permanent damage

Environmental Specifications

Operating Temperature:	0 to 50^0 C (32 to 122^0 F)
Storage Temperature:	-40 to 70^0 C (-40 to 158^0 F)
Relative Humidity:	(operating) 95% at 40^0 C (104^0 F)
MTBF:	greater than 10 years

Regulatory Compliance

EMI:	FCC Part 15 Class A
Interconnect:	CS-03 Issue 6

The CUIF is CSA approved and UL listed.

TERMINAL INTERFACE - DESCRIPTION

The Terminal Interface (TIF) (NT4X25AL) is a desktop unit that connects the IBM terminal to the twisted-pair data line (see Figure 2.5). The TIF is powered by an attached external power supply.

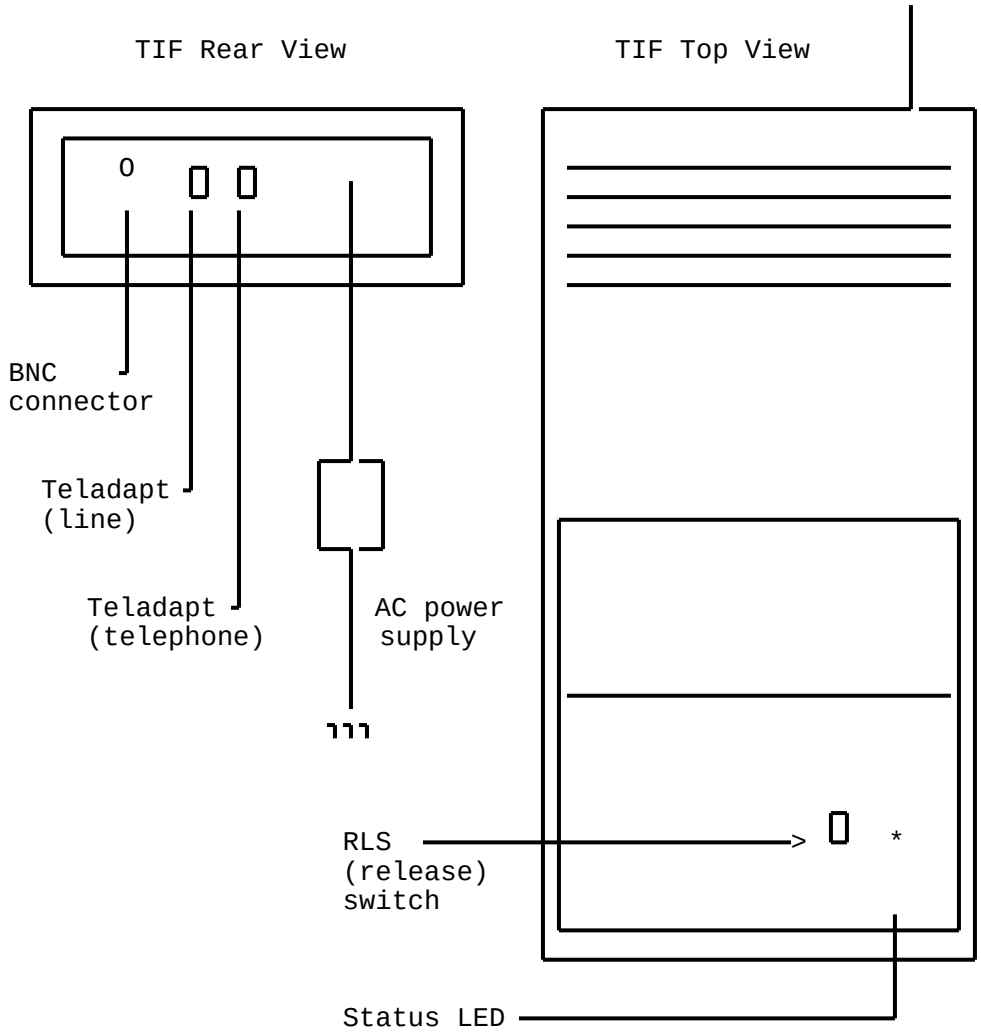

Figure 2.5 Terminal Interface - Rear and Top View

A LED on the top of the unit indicates the status of the TIF power, synchronization, and self-tests.

The toggle switch labeled RLS is used to terminate a data session and release the data line.

The TIF has two female TELADAPT* jacks on its rear face. The jack closest to the BNC connector is used to connect the TIF to the data line. If the operating company provides a voice line connection, the jack closest to the power cord can be used to connect a telephone.

Each time the TIF is powered-up, and upon completion of a call, the integrity of the TIF hardware is tested. If a hardware failure is detected, the failure is indicated by the status LED. For a detailed explanation of the self-test and failure reporting, see Terminal Interface Self-Test on page 6-1.

TERMINAL INTERFACE - SPECIFICATIONS

Mechanical Specifications

TIF

Size:	31.7 cm long x 19.0 cm wide x 6.3 cm high (12.5 in x 7.5 in x 2.5 in)
Weight:	1 kg (2.2 lbs)
Connectors:	1 BNC connector
	2 female Teladapt jacks
Color:	grey

Power Supply

Size:	12.5 cm long x 8 cm wide x 6 cm high (4.9 in x 3.1 in x 2.4 in)
Color:	black

Electrical Specifications

TIF

Inputs:	+5 V dc 1.5 A
	+12 V dc 0.2 A
	-12 V dc 0.2 A

*TELADAPT is a trademark of Northern Telecom

Electrostatic Discharge:	20 kV with no call drop
	25 kV with no permanent damage

Power Supply

Inputs:	110 V ac nominal (92 - 130 V ac) 60 Hz 20 W
Outputs:	+5 V dc 1.5 A
	+12 V dc 0.2 A
	-12 V dc 0.2 A

Environmental Specifications

Operating Temperature:	0 to 50^{0}C (32 to 122^{0}F)
Storage Temperature:	-40 to 70^{0}C (-40 to 158^{0}F)
Relative Humidity:	(operating) 95% at 40^{0}C (104^{0}F)
MTBF:	greater than 10 years

Regulatory Compliance

EMI:	FCC Part 15 Class A
Interconnect:	CS-03 Issue 6

The TIF is CSA approved and UL listed.

CABLE SPECIFICATIONS

Coax Cable

Type: RG62A/U

Maximum Lengths: 1.5 km (4900 ft) from TIF to terminal

1.5 km (4900 ft) from CUIF to control unit

Twisted-pair Cable

TIF to DLC

Maximum Lengths: 4.34 km (2.69 miles) with non-loaded 26-gauge wire

5.47 km (3.39 miles) with non-loaded 24- or 22-gauge wire

CUIF to DLC

Maximum Lengths: 4.34 km (2.69 miles) with non-loaded 26-gauge wire

5.47 km (3.39 miles) with non-loaded 24- or 22-gauge wire

TIF to CUIF

Maximum Lengths: 4.34 km (2.69 miles) with non-loaded 26-gauge wire

5.47 km (3.39 miles) with non-loaded 24- or 22-gauge wire

For a detailed explanation of loop length and other limits refer to 297-2121-182, Line Engineering Rules.

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CHAPTER 3

INSTALLING A DATA LINE FOR 3270 NETWORK SWITCHED ACCESS

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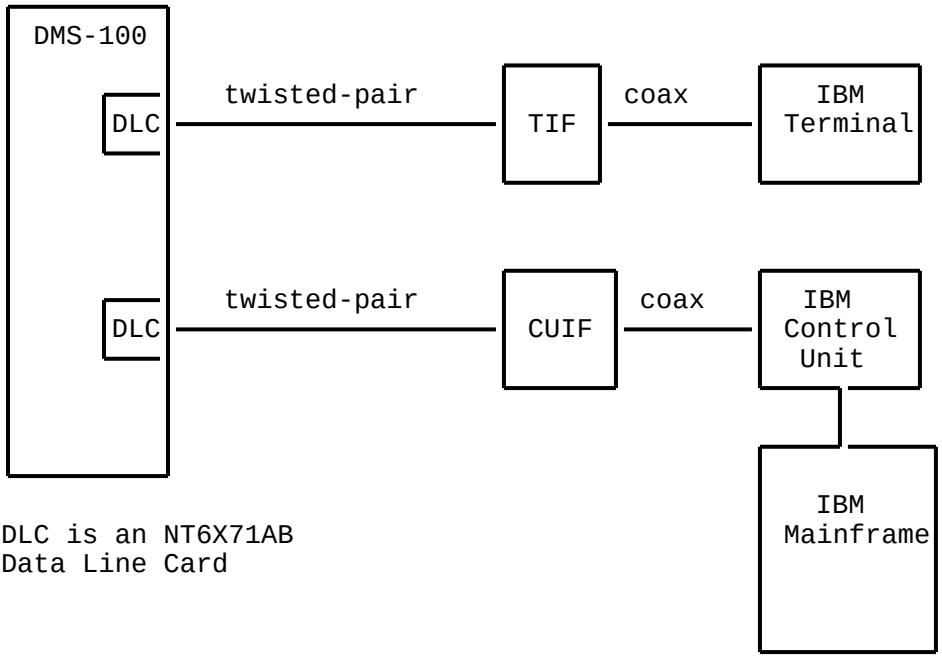
The installation of 3270 Network Switched Access equipment is separated into two specific areas:

* installation of the data line
* installation of the 3270 Network Switched Access hardware

This chapter deals only with the installation of the twisted-pair data line between the Terminal Interface (TIF) and the Control Unit Interface (CUIF).

As shown in Figure 3.1 on page 3-2, the data line can be either switched through the DMS-100 Family switch, or a direct connection from the TIF to the CUIF.

SWITCHED CONFIGURATION



DLC is an NT6X71AB
Data Line Card

NON-SWITCHED CONFIGURATION

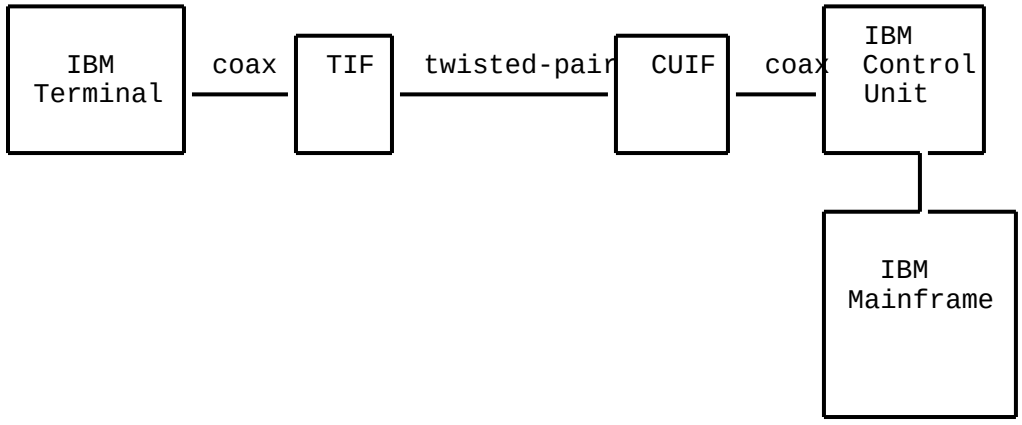


Figure 3.1 Switched Configuration vs Non-switched Configuration

SWITCHED CONFIGURATION

In the switched configuration, the TIF and the CUIF are each associated with an NT6X71AA or NT6X71AB data line card (DLC). Each DLC line equipment number (LEN) must be properly datafilled for either a CUIF or a TIF.

If profile downloading is to be used (DOWNLOAD set to yes), the NT6X71AB DLC must be used.

Datafill

The datafill is entered at the Command Interpreter (CI) level of the Maintenance and Administration Position (MAP*) using the SERVORD command.

The SERVORD fields required for 3270 Network Switched Access are described in Table 3.1.

TABLE 3.1
SERVORD ENTRIES FOR 3270 NETWORK SWITCHED ACCESS

FIELD	DESCRIPTION
DN	Directory Number Specifies the directory number (DN) of the Data Unit (DU). Enter the DN of the CUIF or TIF.
LCC	Line Class Code Determines the Line Class Code (LCC) of the DU associated with the DN. Enter DATA as the LCC for a DU.
GROUP	Customer Group Enter the name of the customer group as required.
SUBGROUP	Customer Subgroup Enter as required.

Table Continued

*MAP is a trademark of Northern Telecom.

TABLE 3.1 (Continued)
SERVORD ENTRIES FOR 3270 NETWORK SWITCHED ACCESS

FIELD	DESCRIPTION
NCOS	Network Class of Service Enter as required.
SNPA	Service Numbering Plan Area Enter as required.
RINGING	Ringing Determines whether ringing is applied to the line. For the TIF enter N (no ringing). For the CUIF enter N (no ringing).
CLASSDU	Class of Data Unit Determines the class of the DU associated with the directory number. For the TIF enter TCU (terminal coax unit). For the CUIF enter CCU (controller coax unit).
DOWNLOAD	Download Profile Determines whether the data stored in the DPROFILE table is downloaded to the DU. Enter N (No) or Y (Yes) as required. When profile downloading is enabled, you can specify the TIF idle time out. You must, however, use the NT6X71AB DLC.
IDLETO	Idle Time Out Determines the length of time the TIF may remain idle before the device times out and the data connection is lost. Enter either of the following: 0 for no time out 1 for 15 minutes idle before time out

Table Continued

TABLE 3.1 (Continued)
SERVORD ENTRIES FOR 3270 NETWORK SWITCHED ACCESS

FIELD	DESCRIPTION
	2 for 30 minutes idle before time out 3 for 60 minutes idle before time out The download must be enabled (Y) if 1, 2, or 3 are entered as the idle time out. This prompt does not appear if CCU has been entered in the CLASS-DU field indicating that a CUIF is being datafilled.
KBDTYP	Keyboard Type Determines the type of keyboard dialing for the TIF. Enter SYMB (symbolic). This prompt does not appear if CCU has been entered in the CLASS-DU field indicating that a CUIF is being datafilled.
DPOPTS	DATAPATH Options Determines the list of Datapath options that the DU is to have. A CUIF must have Auto Answer. There are no TIF options required for 3270 Network Switched Access. The default entry is AUTOANS $ The $ indicates the end of the option list.

Twisted-pair Cabling Requirements

The length of the twisted-pair cable connecting the DU to the corresponding DLC varies with the wire gauge. Use the following list as a guide for maximum cable lengths:

22- 24-gauge maximum length - approximately 5.47 km (3.39 miles)

26-gauge maximum length - approximately 4.34 km (2.69 miles)

1. Make the connections from the DLC to the TIF modular wall jack as shown in Figure 3.2.

2. Make the connections from the DLC to the appropriate twisted-pair of the CUIF interface connector as shown in Figure 3.3 on page 3-7.

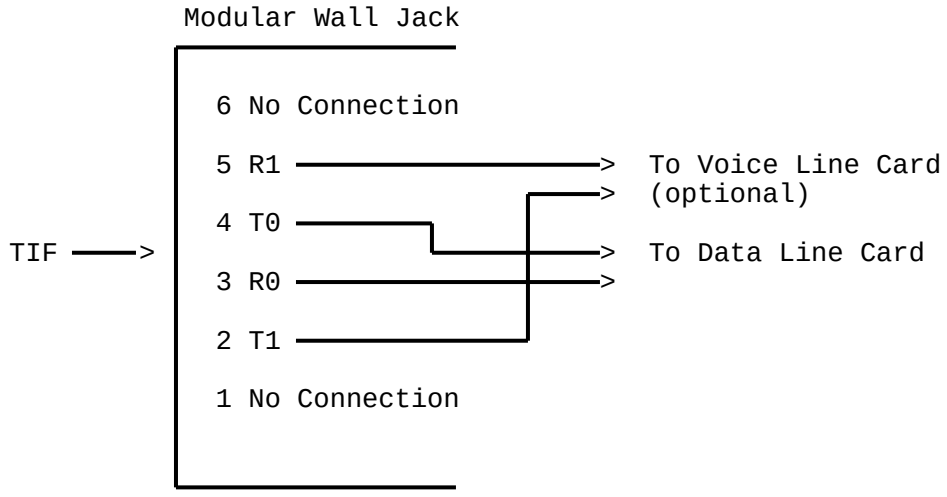


Figure 3.2 Connection from TIF Modular Jack to DLC

CUIF Slot #	Twisted Pair	Pin#	CUIF Slot #	Twisted pair	Pin#
1	T - BL1W	1	9	T - BR1R	9
	R - BL2W	26		R - BR2R	34
2	T - O1W	2	10	T - S1R	10
	R - O2W	27		R - S2R	35
3	T - G1W	3	11	T - BL1BK	11
	R - G2W	28		R - BL2BK	36
4	T - BR1W	4	12	T - O1BK	12
	R - BR2W	29		R - O2BK	37
5	T - S1W	5	13	T - G1BK	13
	R - S2W	30		R - G2BK	38
6	T - BL1R	6	14	T - BR1BK	14
	R - BL2R	31		R - BR2BK	39
7	T - O1R	7	15	T - S1BK	15
	R - O2R	32		R - S2BK	40
8	T - G1R	8	16	T - BL1Y	16
	R - G2R	33		R - BL2Y	41

Color Code
AANBB where AA indicates the primary color
(one or two letters)
B indicates the number of stripes
CC indicates the color of the stripe
(one or two letters)

Figure 3.3 Connections to CUIF Pairs

NON-SWITCHED CONFIGURATION

A non-switched data line is a direct connection from the TIF to the CUIF and does not require any type of datafill.

Cabling Requirements

The length of the twisted-pair cable connecting the TIF to the CUIF varies with the wire gauge. Use the following list as a guide for maximum cable lengths:

22- 24-gauge maximum length - approximately 5.47 km (3.39 miles)

26-gauge maximum length - approximately 4.34 km (2.69 miles)

Make the connections from the modular jack to the appropriate CUIF pair as shown in Figure 3.4, and Figure 3.3 on page 3-7 .

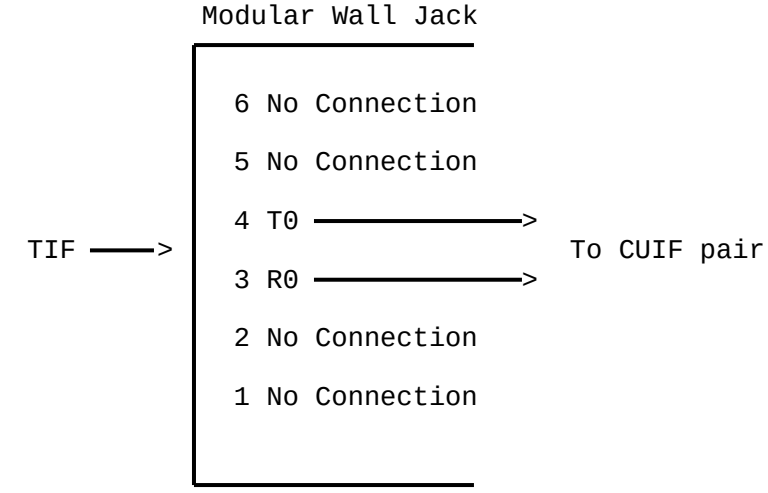


Figure 3.4 Connection from TIF to CUIF

CHAPTER 4

INSTALLING THE 3270 NETWORK SWITCHED ACCESS EQUIPMENT

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INSTALLING THE CONTROL UNIT INTERFACE SHELF

Equipment Required

To install the Control Unit Interface (CUIF) shelf, you need the following equipment.

* one CUIF shelf (NT4X25BS)

* one 48.26 cm (19 in) wide rack. The rack must be a minimum of 56 cm (22 in) deep to accommodate the shelf.

* one 25-pair cable (NT0X26LN) to connect the CUIFs in the shelf to the data lines (only 16 pairs are used). The cable should be terminated with a 50-pin male Amphenol connector (NT part # A0293170) on one end, and the appropriate connection on the other. This will depend on how you are connecting the cable to the data line.

Installation Procedure

To reduce the length of coaxial cable required, locate the rack that houses the CUIF shelf as close to the IBM control unit as possible.

1. Mount the shelf on a 48.26 cm (19 in) rack. If the shelf is mounted with another CUIF shelf or other equipment, install cooling baffles or fans to allow for sufficient ventilation and cooling.

   If inclined cooling baffles are used, allow a minimum of 8.89 cm (3.5 in) between each CUIF shelf and other equipment shelves.

   If forced air cooling is used, a minimum of 65 cfm air flow, evenly distributed throughout the shelf, is required to restrict the maximum internal temperature rise to 15 ^{0}C (27 ^{0}F).

2. Plug the Amphenol connector, which terminates the 25-pair cable, into the shelf and secure it using the two safety clasps. Do not connect the 16-pair cable to the data line(s).

3. Plug the power cord located on the rear of the shelf into a conventional 110 V ac 60 Hz outlet. Place the power switch located on the rear of the shelf in the OFF position.

INSTALLING THE CONTROL UNIT INTERFACE

Equipment Required

To install the CUIF, you need the following equipment.

* CUIF (NT4X25AM)

  Note: A minimum of two CUIFs must be installed in the shelf to satisfy the minimum load requirements of the shelf power supply.

* one data line (see Chapter 3 on page 3-1)

* one coax cable, terminated with BNC connectors, to connect the CUIF to the IBM control unit. Each of the cable pairs must be terminated with a BNC connector.

Installation Procedure

1. Remove the safety bar from the front of the CUIF shelf.

2. Set DIP switches SW1 and SW2 on the CUIF for switched or non-switched operation as shown in Figure 4.1 and in Table 4.1 on page 4-3. See Figure 2.4 on page 2-5 to locate the DIP switches on the CUIF.

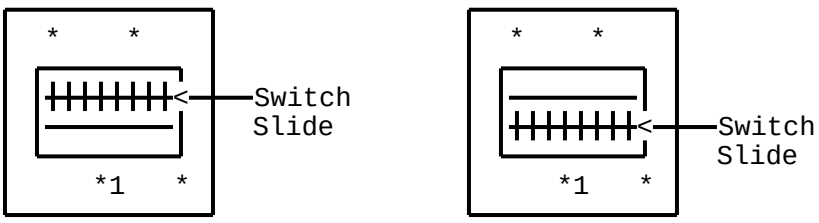

Figure 4.1 SW1 Switch Slide Settings

TABLE 4.1
SW2 SWITCH SLIDE SETTINGS

SWITCH SLIDE	SWITCHED CONFIGURATION	NON-SWITCHED CONFIGURATION
1	off	off
2	on	on
3	on	on
4	off	on

3. Slide the CUIF into one of the slots on the shelf and lock the card extractor tabs into place. The components should be facing the right side of the shelf.

   If this is the first CUIF being installed, install a second CUIF immediately. Place the power switch located on the rear of the CUIF shelf in the ON position.

   The Conn LED on the CUIF should flash to indicate that the CUIF is not connected to the data line.

   The Poll LED should flash to indicate that the CUIF is not connected to the IBM control unit.

   If only the Conn LED flashes then goes out, the CUIF has failed its diagnostic self-test. See Control Unit Interface Circuit Pack Self-Test on page 6-1 for an explanation of the diagnostic self-test.

   If both the Conn and Poll LEDs light steadily before you have established connections to the control unit or DLC, the hardware is faulty. Replace the unit.

4. Connect the appropriate BNC connector on the back of the CUIF shelf to the IBM control unit using the length of coax cable. Each BNC connector on the shelf is numbered so that you can correlate the connector to the circuit pack slot.

   The Poll LED should light steadily to indicate that the CUIF is connected to an IBM control unit. If the Poll LED continues to flash, check that the coax cable connectors are properly mated. If the Poll LED does not light, check the port on the IBM control unit.

   If you have difficulty reaching the BNC connector, temporarily lower the power supply to move it out of the way. To lower the power supply:

a. Loosen, but do not remove, the four hexagonal nuts that secure the power supply to the CUIF shelf.

b. Slide the power supply down by following the cutout pattern on the brackets that secure the power supply to the CUIF shelf.

c. When you have finished working with the BNC connectors, replace the power supply by reversing these steps.

5. Connect the CUIF to the data line using the appropriate pair from the 25-pair cable that is terminated with an Amphenol connector and connected to the back of the CUIF shelf. The cable pair should be connected to the data line using the appropriate connection (see Chapter 3 on page 3-1). The Conn LED on the CUIF circuit pack extinguishes to indicate that the CUIF is now connected to a data line.

6. Replace the safety bar on the front of the CUIF shelf.

INSTALLING THE TERMINAL INTERFACE

Equipment Required

To install the Terminal Interface (TIF), you need the following equipment.

* one TIF (with attached power supply)(NT4X25AL)

* one data line (see Chapter 3 on page 3-1)

* one line cord (NPS50318-LI), terminated with Teladapt connectors, to connect the TIF to the data line.

* one coax cable, terminated with BNC connectors, to connect the TIF to the terminal

Installation Procedure

The TIF must be located next to the terminal so that the RLS (release) key is easily accessible to the terminal user. This also reduces the length of coax cable required to connect the TIF to the terminal.

CAUTION

When installing and operating the TIF, do not place the power supply or any other object on top of the TIF.

1. Plug the power supply cord into a conventional 110 V ac 60 Hz outlet.

2. The LED located on the top of the TIF should flash continuously to indicate that the TIF is not connected to a data line.

   If the LED flashes momentarily and then extinguishes, the TIF has failed its diagnostic self-test. See Terminal Interface Self-Test on page 6-1 for an explanation of the self-test.

3. Connect the TIF to the IBM terminal using the length of coax cable. The BNC connector plugs into the back of the TIF.

   The terminal power should be on. An X followed by a symbol that resembles an elongated Z should be displayed in the terminal information area to indicate that the TIF is not connected to a data line, and does not have TCM synchronization.

0 If these symbols do not appear in the information area, check
0 that the coax cable connectors are properly mated.

0 4. Connect the TIF to the data line using the line cord. The
0 Teladapt connector plugs into the line jack closest to the
0 BNC connector on the back of the TIF.

0 The LED located on the top of the TIF should light steadily
0 to indicate that the TIF is connected to a data line, and has
0 TCM synchronization. The symbols in the terminal information
0 area should disappear.

0 When 3270 Network Switched Access is being used in the
0 switched configuration, a colon appears to indicate that the
0 terminal is ready for user input.

0 Consult Chapter 5 on page 5-1, and Chapter 6 on page 6-1 for
0 information on testing the system.

CHAPTER 5

VERIFYING THE DATA CONNECTION

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This chapter describes the procedures for establishing a data connection. Try to establish a data connection once you have finished installing the data line and the 3270 Network Switched Access hardware, to verify that all equipment is operating properly. Try to establish a connection again when you are performing routine maintenance or troubleshooting the system to help isolate any problems.

CAUTION

After entering each command, wait for the command to be processed and for the terminal screen to be refreshed. If you enter commands in rapid sequence, the screen may occasionally display an incoherent string of characters. If this condition occurs, simply clear the screen. The commands you entered will have been processed.

SWITCHED CONFIGURATION

If 3270 Network Switched Access is used in a switched configuration, data connections are always established from the terminal using the Terminal Interface (TIF). Data calls can be initiated using either Datapath keyboard dialing or automatic dialing. The Control Unit Interface (CUIF) can not be used to originate calls.

A typical data call consists of three different stages:

* call setup
* data transfer
* call take down

The DMS-100 Family switch provides the TIF with messages reporting the progress of the call. These messages are decoded and displayed on the terminal.

The CUIF answers the call automatically.

Once the CUIF receives the terminal identification information automatically from the TIF, it initiates a data session with the host control unit. The terminal screen displays the host logo.

The following is a list of the prompts that are displayed on the terminal.

:	Input selection request
#	Enter directory number
...	Connection in progress
>	Call connected
%?	Line busy - ring again?
+?	Busy line now idle - re-ring?
!?	Reorder prompt - call cannot be processed as dialed

The following is a list of the user inputs that can be entered during Datapath keyboard dialing.

+	Initiate or answer a call
!	Abort call prior to call connection
@	Auto Dial
=	Speed Call
%	Ring Again
ALT T	TIF self-test
ALT H	Physical channel check
ALT C	Clear physical data channel test results
0-9, *,#	Valid digits
A-Y, a-y	Alphas as on keyboard (Q is not valid) These alphas are translated into digits for dialing.

Setting Up a Data Call Using Datapath Keyboard Dialing

The terminal power should be on. If the terminal is equipped with a Normal/Test switch, the switch should be in the Normal position. The TIF power should be on. The LED on the top of the TIF should be lit.

Keyboard dialing does not allow you to edit your entries. If you enter a wrong character or digit while setting up a call, abort the call by entering ! and start again.

1. Toggle the RLS switch on the TIF to reset the TIF. The terminal displays : to indicate that it is ready to receive Datapath keyboard dialing commands.

   If the terminal is equipped with a Normal/Test switch, you can toggle the Normal/Test switch to test the terminal and initiate a self-test on the TIF. If the TIF fails the self-test, the LED on its cover flashes, then goes out. The failure is also indicated on the terminal screen. See Chapter 6 on page 6-1 for a detailed explanation of the failure code.

2. Enter + . The terminal displays # to indicate that it is ready to receive the directory number.

3. Dial the appropriate directory number using the numerical or alpha keys on the keyboard. The terminal displays ... to indicate that the connection is in progress.

When the called party answers, the terminal displays > to indicate that a data call has been established. You may proceed with your data session.

If the terminal receives a busy signal from the called party, it displays %? . You can abort the call or activate the ring again feature.

Setting Up a Data Call Using Automatic Dialing

If the automatic dialing feature is active, you can place a call using automatic dialing.

The terminal power should be on. If the terminal is equipped with a Normal/Test switch, the switch should be in the Normal position. The TIF power should be on. The LED on the top of the TIF should be lit.

Keyboard dialing does not allow you to edit your entries. If you enter a wrong character or digit while setting up a call, abort the call by entering ! and start again.

1. Toggle the RLS switch on the TIF to initiate a self-test and reset the TIF. The terminal displays : to indicate that it is ready to receive Datapath keyboard dialing commands.

   If the terminal is equipped with a Normal/Test switch, you can toggle the Normal/Test switch to test the terminal and initiate a self-test on the TIF.

   If the TIF fails the self-test, the LED on its cover flashes, then goes out. The failure is also indicated on the terminal screen. See Chapter 6 on page 6-1 for a detailed explanation of the failure code.

2. Enter + . The terminal displays # to indicate that it is ready to receive the directory number.

3. Enter @ . The terminal displays ... to indicate that the connection is in progress.

When the called party answers, the terminal displays > to indicate that a data call has been established. You may proceed with your data session.

If the terminal receives a busy signal from the called party, it displays %? . You can abort the call or activate the ring again feature.

Setting Up a Data Call Using Speed Dialing

If the speed dialing feature is active, you can place a call using speed dialing.

Verify that the terminal power is on, and that the Normal/Test switch (if equipped) is in the Normal position. Verify that the TIF power is on and that the LED on the top of the TIF is lit.

Keyboard dialing does not allow you to edit your entries. If you enter a wrong character or digit while setting up a call, abort the call by entering ! and start again.

1. Toggle the RLS switch on the TIF to initiate a self-test and reset the TIF. The terminal displays : to indicate that it is ready to receive Datapath keyboard dialing commands.

   If the terminal is equipped with a Normal/Test switch, you can toggle the Normal/Test switch to test the terminal and initiate a self-test on the TIF.

   If the TIF fails the self-test, the LED on its cover flashes, then goes out. The failure is also indicated on the terminal screen. See Chapter 6 on page 6-1 for a detailed explanation of the failure code.

2. Enter + . The terminal displays # to indicate that it is ready to receive the directory number.

3. Enter = followed by the one- or two-digit code that identifies the directory number you want to dial. The terminal displays ... to indicate that the connection is in progress.

   If the one- or two-digit code that you enter is not a valid code, the terminal displays ?!? . Abort the call and begin again.

When the called party answers, the terminal displays > to indicate that a data call has been established. You may proceed with your data session.

If the terminal receives a busy signal from the called party, it displays %? . You can abort the call or activate the ring again feature.

Aborting a Data Call Prior to Connection

Note: This procedure can only be used to abort a call during dialing. Once the > symbol is displayed, you must take down the data call.

Enter ! . The terminal displays : .

Ringing a Directory Number Again

1. Enter % . The terminal displays : and monitors the busy number.

   You can place another call, or wait until the busy number becomes idle. If you want to cancel the ring again request at this point, enter % again. The terminal displays : to indicate that the ring again request has been cancelled, and it is ready to receive user input.

   When the busy directory number becomes idle, the terminal displays +? .

2. Enter + to indicate that you want to continue. The terminal displays # .

3. Enter % to ring the directory number again. The terminal displays ... to indicate that the connection is in progress.

When the called party answers, the terminal displays > to indicate that the data call has been established. You may proceed with your data session.

Taking Down a Data Call

1. Logoff from the host computer using the usual logoff procedure.

   If you do not logoff, your data session will continue. Toggling the RLS or the Normal/Test switch will not terminate your data session.

2. Toggle the RLS switch on the TIF to release the call.

   If the terminal is equipped with a Normal/Test switch, you can also toggle it to take down the call.

   When you take down a call, a self-test is automatically initiated on the TIF and the CUIF. See Chapter 6 on page 6-1 for a detailed explanation of the equipment self-tests.

CAUTION

Do not attempt to take down the call by disconnecting and reconnecting the Teladapt line cord from the TIF, or by removing and restoring power to the TIF.

Programming the Number to be Auto Dialed

The auto dialing feature lets you program a directory number to be dialed automatically when you enter @ on the terminal instead of a directory number.

The terminal power should be on. If the terminal is equipped with a Normal/Test switch, make sure that the switch is in the Normal position. The TIF power should be on. The LED on the top of the TIF should be lit.

1. Toggle the RLS switch on the TIF to initiate a self-test and reset the TIF. The terminal displays : to indicate that it is ready to receive user input.

   If the terminal is equipped with a Normal/Test switch, you can toggle the Normal/Test switch to test the terminal and initiate a self-test on the TIF.

   If the TIF fails the self-test, the LED on its cover flashes, then goes out. The failure is also indicated on the terminal screen. See Chapter 6 on page 6-1 for a detailed explanation of the failure code.

2. Enter @ . The terminal displays # to indicate that it is ready to receive the auto dialing number.

3. Enter the directory number you want to store, and @ . The terminal displays : to indicate that it has stored the number and is ready to receive Datapath keyboard dialing commands.

Programming the List of Speed Dialing Directory Numbers

The speed dialing feature lets the user program a list of directory numbers that can be dialed by simply entering a one- or two-digit code.

The terminal power should be on. If the terminal is equipped with a Normal/Test switch, make sure that the switch is in the Normal position. The TIF power should be on. The LED on the top of the TIF should be lit.

1. Toggle the RLS switch on the TIF to initiate a self-test and reset the TIF. The terminal displays : to indicate that it is ready to receive Datapath keyboard dialing commands.

   If the terminal is equipped with a Normal/Test switch, you can toggle the Normal/Test switch to test the terminal and initiate a self-test on the TIF.

   If the TIF fails the self-test, the LED on its cover flashes, then goes out. The failure is also indicated on the terminal

screen. See Chapter 6 on page 6-1 for a detailed explanation of the failure code.

2. Enter = . The terminal displays # to indicate that it is ready to receive the speed dial number.

3. Enter a one- or two-digit speed dial code, the directory number you want to store, and = . The terminal displays : to indicate that it has stored the directory number and is ready to receive Datapath keyboard dialing commands.

NON-SWITCHED CONFIGURATION

If 3270 Network Switched Access is used in a non-switched configuration, each terminal is connected to a control unit port via the TIF and the CUIF. To begin a data session, simply logon to the terminal as usual.

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CHAPTER 6

DIAGNOSTICS AND TROUBLESHOOTING

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This chapter describes procedures for testing the 3270 Network Switched Access equipment, and troubleshooting any problems encountered. The Equipment Self-Tests section describes the tests used during installation to verify that all equipment is operating properly. They can also be used after installation for routine maintenance and troubleshooting. The Troubleshooting section describes some of the problems you may encounter with the equipment either during installation or during normal operation. For each problem, a series of corrective actions is suggested.

EQUIPMENT SELF-TESTS

Control Unit Interface Circuit Pack Self-Test

The Control Unit Interface (CUIF) performs a self-test when it is powered up, and following every data call. If any hardware failure is detected, the Conn LED flashes immediately after the self-test to indicate the failure, then goes out. The Conn LED flashes at a rate of one flash per second. The number of flashes indicates the area of the hardware failure:

1 = address decoding
2 = ROM checksum
3 = 8031 bus drivers
4 = external RAM
5 = 8031 CPU (including on-chip RAM)
6 = X14 TCM-LSI
7 = TCM 64 kbps data loopback
8 = inter-processor shared RAM
9 = 8X305 processor
10 = coax loopback

This test can also be initiated from the Maintenance and Administration Position (MAP) of the DMS-100 Family switch (see Troubleshooting from the MAP on page 6-13).

If the CUIF circuit pack fails its self-test, repeat the test to verify the results. If it fails the self-test a second time, replace the CUIF.

Terminal Interface Self-Test

When the Terminal Interface (TIF) is powered up, and following every data call (when the RLS or Normal/Test switch is toggled), the unit performs a self-test. If any hardware failure is detected, the LED flashes immediately after the self-test to indicate the failure, then goes out. The LED flashes at a rate of one flash per second. The number of flashes indicates the area of the hardware failure:

1 = address decoding

2 = ROM checksum
3 = 8031 bus drivers
4 = external RAM
5 = 8031 CPU (including on-chip RAM)
6 = X14 TCM-LSI
7 = TCM 64 kbps data loopback
10 = coax loopback

The results of the self-test are also displayed on the terminal screen. If a failure is detected, the terminal displays an X followed by a two-byte failure code. The code is a hexadecimal representation of the problem areas. The bits of these two bytes are set according to the following format:

BYTE 1, BIT 7 = EPROM checksum failure
BYTE 1, BIT 6 = external RAM failure
BYTE 1, BIT 5 = 56 kbps clock failure
BYTE 1, BIT 4 = digital loopback failure
BYTE 1, BIT 3 = HDLC data loopback failure
BYTE 1, BIT 2 = X14 sync loopback failure
BYTE 1, BIT 1 = analog data loopback failure
BYTE 1, BIT 0 = analog signal loopback failure
BYTE 0, BIT 7 = not used
BYTE 0, BIT 6 = not used
BYTE 0, BIT 5 = not used
BYTE 0, BIT 4 = not used
BYTE 0, BIT 3 = UART failure
BYTE 0, BIT 2 = 8031 on-chip RAM failure
BYTE 0, BIT 1 = 8031 port 1 failure
BYTE 0, BIT 0 = not used

Byte 1 refers to the higher order byte; byte 0 refers to the lower order byte.

In a switched configuration, this test can also be initiated from the terminal keyboard, or from the MAP of the DMS-100 Family switch. To initiate a TIF self-test from the terminal keyboard, press and hold the ALT key and type T . This breaks the connection to the data line card, and runs a loopback diagnostic to the twisted-pair port. The results of the test are reported in the same way as when the test is initiated on power up. To initiate a TIF self-test from the MAP see Troubleshooting from the MAP on page 6-13.

If the TIF fails its self-test, repeat the test to verify the results. If it fails the self-test a second time, replace the TIF.

PHYSICAL CHANNEL CHECKS

In a switched configuration, the data line connection between the TIF and the CUIF is based on a protocol that ensures reliable, error-free data transmission between the two devices. If bit errors do occur, the data is retransmitted. Two separate counts are kept. The first one records the number of data errors detected and corrected. The second one records the number of idle line errors that resulted in the TIF re-establishing idle line synchronization.

To access the peg counts and determine channel quality, press and hold the ALT key, and type H when no data connection is established. The peg counts are displayed as a four digit hexadecimal number. The first two digits indicate the number of link errors detected since the count was last cleared. The last two digits indicate the number of idle line errors that required line synchronization to be re-established since the count was last cleared. To clear the peg counts, press and hold the ALT key and type C .

If a non-zero number is displayed, perform a bit error rate test (BERT) to check the integrity of the data line card (DLC), the loop, and the associated TIF or CUIF (see Troubleshooting from the MAP on page 6-13).

TROUBLESHOOTING

This section describes some of the problems you may encounter with the equipment during either installation or normal operation. For each problem, the symptoms, and a series of corrective actions are described. The corrective actions should be performed in the order in which they are listed. After you have performed each action, check to see if the symptoms have disappeared and the problem has been corrected.

If the problem can not be corrected by following the prescribed actions, replace the defective unit.

TABLE 6.1
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
The TIF LED is not lit.	The TIF is not receiving power.	Verify that the power supply is properly plugged into the electrical outlet. Verify that the TIF is receiving the specified power levels from the electrical outlet (see Terminal Interface - Description on page 2-8).
The TIF LED flashes, then goes out.	The TIF has failed its self-test.	Initiate a self-test on the TIF. See Terminal Interface Self-Test on page 6-1 for information on the TIF self-test.
TIF LED flashes continuously.	There is no TCM synchronization between the TIF and the DLC (switched configuration) or the CUIF (non-switched configuration).	(Switched Configuration) Verify that the TIF is properly connected to its data line. Verify that the data line is operating properly (see Troubleshooting from the MAP on page 6-13 for information on testing the data line).

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		Verify that the CUIF is properly connected to its data line. (Non-switched Configuration) Verify that the TIF is properly connected to its data line. Verify the integrity of the data line. Verify that the CUIF is properly connected to its data line.
The terminal does not display : , before a data call is established. (Switched configuration only)	The terminal is not receiving power.	Verify that the terminal is receiving the required power levels from the electrical outlet (see Terminal Interface - Description on page 2-8) Verify that the terminal power switch is in the On position. Verify that the terminal is operating correctly. (Consult the manufacturer's documentation for further information.)
	The terminal is not properly connected to the TIF.	Verify that the coax cable between the TIF and the terminal is properly connected.
	The coax cable connecting the terminal to the TIF is defective.	Replace the length of coax cable.

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
	The central office is performing maintenance.	Wait until the maintenance symbol (stick man) displayed on the terminal disappears.
	There is a communication error between the TIF and the terminal.	Toggle the RLS switch on the TIF to reset the unit and initiate a self-test. See Terminal Interface Self-Test on page 6-1 for information on the TIF self-test. If the terminal is equipped with a Normal/Test switch, toggle the switch to reset the unit.
When you set up a call and enter + , the terminal does not display # . (Switched configuration only)	A call can not be set up from the TIF.	Abort the call by entering ! and try setting up the call again. Initiate a self-test on the TIF. See Terminal Interface Self-Test on page 6-1 for information on the TIF self-test.
The terminal displays ... (connection in progress prompt) but nothing more. (Switched configuration only)	The called CUIF is busy.	Abort the call by entering ! and try setting up the call again.
	The CUIF you have dialed is not responding.	Abort the call by entering ! and try setting up the call again.

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		Verify that the CUIF is properly configured (see Installing the Control Unit Interface on page 4-2).
Terminal displays an unintelligible string of characters.	The connection between the TIF and the terminal is bad.	Verify that the coax cable between the terminal and the TIF is properly connected.
		Toggle the RLS switch on the TIF to terminate the call and initiate a self-test on the TIF. See Terminal Interface Self-Test on page 6-1 for information on the TIF self-test.
		Press and hold the ALT key and type H to view the channel quality peg counts. See Physical Channel Checks on page 6-3 for information on interpreting the peg counts.
		Initiate a self-test on the terminal. See the manufacturer's documentation for more information.
		Check for possible failures at the CUIF.
	The CUIF DIP switches are not properly set.	Check that the CUIF DIP switches are correctly set for switched or non-switched operation. (See Installing the Control Unit Interface on page 4-2.)

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
Both the CUIF Conn and Poll LEDs light steadily before you have established connections from the CUIF to the control unit or the data line.	The CUIF card is faulty.	Replace the CUIF card.
The CUIF POLL LED flashes continuously.	There is no communication between the CUIF and the control unit.	Verify that the coax cable between the CUIF and the control unit is properly connected. Verify that the CUIF is properly installed and configured (see Installing the Control Unit Interface on page 4-2). Verify that the control unit is operating properly. See the manufacturer's documentation for more information.
The Conn LED on the CUIF flashes continuously.	There is no TCM synchronization between the CUIF and the DLC (switched configuration) or the TIF (non-switched configuration).	Check that the CUIF is properly connected to the data line. Check that the CUIF DIP switches are correctly set for switched or non-switched operation.
The LEDs on one CUIF are not lit.	The CUIF is not receiving power.	Initiate a self-test on the affected CUIF circuit pack by removing and replacing it in the shelf. See Control Unit Interface Circuit Pack Self-Test on page 6-1 for information on interpret-

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		ing the CUIF self-test results. If the LEDs still do not light up, replace the CUIF with a known good unit to determine if the problem is with the shelf.
The CUIF LEDs flash, then extinguish.	The CUIF has failed its self-test.	Replace the CUIF with a known good unit.
None of the CUIF LEDs are lit.	The CUIF shelf is not receiving power.	Check that the power supply cord on the rear of the shelf is properly plugged in at the shelf and at the electrical outlet. Check that the power switch on the rear of the shelf is in the On position. Check that the 7 A fuse on the rear of the shelf is not blown. If the fuse is blown, replace it. If the fuse blows again, replace the power supply by following the procedure described below. Remove the metal plate on the rear of the shelf. Check that the correct voltages are present at each of the terminals. If these voltages are present, replace the CUIF shelf (see Installing the Control Unit Interface

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		Shelf on page 4-1 for information on installing the shelf.) If these voltages are not present, the power supply must be replaced. To replace the power supply: 1. Turn off the power switch located on the rear of the shelf, and unplug the power cord. 2. Remove any tie-wraps securing the wires and leads. 3. Disconnect the terminal strip wires. Note the order of the connections so that you can properly connect the wires of the replacement power supply. 4. Disconnect the leads connected to the AC filter. Note the order of the connections so that you can properly connect the wires of the replacement power supply. 5. Disconnect the lead connected to the 7 A fuse. 6. Remove the hexagonal nuts that secure the

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		power supply to the shelf. 7. Remove the power supply. Replace the power supply with a known good unit by reversing the above procedure.
Response time from the mainframe is unusually long. (Switched configuration only)	The host computer is busy.	Contact the host computer support services.
	The TIF and terminal are not properly connected.	Verify that the coax cable between the TIF and the terminal is properly connected.
	The CUIF DIP switches are not properly set.	Check that the CUIF DIP switches are correctly set for switched or non-switched operation. (See Installing the Control Unit Interface on page 4-2.)
	The current switched connection is poor.	Toggle the RLS switch to terminate the call and initiate a self-test on the TIF. See Terminal Interface Self-Test on page 6-1 for information on the TIF self-test. Press and hold the ALT key and type H to view the channel quality peg counts. See Physical Channel Checks on page 6-3

Table Continued

TABLE 6.1 (Continued)
3270 NETWORK SWITCHED ACCESS TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		Initiate a self-test on the affected CUIF by removing and replacing the unit in the shelf. See Control Unit Interface Circuit Pack Self-Test on page 6-1 for information on interpreting the CUIF self-test results.
		Verify the data line connection between the TIF and the DLC by performing a BERT test (see Troubleshooting from the MAP on page 6-13).
		Verify the data line connection between the CUIF and the DLC by performing a BERT test (see Troubleshooting from the MAP on page 6-13).

TROUBLESHOOTING FROM THE MAP

Troubleshooting procedures can be invoked from the Line Test Position of the Maintenance and Administration Position (MAP).

The following tests are accessed from the MAP:

* diagnostics (DIAG) from the LTP level

* bit error rate test (BERT) from the LTPDATA level

* loopback (LOOPBK) from the LTPDATA level

* subscriber status (SUSTATE) from the LTPDATA level

The DIAG command performs an integrity test and a self-test on the data line card, and tests communication with the associated TIF or CUIF.

The BERT command transmits a bit pattern through the network to the two-wire data facility and the 3270 Network Switched Access equipment. The transmitted bit pattern is compared to the received bit pattern to determine the quantity of bit errors and synchronization slips.

The bit error rate test will not function when the data unit under test is communicating with another data unit.

The LOOPBK command interrupts a bit pattern at a specified loop-back point and returns the pattern to the source. The transmitted bit pattern is compared to the received bit pattern to determine the quantity of errors and synchronization slips between the source and the loopback point.

The SUSTATE command reports the status of the CUIF, the TIF, and the associated two-wire loop.

For details on how to initiate these tests and interpret the results, see NTP 297-2101-516, Lines Maintenance Reference Manual.

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CHAPTER 7

ACRONYMS AND ABBREVIATIONS

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APL	A Program Language
BCS	Batch Change Supplement
CI	Command Interpreter
CCU	Controller Coax Unit
Coax	coaxial
Conn	Connect
CSA	Canadian Standards Association
CUIF	Control Unit Interface
DLC	Data Line Card
DMS	Digital Multiplex System
DN	Directory Number
DU	Data Unit
EMI	Electro Magnetic Interference
ESD	Electro Static Discharge
FCC	Federal Communication Commission
IBM	International Business Machines
LCC	Line Class Code
LED	Light Emitting Diode
LEN	Line Equipment Number
MAP	Maintenance and Administration Position
MTBF	Mean Time Between Failure
NTP	Northern Telecom Practice
PC	Personal Computer
RLS	Release
TCM	Time Compression Multiplexing
TCU	Terminal Coax Unit
TIF	Terminal Interface
UL	Underwriters’ Laboratories
VLC	Voice Line Card