
DIGITAL SWITCHING SYSTEMS

DMS*-100 FAMILY DATAPATH*

MODEM POOLS - INSTALLATION AND MAINTENANCE

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0 PRACTICE 297-2121-224
0 VINTAGE 06.02

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INTRODUCTION

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PRACTICE APPLICATION

The information in this Practice applies to offices with Batch Change Supplement 32 (BCS32) software. Unless reissued, the Practice also applies to any office with subsequent BCS release software. The correspondence between BCS releases and Northern Telecom Practice (NTP) issues is given in 297-1001-001, Master Index of Practices.

REASON FOR REISSUE

This document is reissued to include information on adaptive modem pooling.

GENERAL

Scope

This document describes the procedure for installing and maintaining Datapath modem pools. It identifies the hardware and software components of a modem pool, provides hardware interconnection instructions, and explains how to enter the DMS datafill necessary to use and test the modem pools.

Overview

A modem pool is a Datapath product. Datapath is a comprehensive communications system designed to take full advantage of DMS-100 Family digital switching capabilities.

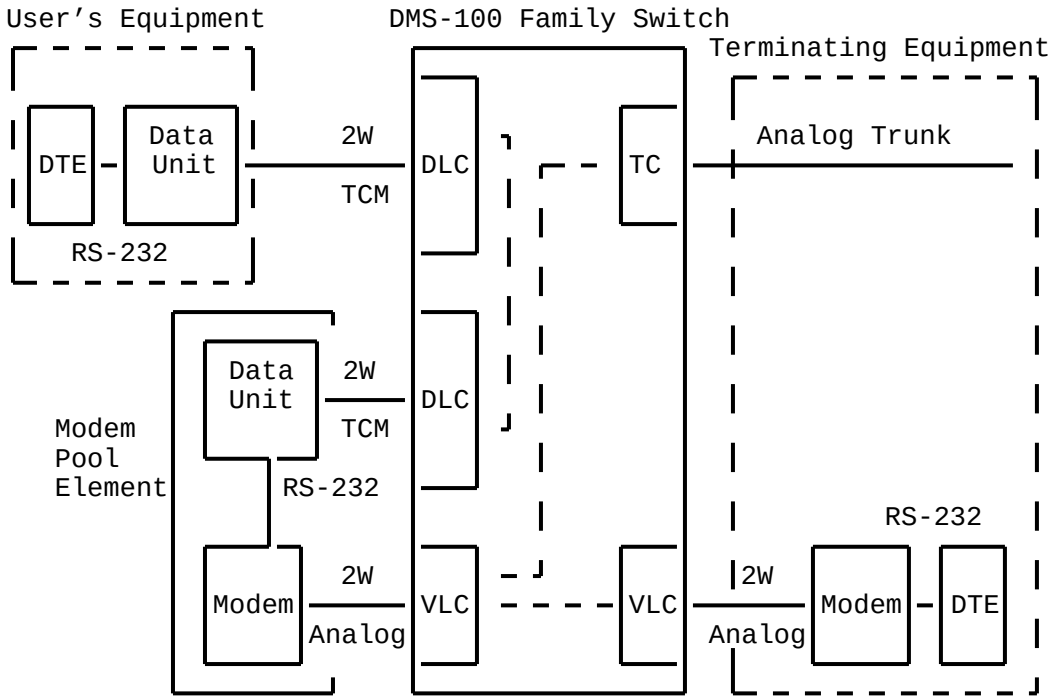
A modem pool allows the Datapath user’s digital equipment to communicate with analog modems, or to communicate via analog facilities by providing the required analog/digital conversion at the switch. When required, a Data Unit (DU), which has been specially wired to a voice frequency analog modem, is inserted into the call path. This DU-modem pair is known as a modem pool member or element. The user’s DU communicates with the modem pool DU. The terminating equipment communicates with the modem pool modem. The modem pool element converts the data from digital to analog and vice versa.

Equipment Configuration

A Datapath modem pool consists of a number of DU/analog modem pairs that are installed in a DMS-100 Family office. Each pair or "element" consists of one modem directly connected to an associated DU. Each modem pool is designated to serve one or more specific user groups that require distinct transmission charac-

0 teristics (e.g., speed and data format). The elements within a
0 particular modem pool are configured to meet the requirements of
0 their specific user group.

0 Figure 1.1 shows the transmission path between a customer's DU
0 and a modem or analog trunk, through a single element of a modem
0 pool (one modem/DU pair).



0 Legend:
0 =======

0 - - - switched connections through the DMS-100 Family network
0 DLC Data Line Card
0 DTE Data Terminal Equipment
0 TC Trunk Card
0 TCM Time Compression Multiplexing
0 VLC Voice Line Card

0 **Figure 1.1 Transmission Path Through a Modem Pool Element**

0 Figure 1.2 on page 1-3 shows an example of modem pools existing
0 in a DMS-100 Family office. It shows the basic connection dif-
0 ference between the inbound, outbound and bidirectional modem

pools, namely the use of MI (Mode Indicator) and MIC (Mode Indicator Common) control leads.

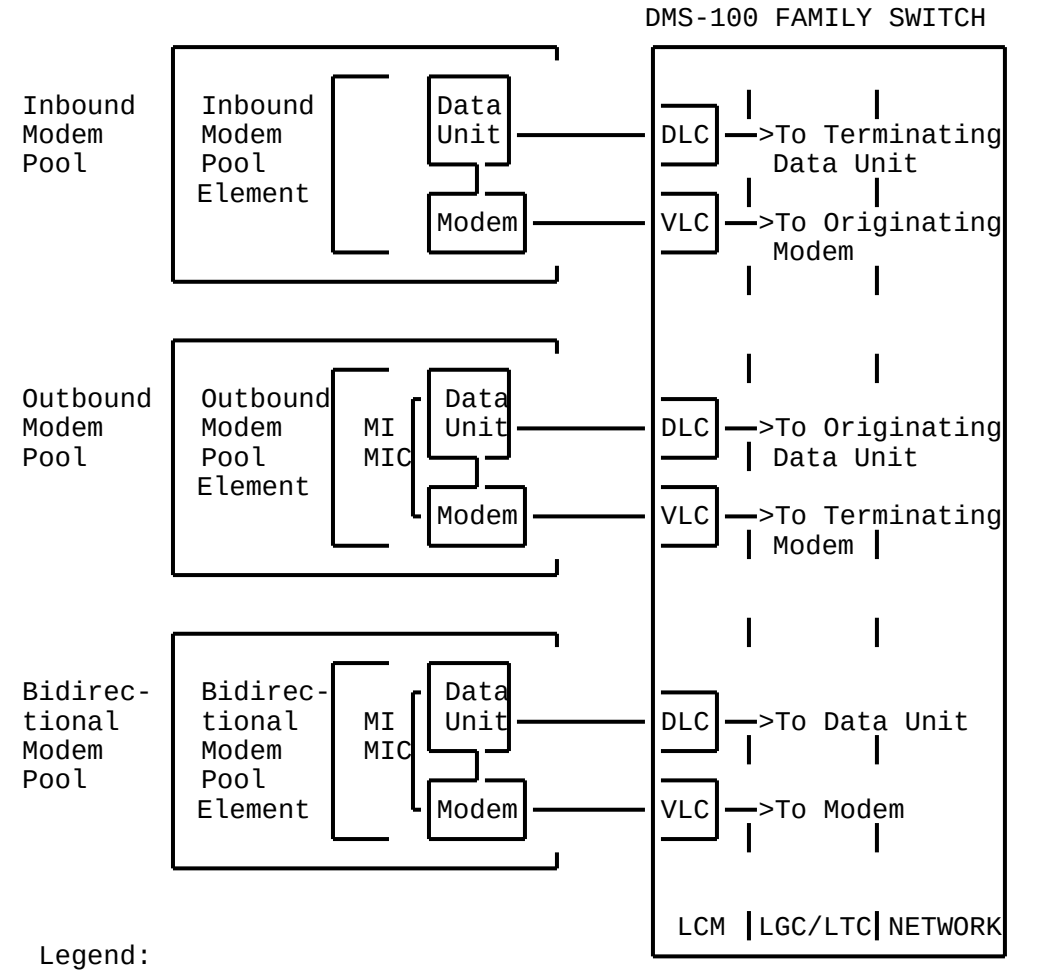


Figure 1.2 Inbound, Outbound and Bidirectional Modem Pools

The number of elements (DU/modem pairs) in a modem pool is determined by traffic requirements for that particular pool. Each modem pool group can have up to 256 elements. The total number of modem pools is constrained by the number of available common language location identifiers (CLLIs). Several pools with different operating characteristics may be configured for use in

0 different applications. Each modem pool is configured to handle 0 inbound calls, outbound calls, or both inbound and outbound 0 calls.

0 Inbound Modem Pool

0 An inbound modem pool is required when the analog (analog modem) 0 side of the connection path originates the call, or when an ana- 0 log facility is used at some point in the transmission path (see 0 Figure 1.2 on page 1-3). The terminating digital switch acti- 0 vates the modem pool when it determines that the terminator is a 0 DU and that a modem or analog facility is used at some point in 0 the transmission path.

0 Outbound Modem Pool

0 An outbound modem pool is required when the digital (subscriber 0 DU) side of the connection path originates the call (see 0 Figure 1.2 on page 1-3). An analog modem is provided when the 0 user's DU calls an analog modem or when the call must go out over 0 an analog trunk.

0 Outbound modem pools (OMP) can be assigned NRS numbers for pre- 0 fixed dialing. This function is provided by the Modem Pooling 0 Phase II feature. Prefixed OMP Selection dialing allows the user 0 to select a specific outbound modem pool, rather than the default 0 outbound modem pool, by dialing certain prefix digits before the 0 normal directory number digits. This capability is referred to 0 as PNO (Prefix Network Resource Selector Outbound).

0 Customer groups can be assigned NRS numbers to prevent an out- 0 bound modem pool (OMP) from being inserted in the path of a call. 0 This function is provided by the Network Resource Selector Over- 0 ride feature. Prefixed OMP override dialing allows the user to 0 prevent an outbound modem pool from being inserted in the call 0 path by dialing certain prefix digits before the normal directory 0 number digits. This feature is used when the user knows that the 0 call will be terminated at a data unit, or placed over all-digi- 0 tal facilities. This capability is referred to as NMP (No Modem 0 Pool).

0 Adaptive Modem Pooling
0
0 In standard modem pooling, the modem pool data unit and its asso- 0 ciated modem operate at a fixed bit rate. For example, if a 0 modem pool provides access to analog facilities operating at 1200 0 bps, and access is required to 2400 bps, a separate modem pool is 0 required.
0
0 In adaptive modem pooling, the modem pool data unit allows the 0 modems to negotiate a data rate before call setup. The modem 0 pool modem would then indicate the negotiated speed to the modem 0 pool data unit. The data units would handshake and operate at 0 that speed.

With standard modem pooling operation, when a data unit call terminates on an analog device, the following events occur:

* the call originator presses the data unit NRS key, which places the modem pool in the call path;

* the originator’s data unit and the modem pool data unit handshake using T-link protocol;

* if the handshake is successful, a Data Terminal Ready (DTR) indication is sent from the originator’s data unit to the modem pool modem;

* the modem pool modem then begins a handshake operation with the far end modem; and

* after a successful handshake, end-to-end connectivity is established.

With adaptive modem pooling, the following events occur:

* the call originator presses the data unit NRS key, which places the modem pool in the call path;

* the modem pool data unit delays the T-link handshake with the originator’s data unit, but sends a DTR indication to the modem pool modem;

* the modem pool modem and the far-end (called) modem handshake, and attain data mode;

* the modem pool modem sends the modem pool data unit a message indicating the negotiated baud rate;

* the modem pool data unit and the originator’s data unit handshake using T-link protocol. Included in the handshake message is the baud rate received from the modem pool modem;

* the originator’s data unit adapts to the baud rate indicated by the modem pool data unit; and

* end-to-end connectivity is achieved.

Only rackmount type data units (NT4X25AD after modification, and NT4X25CH) can be used for Adaptive Modem Pooling. Data unit DIP switch setting are contained in Table 2.2 on page 2-14.

Bidirectional Modem Pool

A modem pool that is designated as both inbound and outbound (bidirectional) can handle inbound or outbound calls.

Automatic Modem Insertion

The automatic modem insertion (AMI) is the process of automatically inserting an outbound modem pool element into the path of a DATAPATH call. With the feature package NTX251AA, AMI feature is available, on per line basis, both for intra-switch and inter-switch data calls. It uses an audio tone detector (ATD) (NT5X29AC) to detect the modem answer tone.

For every data call requiring outbound modem pooling with the AMI feature active, one ATD channel is required to detect an answer tone on the terminating line. The ATD is attached to the line when the far end answers. A modem pool element is inserted automatically when the ATD detects modem answer tone. If no tone is detected the ATD times out in six (6) seconds.

The resource lamp, associated with the resource key on the user data unit, flashes at 120 IPM when the ATD is monitoring the line for modem answer tone. It turns on solid as soon as the modem pool element is inserted in the call path. If the ATD is not available, or times out, the resource lamp will flash at 60 IPM. This indicates that manual insertion of the modem pool element is required. Use the resource feature key to insert the modem pool element.

In the case of keyboard dialing, if the ATD is successful, the modem pool element is inserted in the call path after the first resource prompt '&?'. If the ATD fails, a second resource prompt '&?' appears, indicating that use of the resource key for modem insertion is required.

The timing out of the ATD, or otherwise its failure to detect an answer tone for the AMI feature, is reported by the log report IBN108. For more information on this log report, refer to the Log Report Manual, 297-1001-510.

The AMI feature can be assigned either by table control, or through Service Orders. For information on tables affected, see NTP 297-2101-451. For information on Service Orders, see NTP 297-2101-310.

ISDN Outbound Modem Pooling

Outbound modem pooling is available for ISDN terminal adapters (TA) with feature package NTXE25AA. An ISDN TA uses outbound modem pooling when it calls a modem or another TLINK device over analog facilities. A prefix code in table IBNXLA is used to access a default modem pool group, specified in table KSETFEAT. The modem pool is automatically inserted in the call path after the far end answers. For datafill and other information on these tables, see NTP 297-2101-451.

ISDN Inbound Modem Pooling

This feature provides Inbound Modem Pooling for ISDN subscribers, and is activated when a data call, originating from from analog facilities (modem or analog trunk), is made to an ISDN terminal. The detailed procedure is as follows:

* An incoming call translates to an ISDN SYNonym (SYN) Directory Number (DN) which has the Inbound Modem Pooling (IMP) feature assigned;

* Information, including the actual Directory Number of the called ISDN station, the IMP feature selector, and a prefix code specifying the modem pool name in table KSETFEAT is obtained from table WRDN; and

* A modem pool member from the specified pool is inserted into the call path when an ANSWER message is received from the terminating ISDN terminal.

Outbound Network Modem Pooling

Outbound Network Modem Pooling feature provides a centralized modem pool to be shared between between SL-100 offices, or between an SL-1 and SL-100 switches. Data subscribers originating a call are routed over a digital trunk to an office having a modem pool. A modem is allocated to the call, and inserted in the talk path when carrier tone is returned from the terminating line. If an inbound synchronization message is returned, the modem pool is not required, and the modem pool resource is deallocated.

Maintenance Modem Pool

A maintenance modem pool is a modem pool that is reserved for testing purposes. It is not used in normal call processing. Each maintenance modem pool is designated to test the elements of one or more specific modem pools that require distinct transmission characteristics (speed and data format). The elements within a particular maintenance modem pool are configured to meet the requirements of the corresponding modem pool.

Maintenance modem pools allow the craftsperson to test the modem pool equipment from the Maintenance and Administration Position (MAP*) of the DMS-100 Family switch via integrated test equipment.

Figure 1.3 on page 1-8 shows inbound, outbound, and bidirectional maintenance modem pools.

Figure 1.4 on page 1-9 shows a maintenance modem pool connection.

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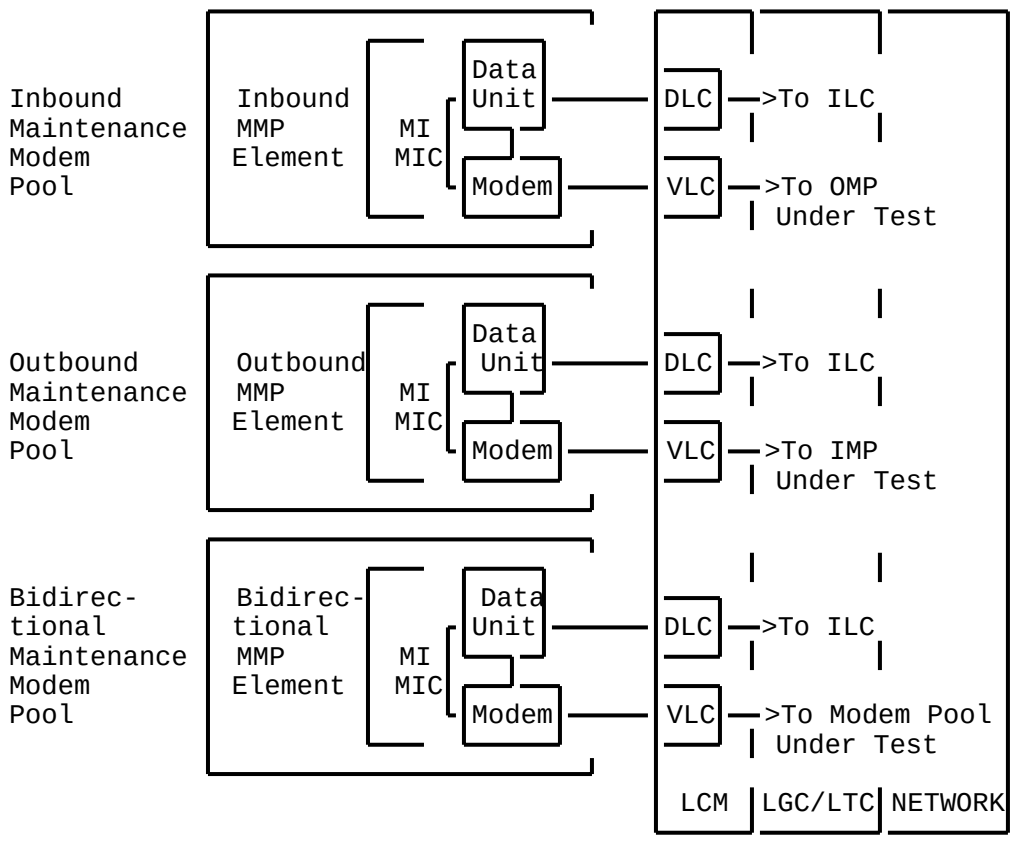
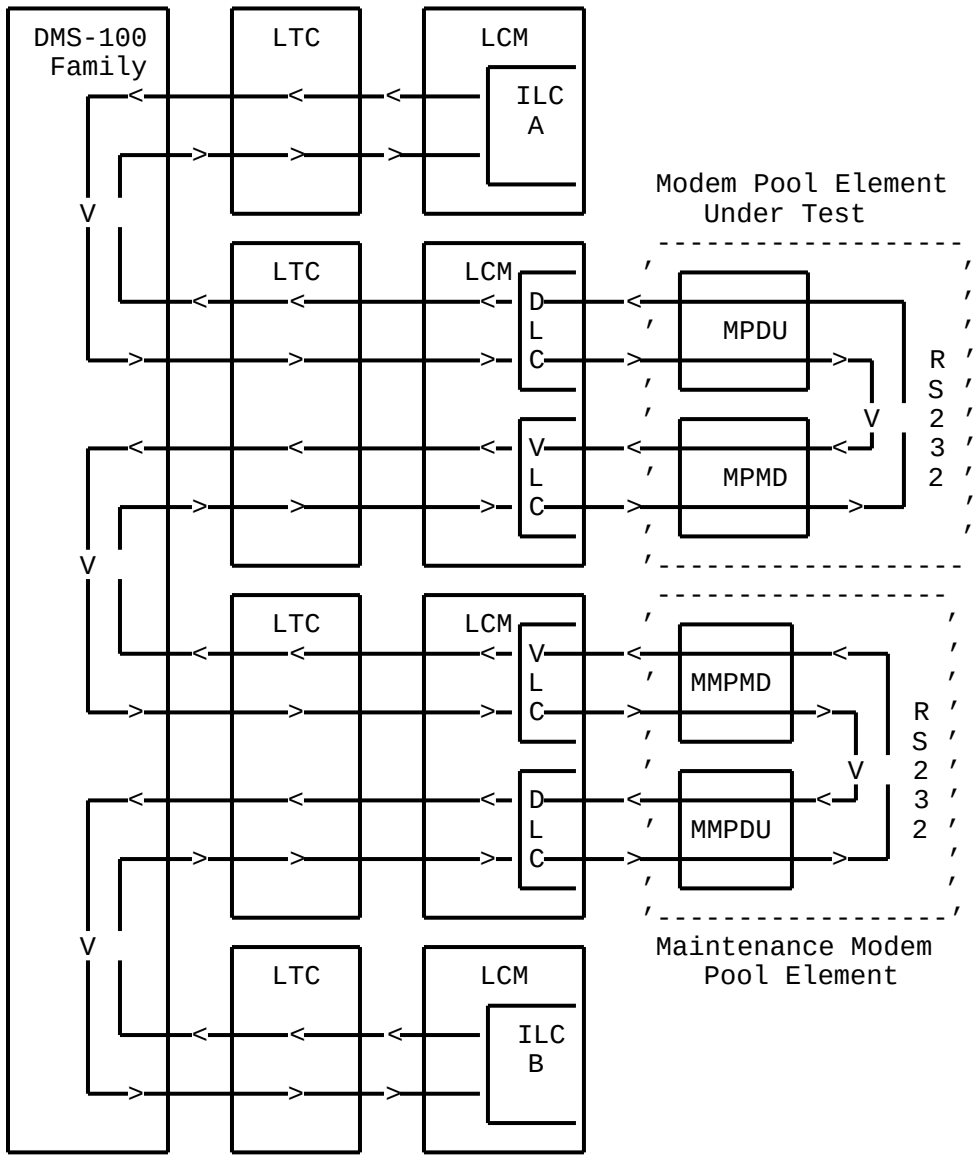
*MAP is a trademark of Northern Telecom



Legend:
======
DLC = Data Line Card
ILC = IBERT Line Card
IMP = Inbound Modem Pool
LCM = Line Concentrating Module
LGC = Line Group Controller
MI = Mode Indicator
LTC = Line Trunk Controller
MIC = Mode Indicator Common
MMP = Maintenance Modem Pool
OMP = Outbound Modem Pool
VLC = Voice Line Card

Figure 1.3 Maintenance Modem Pools



Legend:
======

DLC = Data Line Card	MD = Modem
DU = Data Unit	MMP = Maintenance Modem Pool
ILC = IBERT Line Card	MP = Modem Pool
LCM = Line Concentrating Module	VLC = Voice Line Card
LTC = Line Trunk Controller	

Figure 1.4 Maintenance Modem Pool Connection

REFERENCES

References listed as prerequisites are essential for an understanding of this Practice. Those listed as informative contain detailed information concerning other items mentioned in this Practice, but are not essential. References are inserted at the appropriate places in the text.

Note: The documents listed may exist in more than one version. See 297-1001-001, Master Index of Practices to determine the release code of the version compatible with a specific release of software.

Prerequisite References

DOCUMENT NUMBER	TITLE
297-1001-100	System Description

Informative References

DOCUMENT NUMBER	TITLE
297-1001-001	Master Index of Practices
297-1001-320	Operational Measurements Reference Manual
297-1001-451	Common Customer Data Schema
297-1001-455	Office Parameters Reference Manual
297-1001-510	Log Report Manual
297-1001-814	Operational Measurements (OM)
297-2101-310	Service Order and Query System Reference Manual
297-2101-451	Local Customer Data Schema
297-2101-516	Line Maintenance Reference Manual
297-2121-226	Data Unit - Installation and Maintenance

CHAPTER 2

HARDWARE INSTALLATION

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GENERAL

This chapter deals with the installation of a modem pool. Installing a Rackmount Modem Pool on page 2-4 describes the procedure for installing rackmount data units (DU) and modems. Installing a Desktop Modem Pool on page 2-15describes the procedure for installing desktop DUs and modems.

Rackmount Equipment

The use of rackmount DUs and rackmount modems is recommended. With rackmount equipment, connections between the DUs and modems are made more easily because the cable connections are built into the NT0X43BA frame. In addition, rackmount units take up less space than desktop units.

DATA UNITS

Rackmount DUs (NT4X25CH and NT4X25AD) are used in a modem pool. Desktop DUs (NT4X25AF and NT4X25AN) can also be used. A complete description of these units is found in 297-2121-226, Data Unit - Installation and Maintenance.

Note: The NT4X25AD and NT4X25AN DUs have the following restrictions. They can not be:

* used in bidirectional modem pools
* used in maintenance modem pools
* tested by maintenance modem pools

It is therefore recommended that the NT4X25CH and NT4X25AF DUs be used for modem pools.

MODEMS

A modem to be used with a DU in a modem pool must conform to certain specifications. These requirements are different for inbound, outbound, and bidirectional modem pools.

For Inbound Modem Pools

The modems used in inbound modem pools must support:

* two-wire switched network operation
* speed to match the service application designated for the modem pool

0 * call termination via DTR (data terminal ready) off, loss of carrier detect, or both

0 * 1 start bit, 5, 6, 7, or 8 data bits, 1, 1.5 or 2 stop bits for asynchronous operation

0 * external clock option for synchronous operation

0 * auto-answer when physical ringing is applied

0 For Outbound Modem Pools

0 The modems used in outbound modem pools must support:

0 * two-wire switched network operation

0 * speed to match the service application designated for the modem pool

0 * call termination via DTR off, loss of carrier detect, or both

0 * 1 start bit, 5, 6, 7, or 8 data bits, 1, 1.5 or 2 stop bits for asynchronous operation

0 * external clock option for synchronous operation

0 * MI and MIC (Mode Indicator and Mode Indicator Common) leads

0 For Bidirectional Modem Pools

0 The modems used in bidirectional (inbound and outbound) modem pools must support:

0 * two-wire switched network operation

0 * speed to match the service application designated for the modem pool

0 * call termination via DTR off, loss of carrier detect, or both

0 * 1 start bit, 5, 6, 7 or 8 data bits, 1, 1.5 or 2 stop bits for asynchronous operation

0 * external clock option for synchronous operation

0 * MI and MIC (Mode Indicator and Mode Indicator Common) leads

0 * auto-answer when physical ringing is applied

0 * automatic switching between originate and answer mode

For Adaptive Modem Pools

The modems used in adaptive modem pools must:

* have all the characteristics of a modem used in a standard outgoing modem pool

* have the ability to adapt to the speed and modulation technique of the far-end modem

* have the connect message always transmitted at a preset speed

* be compatible with the Hayes 2400 command set, and be configured as follows:

  - ATX1 - Extended result codes
  - ATV0 - Numeric result codes
  - ATS0-1 - Automatic answering of incoming calls
  - AT&W - Save as default (power on) configuration

Suggested Modems

The following is a sample list of some modems that meet with the requirements for inbound or outbound modem pools.

* GDC 212A/L 300 bps async full-duplex
* GDC 212A/L 1200 bps async full-duplex
* GDC 212A/L 1200 bps sync full-duplex
* GDC 202S/T 1200 bps async half-duplex
* GDC 201C 2400 bps sync half-duplex
* GDC 208B/A 4800 bps sync half-duplex

The GDC 212A/L 1200 bps async full-duplex modem meets with the requirements for bidirectional modem pools.

Note: Modem pool elements using half-duplex modems can not be tested by maintenance modem pools, or used in maintenance modem pools.

INSTALLING A RACKMOUNT MODEM POOL

This section outlines the procedure for installing modem pools using the NT0X43BA frame and General Datacom (GDC) modems. Custom installations using other equipment are possible but require a slightly different installation procedure.

Equipment Required

To install a rackmount modem pool, you need the following equipment.

* NT0X43BA modem pool frame (as required)

* NT4X25CH DU (as required) (The NT4X25AD DU can also be used subject to restrictions. See note.)

* GDC analog modem that meets the modem pool requirements (one per DU)

* NT0X26LN 25-pair cable to connect each shelf to the voice or data line cards through the distribution frame (one per DU or modem shelf)

* NT6X71AA or NT6X71AB data line card (DLC) (one per DU)

* NT6X17AA, NT6X17AB, or NT6X17AC voice line card (VLC) (one per modem)

If the modem pool is to be used as a maintenance modem pool

* NT6X99AA Integrated Bit Error Rate Tester (IBERT) card at the DMS-100 Family switch (as required, minimum of two)

Note: The NT4X25AD DU has the following restrictions. It cannot be:

* used in bidirectional modem pools
* used in maintenance modem pools
* tested by maintenance modem pools

It is therefore recommended that the NT4X25CH DU be used for rackmount modem pools.

NT0X43BA Modem Pool Frame

The NT0X43BA frame houses the modem pool shelves and equipment (see Figure 2.1 on page 2-6). It includes:

* two NT4X25BH shelves

* two NT5X09AA shelves

* one NT0X87AA inverter

The NT4X25BH shelf holds up to 16 rackmount DUs. It is electrically isolated from the frame. The shelf GND (ground) lug is connected to the frame ground. The PC GND (printed circuit ground) lug on the backplane is not used.

The NT5X09AA shelf holds up to 16 modems, depending on the modem size. The shelf is equipped with its own power supply that converts 48 Vdc station battery power to +12 V and distributes it to the modems.

The NT0X87AA inverter, located at the bottom of the frame, is used in a central office environment to supply a source of protected AC for the NT4X25BH shelves. In offices with only one modem pool frame, an optional second NT0X87AA inverter may be provisioned as a backup. In this case each DU shelf is connected to an inverter. In offices with two or more frames, you can install the elements of a modem pool in several frames and thus provide one pool with access to several inverters for back-up.

The shelves are prewired to connect:

* the DU shelf (NT4X25BH) terminal blocks TB1 through TB16 MI and MIC leads to the modem shelf (NT5X09AA) TB1 through TB16 MI and MIC leads respectively

* the RS-232C (DB-25) connectors of the DU shelf to the RS-232C (DB-25) connectors of the modem shelf

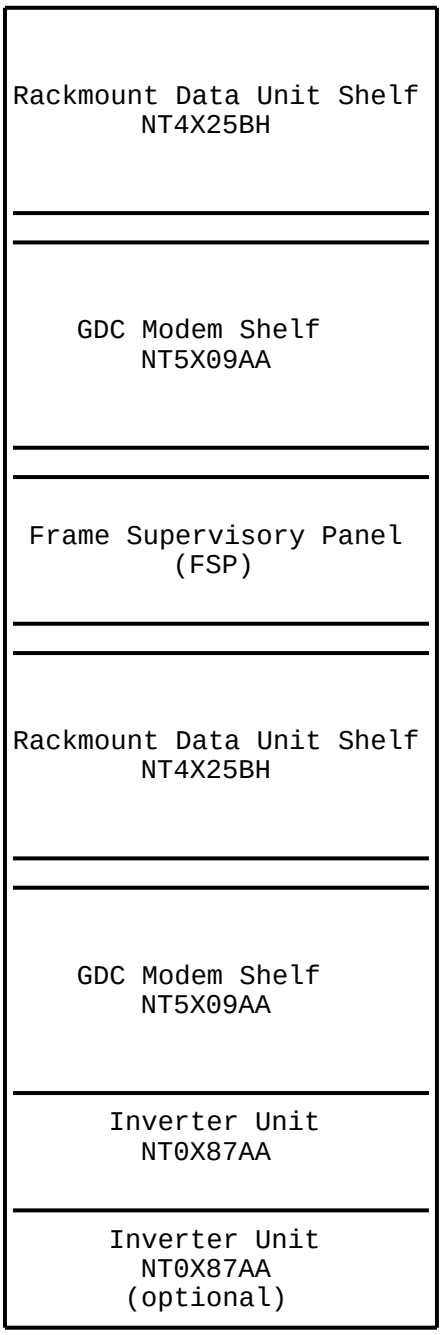


Figure 2.1 Modem Pool Equipment Frame - NT0X43BA

Cabling

The NT0X26LN 25-pair cable is used to connect the DU shelf to the data line cards and the modem shelf to the voice line cards through a distribution frame. One cable is used for each shelf. Only 16 of the 25 pairs are used. The cable is terminated with a 50-pin male Amphenol connector (NT part # A0293170) on one end. Figure 2.2 shows the pinout of the cable.

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

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

Figure 2.2 NT0X26LN Cable Pinout

Installation Procedure - Rackmount Modem Pool

This section outlines the procedure for installing one modem pool element in a modem pool using rackmount equipment.

CAUTION

Some devices on the circuit packs can be damaged by electrostatic discharge. Make sure that your hands and tools are properly grounded before you handle the circuit packs.

The modem pool frame, with pre-installed shelves, should be in place before you begin installing the modem pool element. For each DU and modem shelf, plug the Amphenol connector that terminates the 25-pair cable into the shelf and secure it using the two safety clasps. Do not connect the 16-pair cable to the distribution frame.

1. The DUs in a modem pool must be configured with the same operating characteristics as the subscriber DUs that will have access to the pool. DUs can be configured by setting the on-board DIP switches or by profile downloading. If profile downloading is used, the DIP switches should be set to provide a back-up.

   Set the option switches on the DU to match the application parameters. See Table 2.1 on page 2-11.

   Set the Local Loopback switch on the DU faceplate for no loopback (down).

2. Slide the DU into one of the slots on the shelf and lock the card extractor tabs into place. The components face the right-hand side of the shelf.

   The POWER LED flashes.

3. Connect the appropriate pair from the 25-pair cable connected to the back of the DU shelf to the distribution frame, to terminate the R0 and T0 for the DLC (Figure 2.3 on page 2-9).

   The POWER LED lights steadily.

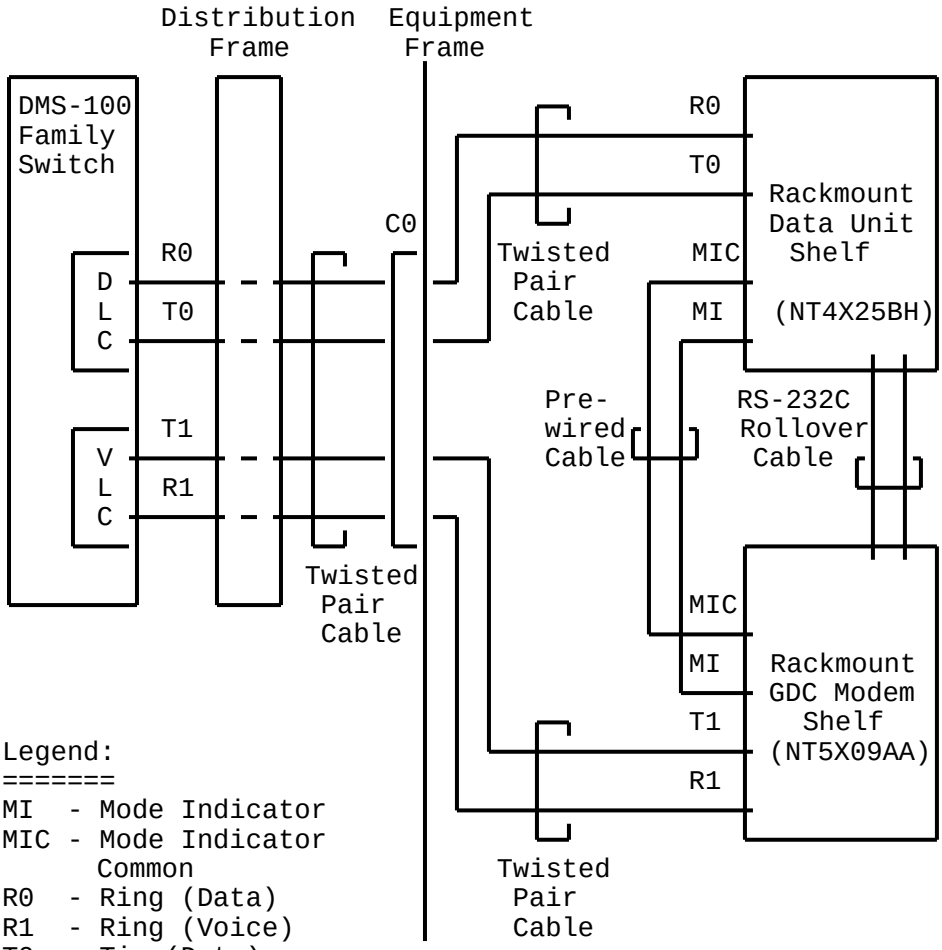


Figure 2.3 Modem Pool Connections for Rackmount Units

4. Toggle the SELF-TEST switch on the DU faceplate to initiate a self-test. All the LEDs light for 4 seconds.

   If any of the LEDs continue to flash, verify the operation of the DU (see 297-2121-226, Data Unit - Installation and Maintenance).

5. Pretest the modem to verify that it is operating properly (consult the manufacturer's documentation).

0 6. Set the modem options according to the modem manufacturer's documentation.

0 For some examples of modem configurations, see Chapter 7 on page 7-1.

0 7. Slide the modem into one of the slots on the modem shelf, and lock the card extractor tabs into place. The components face the right-hand side of the shelf.

0 8. Terminate the R1 and T1 for the VLC (Figure 2.3 on page 2-9) by connecting the appropriate pair from the 25-pair cable connected to the back of the modem shelf to the distribution frame.

0 9. Perform acceptance testing on the element. See Acceptance Testing of Additional Modem Pool Elements on page 4-2.

0 Repeat the above steps for each modem pool element. If any slots in the DU or modem shelves remain unused, use blank faceplates to fill them.

TABLE 2.1
RACKMOUNT DATA UNIT OPTION SETTINGS FOR MODEM POOLS

SWITCH	SETTING
FACEPLATE SWITCH	
Loc Loop	Down (Normal)
CIRCUIT BOARD DIP SWITCHES	
SW1 (four switch slides ganged together) Slave/Master	Slave (Left - Towards Nearest PCB Edge)
SW2-1 Auto Ans/Manual Ans	On (Auto Answer)
SW2-2 Auto Orig/Manual Orig	Off (Manual Origination)
SW2-3 Far-End Loop/Normal	Off (Normal)
SW2-4 T & R Loop/Normal	Off (Normal)
SW2-5 Ext Clock/Int Clock	As Required (See Note 1)
SW2-6 Adaptive/Normal	Off (Normal)
SW2-7 Assert DTR/Normal	On (Assert DTR)
SW2-8 Assert RTS/Normal	Off (Normal)
SW3-1 through 3-4 (speed switch)	Set to appropriate speed (See Table 2.3 on page 2-14)
SW3-5 SAC Enable/Normal (NT4X25CH DU only)	Off
SW3-6 Bit-Oriented/Char-Oriented (NT4X25CH DU only)	Off
SW3-7 Master/Slave	Off (Slave)
SW3-8 Switched/Non-Switched Operation	On (Switched Operation)

Table Continued

TABLE 2.1 (Continued)
RACKMOUNT DATA UNIT OPTION SETTINGS FOR MODEM POOLS

SWITCH	SETTING
SW4-1 Modem Pool/Normal	On (Modem Pool)
SW4-2 MI Pulse/Level	As Required (See Note 2)
SW4-3 MI Inverted/Normal	As Required (See Note 2)
SW4-4 KBD Enable/Disable	Off (Disable)
SW4-5 Assert CD/Normal	Off (Normal)
SW4-6 Local CTS Delay/End-to-End Delay (NT4X25CH DU only)	Off (End-to-End Delay)
SW4-7 CTS Delay A/Normal (NT4X25CH DU only)	Off (Normal)
SW4-8 CTS Delay B/Normal (NT4X25CH DU only)	Off (Normal)
(SW8 appears only on the NT4X25CH DU)	
SW8-1 Test Indicator	Off
SW8-2 Loop 3 Request	Off
SW8-3 Loop 2 Request	Off
SW8-4 Unused	Off

Note 1:

With a synchronous DU, use the external (modem) clock. With an asynchronous DU, use the internal clock.

Note 2:

There are four possible configurations of the MI switches (SW4-2 and SW4-3).

* With the MI switches set PULSE and NORMAL, the MI/MIC leads close when the resource pair is idle. When a call occurs and DSR (data set ready) turns on, the MI and MIC leads open for a pulse period of 2.5 seconds and then close for the duration of the call. When the call is released the MI/MIC leads remain closed (idle state).

* With the MI switches set LEVEL and NORMAL, the MI/MIC leads close when the resource pair is idle. When a call occurs and DSR turns on, the MI and MIC leads open for the total call duration. When the call is released the MI/MIC leads close again (idle state).

* With the MI switches set PULSE and INVERTED, the MI/MIC leads open when the resource pair is idle. When a call occurs and DSR turns on, the MI and MIC leads close for a pulse period of 2.5 seconds and then open for the duration of the call. When the call is released the MI/MIC leads remain open (idle state).

* With the MI switches set LEVEL and INVERTED, the MI/MIC leads open when the resource pair is idle. When a call occurs and DSR turns on, the MI and MIC leads close for the total call duration. When the call is released the MI/MIC leads open again (idle state).

TABLE 2.2
RACKMOUNT DATA UNIT OPTION SETTINGS FOR ADAPTIVE MODEM POOLS

SWITCH	SETTING
All switch settings are identical to those listed in Table 2.1 on page 2-11 with the following exceptions:	
SW2-6 Adaptive/Normal	On
SW4-4 KBD Enable/Disable	On
SW4-1 Modem Pool/Normal	On (Modem Pool)

TABLE 2.3
SETTING THE BAUD RATE OF THE NT4X25CH AND NT4X25AD DATA UNITS

MODE	RATE	SW3-1	SW3-2	SW3-3	SW3-4
ASYNC	300	Off	On	Off	Off
ASYNC	1200	On	On	Off	Off
ASYNC	2400	Off	Off	On	Off
ASYNC	4800	On	Off	On	Off
ASYNC	9600	Off	On	On	Off
ASYNC	19200	On	On	On	Off
ASYNC	AUTOBAUD	Off	Off	Off	On
SYNC	1200	On	Off	Off	On
SYNC	2400	Off	On	Off	On
SYNC	4800	On	On	Off	On
SYNC	9600	Off	Off	On	On
SYNC	19200	On	Off	On	On

Note: Async Autobaud settings should not be used for modem pool equipment.

INSTALLING A DESKTOP MODEM POOL

Equipment Required

To install a desktop modem pool, you need the following equipment:

* NT0X02AB DMS miscellaneous equipment bay to house the desktop DUs and modems (if desired).

* NT4X25AF DU (as required). The NT4X25AF DU requires profile downloading. (The NT4X25AN DU can also be used subject to restrictions. See note.)

* analog modem that meets the modem pool requirements (one per DU)

* RS-232C rollover cable to connect the DU and modem (one per DU/modem pair) (see Cabling on page 2-18 for the pinout of this cable.)

* NT6X71AB data line card (one per DU). The NT6X71AA data line card which does not support profile downloading can be used if the NT4X25AN DU is used.

* NT6X17AA, NT6X17AB, or NT6X17AC voice line card (one per modem)

* non-reversed TELADAPT* line cord (one per modem)

If the modem pool is to be used as a maintenance modem pool

* NT6X99AA IBERT card at the DMS-100 Family switch (as required, minimum of two)

Note: The NT4X25AN DU has the following restrictions. It can not be:

* used in bidirectional modem pools
* used in maintenance modem pools
* tested by maintenance modem pools

It is therefore recommended that the NT4X25AF DU be used for desktop modem pools.

You can install the desktop modems and DUs on a desk or tabletop, or in an equipment bay. Each DU is equipped with its own AC power supply and NT D4B4 Teladapt line cord.

---

*TELADAPT is a trademark of Northern Telecom

0 NT0X02AB Equipment Bay

0 You can install the desktop modem pool equipment in an NT0X02AB 0 DMS Miscellaneous Equipment Bay (MIS). The MIS bay can house the 0 following:

0 * NT3X25AA shelves for DUs or modems

0 * one NT0X88AB frame supervisory panel

0 The MIS (Figure 2.4 on page 2-17) holds up to five (NT3X25AA) 0 shelves. Each shelf can accommodate up to three desktop DUs. 0 Fifteen Teladapt jacks (three on each shelf) provide the con- 0 nections from the DUs and modems to the distribution frame.

0 The NT0X88AA inverter is used in a central office environment to 0 supply a source of protected AC power for the DUs. You can 0 install a second NT0X88AA inverter as a backup.

0 The NT0X88AB frame supervisory panel provides fuse alarms and 0 power for the modems.

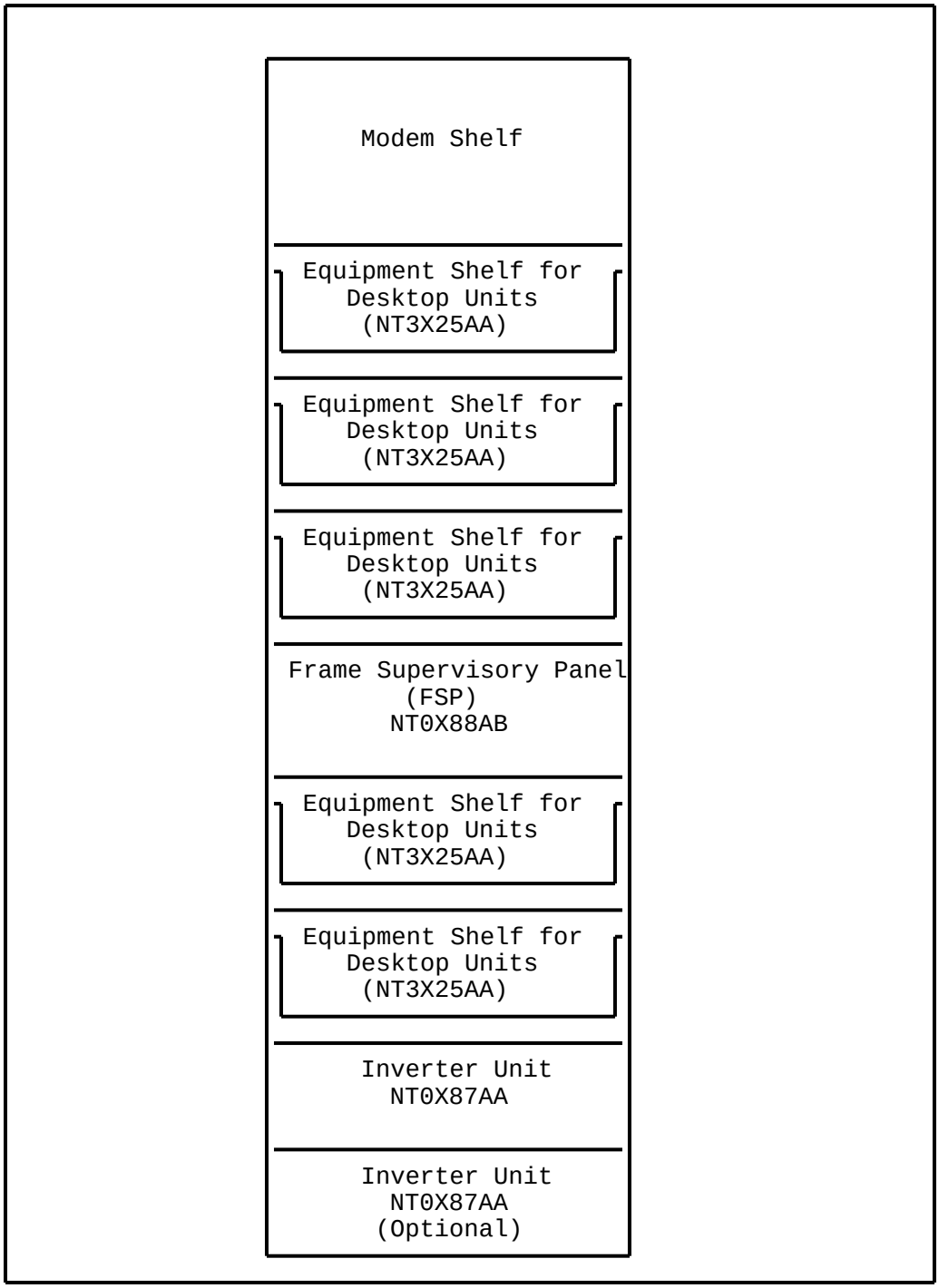


Figure 2.4 Miscellaneous Equipment Frame - NT0X02AB

Cabling

Figure 2.5 shows the pinout of the standard modem pool rollover cable. The rollover cable performs the function of a null terminal connector. This pinout is used to speed up the throughput of the CTS signal.

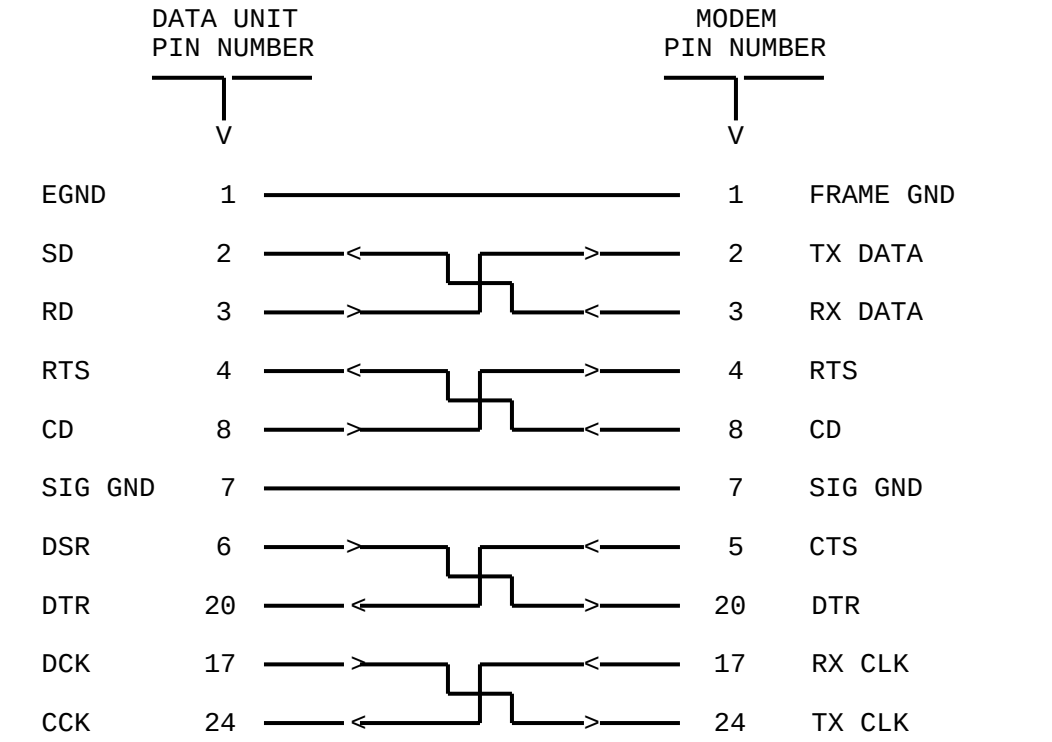


Figure 2.5 RS-232C Rollover Cable

Note: The codes used in Figure 2.5 and Figure 2.6 on page 2-19 are:

CD Carrier Detect
CTS Clear To Send
DTR Data Terminal Ready
DSR Data Set Ready
EGND Earth Ground
FRAME GND Frame Ground
RD Receive Data

RTS	Request To Send
RX CLK	Receive Clock
RX DATA	Receive Data
SD	Send Data
SIG GND	Signal Ground
TX CLK	Transmit Clock
TX DATA	Transmitted Data

Desktop NT4X25AN DUs that use CJM01, CJM02 or CJM03 firmware and rackmount NT4X25AD DUs that use DAX01 or DAX02 firmware must use rollover cable NTA0317172 (see Rollover Cable Application on page 6-1). Units with these firmware versions will not operate using the standard modem pool rollover cable. All other DUs must use the standard modem pool rollover cable or they will not operate. Rollover Cable Application on page 6-1 shows you how to determine the firmware version of your DU. Figure 2.6 shows the pinout of the non-standard modem pool rollover cable.

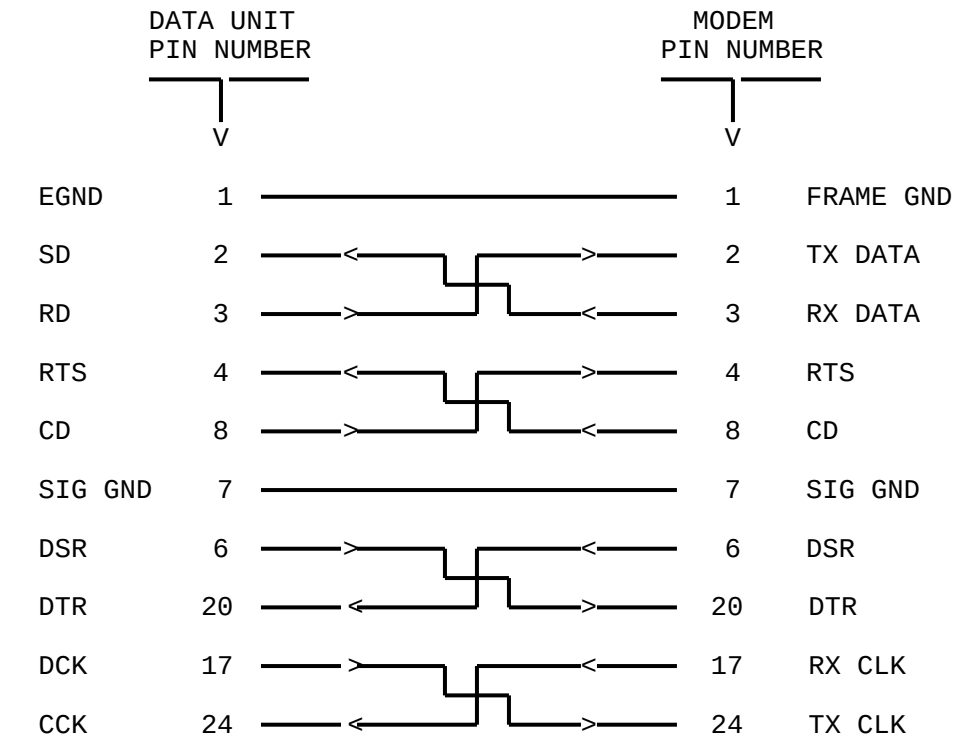


Figure 2.6 Non-Standard Modem Pool RS-232C Rollover Cable

Figure 2.7 on page 2-20 shows the pinout of the Teladapt line cord.

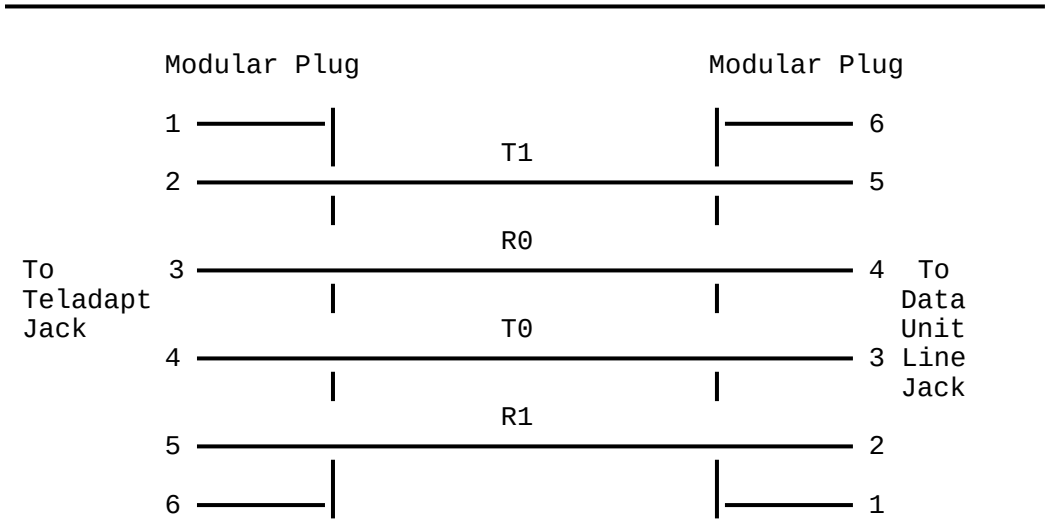


Figure 2.7 Standard Teladapt Line Cord (NT D4B4)

Figure 2.8 shows the pinout of the non-reversed Teladapt line cord.

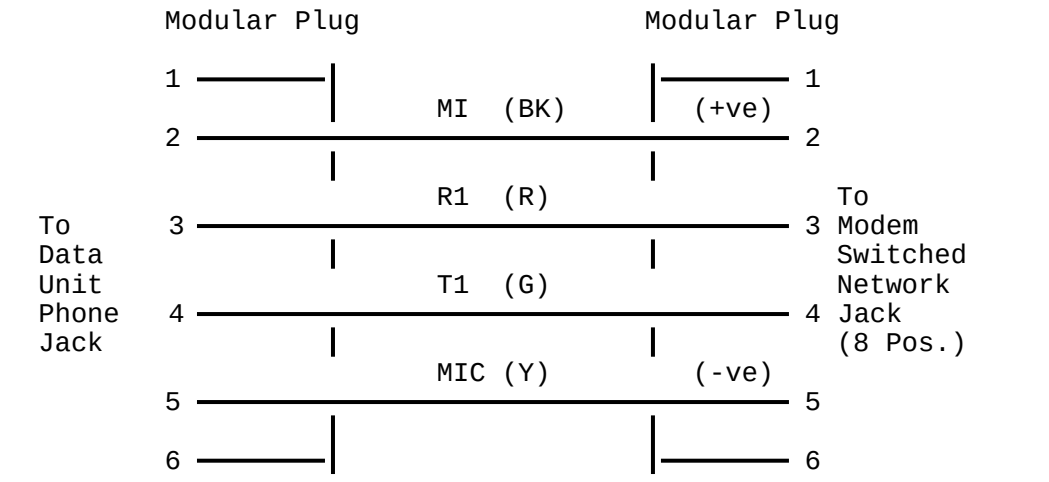


Figure 2.8 Non-Reversed Teladapt Line Cord

Installation Procedure - Desktop Modem Pool

This section outlines the procedure for installing one modem pool element using desktop equipment.

CAUTION

Some devices on the circuit pack can be damaged by electrostatic discharge. Make sure that your hands and tools are properly grounded before you handle the circuit packs.

1. The internal switches on the DU circuit board are preset at the factory for switched/slave operation. If you suspect that the settings may have been changed, reset the switches.

   a. Remove the cover from the DU.

      Set the internal option switches to match the application parameters. See Table 2.4 on page 2-24 or Table 2.6 on page 2-27.

   b. Replace the DU cover.

2. The DUs in a modem pool must be configured with the same operating characteristics as the subscriber DUs that have access to the pool. DUs can be configured by setting the on-board DIP switches or by profile downloading. If profile downloading is used, the DIP switches should be set to provide a back-up.

   Set the external options, visible under the flip-up lid, to match the application parameters. See Table 2.5 on page 2-25 and Table 2.7 on page 2-28.

3. Pretest the modem to verify that it is operating properly (consult the manufacturer’s documentation).

4. Set the modem options as per the modem manufacturer’s documentation.

   For some examples of modem configurations, see Chapter 7 on page 7-1.

5. Connect the RS-232C rollover cable between the DU and the modem using the RS-232 connectors on the units (see Figure 2.9 on page 2-23).

0 Note: DUs that use CJM01, CJM02 or CJM03 firmware must use non-standard modem pool rollover cable NT A0317172 (see Rollover Cable Application on page 6-1).

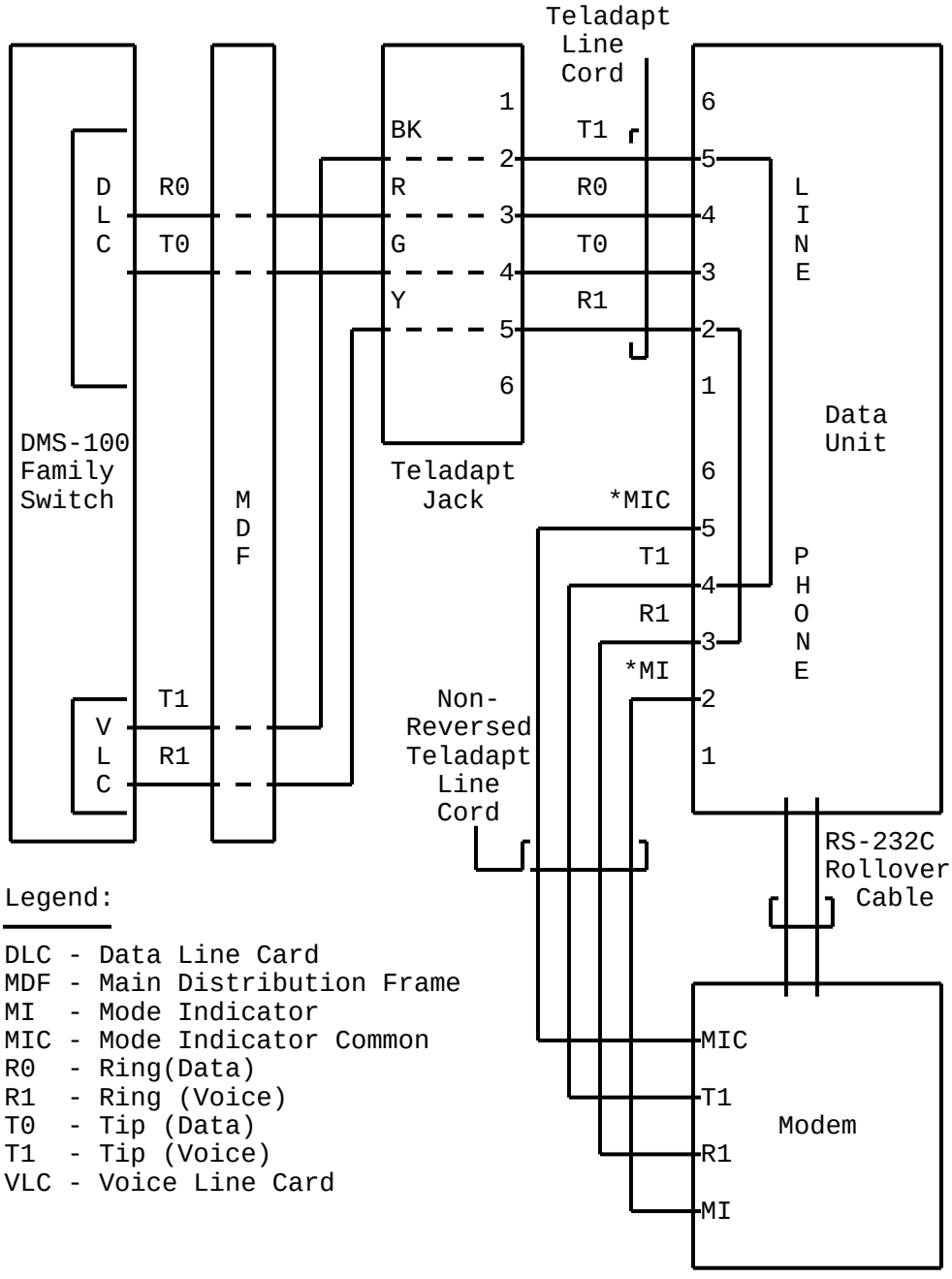
6. Connect the Teladapt line cord from the LINE jack of the DU to the DLC Teladapt jack. See the connections in Figure 2.9 on page 2-23.

7. Connect the non-reversed Teladapt line cord from the PHONE jack of the DU to the SWITCHED NETWORK/TELCO jack on the modem (see Figure 2.9 on page 2-23).

8. Apply power to the DU and modem. This invokes a self-test. The DU LEDs flash for 4 seconds, then go out. The POWER LED lights steadily. If any LEDs continue to flash, verify the operation of the DU (see 297-2121-226, Data Unit - Installation and Maintenance).

9. Perform acceptance testing on the element. See Acceptance Testing of Additional Modem Pool Elements on page 4-2.

Repeat the above steps for each modem pool element.



Legend:

DLC - Data Line Card
MDF - Main Distribution Frame
MI - Mode Indicator
MIC - Mode Indicator Common
R0 - Ring(Data)
R1 - Ring (Voice)
T0 - Tip (Data)
T1 - Tip (Voice)
VLC - Voice Line Card

* Not required for inbound modem pooling

Figure 2.9 Modem Pool Connections for Desktop Units

TABLE 2.4
DESKTOP DATA UNIT (NT4X25AF) FACTORY SET OPTIONS

SWITCH	SETTING
SW1 (four switch slides ganged together)	Position labelled 1 or On
SW2-1 Signal/Frame Ground	Off (Frame Ground)
SW2-2 Master/Slave Operation	Off (Slave Operation)
SW2-3 Switched/Non-Switched Operation	On (Switched Operation)
SW2-4	Off

TABLE 2.5
DESKTOP DATA UNIT (NT4X25AF) OPTIONS FOR MODEM POOLING

SWITCH/LED	SETTING
Local Loop	Off
Far-End Loop	Off
Tip-and-Ring Loop	Off
Synch	As Required
Asynch	As Required
Autobaud	Off
Speed (300, 1200, 2400, 4800, 9600, 19200)	As Required
Assert DTR	On
Assert RTS	Off
Assert CD	Off
Auto Answer	On
Auto Originate	Off
Adaptive	Off
KEYBOARD DIAL Protocol 1	Off
KEYBOARD DIAL Protocol 2	Off
Self-Test	Off
Local CTS Delay	Off
Delay CTS A	Off
Delay CTS B	Off

Table Continued

TABLE 2.5 (Continued)
DESKTOP DATA UNIT (NT4X25AF) OPTIONS FOR MODEM POOLING

SWITCH/LED	SETTING
External Clock	As Required (See Note)
SYNCH AUTO CALL Character-Oriented	Off
SYNCH AUTO CALL Bit-Oriented	Off

Note:

With a synchronous DU, use the external (modem) clock. With an asynchronous DU, use the internal clock.

TABLE 2.6
DESKTOP DATA UNIT (NT4X25AN) FACTORY SET OPTIONS

SWITCH	POSITION
SW1 (4 switch slides ganged together)	Position labelled 1 or On
SW2-1 Signal/Frame Ground	Off (Frame Ground)
SW2-2 Master /Slave Operation	Off (Slave Operation)
SW2-3 Switched/Non-Switched Operation	On (Switched Operation)
SW2-4 Not Used	Off

TABLE 2.7
DESKTOP DATA UNIT (NT4X25AN) OPTIONS FOR MODEM POOLING

SWITCH	POSITION
SW1-1 Auto Ans/Manual Ans	On (Auto Answer)
SW1-2 Auto Orig/Manual Orig	Off (Manual Origination)
SW1-3 Self-Test/Normal	Off (Normal)
SW1-4 Far-End Loop/Normal	Off (Normal)
SW1-5 Local Loop/Normal	Off (Normal)
SW1-6 Ext Clock/Int Clock	As Required (See Note 1)
SW1-7 Adaptive/Normal	Off (Normal)
SW1-8 Buzz Loud/Buzz Soft	Off (Buzz Soft)
SW2-1 Assert DTR/Normal	On (Assert DTR)
SW2-2 Assert RTS/Normal	Off (Normal)
SW2-3 Delay CTS/Normal	On (Delay CTS)
SW2-4 MI Pulse/MI Level	As Required (See Note 2)
SW2-5 MI Invert/Normal	As Required (See Note 2)
SW2-6 KBD Enable/Disable	Off (Disable)
SW2-7 Switch A/Normal	Off (Normal)
SW2-8 Switch B/Normal	Off (Normal)
Speed Switch	Set to appropriate speed

Note 1:

With a synchronous DU, use the external (modem) clock. With an asynchronous DU, use the internal clock.

Note 2: There are four possible configurations of the MI switches (SW2-4 and SW2-5).

* With the MI switches set PULSE and NORMAL, the MI/MIC leads close when the resource pair is idle. When a call occurs (and DSR turns on), the MI and MIC leads open for a pulse

period of 2.5 seconds and then close for the duration of the call. When the call is released the MI/MIC leads remain closed (idle state).

* With the MI switches set LEVEL and NORMAL, the MI/MIC leads close when the resource pair is idle. When a call occurs (and DSR turns on), the MI and MIC leads open for the total call duration. When the call is released the MI/MIC leads close again (idle state).

* With the MI switches set PULSE and INVERTED, the MI/MIC leads open when the resource pair is idle. When a call occurs (and DSR turns on), the MI and MIC leads close for a pulse period of 2.5 seconds and then open for the duration of the call. When the call is released the MI/MIC leads remain open (idle state).

* With the MI switches set LEVEL and INVERTED, the MI/MIC leads open when the resource pair is idle. When a call occurs (and DSR turns on), the MI and MIC leads close for the total call duration. When the call is released the MI/MIC leads open again (idle state).

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CHAPTER 3

DATA ASSIGNMENT

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This chapter describes the data fill that is required for modem pools and for data units that use modem pools.

OFFICE PARAMETERS

When a DMS-100 Family switch is provided with the Modem Pooling feature, the following office parameters must be defined in their respective tables:

PARAMETER	TABLE
NRS_MP	OFCOPT
NRS_AUD_DELAY	OFCENG
IMP_DELAY	OFCENG

These office parameters may require special authorization to implement any changes and are usually left at the default values. Refer to 297-1001-455, The Office Parameters Reference Manual for a complete description of these tables and their fields.

DATA ENTRY FOR MODEM POOL ELEMENTS

The DUs in a modem pool must be configured with the same operating characteristics as the subscriber DUs that will have access to the pool. DUs can be configured by profile downloading. If you use profile downloading to configure the DUs, it is recommended that you also configure the DUs using the on-board DIP switches or LEDs to provide a backup for the profile download. For a description of the DU option settings see Chapter 2 on page 2-1.

Depending on the features selected, some or all of the following tables are used to configure a modem pool and its elements:

LNINV	Line Inventory
CLLI	Common Language Location Identifier
RESGROUP	Resource Group
RESINV	Resource Inventory
RESMEM	Resource Member
DPROFILE	Data Unit Profile
KSETFEAT	Business Set and Data Unit Line Features
WRDN	Write Directory Number
IBNXLA	Integrated Business Network Digit Translation
DIGMAN	Digit Manipulation
IBNRTE	Integrated Business Network Route Table

The LNINV (Line Inventory) table lists the information for the line card slot used for voice line cards (VLC) or data line cards (DLC). It is recommended that both the VLC and DLC (associated with the modem and DU respectively) of the same modem pool element be located in the same Line Concentrating Module (LCM).

The CLLI (Common Language Location Identifier) table is primarily used to identify trunk groups going to or coming from other offices. A CLLI name is assigned to each modem pool in the office. The modem pool CLLI name is used in other tables to identify a particular modem pool.

The RESGROUP (Resource Group) table contains data that is common to all members of a single modem pool. One entry is required for each defined group.

The RESINV (Resource Inventory) table lists the line equipment number (LEN) of all modem pool resources and indicates what type

of resource they are: modems or DUs. The actual input required for the table is the first two fields (RESKEY and RESSEL) followed by the value N in field DETSEL. The remaining fields are filled automatically by the switch when the RESMEM table is completed.

The RESMEM (Resource Member) table contains the data specific to each element of a modem pool. It associates a modem and a DU with a particular modem pool and element number. One entry is required for each modem pool element.

The DPROFILE (Data Unit Profile) table contains the operating characteristics of each Modem Pool DU. This data can be downloaded to the DU to override the option settings selected on the DU.

The DIGMAN (Digit Manipulation) table contains information about the dialing plan used by each customer group for their private communication network. This option allows subscribers served by the switch to dial a fixed number of digits to reach a called party, regardless of the number of digits required to make the connection.

The WRDN (Write Directory Number) table contains only the directory numbers (DNs) not associated with a line equipment number (LEN), and is obtained from operating company input. The maximum size of table WRDN is equal to or less than table DN, as they both reference the same physical store. In this application, the DN selector used is SYN (Synonym Directory Number).

The IBNRTE (IBN Route) table contains customer group route lists. Each route list is identified by a route reference number. A route list comprises from 1 to 8 elements that are linked together: element 1 to element 2 to element 3, and so on. In the majority of cases, the final termination of a route element is a directory number or a trunk group, from which an idle trunk is to be selected. If the directory number is busy or no idle trunk is available, the system advances to the next element in the list. If the end of the list is reached and no idle trunk or idle directory number is found, the system indicates then applies an appropriate response such as re-order tone.

The KSETFEAT (Business Set and Data Unit Feature) table lists the line features assigned to business sets listed in the KSETLINE and IVDINV tables and data units listed in the KSETLINE table. Data units include Meridian Asynchronous Data Option (MADO), and Touch Asynchronous Data Option (TADO).

The IBNXLA (IBN Translation) table stores the data for the digit translation of calls from an IBN station, attendant console, incoming or incoming side of a two-way IBN trunk group.

For more information on these tables, consult 297-2101-451, Customer Data Schema.

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0 MODEM POOL DATA ASSIGNMENT

0 To configure a modem pool and its elements, begin by establishing a modem pool. Once you have established a modem pool, add modem pool elements to it.

0 To delete a modem pool and its elements, begin by deleting the individual elements in the pool. Once you have deleted all the elements in the pool, delete the modem pool.

0 To Establish A Modem Pool

0 To establish a modem pool, enter the appropriate data in the following tables, in the order given:

0 1. CLLI Common Language Location Identifier

0 2. RESGROUP Resource Group

To Add a Modem Pool Element to a Modem Pool

To add a modem pool element to an existing modem pool, enter the appropriate data in the following tables:

1. LNINV Line Inventory

2. RESINV Resource Inventory

3. RESMEM Resource Member

4. DPROFILE Data Unit Profile

Once you have completed the datafill for a new modem pool element, post the element and place it in the Installation Busy (INB) state using the BUSY_INB command from the LTP level of the MAP. This prevents the customer from accessing it until acceptance tests are completed.

0 To Remove an Element from a Modem Pool

0 To remove a modem pool element from an existing modem pool, post the element and place it in the INB (installation busy) state using the BUSY_INB command from the LTP level of the MAP. Then delete the desired tuple from the following data tables, in the order indicated:

0 1. DPROFILE Data Unit Profile

0 2. RESMEM Resource Member

0 3. RESINV Resource Inventory

0 4. LNINV Line Inventory

0 Use the DELETE command on the MAP command line to delete a tuple.

0 To Remove a Modem Pool

0 To remove an entire modem pool, first delete each element in the pool, then delete the desired tuple from the following data tables, in the order indicated:

0 1. RESGROUP Resource Group

0 2. CLLI Common Language Location Identifier

0 Make sure you have deleted all the elements in the modem pool before you delete the pool itself.

0 Use the DELETE command on the MAP command line to delete a tuple.

ASSIGNING NRS NUMBERS FOR PREFIXED DIALING

Prefixed OMP Manual Selection Dialing

An outbound modem pool can be assigned Network Resource Selector (NRS) prefix digits that can be dialed directly from a subscribers data unit. This allows the user to manually select a specific outbound modem pool, rather than the default pool assigned by the DMS-100 Family switch.

The IBNXLA (translation) table is used to assign feature translation type for prefixed NRS outbound (PNO) dialing.

Prefixed OMP Override Dialing

Customer groups can be assigned NRS numbers to prevent the DMS-100 Family switch from inserting an outbound modem pool in a call path. If a call will be routed to a data unit or over all-digital facilities, OMP Override allows the user to dial prefix digits before the directory number to prevent an outbound modem pool from being inserted in the call path. The prefix digits are identified as NMP (no modem pool).

The IBNXLA (translation) table is used to assign feature translation type for prefixed OMP Override (NMP) dialing.

Prefixed OMP Dialing for ISDN Terminals

In the case of ISDN terminals, an outbound modem pool element is inserted automatically when tables KSETFEAT and IBNXLA are appropriately datafilled for NRS feature. The NRS feature is assigned to directory number keys of an ISDN Logical Terminal Identifier (LTID). The directory numbers are identified by a key list in KSETFEAT table. The Prefix NRS Default (PND) option in table IBNXLA allows access to a default group of outbound modem pooling.

0 ASSIGNING DATA UNITS ACCESS TO MODEM POOLS

0 To make use of modem pools that have been installed, a customer's DU must be assigned the NRS option. This option allows the customer's DU to use inbound modem pooling, outbound modem pooling, or both inbound and outbound modem pooling. It also defines which pool is normally used for each type of call. With this option, the customer can determine which of his DUs are to have access to modem pools and which modem pool they are to use. The NRS option is not assigned to DUs that are part of a modem pool; it is assigned to customer DUs that use modem pools.

0 The NRS option is assigned to a DU using the Service Order System. It can be assigned either when the line is first installed or it can be added to an existing line by using the ADO option.

0 Automatic Modem Insertion

0 The automatic modem insertion (AMI) feature can be assigned either by table control (table KSETFEAT), or through Service Orders.

0 The AMI feature is activated through the Service Orders by entering 'Y' to the AMI prompt. The switch must be equipped with automatic tone detector (ATD) for this feature to be active.

0 Datafilling table KSETFEAT

0 When datafilling table KSETFEAT for outbound modem pooling, make an entry for the AMI field, either 'Y' or 'N'.

0 Inbound Modem Pooling (IMP)

0 This feature affects two tables; WRDN and KSETFEAT.

0 Two fields (SYNFEAT and IMPGRP) have been added to table WRDN. These fields allow the assignment of the IMP feature selector and feature data. Entering 'IMP' in the field SYNFEAT indicates the IMP feature is activated. Entering '$' indicates the feature is not assigned.

0 The field IMPGRP is only prompted for if IMP has been entered in field SYNFEAT. This field specifies a modem pool name or has '$' entered. A '$' indicates a default modem pool group is to be used.

0 When field NDI of table KSETFEAT is set to 'Y', a modem pool group name must be datafilled in field NDIGROUP.

Network Modem Pooling

SL-100 offices requiring use of a modem pool in another SL-100 office require changes to tables IBNXLA and KSETFEAT. The NDO field of table KSETFEAT is datafilled with the option NTWRKMP. The FTR field of table IBNXLA is datafilled with either NRSO (which selects the Default Network Modem Pool in the connecting office), or PNRS (Prefix Network Outbound Modem Pool) which allows the call originator to select the modem pool. Refer to Assigning NRS Numbers for Prefixed Dialing on page 3-7.

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CHAPTER 4

TESTING AND MAINTENANCE

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This chapter describes procedures for testing modem pools to verify their operation. In addition to the tests described here, you can perform self-tests on the data unit (DU) and modem to verify that they are functioning properly. For information on the DU self-test, consult 297-2121-226, Data Unit - Installation and Maintenance. For information on the modem self-test, consult the manufacturer's documentation.

ESTABLISHING A FIRST WORKING MAINTENANCE MODEM POOL PAIR

To establish a first working maintenance modem pool pair that can be used to test other modem pool elements, perform the following steps:

1. Verify the datafill information by using the QLEN command to check the two halves of the maintenance modem pool element. Two sample outputs from the QLEN command for modem pools are given in Figure 4.1 on page 4-3. Any discrepancies should be corrected by referring to Chapter 3 on page 3-1.

2. Post the maintenance modem pool element and perform diagnostics (DIAG) from the LTP level of the MAP.

   The DIAG command performs an integrity test and a self-test on the data line card, and tests communication with the associated DU. It then performs an integrity test and a self-test on the voice line card.

3. Post the maintenance modem pool data unit, set the RS-232 loopback and perform a bit error rate test (BERT) from the LTPDATA level of the MAP.

4. Repeat steps 1 through 3 for a second maintenance modem pool element.

5. Post each element and place it in service using the return to service command (RTS) from the LTP level of the MAP.

6. Perform a maintenance modem pool BERT on each of the modem pool elements. For this test you need two maintenance modem pools, or one maintenance modem pool and a regular modem pool. See Maintenance Modem Pool Bit Error Rate Testing on page 4-4 for information on the maintenance modem pool BERT.

   If the BERT detects errors, for each maintenance modem pool element:

   a. Check the cable connections between the DU, the modem, and the voice and data line cards.

0 b. Check the sanity of the IBERT line cards (ILCs) (see 0 297-2101-516, Line Maintenance Reference Manual).

0 c. Invoke a self-test on the DU (see 297-2121-226, Data Unit 0 - Installation and Maintenance).

0 d. Invoke a self-test on the modem (see the manufacturer's 0 documentation).

0 e. Perform a second maintenance modem pool BERT on each of 0 the modem pool elements. See Maintenance Modem Pool Bit 0 Error Rate Testing on page 4-4 If the BERT detects 0 errors again, datafill one maintenance modem pool element 0 as a regular modem pool element (see Chapter 3 on page 0 3-1), and place a call through it. To do this, you must 0 place all the other elements in the pool in the busy 0 state.

0 This procedure will help you to isolate the problem to one 0 modem pool element.

0 ACCEPTANCE TESTING OF ADDITIONAL MODEM POOL ELEMENTS

0 Once the physical hardware installation is complete and the 0 required datafill has been input to the switch, verify that the 0 modem pool element is working correctly and place it in service. 0 To do this, perform the following five steps:

0 1. Verify the datafill information by using the QLEN command to 0 check the two halves of the modem pool element. Two typical 0 outputs from the QLEN command are given in Figure 4.1 on page 0 4-3. Any discrepancies should be corrected by referring to 0 Chapter 3 on page 3-1.

0 2. Post the modem pool element and perform diagnostics (DIAG) 0 from the LTP level of the MAP.

0 The DIAG command performs an integrity test and a self-test 0 on the data line card, and tests communication with the asso- 0 ciated DU. It then performs an integrity test and a self- 0 test on the voice line card.

0 3. Post the modem pool data unit, set the RS-232 loopback and 0 perform a bit error rate test (BERT) from the LTPDATA level 0 of the MAP.

0 If you have maintenance modem pools and have already estab- 0 lished one working pool, perform a maintenance modem pool 0 BERT for more complete testing. See Maintenance Modem Pool 0 Bit Error Rate Testing on page 4-4 for information on the 0 maintenance modem pool BERT.

4. Post the element and place it in service using the return to service command (RTS) from the LTP level of the MAP.

5. (For a modem pool element) Place a call using the modem pool element. To do this you must place all the other elements in the pool in the busy state. For this reason, this test should be performed during a low traffic period.

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

QLEN OUTPUT FOR A MODEM POOL MODEM

```
LEN:  HOST 02 1 12 10
TYPE: NETWORK RESOURCE LINE
RESOURCE TYPE: MPMD
GROUP OMP1200A MEMBER 0 GROUPTYPE MP TMODE FULL SPEED 1200
MATE RESOURCE: MPDU   HOST 02 1 12 09
CARDCNODE: 6X17AA GND: N PADGRP: STDLN BNV: NL MNO: N
PM NODE NUMBER: 192
PM TERMINAL NUMBER: 486
```

QLEN OUTPUT FOR A MODEM POOL DATA UNIT

```
LEN: HOST 02 1 12 09
TYPE: NETWORK RESOURCE LINE
RESOURCE TYPE: MPDU
GROUP OMP1200A MEMBER 0  GROUPTYPE MP TMODE FULL SPEED 1200
MATE RESOURCE: MPMD HOST 02 1 12 10
DATA UNIT PROFILE:
CLASSDU: MP  MIMIC: PI  DOWNLOAD: Y
CONFIG: DTE              DTEIF: RS232C
SYNCHRO: A  DATARATE: 1200  CHARLEN: 8  PARITY: N  STOPBIT:1
DUPLEX: F
SAC: N
DPOPTS: AUTOANS
CARDCODE: 6X71AB GND: N PADGRP: NPDGP BNV: NL MNO: N
PM NODE NUMBER: 192
PM TERMINAL NUMBER: 485
```

Figure 4.1 QLEN Outputs for Modem Pool Element

MAINTENANCE MODEM POOL BIT ERROR RATE TESTING

You can test the transmission quality of a modem pool element from the MAP by connecting the element back-to-back with a maintenance modem pool element and performing a BERT. The test uses two Integrated Bit Error Rate Tester (IBERT) cards to transmit a known bit pattern through the modem pool. Figure 4.2 on page 4-5 shows the BERT configuration and the loopback points that you can use.

Note: This test can only be performed on modem pool elements that use NT4X25CH or NT4X25AF DUs.

You can perform up to 32 individual BERTs at the same time (subject to IBERT card availability).

You can perform a BERT on any modem pool that is:

* installation busy (INB)
* man busy (MB)
* locked out (LO)
* idle (IDL)

To verify that your maintenance modem pool elements are operating properly, perform the tests described in Establishing a First Working Maintenance Modem Pool Pair on page 4-1 and in Acceptance Testing of Additional Modem Pool Elements on page 4-2.

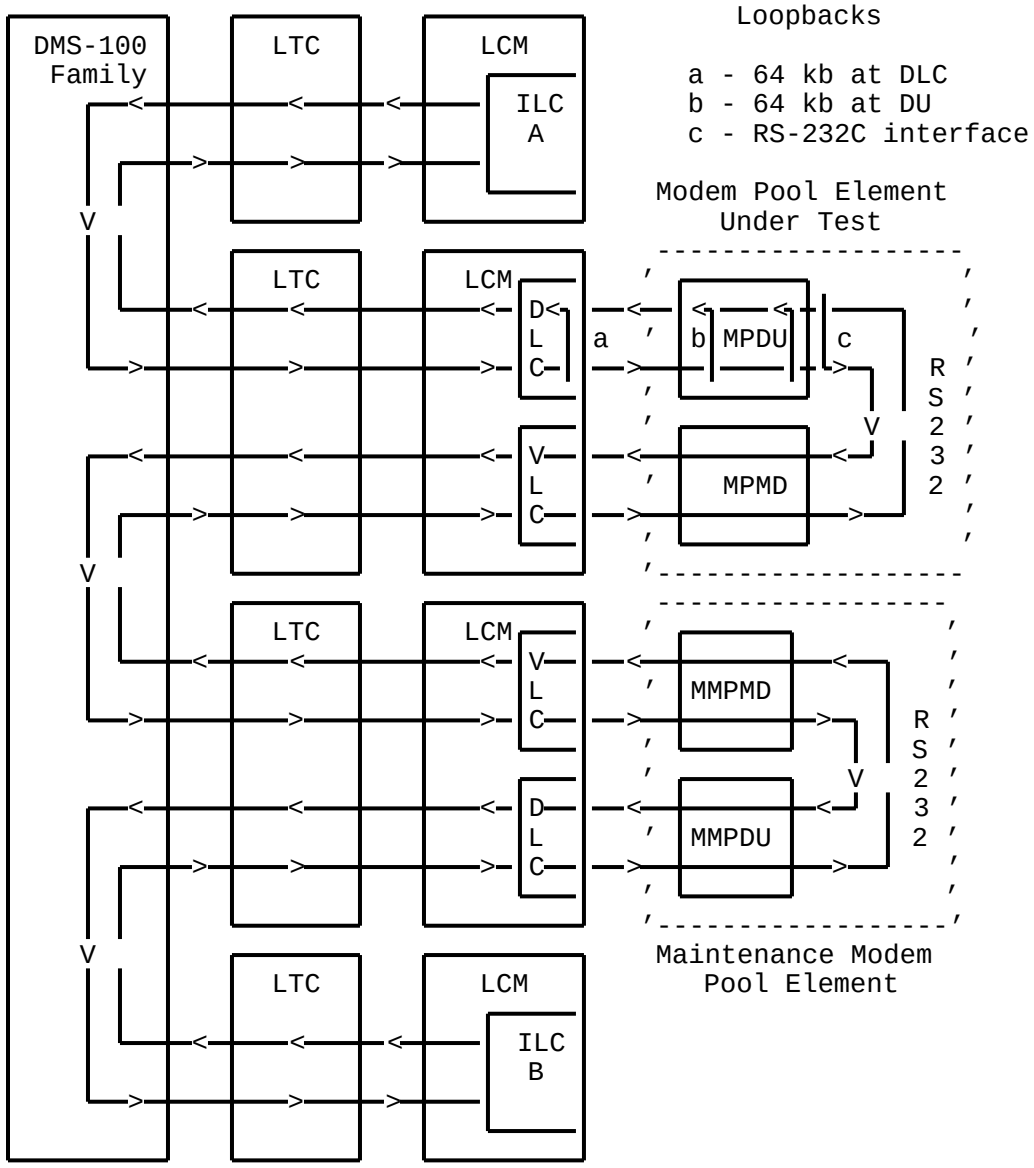
For details on how to invoke a BERT and interpret the results, see 297-2101-516, Line Maintenance Reference Manual.

Performing an End-to-End Bit Error Rate Test

To perform an end-to-end bit error rate test (BERT), post the desired element and enter the BERT START command from the LTPDATA level of the MAP.

The state of the element displayed on the MAP changes to MB (man busy) and a dot (.) appears under the element’s seized indicator. The MAP displays the following information about the BERT in the upper left corner of the display:

* the number of blocks sent
* the number of bit errors detected
* the bit error ratio
* the sync status of the IBERT cards



Legend:
======
DLC = Data Line Card
DU = Data Unit
ILC = IBERT Line Card
LCM = Line Concentrating Module
LTC = Line Trunk Controller
MD = Modem
MMP = Maintenance Modem Pool
MP = Modem Pool
VLC = Voice Line Card

Figure 4.2 Maintenance Modem Pool Configuration

Since two IBERT cards and two DUs are used in a BERT, there are two sets of BERT results. The MAP, however, can only display one set of results while the BERT is running:

The displayed number of blocks sent is the larger value from the two IBERT cards.

The displayed number of bit errors detected is the larger value from the two IBERT cards.

The displayed bit error ratio is computed from the displayed values for the number of blocks sent and the number of bit errors. The smallest ratio allowed is 0.

The displayed sync status is either LOST, WAITING, or INSYNC. When you begin the BERT, the sync status is WAITING. Once the IBERT cards have established synchronization with each other, the status is INSYNC. The IBERT cards begin to transmit a known bit pattern (either 511 or 2047). If synchronization is lost, the status displayed is LOST. The MAP displays the sync status of the IBERT card with the worst status.

To display the information for both IBERT cards use the BERT QUERY command. Figure 4.3 on page 4-7 shows a sample BERT QUERY display.

The MAP display is refreshed once every second. The BERT results for the posted modem pool are only refreshed approximately every 5 seconds. This delay results because the IBERT cards must be queried for their current test results each time. The delay increases with the number of BERTs running at the same time.

Once a BERT is started, it continues running until a BERT STOP command is issued, or until the BERT AUDIT process times it out. You can therefore start a BERT, logoff the MAP and then return, logon and display the BERT results.

Test Results

If the status of IBERT A is INSYNC and the status for IBERT B is WAITING or LOST, the transmit path from IBERT A through the modem pool element is faulty.

If the status of IBERT A is WAITING or LOST and the status for IBERT B is INSYNC, the receive path from IBERT A through the modem pool element is faulty.

If the status of both IBERT A and IBERT B is WAITING or LOST, both the transmit and receive paths from IBERT A through the modem pool element are faulty. The RS-232C connection between the DU and modem may be faulty.

While a BERT is running:

```
MP Member/MMP Member    : OMP1200B      1  MAINT1200     1
IBERTs used for test    : HOST 02 1 05 00  HOST 03 0 01 01
Number of blocks rcvd   : 120              72
Number of bit errors    : 29               7
Number of sync slips    : 1                1
Bit Error Ratio         : 1.1*10E-4        4.7*10E-5
IBERT sync status       : INSYNC           INSYNC
IBERT Tx/Rx speed (bps) : 1200             1200
IBERT transmission mode : ASYNCHRONOUS     ASYNCHRONOUS
Direction of the test is OUTBOUND
The bit pattern length used is 2047 bits
The test was started at : 1986/12/19 14:29:16.200 FRI.
```

After the BERT has stopped:

```
MP Member/MMP Member    : OMP1200B      1  MAINT1200     1
Number of blocks rcvd   : 128              80
Number of bit errors    : 29               0
Number of sync slips    : 1                1
Bit Error Ratio         : 1.1*10E-4        0
Error Free Seconds      : 146              148
Total time in sync      : 152              154
Total test time         : 165              167
The test was run at 1200 bps.
Transmission mode was ASYNCHRONOUS
Direction of the test was OUTBOUND
The bit pattern length used was 2047 bits
The test was started at : 1986/12/19 14:29:16.200 FRI.
The test was stopped at : 1986/12/19 14:33:10.300 FRI.
```

Figure 4.3 Sample BERT QUERY Output

If a fault is detected by the end-to-end BERT, perform an individual BERT (loopback) on the DU element of the modem pool to isolate the problem.

Performing a Loopback Bit Error Rate Test

If a fault is detected by the end-to-end BERT, perform an individual BERT (loopback) on the DU element of the modem pool to isolate the problem. You can perform a loopback at three different points: 64 kb at the DLC, 64 kb at the DU, and the RS-232 connection.

1. To perform a loopback BERT, POST the modem pool element you want to test from the LTPDATA level of the MAP.

0 2. Enter the BERT START command at the MAP to perform an end-to-end BERT.

0 3. HOLD the modem pool element.

0 4. While the end-to-end BERT is running, POST the modem pool DU and activate the loopback BERT at the RS-232 connection using the LOOPBK RS232 command. The loopback remains intact, even if the modem pool element is re-posted.

0 With the loopback set, the IBERT receives back the test pattern that it sent out. Since only one IBERT is sending and receiving a test pattern, the BERT QUERY command displays only one set of results (from the modem pool DU).

0 5. Enter the BERT RESET command to clear the test results and any errors that have been recorded.

0 6. Once the test has run for the desired length of time, enter the LOOPBK RESET command to reset the loopback.

0 7. POST the modem pool element and enter the BERT STOP command to terminate the BERT.

0 Test Results

0 If the end-to-end BERT detects errors but the loopback BERT does not, the modem portion of the element is faulty. Initiate a self-test on the modem (consult the manufacturer’s documentation. Check the connection between the modem and DU.

0 If both the end-to-end and loopback BERTs detect errors, the DU portion of the element is faulty. To further isolate the problem, perform additional loopback BERTS at the DU 64 kb, or the data line card 64 kb loopback points.

0 For details on how to invoke these tests and interpret the results, see 297-2101-516, Line Maintenance Reference Manual.

SCHEDULED MAINTENANCE

Because of the trunk-type usage pattern of modem pool elements, schedule regular maintenance to detect problems before they seriously affect customer performance. Automatic diagnostics can be arranged to run on the DLC, the VLC, the data line and the modem line using the ALT (automatic line test) level of the MAP. Details on the commands required to implement these tests are found in 297-2101-516, Line Maintenance Reference Manual. Reports from these tests allow you to perform required maintenance before the customer generates a trouble report.

NRS AUDITS

An audit system has been developed specifically for the NRS system. The audit periodically checks the sanity of the Network Resource Selector system and corrects any problems that may be encountered.

The activation of the NRS audit system is controlled by a variable office parameter NRS_AUD_DELAY. This parameter determines the time between successive audit cycles and can range from 0 to 60 min (0 disables the audits).

0 PRACTICE 297-2121-224
0 VINTAGE 06.02

CHAPTER 5

OPERATIONAL MEASUREMENTS

0 PRACTICE 297-2121-224
0 VINTAGE 06.02

DESCRIPTION OF OPERATIONAL MEASUREMENTS

Operational Measurements (OM) is a system of monitoring events in a switching machine. It allows you to make calculations that assist in the administration and maintenance of the machine. Counts are kept of events or of the number of pieces of equipment found in a specified state by a cyclical scanning procedure. The results of the counts can be printed, displayed on a Maintenance and Administration Position (MAP), or stored in a data format on a disc or tape.

All OM registers are organized into groups and given appropriate names. This is usually done based on some association, such as all measurements related to a specific subsection of the switch. For modem pooling, the group name is Network Resource Selector (NRS).

As events occur, the counts are stored in registers (memory locations) referred to as the Active Registers. For information on classes and reports see 297-1001-320, Operational Measurements Reference Manual.

The NRS OM group contains data on the operation of all resource groups in a DMS office. Some of the information held in the NRS OM group is useful for maintenance. Other information pertains to traffic. You can obtain data for each modem pool or maintenance modem pool as a whole, but not for individual elements within the pools.

The key field for a modem pool group indicates the Common Language Location Identifier (CLLI) of the modem pool. The information field lists the registers described in Table 5.1 on page 5-2.

For more information on the OM registers, consult 297-1001-114, Operational Measurements (OM).

TABLE 5.1
REGISTER DESCRIPTIONS

REGISTER	DESCRIPTION
COMMON_LANGUAGE_NAME	Key Field The resource CLLI
NRS_OMINFO	Information Field RESTYPE (Resource Type) MP = Modem Pool MMP = Maintenance Modem Pool
NRSRES	NRS Successful Reservations Incremented each time a successful attempt is made to reserve a member of the NRS group. A modem pool or maintenance modem pool element is reserved when it is taken off a queue of idle modem pool elements.
NRSFRES	NRS Failed Reservations Incremented each time an unsuccessful attempt is made to reserve a member of the NRS group. A failure is registered when a modem pool or maintenance modem pool fails to be removed from the queue of idle modem pool elements when it is reserved. (This is useful for maintenance since it indicates the number of times the user encountered an all elements busy condition.)

Table Continued

TABLE 5.1 (Continued)
REGISTER DESCRIPTIONS

REGISTER	DESCRIPTION
NRSCON	NRS Successful Connections Incremented each time a successful connection is made to a member of the NRS group. Modem pools are connected when a call process is setup. Maintenance modem pools are connected when the network connection between the maintenance modem pool and the modem pool under test is established.
NRSFCON	NRS Failed Connections Incremented each time an unsuccessful attempt is made to connect to members of an NRS group. A failure is registered when modem pools fail to connect during call setup, and when a maintenance modem pool fails to connect to a modem pool under test. (This is useful for maintenance since it usually indicates a hardware problem with a modem pool element.)
NRSOVFL	NRS Overflow Incremented each time an NRS group has no free members and an overflow to another group is required to attempt to find a free member.

Table Continued

TABLE 5.1 (Continued)
REGISTER DESCRIPTIONS

REGISTER	DESCRIPTION
NRSRESU	NRS Reservation Usage Usage count of the number of members of an NRS group that are in a reserved state. Scan rate: every 10 seconds Modem pools are reserved when they are taken off a queue of idle modem pool elements to be used for call processing. Maintenance modem pools are reserved when they are taken off a queue of idle maintenance modem pool elements to be used for maintenance.
NRSCONU	NRS Connection Usage Usage count of the number of members of an NRS group that are in a connected state. Scan rate: every 100 seconds Modem pools are connected when a call is in progress. Maintenance modem pools are connected when the network connection between the maintenance modem pool and the modem pool under test is established and a bit error rate test (BERT) is running.
NRSMBU	NRS Man Busy Usage Usage count of the number of members of an NRS group that are in a man-busy state by use of the BUSY command at the MAP. Scan rate: every 100 seconds This count does not include a maintenance modem pool that is man-busy while performing a BERT on another modem pool.

Table Continued

TABLE 5.1 (Continued)
REGISTER DESCRIPTIONS

REGISTER	DESCRIPTION
NRSSBU	NRS System-Busy Usage Usage count of the number of members of an NRS group that are in a system-busy state. Scan rate: every 100 seconds
NMSNMP	NRS No Modem Pool Incremented each time a member of a customer user group with the NRS Override feature dials the OMP override prefix digits. The NRS No Modem Pool feature is used when a member of a customer user group knows that a data call will be terminated at a data unit or placed over all-digital facilities. The user dials the OMP override prefix digits to prevent an outbound modem pool from being inserted in the call path.

MAP DISPLAY OF OPERATIONAL MEASUREMENTS DATA

You can display OM data on a Map using the OMSHOW command. For example:

```
OMSHOW NRS ACTIVE
       or
OMSHOW NRS HOLDING
```

The output from this command provides information on the modem pool(s) specified and contains the following fields:

NRS: (group name)

CLASS: class name
(ACTIVE or HOLDING)

START: date time day_of_week
(of the beginning of the sampling period)

STOP: date time day_of_week
(of the end of the sampling period)

SLOWSAMPLES: nnnn
(The total number of slow-scan samples made in the period. A slow scan is done every 100 seconds.)

FASTSAMPLES: nnnn
(The total number of fast-scan samples made in the period. A fast scan is done every 10 seconds.)

KEY: nn CLLI
CLLI = modem pool or maintenance modem pool
(Identifies each modem pool by a number and by its CLLI.)

INFO: Provides the nine items of data for each modem pool:

NRSRES	NRSFRES	NRSCON	NRSFCON
NRSOVFL	NRSRESU	NRSCONU	NRSMBU
NRSSBU	NRMNMP		

More information on the OMSHOW command can be found in 297-1001-320, Operational Measurements Reference Manual.

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0 CHAPTER 6

0 APPENDIX A - NON-STANDARD MODEM POOL
0 ROLLOVER CABLE

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0 PRACTICE 297-2121-224
0 VINTAGE 06.02

ROLLOVER CABLE APPLICATION

The rollover cable performs the function of a null terminal connector.

Rackmount NT4X25AD data units (DUs) with DAX01 or DAX02 firmware versions and desktop DUs with CJM01, CJM02 or CJM03 firmware versions must use NT A0317172 non-standard modem pool rollover cable. All other DUs must use the rollover cable pinout shown in Figure 2.5 on page 2-18.

Figure 6.1 shows the pinout of the NT A0317172 rollover cable.

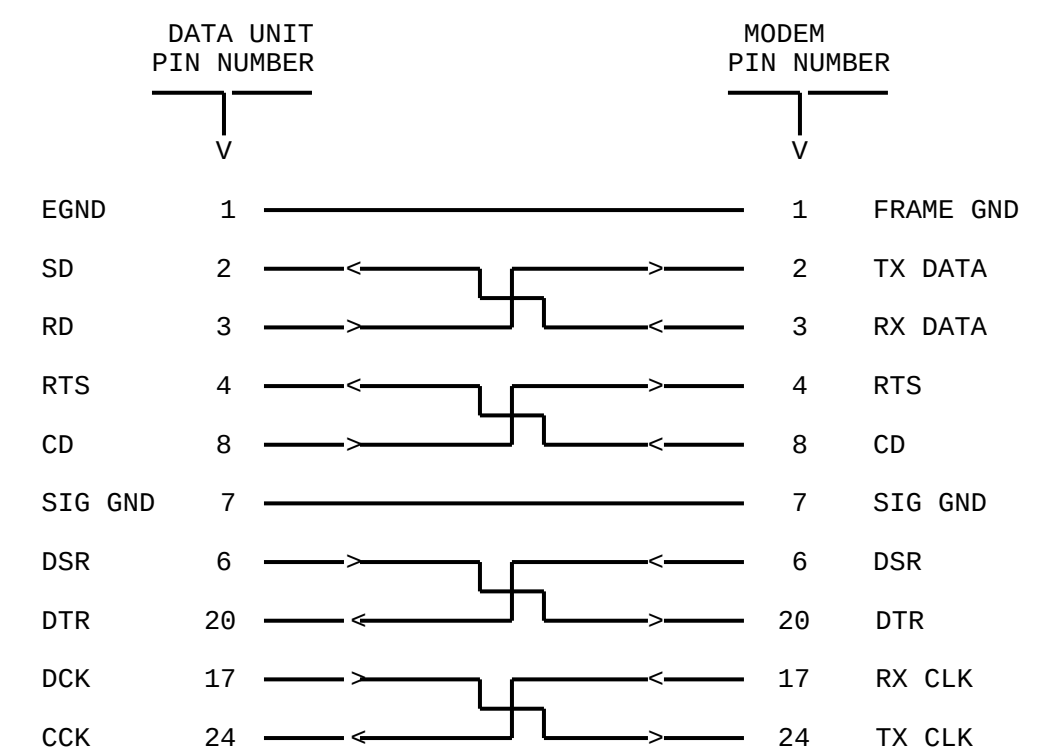

Figure 6.1 Non-Standard Modem Pool RS-232C Rollover Cable

Note: The codes used in Figure 6.1 on page 6-1 are:

CD	Carrier Detect
CTS	Clear To Send
DTR	Data Terminal Ready
DSR	Data Set Ready
EGND	Earth Ground
FRAME GND	Frame Ground
RD	Receive Data
RTS	Request To Send
RX CLK	Receive Clock
RX DATA	Receive Data
SD	Send Data
SIG GND	Signal Ground
TX CLK	Transmit Clock
TX DATA	Transmitted Data

Determining Your Data Unit Firmware Code

The firmware code is stamped on an EPROM chip on the motherboard of the DU.

NT4X25AD Data Unit. The location of the EPROM chip on the NT4X25AD rackmount DU, is shown in Figure 6.2 on page 6-3.

NT4X25AN Data Unit. On the NT4X25AN desktop DU, the EPROM chip is in location U9 as marked on the printed circuit board (motherboard). It is visible when you remove the top cover of the DU. See Figure 6.3 on page 6-4

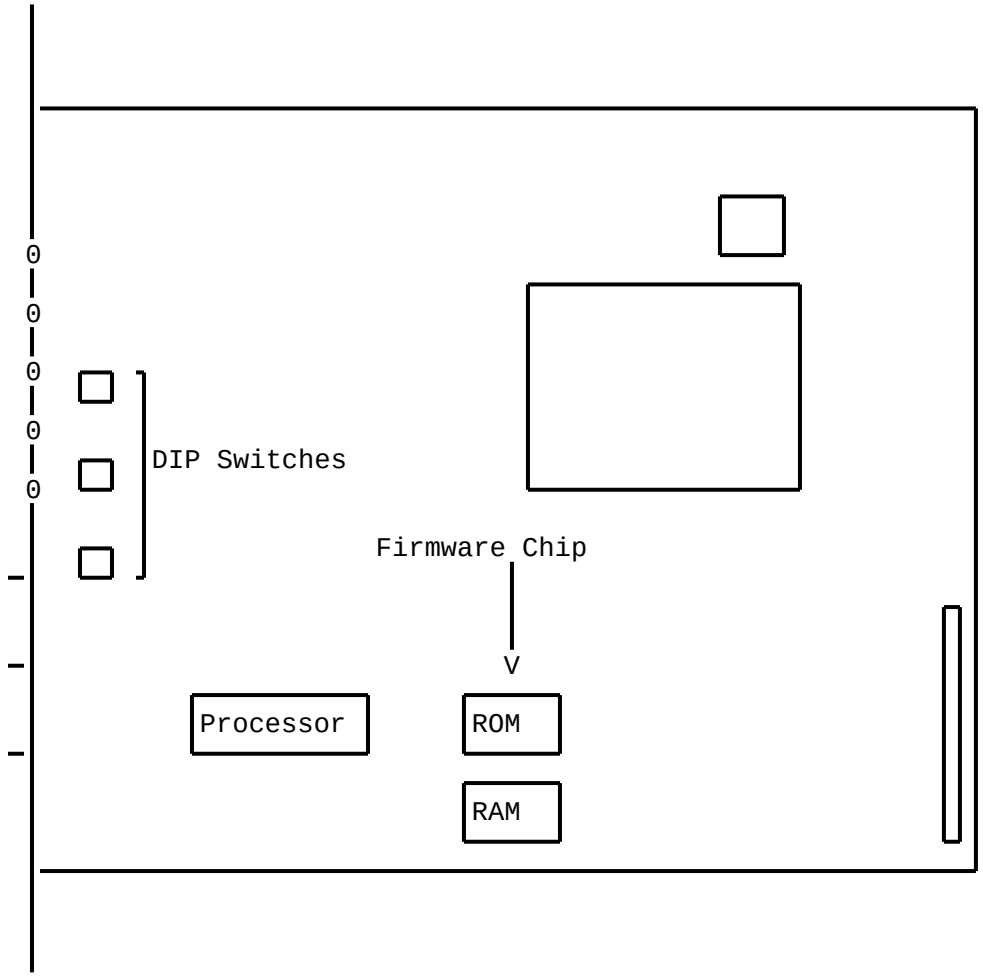

Figure 6.2 Location of Firmware Chip on NT4X25AD DU

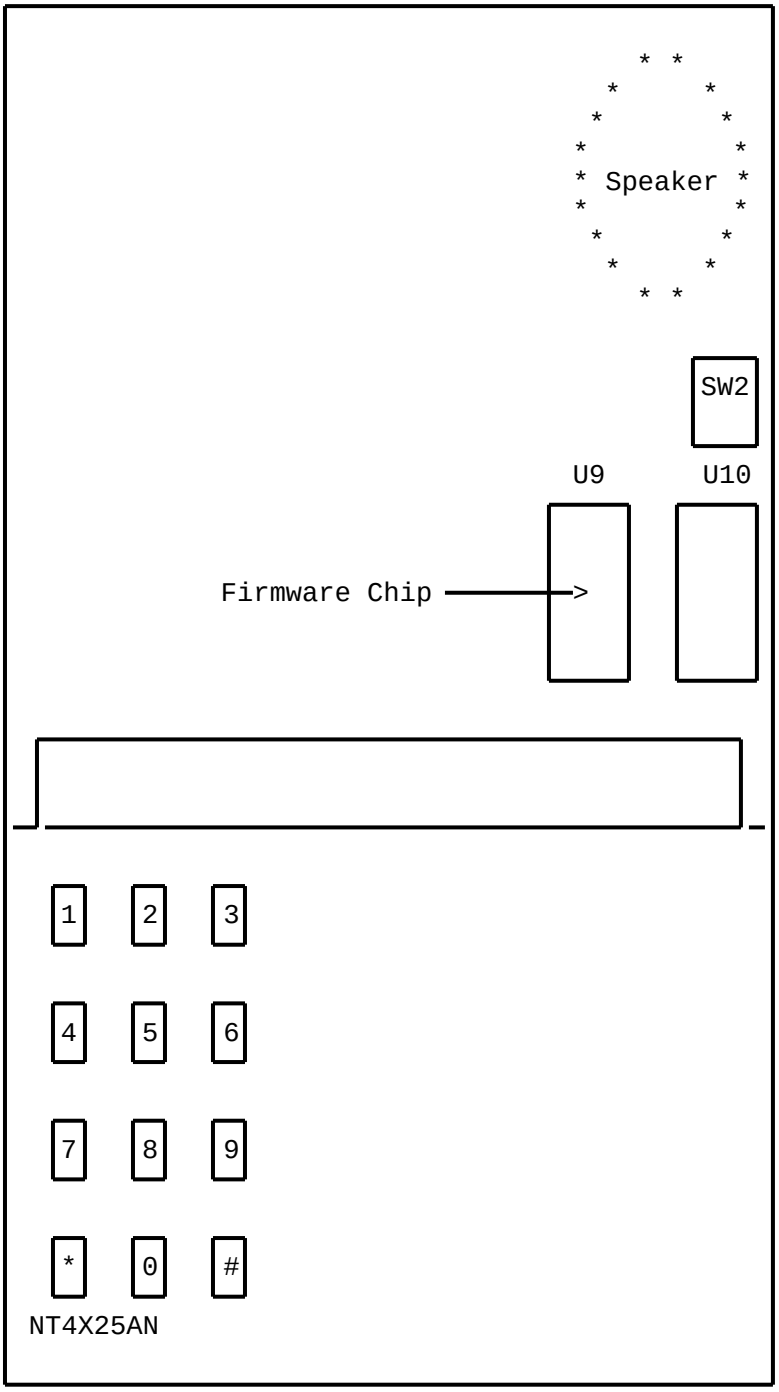

Figure 6.3 Location of Firmware Chip on NT4X25AN DU

CHAPTER 7

APPENDIX B - SUGGESTED MODEMS

0 PRACTICE 297-2121-224
0 VINTAGE 06.02

This appendix lists the option settings for some suggested modems that meet the modem pool requirements. Modems used in modem pools can be set to speeds up to 19,200 bps.

Note: The accuracy of this information can not be guaranteed as the information pertains to equipment which is not produced by Northern Telecom. Please consult the manufacturer's documentation for further information.

GDC 201C MODEM

TABLE 7.1
GDC 201C OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
1C	Controlled Carrier, 150 ms CTS Delay	Modems placing calls through half-duplex modem pools must have a CTS delay greater than 50 ms.
2A	Controlled Carrier	
3B	2-Wire	
4B	Switched Network	
5B	External Control of DSR Disabled	
6B	Satellite Timing 53 ms	
7M	-12 dBm TX Level	
8B	900 RX Impedance	
9B	900 TX Impedance	
10A	Amplitude and Delay Equalizers Enabled	
11B	Highest Sensitivity	
12C	External TX Timing	
13A	New Sync Disabled	
14B	Auto Answer Enabled	
15B	Separate Signal and Frame Grounds	Selected due to the CO location
16B	DSR ON During AL	

Note: Refer to Table 7.2 on page 7-3 and Table 7.3 on page 7-5 for associated information.

Table Continued

TABLE 7.1 (Continued)
GDC 201C OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
17B	RX Clock Enabled During CD OFF	
18B	Pin 18 is RX Dibit Clock	
19A	Scrambler Disabled	
20A	Abort Timer Disabled	
21A	Anti-streaming Timer 27 s	
22A	Programmable TX Level	
23A	Make Busy During AL Disabled	
24B	Second Pair Make Busy Floating Contact	
25A	Answer Tone B Sequence	
26B	Quality Alarm Enabled	
27A	External Data Rate Control Disabled	
28A	Data Rate 2400 bps	
29A	Delayed AL Disabled	
30B	DSR ON During AL	
31A	External AL Control Disabled	
32B	RX Inhibit During TX Enabled	
33A	RX Dibit Clock Enabled When CD is OFF	
34A	External Control of CTS Delay Disabled	
35A	Quality Monitor Does Not Inhibit Customer System (CS)	
36B	Incandescent Lamp	
37C	RCT Telephone	
38A	Test Mode Indication on Pin 25	
39B	RDL Disabled	
40B	Quality Alarm on Pin 21	
X15	Adjustable TX Level	

TABLE 7.2
SWITCH POSITION SUMMARY (GDC 201C)

SWITCH	POSITION
S1-1	QA
(BC)2	Off
-3	Off
-4	Off
-5	MRA
-6	MRT
-7	Off
-8	Off
S2-1	Off
-2	Off
-3	Off
-4	Off
-5	Off
S3-1	Off
-2	RI
-3	Off
-4	RDE
-5	RCE
-6	Off
-7	Off
-8	Off
S4-1	EQ1
-2	2WF
-3	900R
-4	900T
-8	500
S12-1	Off
-2	Off
-3	On
-4	On
S13-1	On
-2	On
-3	On
-4	On

Table Continued

TABLE 7.2 (Continued)
SWITCH POSITION SUMMARY (GDC 201C)

SWITCH	POSITION
S1-1	Off
(SN)2	B SEQ
-3	Off
-4	503

TABLE 7.3
JUMPER POSITION SUMMARY (GDC 201C)

JUMPER	POSITION
X1(BC)	DCR
X2	Off
X3	EIA
X4	100
X5	Off
X6	MB
X7	Off
X8	Off
X9	Off
X14	TM
X15	ADJ
X17	QA
X18	OIS
X20	Off
X21	Off
X22	Off
X23	Off
X24	Off
X1(SN)	PR

Note: Mounting Holes = SN

TABLE 7.4
GDC 202S/T OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENT
1B	Automatic Answer	
2A	180 ms CTS Delay	Modems placing calls through half-duplex modem pools must have a CTS delay greater than 50 ms.
3A	23 ms Acquire 10 ms Release	CD time constant
4A	24 ms/156 ms	Soft turnoff squelch intervals
5B	2W Without Reverse Channel (RC)	
6B	No Local Copy on Reverse	No RC
7C	2-Wire Switched Network	
8B	Controlled Carrier	
9B	Disconnect Timer Out	
10B	-45 dBm CD	
11	-12 dBm TX Level	
12A	Programmable TX Level	
13B	Received Data (RD) Clamped Mark	
14B	No Local Copy	
15B	Separate Signal and Chassis Ground	Selected due to CO location
16B	Fast Carrier Detector Reset OUT	
17A	Compromise Equalizer IN	
18A	1200/2200 Mark/Space Frequency Deviation	
19B	Echo Suppressor Enable OUT	
20C	503 (RTC) Telephone	
21A	Controlled Carrier Turnaround IN	
22B	900 Line Impedance	
23A	Modem Ready Early in Answer Mode	

Note: Refer to Table 7.5 on page 7-8 and Table 7.6 on page 7-9 for associated information.

Table Continued

TABLE 7.4 (Continued)
GDC 202S/T OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENT
24A	Modem Ready ON in ANALOOP*	
25A	RTS Normal	
26A	DTR Normal	
27B	Frame Ground not on EIA PIN 1	
28-33	No Reverse Channel	

* ANALOOP is a trademark of General Datacom Industries, Norwalk, Conn.

TABLE 7.5
SWITCH POSITION SUMMARY (GDC 202S/T)

SWITCH	POSITION
S4-1	Off
-2	S-S
-3	Off
-4	S-S
-5	Off
-6	Off
-7	Off
-8	180 ms
S5-1	Off
-2	CE
-3	503
-4	AA
-5	On
S6-1	CCTA
-2	Off
-3	Off
-4	Off
-5	Off
-6	BB CMP
-7	Off
-8	Off
S7-1	Off
-2	Off
-3	9
-4	NO DAS
-5	Off
S8-1	Off
-2	Off
-3	4
-4	8

TABLE 7.6
JUMPER POSITION SUMMARY (GDC 202S/T)

JUMPER	POSITION
X1	Norm
X2	In
X3	45 dBm
X4	2W
X5	REV. CH. Out
X6	PR
X7	Off
X11	Not Strapped
X12	Not Strapped
X13	ADJ
X14	Not Strapped
X15	Not Strapped
X18	Closed
X19	Closed
PP1	Program Plug In
PP2	Open Socket

TABLE 7.7
GDC 208B/A OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
1	Switched Carrier	Modems placing calls through half-duplex modem pools must have a CTS delay greater than 50 ms.
6	DAS Does Not Control DSR	
7	DSR ON in AL	
9	Compromise EQ Test Disabled	
11	1 s Hold-over Disabled	
14	Compromise EQ Enabled 4 dB Amplitude Symmetrical Delay	
34	-12 dBm TX Level	
38	New Sync Disabled	
41	External TX Timing	
43	Automatic Answer Enabled	
45	Abort Timer Disabled	
47	Signal Quality Abort Disabled	
49	Make Busy in AL Disabled	
51	External Control of CTS Delay Disabled	
53	Pin 21 is CP ON Indication	
55	RX Timing not Disabled When CD is OFF	
57	No External Control of AL	
59A	TM Indication on Pin 25	
61	Clock Wrap Disabled	
61B	Baud Rate Clock on Pin 18	
61C	RDL Disabled	
62	Switched Network	
64	High RX Sensitivity	
67	Programmable TX Level	
69	900 Line Impedance	

Note: Refer to Table 7.8 and Table 7.9 for associated information.

Table Continued

TABLE 7.7 (Continued)
GDC 208B/A OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
70	511 Bit-Test Pattern	
73	600 ms CTS Delay Disabled	
74	Incandescent Telephone Lamp	
77	Separate Signal and Frame Grounds	Selected due to the CO location
79	50 ms Training Sequence	
80	Eye Pattern Output	
82	No Telephone Set Connected to J2	

TABLE 7.8
SWITCH POSITION SUMMARY (GDC 208B/A)

SWITCH	POSITION
S1-1	EXT
(BC)2	Open
-3	Open
-4	Open
-5	Open/Norm
-6	TM
-7	Open
-8	Open/Norm
S1-1	Open
(DPC)2	AUTO ANS
-3	Open
-4	Open
-5	Open
-6	FPDIS
-7	Open
-8	Open
S10-1	-8 dB
-2	-4 dB
-3	Open
-4	Open
S2-1	Open
(DPC)2	Open
-3	Open
-4	NRDL
-5	PTRN
-6	Norm
-7	Open
-8	Open
S11-1	HI Out
-2	SYM In
-3	EQ IN
-4	AMP 4 dB

TABLE 7.9
JUMPER POSITION SUMMARY (GDC 208B/A)

JUMPER	POSITION
X1	Norm
X3	150
X4	HI SENS
X5	PR
X6	Norm
X7	Norm
X8	Norm
X9	900
X10	900
X11	Norm
X12	ADJ
X13	
X14	Factory Test Options Leave In Place
X15	
X16	
X17	
X18	
X19	
X20	Norm
X21	Norm
X22	SQM

Note: Program Plug = 208B

TABLE 7.10
GDC 212A/L OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
Note: Refer to Table 7.11 and Table 7.12 for associated information.		
1A	Switched Network, DTR Active	
2A	Originate/Answer	Capable of both functions
3B	Dual Speed	
4A	1200 bps Asynchronous	Choose 4A for asynchronous, 4B for 1200 bps synchronous
5C	10-Bit Characters	
6A	Automatic Answer	
7C	RCT-Type 503 Telephone	S10-8 must be in the 500 position for proper MI lead operation.
8B	RCT-Type Telephone	
9A	Incandescent Lamp	
10B	Programmable Transmit Level	
11N	-12 dBm Transmit Level	
12A	Send Space Disconnect Enabled	
13A	Receive Space Disconnect Enabled	
14B	Loss of Carrier Disconnect Disabled	
15A	CB and CF Common	
16B	Answer Mode Indication Disabled	
17B	Signal Rate Indicator Disabled	
18A	Data Set Ready (DSR) ON During Loopback	
19B	Test Mode Indication Disabled	
20E	Make Busy/Analog Loopback (AL) Control Via Front Panel Only	
21B	Speed Selector from Terminal Disabled	
22A	Second Pair Make-Busy by Floating Contact	

Table Continued

TABLE 7.10 (Continued)
GDC 212A/L OPTIONS FOR MODEM POOLS

GDC OPTION NUMBER	OPTION SELECTION	COMMENTS
23B	Continuous Busy when Out-of-Service	
24B	900 ohm Line Impedance	
25C	Remote Digital Loopback (RDL) Control by Terminal Disabled	
26A	Receive Responds to RDL	
27B	Internal TX Timing	Choose 27B for asynchronous, 27A for synchronous
28B	Separate Signal and Frame Grounds	Selected because of the CO location

0 TABLE 7.11
0 SWITCH POSITION SUMMARY (GDC 212A/L)

SWITCH	POSITION
S7-1	Off
-2	Off
-3	Off
-4	Off
-5	Off
-6	Off
-7	Off
-8	Off
S8-1	Off
-2	INT CLK(Off)
-3	RC RDL(Off)
-4	Off
-5	Off
-6	CC AL(On)
-7	DUAL(Off)
-8	Off
S9-1	ASYNC(Off)
-2	Off
-3	On
-4	CF=CB(On)
-5	SSD(On)
-6	RSD(On)
-7	On
-8	Off
S10-1	AUTO ANS
-2	Off
-3	ANS/ORIG(On)
-4	Off
-5	565/500(On)
-6	Lamp
-7	Off
-8	500(On)
S12-1	1dB(On)
-2	2dB(Off)
-3	4dB(Off)
-4	8dB(On)

TABLE 7.12
JUMPER POSITION SUMMARY (GDC 212A/L)

JUMPER	POSITION
X1	SN
X2	PERM
X3	Out
X4	600
X5	MB
X6	In
X7	MBI
X8	GND In
X9	Out
X10	Out
X11	Out
X12	None
X13	In (+12)
X14	In (-12)
X15	In (+5)
X16	Other
X17	Norm
X18	Norm
X19	ADJ
X20	Out

Note: Front panel HS (High Speed) button should be In for 1200 bps operation and Out for 300 bps.

0 PRACTICE 297-2121-224
0 VINTAGE 06.02

0

CHAPTER 8

ABBREVIATIONS

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0 PRACTICE 297-2121-224
0 VINTAGE 06.02

AMI	Automatic Modem Insertion
ATD	Automatic Tone Detector
BCS	Batch Change Supplement
BERT	Bit Error Rate Test
bps	Bits Per Second
CLLI	Common Language Location Identifier
CO	Central Office
CR	Carriage Return
DCE	Data Communication Equipment
DF	Distribution Frame
DLC	Data Line Card
DMS	Digital Multiplex System
DN	Directory Number
DTE	Data Terminal Equipment
DU	Data Unit
FSP	Frame Supervisory Panel
GDC	General DataComm Inc.
HASU	Hardware Assigned Software Unequipped
IBERT	Integrated Bit Error Rate Tester
IMP	Inbound Modem Pool
INB	Installation Busy
IPM	Impulses Per Minute
ISDN	Integrated Services Digital Network
LCM	Line Concentrating Module
LED	Light Emitting Diode
LEN	Line Equipment Number

0	LGC	Line Group Controller
0	LTC	Line Trunk Controller
0	LTP	Line Test Position
0	MAP	Maintenance and Administration Position
0	MD	Modem
0	MDF	Main Distribution Frame
0	MI	Mode Indicator
0	MIC	Mode Indicator Common
0	MIS	Miscellaneous Equipment Bay
0	MMP	Maintenance Modem Pool
0	MMPDU	Maintenance Modem Pool Data Unit
0	MMPMD	Maintenance Modem Pool Modem
0	MP	Modem Pool
0	MPDU	Modem Pool Data Unit
0	MPMD	Modem Pool Modem
0	NMP	No Modem Pool
0	NRS	Network Resource Selector
0	NTP	Northern Telecom Practice
0	OM	Operational Measurements
0	OMP	Outbound Modem Pool
0	PNO	Prefix Network Resource Selector Outbound
0	SC	Switching Center
0	TC	Trunk Card
0	TCM	Time Compression Multiplexing
0	VLC	Voice Line Card