297-2121-226
VINTAGE 05.01
STANDARD

DIGITAL SWITCHING SYSTEMS

DMS*-100 FAMILY DATAPATH*

DATA UNIT - INSTALLATION AND MAINTENANCE

---

* DMS and DATAPATH are trademarks of Northern Telecom.

0 297-2121-226
0 VINTAGE 05.01

0 (c) Northern Telecom 1989, 1990, 1993

CONTENTS

CHAPTER 1: ABOUT THIS DOCUMENT

PURPOSE 1-1

APPLICABILITY OF THIS DOCUMENT 1-1

How to identify the software in your office 1-2

REVISION HISTORY 1-2

WHERE TO FIND INFORMATION 1-2

In the DATAPATH documentation package 1-3
In other documents 1-3

CHAPTER 2: UNDERSTANDING DATAPATH DATA UNITS

DATA UNIT CAPABILITIES 2-1

DATA UNIT CONFIGURATIONS 2-1

CALL PATH RESTORATION 2-3

CHAPTER 3: DESCRIPTIONS AND SPECIFICATIONS

DESKTOP DATA UNIT DESCRIPTION 3-2

Controls and Indicators (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ) 3-11
Internal Options (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ) 3-23

DESKTOP DATA UNIT SPECIFICATIONS 3-24

Mechanical Specifications 3-24
Electrical Specifications 3-24
Environmental Specifications 3-25
Regulatory Compliance 3-25

RACKMOUNT DATA UNIT DESCRIPTION 3-26

Controls and Indicators (NT4X25AD /AV /CH /DF) . . . 3-29
Options (NT4X25AD /AV /CH /DF) 3-31

RACKMOUNT DATA UNIT SPECIFICATIONS 3-40

Mechanical Specifications 3-40
Electrical Specifications 3-40
Environmental Specifications 3-40
Regulatory Compliance 3-40

SHELF AND POWER SUPPLY DESCRIPTION 3-41

Shelf - NT4X25BH or NT4X25DH 3-41
Power Supply 3-43

SHELF SPECIFICATIONS (NT4X25BH/DH) 3-44

Mechanical Specifications 3-44

POWER SUPPLY SPECIFICATIONS - NT4X2554 3-45

Mechanical Specifications 3-45
Electrical Specifications 3-45
Environmental Specifications 3-45
Regulatory Compliance 3-45

POWER SUPPLY SPECIFICATIONS - NT4X25DK 3-46

Mechanical Specifications 3-46
Electrical Specifications 3-46
Environmental Specifications 3-46
Regulatory Compliance 3-46

POWER SUPPLY SPECIFICATIONS - NT4X25DL 3-47

Mechanical Specifications 3-47
Electrical Specifications 3-47
Environmental Specifications 3-47
Regulatory Compliance 3-47

CALL PATH RESTORATION 3-48

Setting Up The CPR Feature 3-48
Datafilling the CPR feature 3-48
Removing the CPR Feature 3-49

CHAPTER 4: DATA UNIT INSTALLATION

DESKTOP DATA UNIT INSTALLATION 4-1

Setting the Configuration Switches 4-1
Making the Connections to the DU 4-5
Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) . 4-6
Setting the Options (NT4X25AF /AG /AH /AK) 4-7

RACKMOUNT DATA UNIT INSTALLATION (NT4X25AD /CH /AV /DF) 4-9

Installing the NT4X25DH shelf 4-9
Installing the Rackmount Shelf Alarms 4-11
Connecting Data Lines to the Shelf 4-12
Setting the Configuration Switches 4-12
Setting the Options 4-13
Installing the Rackmount DUs 4-13

CHAPTER 5: VERIFYING OPERATION

STATUS INDICATOR LEDS 5-1

DESKTOP DU (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ) 5-3

Self-test 5-3
Switched Configuration Verification 5-4
Non-Switched Configuration Verification 5-9

RACKMOUNT DU (NT4X25AD /CH /AV /DF) 5-9

Self-test 5-9
Switched Configuration Verification 5-10
Non-Switched Configuration Verification (NT4X25AD /CH /AV /DF) 5-12

CHAPTER 6: TROUBLESHOOTING

STATUS INDICATORS 6-1

TROUBLESHOOTING 6-3

CHAPTER 7: GLOSSARY

ILLUSTRATIONS

FIGURES

2.1 Typical Switched Configuration 2-2
2.2 Typical Non-Switched Configuration 2-2
3.1 NT4X25AA /AN /AX /AZ - RS-232C Desktop Data Unit . 3-3
3.2 NT4X25AE /AP - V.35 Desktop Data Unit 3-4
3.3 NT4X25AF/AH RS-232C Desktop Data Unit 3-5
3.4 NT4X25AG/AK V.35 Desktop Data Unit 3-6
3.5 NT4X25AA /AE /AN /AP /AX /AZ - Rear View 3-8
3.6 NT4X25AF /AG /AH /AK - Rear View 3-9
3.7 DTE Connector Pinout 3-10
3.8 MI Pulse/MI Level and MI Invert/Normal Settings . . 3-17

0 3.9 NT4X25AF /AH Switch Settings for CTS Delay 3-21
0 3.10 NT4X25AD /AV /CH /DF Rackmount DU - Front View . . 3-26
0 3.11 MI Pulse/MI Level and MI Invert/Normal Settings . . 3-36
0 3.12 NT4X25CH Switch Settings for Modem Pool CTS Delay 3-38
0 3.13 Rackmount DU Option Switches 3-39
0 3.14 NT4X25BH/DH Shelf - Mounting Hole Dimensions . . . 3-41
0 3.15 C0 and C1 Connector Pinout 3-42
0 3.16 DU Shelf Backplane 3-43
0 4.1 Desktop DU - SW1 and SW2 Configuration Switch Locations 4-3
0 4.2 Desktop DU - SW1 and SW2 Configuration Switch Settings 4-4
0 4.3 Desktop DU Connections - Rear View 4-5
0 4.4 Desktop DU - Option Selector Switches 4-6
0 4.5 Rackmount DU - Connections to the Backplane 4-10
0 4.6 Rackmount DU - Configuration Switch Settings . . . 4-14
0 4.7 Rackmount DU Option Switches 4-15
0 4.8 Rackmount DU - Baud Rate Switch Settings 4-16
0 5.1 Status Indicator Chart 5-2
0 6.1 Failures Indicated by Status LEDs 6-2

0 TABLES

0 3.1 Desktop Data Unit Controls and Indicators 3-11
0 3.2 Desktop Data Unit Options 3-14
0 3.3 Rackmount Data Unit Options 3-31
0 4.1 Additional Speed Settings 4-8
0 6.1 Data Unit Troubleshooting 6-3

CHAPTER 1

ABOUT THIS DOCUMENT

0 297-2121-226
0 VINTAGE 05.01

PURPOSE

This document describes rackmount and desktop data units for Datapath. It provides installation instructions, verification methods and troubleshooting information for installation and maintenance personnel. Where applicable, shelves and external power supplies associated with the data units are also described.

This document applies to the following data units:

- NT4X25AA (Manufacture Discontinued)
- NT4X25AD (Manufacture Discontinued)
- NT4X25AE (Manufacture Discontinued)
- NT4X25AF
- NT4X25AG
- NT4X25AH
- NT4X25AK
- NT4X25AN
- NT4X25AP
- NT4X25AV
- NT4X25AX (Manufacture Discontinued)
- NT4X25AZ
- NT4X25CH
- NT4X25DF

This document applies to the following data unit shelves:

- NT4X25BH (Manufacture Discontinued)
- NT4X25DH

This document applies to the following power supply units, used with the NT4X25DH data unit shelf:

- NT4X25DK
- NT4X25DL

APPLICABILITY OF THIS DOCUMENT

Northern Telecom (NT) software releases are referred to as batch change supplements (BCS) and are identified by a number, for example, BCS26.

This document applies to DMS-100 Family offices that have BCS35. Unless the document is revised, it also applies to offices that have software releases greater than BCS35.

To determine if this document has been revised, check the release information in the Master index of publications, 297-1001-001.

How to identify the software in your office

The Office feature record D190 lists your current BCS and the NT feature packages which it comprises.

To view similar information on screen, enter the following command string at a MAP (maintenance and administration position).

```
>PATCHER;INFORM LIST;LEAVE
```

Datapath RS-232C data unit and V.35 data unit features are contained in software package NTX250AA.

REVISION HISTORY

BCS	DATE	REVISIONS
BCS35	March 1993	Added information on NT4X25DH Data Unit Shelf, NT4X25DK AC to DC Power Supply, and NT4X25DL DC to DC Power Supply.
BCS30	February 1990	Added information on the Call Path Restoration (CPR) feature.

WHERE TO FIND INFORMATION

Documents that you require to understand the content of this document, or to perform the procedures it describes, are referred to in the appropriate places in the text.

These documents, and others that contain related information, are listed in the following sections:

* In the DATAPATH documentation package

* In other documents

Note: More than one version of these documents may exist. To determine which version of a document applies to the BCS in your office, check the release information in the Master index of publications, 297-1001-001.

0 In the DATAPATH documentation package

0 The DATAPATH package contains these documents.

DOCUMENT	TITLE
297-2121-100	Datapath - Guide to Documentation
297-2121-182	Line Engineering - Rules and Procedures
297-2121-224	Modem Pools Installation and Maintenance
297-2121-100	Datapath - Guide to Documentation
297-2121-182	Line Engineering - Rules and Procedures
297-2121-100	Modem Pools Installation and Maintenance

0 In other documents

0 This section lists documents that contain information on related topics.

DOCUMENT	TITLE
297-1001-100	System Description
297-1001-001	Guide to Northern Telecom Practices
297-1001-825	Glossary of Terms and Abbreviations
297-1001-300	Basic Administration Procedures
297-1001-451	Customer Data Schema
297-1001-455	The Office Parameters Reference Manual
297-1001-533	Bit Error Rate Performance Testing
297-1001-814	Operational Measurements (OM)
297-1001-820	Non-Menu Commands Reference Manual

0 Table Continued

DOCUMENT	TITLE
297-1001-821	Menu Commands Reference Manual

CHAPTER 2

UNDERSTANDING DATAPATH DATA UNITS

0 297-2121-226
0 VINTAGE 05.01

This chapter outlines the capabilities of a data unit (DU) and briefly describes DU configurations.

DATA UNIT CAPABILITIES

A DU provides an interface between data terminal equipment (DTE) and a two-wire non-loaded loop. Data is transmitted on the two-wire loop using time compression multiplexing (TCM). The TCM technology provides a data channel that is capable of handling data at a rate of 64 kbps with an 8 kbps signaling channel.

There are two types of data units:

* RS-232C data units

* V.35 data units

RS-232C data units have an RS-232C DTE interface and are capable of transmitting data synchronously or asynchronously. Transmission speeds are user-selectable up to 19.2 kbps in full-duplex mode (half-duplex mode is supported). The RS-232C DUs are available in desktop (standalone) or rackmount models.

V.35 data units have a V.35 interface and are capable of transmitting data synchronously at 48 kbps, 56 kbps or 64 kbps in full-duplex mode (half-duplex mode is supported). The V.35 DUs are available in desktop or rackmount models.

Data units have controls and indicators for selecting options, features and diagnostic self-tests.

For detailed descriptions and specifications see Chapter 3 on page 3-1. For details on diagnostics see Chapter 5 on page 5-1.

DATA UNIT CONFIGURATIONS

Data units can be connected in either of two configurations:

* switched

* non-switched

In a switched configuration, the DU is connected to a data line card (DLC) in the DMS-100 Family switch. In a typical application, data on the two-wire loop is switched through the central office to another DU and DTE (see Figure 2.1 on page 2-2).

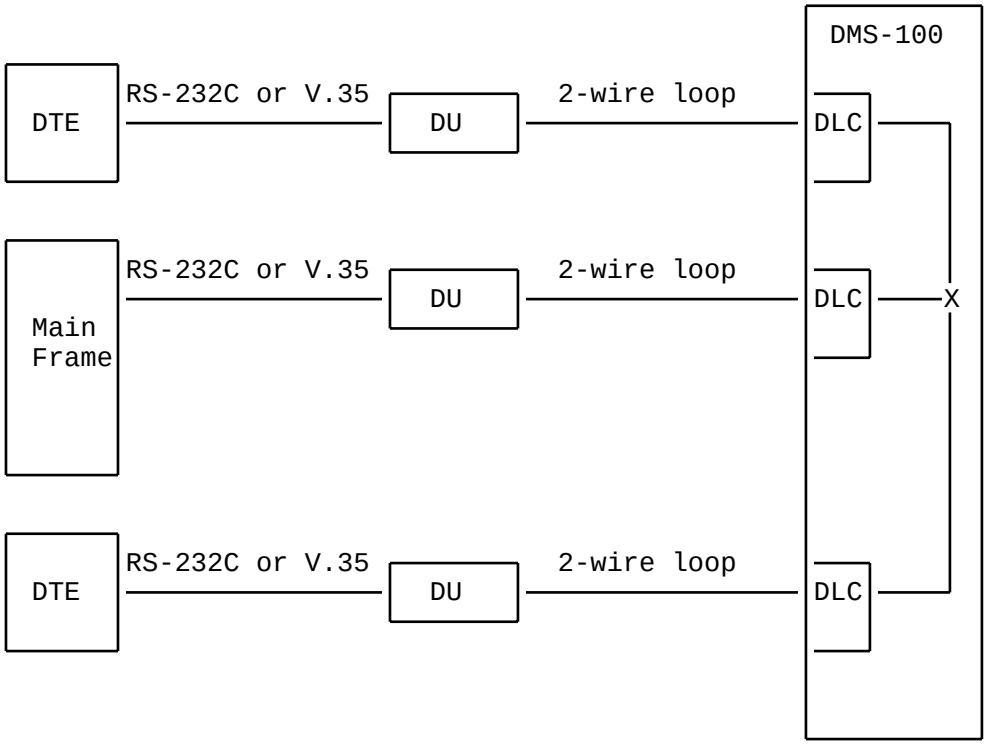


Figure 2.1 Typical Switched Configuration

In a non-switched (back-to-back) configuration, two DUs are directly connected on a single two-wire loop (see Figure 2.2).

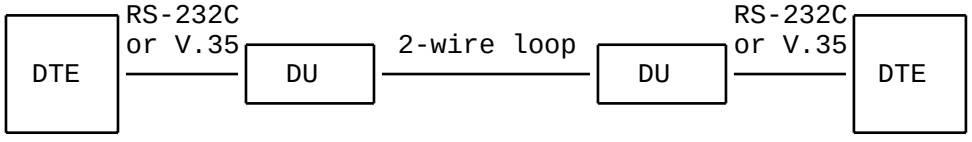


Figure 2.2 Typical Non-Switched Configuration

Refer to 297-2121-182, Line Engineering Rules for information on maximum cable lengths.

CALL PATH RESTORATION

In a switched configuration, if you assign the Call Path Restoration (CPR) feature to a data line of an associated data unit (DU), the data unit re-establishes any calls that are inadvertently disconnected.

This feature and the Virtual Private Line (VPL) option (see Paragraph: Virtual Private Line on page 3-22) can be useful for such applications as:

* mainframe to printer connection

* host to remote terminal

* LAN bridging

In such applications, assign the CPR feature to the data unit at the remote site. For a description of the CPR feature, see Call Path Restoration on page 3-48.

0 297-2121-226
0 VINTAGE 05.01

CHAPTER 3

DESCRIPTIONS AND SPECIFICATIONS

0 297-2121-226
0 VINTAGE 05.01

This chapter provides detailed descriptions and specifications for the following data units (DUs):

Desktop DUs		Rackmount DUs	
RS-232C	V.35	RS-232C	V.35
NT4X25AA	NT4X25AE	NT4X25AD	NT4X25AV
NT4X25AF	NT4X25AG	NT4X25CH	
NT4X25AH	NT4X25AK	NT4X25DF *	
NT4X25AN	NT4X25AP		
NT4X25AX			
NT4X25AZ *			

*
Change kit NT4X25AY (must be ordered separately) upgrades the NT4X25AN DU to the NT4X25AZ DU. Change kit NT4X25DE (must be ordered separately) upgrades the NT4X25AD DU to the NT4X25DF DU. The upgrade consists of Electronic Industries Association (EIA) hardware lead modifications to support data-flow control, and enhancements to NT symbolic keyboard dialing for host computer applications.

Rackmount DU Shelves and Power Supplies

Descriptions and specifications for the rackmount data unit shelves and their associated power supplies are also provided. These are:

* NT4X25BH shelf (manufacture discontinued)

* NT4X2554 AC to DC power supply for NT4X25BH shelf (manufacture discontinued)

* NT4X25DH shelf (replaces NT4X25BH shelf, requires NT4X25DK or NT4X25DL power supply - see below)

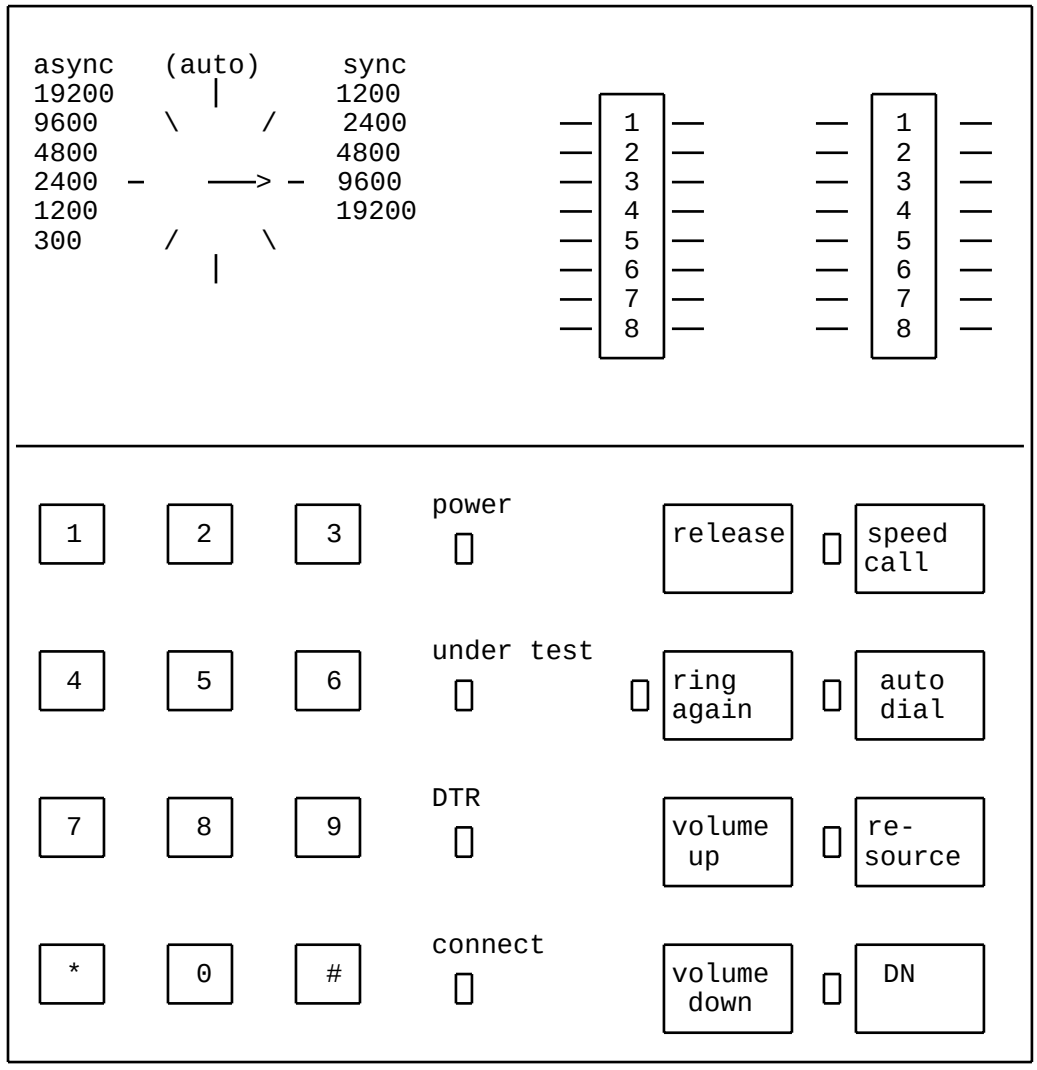
* NT4X25DK (provisionable AC to DC power supply for NT4X25DH shelf)

* NT4X25DL (provisionable DC to DC power supply for NT4X25DH shelf)

0 297-2121-226
0 VINTAGE 05.01

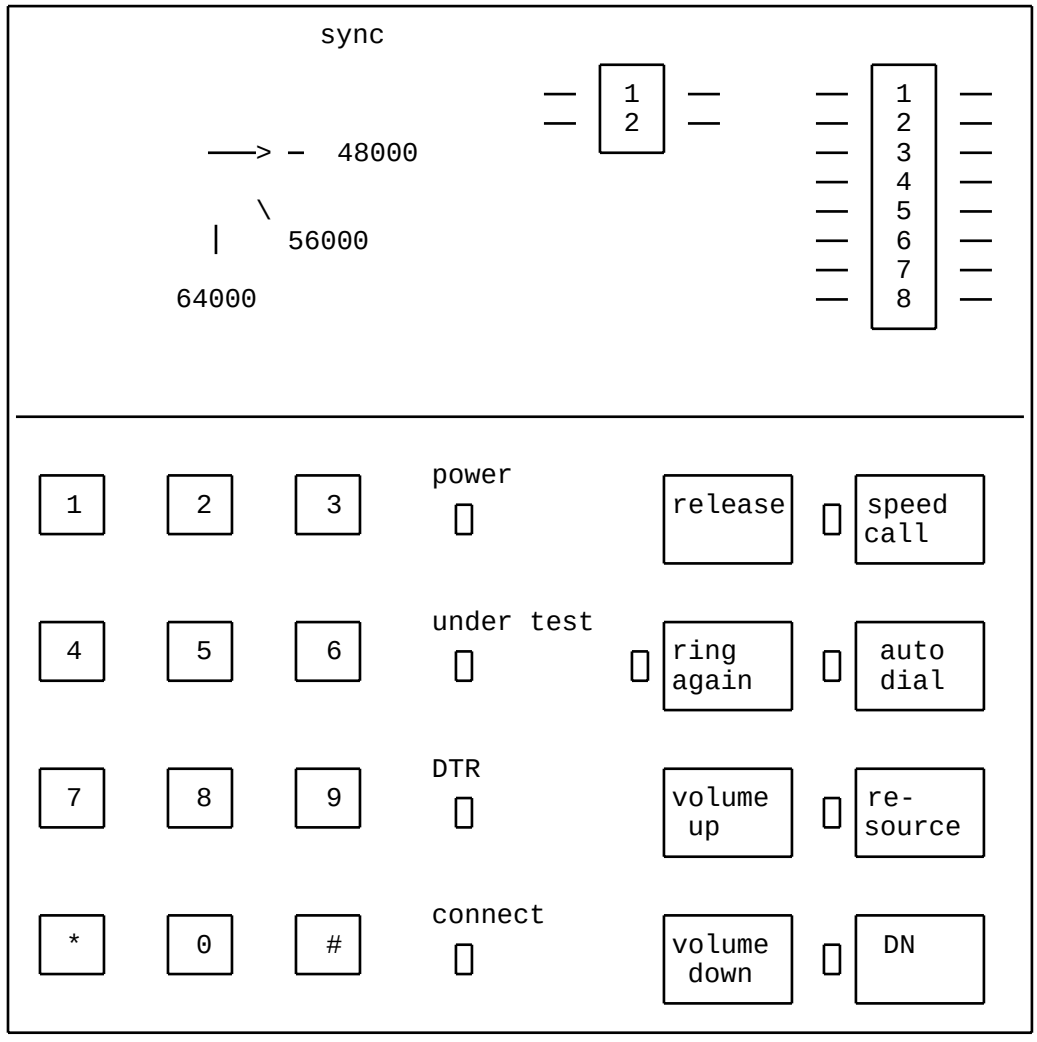
0 DESKTOP DATA UNIT DESCRIPTION

0 The controls and indicators on the front panel of the desktop DUs
0 described in this section are illustrated in Figure 3.1 on page
0 3-3, Figure 3.2 on page 3-4, Figure 3.3 on page 3-5 and
0 Figure 3.4 on page 3-6.



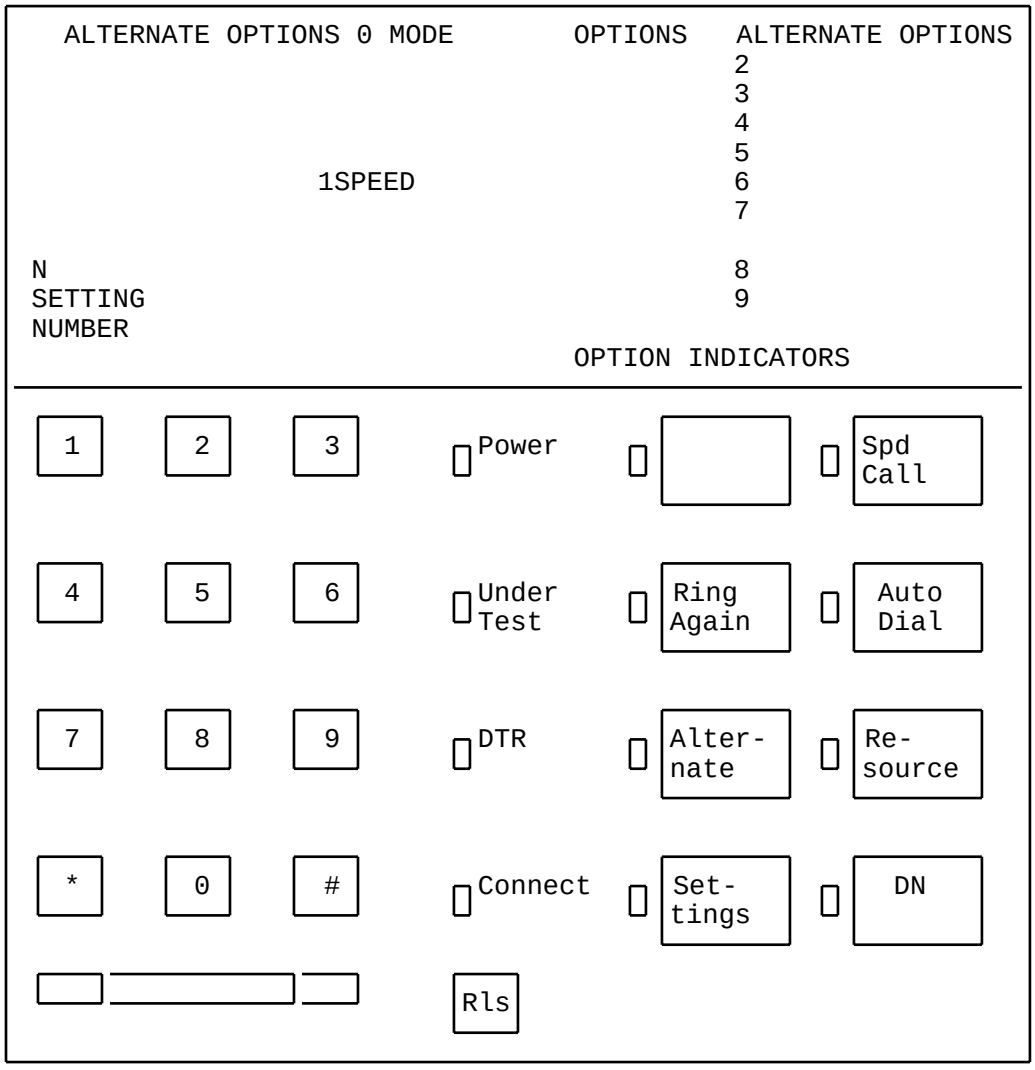
Note: The speed selector and option switches are under a flip-up lid.

Figure 3.1 NT4X25AA /AN /AX /AZ - RS-232C Desktop Data Unit



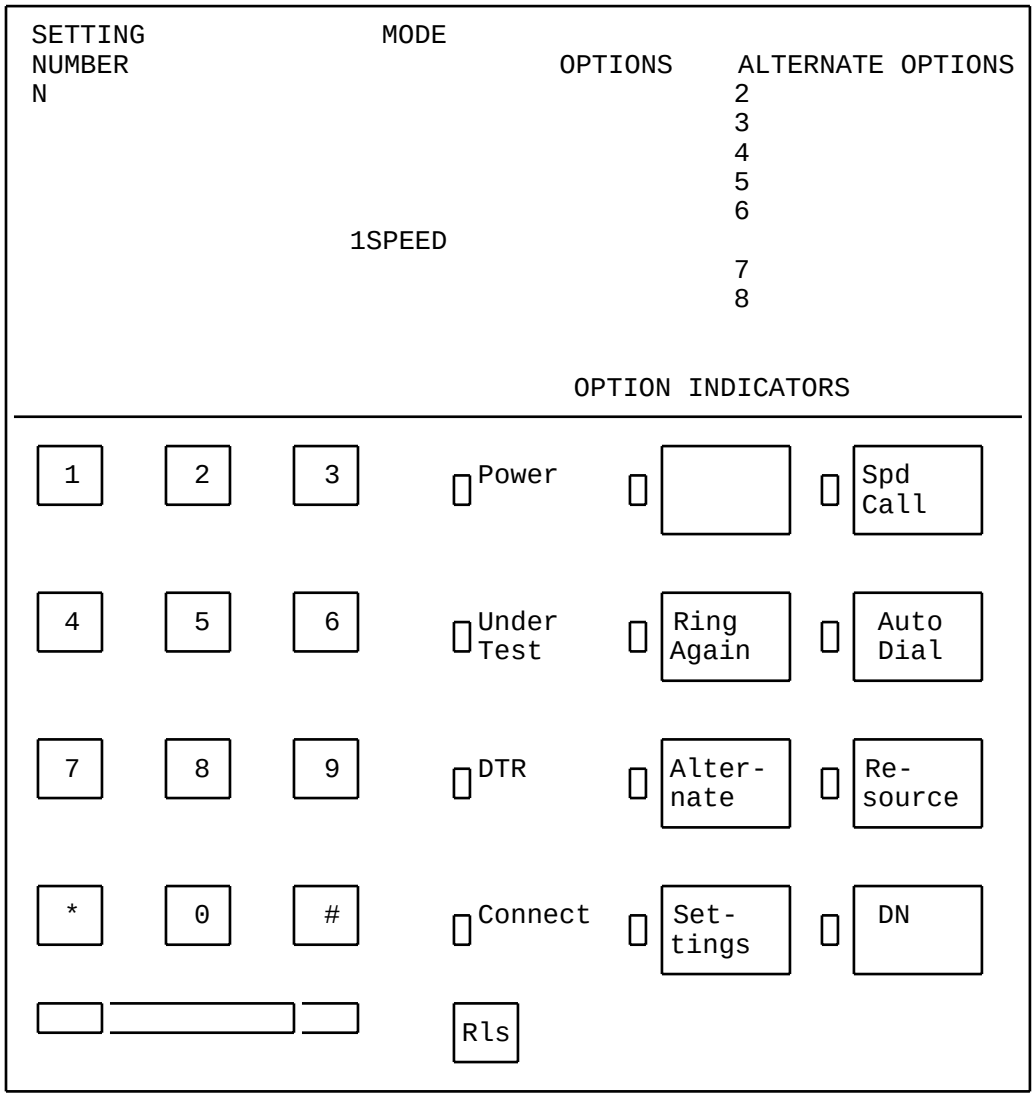
Note: The speed selector and option switches are under a flip-up lid.

Figure 3.2 NT4X25AE /AP - V.35 Desktop Data Unit



Note: The option LEDs are located under a flip-up lid.

Figure 3.3 NT4X25AF/AH RS-232C Desktop Data Unit



Note: The option LEDs are located under a flip-up lid.

Figure 3.4 NT4X25AG/AK V.35 Desktop Data Unit

Desktop DUs provide an interface between data terminal equipment (DTE) and a two-wire non-loaded loop. Data is transmitted on the loop using time compression multiplexing (TCM). The TCM technology provides a data channel that is capable of handling data at a rate of 64 kbps with an 8 kbps signaling channel.

The RS-232C desktop DUs can transmit data in any of three modes:

* synchronous
* asynchronous
* asynchronous autobaud

Transmission speeds are selectable up to 19.2 kbps. In the asynchronous autobaud mode, the DU adapts to the speed of the DTE and supports the following speeds:

* 50 bps
* 75 bps
* 110 bps
* 134.5 bps
* 150 bps
* 300 bps
* 600 bps
* 1200 bps
* 1800 bps
* 2000 bps
* 2400 bps
* 3600 bps
* 4800 bps
* 7200 bps
* 9600 bps
* 19200 bps

In the asynchronous autobaud mode, the data unit can transmit data with odd, even or no parity.

The V.35 desktop DUs are can transmit data synchronously at 48 kbps, 56 kbps, or 64 kbps.

Both the RS-232C and V.35 DUs transmit in full-duplex mode (half-duplex is supported).

The desktop DU is packaged in a plastic housing for installation on a desktop, or on the wall. It has an attached external power supply that connects to a standard 110 V ac power receptacle. The power supply is placed on the floor. There is a flip-up lid on the DU that conceals the option selector switches. These switches are used to set DU options and transmission speeds. User instructions are printed on a quick-reference panel on the underside of the lid.

Profile downloading, if available, allows some options to be downloaded from the NT6X71AB data line card (DLC). Additional

features such as automatic line are entered using Service Orders at the DMS-100 Family switch.

On the rear of the desktop DU there are two TELADAPT* jacks and a DTE interface (DB-25 or V.35 connector). Figure 3.5 and Figure 3.6 on page 3-9 show rear views of the desktop DUs.

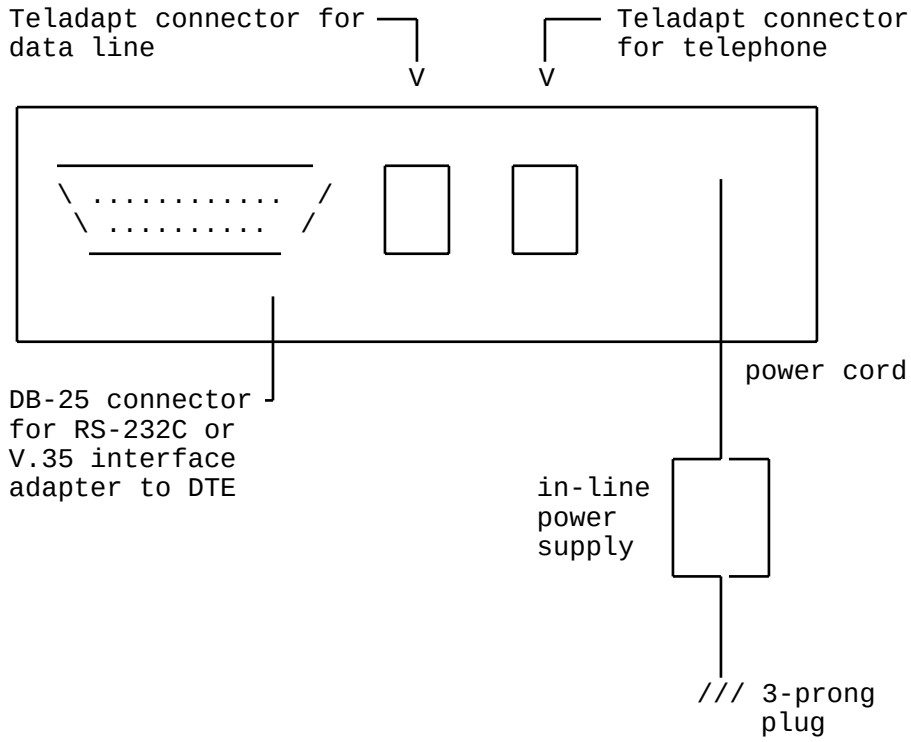


Figure 3.5 NT4X25AA /AE /AN /AP /AX /AZ - Rear View

The data terminal equipment (DTE) connects to the DB-25 or V.35 connector on the DU with an RS-232C or V.35 interface cable. An adapter cable is supplied with the NT4X25AE /AP V.35 model DUs to connect the DTE to the DB-25 connector on the DU. The pinouts for the DB-25 connector and the V.35 adapter cable are illustrated in Figure 3.7 on page 3-10.

The Teladapt jack closest to the DB-25 or V.35 connector connects to the two-wire loop (data line). If a voice line has been installed by the operating company, the Teladapt jack closest to the power cord is used to connect a telephone.

* TELADAPT is a trademark of Northern Telecom

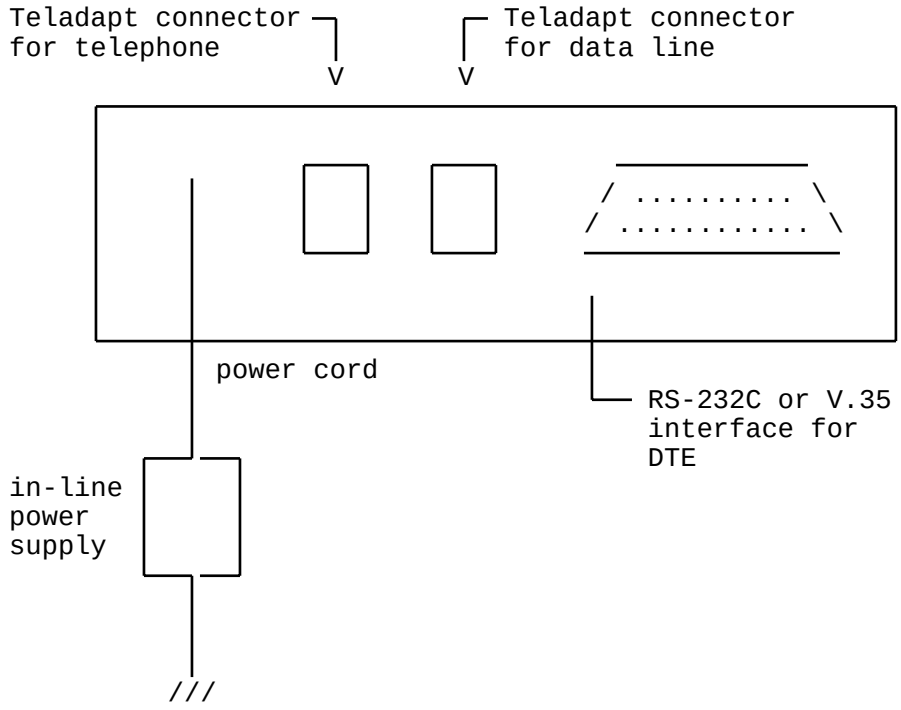


Figure 3.6 NT4X25AF /AG /AH /AK - Rear View

Each desktop DU has LEDs (light emitting diodes) that indicate the status of tests, power, ring again and other operations. A built-in speaker lets you hear call progress tones such as ring back, busy tones and recorded announcements. Control keys on the front panel of the unit control such functions as volume, call release, auto dial and speed call.

There are two banks of DIP switches located on the circuit card inside the DU (SW1 and SW2) (see Figure 4.1 on page 4-3 and Figure 4.2 on page 4-4). These DIP switches are set at the factory for a switched/slave configuration. Switch SW2-1 allows signal ground to be connected or isolated from ac ground. This switch is factory-set with signal ground isolated from ac ground. If you need to reset these switches, see Setting the Configuration Switches on page 4-1.

DB-25 Pin	V.35 Pin	EIA Signal	CCITT Circuits		Schematic Label
1	A	AA	DG	101	EGND
2	P	BA	SDA	103A	SD
3	R	BB	RDA	104A	RD
4	C	CA	RTS	105	RTS
5	D	CB	CTS	106	CTS
6	E	CC	DSR	107	DSR
7	B	AB	SG	102	GND
8	F	CF	RSLD	109	CD
9	CC	-	-	-	+12 test
10	L	-	-	-	-12 test
11	K	-	-	-	-
12	X	-	SCRB	115B	SCB
13	S	-	SDB	103B	SDB
14	AA	-	SCTB	114B	SCB
15	Y	DB	SCTA	114A	DCK
16	T	-	RDB	104B	RDB
17	V	DD	SCRA	115A	DCK
18	M	-	-	-	-
19	HH	-	-	-	-
20	H	CD	DTR	108.2	DTR
21	EE	CG	SQD	110	ALM
22	J	CE	RI	125	RI
23	W	-	CSTEB	113B	CSA
24	U	DA	CSTEA	113A	CCK
25	MM	-	-	-	-

Note:
- The +12 and -12 test points are not available on the NT4X25AA /AE /AX models.
- Pins 13, 16 and 23 are not connected on the NT4X25AF /AH data unit.

Figure 3.7 DTE Connector Pinout

Controls and Indicators (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ)

The controls and indicator LEDs described in this section are located on the front panel of the DU. Table 3.1 lists the controls and indicators found on each data unit model. For details on how to use the controls and indicators described in this section, consult the user guide supplied with the DU.

TABLE 3.1
DESKTOP DATA UNIT CONTROLS AND INDICATORS

	PEC SUFFIX									
CONTROLS	AA	AE	AF	AG	AH	AK	AN	AP	AX	AZ
Power LED	X	X	X	X	X	X	X	X	X	X
Under Test or Self-Test LED	X	X	X	X	X	X	X	X	X	X
DTR LED	X	X	X	X	X	X	X	X	X	X
Connect LED	X	X	X	X	X	X	X	X	X	X
DN key and LED	X	X	X	X	X	X	X	X	X	X
Auto Dial key and LED	X	X	X	X	X	X	X	X	X	X
Ring Again key and LED	X	X	X	X	X	X	X	X	X	X
Speed Call key and LED	X	X	X	X	X	X	X	X	X	X
Resource key and LED	X	X	X	X	X	X	X	X	X	X
Volume Up/Down keys	X	X	X	X	X	X	X	X	X	X
Release key	X	X	X	X	X	X	X	X	X	X
Speaker	X	X	X	X	X	X	X	X	X	X
Alternate key and LED			X	X	X	X				
Settings key and LED			X	X	X	X				
Spare Feature key and LED			X*	X*	X*	X*				

*This key is assigned a function using Service Orders

0 Power LED:

The Power LED provides an indication of power and synchronization with the DLC (switched configuration) or another DU (non-switched configuration). When power is supplied to the DU and there is no synchronization with the DLC or another DU, the LED flashes. When power is supplied to the DU and there is synchronization with the DLC or another DU, the LED remains lit. If there is no power to the DU, the LED is off.

0 Under test LED:

When the DU undergoes any diagnostic or loopback test, the Under Test LED remains lit for the duration of the test.

0 DTR LED:

The DTR (data terminal ready) LED lights when the DTE is ready to setup a data connection. The DTR LED remains lit when the DTR option is asserted. See Paragraph: Assert DTR/Normal on page 3-15.

0 Connect LED:

The Connect LED flashes while a call is being connected. Once the data connection is established, the LED remains lit.

0 DN key and LED:

The DN key is used to originate and answer calls. When there is an incoming call, the DN LED flashes. While there is a call in progress, the DN LED remains lit. When the DU is idle, the DN LED is off.

0 Auto Dial key and LED:

The Auto Dial feature is used to automatically dial a stored directory number. The Auto Dial key activates the feature. The Auto Dial LED flashes when the DU is ready to store the directory number during programming. The Auto Dial LED is either off or flashing; it is never continuously lit.

This feature is provided by the DMS-100 Family switch.

0 Ring Again key and LED:

The Ring Again feature is used to monitor a busy line. The Ring Again key activates the feature. While the feature is active, and a busy line is being monitored, the Ring Again LED remains lit. When the line being monitored becomes free, the LED flashes.

This feature is provided by the DMS-100 Family switch.

0 Speed Call key and LED:

The Speed Call feature automatically dials one of the directory numbers stored in memory. The Speed Call key activates the feature and allows you to dial the desired speed call code from either the short or long list of directory numbers.

This feature is provided by the DMS-100 Family switch.

0 Resource key and LED:

The Resource key is used to connect the DU to a special network resource such as a modem pool. When the Resource LED flashes, the Resource key is pressed to engage the resource (such as a modem pool element). The Resource LED remains lit while the resource is in use.

This feature is provided by the DMS-100 Family switch.

0 Volume Up/Down keys:

The Volume Up key is used to increase the volume of the call progress tones heard through the DU speaker. The Volume Down key is used to decrease the volume of the call progress tones heard through the DU speaker. On the NT4X25AF /AG /AH /AK data units, these two keys are combined into one rocker switch.

0 Release key:

The Release key provides a momentary on-hook signal to take down a call.

0 Speaker:

The built-in speaker allows you to hear call progress tones such as dial tone, busy tone, and ring back.

0 Settings key and LED:

The Settings key is used to select the various options located under the flip-up lid. When the settings key is pressed and the LED flashes, use the numeric keypad to select options. Pressing the key again turns off the LED and disables the option setting.

0 Alternate key and LED:

The Alternate key is used in conjunction with the Settings key to set various options located under the flip-up lid. When both the Settings and Alternate keys are pressed, the Settings LED flashes and the Alternate LED lights steadily. Use the numeric keypad to set the Alternate options located under the flip-up lid. Press the Alternate key again to turn off the LED and disable the Alternate option.

Spare Feature key and LED:

The spare feature key and LED can be assigned to any DMS-100 Family switch feature, such as Make Set Busy, using Service Orders.

This feature is provided by the DMS-100 Family Switch.

TABLE 3.2
DESKTOP DATA UNIT OPTIONS

	PEC SUFFIX									
OPTIONS	AA	AE	AF	AG	AH	AK	AN	AP	AX	AZ
Assert DTR/Normal	X	X	X	X	X	X	X	X	X	X
Assert RTS/Normal	X	X	X	X	X	X	X	X	X	X
Delay CTS/Normal	X						X		X	X
MI Pulse/MI Level	X		X*		X*		X		X	X
MI Invert/Normal			X*		X*		X		X	X
KBD Enable/Disable							X		X	X
Switch A/Normal							X		X	X
Switch B/Normal							X		X	X
Auto Ans/Man Ans	X	X	X	X	X	X	X	X	X	X
Auto Orig/Man Orig	X	X	X	X	X	X	X	X	X	X
Self-Test/Normal	X	X	X	X	X	X	X	X	X	X
Far-End Loop/Normal	X	X	X	X	X	X	X	X	X	X
Local Loop/Normal	X	X	X	X	X	X	X	X	X	X
Ext Clock/Int Clock	X	X	X	X	X	X	X	X	X	X
Adaptive/Normal	X	X	X	X	X	X	X	X	X	X
Buzz Loud/Soft	X	X					X	X	X	X
Data Speed	X	X	X	X	X	X	X	X	X	X

Table Continued

TABLE 3.2 (Continued)

DESKTOP DATA UNIT OPTIONS

OPTIONS	PEC SUFFIX AA	AE	AF	AG	AH	AK	AN	AP	AX	AZ
Synch	X	X	X	X	X	X	X	X	X	X
Asynch	X		X		X		X		X	X
Autobaud	X		X		X		X		X	X
Local CTS Delay			X		X					
CTS Delay A			X		X					
CTS Delay B			X		X					
Assert CD			X	X	X	X				
Keyboard Dial Protocol 1			X		X					
Keyboard Dial Protocol 2			X		X					
Tip & Ring Loop			X	X	X	X				
Synch Auto Call Character Oriented			X	X	X	X				
Synch Auto Call Bit Oriented			X	X	X	X				
Modem Pool DU			X*		X*					
Virtual Private Line			X	X	X	X				

*These options are available using profile download only.

Assert DTR/Normal:

When the Assert DTR (Data Terminal Ready) option is selected, the DU assumes that the RS-232C DTR signal from the DTE is always on. Select the Assert DTR option when the user does not require the DTE to control the DTR signal. When the Assert DTR option is not selected (Normal), the DTE controls the DTR signal to the DU. The Assert DTR option can be used in conjunction with the Auto Orig option to provide a virtual private line. See Paragraph: Virtual Private Line on page 3-22 for details.

0 Assert RTS/Normal:

When the Assert RTS (request to send) option is selected, the DU assumes that the RS-232C RTS signal from the DTE is always on. Select the Assert RTS option when the user does not require the DTE to control the RTS signal. When the Assert RTS option is not selected (Normal), the DTE controls the RTS signal to the DU.

0 Delay CTS/Normal: (NT4X25AA / AN /AX /AZ)

The Delay CTS (clear to send) option configures the DU for normal use or for use in a modem pool. When the Delay CTS option is selected, a 250 ms delay is added to the CTS signal for modem pooling. When the Delay CTS option is not selected (Normal), no CTS delay is added. When the Delay CTS option is selected on the NT4X25AN data unit, the modem pool data unit accepts the CTS signal from the modem and sends it back to the far-end data unit. When the Delay CTS option is not selected (Normal), no CTS delay is added.

0 MI Pulse/MI Level: (NT4X25AA / AF /AH /AN /AX /AZ)

The MI Pulse/MI Level option determines the duration of the MI and MIC state. When the MI (mode indicator) Pulse option is selected, the MI and MIC leads are either shorted or open for a 2.5 second pulse when a call occurs. When the MI Level option is selected, the MI and MIC leads are either shorted or open for the duration of a call. When the DU is not in a modem pool, select the MI Level option. See Figure 3.8 on page 3-17 for switch settings.

0 MI Invert/Normal: (NT4X25AF /AH /AN /AX /AZ)

The MI Invert/Normal option determines the state of the MI and MIC leads. When the MI Invert option is selected, the MI and MIC leads are shorted for the duration determined by the MI Pulse/MI Level setting. When the MI Invert option is not selected (Normal), the MI and MIC leads are open for the duration determined by the MI Pulse/MI Level setting. When the DU is not in a modem pool, select the MI Invert option. See Figure 3.8 on page 3-17 for switch settings.

switch	MI Pulse/	MI Level
MI Invert/	MI and MIC leads are shorted for 2.5 sec when a call occurs.	MI and MIC leads are shorted for the duration of the call.
Normal	MI and MIC leads are open for 2.5 sec when a call occurs.	* MI and MIC leads are open for the duration of the call.

* Standard setting when not configured for a modem pool.

Figure 3.8 MI Pulse/MI Level and MI Invert/Normal Settings

KBD Enable/Disable: (NT4X25AN /AX /AZ)

When the KBD (keyboard) Enable option is selected, keyboard dialing is performed from the DTE keyboard. When the KBD Disable option is selected, you can not dial from the DTE keyboard. All dialing is done from the DU keypad.

Switch A/Normal: (NT4X25AN /AX /AZ)

This option is the same as Assert CD. This option applies only to firmware feature CJM04 and higher on the NT4X25AN DU.

When the Switch A option is selected, the CD (carrier detect) signal is asserted on the RS-232C interface towards the DTE. The Switch A option is used when the DTE requires the CD lead to be asserted before receiving characters during Datapath keyboard dialing. When the Switch A option is not selected (Normal), the CD signal reflects the state of the carrier during the data call. If the DTE does not require the CD lead to be asserted to receive characters during Datapath keyboard dialing, do not select the Switch A option.

Switch B/Normal: (NT4X25AN /AX /AZ)

This option is not used on the NT4X25AN /AX DU’s. In certain host computer applications, a finite-sized buffer is used to save received data before it is processed further. If the incoming data arrives faster than it can be processed, the buffer becomes full. Normal RS-232C data-flow control does not provide a means to automatically stop the far-end DTE from sending data. If the far-end DTE continues to transmit, the host can be overrun and the information lost. In host computer applications the NT4X25AZ DU provides the host computer with a mechanism for controlling

far-end DTE transmission by using an EIA leads arrangement that is non-standard with respect to the RS-232C specification. The non-standard arrangement lets the host computer send flow-control signals across the data connection. Set the switch to Switch B to select the non-standard flow-control method. For the non-standard mode to operate correctly both the near-end and far-end DU's must be set to the Switch B position.

A DU set to flow-control mode cannot be used in a half-duplex application. A DU set to flow control mode cannot be used with modem pooling.

When a DU is set to flow-control mode:

* local CTS is controlled by far-end RTS
* local CD is automatically asserted while a data call is in progress
* the DU can transmit data regardless of the state of RTS

0 Auto Ans/Man Ans:

This switch selects the method by which calls are answered, either automatically (Auto Ans) or manually (Man Ans). When the switch is set to Auto Ans, incoming calls are answered after one ring. When the switch is set to Man Ans, incoming calls are answered manually by pressing the DN key.

0 Auto Orig/Man Orig:

This option selects the method by which calls are originated, either automatically (Auto Orig) or manually (Man Orig). When the Auto Orig option is selected, the DU automatically goes off-hook when the DTE is powered up (a low to high transition of the DTR lead). (If the Assert DTR option is selected, the auto originate option will not place the DU off-hook when the DTE is powered up.) When the Man Orig option is selected, press the DN key to manually take the DU off-hook. The Auto Orig option can be used in conjunction with the Assert DTR option to provide a virtual private line. See Paragraph: Virtual Private Line on page 3-22 for details.

0 Self-test/Normal:

The Self-test/Normal option selects either normal operation or a diagnostic self-test. When the Self-test option is not selected (Normal), the DU is set for normal operation. When the Self-test option is selected, a diagnostic self-test is performed on the DU circuitry (the same as the power-up self-test). Failures are indicated by the light emitting diodes on the front panel of the DU. For more details on diagnostic self-tests see Self-test on page 5-3.

Far-end Loop/Normal:

This option selects either normal operation or a far-end loopback test. When the Far-end Loop option is selected, and a call is placed to another DU, the integrity of the end-to-end data channel is checked. When activated, the near-end DU tells the far-end DU to loop back data at the RS-232C interface. Characters entered on the DTE keyboard are echoed back to the DTE. The Under Test LEDs on both DUs are on during a far-end loop test. When the Far-end Loop is not selected (Normal), the DU is set for normal operation. For more details see Loopback Tests on page 5-4.

Local Loop/Normal:

This option selects either normal operation or a local loopback test. When the Local Loop (loopback) option is selected, the integrity of the DTE to DU connection is checked. When activated, the DU loops back data at the RS-232C interface towards the DTE. Characters entered on the DTE keyboard are echoed back to the DTE. The under test LED lights during the test. When the Local Loop option is not selected (Normal), the DU is set for normal operation. For more details see Loopback Tests on page 5-4.

Ext Clock/Int Clock:

When operating at synchronous speeds, this option selects the clock for clocking data from the DTE to the DU. When Ext (external) Clock is selected, the clock is provided by the DTE. When Int (internal) Clock is selected, the clock is provided by the DU. Int Clock is the usual setting. For synchronous transmissions, select the Int Clock option for at least one of the communicating DUs.

Adaptive/Normal:

This option allows the DU to adapt to and display the operating parameters (e.g., speed, mode) of the far-end DU. When the switch is set to Adaptive, the DU adapts its operating parameters (data rate and synch/asynch mode) to match the far-end DU. When the switch is set to Normal, the DU does not adapt to the operating parameters of the far-end DU. (The Connect LED flashes until both DUs have compatible operating parameters).

Buzz Loud/Soft: (NT4X25AA /AE /AN /AP /AX /AZ)

This option is used to control the volume, either Loud or Soft, of the tone generated when the Ring Again feature is used. When the Ring Again feature is activated, the DMS-100 Family switch sends a signal to alert the calling DU.

0 Data Speed:

The Data Speed option is used to select the data transmission speed of the data call.

0 Synch/Asynch/Autobaud:

This option is used to select the transmission mode, either synchronous, asynchronous, or autobaud where the data unit automatically adjusts to the asynchronous speed of the terminal.

0 Local CTS Delay/CTS Delay A/CTS Delay B: (NT4X25AF /AH)

The CTS (clear to send) Delay option selects the method that determines the length of the CTS (clear to send) delay.

When set to Local CTS Delay, the CTS delay is determined only by the setting of CTS Delay A and CTS Delay B options. When The Local CTS Delay option is not set, the CTS delay is determined by CTS Delay A and CTS Delay B or by the end-to-end delay time (i.e., the time required for the CTS signal to return from the far-end unit), whichever is longer.

The CTS delay timer is controlled by selecting the CTS Delay A and CTS Delay B options as shown in Figure 3.9 on page 3-21.

Option Settings			
Local CTS Delay	CTS Delay A	CTS Delay B	CTS Delay(ms)
ON	OFF	OFF	10 *
ON	ON	OFF	30
ON	OFF	ON	45
ON	ON	ON	60
OFF	OFF	OFF	n **
OFF	ON	OFF	minimum 50
OFF	OFF	ON	minimum 100
OFF	ON	ON	minimum 150

* represents an approximate time dependent upon current processor activity. (range 5 - 15 ms)

** n represents the actual end-to-end delay time of the CTS signal returned from the far-end DU. (minimum 15 ms delay for an intraswitch call)

Figure 3.9 NT4X25AF /AH Switch Settings for CTS Delay

Assert CD: (NT4X25AF /AG /AH /AK)

This option is the same as the Switch A option.

When the Assert CD option is selected, the CD (carrier detect) signal is asserted on the RS-232C interface towards the DTE. The Assert CD option is used when the DTE requires the CD lead to be asserted before receiving characters during Datapath keyboard dialing. When the Assert CD option is not selected, the CD signal reflects the state of the carrier during the data call. If the DTE does not require the CD lead to be asserted to receive characters during Datapath keyboard dialing, do not select the Assert CD option.

Keyboard Dialing Protocol 1: (NT4X25AF /AH)

This option select the NT symbolic protocol (normal) for keyboard dialing.

Keyboard Dialing Protocol 2: (NT4X25AF /AH)

This option selects a Hayes-compatible protocol for keyboard dialing.

Tip-and-ring Loop: (NT4X25AF /AG /AH /AK)

When the tip-and-ring loop option is selected, the DU is isolated from the loop and data is looped back at the Tip and Ring leads, toward the DTE. A T-and-R loopback test does not require a call to be placed to another DU. Characters entered on the DTE keyboard are echoed back to the DTE. For more details see Loopback Tests on page 5-4.

Synch Auto Call Character Oriented: (NT4X25AF /AG /AH /AK)

The Synch Auto Call Character Oriented option allows for synchronous data connection using the character-oriented SAC (Synchronous Automatic Calling, CCITT recommendation V.25 BIS) protocol.

Synch Auto Call Bit Oriented: (NT4X25AF /AG /AH /AK)

The Synch Auto Call Bit Oriented option allows for synchronous data connection using the bit-oriented SAC protocol.

Modem Pool DU: (NT4X25AF /AH)

The Modem Pool DU option is downloaded from the DMS-100 Family switch. It allows a data unit to be designated for use in a modem pool. When a modem pool profile is downloaded, the data unit’s operating parameters are determined by the modem pool datafill.

Virtual Private Line: (NT4X25AF /AG /AH /AK)

The Virtual Private Line (VPL) feature of the data unit works with the DMS-100 automatic line feature to maintain a data connection to another data unit. If the data call to the called data unit is dropped for any reason other than a valid request from the calling data unit, the VPL feature will attempt to reestablish the data call.

Enable the VPL feature by turning on the following two data unit options:

- Auto Originate
- Assert DTR

The directory number for the far end data unit is stored in the DMS-100 datafill for the Automatic Line feature.

The VPL feature will start when either of the following events occur:

* you turn the data unit from off to on
* you toggle the Assert DTR switch from off to on
* you press the DN key
* after a DU self-test has completed

The data call can only be disconnected from the calling data unit, by pressing the release key. If you attempt to disconnect the data call at the called data unit, the calling data unit with the VPL feature will attempt to re-establish the data call. If the data unit with the VPL feature does not re-establish the call to the far end data unit within approximately 44 seconds, the VPL data unit will again try to re-establish the call. The data unit will try to re-establish the call until you press the release key.

Internal Options (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ)

The options described in this section are available on all data units. They are set using DIP switches located on the circuit card inside the data unit. These options are preset at the factory, and do not normally need to be reset. If required, these settings can be changed (see Setting the Configuration Switches on page 4-1).

Master/Slave Sealing Current:

This option (SW1 four switch slides ganged together) allows a Sealing current to be connected or disconnected from the loop. When set to Master, a sealing current is placed on the loop when two data units are connected back-to-back. If the data unit is connected in a switched configuration, set this option to Slave.

Signal/Frame Ground:

This option allows the signal ground to be connected or isolated from the ac ground. When set to Signal, the signal ground is connected to the ac ground; when set to Frame, the signal ground is isolated from the ac ground. This option is preset to Frame Ground.

Master/Slave:

This option configures the data unit for operation as a master or slave unit. When the DU is installed in a switched configuration, set this option to the Slave position. When two DUs are installed in a non-switched configuration, set one DU to Master and the other to the Slave position. This option is preset to Slave.

Switched/Non-Switched:

This option selects the configuration of the DU, either switched or non-switched (back-to-back). When the DU is connected in a switched configuration through the DMS-100 Family switch, set

this option to the Switched position. When the DU is connected directly to another DU in a non-switched configuration, set this option to the Non-Switched position. This option is preset to Switched.

DESKTOP DATA UNIT SPECIFICATIONS

Mechanical Specifications

size	12.5 in (32 cm) long
	7.5 in (19 cm) wide
	2.75 in (7 cm) high
weight	approximately 2 lbs (1 kg)
connectors	2 female Teladapt jacks
	1 DB-25 (DTE interface) (NT4X25AA /AE /AF /AH /AN /AP /AX /AZ)
	1 V.35 connector (DTE interface) (NT4X25AG /AK DU)
	RS-232C to V.35 adapter cable (NT4X25AE /AP)
color	chameleon grey (NT4X25AA /AE /AH /AK /AN /AP /AX /AZ)
	dolphin grey (NT4X25AF /AG)

Electrical Specifications

ac input	110 V ac nominal (92 to 130 V ac)
dc output	+5 V dc @ 1.5 A
	+12 V dc @ 0.2 A
	-12 V dc @ 0.2 A

Electrostatic Discharge

(AA /AE /AN /AP /AX)	12 kV with no call drop
	16 kV with no permanent damage

(AF /AG /AH /AK)	20 kV with no call drop or permanent damage

Environmental Specifications

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

Regulatory Compliance

EMI	FCC part 15 Class A computing device (NT4X25AA /AE /AG /AK /AN /AP /AX /AZ)
	FCC part 15 Class B computing device (NT4X25AF /AH)
Interconnect	CS-03 Issue 6
	FCC part 68

Data units are CSA (Canadian Standards Association) approved and UL (Underwriters Laboratories) listed.

RACKMOUNT DATA UNIT DESCRIPTION

The rackmount DUs described in this section are illustrated in Figure 3.10.

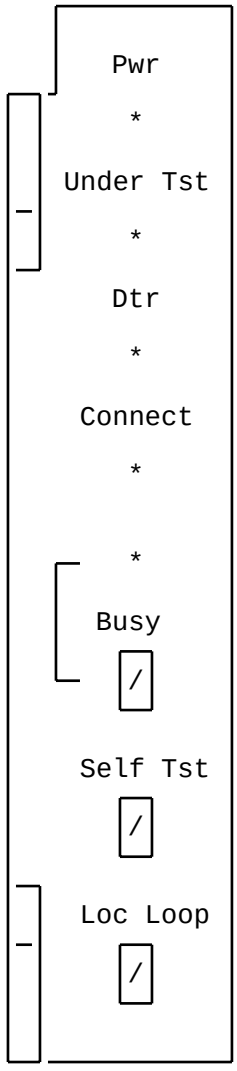


Figure 3.10 NT4X25AD /AV /CH /DF Rackmount DU - Front View

Rackmount DUs provide an interface between data terminal equipment (DTE) and a two-wire non-loaded loop. Data is transmitted on the loop using time compression multiplexing (TCM). The TCM technology provides a data channel that is capable of handling data at a rate of 64 kbps with an 8 kbps signaling channel.

The RS-232C rackmount DUs can transmit data up to 19.2 kbps in one of three modes:

* synchronous
* asynchronous
* asynchronous autobaud

Transmission speeds are selectable up to 19.2 kbps. In the asynchronous autobaud mode, the DU adapts to the speed of the DTE and supports the following speeds:

* 50 bps
* 75 bps
* 110 bps
* 134.5 bps
* 150 bps
* 300 bps
* 600 bps
* 1200 bps
* 1800 bps
* 2000 bps
* 2400 bps
* 3600 bps
* 4800 bps
* 7200 bps
* 9600 bps
* 19200 bps

In the asynchronous autobaud mode, the data unit can transmit data with odd, even or no parity.

The V.35 rackmount DUs can transmit data synchronously at 48 kbps, 56 kbps, or 64 kbps.

Transmission speeds are selected by setting DIP switches on the circuit card.

Both the RS-232C and V.35 DUs transmit in full-duplex mode (half-duplex mode is supported).

Rackmount DUs are circuit packs that are housed in an equipment shelf. The shelf accommodates up to 16 DUs and a power supply. The data terminal equipment (DTE) connects to the rear of the shelf. For a detailed description of the shelf and power supply see Shelf and Power Supply Description on page 3-41. A backplane connector on the rear of the DU plugs into the pins on the shelf backplane. Typically, the rackmount DUs are located in the central office, in a computer room or wherever a high concentration

0 of circuits is required. Since the DUs are not readily accessi-
0 ble to the user, they are not equipped with speakers or keypads.

0 Data unit options are selected by setting DIP switches located on
0 the circuit card. Each DU is factory-set for a switched/slave
0 configuration. Switch SW2-1 allows signal ground to be connected
0 or isolated from ac ground. This switch is factory-set with sig-
0 nal ground isolated from ac ground. If required, these settings
0 are easily changed for a new configuration (see Setting the Con-
0 figuration Switches on page 4-12).

0 Where profile downloading is available, some options can be down-
0 loaded from the NT6X71AB data line card (DLC). Additional fea-
0 tures such as automatic line are entered using Service Orders at
0 the DMS-100 Family switch.

0 The faceplate of the DU circuit pack has status indicator LEDs
0 for Power, Under Tst, DTR, Connect and Busy. The faceplate also
0 has switches for performing diagnostic tests such as self-test
0 and local loop.

Controls and Indicators (NT4X25AD /AV /CH /DF)

The controls and indicator LEDs described in this section apply to NT4X25AD /AV /CH /DF DUs.

Power LED:

The Power (Pwr) LED provides an indication of ac power and synchronization with the DLC or another DU. When power is supplied to the DU and there is no synchronization with the DLC or another DU, the LED flashes. When power is supplied to the DU and there is synchronization with the DLC or another DU, the LED remains lit. If there is no power to the DU, the LED is off.

Under Test LED:

When the DU undergoes any diagnostic or loopback test, the Under Test LED remains lit for the duration of the test.

DTR LED:

The DTR LED (data terminal ready) lights when the DTE is ready to transmit or receive data. This LED remains lit when the DTR option is asserted. See Paragraph: Assert DTR/Normal on page 3-33.

Connect LED:

The Connect LED flashes while a call is being connected. When the connection is made and operating parameters have been exchanged, the LED remains lit.

Busy key and LED:

This key (push button) places the DU in a busy state and informs the DMS-100 Family switch that maintenance action is in progress. The DMS-100 Family switch takes the DU out of service. The Busy LED lights when the DU is in the busy state. When the Busy LED is off, the DMS-100 Family switch is not informed of maintenance action and the DU is placed in service.

This is an optional control provided by the DMS-100 Family switch.

Self Test:

This key (push button) selects either normal operation or a diagnostic self-test. When this key is pressed, a diagnostic self-test is performed on the DU circuitry (the same as the power-up self-test when the DU is inserted in the rack). Failures are indicated by the LEDs on the faceplate of the DU. For more details on diagnostic self-tests see Self-test on page 5-9. When this key is not pressed, the DU is set for normal operation.

Local Loop:

This toggle switch, labeled Loc Loop, selects either normal operation or a local loopback (loop) test. When this switch is not in the Loc Loop position, the DU is set for normal operation. When the switch is in to Loc Loop position, the integrity of the DTE to DU connection is checked. When activated, the DU loops back data at the DB-25 DTE interface towards the DTE. Characters entered on the DTE keyboard are echoed on the DTE screen. The Under Test LED lights during the test. For more details see Loopback Tests (NT4X25AD /CH /AV /DF) on page 5-10.

Options (NT4X25AD /AV /CH /DF)

The options, described in this section do not apply to all rack-mount DUs. Options available on the DUs are selectable using DIP switches. Table 3.3 lists the options available with each data unit. For details on how to set the options described in this chapter, see Setting the Options on page 4-13.

The option switches described in this section are illustrated in Figure 3.13 on page 3-39.

The DIP switches on the DU circuit card are not labeled. As shown in Figure 3.13 on page 3-39, the option is selected by setting the appropriate DIP switch either ON or OFF. In Figure 3.13 on page 3-39, the applicable product engineering codes (PECs) are listed beside each option selector. See Setting the Configuration Switches on page 4-12 for details on setting the DIP switches.

TABLE 3.3
RACKMOUNT DATA UNIT OPTIONS

OPTIONS	PEC SUFFIX AD	AV	CH	DF
Auto Ans/Man Ans	X	X	X	X
Auto Orig/Man Orig	X	X	X	X
Far-end Loop/Normal	X	X	X	X
Tip and Ring Loop/Normal	X	X	X	X
Ext Clock/Int Clock	X	X	X	X
Adaptive/Normal	X	X	X	X
Assert DTR/Normal	X	X	X	X
Assert RTS/Normal	X	X	X	X
Data Speed Selection	X	X	X	X
SAC Enable/Normal		X	X	
Bit-Oriented/Character-Oriented		X	X	

Table Continued

TABLE 3.3 (Continued)

RACKMOUNT DATA UNIT OPTIONS

OPTIONS	PEC SUFFIX AD	AV	CH	DF
Master/Slave	X	X	X	X
Switched/Non-Switched	X	X	X	X
Modem Pool/Normal	X		X	X
MI Pulse/MI Level	X		X	X
MI Invert/Normal	X		X	X
KBD Enable/Disable	X		X	X
Assert CD/Off	X	X	X	X
Switch B/Normal				X
Local CTS Delay/End-to-end Delay			X	
CTS Delay A On/Off			X	
CTS Delay B On/Off			X	
V.54 Interface Enable/Disable		X	X	

Auto Ans/Man Ans:

This switch (number 1 on SW2) selects the method by which calls are answered, either automatically (Auto Ans) or manually (Man Ans). When the switch is set to Auto Ans, incoming calls are answered after one ring. When the switch is set to Man Ans, incoming calls are answered manually.

Auto Orig/Man Orig:

This switch (number 2 on SW2) selects the method by which calls are originated, either automatically (Auto Orig) or manually (Man Orig). When the switch is set to Auto Orig, the DU automatically goes off-hook when the DTE is powered up (a low to high transition of the DTR lead). (If the Assert DTR/Normal switch is set to Assert DTR, the Auto Orig option will not place the DU off-hook when the DTE is powered up.) When this switch is set to Man Orig, take the DU off-hook from the DTE.

Far-end Loop/Normal:

This switch (number 3 on SW2) selects either normal operation or a far-end loopback test. When this switch is set to Normal, the DU is set for normal operation. When the switch is set to Far-end Loop and a call is placed to another DU, the integrity of the end-to-end data channel is checked by using test equipment or by entering characters from the DTE. When activated, the near-end DU tells the far-end DU to loop data back at the RS-232C interface. Characters entered on the DTE keyboard are echoed back to the DTE. The Under Test LED on both DUs is on during a far-end loop back test. For more details see Loopback Tests (NT4X25AD /CH /AV /DF) on page 5-10.

T-and-R Loop/Normal:

This switch (number 4 on SW2) selects either normal operation or a Tip (T) and Ring (R) loopback on the Tip and Ring leads. When this switch is set to Normal, the DU is set for normal operation. When the switch is set to T-and-R Loop, the DU is isolated from the loop and data is looped back at the Tip and Ring leads, toward the DTE. A T-and-R loopback test does not require a call to be placed to another DU. Characters entered on the DTE keyboard are echoed back to the DTE. For more details see Loopback Tests (NT4X25AD /CH /AV /DF) on page 5-10.

Ext Clock/Int Clock:

When operating at synchronous speeds, this option switch (number 5 on SW2) selects the clock for clocking data from the DTE to the DU. When Ext (external) Clock is selected, the DTE provides the clock. When Int (internal) Clock is selected, the DU provides the clock. Int Clock is the usual setting. For synchronous transmissions, select the Int Clock option for at least one of the communicating DUs.

Adaptive/Normal:

This option switch (number 6 on SW2) allows the DU to adapt to the operating parameters, such as speed and mode, of the far-end DU. When the switch is set to Adaptive, the DU adapts its operating parameters (data rate and synch/asynch mode) to match the far-end DU. When the switch is set to Normal, the DU does not adapt to the operating parameters of the far-end DU. (The Connect LED flashes until both DUs have compatible operating parameters).

Assert DTR/Normal:

When this switch (number 7 on SW2) is set to Assert DTR (Data Terminal Ready), the DU assumes that the RS-232C DTR signal from the DTE is always on. Select the Assert DTR option when the user does not require the DTE to control the DTR signal. When the

switch is set to Normal the DTE controls the DTR signal to the DU.

Assert RTS/Normal:

When this switch (number 8 on SW2) is set to Assert RTS (request to send), the DU provides the RS-232C RTS signal for the DTE. Set this option to Assert RTS when the user does not require the DTE to control the RTS signal. When this switch is set to Normal, the DTE controls the RTS signal to the DU.

Data Speed Selector Switches:

The Data Speed Selector switches (numbers 1, 2, 3, and 4 on SW3 for NT4X25AD/CH and numbers 1 and 2 on SW3 for NT4X25AV) are used to select the data transmission speed and the transmission mode (asynchronous or synchronous) of the data call.

The Async (Autobaud) setting automatically sets the DU to the asynchronous transmission speed of the DTE (asynchronous only). See Figure 4.8 on page 4-16 for the switch settings.

SAC Enable/Normal: (NT4X25AV /CH)

This switch (number 5 on SW3) is used to select normal operation or SAC (synchronous automatic calling).

Bit-Oriented /Char-Oriented: (NT4X25AV /CH)

This switch (number 6 on SW3) is used in conjunction with the SAC Enable/Normal switch. It selects either the Bit-Oriented protocol or Character-(Char) Oriented protocol for SAC from a synchronous DTE.

Master/Slave:

This switch (number 7 on SW3) configures the data unit for operation as a master or slave unit. When the DU is installed in a switched configuration, set this switch to the Slave position. When two DUs are installed in a non-switched configuration, set one DU to Master and the other to the Slave position. This option is preset to Slave.

Switched/Non-Switched:

This switch (number 8 on SW3) selects the configuration of the DU, either switched or non-switched (back-to-back). When the DU is connected in a switched configuration through the DMS-100 Family switch, set this switch to the Switched position. When the DU is connected directly to another DU in a non-switched configuration, set this switch to the Non-Switched position. This option is preset to Switched.

0 V.54 Interface Enable/Disable: (NT4X25AV /CH)

0 This option provides normal operation or V.54 external testing. 0 When this switch (ganged) is in the Disable position, V.54 test- 0 ing is disabled and the data unit operates normally. When this 0 switch is set to the Enable position, the test indicator output 0 to the DTE and the loopback signal inputs from the DTE are ena- 0 ble, allowing testing to be performed from a V.54 interface. 0 This option is preset to Disable.

0 Modem Pool/Normal: (NT4X25AD /CH /DF)

0 This switch configures the DU for normal use or for use in a 0 modem pool. When this switch is set to Modem Pool on the 0 NT4X25AD, a 250 millisecond CTS (clear to send) delay is added 0 for modem pooling. When it is set to Normal, no CTS delay is 0 added. When this switch is set to Modem Pool on the NT4X25CH, 0 the modem pool data unit accepts the CTS signal from the modem 0 and sends it back to the far-end data unit.

0 MI Pulse/MI Level: (NT4X25AD /CH /DF)

0 This option switch (number 2 on SW4) determines the duration of 0 the MI and MIC state. When the switch is set to MI (mode indica- 0 tor) Pulse, the MI and MIC leads are either shorted or open for a 0 2.5 second pulse when a call occurs. When the switch is set to 0 MI Level, the MI and MIC leads are either shorted or open for the 0 duration of a call. When the DU is not in a modem pool, set the 0 switch to the MI Level position. See Figure 3.11 on page 3-36 0 for switch settings.

0 MI Invert/Normal: (NT4X25AD /CH /DF)

0 This option switch (number 3 on SW4) determines the state of the 0 MI and MIC leads. When the switch is set to MI Invert, the MI 0 and MIC leads are shorted for the duration determined by the MI 0 Pulse/MI Level setting. When the switch is set to Normal, the MI 0 and MIC leads are open for the duration determined by the MI 0 Pulse/MI Level setting. When the DU is not in a modem pool, set 0 this switch to the Normal position. See Figure 3.11 on page 3-36 0 for switch settings.

switch	MI Pulse/	MI Level
MI Invert/	MI and MIC leads are shorted for 2.5 sec when a call occurs.	MI and MIC leads are shorted for the duration of the call.
Normal	MI and MIC leads are open for 2.5 sec when a call occurs.	* MI and MIC leads are open for the duration of the call.

* Standard setting when not configured for a modem pool.

Figure 3.11 MI Pulse/MI Level and MI Invert/Normal Settings

KBD Enable/Disable: (NT4X25AD /CH /DF)

When this switch (number 4 on SW4) is set to KBD Enable, KBD (keyboard dialing) is performed from the DTE keyboard. When this switch is set to Disable, you cannot dial from the DTE keyboard.

Assert CD/Off:

When this switch (number 5 on SW4 for NT4X25AD /CH /DF, number 4 on SW3 for NT4X25AV) is set to Assert CD, the CD (carrier detect) signal is asserted on the RS-232C interface towards the DTE. The Assert CD setting is used when the DTE requires the CD lead to be asserted before receiving characters during Datapath keyboard dialing. When this switch is set to Off, the CD signal reflects the state of the carrier during the data call. Choose the Off setting if the DTE does not require the CD lead to be asserted to receive characters during Datapath keyboard dialing.

Switch B/Normal: (NT4X25DF)

This switch is switch number 8 on SW4. In certain host computer applications, a finite-sized buffer is used to save received data before it is processed further. If the incoming data arrives faster than it can be processed, the buffer becomes full. Normal RS-232C data-flow control does not provide a means to automatically stop the far-end DTE from sending data. If the far-end DTE continues to transmit, the host can be overrun and the information lost. In host computer applications the NT4X25DF DU provides the host computer with a mechanism for controlling far-end DTE transmission by using an EIA leads arrangement that is non-standard with respect to the RS-232C specification. The non-standard arrangement lets the host computer send flow-control signals across the data connection. Set the switch to Switch B to select

the non-standard flow-control method. For the non-standard mode to operate correctly both the near-end and far-end DU's must be set to the Switch B position.

A DU set to flow-control mode cannot be used in a half-duplex application. A DU set to flow control mode cannot be used with modem pooling.

When a DU is set to flow-control mode:

* local CTS is controlled by far-end RTS
* local CD is automatically asserted while a data call is in progress
* the DU can transmit data regardless of the state of RTS

Local CTS Delay/End-to-End Delay: (NT4X25CH)

This switch (number 6 on SW4) selects the method that determines the length of the CTS (clear to send) delay.

When set to Local CTS Delay, the duration of the CTS delay is controlled by the setting of the delay timer, not by the end-to-end delay of the CTS signal returned from the far-end DU.

When set to End-to-End Delay, the duration of the CTS delay is determined by the end-to-end delay time of the CTS signal returned from the far-end DU. Setting the delay timer ensures a minimum duration for this end-to-end delay.

The CTS delay timer is controlled by setting SW4-7 (CTS Delay A ON/OFF) and SW4-8 (CTS Delay B ON/OFF) as shown in Figure 3.12 on page 3-38.

CTS Delay A ON/OFF: (NT4X25CH)

This switch (number 7 on SW4) is used to set the duration of the CTS delay. See Figure 3.12 on page 3-38 for switch settings.

CTS Delay B ON/OFF: (NT4X25CH)

This switch (number 8 on SW4) is used to set the duration of the CTS delay. See Figure 3.12 on page 3-38 for switch settings.

SW4 Settings for positions 6, 7, and 8			
position 6	Delay A position 7	Delay B position 8	CTS Delay in milli seconds
Local CTS	OFF	OFF	17 *
Local CTS	ON	OFF	30
Local CTS	OFF	ON	45
Local CTS	ON	ON	60
End-to-End	OFF	OFF	n **
End-to-End	ON	OFF	minimum 50
End-to-End	OFF	ON	minimum 100
End-to-End	ON	ON	minimum 150

* represents an approximate time that is dependent upon current processor activity.

** n represents the actual end-to-end delay time of the CTS signal that is returned from the far-end DU.

Figure 3.12 NT4X25CH Switch Settings for Modem Pool CTS Delay

DIP SW2

	ON / OFF		Applicable PECs
Auto Ans	1	Man Ans	NT4X25AD /CH /AV
Auto Orig	2	Man Orig	
Far-end Loop	3	Normal	
T-and-R Loop	4	Normal	
Ext Clock	5	Int Clock	
Adaptive	6	Normal	
Assert DTR	7	Normal	
Assert RTS	8	Normal	

DIP SW3

	ON / OFF		
Baud	1	Baud	NT4X25AD /CH /AV
Baud	2	Baud	
Baud	3	Baud	NT4X25AD /CH
Assert CD	4	Normal	NT4X25AV *
SAC Enable	5	Normal	NT4X25CH /AV
Bit-Oriented	6	Char-Oriented	
Master	7	Slave	NT4X25AD /CH /AV
Switched	8	Non-Switched	

DIP SW4

	ON / OFF		
Modem Pool	1	Normal	NT4X25AD /CH
MI Pulse	2	MI Level	NT4X25AD /CH
MI Invert	3	Normal	
KBD Enable	4	Disable	
Assert CD	5	Off	NT4X25AD /CH
Local CTS Delay	6	End-to-End Delay	NT4X25CH
CTS Delay A ON	7	OFF	
CTS Delay B ON*	8	OFF	

DIP SW8 - for V.54 external testing

	ON / OFF		
TI Enable	1	Disable	NT4X25CH /AV
LLB Enable	2	Disable	
LB Enable	3	Disable	
Not Used	4		

* On NT4X25DF switch number 8 functions as Switch B/Normal switch
* On NT4X25AD/CH switch number 4 is a data speed selector switch

Figure 3.13 Rackmount DU Option Switches

297-2121-226
VINTAGE 05.01

RACKMOUNT DATA UNIT SPECIFICATIONS

The following specifications apply to NT4X25AD /CH /AV rackmount data units unless otherwise specified.

Mechanical Specifications

faceplate size	8.75 in (21.5 cm) high
	0.8 in (2 cm) wide
circuit card size	12.25 in (31 cm) long
	6.8 in (17 cm) wide
connectors	backplane connector

Electrical Specifications

inputs	+5 V dc @ 1.0 A
	+12 V dc @ 0.1 A
	-12 V dc @ 0.1 A
ESD	20 kV to the faceplate with no call drop
	25 kV with no permanent damage
fuse F1 (on circuit)	2 A 5 V rating
fuse F2 (on circuit)	500 mA 12 V rating
fuse F3 (on circuit)	500 mA 12 V rating

Environmental Specifications

operating temperature	32 to 122 ^{0}F (0 to 50 ^{0}C)
storage temperature	-40 to 158 ^{0}F (-40 to 70 ^{0}C)
relative humidity	(operating) 95% non-condensing at 40 ^{0}C (104 ^{0}F)
MTBF	greater than 10 years

Regulatory Compliance

EMI	FCC part 15 Class A computing device
interconnect	CS-03 Issue 6
	FCC Part 68

Data units are CSA (Canadian Standards Association) approved and UL (Underwriters Laboratories) listed.

SHELF AND POWER SUPPLY DESCRIPTION

Shelf - NT4X25BH or NT4X25DH

The rackmount DU equipment shelf (NT4X25BH or NT4X25DH) fits into a standard 19 in (48.3 cm) rack (frame). The shelf accommodates up to 16 rackmount DUs and one power supply (NT4X2554 for the NT4X25BH shelf, NT4X25DK or DL for the NT4X25DH shelf). A mounting hardware kit (NT4X2591) is required to install the shelf. Adapter plates (PO686254) are available to mount the shelf in a rack that is wider than 19 in (48.3 cm). The spacing for the mounting holes on the shelf is illustrated in Figure 3.14. The front of the shelf has a safety bar to secure the DUs in place.

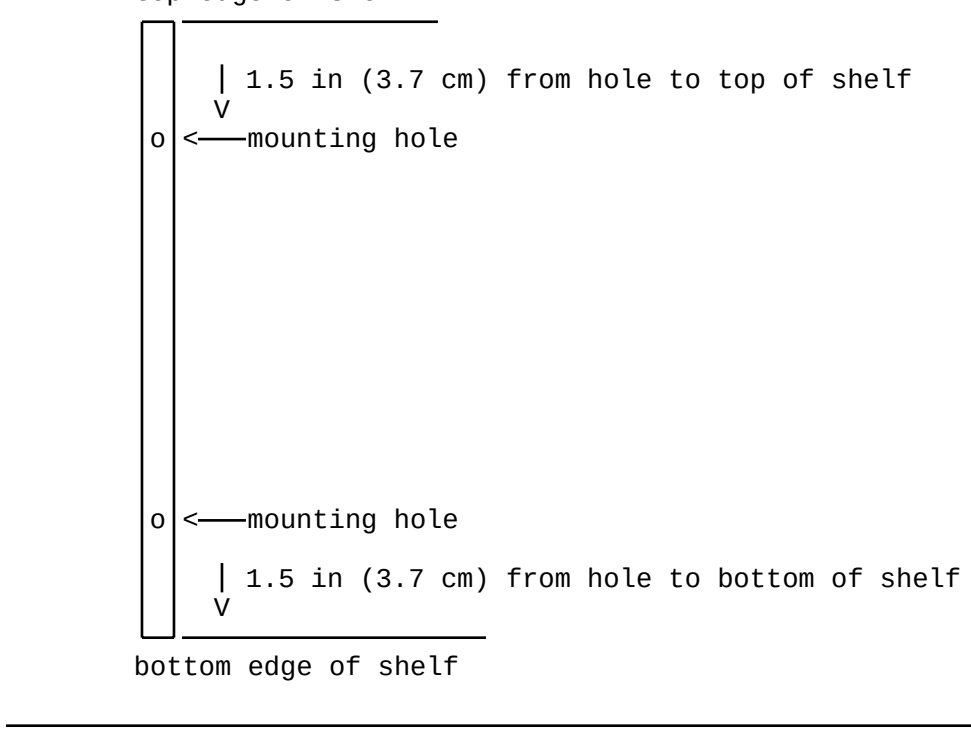


Figure 3.14 NT4X25BH/DH Shelf - Mounting Hole Dimensions

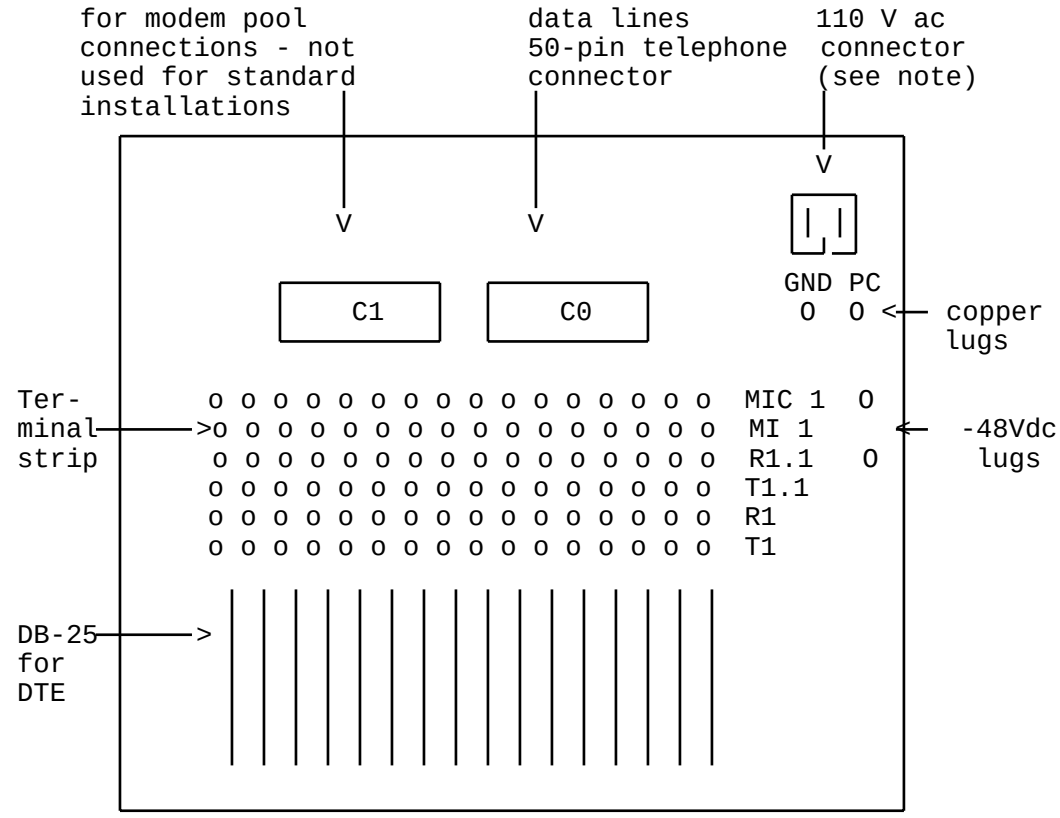
The backplane of the shelf has a C0 connector for terminating a 16-pair data line cable. There are 16 DB-25 connectors for the DTE. The V.35 DUs require an RS-232C-to-V.35 adapter cable that

connects to the DTE interface. The pinout configuration for the DTE connectors are shown in Figure 3.7 on page 3-10. The pinout of the C0 connector is shown in Figure 3.15 on page 3-42.

pin	C0 lead	C1 lead	pin	C0 lead	C1 lead
1	T1	T1.1	26	R1	R1.1
2	T2	T2.1	27	R2	R2.1
3	T3	T3.1	28	R3	R3.1
4	T4	T4.1	29	R4	R4.1
5	T5	T5.1	30	R5	R5.1
6	T6	T6.1	31	R6	R6.1
7	T7	T7.1	32	R7	R7.1
8	T8	T8.1	33	R8	R8.1
9	T9	T9.1	34	R9	R9.1
10	T10	T10.1	35	R10	R10.1
11	T11	T11.1	36	R11	R11.1
12	T12	T12.1	37	R12	R12.1
13	T13	T13.1	38	R13	R13.1
14	T14	T14.1	39	R14	R14.1
15	T15	T15.1	40	R15	R15.1
16	T16	T16.1	41	R16	R16.1

Figure 3.15 C0 and C1 Connector Pinout

The backplane of the shelf is illustrated in Figure 3.16 on page 3-43.



An RS-232C to V.35 adapter cable is required for V.35 data units

Note: not provisioned on NT4X25DH shelf if NT4X25DL DC to DC power supply is provisioned.

Figure 3.16 DU Shelf Backplane

Power Supply

The power supply circuit pack for the rackmount shelf occupies two special slots on the left of the shelf and powers up to 16 rackmount DUs. The NT4X25DH shelf can be provisioned with either an NT4X25DK AC to DC power supply, or an NT4X25DL DC to DC power supply. The NT4X25DK supply connects to a standard 110 V AC outlet via a separate power cord which connects to the rear of the power supply, for shelf usage in environments such as a computer room. The NT4X25DL power supply operates from a standard -48V DC supply, and is typically provisioned in a central office environment. The NT4X25DL supply is connected via lugs on the shelf backplane. In either case, the power supply requires a minimum loading of one DU. The power supply has an ON/OFF switch to control the power and a fuse (5A for NT4X2554 and NT4X25DK, 8A for

NT4X25DL) to protect against overload. There is a power indicator LED on the face of the supply to indicate the presence of power.

Follow the instructions provided in Chapter 4 of this document to install the power supply.

SHELF SPECIFICATIONS (NT4X25BH/DH)

The product equipment code (PEC) for the shelf is NT4X25DH. The following information also applies to the NT4X25BH shelf (manufacture discontinued), except as noted.

Mechanical Specifications

size	14 in (35.5 cm) long
	17.5 in (44.8 cm) wide
	8.5 in (22 cm) high
connectors	C0 - 50-pin telephone connector (female)
	C1 - 50-pin telephone connector (female) for modem pooling
	Gnd - copper lug
	PC - copper lug
	-48V DC - copper lug (NT4X25DH shelf only)
	DC ground - copper lug (NT4X25DH shelf only)
	110 V AC connector (not provisioned on NT4X25DH shelf if NT4X25DL DC to DC power supply is provisioned)
	DTE - DB-25
	Data Line (optional to C0 and C1) - 6-position terminal strip

POWER SUPPLY SPECIFICATIONS - NT4X2554

Mechanical Specifications

size	12.25 in (31 cm) long
	8.75 in (21.5 cm) high at the faceplate
connectors	backplane connector

Electrical Specifications

AC inputs	110 V ac nominal (92 to 130 V ac)
outputs	+5 V dc @ 50 A
	+12 V dc @ 5 A
	-12 V dc @ 5 A
ESD (faceplate only)	20 kV
fuse (on faceplate)	5 A 250 V rating
minimum loading	one data unit

Environmental Specifications

operating temperature	32 to 122 ^{0}F (0 to 50 ^{0}C)
storage temperature	-40 to 158 ^{0}F (-40 to 70 ^{0}C)
relative humidity	(operating) 95% non-condensing at 104 ^{0}F (40^{0}C)
MTBF	greater than 10 years

Regulatory Compliance

EMI	FCC Part 15 Class A

The shelf and power supply are CSA approved and UL listed.

POWER SUPPLY SPECIFICATIONS - NT4X25DK

Mechanical Specifications

Mounting dimensions	6.80 X 12.10 X 3.05 inches (172.72 X 307.34 X 77.47 mm)
Weight	4.0 lbs. (1.9 kg)
Output connection:	2 X 18 Dupont Female Edge Connector

Electrical Specifications

AC inputs	110 V ac nominal (95 to 135 V ac)
outputs	+5 V dc @ 20 A
	+12 V dc @ 3 A
	-12 V dc @ 3 A
fuse (on faceplate)	5 A 250 V , slo-blo
minimum loading	one data unit
over-voltage protection	all outputs

Environmental Specifications

operating temperature	32 to 122 ^{0}F (0 to 50 ^{0}C)
storage temperature	-20 to 85 ^{0}C)
relative humidity	(operating) 95%
MTBF	150,000 hours in operation

Regulatory Compliance

EMI/RFI	FCC Class B Radiating and Class A Conducting
UL recognized	UL1459 issue 2, UL1012 for Safety
CSA approved	CSAC 22.2 #225-M90

POWER SUPPLY SPECIFICATIONS - NT4X25DL

Mechanical Specifications

Mounting dimensions	6.80 X 12.10 X 3.05 inches (172.72 X 307.34 X 77.47 mm)
Weight	4.0 lbs. (1.9 kg)
Output connection:	2 X 18 Dupont Female Edge Connector

Electrical Specifications

DC input	-43 to -56 V dc (-48V dc nominal)
outputs	+5 V dc @ 20 A
	+12 V dc @ 3 A
	-12 V dc @ 3 A
fuse (on faceplate)	8 A slo-blo
minimum loading	one data unit
over-voltage protection	all outputs

Environmental Specifications

operating temperature	32 to 122 ^{0}F (0 to 50 ^{0}C)
storage temperature	-20 to 85 ^{0}C)
relative humidity	(operating) 95%
MTBF	150,000 hours in operation

Regulatory Compliance

EMI/RFI	FCC Class B Radiating and Class A Conducting
UL recognized	UL1459 issue 2, UL1012 for Safety
CSA approved	CSAC 22.2 #225-M90

CALL PATH RESTORATION

The Call Path Restoration (CPR) feature re-establishes a datapath call when a call is inadvertently disconnected.

The DMS audit process re-originates calls that are in the idle state. The audit process runs every five minutes and scans the datapath lines with the CPR feature. When the audit process finds an idle line, it busies and then releases the data unit. If the auto-originate switch is enabled on the data unit, then the data unit sends the call again.

The CPR feature is available with the following data units (DUs):

- low speed DUs
- high speed DUs
- LIU/DTU
- AILC(6X76AC)
- COAX TIF
- low speed rackmount DUs
- high speed rackmount DUs

Setting Up The CPR Feature

To set up the CPR feature, datafill the data unit line with the CPR feature and enable auto-originate on the data unit. If you have an AILC (6X76AC) data unit, then enable auto-originate by profile downloading.

When the CPR feature is datafilled, the DMS audit process re-originates calls that are in the idle state.

Datafilling the CPR feature

CPR is a keyset feature. You must assign it to the DN key, function key 1. Datafill the feature in table KSETFEAT, using service orders as follows:

```
>SERVORD (CR)
SO:
>ADO (CR)
SONUMBER:  NOW 89  12  12  AM
>   (CR)
DN_OR_LEN:
>1 0 10 12 (CR)
OPTKEY:
>1 (cr)
OPTION:
>CPR (CR)
CPRDN:
>7224001 (CR)                  (note)
OPTKEY:
>$ (CR)
```

Note: Use only a maximum of 15 digits for the DPRDN. Do not use symbols such as * and #.

Removing the CPR Feature

To remove the CPR feature from the data unit, use the DEO command in service orders.

Note: Do not remove the CPR feature by disabling the auto-originate option on the data unit line because the audit process remains active and it uses real time.

0 297-2121-226
0 VINTAGE 05.01

CHAPTER 4

DATA UNIT INSTALLATION

0 297-2121-226
0 VINTAGE 05.01

This chapter provides installation instructions for rackmount and desktop data units (DUs).

This chapter assumes that the required data lines (and optional voice lines) have been properly installed and datafilled by the operating company.

If the result of any procedure in this chapter is not as expected, refer to Chapter 6 on page 6-1.

DESKTOP DATA UNIT INSTALLATION (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ)

To install a desktop DU the following equipment is required:

* desktop DU with Teladapt line cord, V.35 adapter cable (NT4X25AE /AP DU only), and attached power supply

* data line terminated with a Teladapt jack

* RS-232C or V.35 cable for DTE connection

Setting the Configuration Switches

The desktop DUs are factory-set for a switched/slave configuration with the signal ground isolated from the AC ground.

When a DU is installed in a switched configuration through the DMS-100 Family switch, set the configuration switches for switched/slave operation.

When two DUs are installed in a non-switched configuration, set one DU for non-switched/slave operation, and the other for non-switched/master operation.

If it is necessary to change the factory setting of the configuration switches, carefully follow this procedure to set DIP switch SW1 and SW2:

CAUTION

Some devices inside the DU can be damaged by electrostatic discharge. Wear a grounding strap while working on the DU and discharge all tools by touching them to ground. Make sure the ac power is NOT connected before opening the DU.

1. Hold the DU facedown and unfasten the six screws.

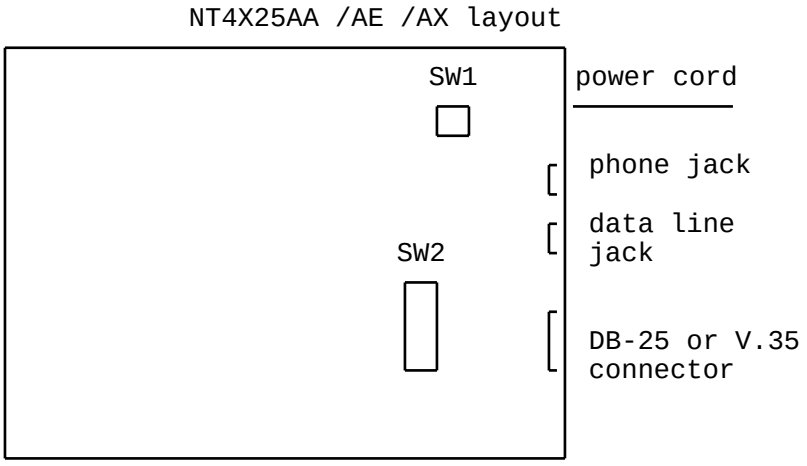
2. Turn the DU faceup, then remove the top cover. The screws will not fall out when the unit is turned over.

3. Figure 4.1 on page 4-3 shows the location of the configuration DIP switches (SW1 and SW2). Use the tip of a pen or small screwdriver to set the switches as shown in Figure 4.2 on page 4-4.

   On the NT4X25AF /AG /AH /AK data units, the circuit card that the DIP switches are located on faces down. Remove the card from the unit to gain access to the DIP switches.

4. After the configuration switches are set, replace the top cover.

5. While holding the top and bottom cover together, turn the DU facedown and fasten the screws.



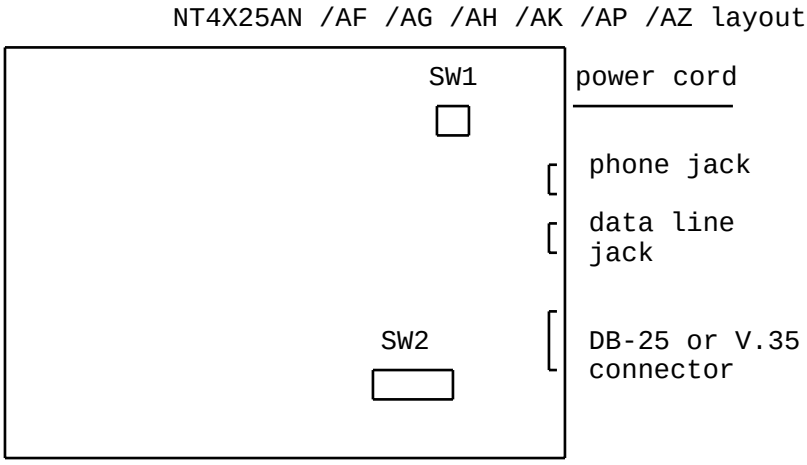
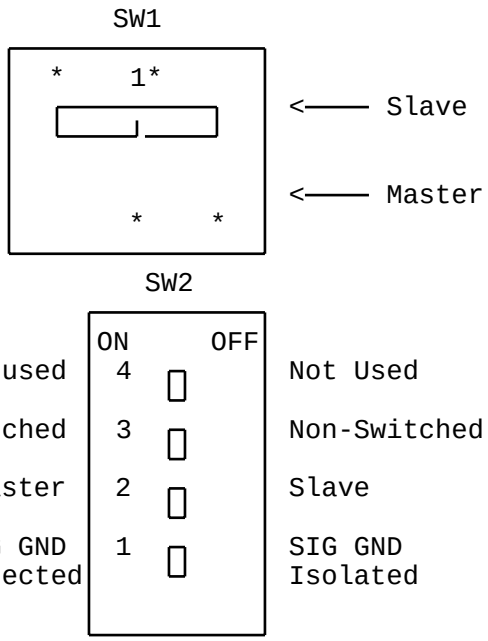


Figure 4.1 Desktop DU - SW1 and SW2 Configuration Switch Locations



Switched Configuration	Non-Switched Configuration
SW1 - Slave (down)	SW1 - one DU set to Slave - one DU set to Master
SW2-1 - SIG GND Isolated (OFF)	SW2-1 - SIG GND Isolated (OFF)
SW2-2 - Slave (OFF)	SW2-2 - one DU Slave (OFF) - one DU Master (ON)
SW2-3 - Switched (ON)	SW2-3 - Non-switched (OFF)
SW2-4 - not used	SW2-4 - not used

Figure 4.2 Desktop DU - SW1 and SW2 Configuration Switch Settings

Making the Connections to the DU

The connectors for this procedure are illustrated in Figure 4.3.

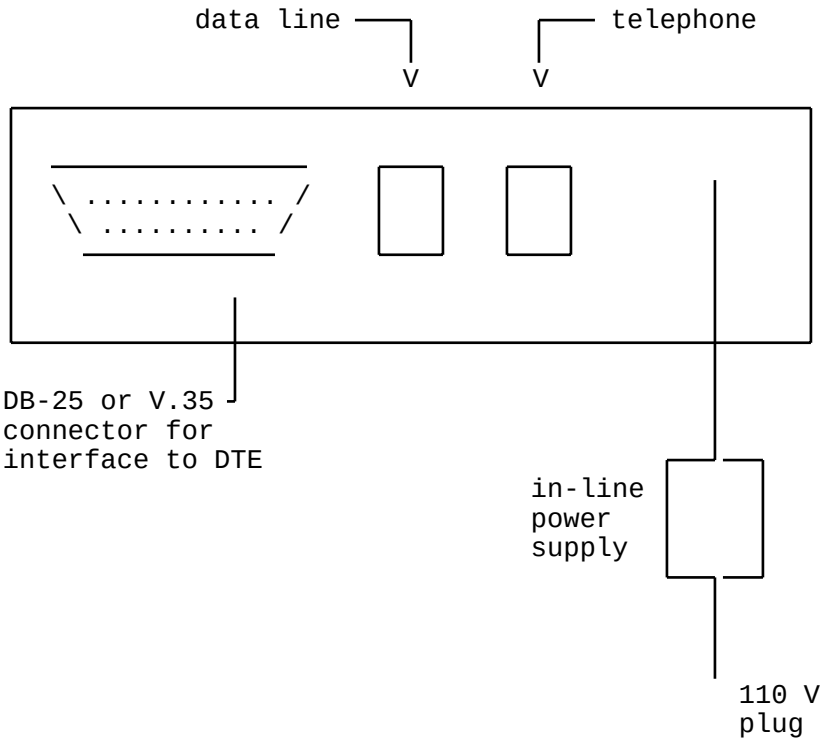


Figure 4.3 Desktop DU Connections - Rear View

1. Plug the DU power cord into any standard (unswitched) 110 V ac electrical outlet. Do not place the power supply on the DU.

   The DU automatically performs a self-test on power-up. For a complete explanation of the self-test see Self-test on page 5-3.

   The flashing power LED indicates that the data line is not connected.

2. Use the Teladapt line cord to connect the Teladapt jack closest to the DB-25 or V.35 connector to the data line (see Figure 4.3). The power LED stops flashing and lights steadily indicating synchronization with the DMS-100 Family switch.

Note that, in a non-switched configuration, the power LED continues to flash until the second DU is connected to the data line.

3. To connect the DTE to the DU use an RS-232C, V.35 or V.35 adapter cable as required. Plug the DTE cable into the DB-25 or V.35 connector on the rear of the DU. See Figure 4.3 on page 4-5.

4. If the operating company has terminated a voice line at the Teladapt jack, a telephone can be connected to the DU. Plug the telephone into the Teladapt jack closest to the power cord. See Figure 4.3 on page 4-5.

Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ)

Under the flip-up lid on the face of the DU are two banks of DIP switches and a rotary speed selector switch. These switches are used to set the DU to the desired operating parameters. For a detailed description of each feature and option see Controls and Indicators (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ) on page 3-11.

1. To set the options, use a small screw driver or the tip of a pen to place the switch into the desired position. The two DIP switch banks are illustrated in Figure 4.4.

assert DTR	1	normal		auto ans	1	man ans
assert RTS	2	normal		auto orig	2	man orig
delay CTS	3	normal		self-test	3	normal
MI pulse	4	MI level		far-end loop	4	normal
MI invert	5	normal		local loop	5	normal
KBD enable	6	disable		ext clock	6	int clock
switch A	7	normal		adaptive	7	normal
switch B	8	normal		buzz loud	8	buzz soft

Note: not all switches appear on all DU models.

Figure 4.4 Desktop DU - Option Selector Switches

2. To set the DU to the desired transmission speed, use a slot-head screwdriver to rotate the selector to the desired operating speed.

If asynch autobaud is selected on the RS-232C data unit, the following DTE speeds are supported:

* 50 bps
* 75 bps
* 110 bps
* 134.5 bps
* 150 bps
* 300 bps
* 600 bps
* 1200 bps
* 1800 bps
* 2000 bps
* 2400 bps
* 3600 bps
* 4800 bps
* 7200 bps
* 9600 bps
* 19200 bps

Setting the Options (NT4X25AF /AG /AH /AK)

Under the flip-up lid on the face of the data unit are a series of LEDs. These LEDs are used to set the DU to the desired operating parameters. For a detailed description of each feature and option, see Controls and Indicators (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ) on page 3-11.

To set an option:

1. Press the Settings key. The LED located to the left of the key flashes.

   To set an alternate option, press the Settings key and the Alternate key. The Led located to the left of the Alternate key lights steadily. The LED located to the left of the Settings key flashes.

2. Use the numeric keys on the keypad to select the options. When an option is selected, the corresponding LED is lit.

   The LEDs, when pressed, either toggle on and off, or move through a series of choices. Some option selections are mutually exclusive (e.g., Keyboard Dialing Protocol 1 and Protocol 2). Selecting one option will cause the other(s) to be unselected.

To set the operating speed (NT4X25AF /AH):

You can set the data unit to operate at one of sixteen speeds. Only six of the available speeds are listed under the DU flip-up lid. To select a speed that is not listed, perform the following steps:

1. Select the Autobaud mode option.

2. Configure your terminal to the desired speed and start autobaud from your terminal keyboard. To start autobaud enter a period followed by a carriage return. The data unit adjusts itself automatically. Two Speed LEDs light to indicate that a speed other than the ones listed has been selected.

   Table 4.1 lists the available speeds, and the corresponding LEDs that are lit when the speed is selected.

TABLE 4.1
ADDITIONAL SPEED SETTINGS

Speed Settings (bps)	300	1200	2400
1200	50	-	-
2400	75	600	-
4800	110	1800	7200
9600	134.5	2000	-
19200	150	3600	

RACKMOUNT DATA UNIT INSTALLATION (NT4X25AD /CH /AV /DF)

To install rackmount DUs, the following equipment is required:

* an installed equipment frame (rack)
* data unit shelf (NT4X25BH or NT4X25DH)
* power supply (NT4X2554, NT4X25DK, or NT4X25DL)
* an NT4X2591 mounting hardware kit
* data lines
* minimum of one rackmount DU (to meet power supply loading requirements) maximum 16 per shelf
* DTE interface cables (AO300753 - must be ordered separately for NT4X25AV DU)

Note - NT4X25BH shelf and its associated power supply, NT4X2554, are manufacture discontinued. Installation instructions for these items can be obtained from NTP 297-2121-226, issue 04.01.

Installing the NT4X25DH shelf

The backplane of the shelf is illustrated in Figure 4.5 on page 4-10. The shelf is shipped with a metal cover plate on the back-plane to protect the terminal cover strips and DTE connectors during transit. Remove the plate before installing the shelf.

The shelf is shipped with blank faceplates covering all empty circuit-card slots, where and when provisioned. A faceplate per card is removed only at the time of card installations.

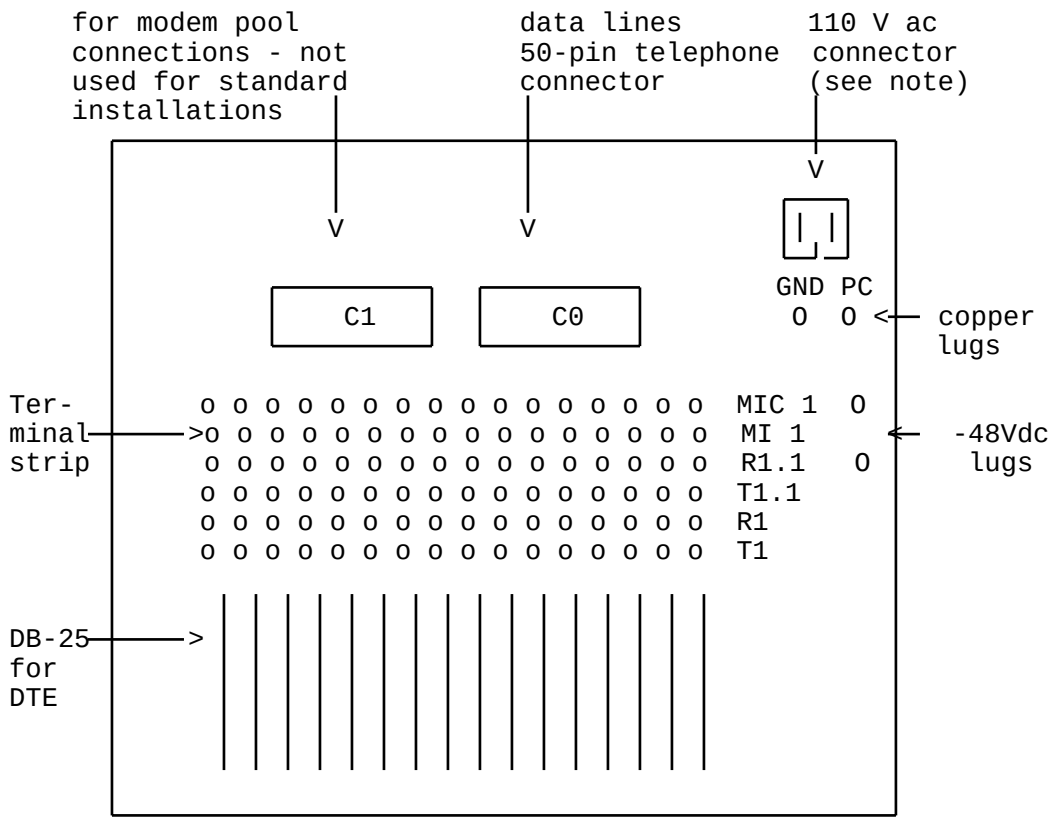
<u>To install the AC powered shelf in a computer room</u>:

1. Mount the shelf in the frame (rack) using machine screws. The shelf is a standard 44.8 cm width. If the frame is wider than 48.36 cm, use P0686254 adapter brackets, included in the NT4X2591 mounting hardware kit, to extend the width of the shelf as necessary.

2. Connect the frame ground to the copper ground lug labeled GND on the shelf backplane. See Figure 4.5 on page 4-10.

3. Ensure that the power switch on the faceplate of the NT4X25DK power supply is switched OFF, then install the power supply in the left side of the shelf. Before proceeding to the next step, ensure that the power supply retaining screw, located at the bottom front of the power supply, is tightened.

   WARNING: Do not turn on the power supply until there is at least one data unit installed in the shelf. Turning on the



An RS-232C to V.35 adapter cable is required for V.35 data units

Note: not provisioned on NT4X25DH shelf if NT4X25DL DC to DC power supply is provisioned.

Figure 4.5 Rackmount DU - Connections to the Backplane

power supply without the minimum load of one data unit may damage it.

4. Connect the receptacle end of the power cord to the power supply via the location in the shelf backplane, then connect the plug end of the cord to an unswitched 110V AC outlet.

5. Remove the protective safety bar from the front of the shelf.

To install the DC powered shelf in a central office:

WARNING - Ensure that the grounding precautions outlined in the following procedure are taken during installation of the shelf in a central office environment. Failure to do so may cause damage to existing -48 VDC equipment located in the building, such as the DMS-100 Family switch. The installation should be performed

by experienced power cabling personnel, to avoid electrical shock, equipment damage, or service interruption.

1. Mount the shelf in the frame (rack) using machine screws. The shelf is a standard 44.8 cm width. If the rack is wider than 48.36 cm, use P0686254 adapter brackets included in the NT4X2591 mounting hardware kit to extend the width of the shelf as required.

2. Connect the frame ground bus bar to the GND terminal lug, and the logic return ground bus bar to the PC GND terminal lug. See Figure 4.5 on page 4-10 for locations of the shelf connectors. For general reference information on power connections in a central office environment, refer to NTP 297-1001-156, Power Distribution and Grounding Systems, as required.

3. Connect the -48V DC power and ground leads to the labelled lugs on the shelf backplane, and the other end to the appropriate power distibution center (PDC) or frame supervisory panel (FSP).

   Note - if using the frame PDC as power source, the alarm battery supply (ABS) alarm cabling from the respective fuse or circuit breaker should be connected before connecting the -48V DC power, otherwise the circuit may not operate properly and a frame fail signal will exist. Refer to IM925, section 1138 for alarm cabling instructions, or contact Installation Technical Assistance Services (ITAS) for assistance.

4. Remove the protective safety bar from the front of the shelf.

5. Ensure that the NT4X25DL power supply is switched off (set the on/off switch on its faceplate to OFF), then install the power supply in the left side of the shelf. Tighten the faceplate retaining screw to secure it.

   WARNING: Do not turn on the power supply until there is at least one data unit stored in the shelf. Turning on the power supply without the minimum load of one data unit may damage it.

Installing the Rackmount Shelf Alarms

The NT4X25DL power supply has two relay circuits which can be used to trigger shelf power failure alarms. These circuits are accessed via the 9 pin D-type connector located on the power supply. The connector pinout is as follows:

Pin 1 Alarm 1 - normally closed (NC)

Pin 2 Alarm 1 - normally open (NO)

Pin 3	Alarm 2 - normally closed (NC)
Pin 4	Alarm 2 - normally open (NO)
Pin 5	Ground
Pin 6	Alarm 1 - common
Pin 7	Alarm 2 - common
Pin 8	not used
Pin 9	not used

Both modes (NO or NC) of alarm circuit 2 can be enabled or disabled using switches located on the printed circuit board of the power supply. To enable the NC alarm 2 circuit, SW2 must be on (closed). To enable the NO alarm 2 circuit, SW1 must be on (closed). The alarm 1 circuits are always enabled.

If enabled, the alarm circuits signal alarm mode (that is, normally open circuits close, and normally closed circuits open) whenever the input voltage to the power supply is not within the standard DMS range of -42.5 to -56 VDC.

For general reference information on DMS alarms, refer to NTP 297-1001-122, Alarm System Description.

Connecting Data Lines to the Shelf

1. Connect the data lines to the appropriate shelf backplane connector. If data lines are terminated on a multi-pair cable with a 50-pin telephone connector, make the connection to the C0 connector (see Figure 4.5 on page 4-10). If data lines are on single-pair cables, make connections to the T1 and R1 screws of the six-position terminal strips on the shelf backplane (see Figure 4.5 on page 4-10).

2. For RS-232C DUs, use an RS-232C interface cable to connect the DTE to DB-25 connectors on the rear of the shelf. See Figure 4.5 on page 4-10.

   For V.35 DUs, use the adapter cable to connect the DTE to the DB-25 connector on the rear of the shelf. See Figure 4.5 on page 4-10.

Setting the Configuration Switches

The DUs are factory-set for a specific configuration, switched/slave.

When a DU is installed in a switched configuration through the DMS-100 Family switch, the configuration switch must be set for switched/slave operation.

When two DUs are installed in a non-switched configuration, one DU must be set for non-switched/slave, and the other must be set for non-switched/master.

If it is necessary to change the factory setting of the configuration switches, set SW1, SW3-7 and SW3-8 to the required position as shown in Figure 4.6 on page 4-14.

CAUTION

Some devices on the DU circuit card can be damaged by electrostatic discharge. Wear a grounding strap while working on the DU and discharge all tools by touching them to ground.

Setting the Options

On the component side of the rackmount DU there are three banks of DIP switches. See Figure 4.6 on page 4-14 for the location of these switches (SW2, SW3, and SW4). These switches are used to set the desired operating parameters for the DU. For a detailed description of each feature and option see Options (NT4X25AD /AV /CH /DF) on page 3-31. The position settings are shown in Figure 4.7 on page 4-15. In Figure 4.7 on page 4-15, the product engineering codes are listed beside each option switch to indicate which DUs apply.

1. Set the baud rate switches on SW3 to match the DTE baud rate as shown in Figure 4.8 on page 4-16.

2. To set the options, use a small screw driver or the tip of a pen to place the switches in the desired position. See Figure 4.6 on page 4-14.

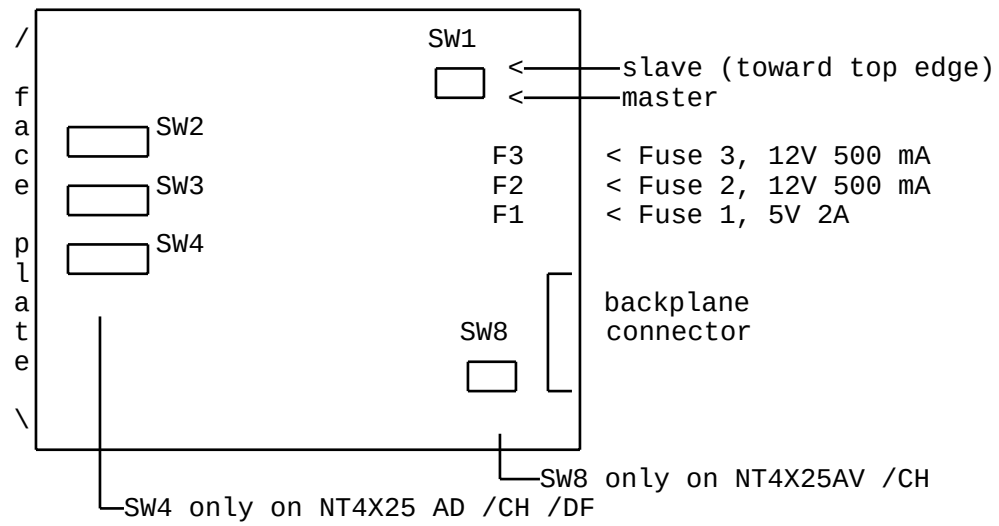
Installing the Rackmount DUs

To meet the minimum loading requirements of the power supply, there must be at least one DU installed in the shelf. The shelf is shipped with blank faceplates covering all empty slots. A faceplate per DU is removed only at the time of DU installation.

1. Plug one rackmount DU into a slot that corresponds to a wired connector on the backplane. This meets the minimum loading requirement of the power supply.

2. Turn the power supply ON.

NT4X25AD /AV /CH layout



Switched Configuration	Non-Switched Configuration
SW1 - slave	SW1 - one DU set to slave - one DU set to master
SW3-7 - slave (OFF)	SW3-7 - one DU slave (OFF) - one DU master (ON)
SW3-8 - switched (ON)	SW3-8 - non-switched (OFF)

Figure 4.6 Rackmount DU - Configuration Switch Settings

When the power supply is turned ON, the DU performs a power-up self-test. A self-test is performed on each subsequent DU when the DU is plugged into the powered-up shelf. For a complete explanation of the self-test see Self-test on page 5-9.

Note that, in a non-switched configuration, the power LED continues to flash until the second DU is connected to the data line.

3. Plug the remaining DUs into slots that correspond to a wired connector on the backplane.

4. Re-install the protective safety bar on the front of the shelf.

DIP SW2

	ON / OFF		Applicable PECs
Auto ans	1	Man ans	NT4X25AD /CH /AV
Auto orig	2	Man orig	
Far-end loop	3	Normal	
T and R loop	4	Normal	
Ext clock	5	Int clock	
Adaptive	6	Normal	
Assert DTR	7	Normal	
Assert RTS	8	Normal	

DIP SW3

	ON / OFF		
Baud	1	Baud	NT4X25AD /CH /AV
Baud	2	Baud	
Baud	3	Baud	NT4X25AD /CH
Assert CD	4	Normal	NT4X25AV *
SAC enable	5	Normal	NT4X25CH /AV
Bit-oriented	6	Char-oriented	
Master	7	Slave	NT4X25AD /CH /AV
Switched	8	Non-Switched	

DIP SW4

	ON / OFF		
Modem Pool	1	Normal	NT4X25AD /CH
MI pulse	2	MI level	NT4X25AD /CH
MI invert	3	Normal	
KBD enable	4	Disable	
Assert CD	5	Normal	NT4X25AD /CH
Local CTS Delay	6	End-to-End Delay	NT4X25CH
CTS Delay A ON	7	OFF	
CTS Delay B ON*	8	OFF	

DIP SW8 - for V.54 external testing

	ON / OFF		
TI Enable	1	Disable	NT4X25CH /AV
LLB Enable	2	Disable	
LB Enable	3	Disable	
Not Used	4		

* On NT4X25DF switch number 8 functions as Switch B/Normal switch
* For NT4X25AD/CH switch number 4 is a data speed selector switch

Figure 4.7 Rackmount DU Option Switches

NT4X25AD /CH

Mode	Baud Rate	SW3 4	SW3 3	SW3 2	SW3 1
async	300	OFF	OFF	ON	OFF
async	1200	OFF	OFF	ON	ON
async	2400	OFF	ON	OFF	OFF
async	4800	OFF	ON	OFF	ON
async	9600	OFF	ON	ON	OFF
async	19200	OFF	ON	ON	ON
async	autobaud	ON	OFF	OFF	OFF
sync	1200	ON	OFF	OFF	ON
sync	2400	ON	OFF	ON	OFF
sync	4800	ON	OFF	ON	ON
sync	9600	ON	ON	OFF	OFF
sync	19200	ON	ON	OFF	ON

NT4X25AV

Mode	Baud Rate	SW3 4	SW3 3	SW3 2	SW3 1
sync	48000	N/A	N/A	OFF	OFF
sync	56000	N/A	N/A	OFF	ON
sync	64000	N/A	N/A	ON	OFF

Figure 4.8 Rackmount DU - Baud Rate Switch Settings

CHAPTER 5

VERIFYING OPERATION

0 297-2121-226
0 VINTAGE 05.01

This chapter provides information for the installation and maintenance personnel to verify the operation of the data unit (DU).

If a problem is reported, these procedures can also be used as a quick check of the DU's integrity, prior to more detailed troubleshooting. If you diagnose a DU as being faulty, replace the DU. Data units are not site-serviceable.

Before verifying the operation of a DU, determine whether the DU is connected in a switched or non-switched configuration.

STATUS INDICATOR LEDS

The indicator LEDs on the face of the DU provide a visual indication of the operating status. Use the chart in Figure 5.1 on page 5-2 to determine the operating status of the DU.

Status Indicator Chart

LED	State	Meaning
Power (Pwr)	off	Power is not being supplied to the DU.
	flash	Power is being supplied but the DU is not synchronized with the DMS-100 Family switch. (In a non-switched configuration, the DU is not connected to another DU).
	on	Power is being supplied, and the DU is synchronized with the DMS-100 Family Switch.
Under Test (tst)	off	DU is not being tested.
	on	Maintenance is in progress.
DTR	off	DTR is not on, due to the terminal being off, the DTE cable not being connected, or the DTR DIP switch not being asserted.
	on	DTR lead on the DTE interface is on or the DTR DIP switch is asserted.
Connect	off	There is no connection.
	flash	Data connection setup is in progress.
	on	Data connection is complete, and the DU is ready to pass data.

Figure 5.1 Status Indicator Chart

DESKTOP DU (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ)

Self-test

A DU self-test is performed automatically upon power-up, or can be initiated manually. If a call is in progress when a self-test is performed, the call is dropped.

To Perform a Manual Self-test on the DU: (NT4X25AA /AE /AN /AP /AX /AZ)

1. Toggle the Self-test/Normal option switch to the Self-test position, then back to the Normal position.

   (The Self-test/Normal switch is located under the flip-top lid on the face of the DU).

   This causes the following to happen:

   * A short beep is heard.

   * After a short delay, all LEDs on the face of the DU light for approximately four seconds.

     If the speed call, auto dial, resource, or DN LEDs flash, a self-test failure is indicated.

   * A short beep is heard, then all LEDs except for the Power LED turn off.

To Perform a Power-up Self-test on the DU: (NT4X25AA /AE /AN /AP /AX /AZ)

1. Disconnect the power supply from the electrical outlet, then reconnect power.

   This causes the following to happen:

   * A short beep is heard.

   * After a short delay, all LEDs on the face of the DU light for approximately four seconds.

     If the speed call, auto dial, resource, or DN LEDs flash, a self-test failure is indicated.

   * A short beep is heard and all LEDs except for the Power LED turn off.

To Perform a Manual Self-test on the DU: (NT4X25AF /AG /AH /AK)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press 2 on DU numerical keypad. The Self-test LED lights.

4. Press the Settings key again. The Settings LED turns off. The Under Test Led on the DU faceplate lights and a beep is heard.

   If the data unit passes the test, all the LEDs light momentarily. If the data unit fails the test, some of the LEDs flash or do not light.

   A second beep is heard to indicate that the test is completed. All the LEDs turn off except the Power, DTR and Alternate LEDs on the DU faceplate.

5. Press the Alternate key. The Alternate LED turns off.

To Perform a Power-up Self-test on the DU: (NT4X25AF /AG /AH /AK)

1. Disconnect the power supply from the electrical outlet, then reconnect power.

   This causes the following to happen:

   * A short beep is heard.

   * After a short delay, all LEDs on the face of the DU light for approximately four seconds.

     If the speed call, auto dial, resource, or DN LEDs flash, a self-test failure is indicated.

   * A second beep is heard to indicate that the test is completed and all LEDs except for the Power and DTR LEDs turn off.

Switched Configuration Verification

Station Ringer Test (NT4X25AA /AE /AF /AG /AH /AK /AN /AP /AX /AZ)

Operating company personnel can perform a station ringer test (SRT) on the DU as outlined in 297-2101-516, Line Maintenance Reference Manual. The SRT test is accessed by dialing a code at the DU.

Loopback Tests

There are three loopback tests:

* local loopback

* far-end loopback

* tip and ring loopback

Note: The tip and ring loopback test is only available on the NT4X25AF /AG /AH /AK data units.

Operating company personnel can also perform a CO loopback test on the DU as outlined in 297-2101-516, Line Maintenance Reference Manual.

The local loopback test checks the terminal-to-DU connection. The DU loops back data at the DTE interface towards the DTE. Characters entered on the DTE keyboard are echoed back to the DTE.

To Perform a Local Loopback Test: (NT4X25AA /AE /AN /AP /AX /AZ)

1. Set the Local Loop/Normal option switch, located under the DU flip-up lid, to the Local Loop position. The Under Test LED lights.

2. Make sure the DTE power is on, then type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the DTE to DU connection is good.

3. Return the Local Loop/Normal switch to the Normal position. The Under Test LED turns off.

Note: You can not perform a local loopback test if there is no TCM synchronization between the data unit and data line card.

To Perform a Local Loopback Test: (NT4X25AF /AH)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 0 on the numeric keypad until the Local Loop LED is lit.

4. Press the Settings key again. The Settings LED turns off and the Under Test LED lights.

5. Make sure the DTE power is on, then type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the DTE to DU connection is good.

6. Press the Settings key. The Settings LED lights.

7. Press the 0 on the numeric keypad until none of the Loopback LEDs are lit.

8. Press the Settings key. The Settings and Under Test LEDs turn off.

9. Press the Alternate key. The Alternate LED turns off.

To Perform a Local Loopback Test: (NT4X25AG /AK)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 3 on the numeric keypad. The Local Loop LED lights.

4. Press the Settings key again. The Settings LED turns off and the Under Test LED lights.

5. Make sure the DTE power is on, then type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the DTE to DU connection is good.

6. Press the Settings key. The Settings LED lights.

7. Press the 3 on the numeric keypad. The Local Loopback LED turns off.

8. Press the Settings key. The Settings and Under Test LEDs turn off.

9. Press the Alternate key. The Alternate LED turns off.

The far-end loopback test checks the end-to-end data channel. The data is looped back at the DTE interface of the far-end DU toward the near DU. Characters entered on the DTE keyboard are echoed back to the DTE.

To Perform a Far-end Loopback Test:: (NT4X25AA /AE /AN /AP /AX /AZ)

1. Set the Far-end Loop/Normal option switch, located under the flip-up lid, to the Far-end Loop position. The Under Test LED lights.

2. Setup a call to another DU.

3. Type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the end-to-end data channel is good.

4. Take down the call.

5. Return the Far-end Loop/Normal switch to the Normal position. The Under Test LED turns off.

To Perform a Far-end Loopback Test: (NT4X25AF /AH)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 0 on the numeric keypad until the Far-end Loopback LED lights.

4. Press the Settings key. The Settings LED turns off and the Under Test LED lights.

5. Setup a call to another DU.

6. Type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the end-to-end data channel is good.

7. Take down the call.

8. Press the Settings key. The Settings LED lights.

9. Press the 0 on the numeric keypad until none of the Loopback LEDs are lit.

10. Press the Settings key. The Settings and Under Test LEDs turn off.

11. Press the Alternate key. The Alternate LED turns off.

To Perform a Far-end Loopback Test: (NT4X25AG /AK)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 4 on the numeric keypad until the Far-end Loop LED is lit.

4. Press the Settings key again. The Settings LED turns off and the Under Test LED lights.

5. Setup a call to another DU.

6. Make sure the DTE power is on, then type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the end-to-end connection is good.

7. Take down the call.

8. Press the Settings key. The Settings LED lights.

9. Press the 4 on the numeric keypad. The Far-end Loopback LED turns off.

10. Press the Settings key. The Settings and Under Test LEDs turn off.

11. Press the Alternate key. The Alternate LEDs turn off.

To Perform a Tip-and-ring Loopback Test: (NT4X25AF /AH)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 0 on the numeric keypad until the Tip-and-Ring Loopback LED lights.

4. Press the Settings key. The Settings LED turns off and the Under Test LED lights.

5. Type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the channel between the DU and the DTE, and the DU circuitry is good.

6. Press the Settings key. The Settings LED lights.

7. Press the 0 on the numeric keypad until none of the loopback LEDs are lit.

8. Press the Settings key. The Settings and Under Test LEDs turn off.

9. Press the Alternate key. The Alternate LED turns off.

To Perform a Tip-and-ring Loopback Test: (NT4X25AG /AK)

1. Press the Settings key. The Settings LED lights.

2. Press the Alternate key. The Alternate LED lights.

3. Press the 5 on the numeric keypad until the Tip-and-ring Loop LED is lit.

4. Press the Settings key again. The Settings LED turns off and the Under Test LED lights.

5. Type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the channel between the DU and the DTE, and the DU circuitry is good.

6. Press the Settings key. The Settings LED lights.

7. Press the 5 on the numeric keypad. The Tip-and-ring Loopback LED turns off.

8. Press the Settings key. The Settings and Under Test LEDs turn off.

9. Press the Alternate key. The Alternate LED turns off.

Non-Switched Configuration Verification

In a non-switched configuration two DUs are connected directly to each other without going through the DMS-100 Family switch.

To verify the operation of a DU in a non-switched configuration, ensure that both DTEs and DUs are turned on, then perform any standard DTE activity such as logging-on or transmitting data.

RACKMOUNT DU (NT4X25AD /CH /AV /DF)

Self-test

A DU self-test is performed automatically upon power-up, or can be invoked manually by using the Self-test (Self Tst) push button switch. If a call is in progress when a self-test is performed, the call will be dropped.

To Perform a Manual Self-test on the DU: (NT4X25AD /CH /AV /DF)

1. Press the Self-test push button on the DU faceplate.

   This causes the following to happen:

   * All LEDs on the face of the DU light for approximately four seconds.

     If any of the LEDs flash, a failure is indicated.

   * All LEDs except for the Power LED turn off.

To Perform A Power-up Self-test on the DU: (NT4X25AD /CH /AV /DF)

1. Unplug the DU from the shelf backplane, then plug the DU back in to the backplane.

   This causes the following to happen:

   * All LEDs on the face of the DU turn on for approximately four seconds.

     If any of the LEDs flash, a failure is indicated.

   * All LEDs except for the Power LED turn off.

Switched Configuration Verification

Loopback Tests (NT4X25AD /CH /AV /DF)

There are three loopback tests:

* local loopback

* tip-and-ring loopback

* far-end loopback

The local loopback test checks the terminal-to-DU connection. The DU loops back data at the RS-232C interface towards the DTE. Typically, characters entered on the DTE keyboard are echoed back to the DTE. The Under Test LED lights during the test. The Local (Loc) Loop switch is located on the DU faceplate.

1. If the Make Set Busy feature is assigned by the operating company, inform the DMS-100 Family switch of maintenance action by pressing the Busy key on the face of the DU. The Busy LED lights. The DMS-100 Family switch places the DU out of service for testing.

2. To perform a local loopback test, set the Loc Loop switch to the Loc Loop position. The Under Test LED lights.

3. Make sure the DTE power is on, then transmit a string of characters from the DTE (for example, type characters on the DTE keyboard). If the transmitted characters are echoed back to the terminal, the connection is good.

4. Return the Loc Loop switch to the off position. The Under Test LED turns off.

5. Press the Busy key to turn the Busy LED off. The DMS-100 Family switch returns the DU to service.

The tip-and-ring (T-and-R) loopback test checks the data from the DTE to the tip-and-ring interface at the DU. The DU is isolated from the loop and the data is looped back at tip-and-ring interface toward the DTE. The T-and-R Loop/Normal switch is located on the component side of the DU circuit card on SW2, switch position 4. See Figure 4.6 on page 4-14 for the location of the switch.

1. If the Make Set Busy feature is assigned by the operating company, inform the DMS-100 Family switch of maintenance action by pressing the Busy key on the face of the DU. The Busy LED lights. The DMS-100 Family switch takes the DU out of service for testing.

2. To perform a tip-and-ring loopback test, unplug the DU from the backplane in order to gain access to SW2. Set SW2-4 ON. (T-and-R Loop position) as shown in Figure 4.7 on page 4-15.

3. Plug the DU into the backplane. A power-up self-test is performed on the DU. The Under Test LED on the DU faceplate remains on.

4. Go to the DTE and type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the path from the DTE to tip and ring is good.

5. Unplug the DU from the backplane and return SW2-4 to the OFF (normal) position.

6. Plug the DU into the backplane. A power-up self-test is performed on the DU. The under test LED turns off.

7. Press the Busy key to turn the Busy LED off. The DMS-100 Family switch returns the DU to service.

The far-end loopback test checks the end-to-end data channel. The data is looped back at the RS-232C interface of the far-end DU toward the near DU.

There are two methods of performing a far-end loopback test. Choose the one that is appropriate for the installation:

* Method one is for testing a rackmount DU connected to a DTE capable of keyboard dialing. This method typically applies to the NT4X25AD /CH /DF data units.

* Method two is for testing a rackmount DU connected to a dial-up DTE, such as a mainframe computer. This method typically applies to the NT4X25AV data unit. Method two requires a known good desktop DU connected to a DTE that can transmit characters.

Far-end Loopback Test - Method One:

1. To perform a far-end loopback test, unplug the DU from the backplane in order to gain access to SW2. Set SW2-3 to the ON position (Far-end Loop) as shown in Figure 4.7 on page 4-15. See Figure 4.6 on page 4-14 for the location of SW2.

2. Plug the DU into the backplane. A power-up self-test is performed on the DU. The Under Test LED on the DU faceplate remains on.

3. Establish a call to another DU by using the keyboard dialing feature at the DTE.

4. Type a string of characters on the DTE keyboard. If the typed characters are echoed back to the terminal, the end-to-end channel is good.

5. Disconnect the call.

6. Unplug the DU from the backplane and return switch SW2-3 to the OFF position (Normal position).

7. Plug the DU into the backplane. A power-up self-test is performed on the DU. The Under Test LED turns off.

Far-end Loopback Test - Method Two:

1. At a known good desktop DU, enable the Far-end Loop option. The Under Test LED lights.

2. Place a call to the rackmount DU to be tested.

3. From the known good DU, transmit a string of characters to the rackmount DU. If the transmitted characters are echoed back to the DTE of the known good DU, the rackmount DU is operating properly and the end-to-end data channel is good.

4. Disconnect the call.

Non-Switched Configuration Verification (NT4X25AD /CH /AV /DF)

In a non-switched configuration two DUs are connected directly to each other without going through the DMS-100 Family switch.

To verify the operation of a DU in a non-switched configuration, ensure that both DTEs and DUs are turned on, then perform any standard DTE activity such as logging-on or transmitting data.

CHAPTER 6

TROUBLESHOOTING

0 297-2121-226
0 VINTAGE 05.01

This chapter describes some of the problems you may encounter with the data units either during installation or during normal operation. For each problem, a series of corrective actions is suggested. Before following some of these actions, you may want to perform the diagnostic tests outlined in Chapter 5 on page 5-1. If a DU is diagnosed as faulty, replace it. The DU is not site-serviceable.

STATUS INDICATORS

There are four status indicator LEDs on the face of a DU:

* power
* under test
* DTR
* connect

These LEDs indicate the operating status of the DU. For example, the power LED indicates both ac power and synchronization. Use the information in Figure 6.1 on page 6-2 to determine the status of the DU.

Status Indicator Chart

LED	State	Meaning
Power (Pwr)	off	Power is not being supplied to the DU.
	flash	Power is being supplied but the DU is not synchronized with the DMS-100 Family switch. (In a non-switched configuration, the DU is not connected to another DU).
	on	Power is being supplied, and the DU is synchronized with the DMS-100 Family Switch.
Under Test (tst)	off	DU is not being tested.
	on	Maintenance is in progress.
DTR	off	DTR is not on, due to the terminal being off, the DTE cable not being connected, or the DTR DIP switch not being asserted.
	on	DTR lead on the DTE interface is on or the DTR DIP switch is asserted.
Connect	off	There is no connection.
	flash	Data connection setup is in progress.
	on	Data connection is complete, and the DU is ready to pass data.

Figure 6.1 Failures Indicated by Status LEDs

TABLE 6.1
DATA UNIT TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
The Power LED is off on a DU.	DU power is not connected (desktop).	Connect DU power supply cord to 110 V ac outlet.
	DU power is not connected (rackmount).	Plug DU into backplane and turn power supply on.
	On-board fuses are blown (rackmount).	Replace the data unit.
The Power LED is off on all DUs (Rackmount).	110 Vac power not available (shelf powered by NT4X25DK power supply)	Ensure AC power is available at the 110 Vac outlet, reconnect power cord if necessary, and ensure shelf power supply is turned on.
	-48V DC power not available (shelf powered by NT4X25DL power supply)	Ensure -48Vdc is available at the source, ensure that the DC supply is connected and that connections are not reversed, and that the shelf power supply is turned on.
	On-board fuse is blown.	Replace the fuse.
Power LED flashes.	DU does not have synchronization with DMS-100 Family switch.	(desktop) Connect data line to Teladapt jack on DU. See Making the Connections to the DU on page 4-5.
		(rackmount) Connect data line at C0 or terminal strip. See Connecting Data Lines to the Shelf on page 4-12.

Table Continued

TABLE 6.1 (Continued)
DATA UNIT TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		Check that data line is properly connected.
(Desktop) When the DN key is pressed, the DN LED turns on, and a reorder tone is heard.	DTR is not provided to the DU.	Turn DTE on. Check RS-232/V.35 connection. Set assert DTR option to assert DTR. See Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7.
DU does not transmit data. Connect LED is lit.	The RTS signal must be on for the DU to transmit data.	Enable Assert RTS (see Chapter 3 on page 3-1 and Chapter 4 on page 4-1).
Speed call and auto dial numbers can not be programmed.	These features may not be available to subscriber.	Contact operating company.
DU does not answer incoming calls.	DTR is not asserted.	Set assert DTR option to assert DTR. (For desktop DUs see Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7). (For rack-mount DUs see Setting the Options on page 4-13).
	Incorrect option switch setting. DTE not turned on.	Set the auto answer option switch to the auto answer position. (For desktop DUs see Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7). (For

Table Continued

TABLE 6.1 (Continued)
DATA UNIT TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		rackmount DUs see Setting the Options on page 4-13). Turn the DTE power on and check that it is properly connected to the DU.
No keyboard dialing prompt (colon).	Incorrect KBD option switch setting.	Set the KBD enable option switch to the KBD enable position. (For desktop DUs see Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7). (For rack-mount DUs see Setting the Options on page 4-13).
(NT4X25AX only) Some characters are not echoed on the screen during keyboard dialing.	Character entry too fast.	Enter characters at the keyboard slowly. Wait until each character is echoed on the screen before entering another.
Characters are not echoed on the screen while keyboard dialing.	Using incorrect keyboard dialing characters.	Consult the user guide supplied with the DU.
DU answers but the connect indicator flashes.	Incorrect DU operating parameters.	Make sure that both DUs are set to the same speed and mode. Set the adaptive option switch to the adaptive position. (For desktop DUs see Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7). (For rack-

Table Continued

TABLE 6.1 (Continued)
DATA UNIT TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
		mount DUs see Setting the Options on page 4-13).
	Both DUs are set to external clock.	Set one DU to internal clock. (For desktop DUs see Setting the Options (NT4X25AA /AE /AN /AP /AX /AZ) on page 4-6 and Setting the Options (NT4X25AF /AG /AH /AK) on page 4-7). (For rackmount DUs see Setting the Options on page 4-13).
	Connection may be over analog trunk and a modem pool is required.	If connection is over an analog trunk the call can not be made without a modem pool. If modem pooling is assigned to the DU line, press the Resource key on the DU to engage a modem pool. If modem pooling is not assigned to the DU line, contact the operating company for assignment.
Can connect but can not exchange data.	Transmission problem.	Make sure the DTE and DU have the same operating parameters. Make sure the DTE is turned on and properly connected to the DU. Perform a far-end loopback test. (For desktop DUs see Loopback Tests on page 5-4). (For rackmount DUs see Loopback Tests (NT4X25AD /CH /AV /DF) on page 5-10).

Table Continued

TABLE 6.1 (Continued)
DATA UNIT TROUBLESHOOTING

SYMPTOM	PROBLEM	ACTION
Garbled characters on DTE screen.	Incorrect operating parameters between DU and DTE.	Make sure both DU and DTE are set to the same speed and mode. Report the problem to the operating company.
Cannot disconnect data call. Data call automatically reconnects.	Calling DU has the virtual private line feature on. With this feature, the calling DU will continually try to re-establish the data call to the far end DU.	The data call must be disconnected from the calling DU by pressing the release key.

0 297-2121-226
0 VINTAGE 05.01

CHAPTER 7

GLOSSARY

0 297-2121-226
0 VINTAGE 05.01

This chapter provides definitions for terms and abbreviations that are relevant to Datapath data units. Many terms and abbreviations are included that are not exclusive to Datapath or DMS-100, but provide a better understanding of the information in this manual.

A more comprehensive Glossary of DMS-100 terms can be found in 297-1001-825, Glossary of Terms and Abbreviations.

Items in this glossary are entered in strict alphabetical order, disregarding punctuation and all non-alphanumeric characters. Numbers appear in order following the last letter of the alphabet.

A separate list of abbreviations is not used. Abbreviations are entered in the text at their appropriate alphabetical locations. Definitions of abbreviations consist solely of the full terms to which they refer.

AILC	Asynchronous Interface Line Card
Analog	Pertains to representation by means of continuously variable physical quantities. Contrast with Digital.
Asynchronous Transmission	Transmission in which each information character, word, or small block is individually synchronized -- usually by the use of start and stop elements. The gap between each character or word is not necessarily of a fixed length. Contrast with Synchronous Transmission.
bps	Bits per second
BCS	Batch Change Supplement
Baud	A unit of signaling speed equal to the number of discrete conditions or signaling events per second.
CCITT	International Telegraph and Telephone Consultative Committee
CD	Carrier Detect
COAX TIF	Coaxial Terminal Interface
CPR	Call Path Restoration
CSA	Canadian Standards Association

CTS	Clear To Send
Data Line Card (DLC)	The line card that interfaces a Datapath loop to a Data Unit. It is part of a line subgroup in a Line Concentrating Module.
Datapath	An end-to-end digital data service that includes a data unit and a two-wire loop into the network.
Digital	Pertaining to digits or to the representation of data or physical quantities by digits. Contrast with Analog.
DIP	Dual In-line Package
DLC	Data Line Card
DMS	Digital Multiplex System
DN	Directory Number
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
DTU	Data Terminating Unit
DU	Data Unit
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
FSP	Frame Supervisory Panel
Full-duplex	Pertains to a simultaneous two-way independent transmission in both directions. Contrast with Half-duplex.
Half-duplex	Data transmission in two directions, one way at a time. Contrast with Full-duplex.
KBD	Keyboard Dialing
kbps	Kilo bits per second
LB	DCE/DTE interface lead used to request a loop 2 test condition.

LED	Light Emitting Diode
LIU	Line Interface Unit
LLB	DCE/DTE interface lead used to request a loop 3 test condition.
MI	Mode Indicator
MTBF	Mean Time Between Failures
NPA	Numbering Plan Area
NTP	Northern Telecom Practice
PDC	Power Distribution Center
RTS	Request To Send
SW	Switch
TCM	Time Compression Multiplexing
TI	DCE/DTE interface lead used to indicate a test condition.
UL	Underwriters Laboratories
VPL	Virtual Private Line