ISU 2x64 Rackmount
128 kbps ISDN Service Unit
User Manual

Part Number

U-Interface, Data Only	**1200074L1**
U-Interface, Dual V.34 Modems	**1200074L3**
S/T Interface, Data Only	**1200074L4**
S/T Interface, Dual V.34 Modems	**1200074L6**

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December 1996

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FCC regulations require that the following information be provided to the customer in this manual.

1. If your telephone equipment (ISU 2x64) causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

2. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice to give you an opportunity to maintain uninterrupted service.

3. If you experience trouble with this equipment (ISU 2x64), please contact ADTRAN customer service for repair/warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.

4. This unit contains no user-serviceable parts.

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

WARNING *Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

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Chapter 1
Understanding ISDN and the ISU 2x64 Rackmount

ISDN OVERVIEW

The Integrated Services Digital Network (ISDN) is a public or private *switched digital* network. ISDN is an international standard for digital communications, allowing a full range of enhanced services supporting voice, data, and image applications through standard interfaces over a single telephone wire. ISDN provides a means of integrating these services and modernizing communication networks for information movement and management efficiency.

THE ADTRAN ISU 2X64 RACKMOUNT

The ADTRAN ISU 2x64 Rackmount ISDN Service Unit (part number 1200074L1, L3, L4, and L6) is a rackmount device, installed in the ADTRAN Smart 16 shelf. The ISU 2x64 Rackmount connects data terminal equipment (DTE) to the ISDN network or to a leased digital network for data transmission. The ISU 2x64 Rackmount allows high-speed data transmission (up to 128 kbps) using a single ISDN line. The ISU 2x64 Rackmount is available with or without an integrated NT1. Figure 1-1 is an illustration of the ADTRAN ISU 2x64 Rackmount front panel.

The ISU 2x64 Rackmount features dual RS-530/RS-232 DTE interfaces. An RS-530-to-V.35 adapter is available to support V.35 DTE interfaces. Synchronous data transfer rates from 2400 bps to 128 kbps and asynchronous rates from 300 bps to 115.2 kbps are supported on a single DTE interface.

Synchronous data transfer rates from 2400 bps to 64 kbps and asynchronous rates from 300 bps to 57.6 kbps are supported when using dual DTE interfaces. For speeds over 64 kbps using a single DTE interface, the industry standard BONDING protocol aggregates the two 64 kbps B channels for a maximum of 128 kbps.

The ISU 2x64 Rackmount has one RJ-45 jack on the rear panel for ISDN network connection (see Figure 1-2). The RJ-45 jack is labeled **NETWORK**. ISDN Basic Rate Service divides a standard telephone line into three digital channels capable of simultaneous voice and data transmission. The three channels are comprised of two Bearer (B) channels at 64 kbps and one Delta (D) channel at 16 kbps (also known as 2B+D).

Dialing from the ISU 2x64 Rackmount is accomplished in a variety of ways:

- Dialing manually from the DATAMATE keypad or terminal keyboard.
- Dialing automatically from up to ten stored numbers per DTE interface.
- Dialing over the DTE interface using the AT command set.
- V.25 bis in-band dialing (used in applications such as LAN/WAN bridging).
- Dialing while DTR is enabled. Routers raise DTR when bandwidth on their dedicated line is exceeded. In high-traffic times, this allows the ISU 2x64 to dial out over the ISDN for an extra 128 kbps of bandwidth-on-demand.

The ISU 2x64 Rackmount is configured by using the DATAMATE keypad supplied with the Smart 16 shelf controller, or through the use of a terminal attached to the Smart 16 shelf controller card. The DATAMATE provides a 2-line by 16-character LCD display. The keypad is used for selecting and configuring the units present in the shelf (see the Smart 16 shelf user manual for more details).

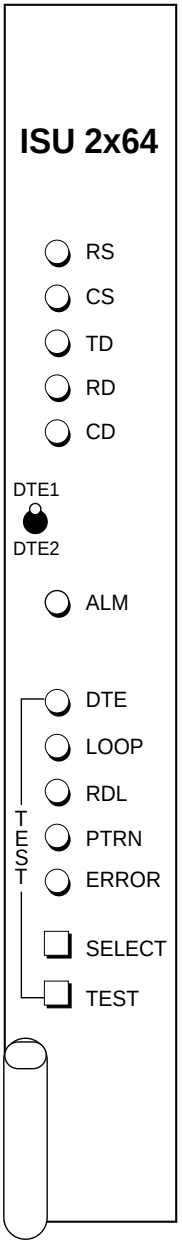

Figure 1-1
ISU 2x64 Rackmount Faceplate

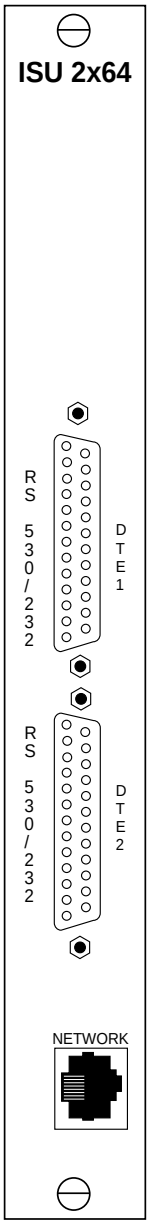

Figure 1-2
ISU 2x64 Rackmount Rear Panel

Before the ISU 2x64 Rackmount can be configured, the unit must be selected. To select the ISU using the DATAMATE, the proper shelf and slot must be entered. Once this is done, the display changes to show the menu selections of the ISU 2x64 Rackmount.

To select the ISU 2x64 Rackmount using a terminal, the proper shelf and slot must be entered. For more information on the terminal and DATAMATE interfaces, see the Smart 16 shelf user manual.

Table 1-A defines the DTE indicators located on the front panel.

Table 1-A
DTE Indicators

Indicator	Definition
RS	Request to Send. Indicates the DTE is ready to transmit.
CS	Clear to Send. Indicates the ISU 2x64 Rackmount is ready to transmit.
TD	Transmit Data. On when the DTE is transmitting to the ISU 2x64 Rackmount.
RD	Receive Data. On when the ISU 2x64 Rackmount is receiving data from the far end.
CD	Carrier Detect. On when the ISU 2x64 Rackmount is connected to a remote unit.

ISU 2X64 RACKMOUNT INTEROPERABILITY

The ISU 2x64 Rackmount bridges the transition from analog to digital technologies by supporting communications with existing and future network services and equipment. The ISU 2x64 Rackmount supports communications with Switched 56 Service and Switched 56 DSUs (2-wire and 4-wire) as well as various ISDN terminal adapters, ISDN terminal equipment, BONDING mode 1-compatible inverse multiplexers and optionally analog modems.

ISU 2X64 RACKMOUNT SINGLE PORT OPERATION

The ISU 2x64 Rackmount is designed to operate over multipoint ISDN lines requiring the user to obtain two service profile identification (SPID) numbers from the telephone company when the ISDN lines are installed. SPID numbers tell the ISU 2x64 Rackmount which DTE interface to route incoming or outgoing calls.

When the ISU 2x64 Rackmount is used on an ISDN line that is not multipoint, with one SPID or no SPID numbers, additional considerations should be addressed. If DTE specific operation is desired, the ISDN line must be converted to multipoint operation (2 SPIDS). If not, the following applies:

1. If a single SPID is supplied, it must be entered under SPID DTE #1 (DATAMATE), or SPID1 (TERMINAL).
2. When no calls are active, the first incoming call will always be directed to DTE #1.
3. DTE #2 will only accept incoming calls when a call is active on DTE #1.
4. Outgoing calls can be placed without restrictions from either port.

RECOMMENDED OPERATING PROTOCOLS

The ISU 2x64 Rackmount supports a wide range of operating modes. Many combinations of circuit type, protocol, and data rate may be selected. However, only the combinations shown in Table 1-B are recommended. As noted in Table 1-B, all asynchronous rates will support flow control. However, the 115200 rate requires the use of flow control with the SAP, V.120, V.34, and PPP protocols.

Table 1-B shows that a given data rate may be achieved by more than one protocol/rate adaption selection. The table is organized so that selections with the least transport delay are closer to the top of the table for any given circuit type. Therefore, users should choose a protocol and rate closer to the top of the protocol rate list for a given circuit type.

Table 1-B
Recommended Operating Modes

Call Type	Protocol	Sync/ Async	Rates Supported (bps)								
DIAL-64K	BONDING	Sync	56000	64000							
	Clear Chan	Sync	48000	56000	64000						
	PPP	Sync	2400	4800	9600	19200	56000	64000			
	V.120	Sync	9600	19200	38400	48000					
	Tlink	Sync	2400	4800	9600	19200	56000	64000			
	SAP	Sync	38400								
	PPP async-sync	Async	1200	2400	4800	9600	19200	38400	57600	115200*f*	
	BONDING	Async	2400	4800	9600	19200	38400	57600	115200		
	V.120	Async	1200	2400	4800	9600	19200	38400	57600	115200*f*	
	Tlink	Async	1200	2400	4800	9600	19200				
	SAP	Async	38400	57600	115200*f*						
DIAL-56K	BONDING	Sync	56000								
	Clear Chan	Sync	48000	56000							
	PPP	Sync	2400	4800	9600	19200	56000				
	V.120	Sync	9600	19200	38400	48000					
	TLINK	Sync	2400	4800	9600	19200	56000				
	PPP async-sync	Async	1200	2400	4800	9600	19200	38400	57600	115200*f*	
	BONDING	Async	2400	4800	9600	19200	38400	57600			
	DSU 57.6	Async	57600								
	V.120	Async	1200	2400	4800	9600	19200	38400	57600	115200*f*	
	Tlink	Async	1200	2400	4800	9600	19200				
DIAL-64K*2	BONDING	Sync	128000								
	BONDING	Async	115200								
DIAL-56K*2	BONDING	Sync	112000								
	BONDING	Async	115200								
DIAL AUDIO†	V.34	Async	300	1200	2400	4800	9600	19200*f*	38400*f*	57600*f*	115200*f*
LEASED 64K	Clear Chan	Sync	48000	56000	64000						
	SAP	Sync	2400	4800	9600	19200	38400				
	DSU 57.6	Async	57600								
	SAP	Async	1200	2400	4800	9600	19200	38400	57600*f*	115200*f*	
LEASED 128K	Clear Chan	Sync	128000								
	SAP	Async	57600	115200*f*							

1. *All asynchronous rates support flow control.*
2. *All dial-up modes support front panel, DTR, AT command, and V.25 bis dialing methods.*
3. *Rates marked with **f** require flow control.*
4. *Given a choice between two protocols, pick the protocol closer to the top of the list.*
5. *† - Available only in ISU 2x64 with V.34 modem option, P/Ns 1200074L3 and L6.*
6. *Flow control is recommended for all rates with the V.34 protocol.*

Chapter 2
ISDN Ordering Codes (IOCs)

ORDERING ISDN USING IOCS

The development of ISDN ordering codes (IOCs) simplifies the process of ordering ISDN service. The ISDN Solutions Group, a consortium of ISDN equipment vendors, service providers, and Bellcore, established these codes to represent predetermined line configurations for ISDN Basic Rate service for specific applications.

ADTRAN and Bellcore have registered and tested eight generic IOCs. Of these, four are recommended for operation of the ISU 2x64 Rackmount. After reviewing the list in this chapter, order your ISDN lines from the local service provider. Request the appropriate IOC for your application. They are described in detail in this chapter.

In some areas, ISDN tariffs may warrant the use of ordering codes with less features. For example, in a particular region, there may be additional monthly expense associated with having voice service on each B-channel. If you have a data only application, **Capability R** may be more cost-effective.

If these IOCs are not available from your service provider or you would like more information regarding ordering ISDN see the ADTRAN document *Ordering ISDN Service User Guide* part number 60000.015-8 or contact your telephone company for alternative line configurations. The *Ordering ISDN Service User Guide* is available on the ADTRAN home page at **http://www.adtran.com** or by calling ADTRAN.

ADTRAN has registered the following ISDN ordering codes to support a variety of tariffs and applications:

Capability S

- 2B service
- Both B channels alternating voice and data
- Two directory numbers

Applications

- Host data center, internet access, bulletin board, and modem pooling applications
- Modem capability
- Generic data transfer, including remote access and LAN/WAN connectivity and telecommuting

Capability R

- 2B service
- Data only
- Two directory numbers

Applications

- Host data center, internet access, bulletin board, and modem pooling applications
- Data only applications, no modem capability
- Data transfer applications, including remote access and LAN/WAN connectivity, telecommuting

Capability B

- 1B service
- Data only
- One directory number

Capability C

- 1B service
- Alternating voice and data
- One directory number

Chapter 3
Installation

After unpacking the unit, immediately inspect it for possible shipping damage. If damage is discovered, file a claim immediately with the shipping carrier, then contact ADTRAN Repair and Return Department.

A DTE connector card is provided with each ISU 2x64 Rackmount. The unit may be installed in any slot of a Smart 16 shelf. Once the unit is installed in the slot, the provided DTE connector board must be installed in the corresponding slot at the rear of the Smart 16 shelf. Ensure that a tight connection is made between the DTE card and the ISU 2x64 Rackmount.

NETWORK CONNECTION

The ISU 2x64 Rackmount supports either **Dial** or **Leased** operation. One eight-pin RJ-45 modular jack on the rear panel of the ISU allows connection to either network service.

If using the ISU 2x64 Rackmount, part number 1200074L1 or 1200074L3, connect the telephone company-provided ISDN Basic Rate U interface to the **NETWORK** connector. An external NT1 is not needed.

If using the ISU 2x64 Rackmount, part numbers 1200074L4 or 1200074L6, connect the ISDN Basic Rate S/T interface to the **NETWORK** connector. The S/T interface can be provided from an S/T line card of an ISDN switch or PBX, or from an NT1 network termination unit.

Dial operation allows the ISU 2x64 Rackmount to dial out over the ISDN network.

The **Leased** mode of operation supports a dedicated data service at rates of up to 2x64 kbps by using a nailed-up circuit or a permanent connection between end points. This could be a limited distance modem or point-to-point connection.

Refer to the appendix *Connector Pinouts* for network connection pin assignments.

DTE DATA CONNECTION

Data terminal equipment (DTE) is connected to the ISU 2x64 Rackmount by using the RS-530/RS-232 interfaces, or by using the external RS-530-to-V.35 adapters (part number 1200072L1) on the DTE connectors of the ISU 2x64 Rackmount. The recommended maximum cable lengths are shown in Table 3-A. The pin assignments for the DTE interfaces are shown in the appendix *Connector Pinouts*.

Table 3-A
Maximum DTE Interface Cable Lengths

DTE Interface	Max cable length
RS-530	50 feet
V.35	30 feet
RS-232	15 feet

The RS-530 interface, the V.35 interface, and the RS-232 interface support data rates up to 2x64 kbps. The DTE rate is configured from the DATAMATE or terminal interface of the ISU 2x64 Rackmount or by using AT commands. See the chapter *Configuration* to configure the ISU 2x64 Rackmount with the appropriate data rates for your application.

To prevent possible radio frequency interference emissions, a shielded V.35 cable is required.

Chapter 4
Operation

MENU NAVIGATION

Moving around the various menu items on the ISU 2x64 Rackmount is a simple task. Four function keys on the top of the DATAMATE allow the user to enter, exit, and scroll through the various menu branches. The four function keys are:

Enter	Selects a displayed item.
Up arrow	Scrolls up a menu tree.
Down arrow	Scrolls down a menu tree.
Cancel	Exits back one level from the current branch of the menu.

Function keys are represented in bold, initial capitalization text. Selectable menu items and messages displayed on the LCD are represented in bold type as they appear on the LCD.

DATAMATE OPERATION

To choose an item, press the number on the keypad corresponding with that item. That item blinks on and off to show that it is the currently selected choice. Pressing either the **Up** or **Down** arrow deselects the current choice. Pressing **Enter** selects the item. Figure 6-3 shows the DATAMATE Configuration menu tree.

TERMINAL OPERATION

The ISU 2x64 Rackmount may also be configured by using the terminal interface. Menu selections are made by entering the appropriate numbered item displayed on the terminal. The screen changes to show the affect of the selection. Figure 6-4 and 6-5 illustrate the entire VT100 Terminal Menu Tree.

It is important to note that some features in the ISU 2x64 Rackmount do not immediately take effect upon selection. This prevents unintentional reconfiguration of the ISU 2x64 Rackmount during an active call. Items such as **bit rate**, **protocol**, and **call type** take effect *only* at the beginning of a new call.

GETTING STARTED

The ISU 2x64 Rackmount performs an initial self test upon installation. Once the self test is successfully completed, the unit may be configured, tested, or used. Select the unit by entering the proper shelf and slot number on the DATAMATE or terminal keypad. For details on shelf numbering, see the *Smart 16 Shelf User Manual.*

Once the unit is selected, the DATAMATE display is in the Current Status mode. This is the recommended *resting place* for the display as it shows the current operational status of the unit. For instance, if the ISU 2x64 Rackmount is not connected to the network, the Current Status menu displays:

2x64-U XX: DTE#1 Link Down

XX indicates the slot number where the 2x64 Rackmount is installed in the Smart 16 shelf.

If the unit is connected to the network and functioning properly, it displays:

ISU 2x64-U XX: Ready

XX indicates the slot number where the 2x64 Rackmount is installed in the Smart 16 shelf.

A list of current status messages is provided in the appendix *Current Status Messages*. Repeatedly pressing **Cancel** returns the unit to this screen. Pressing the arrow keys alternates between DTE1 and DTE2 status. Pressing *any* other key changes the display to the top of the menu tree. The menu tree allows the user to set up and operate the ISU 2x64 Rackmount from the DATAMATE.

The main branches of the DATAMATE menu tree are

1. STATUS
2. TEST
3. CONFIG
4. DIAL

Once the unit is selected using the terminal interface, the display shows the initial menu tree. To determine the current status of the unit, select **1 . STATUS**. This screen shows the current configuration, line, and call status for the selected unit.

The main branches of the terminal menu tree are

1. STATUS
2. STATUS BUFFER
3. TEST
4. CONFIGURE LINE
5. CONFIGURE DTE#1/DTE#2
6. DIAL
7. QUICK SETUP
8. AUX CONFIG
9. REM CONFIG

The Main Menu terminal screen is shown in Figure 4-1.

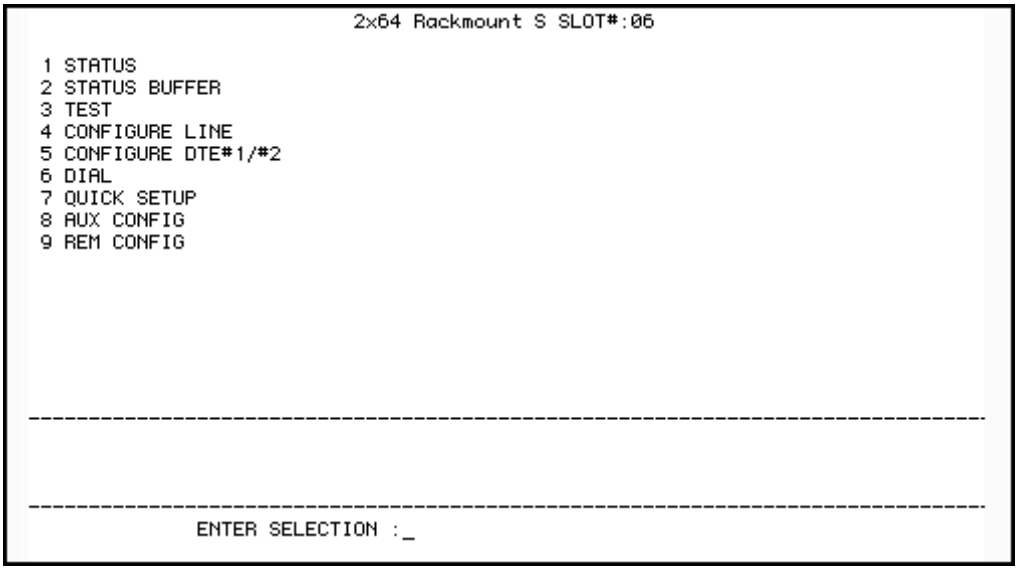

Figure 4-1
VT 100 Main Menu Screen

No distinction between the terminal and DATAMATE interfaces are made in the remainder of this chapter. The actual choice made does not differ between the two interfaces, although the selection process may. For instance, the DATAMATE user must use the **Up** and **Down** arrows to make selections. This is not applicable to the terminal user.

To switch from the DATAMATE to the terminal, press the DATAMATE **Cancel** button until the **Select Unit** option is displayed on the DATAMATE; then press **Return** four times on the terminal keyboard to enter Terminal mode. To change from terminal to DATAMATE interface, press **ESC** until the **Select Unit** prompt is displayed on the DATAMATE, then select the unit with the DATAMATE.

To quickly and easily configure the ISU 2x64 Rackmount for most common applications, see the chapter *Quick Setup.*

STATUS SCREEN

The Status Screen displays unit information such as the loop status, software revision, and the result of the initial self test. The VT 100 Status Screen is shown in Figure 4-2.

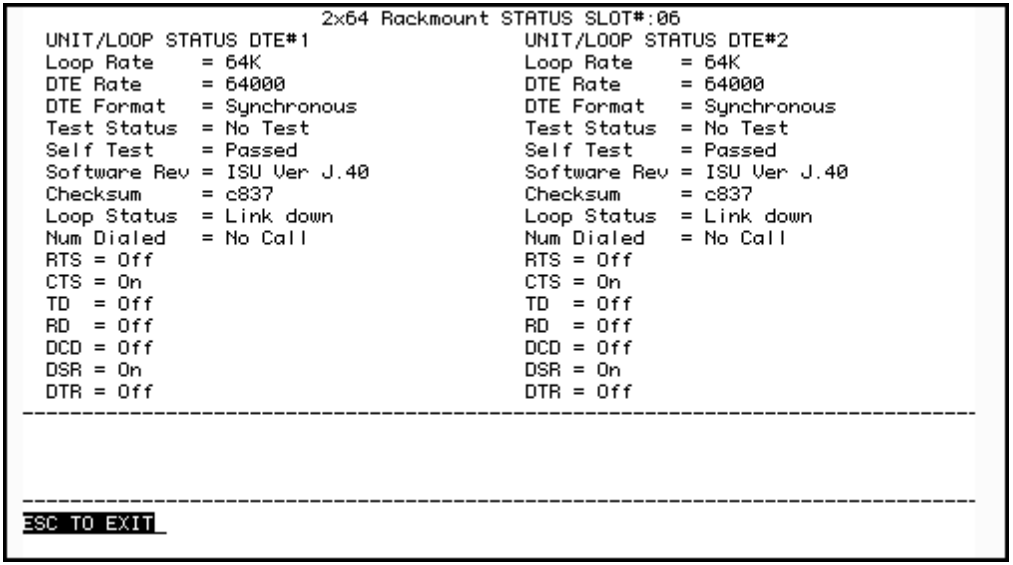

Figure 4-2
VT 100 Status Screen

THE STATUS BUFFER

Selecting **1=Status** from the DATAMATE main menu displays the contents of the status buffer. The **Up** and **Down** arrows allow the viewing of the last fifty status messages generated during the operation of the unit. (An explanation of status buffer messages can be found in the appendix *Status Buffer Messages*). Figure 4-3 shows the VT 100 Status Buffer screen, accessed from the main menu. To dump the status buffer information from the DTE port, type **AT!S**.

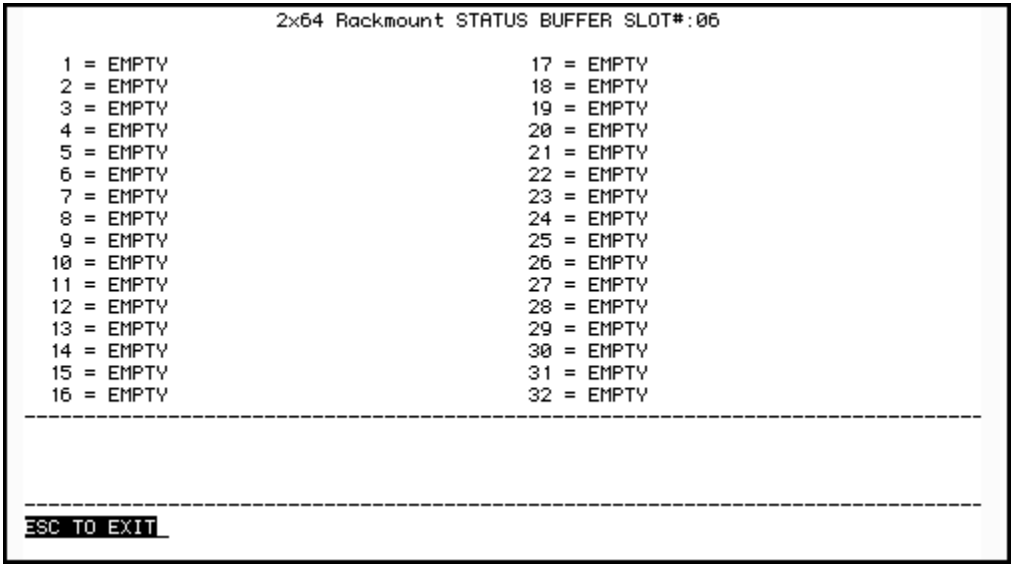

Figure 4-3
VT 100 Status Buffer Screen

Chapter 5
Testing

TEST OPTIONS

Selecting **2=TEST** from the DATAMATE main menu tree or **3 Test** from the VT 100 main menu displays available local testing options; this screen is shown in Figure 5-1.

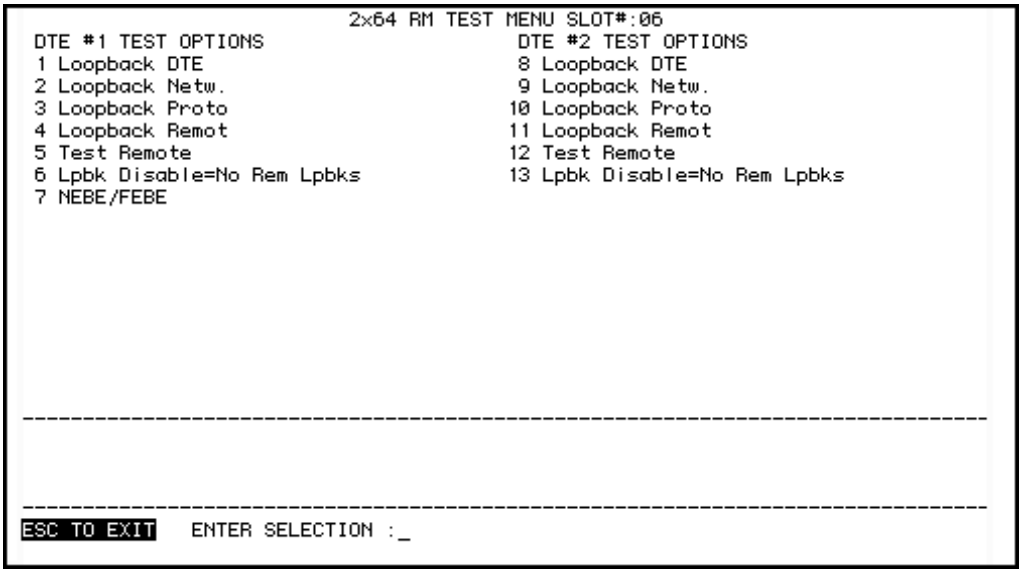

Figure 5-1
VT 100 Test Menu Screen

Loopback DTE

Loopback DTE causes the DTE port to loop back toward user equipment. This allows a bit error rate test (BERT) to be performed between the ISU 2x64 Rackmount and end-user equipment to verify proper cable connection, etc.

Loopback Network

Loopback Network forces the ISU 2x64 Rackmount to loop back both the B1 and B2 channels toward the network. This can be used to allow a far-end user to perform a BERT all the way through the network.

Loopback Protocol

Loopback Protocol allows data to loop back toward the network after passing through a selected protocol such as T-Link or BONDING. See Figure 5-2 for loopback points. (RTS signal must be active.)

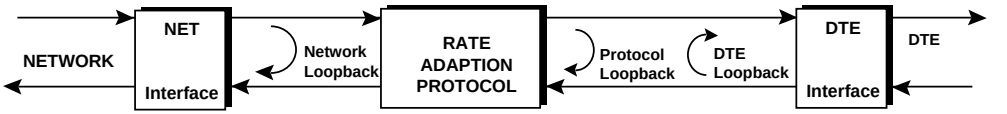

Figure 5-2
Loopback Points

Loopback Remote

Loopback Remote allows the ISU 2x64 to issue a V.54 in-band loopback command to a far-end unit while still accepting data from the DTE connector. This allows bit error rate testing of an entire link using an external BERT tester. To use this feature, both units must be configured for Clear Channel operation and the far-end unit must be able to respond to V.54 loopback commands. See the section *Setting Protocol Options* to configure the unit for Clear Channel operation. Press **Cancel** to end the test.

Test Remote

Test Remote allows the ISU 2x64 to issue a V.54 in-band loopback command to a far-end unit and BERT test the link using a built-in 2047 pattern generator/checker. This allows for testing a circuit without extra test equipment. To use this feature, both units must be configured for Clear Channel operation and the far-end unit must be able to respond to V.54 loopback commands. See the section *Setting Protocol Options* for information regarding optioning the unit for Clear Channel operation. The built-in 2047 pattern generator/checker displays the number of bytes transmitted on the top line and the number of errored bytes received on the lower line of the DATAMATE. Press **0** to clear the counts. Press **Cancel** to end the test.

Loopback Disable

No Remote Loopbacks
The ISU ignores all V.54 and DDS loopback commands.

DDS Accepted
The ISU 2x64 Rackmount responds to DSU latching loopback commands. This option only takes effect if the unit is in leased line mode.

V54 Accepted
The ISU 2x64 Rackmount responds to V.54 loopback commands.

DDS+V54 Accept
The ISU responds to both DSU latching loopback commands (leased line mode only) and V.54 loopback commands.

Near-End Block Errors/Far-End Block Errors (NEBE/FEBE)

NEBE/FEBE allows the user to determine the quality of the network connection by viewing the number of near-end block errors (NEBE) and far-end block errors (FEBE) occurring on the ISDN U-interface. A large count indicates problems with network equipment.

Loopback Both DTEs

Loopback Both DTEs applies only to the DATAMATE and causes both DTE#1 and DTE#2 to loopback towar d the user equipment (see *Loopback DTE* of this chapter).

Pressing **Cancel** exits any of these options.

Terminal Test Screen

The VT 100 terminal screen changes during test operation. Figure 5-3 shows the features available during test mode.

```
                        2x64 RM TEST MENU SLOT#:06
DTE #1 TEST OPTIONS                      DTE #2 DTE LOOPBACK
1 Loopback DTE                           8 End Test
2 Loopback Netw.
3 Loopback Proto
4 Loopback Remot
5 Test Remote
6 Lpbk Disable=V54 Accepted
7 NEBE/FEBE

--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_
```

Figure 5-3
VT 100 Screen During Test Operation

A test can be executed from the front panel using the **Test** and **Select** buttons on the front panel. To specify the test, press the **Select** button under the Test LEDs and scroll through the available tests. When the yellow LED(s) for the desired test is illuminated, press **Test** to execute. If there are any errors, the red Error LED turns on. To terminate the test, press **Test** again.

Chapter 6
Configuration

DIAL LINE OPERATION

This section explains how to configure the ISU 2x64 Rackmount when using ISDN Basic Rate switched service. Figures 6-3, 6-4, and 6-5 illustrate the entire menu tree for the DATAMATE and the VT 100 terminal.

To dial calls over ISDN, the unit must be configured for **Dial Line.** The menu path to follow to select Dial Line operation using the DATAMATE is shown in Figure 6-1.

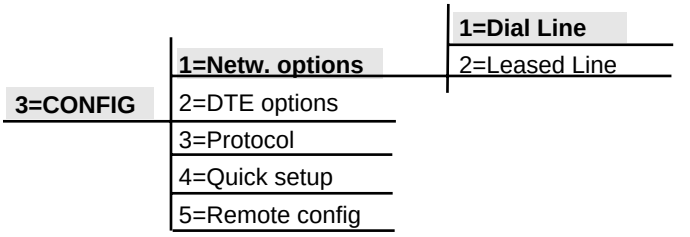

Figure 6-1
DATAMATE Dial Line Menu Path

When using a VT 100 terminal, select the main menu option **4=CONFIGURE LINE,** then set the **Line type** option to **Dial Line**. The screen appears as shown in Figure 6-2.

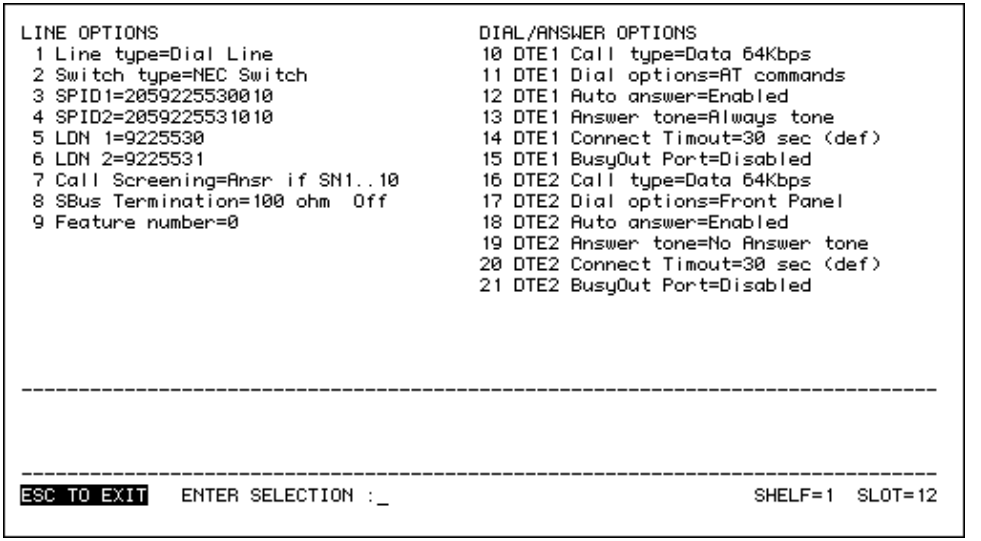

Figure 6-2
VT 100 Dial Line Configuration Menu Screen

Switch Protocol

Find out what kind of ISDN switch the local CO is using by asking the telephone administrator or the telephone company representative. Configure the ISU 2x64 Rackmount for either a Northern Telecom DMS-100, AT&T 5ESS CO switch, or a switch conforming to the National ISDN-1 standard (usually an AT&T 5ESS, NTI DMS-100, or Siemens EWSD).

Terminal ID

Terminal identification is assigned by the local telephone company, and consists of a SPID (service profile identifier) and an LDN (local directory number).

SPID

The SPID is a sequence of digits used to identify ISDN terminal equipment to the ISDN switch. The SPID is assigned by the local phone company when the ISDN line is installed and it usually looks similar to the phone number. Obtain the SPIDs from the telephone administrator or local telephone representative.

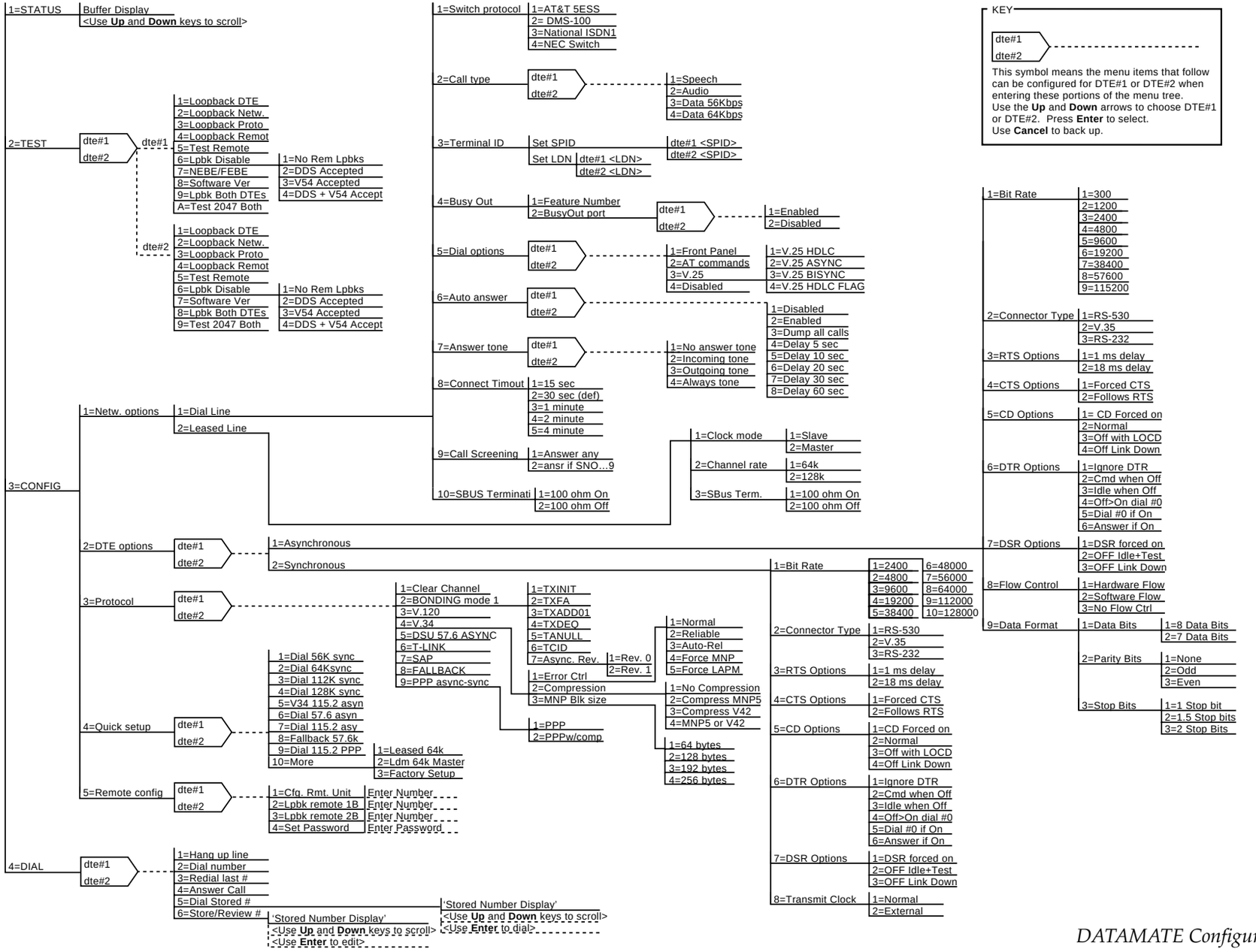

Figure 6-3
DATAMATE Configuration Menu Tree

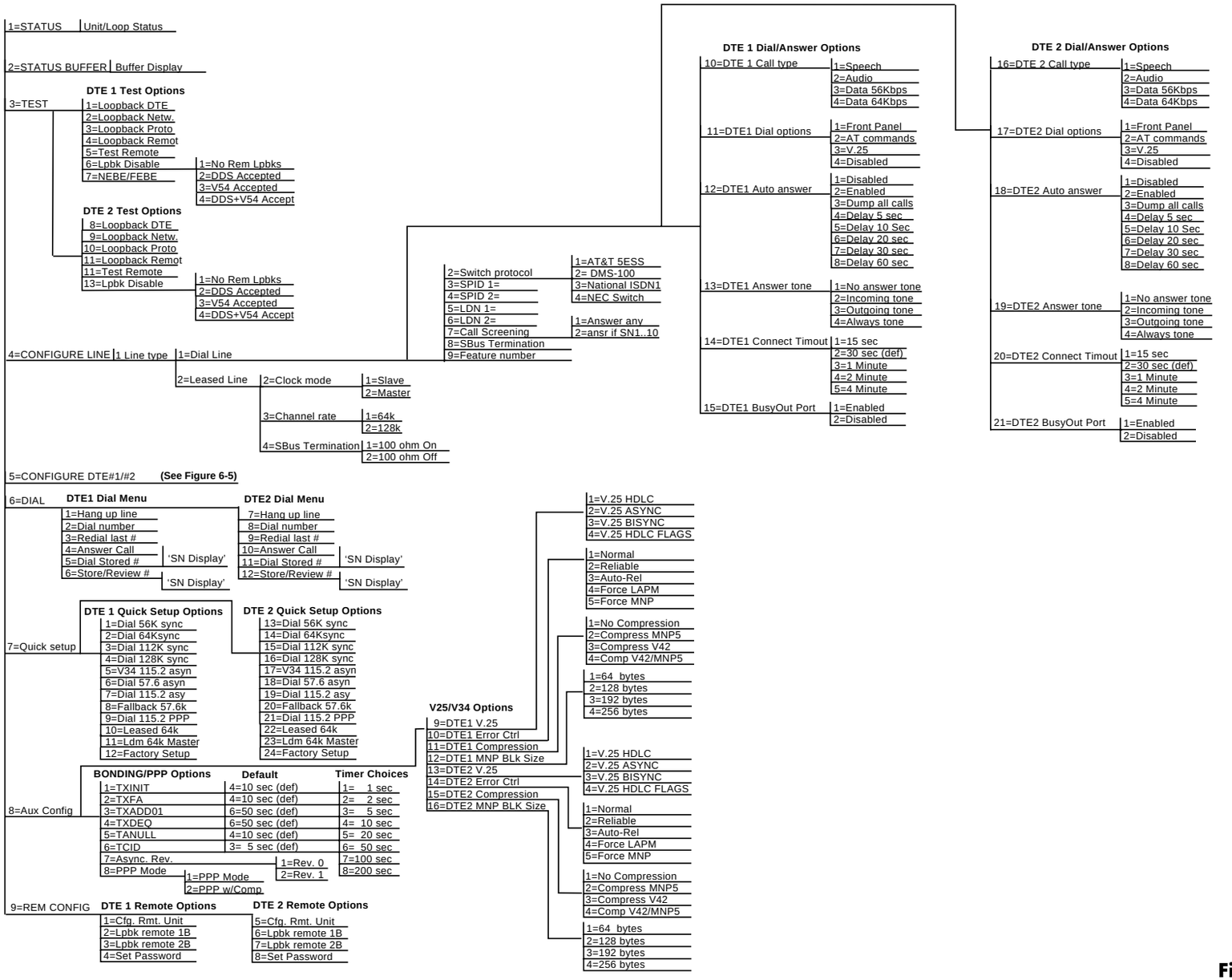

Figure 6-4
VT 100 Terminal Configuration Menu Tree

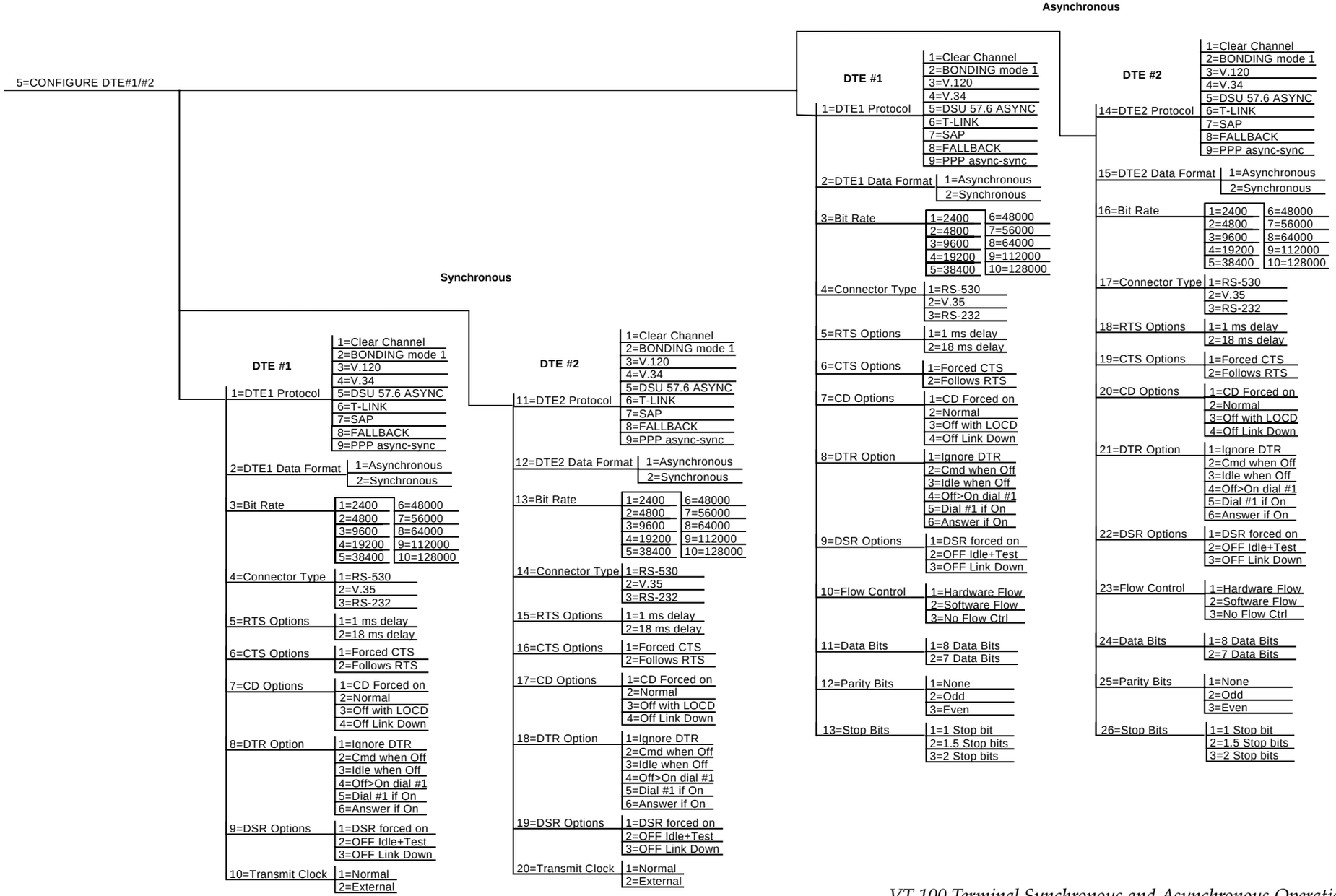

Figure 6-5
VT 100 Terminal Synchronous and Asynchronous Operation Menu Tree

The number of SPIDs required (0, 1, or 2) depends on how the ISDN line is configured. For instance, a point-to-point line has no SPID. Multipoint lines may have one or two SPIDs. The ISU 2x64 Rackmount uses the presence of SPID DTE# 1 to determine if the line is multipoint. If the line has only one SPID, then it must be entered in SPID DTE#1. It is recommended to use two SPIDs with the ISU 2x64 Rackmount, with a SPID assigned to each DTE port.

When entering a SPID using a DATAMATE, use the **Up** and **Down** arrows to select between SPID DTE#1 and SPID DTE#2. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

Press **Enter** to select the SPID and use the keypad to enter the SPID number. While keying/editing a SPID, the **Up** arrow allows backspacing through the number string to correct mistakes. The **Down** arrow scrolls back to the last digit entered. To cancel a number, use the **Up** arrow to backspace through the number, then press **Enter**. After entering each SPID, press **Enter**. To abort changes at any time, press **Cancel**. The changes are discarded, leaving the original number unchanged.

LDN (Local Directory Number)

This option allows the entry of 0, 1, or 2 LDNs. The LDN is used when placing or receiving BONDING calls or receiving separate calls for each DTE connection. The LDN is the seven-digit local phone number assigned to the line.

When entering an LDN using a DATAMATE, use the **Up** and **Down** arrows to select between LDN DTE #1 and LDN DTE #2. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

Press **Enter** to select the LDN and use the keypad to enter the LDN number. While keying/editing an LDN, the **Up** arrow allows backspacing through the number string to correct mistakes. The **Down** arrow scrolls back to the last digit entered. To cancel a number, use the **Up** arrow to backspace through the number, then press **Enter**. After entering each LDN, press **Enter**.

To abort changes at any time, press **Cancel**. The changes are discarded, leaving the original number unchanged.

SPID and LDN numbers are entered in pairs and should not be crossed between the two DTE ports. Each SPID has a unique LDN. Ensure that the SPID for DTE #1 matches the LDN for DTE #1, and the SPID for DTE #2 matches the LDN for DTE #2.

Disconnect the network interface from the unit before initially entering or altering the SPIDs and LDNs.

Busy Out

The Busy Out Port is recommended for use in Hunt Group applications only. This option allows the ISU 2x64 Rackmount to command the switch to no longer route calls to the 2x64 Rackmount. The Busy Out Port requires the ISDN line to be configured by the telephone company to support the Make Busy feature and a feature button number to be assigned for activating and deactivating busy status.

Feature buttons are buttons that are normally available on ISDN telephone sets. The ISU 2x64 Rackmount simulates pressing a feature button when the Busy Out Port option is changed. When the Busy Out Port option is changed, the ISU 2x64 Rackmount sends a Feature Activation message to the switch using the feature button number stored in S-register 23. If S-register 23 is not programmed with the correct button number for the Make Busy feature, the switch will not change the busy status of the ISU 2x64. The telephone company will need to tell you which feature button number was assigned to the Make Busy feature.

Call Screening

Call Screening allows the ISU 2x64 Rackmount to answer all incoming calls (default) or only calls originating from phone numbers stored in the **DIAL** menu as stored numbers SN0 through SN9. See the chapter *Dial Options* for reviewing and storing numbers.

When **Call Screening** is set to answer any numbers stored in SN0 through SN9, an incoming call is not answered if the Call ID received from the switch does not match a stored number. Depending on the switch type, the Call ID may be presented in either a seven-digit or ten-digit format. The ISU 2x64 Rackmount displays the Call ID for all dumped calls in the Status buffer. See the chapter *Operation* for more information on the Status buffer.

Because different switches handle calls and Call ID differently, use the following procedure to determine if the switch uses a seven-digit or ten-digit Call ID format/Call ID (phone number).

1. Select **Ansr if SN0. . .9** under **Call Screening**.
2. Store the seven-digit number in SN0.
3. Place a call to the ISU 2x64 Rackmount with the stored number to see if it answers.
4. If the ISU 2x64 Rackmount does not answer the call, look at the Call ID message in the Status buffer. More than likely, the Call ID number is a ten-digit number.
5. Restore the number in SN0 as it is displayed in the Call ID message and test **Call Screening** again.

Not all telephone service providers provide Call ID information.

SBus Termination

SBus termination allows the user to select 100 ohm termination resistors for the S/T interface on ISU 2x64 Rackmount units that are equipped for the ISDN S/T interface. These units, part numbers 1200074L4 and 1200074L6 connect to the S/T interface of an NT1 device or an S/T line card.

Select **100 ohm On** to turn on the 100 ohm termination resistance across the S/T transmit and receive pairs. Select **100 ohm Off** to turn off the 100 ohm termination resistance across the S/T transmit and receive pairs.

The SBus Termination resistors are not present on ISU 2x64 units equipped with the integrated NT1 (part numbers 1200074L1 and 1200074L3). Setting the SBus Termination resistance to on or off on these units has no effect on their operation and can be ignored.

SBus Termination only takes effect at power up. To enable or disable SBus Termination, power the unit off then back on for the change to take effect.

Call Type

Call type is configured separately for both DTE#1 and DTE#2. When using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

The Call type can be configured four different ways, depending on the type of service used: Speech, Audio, Data 56kbps, and Data 64kbps.

Speech

Speech directs the call control software to request a Mu-law speech circuit as the bearer capability for outgoing calls. The **Speech** option is used with an ISDN line configured for voice service. In some areas voice service costs less than data service. A speech call type does not guarantee an end-to-end digital connection with some local and long distance carriers.

Audio

Audio directs the call control software to request a 3.1 kHz audio circuit as the bearer capability for outgoing calls. The **Audio** option is used with an ISDN line configured for voice service. In some areas audio service is less expensive than data service. Selecting an audio call type guarantees a digital end-to-end ISDN connection.

Data 56kbps

Data 56kbps directs the call control software to request a 64 kbps data circuit that is rate-adapted to 56 kbps. **Data 56kbps** is intended for use in circumstances where interoperability with Switched 56 service is desired.

Data 64kbps

The default call type for ISDN service is **Data 64kbps**. This directs the call control software to request an unrestricted 64 kbps circuit.

Dial Options

Dial options are configured separately for both DTE#1 and DTE#2. When using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

The ISU 2x64 Rackmount can be configured using the DATAMATE and the VT 100 terminal (referred to as the Front Panel), AT commands, or V.25 bis commands.

Front Panel

To establish and disconnect calls from the DATAMATE or VT 100 terminal keypad configure **Dial options** for **Front Panel**. This disables all in-band dialing.

AT Commands

Configuring the ISU 2x64 Rackmount for **AT commands** enables in-band dialing over the DTE interface using asynchronous AT commands. AT commands can be used to set up the ISU 2x64 Rackmount as well as establish and end a call. Disconnecting calls can also be done from the DATAMATE or terminal (as described previously) or from the far-end unit. See the appendix *AT Commands* for a listing of supported AT commands and their functions.

When AT commands are selected, the DTE port becomes dual purpose. First, while a call is not established, the port accepts AT commands. During this time, the CD signal is inactive. Second, when a call is established, the port is used for data, which is indicated by the active CD signal.

To exit the data mode and enter the command mode, the asynchronous DTE device must transmit a proper escape sequence to the ISU 2x64 Rackmount. A specified time delay must occur between the last data character and the first escape sequence character. This is the guard time delay, and it can be changed by writing a value to the S12 register. The default value for the guard time is one second. For a valid escape sequence to occur, the DTE must transmit the escape code character three times in succession with delay between each character being less than the guard time. The default escape sequence is +++.

Once command mode is entered, AT commands can be transmitted to the ISU 2x64 Rackmount to configure options and dial remote devices. All command lines must begin with the AT characters. A command line can be terminated at any time by transmitting CTRL-X (ASCII 018) after the AT attention code. The ISU 2x64 Rackmount ignores this command line and issues an OK response.

The command line may contain a single command or a series of commands after the AT attention code. When a series of commands is used, the individual commands may be separated with spaces for readability. The maximum length for a command line is 40 characters. Each command line is executed by the ISU 2x64 Rackmount upon receipt of a terminating character. The default terminating character is a carriage return (ASCII 013), but it can be changed by writing a different value to register S3. Before the terminating character is transmitted, the command line can be edited by using the backspace character (ASCII 008) to erase errors. Examples of using AT commands follow:

Using AT Commands

Type **AT** followed by the letter of the command and numeric value of the setting desired and then press **Enter**. The following command returns the software version of the unit:

```
ATI1
```

Using S-Registers

The configuration of the ISU 2x64 Rackmount can be changed or reviewed with S-registers. See the appendix *S-Register List* for a description of each S-register and its corresponding range of values.

Reading S-Registers

Type **ATS** followed by the number of the S-register to be read followed by a question mark and press **Enter**.

```
ATS0?
```

Reading S-Register Strings

The ISU 2x64 Rackmount uses S-register strings to store strings of digits for stored phone numbers, SPIDs, etc. Type **ATSS** followed by the number of the S-register string to be read followed by a question mark and press **Enter.**

```
ATSS80?
```

Changing S-Registers

Type **ATS** followed by the number of the S-register to be changed, an equal sign, the numeric value to be assigned to the register, then press **Enter**.

```
ATS0=2
```

Changing S-Registers String

Type **ATSS** followed by the number of the S-register string to be changed, an equal sign, the numeric string to be assigned to the register, then press **Enter**.

```
ATSS80=5551212
```

S-registers string can be changed only if no other commands are entered in the same command line.

Dialing a Call Using AT Commands

To dial a call using a DTE terminal and AT commands, type **ATD** and the telephone number on one line and press **Enter**.

```
ATD5551212
```

When the dialing process begins, the DATAMATE or terminal displays **Dialing 5551212**. If the call is successful, **Connect** is displayed, followed by the rate adaption protocol in use and the bit rate. If the call is not successful, **Disconnect** displays followed by **Ready**. At this time, the unit is ready for another call. The status buffer can be examined to find the reason for an unsuccessful call.

To end an active call with the AT command processor, press the break-in key sequence, +++ or the redefined key, then type **ATH** and press **Enter** to hang up the line.

The break-in sequence will not operate when the DTE is in synchronous on-line mode. DTR can be set to return to command mode when it is inactive.

V.25 bis

Configuring the ISU 2x64 Rackmount for **V.25 bis** enables in-band dialing over the DTE interface using asynchronous or synchronous V.25 bis commands. **V.25 bis** can be used to establish and end a call. Calls can be disconnected from the DATAMATE or terminal (as described previously) or from the far-end unit.

V.25 bis dialing is used primarily by DTE with synchronous interfaces (HDLC/SDLC or BSC/BISYNC) not supporting the AT command set, which is commonly used by asynchronous

devices. The ISU 2x64 Rackmount supports V.25 bis in-band dialing in accordance with Fascicle VIII.I - V.25 bis (Malaga-Torremolinos 1984, Melbourne 1988).

Recommendation V.25 uses the following DCE/DTE control signals:

Transmitted data ..... Circuit 103
Received data ..... Circuit 104
Ready for sending ..... Circuit 106
Data set ready ..... Circuit 107
Data terminal ready ..... Circuit 108/2
Calling indicator ..... Circuit 125

The ISU 2x64 Rackmount supports the following V.25 bis commands to control automatic calling and answering:

CRN .....Call request (number in command)
CRS ..... Call request (using stored number)
PRN ..... Program stored number
RLN ..... List stored number
CIC ..... Connect incoming call
DIC ..... Disconnect incoming call

When using stored numbers, V.25 bis accesses stored numbers 0 through 9 used by DATAMATE dialing. See the section ***Dial Options*** *in this chapter.*

Auto answer should be disabled if V.25 bis is in control of answering incoming calls with the CIC/DIC commands, since the other setting for Auto answer overrides V.25 control of the answer function. Set CTS for **Follow RTS** and DTR for **Idle when Off**.

Asynchronous V.25 Dialing

V.25 bis specifies that the characters should be 7-bit ASCII , even parity, with one stop bit. However, for versatility the ISU 2x64 Rackmount allows the data bits, parity, and stop bits to be defined under the **Data bits** menu option.

This setting allows for V.25 bis messages in asynchronous (start/stop) data format.

Although V.25 bis allows asynchronous data format, asynchronous DTE is more likely to support the AT command set than V.25 bis.

Synchronous V.25 HDLC Dialing
This setting provides V.25 bis messages in bit-synchronous format (for example, HDLC, SDLC, X.25). Bit-synchronous format is the most commonly used V.25 bis format.

This option specifies that the characters should be 7-bit ASCII, with the eighth bit ignored (it may be either 0 or 1).

Auto Answer

Auto answer is configured separately for both DTE#1 and DTE#2. Using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

There are four Auto Answer options: Disable, Enable, Dump All Calls, and Delay X Sec.

Disabled

When **Disabled** is selected, the ISU 2x64 Rackmount does not answer the call. An AT answer command (ATA) option must be issued to the ISU 2x64 Rackmount before it accepts the incoming call. The ringing call can be dumped using the **Hang up line** command.

Enabled

When **Enabled** is selected, the incoming call is answered. If the incoming call is a BONDING call, requiring two B-channels, the second call is answered. If the other port is idle, the port assigned to the second SPID/LDN pair is disabled for the duration of the BONDING call.

Dump all calls

When **Dump all calls** is selected, the ISU 2x64 Rackmount does not accept any incoming calls, keeping the line clear for outgoing calls.

Delay x sec

When **Delay x sec** is selected, Auto Answer is enabled but a minimum guard time must elapse between incoming calls. The selectable guard times are 5 sec, 10 sec, 20 sec, 30 sec, and 60 sec.

Answer Tone

Answer tone is configured separately for both DTE#1 and DTE#2. Using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

The **Answer tone** option enables the transmission of a modem answer tone at the start of voice and audio calls. The purpose of this tone is to disable echo suppression and echo canceling on the circuit in order to get a clear digital circuit. This may be necessary on some long distance circuits. The specifics of the tone are 4 seconds, 2100 Hz at a -10 dB level with phase reversals every 475 ms.

No Answer tone (Default)

This option disables **Answer tone** on incoming calls.

Incoming tone

This option enables the **Answer tone** on incoming calls.

Outgoing tone

This option enables the **Answer tone** on outgoing calls.

Always tone

This option enables the **Answer tone** on both incoming and outgoing calls.

Connect Timeout

Connect Timeout is configured separately for both DTE#1 and DTE#2. Using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using a VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**.

Connect Timeout sets the length of time that the ISU 2x64 Rackmount waits for a far-end unit to answer an outgoing call.

LEASED DIGITAL SERVICE

This section explains how to configure the ISU 2x64 Rackmount when using a 2B1Q Leased Digital service or a service that provides a permanent connection between end points.

Selecting **Leased Line** configures the unit for leased line service or service that provides a permanent connection between end points such as Limited Distance Modem (LDM) service. The menu path to follow to select Leased Line operation using the DATAMATE is shown in Figure 6-6.

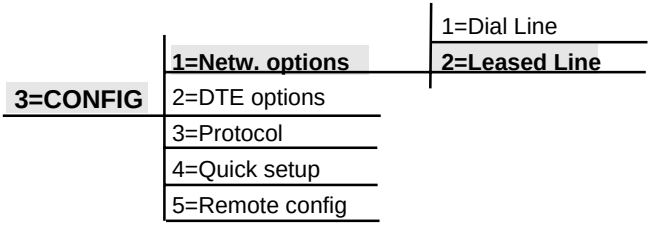

Figure 6-6
DATAMATE Leased Line Menu Path

When using a VT 100 terminal, select the main menu option **4=CONFIGURE LINE,** then set the **Line type** option to **Leased Line**. The screen appears as shown in Figure 6-7.

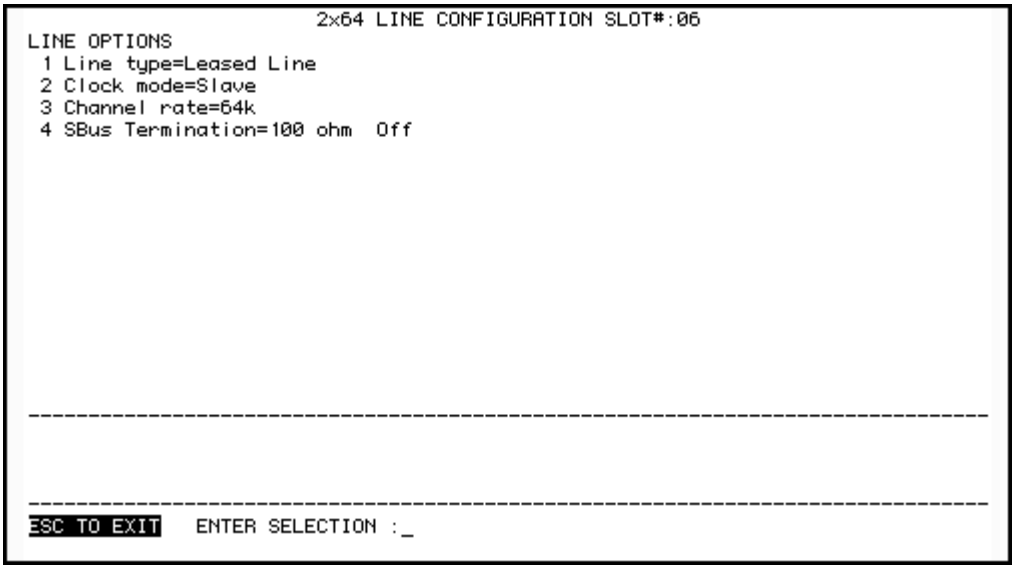

Figure 6-7
VT 100 Leased Line Menu Screen

Clock mode: Slave/Master

By configuring the ISU 2x64 Rackmount for master timing, the ISU 2x64 Rackmount can provide clocking for both ends of the phone line. The **Master** option is intended to be used at one end of an LDM application, where two ISU 2x64 Rackmount units are directly connected without the use of channel banks. The far-end unit should be configured for **Slave** and it derives its clocking from the ISU 2x64 Rackmount unit configured for **Master** timing. If two units are connected through channel banks, both units should be configured for **Slave** mode.

Channel rate

In **Leased Line** operation, the channel rate for the ISU 2x64 Rackmount can be configured for 64 kbps or 128 kbps. When the channel rate is set to 64 kbps, *each* DTE port is assigned one of the bearer channels. For example, if two ISU 2x64 Rackmount

units are configured for leased line service and the channel rate is set to 64 kbps in both units, then DTE#1 of the master unit and DTE#1 of the slave unit would be connected through one of the bearer channels and could utilize up to 64 kbps of bandwidth. Likewise, DTE#2 of the master and DTE#2 of the slave would be connected through the other bearer channel and could also utilize up to 64 kbps of bandwidth.

When the channel rate is set for 128 kbps in both units, both bearer channels are assigned to *one* DTE port. This assignment is configured by the user. Select a DTE rate higher than 64 kbps for the DTE port that will run the application requiring greater than 64 kbps bandwidth. Select the same DTE port for both boxes. Set the unused DTE port to a rate less than 64 kbps to facilitate correct operation between the two ISU 2x64 Rackmount units.

For example, to run an application requiring 128 kbps through DTE#1, first configure the channel rate of the leased line to 128 kbps and set the DTE rate for DTE#1 to 128 kbps synchronous. The DTE rate for DTE#2 should be set at 56 kbps or lower. Enter these settings into both units. This allows an application to utilize up to 128 kbps of bandwidth between DTE#1 on the master unit and DTE#1 on the slave unit.

DTE OPTIONS

The DTE options are configured separately for both DTE#1 and DTE#2. When using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using the VT 100 terminal, select the option number corresponding to the appropriate DTE and press **Return**. Figure 6-8 illustrates the DTE Configuration menu screen with DTE#1 set for synchronous operation and DTE#2 set for asynchronous operation to show the two different menu lists. See Figure 6-4 and 6-5 for an illustration of the entire VT 100 menu tree.

Ensure the DTE equipment is set for asynchronous operation before attempting to make an asynchronous call. Failure to do so causes the call attempt to fail.

```
                    2x64 DTE CONFIGURATION SLOT#:06
DTE #1                                  DTE #2
 1 DTE1 Protocol=FALLBACK                14 DTE2 Protocol=Clear Channel
 2 DTE1 Data Format=Asynchronous         15 DTE2 Data Format=Synchronous
 3 Bit Rate=300                          16 Bit Rate=64000
 4 Connector Type=RS-530                 17 Connector Type=RS-530
 5 RTS Options=1 ms delay                18 RTS Options=1 ms delay
 6 CTS Options=Forced CTS                19 CTS Options=Forced CTS
 7 CD Options=Normal                     20 CD Options=Normal
 8 DTR Options=Ignore DTR                21 DTR Options=Ignore DTR
 9 DSR Options=DSR forced on             22 DSR Options=DSR forced on
10 Flow Control=No Flow Ctrl             23 Transmit Clock=Normal
11 Data Bits=8 Data bits
12 Parity Bits=None
13 Stop Bits=1 Stop bit

--------------------------------------------------------------------------------


--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :
```

Figure 6-8
VT 100 DTE Configuration Menu Screen

Protocol Options

The ISU 2x64 Rackmount communicates with many different types of telecommunication equipment including other ISU 2x64 Rackmounts, ISDN terminal adapters, Switched 56 DSUs, BONDING mode 1-compatible inverse multiplexers, and V.34 compatible analog modems (optional). Communicating between such diverse types of equipment requires the use of various rate adaptation protocols to support various bit rates and DTE settings. The ISU 2x64 Rackmount supports the following rate adaptation protocols:

- BONDING mode 1 (Bandwidth on Demand Interoperability Group).
- TLINK (Dial DDS DSU/CSU).
- SAP (Simple ADTRAN Protocol).
- Clear Channel (no rate adaption protocol).
- CCITT V.120.
- DSU 56.7 Async (for communication with ADTRAN DSUs).
- V.34 (for communicating with analog modems) V.34 is only available in PNs 1200074L3 and 1200074L6.
- Point-to-point protocol (PPP) asynchronous to synchronous conversion.

See Table 1-B for more information on recommended modes of operation.

The desired protocol may be selected with AT commands at the DTE port or from the DATAMATE or terminal interface. Descriptions of the protocols follow:

Clear Channel

Clear Channel provides the entire bearer channel to the DTE without regard to data format or protocol. This provides a rate adaptation at or near the ISDN circuit rate. The primary usage for **Clear Channel** in the dial line mode is for 56 kbps and 64 kbps synchronous rates. It is useful when the DTE performs its own internal synchronous protocol/rate adaption or the ISU 2x64 Rackmount is calling a 4-wire Switched 56 DSU. In the leased line mode, **Clear Channel** can provide synchronous bit rates of 56 kbps, 64 kbps, 112 kbps, and 128 kbps.

BONDING mode 1

The BONDING mode 1 protocol allows the ISU 2x64 Rackmount to communicate at bit rates in excess of 64 kbps to a maximum of 128 kbps. BONDING provides high-speed communication between ISU 2x64 Rackmounts, ISDN TE (terminal equiment)/ TAs (terminal adapter), and inverse multiplexing equipment supporting the BONDING protocol. The protocol allows use of both synchronous and asynchronous bit rates. When the ISU 2x64 Rackmount uses the BONDING mode 1 protocol, it must make two separate ISDN calls to seize control of both ISDN bearer channels. The protocol corrects any delays existing between the two bearer channels and presents a single high speed data channel to the DTE. For successful high-speed operation, both the near- and far-end DCE need to be configured to use the BONDING mode 1 protocol. The BONDING mode 1 protocol negotiation phase has numerous timers to accommodate transmission delays due to satellite hops, international calls, etc.

The BONDING timers may be adjusted as necessary from the **BONDING mode 1** submenu. When using the DATAMATE this submenu automatically appears after selecting **BONDING mode 1** protocol. When using a VT 100 terminal these timers can be adjusted from the Auxiliary Configuration Screen; see Figure 6-9.

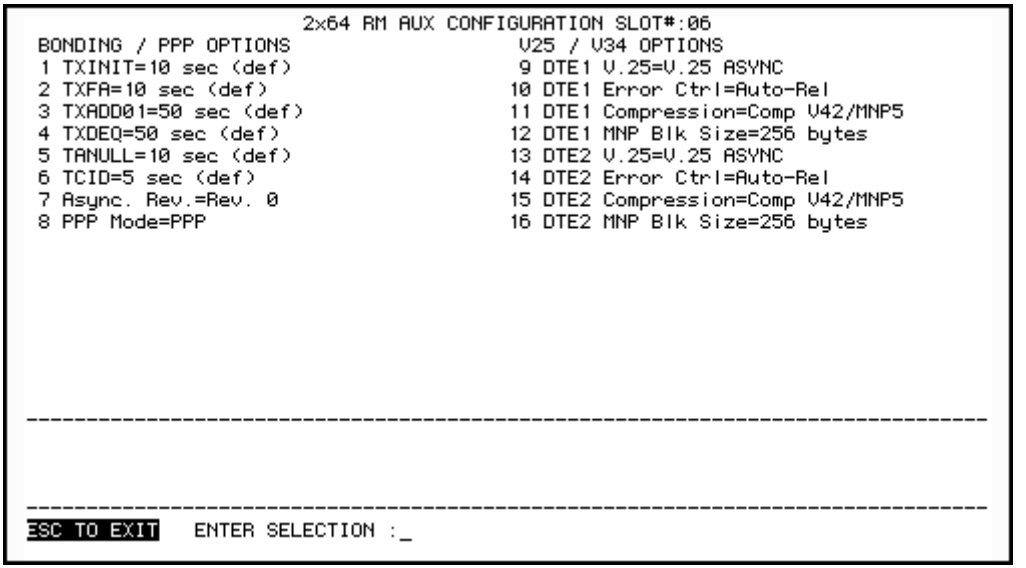

Figure 6-9
VT 100 Auxiliary Configuration Menu Screen

The timers are defined as follows, per SP-3014 BONDING specification:

TXINIT
This option specifies the length of time the originating endpoint attempts to detect the BONDING negotiation pattern from the answering endpoint before deciding the BONDING call has failed. In general, this timer value should be left at the factory default setting of 10 seconds. Select from values of 1, 2, 5, 10 (default), 20, 50, 100, and 200 seconds.

TXFA
This option specifies the length of time both endpoints attempt to detect the BONDING frame pattern when a call is connected before deciding the BONDING call has failed. This timer value should be left at the factory default setting of 10 seconds. However, when interoperating with other manufacturers' BONDING equipment it may be necessary to lengthen this timer so that it matches TXADD01. Select from values of 1, 2, 5, 10 (default), 20, 50, 100, and 200 seconds.

TXADD01
This option specifies the length of time both endpoints wait for the additional call to be connected at the end of negotiation before deciding the BONDING call has failed. The factory default setting of 50 seconds is sufficient for most calls to connect, although when dialing overseas it may be necessary to lengthen this timer to allow for slower call routing. Values of 1, 2, 5, 10, 20, 50 (default), 100, and 200 seconds can be selected.

TXDEQ
This option specifies the length of time both endpoints attempt to equalize the network delay between the bearer channels before deciding the BONDING call has failed. This timer default setting is 50 seconds. Values of 1, 2, 5, 10, 20, 50 (default), 100, and 200 seconds are available.

TANULL
This option specifies the length of time the answering endpoint attempts to detect the BONDING negotiation pattern from the originating endpoint before aborting to clear channel mode. In general, this timer value should be left at the factory default setting of 10 seconds. However, it may be necessary to shorten this timer if the DTE equipment connected to the ISU also has timer constraints for completing non-BONDING parameter negotiation. Values of 1, 2, 5, 10 (default), 20, 50, 100, and 200 seconds can be selected.

TCID
This option specifies the length of time both endpoints attempt to negotiate an agreeable value for bearer channels and channel capacities before deciding the BONDING call has failed. The timer default setting is 5 seconds. Values of 1, 2, 5 (default), 10, 20, 50, 100, and 200 seconds can be selected.

Asynchronous Bonding Revision

This option specifies which asynchronous BONDING revision should be used during BONDING negotiation. **Rev. 0** uses Adtran's original proprietary asynchronous BONDING negotiation. **Rev. 1** uses Multi-Vendor asynchronous BONDING negotiation. Revision 1 Multi-Vendor BONDING will negotiate

with Revision 0 and Revision 1 in answer mode but will only negotiate with Revision 1 in originate mode.

***Async. Rev.** should be set to **Rev. 0** for synchronous BONDING operation.*

V.120

The **V.120** protocol is a CCITT compliant rate adaption method which provides DTE service between the ISU 2x64 Rackmount and other V.120 compliant devices at rates less than the 64 kbps ISDN Bearer channel rate. V.120 supports synchronous and asynchronous DTE rates. See Table 1-B for available V.120 rates.

V.34

The **V.34** protocol allows the ISU to originate to and receive calls from analog modems. The V.34 modem only supports asynchronous DTE rates. To place an outgoing call to an analog modem, the call type must be changed to **Audio** or **Speech**. See the section *Call Type* of this chapter to change call types.

When using a DATAMATE, V.34 options may be changed in the submenu that follows. However, when using a VT 100 terminal these options must be set from the Auxiliary Configuration menu; see Figure 6-9.

ISU 2x64 Rackmounts with a V.34 modem (PNs 1200074L3 and 1200074L6) allow operation of this protocol.

The V.34 modem operational parameters are as follows:

Error Control (Error Ctrl)
This option sets the type of error control to be negotiated with the far-end modem during train up. **Normal** turns all error control off and makes allowances for flow control. **Reliable** uses MNP or LAPM error control. If the far end does not support error control then the call is terminated. When **Auto-Rel** is selected, the ISU 2x64 Rackmount attempts to use error control.

If the far end does not use error control, then normal operation is used. **Force MNP** allows only MNP error corrected calls to connect. **Force LAPM** allows only LAPM (V.42) error corrected calls to connect.

Compression
No Compression turns off the compression algorithms in the ISU 2x64 Rackmount. **Compress MNP5** enables MNP5 data compression. **Compress V42** enables V.42 bis data compression. **MNP5** or **V42** allows the 2x64 Rackmount to negotiate MNP5 or V.42 bis compression.

Microcom® Network Protocol Block Size (MNP® Blk Size)
When error control is enabled, this option sets the amount of data sent in a single packet during MNP error-controlled stream operation. Options available are 64, 128, 192, and 256 bytes.

DSU 57.6 ASYNC

The **DSU 57.6 ASYNC** protocol allows the ISU 2x64 Rackmount to communicate asynchronously at 57.6 kbps with ADTRAN 2-wire and 4-wire Switched 56 DSU products. In addition, the ISU 2x64 Rackmount communicates with other ISU Rackmounts over dial and leased connections using this protocol.

T-Link

The **T-Link** protocol allows the ISU 2x64 Rackmount to communicate with 2-wire Switched 56 DataPath DUs. The T-Link protocol performs two functions:

- T-Link adapts the DTE data subrates of 64 kbps to the 64 kbps bandwidth of the ISDN bearer channel.
- T-Link transmits the status of the DCE-DTE EIA leads to facilitate flow control and maintenance for asynchronous and synchronous DTE rates up to 19.2 kbps.

In addition to 2-wire Switched 56 DataPath DUs, the ISU 2x64 Rackmount can communicate with any other device that uses the T-Link protocol.

Simple ADTRAN Protocol (SAP)

SAP is a rate adaption method which provides DTE service between ISU 2x64 Rackmount units at a lower rate than the 64 kbps ISDN bearer channel rate. Selecting this menu item causes the ISU 2x64 Rackmount to use SAP protocol.

The primary usage for SAP is general purpose asynchronous rate adaption in a dial-up or leased environment.

SAP only operates on a 64 kbps call type.

FALLBACK

The **FALLBACK** asynchronous rate adaption protocol provides the capability to automatically establish calls with other ISDN Terminal Adapters, Switched 56 DSUs, V.34 modems (optional), as well as other ISUs using a single configuration.

To communicate with analog modems, the ISU 2x64 Rackmount with V.34 modem option (PNs 1200074L3 and 1200074L6) must be used. The ISU 2x64 Rackmount must be optioned as follows for FALLBACK operation:

1. Any asynchronous bit rate up to 115.2 kbps which is supported by the DTE.

2. Flow control must be enabled and supported by the DTE.

FALLBACK supports the following protocols based on the Call Type: BONDING Mode 1, V.120, T-Link, V.34, and PPP.

When answering calls, the ISU 2x64 Rackmount uses the incoming Call Type to determine which rate adaption protocols to support. See Table 6-A.

Table 6-A
Rate Adaption Protocols

Call Type	Rate Adaption Protocols Supported	Typical Units Supported
Data 64k	BONDING mode 1	ISUs
	V.120	ISDN TAs
	PPP	PPP compatible bridges/routers
Data 56k	BONDING mode 1	ISUs
	V.120	ISDN TAs
	T-Link	2-Wire Switched-56 DSUs
	PPP	PPP compatible bridges/routers
Speech or Audio	V.34	V.34 compatible modems

When originating calls to unknown units, the ISU begins protocol selection based on the local call type. (Data 64k is used for FALLBACK selected from Quick Setup menu.) Upon connection at 64k call type, BONDING, V.120, and PPP are attempted. If connection is not made at 64k, the ISU 2x64 Rackmount attempts another call at 56k call type. If connection is made at 56k, V.120, T-Link, and PPP are attempted. If connection is not made at 56k, then an audio call type is attempted, provided the ISU 2x64 Rackmount with the V.34 modem option is used. If the ISU 2x64 Rackmount connects the audio call type, the V.34 protocol is attempted for V.34 compatible modems. Once a call connects, if the protocol cannot be negotiated, the ISU 2x64 Rackmount hangs up the call.

Point-to-Point Protocol (PPP) Async-to-Sync

Point-to-Point Protocol

The ISU 2x64 Rackmount is configured for PPP from the protocol options of the configuration menu by selecting **1=PPP** or by setting S-register S27 to a value of 0. Figure 6-10 illustrates the menu path for setting PPP, and PPP w/Comp.

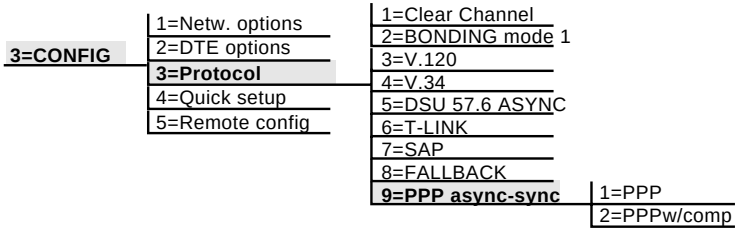

Figure 6-10
DATAMATE PPP Menu Path

PPP with Compression
The ISU 2x64 Rackmount is configured for PPP with compression from the protocol options of the configuration menu by selecting **2=PPP w/Comp** or by setting S-register S27 to a value of 2.

When set up for PPP with compression, the ISU 2x64 Rackmount negotiates the compression control protocol (CCP) with the network PPP peer. If STAC™ compression is successfully negotiated with the peer, data packets from the DTE are compressed before being sent out through the network. Likewise, compressed packets from the network are decompressed before being transmitted through the DTE.

Asynchronous and Synchronous Data Format

The data format is configured separately for both DTE#1 and DTE#2. When using the DATAMATE, select the appropriate DTE with either arrow key and press **Enter**. When using the VT 100 terminal select the option number corresponding to the appropriate DTE and press **Return**.

Ensure the DTE equipment is set for asynchronous operation before attempting to make an asynchronous call. Failure to do so causes the call attempt to fail.

Bit Rate

The **Bit Rate** can be set for asynchronous rates 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 bps.

The **Bit Rate** can be set for synchronous rates 2400, 4800, 9600, 19200, 38400, 48000, 56000, 64000, 112000, and 128000 bps.

Connector Type

The ISU 2x64 Rackmount provides an RS-232, RS-530, or a V.35 interface to a DTE by selecting the desired connector type. The V.35 interface requires the RS-530-to-V.35 adapter, part number 1200072L1.

RTS Options

Selecting **1 MS delay** causes the clear to send (CTS) signal to change state 1 millisecond after the DTE request to send (RTS) signal changes state. The **18 MS delay** causes the CTS signal to change state 18 milliseconds after the DTE RTS signal changes state.

CTS Options

Selecting this option causes the CTS signal on the DTE connector to be either continually asserted or to follow the state of the RTS lead.

CD Options

Selecting **CD Forced on** causes the carrier detect (CD) signal to always be asserted. Selecting **Normal** causes the CD signal to be asserted when a call has been successfully established. Selecting **Off with LOCD** causes the CD signal to be disasserted for a period of 5 seconds, then reasserted at the termination of a call. Selecting **Off with Link Down** causes the CD signal to be disasserted when the U-interface is not present.

DTR Options

Selecting **Ignore DTR** causes the ISU 2x64 Rackmount to disregard the state of the data terminal ready (DTR) pin.

Cmd when Off forces the unit into the AT command processor mode when DTR is not asserted. To return on-line, DTR must be asserted, followed by the ATO command.

Idle when Off forces the unit to end the current call when DTR is no longer asserted.

Off>On dial #0 allows one call attempt to be automatically established when the DTR signal goes from inactive to active. While DTR is active, DATAMATE dialing is also possible. When DTR goes inactive, any present outgoing call is disconnected.

Off>On dial #0 uses the phone number in stored number register 0 to establish the call. To store a number for automatic dialing see *DATAMATE Dialing Options* of this chapter.

Selecting **Dial #0 if On** allows calls to be automatically established when the DTR signal is in the active state. The unit attempts to establish a call using SN0 until the call is established or DTR goes inactive.

Selecting **Answer if On** only allows the unit to answer an incoming call if the DTR signal is asserted.

The terminal interface stored numbers are numbered 1 through 10. Stored number 1 on the terminal is equivalent to stored number 0 on the DATAMATE.

DSR Options

Selecting **DSR forced on** causes the DSR signal on the DTE connector to always be asserted. Selecting **OFF Idle+Test** causes DSR to be unasserted if the network interface is in test or there is not an active call. **OFF Link Down** causes DSR to be unasserted if the network interface is disrupted.

Transmit Clock (Synchronous Data Format)

Selecting the **Normal** option causes the ISU 2x64 Rackmount to be the synchronous DTE interface transmit timing source. Transmit data is timed from the transmit clock provided by the ISU 2x64 Rackmount on the DTE connector. **Normal** clock is the normal and recommended mode of operation.

With the **External** option selected, the ISU 2x64 Rackmount slaves to an external transmit timing source. The external clock is provided to the ISU 2x64 Rackmount by the external transmit clock signal at the DTE connector. This signal is echoed by the ISU 2x64 Rackmount to the transmit clock signal on the DTE connector.

This option is provided for situations where equipment connected to the ISU 2x64 Rackmount DTE connector cannot slave to the ISU 2x64 Rackmount-provided clock. The ISU 2x64 Rackmount uses the telco as the frequency standard when it must provide a synchronous receive or transmit clock. The externally provided clock must be of the same average frequency as the clock that the ISU 2x64 Rackmount would provide if internal clock were selected. If this is not the case, then bit errors may occur.

Flow Control (Asynchronous Data Format)

Selecting **Hardware Flow** allows RX (receive) data to be presented to the DTE interface only when RTS is asserted and data is accepted on TX (transmit) from the DTE when CTS is asserted. **Software Flow** control uses Xon/Xoff to control data transferred between the DTE and the ISU 2x64 Rackmount. Selecting **No Flow Ctrl** disables flow control.

Data Bits (Asynchronous Data Format)

These options select the number of data bits in each asynchronous frame. A frame consists of a start bit, 7 or 8 data bits, 0 or 1 parity bit, and 1 to 2 stop bits.

Parity Bits (Asynchronous Data Format)

The **None** option selects no parity bits in each asynchronous frame. A frame consists of a start bit, 7 or 8 data bits, 0 or 1 parity bits, and 1 to 2 stop bits. The **Odd** option selects an odd parity bit in each asynchronous frame. The **Even** option selects an even parity bit in each asynchronous frame.

Stop Bits (Asynchronous Data Format)

These options select the number of stop bits sent in each asynchronous frame. A frame consists of a start bit, 7 or 8 data bits, 0 or 1 parity bits, and 1 to 2 stop bits.

Chapter 7
Dial Options

Dialing Options

Selecting **4=DIAL** or pressing the # (pound) from the top of the menu tree displays the available DATAMATE dialing options. The dial options are only available when the ISU 2x64 Rackmount is configured for **Dial Line** operation (not **Leased Line**). The dial options are shown in Figure 7-1.

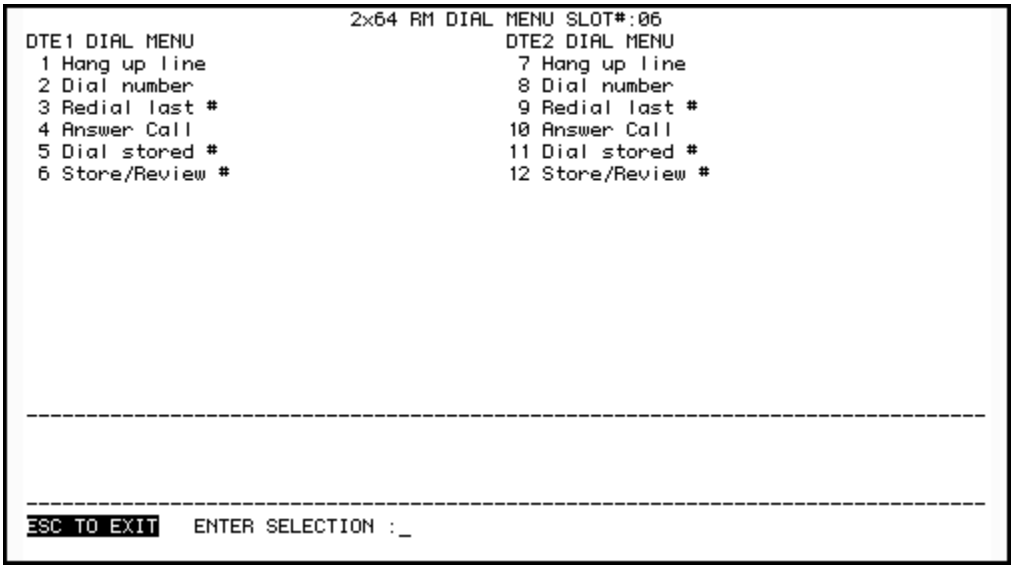

Figure 7-1
VT 100 Dial Options Menu Screen

Hang Up Line

Terminates current call.

Dial Number

Allows a number to be entered and dialed from the key pad. If an error is made while entering a number, pressing **Cancel** allows the entered number to be erased and reentered. Pressing the **Cancel** key twice consecutively exits this menu item without dialing a number. Pressing **Enter** after keying in a number causes the ISU 2x64 Rackmount to dial the number and save the dialed number in stored number 9 (10 for terminal) for redial purposes.

Redial Last Number

Allows redial of the last number called. This number was saved as stored number 9 (10 for terminal) from the last attempted phone call.

AT command and V.25 bis dialing does not store the number for redial purposes.

Answer Call

Allows selective answer of incoming calls when Auto Answer is configured for **Disable**. (Auto Answer is described in the chapter *Configuration*.)

Dial Stored Number

Allows the dialing of one of ten stored phone numbers. Upon entering this menu, the **Up** and **Down** arrows permit viewing and selection of a stored number. Press **Enter** to dial the number. A copy of that number is saved as stored number 9 (SN9) (SN10 for terminal) for redial purposes.

Store/Review Number

Permits entry and review of stored numbers. Pressing the **Up** and **Down** arrow keys scrolls through the 10 stored numbers (SN0 - SN9 for DATAMATE and SN1-SN10 for VT 100). To store a number, scroll to the desired stored number location, enter the number, and press **Enter** to save. If a mistake is made, pressing **Cancel** (DATAMATE) or **ESC** (VT 100) aborts the entry and allows another attempt. Pressing **Cancel** (DATAMATE) or **ESC** (VT 100) twice in succession exits this menu item without changing the selected stored number.

Chapter 8
Quick Setup

Configuring the ISU 2x64 Rackmount Using Quick Setup

Quick setup is configured separately for both DTE#1 and DTE#2. Select the appropriate DTE with either arrow key and press **Enter**.

To configure the DTE Options quickly and easily, the **Quick Setup** menu is available to automatically set up the most common DTE configurations. For fine-tuning a particular application and DTE settings, see the section *DTE Options for Asynchronous and Synchronous Operation* in the chapter *Configurations* for a step-by-step, detailed configuration of the DTE Options.

Quick Setup

To aid in configuring the DTE options for the ISU 2x64 Rackmount, twelve common configurations are preset for **Quick Setup**. These include dial operation for 56 kbps, 64 kbps, 112 kbps, 128 kbps, 57.6 kbps, 115.2 kbps service, 115.2 kbps PPP, 64 kbps leased service, and 2x64 kbps limited distance modem using **Master** clocking.

In the following descriptions, an asterisk (*) following the option indicates the option requires ISDN Switch Type to be configured. Multipoint lines also require SPID and LDN information. See the section ***Dial Options*** in the chapter, ***Configurations.***

Dial 56K sync*

When the ISU 2x64 Rackmount is configured for **Dial 56K sync** service, the following parameters are automatically preset:

Service type ..... ISDN dial line
Automatic answering ..... Enabled
ISDN call type ..... 56 kbps data
Data protocol ..... Clear Channel
DTE mode ..... Synchronous
DTE connector bit rate ..... 56 kbps
DTE flow control ..... N/A
RTS line ..... 1 msec delay
CTS line ..... Forced on
Transmit data clock ..... Normal clock source
V.54 loopbacks ..... Accepted

Dial 64K sync*

When the ISU 2x64 Rackmount is configured for **Dial 64K sync** service, the following parameters are automatically preset:

Service type ..... ISDN dial line
Automatic answering ..... Enabled
ISDN call type ..... 64 kbps data
Data protocol ..... Clear Channel
DTE mode ..... Synchronous
DTE connector bit rate ..... 64 kbps
DTE flow control ..... N/A
RTS line ..... 1 msec delay
CTS line ..... Forced on
Transmit data clock ..... Normal clock source
V.54 loopbacks ..... Accepted

Dial 112K sync*

When the ISU 2x64 Rackmount is configured for **Dial 112K sync** service, the following parameters are automatically preset:

Service type	ISDN dial line
Automatic answering	Enabled
ISDN call type	56 kbps data
Data protocol	BONDING mode 1
DTE mode	Synchronous
DTE connector bit rate	112 kbps
DTE flow control	N/A
RTS line	1 msec delay
CTS line	Forced on
Transmit data clock	Normal clock source
BONDING timer TXINIT	10 seconds
BONDING timer TXFA	10 seconds
BONDING timer TXADD01	50 seconds
BONDING timer TXDEQ	50 seconds
BONDING timer TANULL	10 seconds
BONDING timer TCID	5 seconds
V.54 loopbacks	Accepted
Async. Rev.	Rev. 0

Dial 128K sync*

When the ISU 2x64 Rackmount is configured for **Dial 128K sync** service, the following parameters are automatically preset:

Service type	ISDN dial line
Automatic answering	Enabled
ISDN call type	64 kbps data
Data protocol	BONDING mode 1
DTE mode	Synchronous
DTE connector bit rate	128 kbps
DTE flow control	N/A
RTS line	1 msec delay
CTS line	Forced on
Transmit data clock	Normal clock source
BONDING timer TXINIT	10 seconds
BONDING timer TXFA	10 seconds
BONDING timer TXADD01	50 seconds
BONDING timer TXDEQ	50 seconds
BONDING timer TANULL	10 seconds
BONDING timer TCID	5 seconds
V.54 loopbacks	Accepted
Async. Rev.	Rev. 0

V.34 115.2 asyn*

When the ISU 2x64 Rackmount is configured for **V.34 115.2 asyn**, the following parameters are automatically preset:

Service type	ISDN dial line
ISDN call type	Audio
Data protocol	V.34
DTE mode	Asynchronous
Data bits	8
Parity bits	None
Stop bits	1
DTE connector bit rate	115.2 kbps
DTE flow control	Hardware
RTS line	1 msec delay
CTS line	Follows RTS
Error control	Auto-reliable
Compression	Compress MNP5 and V42
MNP block size	256 bytes
Dial modes	AT commands

The V.34 115.2 asyn option is only used with ISU 2x64 Rackmounts with the V.34 modem option (PNs 1200074L3 and 1200074L6).

Dial 57.6 asyn*

When the ISU 2x64 Rackmount is configured for **Dial 57.6 asyn**, the following parameters are automatically preset:

Service type ..... ISDN dial line
ISDN call type ..... 64 kbps data
Data protocol V.120
DTE mode ..... Asynchronous
Data bits 8
Parity bits ..... None
Stop bits 1
DTE connector bit rate ..... 57.6 kbps
DTE flow control ..... None
RTS line ..... 1 msec delay
CTS line ..... Forced on
Dial mode ..... AT commands

Dial 115.2 asyn*

When the ISU 2x64 Rackmount is configured for **Dial 115.2 asyn**, the following parameters are automatically preset:

Service type ..... ISDN dial line
ISDN call type ..... 64 kbps data
Data protocol ..... BONDING mode 1
DTE mode ..... Asynchronous
Data bits 8
Parity bits ..... None
Stop bits 1
DTE connector bit rate ..... 115.2 kbps
DTE flow control ..... None
RTS line ..... 1 msec delay
CTS line ..... Forced on
Dial Mode ..... AT Commands
Async. Rev. Rev.1

Fallback 57.6k*

When the ISU 2x64 Rackmount is configured for **Fallback 57.6k** the following parameters are automatically preset:

Service type	Dial line
Automatic answering	Yes
ISDN call type	64 kbps data
Data protocol	Fallback
DTE mode	Asynchronous
Data bits	8
Parity bits	None
Stop bits	1
DTE connector bit rate	57.6 kbps
DTE flow control	Hardware
RTS line	1 msec delay
CTS line	Follows RTS
Dial mode	AT commands
Async. Rev.	Rev. 1

Dial 115.2 PPP

When the ISU 2x64 Rackmount is configured for **Dial 115.2 PPP,** the following parameters are automatically preset:

Service type	Dial line
Automatic answering	Yes
ISDN call type	64 kbps data
Data protocol	PPP w/Comp
DTE mode	Asynchronous
Data bits	8
Parity bits	None
Stop bits	1
DTE connector bit rate	115.2 kbps
DTE flow control	Hardware
RTS line	1 msec delay
CTS line	Follows RTS
Dial mode	AT commands

More

Selecting **More** enters into the following level of choices:

Leased 64K

When the ISU 2x64 Rackmount is configured for **Leased 64K** service, the following parameters are automatically preset:

Service type ..... Leased line
Network clock source ..... Slave
Channel rate 64K
Data Protocol ..... Clear channel
DDS loopbacks enabled ..... Yes
DTE mode ..... Synchronous
DTE connector bit rate ..... 64 kbps
DTE flow control ..... N/A
RTS line ..... 1 msec delay
CTS line ..... Forced on
Transmit data clock ..... Normal clock source

LDM 64 Master

When the ISU 2x64 Rackmount is configured for a point-to-point application such as a Limited Distance Modem arrangement, the **Ldm 64 Master** option automatically presets the following:

Service type ..... Leased Line
Network clock source ..... Master
Channel rate 64K
Data protocol ..... Clear channel
DDS loopbacks enabled ..... Yes
DTE mode ..... Synchronous
DTE connector bit rate ..... 64 kbps
DTE flow control ..... N/A
RTS line ..... 1 msec delay
CTS line ..... Forced on
Transmit data clock ..... Normal clock source

Factory Default

This option restores the ISU 2x64 Rackmount to the factory default setup. This option affects both DTE port settings.

Service type	ISDN dial line
ISDN switch type	AT&T 5ESS
ISDN call type	64k
Dialing mode	Front panel
Data protocol	Clear channel
DTE connector bit rate	64 kbps
DTE flow control	none
RTS line	1 msec delay
CTS line	Forced on
CD line	Turned on when call is up
DSR line	Forced on
Transmit data clock	Internal clock source
BONDING timer TXINIT	10 seconds
BONDING timer TXFA	10 seconds
BONDING timer TXADD01	10 seconds
BONDING timer TXDEQ	50 seconds
BONDING timer TANULL	50 seconds
BONDING timer TXID	5 seconds
AT command escape character	+
AT command end-of-line character value	13
AT command line feed character value	10
AT command backspace character value	8
Transmit data clock	Normal clock source

Factory default erases all stored phone numbers, SPIDs, and LDNs.

Chapter 9
Remote Configuration

Remote Configuration allows configuration and testing of a remote unit by calling the remote unit from a local unit. The remote unit can be configured using AT commands, the DATAMATE, or the VT100 terminal interface.

There are 6 items that cannot be set through remote configuration. The items are Line Mode, SPID(s), LDN(s), Switch Type, Quick Setup, and Factory Default.

Configuring with AT Commands

A remote unit can be configured by issuing an ATD command with the phone number of the remote unit plus a dial string modifier. The configuration command syntax is:

```
ATD nnnnnnn#6#yyyyyy
```

Where nnnnnnn is the remote number to call, and yyyyyy is a password of up to six digits.

After the connection is established, AT commands issued to the local unit are sent to the remote unit and executed. The remote unit sends response back to the local unit which then sends the response out of the DTE interface connector. See the appendices *AT Commands* and *S-Registers* for a complete list of commands.

Configuring and Testing with the DATAMATE or Terminal

The menu path to follow to select remote configuration on the DATAMATE is shown in Figure 9-1.

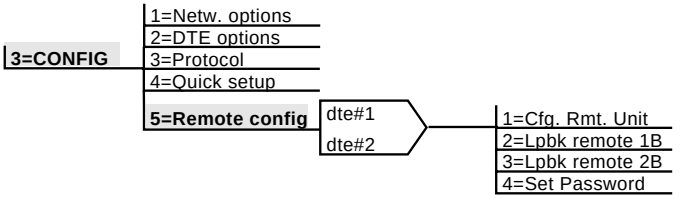

Figure 9-1
Remote Configuration Menu Path

When using the VT100 terminal interface, select the main menu option **9=REM CONFIG**. The screen appears as shown in Figure 9-2.

```
                    2x64 RM REMOTE CONFIGURATION SLOT#:06
DTE1 REMOTE OPTIONS                    DTE2 REMOTE OPTIONS
 1 Cfg. Rmt. Unit                       5 Cfg. Rmt. Unit
 2 Lpbk remote 1B                       6 Lpbk remote 1B
 3 Lpbk remote 2B                       7 Lpbk remote 2B
 4 Set Password                         8 Set Password

--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_
```

Figure 9-2
VT 100 Remote Configuration Screen

Configure Remote Unit

This option allows configuration of a remote 2x64 Rackmount. The DATAMATE will display a prompt for the remote number to dial. Enter a number and press **Enter** to continue. A prompt for the remote password will be displayed. Enter up to six digits for the password to access the remote unit and press **Enter** to continue. The DATAMATE displays status information about the call. When a connection is established, the DATAMATE will display information as if the remote unit were connected to the DATAMATE. If the connection was not successful, the DATAMATE displays information for the local unit connection. Pressing **Cancel** anytime up to this point cancels the call. Pressing **Cancel** at the first remote display screen or selecting **Hang up line** disconnects the call.

Figure 9-3 illustrates the VT 100 terminal screen when **1=Cfg. Rmt. Unit** is selected. To enter the remote number to call, select **1=Remote Number**. Press **1**, **Enter**, type the number, and press **Enter** to complete the entry. Press **Esc** to return to the Configure Remote Unit menu. If a password has been set for accessing the remote unit, enter the number by selecting **2=Remote Password**. Press **1**, **Enter**, type the numeric password, and press **Enter** to complete the entry. Press **Esc** to return to the menu. If there is not a password set for the remote unit, skip the previous step. Place the remote configuration call by selecting **3=Execute.** The VT100 terminal screen displays information as if the remote unit were connected to the VT100 terminal. The call may be terminated at any time by pressing **Esc** from the top of the menu tree.

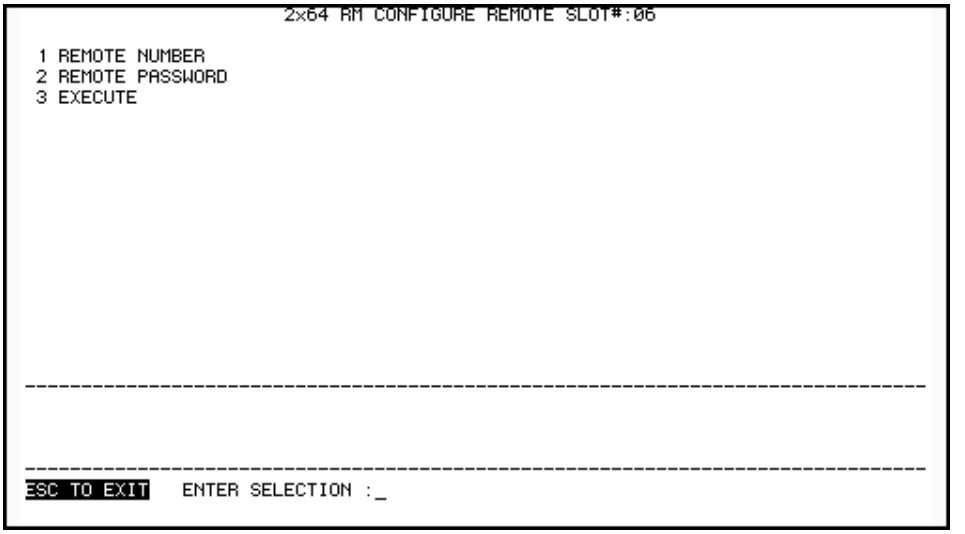

Figure 9-3
Configure Remote Unit Screen

The DATAMATE and VT100 interfaces can only be used to configure other Rackmount ISU devices. AT commands can be used to configure any ISU device that supports remote configuration, such as the Express XR/XRT and the ISU 128 (second generation).

Loopback Remote 1B

The **Lpbk Remote 1B** option allows a local unit to call, loopback, and BERT test a remote unit on one B-channel if both the local and remote units are configured for Fallback protocol option. The DATAMATE and VT100 terminal prompts for the remote number to dial. When a connection is established, error information is displayed. Press **Cancel** or **Escape** to exit the test.

Loopback Remote 2B

The **Lpbk Remote 2B** option allows a local unit to call, loopback, and BERT test a remote unit on two B-channels if both the local and remote units are configured for the Fallback protocol option.

The DATAMATE and VT100 terminal will prompt for the remote number to dial. When a connection is established, error information is displayed. Press **Cancel** or **Escape** to exit the test.

Set Password

The **Set Password** option allows the user to store a password up to six digits for remote configuration access. If a password is entered, any other unit used to configure this unit remotely must send a password matching the stored password. If passwords do not match, the remote configuration fails to connect. The VT 100 is illustrated in Figure 9-4. To set the password, choose **4=Set Password** from the Remote Configuration Menu. Type **1**, press **Enter**, type the six digit (or less) password, then press **Enter**. Press **Esc** to return to the Remote Configuration Menu.

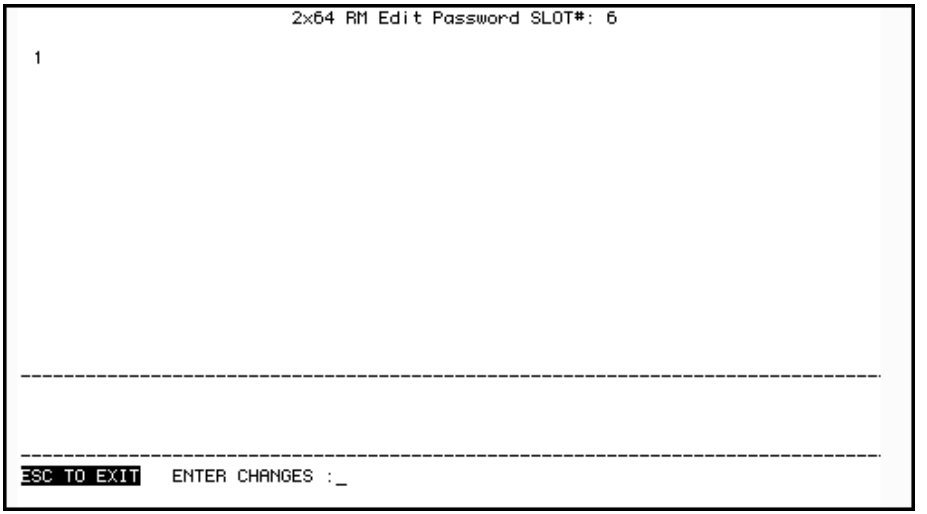

Figure 9-4
Set Password Screen

The password option can be selected for DTE#1 or DTE#2. Changes to one are updated to the other.

Chapter 10
Troubleshooting

When the ISU 2x64 Rackmount powers up, it performs an internal self test. This takes about 10 seconds. At the end of the test, the front panel displays **Self Test Passed**.

IF SELF TEST FAILS

If **Self Test Passed** is not displayed, perform the following procedure to verify if the problem can be fixed locally:

1. Ensure that the ISU 2x64 Rackmount is receiving power and is switched on.

2. Turn off the ISU 2x64 Rackmount. While holding down the **0** key, power back on. Continue to press **0** for 15 seconds. This will reset all the internal settings to factory defaults.

3. If the ISU 2x64 Rackmount still does not pass self test, call ADTRAN Technical Support for assistance. See the back of this manual for phone numbers.

IF THE ISU 2X64 RACKMOUNT DOES NOT READ READY

When the ISU 2x64 Rackmount has been set up and connected to an ISDN line but the front panel does not read **Ready** after a few minutes, use the following troubleshooting procedure:

1. Cycle power on the ISU 2x64 Rackmount, leaving it off for a minimum of two seconds. Turn the power on for one minute to ensure the unit does not read **Ready**.

2. Disconnect the ISU 2x64 Rackmount from the ISDN line. From a functioning voice phone, call the local directory number(s) provided with your line. Calling a good ISDN line with nothing connected usually results in a ring or fast busy tone. If someone answers or a not-in-service intercept is received, there is probably something wrong with the translation of the ISDN line. The phone service provider should be able to help.

3. If the ISU 2x64 Rackmount continues to read **Link Down**, there is a physical problem with the ISDN phone line (more than likely, a problem with the Layer 1 setup). The problem may be one or more of the following:

   - The ISU 2x64 Rackmount software setup
   - The ISU 2x64 Rackmount hardware
   - The wiring on your premises
   - The telephone service provider's wiring
   - The telephone service provider's hardware
   - The telephone service provider's software setup

   To isolate the problem, perform the following procedure:

   A. Make sure the ISU 2x64 Rackmount is configured for dial line service. Check that **CONFIG**, **Netw. options, Dial Line**, is selected on the menu.

   B. Try another piece of functioning ISDN equipment with a U-interface on the ISDN line.

   C. Talk to your service provider and ensure you have an ISDN Basic Rate U-Interface with 2B1Q line coding (wrong options are an S or T interface or AMI line coding).

   D. Ensure that your ISDN phone line is connected to the actual telephone line (U-interface) provided by your telephone company. Make sure your ISDN line is not connected though another piece of equipment such as an NT1 in a wiring closet somewhere.

E. Make sure nothing else is bridged across the ISDN line pair.

F. With a minimum of extra wiring, try connecting to the ISDN line pair at the point where service provider's wiring ends.

G. With the ISU 2x64 Rackmount connected to the ISDN line and powered up, talk to your service provider's repair group and inform them that your ISDN basic rate line has a physical layer 1 problem. Ask them to check the ISDN line. Tell them that you have an NT1-like device at the end of the ISDN line.

4. If the ISU 2x64 Rackmount continues to read **Getting TEI #1**, the ISU 2x64 Rackmount is physically connected to your local telephone service provider but is unable to establish logical layer 2. The problem may be one or more of the following:

   • The ISU 2x64 Rackmount software setup
   • The telephone service provider's software setup
   • Hardware configuration if the ISDN line is extended from the switch

   To isolate the problem, use the following procedure:

   A. Ensure the ISU 2x64 Rackmount is set up for the correct switch protocol by selecting **CONFIG**, **Netw. options, Dial Line**, **Switch protocl**.

   B. Ensure the line quality is satisfactory by checking for near- and far-end block errors (NEBEs and FEBEs). To do this, select **Test**, **NEBE/FEBE**. If the counts are non-zero and incrementing, there may be a physical link problem as described under **Link Down** (Step 3).

   C. Try another piece of functioning ISDN equipment with a U-interface on the line.

   D. With the ISU 2x64 Rackmount connected to the line and powered up, talk to your service provider's repair group

and tell them you have an ISDN basic rate line that appears physically okay but has no terminal endpoint identifier (TEI). Ask them to check the ISDN line translation and ensure that the ISDN line supports dynamic TEI allocation. Tell them that you have an NT1 and terminal adapter device connected to the line.

5. If the ISU 2x64 Rackmount continues to read **Register SPID #1**, the ISU 2x64 Rackmount is physically connected to the local telephone service provider and has established logical layer 2. The ISU 2x64 Rackmount is unable to establish layer 3. The problem may be one or more of the following:

   • The ISU 2x64 Rackmount software setup
   • The telephone service provider's software setup

   To isolate the problem, use the following procedure:

   A. Ensure the ISU 2x64 Rackmount is set up for the correct switch protocol by selecting **CONFIG**, **Netw. options, Dial line**, **Switch protocl**.

   B. Ensure the ISDN line is multipoint.

   C. Make sure that the ISU 2x64 Rackmount is set up with the correct SPID and LDN by selecting **CONFIG**, **Netw. options, Dial Line**, **Terminal ID**, **SPID/LDN**.

   D. Try another piece of functioning ISDN equipment with a U-interface on the line.

   E. With the ISU 2x64 Rackmount connected to the ISDN line and powered up, talk to your service provider's repair group and tell them you have an ISDN basic rate line that appears physically okay but has no terminal endpoint identifier (TEI). Ask them to check the line translation and ensure that the line supports dynamic TEI allocation. Tell them that you have an NT1 and terminal adapter device connected to the line.

6 . If the ISU 2x64 Rackmount continues to read **Getting TEI #2,**

the ISU 2x64 Rackmount has completely initialized the first phone number but is unable to establish logical layer 2 for the second phone number. The problem may be one or more of the following:

- The ISU 2x64 Rackmount software setup
- The telephone service provider's software setup

To isolate the problem, use the following procedure:

A. Ensure the ISDN line is multipoint with two phone numbers.

B. Ensure that the ISU 2x64 Rackmount is set up with the correct SPID and LDN by selecting **CONFIG**, **Netw. options, Dial Line**, **Terminal ID**, **SPID/LDN**.

C. Try swapping SPID1 with SPID2 and LDN1 with LDN2. Determine if the problem is the second phone number or the quantity of phone numbers.

D. Try another piece of functioning ISDN equipment with a U-interface on the ISDN line.

E. With the ISU 2x64 Rackmount connected to the ISDN line and powered up, talk to your service provider's repair group and tell them you have an ISDN basic rate line that appears physically okay but has no TEI. Ask them to check the line translation and ensure that the line supports *dynamic* TEI allocation. Tell them that you have an NT1 and terminal adapter device connected to the line.

7. If the ISU 2x64 Rackmount continues to read **Register SPID #2**, the ISU 2x64 Rackmount has completely initialized the first phone number but is unable to establish logical layer 3 for the second phone number. The problem is in one or more of the following places:

- The ISU 2x64 Rackmount software setup
- The telephone service provider's software setup

To isolate the problem, use the following procedure:

A. Ensure the ISDN line is multipoint with two phone numbers.

B. Ensure that the ISU 2x64 Rackmount is set up with the correct SPID and LDN by selecting **CONFIG**, **Netw. options, Dial Line**, **Terminal ID**, **SPID/LDN**.

C. Try swapping SPID1 with SPID2 and LDN1 with LDN2. Determine if the problem is the second phone number or the quantity of phone numbers.

D. Try another piece of functioning ISDN equipment with a U-interface on the line.

E. With the ISU 2x64 Rackmount connected to the line and powered up, talk to your service provider's repair group and tell them you have an ISDN basic rate line that appears physically okay but has no terminal endpoint identifier (TEI). Ask them to check the line translation and ensure that the line supports dynamic TEI allocation. Tell them that you have an NT1 and terminal adapter device connected to the line.

Chapter 11
Specifications

The ISU 2x64 Rackmount specifications are listed in this chapter.

Network Interface

- RJ-45 for ISDN basic rate U-interface, part numbers 1200074L1 and L3
- RJ-45 for ISDN basic rate S/T interface, part numbers 1200074L4 and L6

DTE Interface

- Two DB-25s, each RS-530/RS-232 interfaces
- V.35 interfaces available with RS-530-to-V.35 adapters, part number 1200072L1

Dialing Selections

- In-band dialing: V.25 bis or AT commands
- Manual or automatic stored number dialing
- DTR assertion

Data Rates

- Network: 64 kbps (1 B-channel), 128 kbps (2 B-channels)
- DTE: 300 bps to 115.2 kbps asynchronous, 2400 bps to 128 kbps synchronous

Rate Adaption

- T-Link
- CCITT V.120
- Clear Channel
- SAP

- FALLBACK
- DSU 57.6 async
- BONDING mode 1
- V.34 (optional)
- PPP async-sync

Interoperability

- Various BONDING mode 1-compatible inverse multiplexers
- Switched 56 DSUs
- ISDN TAs,
- V.34 analog modems (optional)

D-Channel Switch Compatibility

- AT&T 5ESS
- NTI DMS-100
- National ISDN-1
- NEC

B-Channel Aggregation

BONDING mode 1 - used for speeds over 64 kbps from a single DTE interface

Display

None, available through terminal or DATAMATE interface

Environmental

- Operating Temperature: 0 - 50°C
- Storage Temperature: 20 - 70°C
- Relative Humidity: Up to 95%, non-condensing

Physical

- Dimensions: 6.75" W x 10.5" L
- Weight: 3 lbs.

Power

Powered through Smart 16 power supply

Glossary

asynchronous transmission

Not Synchronous. A method of data transmission which allows characters to be sent at irregular intervals by preceding each character with a *start* bit and following it with a *stop* bit. The timing of the transmission is not determined by the timing of a previous character. Applications include communication between most small computers (especially PCs) and mainframes, lower speed transmission, and less expensive computer transmission systems. See **synchronous**.

B-channel

64 kbps *bearer* channel used for voice, circuit, or packet switched data.

bandwidth

The range of electrical frequencies a device is capable of handling. The amount of bandwidth a channel is capable of carrying tells you what kinds of communications can be carried on it. For example, a wide band circuit can carry a TV channel. A wide band circuit that is capable of providing one video channel can also provide 1,200 voice telephone channels.

bearer service

As defined by CCITT standards, a type of telecommunication service that provides the capability for the transmission of information between user-to-network interfaces. Bearer services defined for ISDN are circuit mode and packet mode.

BONDING mode 1 protocol

Industry standard B-channel aggregation protocol. Developed by the Bandwidth on Demand Interoperability Group.

BRA

basic rate access. The BRA includes two 64 kbps B-channels and one 16 kbps D-channel. Also known as basic rate interface (BRI).

bridging

The technique whereby additional stations may be served from a two-point facility by extending the facility from a *bridge* at one of the facility's terminating points.

CCITT

Consultative Committee on International Telephony and Telegraphy. A body of the International Telegraph Union (ITU) which prepares recommendations, commonly referred to as international standards, to resolve technical telegraph and telephone problems.

central office (CO)

In telephony, the facility housing the switching system and related equipment that provides telephone service for customers in the immediate geographical area.

circuit mode

Type of switching that assigns a call to a specific circuit path. The circuit is not shared with other calls.

clear channel

A channel in which all the 64 kbps are used for transmission. To achieve this, bit robbing signalling must be eliminated.

common channel interoffice signalling (CCIS)

A signalling system developed for use between stored program switching systems. All of the signalling information for a group of trunks is transmitted over a dedicated high-speed data link rather than on a trunk. CCIS reduces call setup time compared to individual trunk signalling.

CPE

customer premises equipment. A generic term for communications terminal gear owned by the customer, residing on customer premises.

CSU

channel service unit. A component of CPE used to terminate a digital circuit, such as DDS or T1 at the customer site. Performs certain line-conditioning functions, ensures network compliance per FCC rules, and responds to loopback commands from the central office. Also ensures proper 1s density in transmitted bit stream and performs bipolar violation correction. See **DSU**.

D-channel

The ISDN channel that carries signalling information to control the call setup, teardown, or invocation of supplementary services. The D-channel may also be used to provide packet mode data service.

DCE

data communications equipment. The portion of a data terminal that provides the interface to the network.

DDS

dataphone digital service. AT&T private line service for transmitting data over a digital system. The digital transmission system transmits electrical signals directly, instead of translating the signals into tone of varied frequencies as with traditional analog transmission systems. Digital techniques provide more efficient use of transmission facilities, resulting in lower error rates and costs than analog systems.

digital

Referring to communications procedures, techniques, and equipment where information is encoded as either a binary 1 or 0, the representation of information in discrete binary form, discontinuous in time, as opposed to the analog representation of information in variable but continuous waveforms.

DSU

data service unit. A device providing interface between a data terminal or other data communications device and a digital access line.

DTE

data terminal equipment. The portion of a data terminal that interfaces to the end-user's equipment. The main difference between DCE and DTE is that pins 2 and 3 are reversed on the RS-232.

frame

A group of bits sent serially over a communications channel. Generally a local transmission unit sent between data-link-layer entities that contains its own control information for addressing and error checking. The basic data transmission unit is employed with bit-oriented protocols, similar to blocks. In video transmission, a set of electron scan lines that comprises a television picture (usually 525 in the U.S.).

in-band signalling

Signalling made up of tones which pass within the voice frequency band and are carried along the same circuit as the talk path being established by the signals. Virtually all signalling (request for service, dialing, disconnect, etc.) in the U.S. is in-band signalling. Most of that signalling is MF (multi-frequency) dialing. The more modern form of signalling is out-of-band.

information element

The name for the data fields within an ISDN Layer 3 message.

interface

A common boundary between two systems over which the inter-system communication occurs.

interworking

Communication between two types of networks or end equipment. This may or may not involve a difference in signalling or protocol elements supported.

ISDN

integrated service digital network. A network architecture that enables end-to-end digital connections. The network supports diverse services through integrated access arrangements and defines a limited set of standard, multipurpose interfaces for equipment vendors, network providers, and customers. Interworking with a public switched telephone network is retained.

LATA

local access and transport area. One of 161 local telephone serving areas in the United States, generally encompassing the largest standard statistical metropolitan areas. Subdivisions established as a result of the AT&T divestiture that now distinguish local from long distance service. Circuits with both end-points within the LATA (intraLATA) are generally the sole responsibility of the local telephone company, while circuits that cross outside the LATA (interLATA) are passed on to an interexchange carrier.

loopback
A diagnostic procedure where data is sent to the device being tested, and the output of the device is fed directly back to its input, looped around, and the returning data is checked against that which was sent.

loopback test
A test typically run on a 4-wire circuit. Two transmit leads are joined to the two receive leads. A signal is then sent around the loop. Measuring differences between the sent and received signal is the essence of a loopback test.

master clock
The source of timing signals, or the signals themselves, which all network stations use for synchronization.

message
The Layer 3 information that is passed between the CPE and SPCS for signalling.

multiplexing
The combining of multiple data channels onto a single transmission medium. Any process through which a circuit normally dedicated to a single user can be shared by multiple users. Typically, user data streams are interleaved on a bit or byte basis (time division) or separated by different carrier frequencies (frequency division).

multipoint circuit
A circuit consisting of three or more stations connected directly electrically.

NEXT (near-end crosstalk)
Unwanted energy transferred from one circuit to an adjoining circuit. Occurs at the end of the transmission link where the signal source is located. The absorbed energy is usually propagated in the direction opposite to the absorbing channel's normal current flow. Caused by high-frequency or unbalanced signals and insufficient shielding.

non-ISDN line
Any connection from a CPE to a SPCS that is not served by D-channel signalling.

non-ISDN trunk
Any trunk not served by either SS7 or D-channel signalling.

NT1

network termination 1. A unit that provides physical and electromagnetic termination of the U-interface 2-wire transmission line, converts between Layer 1 formats used at the U- and T- reference points, and performs some maintenance functions.

packet mode

Refers to switching of packets of information for different users by statistically multiplexing them over the same transmission facilities. ISDN packet mode capabilities are based on CCITT recommendation X.25 procedures.

point-to-point

Describing a circuit connecting two points directly with no intermediate processing nodes or computers (although switching facilities could exist). A type of connection that links two logical entities (i.e., phone-line circuit).

S-interface

S-reference point. The interface that connects an ISDN terminal (TE1) or terminal adapter (TA) to the NT2 reference point as defined in the I.411 recommendation.

SPCS

stored program controlled switch. All ISDN switches are SPCSs

SDLC

synchronous data link control. A data communications line protocol associated with the IBM System Network Architecture. SDLC is a bit-oriented protocol (not a character-oriented protocol) that includes multiple block error checking and full duplex line operation.

sync bits

Framing or synchronizing bits in synchronous transmission.

synchronous

1. The condition occurring when two events happen in a specific time relationship with each other, both under control of a master clock. **2.** A method of data transmission requiring the transmission of timing pulses to keep the sender and receiver synchronized in their communication used to send blocks of information. Synchronous data transmission is used in high-speed data circuits because there is less overhead than asynchronous transmission of characters which contain two extra bits per character to affect timing

T1

Also T-1. A digital transmission link with a capacity of 1.544 Mbps. T1 uses two pairs of normal twisted wires. T1 normally can handle 24 voice conversations with each conversation being digitized at 64 kbps. With more advanced digital voice encoding techniques, it can handle more voice channels. T1 is a standard for digital transmission in North America.

TA

terminal adaptor. A DCE that connects to the ISDN S-interface and enables non-ISDN terminal equipment to communicate over the ISDN.

TE

terminal equipment. Combination of TE1 and TE2.

TE1

terminal equipment type 1. ISDN-compatible terminals.

TE2

terminal equipment type 2. Non-ISDN terminal equipment linked at the RS-232, RS-449, or V.35 interface.

transmission

The dispatching of a signal, message, or other form of intelligence by wire, radio, telegraphy, telephony, facsimile, or other means. A series of characters, messages or blocks including control information and user data. The signalling of data over communications channels.

transmission level

The power of a transmission signal at a point of a transmission facility. It may be measured in absolute terms (dBm) or in a ratio to its level at some reference point (dB).

twisted pair

Two wires twisted around each other to reduce induction (interference) from one wire to the other. Several sets of twisted pair wires may be enclosed in a single cable. Twisted pair is the normal cabling from a Central Office to your home or office, or from your PBX to your office phone. Twisted pair wiring comes in various thicknesses. As a general rule, the thicker the cable is, the better the quality of the conversation and the longer the cable can be and still get acceptable conversation quality. However, the thicker it is, the more it costs.

2B+D

The basic rate interface (BRI) in ISDN. A single ISDN circuit divided into two 64 kbps digital channels for voice or data and one 16 kbps channel for low speed data (up to 9,600 baud) and signalling. 2B+D is carried on one or two pairs of wires depending on the interface, the same wire pairs that today bring a single voice circuit into your home or office. See **ISDN.**

U-interface

A twisted pair subscriber loop that connects the NT1 reference point to the ISDN network, as defined in the I.411 recommendation. This interface provides basic rate access with an operating frequency of 160 kbps and an information rate of 144 kbps. Under U.S. regulations, this also marks the line of demarcation between customer-owned equipment and the public network.

V.34

28.8 kbps, 2-wire duplex modem standard.

videoconferencing

The real-time, usually two-way, transmission of digitized video images between two or more locations. Videoconferencing requires a wideband transmission facility. Transmitted images may be freeze-frame (where screen is repainted every few seconds to every 20 seconds) or full motion. Bandwidth requirements for two-way video conferencing range from six MHz for analog, full-motion, full-color, commercial grade TV to 56 kbps for digitally-encoded freeze-frame to 1.544 kbps for high-quality, full-color, full-motion TV picture.

X.25

A packet data transfer protocol for the B and D-channels. Defines the interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuits.

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