ISU 512e ISDN Service Unit Part Number 1203086L1 Document Number 61203086L1-1A

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#### **IMPORTANT SAFETY INSTRUCTIONS**

When using your telephone equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock and injury to persons. The precautions are listed below.

- 1. Do not use this product near water (for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement or near a swimming pool).
- 2. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- 3. Do not use the telephone to report a gas leak in the vicinity of the leak.
- 4. Use only the power cord, power supply, and/or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check local codes for any special disposal instructions.

SAVE THESE INSTRUCTIONS.

# FCC regulations require that the following information be provided in this manual:

- 1. This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment housing is a label that shows the FCC registration number and Ringer Equivalent Number (REN) for this equipment. If requested, provide this information to the telephone company.
- 2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given; otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.
- 3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment; advance notification and the opportunity to maintain uninterrupted service are given.
- 4. If experiencing difficulty with this equipment, please contact ADT-RAN (see inside back cover) for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected or until it is certain the equipment is not malfunctioning.
- 5. This unit contains no user serviceable parts.
- 6. An FCC compliant telephone cord with a modular plug is provided with this equipment. In addition, an FCC compliant cable appropriate for the dial backup option ordered is provided. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.
- 7. The following information may be required when applying to the local telephone company for leased line facilities.

Service Type Digital Facility		Service Order	Network
Interface Code		Code	Jacks
ISDN	021S5	6.0F	RJ-49C

### FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT:

This equipment has been tested and found to comply with the limits for a Class B 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 residential 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 or TV reception. The user is encouraged to try to correct the interference by one or more of the following measures:

- 1. Reorient or relocate the receiving antenna.
- 2. Increase the separation between the equipment and receiver.
- 3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 4. Consult the dealer or an experienced radio/TV technician for help.



Change or modifications to this unit not expressly approved by ADTRAN will void the user's authority to operate the equipment.

#### **CANADIAN EMISSIONS REQUIREMENTS**

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interferencecausing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil nuerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Class B prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministre des Communications.

#### **CANADIAN EQUIPMENT LIMITATIONS**

Notice: The Canadian Industry and Science Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (telephone extension cord). Compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.



Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or an electrician, as appropriate.

The **Load Number** (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

## AFFIDAVIT REQUIREMENTS FOR CONNECTION TO DIGITAL SERVICES

- An affidavit is required to be given to the telephone company whenever digital terminal equipment without encoded analog content and billing protection is used to transmit digital signals containing encoded analog content which are intended for eventual conversion into voiceband analog signals and transmitted on the network.
- The affidavit shall affirm that either no encoded analog content or billing information is being transmitted or that the output of the device meets Part 68 encoded analog content or billing protection specifications.
- End user/customer will be responsible to file an affidavit with the local exchange carrier when connecting unprotected CPE to a 1.544 Mbps or subrate digital service.
- Until such time as subrate digital terminal equipment is registered for voice applications, the affidavit requirement for subrate services is waived.

### AFFIDAVIT FOR CONNECTION OF CUSTOMER PREMISES EQUIPMENT TO 1.544 MBPS AND/OR SUBRATE DIGITAL SERVICES

For the work to be performed in the certified territory of

(telco name) State of County of	-
I,	(name),
	(business address),
	(telephone number)

being duly sworn, state:

I have responsibility for the operation and maintenance of the terminal equipment to be connected to 1.544 Mbps and/or

() I attest that all operations associated with the establishment, maintenance, and adjustment of the digital CPE with respect to encoded analog content and billing protection information continuously complies with Part 68 of the FCC Rules and Regulations.

() The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.

() The encoded analog content and billing protection is factory set and is not under the control of the customer.

I attest that the operator(s)/maintainer(s) of the digital CPE responsible for establishment, maintenance, and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully having completed one of the following (check appropriate blocks):

( ) A. A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

() B. A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

() C. An independent training course (e.g., trade school or technical institution) recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

() D. In lieu of the preceding training requirements, the operator(s)/maintainer(s) is (are) under the control of a supervisor trained in accordance with \_\_\_\_\_\_ (circle one) above.

I agree to provide \_\_\_\_\_\_(telco's name) with proper documentation to demonstrate compliance with the information as provided in the preceding paragraph, if so requested.

\_\_\_\_\_Signature

Title

\_\_\_\_\_Date

Transcribed and sworn to before me

This \_\_\_\_\_day of \_\_\_\_\_\_, 199 \_\_\_\_\_

Notary Public

My commission expires:

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# **Quick Start Guide**

Before configuring the ISU<sup>™</sup> 512e, the telephone service provider must supply the switch protocol, service profile identifier (SPID), and local directory number (LDN). For example, for one ISDN BRI 2B+D line:

Switch Protocol SPID1 SPID2 LDN1 LDN2 National ISDN-1 20455512120100 20455512130100 5551212 5551213

To configure the ISU 512e from the front panel, press **Enter** from the initial status screen and continue entering the appropriate numbers (as shown below) until the switch protocol, SPIDs, and LDNs have been entered.

3=CONFIG 1=NETW. OPTIONS 1=DIAL LINE 1=ISDN MENU 1=SWITCH PROTO 1=LUCENT 5ESS 2=DMS-100 3=NATIONAL ISDN1 4=NI-1 ENBLOC 2=AREA CODE 3=SET LDN 4=SET SPID

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Press **Cancel** to exit to the status screen and verify **READY** conditions for each BRI line configured. If the status screen reads **SYNC**, **DOWN**, **TEI**, or **SPID**, either the configurations of the switch protocol and SPIDs are incorrect or there may be a problem with the ISDN line or translations (see *Troubleshooting* on page 8-1).

Service Profile/	Line Interface	Maximum Bandwidth
Directory Number		
SPID1/LDN1	Line 1	128 kbps
SPID2/LDN2		
SPID3/LDN3	Line 2	256 kbps
SPID4/LDN4		
SPID5/LDN5	Line 3	384 kbps
SPID6/LDN6		
SPID7/LDN7	Line 4	512 kbps
SPID8/LDN8		

To configure the ISU 512e using the VT 100 terminal interface, use the following procedure:

- 1. Connect a VT 100 async terminal, or personal computer with a terminal emulator running 9600 8-N-1, to the **EIA232 MAINT PORT**.
- 2. Hold down the **Control** key and press **R**, and then press **Enter** to display the top level menu.



- 3. Using the arrow keys and Enter key to navigate the menus, go to the CONFIGURATION/NETWORK OPTIONS/DIAL LINE/ISDN menu. Enter the SPIDs, LDNs, and Switch Protocol.
- 4. Use the left arrow or **Escape** key to go back up the menu tree. When asked to save the ISDN parameters, type **Y**.
- 5. Connect the ISDN lines.

Once the  $\ensuremath{\text{READY}}$  condition has been achieved, a call can be placed from the  $\ensuremath{\text{DiaL}}$  menu.

NOTE	If the SPIDs do not work or are unknown, try activating the Expert ISDN <sup>™</sup> feature. First enter the area code and local directory numbers; then select the specific line number or ALL, and press Enter over the highlighted EXPERT ISDN START/STOP field.
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Quick Start Guide

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# Chapter 1 Understanding ISDN and the ISU 512e

# **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 pair of telephone wires. ISDN provides a means of integrating these services and modernizing communication networks for information movement and management efficiency.

# **PRODUCT OVERVIEW**

The ADTRAN ISDN Service Unit (ISU<sup>TM</sup>) 512e is a standalone device that connects data terminal equipment (DTE) to the ISDN network. The ISU 512e is specifically designed as a low-cost solution for applications such as video-conferencing, T1 backup, LAN/WAN connectivity, and high-speed file transfer.

Embedded SNMP and Telnet are available through a 10BaseT Ethernet port. Through the Management Information Base (MIB)-II standard and an ADTRAN-supplied enterprise MIB, the ISU 512e can be configured, monitored, and diagnosed using standard SNMP network management programs such as HP Openview<sup>®</sup>, Netview<sup>®</sup>, and SunNet<sup>®</sup> Manager.

The ISU 512e connects directly to the ISDN network using up to four Basic Rate ISDN (BRI) lines. By terminating four BRI circuits,

the ISU 512e can create an aggregate bandwidth of up to 512 kbps which can be used to backup a T1 circuit.

Since ISDN is a switched digital service, bandwidth can be established and utilized on an as needed basis. Therefore, the ISU 512e is well suited for applications where a high bandwidth connection is needed to support bursty or infrequent traffic like medical image or large file transfer.

The ISU 512e supports synchronous data rates from 56 kbps to 512 kbps. At rates over 64 kbps, the ISU 512e supports BONDING Mode 1 and Multilink Point-to-Point Protocol (MLPPP) utilizing from one to eight 64 kbps B channels. By supporting BONDING, the ISU 512e interoperates with other BONDING-compatible inverse multiplexers and ISDN terminal adapters. By supporting MLPPP, the ISU 512e interoperates with MLPPP-compatible routers and bridges.

The ISU 512e can be configured and maintained, locally or remotely, using a VT 100 terminal interface. For remote configuration, the unit can be accessed over the ISDN line from another ISU 512e or over the LAN via Telnet.

The front panel of the ISU 512e consists of a 2-line by 16-character LCD, 7 LEDs, and a 16-button keypad. This allows for configuring, dialing, testing, and monitoring the unit without data terminal or test equipment.

Dialing from the unit is accomplished by using the front panel, terminal menu system, stored numbers, DTR assertion, or V.25 bis in-band dialing. The EIA-366 parallel dial interface is available for applications such as video-conferencing. The ISU 512e also supports dedicated 2B1Q services that allow data to be transferred at up to 512 kbps using the BONDING Mode 1 Protocol. This provides a dedicated point-topoint service (as in a limited distance modem or leased line application) with no dialing necessary.

Figure 1-1 on page 1-3 illustrates the ISU 512e operation in various switched network services and customer premises products.



Figure 1-1. ISU 512e Applications

# **ORDERING ISDN**

ISDN is a complex service with many network options. Obtaining service from the local telephone company and long distance providers can be complicated.

In North America, 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. These IOCs are supported by all major local exchange carriers as well as several independent carriers.

**Capability S** (previously **Generic Data M**) ordering code is recommended for ISU 512e applications. It is the most feature-rich and supports most voice and data applications. The voice capability is not necessary for operation of the ISU 512e; however, it is useful in troubleshooting a misconfigured ISDN line. 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** (previously **Generic Data I**) may be more cost-effective. Each ISDN line provides 112/128 kbps of service. If 512 kbps is needed for your application, order four ISDN lines. If 384 kbps is needed, only order three ISDN lines, etc.

For more information regarding ordering ISDN, see the ADTRAN document *Ordering ISDN Service User Guide* part number 60000.015-8, or contact the telephone company for alternative line configurations. The *Ordering ISDN Service User Guide* is available on the ADTRAN website at http://www.adtran.com (go to the Service and Support page and then to the ISDN Information Desk), or call ADTRAN at (888) 4ADTRAN.

# Chapter 2 Installation

After unpacking the unit, immediately inspect it for shipping damage. If damage is discovered, file a claim immediately with the shipping carrier, then contact ADTRAN Customer and Product Service; see the last page of this manual for phone numbers.

# **NETWORK CONNECTION**

The ISU 512e supports either dial or leased operation. Four 8-pin RJ-45 modular jacks on the rear panel of the ISU 512e allow connection to the network service. (See Figure 2-1.)



Figure 2-1. ISU 512e Rear Panel

Dial operation uses the ISDN Basic Rate interface and allows the ISU 512e to dial out over the ISDN network. When used in this mode of operation, the telephone company provided ISDN Basic Rate interface is connected to the RJ-45 connectors marked **ISDN IFC #1**, **#2**, **#3**, and **#4**. Connect the Basic Rate interfaces to the ISU 512e in order, starting with **ISDN IFC #1**, until the maximum number of lines (four) is reached.

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The leased mode of operation supports a dedicated 2B1Q data service at rates of up to 512 kbps by using nailed up circuits or a permanent connection between endpoints. This could be a limited distance modem or point-to-point connection.

See Appendix A *Pinouts* on page A-1 for network connection pin assignments.

# DTE DATA CONNECTION

Data terminal equipment (DTE) is connected to the ISU 512e by using the **V.35** interface on the rear panel of the ISU 512e. The maximum cable length recommended is 150 feet for the V.35 interface. The pin assignments for the V.35 interface are shown in Appendix A *Pinouts* on page A-1.

The V.35 interface supports data rates up to 512 kbps. The DTE rate can be configured from the front panel or the VT 100 terminal interface of the ISU 512e. See Chapter 6 *Configuration Menu* on page 6-1 for information on configuring the ISU 512e with the appropriate data rates for the application.



# LOCAL AREA NETWORK CONNECTION

The ISU 512e has a **10BASET** connector that provides half-duplex 10 Mbps operation over a 4-wire twisted pair. Other types of Ethernet interfaces (i.e., AUI, 10 Base 2, etc.) can be accommodated by obtaining an appropriate converter.

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# DIAL INTERFACE CONNECTION

If out-of-band EIA-366 dialing is required for applications such as video-conferencing, the dialing interface of the host DTE should be connected to the port labeled **EIA366 DIALING PORT**. For pin assignment information for the EIA-366 connector, see Appendix A *Pinouts* on page A-1.

## **Smart Dial String Formats**

The ISU 512e can accept changes to **CALL TYPE** and **CHANNEL RATE** by using suffix commands appended to the end of the dial string. The following string format is used.



Where **#C** changes the **CALL TYPE** as follows:

- 1 = SPEECH
- 2 = AUDIO
- 3 = 56K DATA
- 4 = 64K DATA

Where **#R** changes the **CHANNEL RATE** (number of ISDN B channels) as follows:

0 = (1x56k and 1x64k) TRANSPARENT (CLEAR CHANNEL) 1 = 1 B CHANNEL (1x56k, 1x64k) BONDING or MPPP 2 = 2 B CHANNELS (2x56k, 2x64k) BONDING or MPPP 3 = 3 B CHANNELS (3x56k, 3x64k) BONDING or MPPP 4 = 4 B CHANNELS (4x56k, 4x64k) BONDING or MPPP 5 = 5 B CHANNELS (5x56k, 5x64k) BONDING or MPPP 6 = 6 B CHANNELS (6x56k, 6x64k) BONDING OR MPPP 7 = 7 B CHANNELS (7x56k, 7x64k) BONDING OR MPPP 8 = 8 B CHANNELS (8x56k, 8x64k) BONDING OR MPPP

If no suffix is used, the call is placed using the values configured for the ISU 512e. For example, if the ISU 512e is configured for **384K**, the dial string 7082906055 is the same as 7082906055#4#6.

If the CHANNEL RATE suffix is used, the CALL TYPE suffix is required. However, the CHANNEL RATE is not required to make changes to the CALL TYPE. For example, if the ISU 512e is configured for **384K CALL** TYPE, only the **#3** suffix is required to change the CALL TYPE to **336K**. The dial string 7082906055#3 is the same as 7082906055#3#6.

# SOFTWARE UPDATE

There are three methods available for updating ISU 512e software. The local method involves using the maintenance port and is described in this section. The other two methods are described in *RDL Password* (*Remote Download*) on page 6-11 and in *Utilities/Upgrade* on page 6-20.

The ISU 512e contains Flash memory allowing the software to be updated using any PC with an EIA232 COM port and a communication package supporting XMODEM protocol. After obtaining a new code file with the extension (.bin) from Technical Support (see the last page of this manual), use the following procedure to update the software:



- 1. Power the ISU 512e OFF.
- 2. Connect the PC to the ISU 512e using a standard DB-25 cable connected from the **EIA232 MAINT PORT** on the rear panel of the ISU 512e to the COM port on the PC.

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- 3. Start the communication package, supporting XMODEM protocol, on the PC. Set for **CONNECT LOCAL** if necessary.
- 4. Set the COM port for the desired download rate (either 57600 or 9600), 8 data bits, no parity, 1 stop bit (8-N-1), and no flow control.
- 5. Select the **XMODEM** protocol and transfer the .bin file to the ISU 512e once the C's appear on the screen. **1K XMODEM** can be used at the 57600 rate only.
- 6. Power **ON** the ISU 512e while holding the up arrow for a download speed of 57600, or the down arrow for 9600. Holding the up or down arrow during self test initiates the software update.



Do not power **OFF** the unit during the loading process. After the load is complete, the ISU 512e restarts itself. If power is lost during the software load, repeat the procedure from the beginning. Chapter 2. Installation

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Chapter 3 **Operation** 

# **MENU STRUCTURE**

The ISU 512e uses a multilevel menu structure to access its configuration options and activate its feature set. The menu structure can be accessed in several ways:

- Through the front panel (see *Front Panel and Front Panel Menu* on page 3-8).
- Through a VT 100 terminal interface connected to the **EIA232 MAINT PORT** (see *Terminal Menu* on page 3-1).
- Via a Telnet connection.
- Remotely from another ISU 512 or ISU 512e (see *SPV Password* (*Remote Supervision*) on page 6-11).

The latter three methods all display the same multilevel terminal menu system from which all configuration options and device operations are accessible. The front panel displays a similar, although somewhat abbreviated, form of this multilevel structure. This chapter briefly describes ISU 512e terminal menu and front panel menu structure, navigation, and operation. Chapters 4 through 7 describe the menu options and operation in detail.

# **Terminal Menu**

The ISU 512e is shipped with the factory default configuration. Connect any VT 100 or VT 220 type terminal emulator to the **EIA232 MAINT PORT**. The default rate is 9600 baud 8-N-1. No flow control is necessary. The main menu (or top-level menu) is the access point to all other options and operations.



Each main menu item has several functions and submenus to identify and access configuration parameters and perform specific actions. Figure 3-1 on page 3-3 shows the top-level terminal menu.

#### **Terminal Menu Description**

The main menu contains the following options:

#### Status

The **STATUS** menu provides options to review and monitor the status of the ISU 512e system. See Chapter 4 *Status Menu* on page 4-1 for detailed information on the available options.

#### Test

The **TEST** menu can be used for performing both local and remote diagnostic testing of the ISU 512e. See Chapter 5 *Test Menu* on page 5-1 for detailed information on the available options.

#### Configuration

The **CONFIGURATION** menu provides options to set up the operational parameters for the ISU 512e. See Chapter 6 *Configuration Menu* on page 6-55 for detailed information on the available options.

#### Dial

The **DIAL** menu provides the manual dialing functions. Numbers can be input directly or selected from one of ten previously stored numbers. See Chapter 7 *Dial Menu* on page 7-1 for detailed information on the available options.


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#### **Terminal Menu Navigation**

When you first start a terminal menu session, the window shown in Figure 3-1 on page 3-3 displays. The screen is divided into left and right panes. The left pane shows the current list of submenus, while the right pane shows the contents of a selected submenu.

The top line of the display shows the session's current position (path) in the menu tree. Figure 3-1 shows the top menu level with the cursor on the **STATUS** menu, so the path display shows **ISU 512E/STATUS**.

Table 3-1 describes the options that display throughout the menus to indicate the status of a particular field.

If a menu item	It means that
displays [+]	more items are available when selected.
displays <+>	an action is to be taken, such as activating a test.
is highlighted	you can enter data in that field.*
is <u>underlined</u>	it contains read-only information.

Table 3-1. Terminal Menu Display

NOTE	*When data is changed, the left arrow or <b>Escape</b> key must be used to go back up the menu tree until a <b>SAVE</b> <b>PARAMETER</b> screen is reached. The changes are only saved after this screen is displayed and a response of <b>Y</b> (yes) is entered.
	entered.

Navigation with the Keyboard You can use various keystrokes to navigate through the terminal menu. Table 3-2, Table 3-3, and Table 3-4 describe these keystrokes and their functions.



### Table 3-2. General Navigation Keystrokes

Pressing this	Does this	
Н	returns to the home screen.	
J	jumps between two menu items. Press J while on a menu item of interest, and you will jump back to the main screen. Go to another menu item of interest, press J, and you will jump back to the screen that was displayed the first time you pressed J. Press J anytime you want to jump between these items.	
Arrow keys	move between the left and right panes, and scroll through items within a menu. The left arrow key allows you to go back up the menu.	
Enter	activates an item or moves into submenu.	
Escape	cancels an edit. Allows you to go back up the menu. Also will dismiss the pop-up help screens.	
Tab	moves between the left and right panes.	
Α	moves to the top of a screen.	
Z	moves to the bottom of a screen.	
Backspace	ascends one menu level.	

Pressing this	Does this	
Control-L	logs out of the session.	
Control-S	invalidates the password entry and returns to the login screen. The Password prompt will display.	
Control-R	refreshes the screen. To save time, only the portion of the screen that has changed is refreshed. This option should be necessary only if the display picks up incorrect characters.	

### Table 3-3. Session Management Keystrokes

Pressing this	Does this		
F	restores factory default settings. This setting restores the factory defaults based on the location of the cursor. Entire submenus can be factory defaulted.		
C	copies selected items to the clipboard. The amount of information you can copy depends on the cursor location when you press <b>C</b> . For example, if the cursor is over an editable field, only that item is copied. If the cursor is over the index number of a list, then all of the items in the row of the list are copied. For example, if the cursor is over the <b>NUM</b> field in the <b>CONNECTION LIST</b> screen, all of the information associated with the <b>CONNECTION LIST</b> entry is copied.		
Ρ	pastes the item stored in the clipboard, if the information is compatible. You must confirm all pastes except those to a single editable field.		
>	for certain types of fields, when you paste information into the field, the value increments by 1.		
<	for certain types of fields, when you paste information into the field, the value decrements by 1.		
1	inserts a new item in a list. For example, add a new item to the <b>CONNECTION LIST</b> by pressing I while the cursor is over the index number.		
D	deletes a list item. For example, delete an item from the <b>CONNECTION LIST</b> by pressing <b>D</b> while the index number is active.		

### Table 3-4. Configuration Keystrokes

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### Front Panel and Front Panel Menu

Figure 3-2 shows the ISU 512e front panel.



Figure 3-2. ISU 512e Front View

#### **Front Panel Description**

The ISU 512e front panel consists of a 2-line, 16-character LCD display, 7 LED indicators, and a 16-button keypad. This allows for configuring most options, dialing, testing, and monitoring the unit without data terminal or test equipment.

#### **LCD Window**

This window displays menu items and messages in 2 lines by 16 characters.

#### **Function Keys**

These keys are described in Table 3-6 on page 3-10.

#### Numeric Keypad

The numeric keypad contains the numbers **0** through **9**, \*, and # which are used to activate menu items and enter parameters.

#### **LED Descriptions**

The LED indicators monitor data flow and display the status of key DTE interface leads. Table 3-5 lists the LEDs and their descriptions.

#### Table 3-5. Front Panel LEDs

LED	Description	
RS	Request to send.	
CS	Clear to send. Indicates the ISU 512e is ready to transmit.	
TD	Transmit data. On when the DTE is transmitting to the ISU 512e.	
RD	Receive data. On when the ISU 512e is receiving data from the far end.	
CD	Carrier detect. Indicates the ISU 512e is connected to a remote unit.	
TR	Terminal ready from DTE. On when DTR is active at DTE interface.	
SR	Data set ready.	

### Self Test

The ISU 512e performs an initial self test upon powerup. Once the self test is successfully completed, the current status mode is displayed by the front panel. If the ISU 512e is not connected to the network, the **STATUS** menu displays **DOWN** next to the network connection number. If the unit is connected to the network and configured properly, **READY** is displayed next to the network connection number (see Figure 3-3).



Figure 3-3. Network Connection Status

#### **Front Panel Menu Navigation**

To configure the ISU 512e from the front panel, press the **Enter** key to display the main menu. Here again, the main menu is the access point to all options and operations. The four branches of the front panel top-level menu are shown in Figure 3-4.



#### Figure 3-4. Front Panel Top-Level Menu

Four function keys on the ISU 512e keypad allow the various menu branches to be entered, exited, and scrolled through. Table 3-6 describes these function keys.

Pressing this	Does this	
Enter	selects flashing menu item.	
the up arrow	scrolls up the menu tree.	
the down arrow	scrolls down the menu tree.	
Cancel	exits (back one level) from the current branch of the menu.	

Table 3-6. Front Panel Function Keys

To choose an item, press the corresponding number on the keypad. The item flashes on and off to show it is the currently selected (active) choice. As shown in Table 3-5, pressing either the up or down arrow scrolls through the available menu items. Press **Enter** to select the flashing item.

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The following example illustrates how to select ISU 512e Dial Options:

- 1. Select Configuration (CONFIG) by pressing 3, then Enter.
- 2. Use the up and down arrows to view submenu items.
- 3. Select Network Options (**NETW. OPTIONS**) by pressing **1**, then **Enter**.
- 4. Select **DIAL LINE** options by pressing **1**, then **Enter**.
- 5. Select **DIAL OPTIONS** by pressing **4**, then Enter.

The menu path is as follows:

3=CONFIG 1=NETW. OPTIONS 1=DIAL LINE 4=DIAL OPTIONS

It is important to note that some features in the ISU 512e do not immediately take effect upon selection. This prevents unintentional reconfiguration of the ISU 512e during an active call. Items such as LEASED/ DIAL LINE, SPID/LDN, and ISDN SWITCH PROTOCOL, take effect only when the ISU 512e is powered up or an active call is disconnected. Also, items such as MAX BIT RATE, BONDING OPTIONS, and CALL TYPE take effect only at the beginning of a new call. Chapter 3. Operation

## Chapter 4 Status Menu

Figure 4-1 shows the  $\ensuremath{\mathsf{STATUS}}$  menu as it appears on the terminal screen.

🔛 VT100 Termi	nal 🗖 🗖 🗶
Session Edit I	Port <u>O</u> ptions <u>C</u> apture <u>H</u> elp
ISU512e/Statu Status Test Configuration Dial	s Status Buffer [+] System Info [+] ARP Cache [+] IP Routes [+] Exit <+>
DSL1: Down	DSL2: Down DSL3: Down DSL4: Down Z=help

Figure 4-1. Status Terminal Menu

Chapter 4. Status Menu

### STATUS/STATUS BUFFER

The **STATUS BUFFER** submenu displays the status messages generated by the ISU 512e during operation. Appendix B *Status Buffer Messages* on page B-1 contains an explanation of the status buffer messages.



The Status buffer is the only **STATUS** menu item displayed by the front panel under the **STATUS** menu. Press 1 + **Enter** to display the contents of the Status buffer. The up and down arrows allow viewing of the last 20 status messages. Press 0 to clear the buffer. Press **Cancel** to return to the main menu.

### STATUS/SYSTEM INFO

**SYSTEM INFO**, another submenu of the **STATUS** menu, provides basic information about the unit and displays data fields for editing information. Figure 4-2 displays the selections available under this submenu as they appear on the terminal screen.



Figure 4-2. Status/System Info Menu

### System Info/System Name

This provides a user configurable text string for the name of the ISU 512e. This name can help distinguish between different installations. You can enter up to 31 alpha-numeric characters in this field, including spaces and special characters (such as an under bar).

### System Info/System Location

This provides a user configurable text string for the location of the ISU 512e. This helps to keep track of the physical location of the unit. You can enter up to 31 alpha-numeric characters in this field, including spaces and special characters (such as an under bar).

## System Info/System Contact

This field provides a user configurable text string for the contact name. The field can contain a name, phone number, or e-mail address of a person responsible for the ISU 512e. You can enter up to 31 alpha-numeric characters in this field, including spaces and special characters (such as an under bar).

### System Info/Firmware Revision

This displays the current firmware revision level of the ISU 512e. This is a read-only field.



This information is displayed by the front panel as item **5** under the **TEST** menu.

### System Info/System Uptime

This displays the length of time the ISU 512e has been running since power up or reset. This is a read-only field.

Chapter 4. Status Menu

## System Info/Loop Status

The ISU 512e displays the current loop status for each ISDN line both here and on the bottom, center line of the terminal screen. Appendix C *Loop Status Messages* on page C-1 gives an explanation of the loop status messages.



The loop status is displayed by the front panel on the toplevel menu. (See Figure 3-3 on page 3-9.)

## System Info/NEBE/FEBE

This allows the user to monitor the quality of the local loop by viewing the number of near-end block errors (NEBE) and far-end block errors (FEBE) occurring on the ISDN U-interface. An incrementing count of NEBEs indicates a problem on the local loop from the switch to the NT-1. An incrementing count of FEBEs indicates a problem on the local loop from the NT-1 to the switch. A call does not have to be placed to use the NEBE/FEBE counter.



These counts are displayed by the front panel as item **4** under the **TEST** menu.

### System Info/Dial State

This field indicates the status of the call in progress.

# System Info/RTS, CTS, CD, DTR, DSR (LED States)

These five fields display the state of the EIA leads (see Table 3-5 on page 3-9).

### System Info/LI

This field displays the link integrity of the 10BaseT Ethernet port and corresponds to the green LED on the Ethernet connector. It indicates that there is a good physical connection between the ISU 512e and the LAN.

### STATUS/ARP CACHE

This **STATUS** submenu lists the contents of the ISU 512e's Address Resolution Protocol (ARP) table. All resolved cache entries time out after 20 minutes. Unresolved entries time out in 3 minutes.

### ARP Cache/IP Address

This is the IP address used for resolving MAC address.

### **ARP Cache/MAC Address**

MAC address resolved (0=no resolution).

### **ARP Cache/Time**

This displays the minutes since the entry was first made.

### STATUS/IP ROUTES

This submenu lists the contents of the ISU 512e's IP router table.

### IP Routes/IP Address

This is the network or host destination address.

### **IP Routes/Netmask**

This is the network mask applied to the destination address.

### **IP Routes/Gateway**

This is the host or router to receive this packet.

### **IP Routes/Port**

This is the port gateway is located on:

local	sent directly to the ISU 512e IP stack
eth0	ISU 512e's Ethernet port

### **IP Routes/Use**

This is the number of times the ISU 512e has referenced the route.

### **IP Routes/Flags**

These are important tags associated with the route entry:

н	route is a host route
G	route is a gateway route
D	route learned dynamically from RIP
I	route learned from an ICMP redirect
Ρ	route is private and is not advertised with RIP
т	route is to a triggered port (updates only when table changes)

### **IP Routes/Hops**

This is the number of routers that must be traversed to get to destination. Ranges from **0-15** or **16** for infinite (can't get there from here).

### **IP Routes/TTL**

This is the number of seconds until the address is removed from the table or "zombied." A value of **999** means route is static.

### STATUS/EXIT

Activating this feature will exit the terminal session from the maintenance port or Telnet. It is equivalent to the key combination **Control L.**  Chapter 4. Status Menu

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## Chapter 5 Test Menu

Figure 5-1 shows the selections available from the front panel for the **TEST** menu. (From the top-level menu, press **2** and then press **Enter** to display the **TEST** menu options on the front panel LCD.) Figure 5-2 shows the **TEST** menu as it appears on the terminal screen. Descriptions of the menu selections follow these figures. Functions performed in a different manner from the front panel are specifically identified.

2=Test 1=Loopback DTE 2=Loopback Proto 3=2047 Checker 4=NEBE/FEBE 5=Firmware Rev

Figure 5-1. Test Front Panel Menu

NOTE	See System Info/NEBE/FEBE on page 4-4 and System Info/ Firmware Revision on page 4-3 for descriptions of the last two menu items in Figure 5-1.		
ISU512e/Test Status I <u>est</u> Configuration Dial	Test Status Stop Test Loopback DTE Loopback Protocol 2047 Checker Count Errors Clear Counts	No Test <+> <+> <+> <+> 0 Kb 0 : Time 0 <+>	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down ^Z=help

Figure 5-2. Test Terminal Menu

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Chapter 5. Test Menu

### **TEST/TEST STATUS**

This item indicates whether there is a test in progress. This displays automatically on the front panel when a test is initiated.

### **TEST/STOP TEST**

This item causes a test in progress to be cancelled. On the front panel, this function is performed by pressing any key to cancel loopback tests, or the Cancel key to stop the 2047 Checker.

### **TEST/LOOPBACK DTE**

Causes the V.35 port to loop back toward user equipment. This allows performance of a bit error rate test (BERT) between the ISU 512e and end user equipment to verify proper cable connection, etc.

### **TEST/LOOPBACK PROTOCOL**

Allows data to be looped back toward the network after passing through BONDING protocol. See Figure 5-3 for loopback points.



Figure 5-3. ISU 512e Loopback Points

### **TEST/2047 CHECKER**

The ISU 512e has the ability to generate and check a 2047 BERT patterns through the BONDING protocol. This allows 2047 BERT patterns to be run on multiple ISDN connections (through BONDING). The originating ISU 512e generates the 2047 patterns and checks the incoming pattern for errors. The test is run for 120 seconds. The results of the test are placed in the status buffer of the originating unit.

In addition, the ISU 512e can loop back a remote unit automatically at the start of a BONDING call and run the 2047 pattern. This is accomplished through a smart dial string: <number> #5.

For example, the dial string 9224323#5 places a remote loopback call to the remote unit. After BONDING connects, the originating unit displays the byte count and error count for the current test along with the amount of time left in the test. The remote unit remains in protocol loopback and displays the amount of time left before the unit(s) enter data mode. This allows the originating side to complete the test and write the results to the status buffer.

NOTE	Pressing <b>Cancel</b> on the Remote unit before the end of the test causes the Originating unit to receive errors and terminate the test. Pressing <b>Cancel</b> on the Originating unit before the end of the test does not terminate the test at the Remote Site.
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Chapter 5. Test Menu

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## Chapter 6 Configuration Menu

Appendix D *Front Panel Configuration Menu* on page D-1 shows the entire configuration structure available from the front panel for the **CON-FIGURATION** menu. (From the top-level menu, press **3** and then press **Enter** to display the **CONFIGURATION** menu options on the front panel LCD.) Figure 6-1 shows the **CONFIGURATION** menu as it appears on the terminal screen. Descriptions of the menu selections follow these figures. Items not accessible through the front panel or items located in a different position through the front panel are specifically identified.

ISUSIZE/Confid Status Test Vonfiguration Dial	Uration Network Options U.35 Options IP Options Protocol Management Quick Setup Terminal Mode	[*] [*] [*] [*] [*] [*] <*>	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down ^Z=help

Figure 6-1. Configuration Terminal Menu

### **CONFIGURATION/NETWORK OPTIONS**

The **NETWORK OPTIONS** menu (see Figure 6-2 on page 6-2) is used to set up the ISDN parameters for the ISU 512e.

Chapter 6. Configuration Menu

ISUS12e/Configur Network Options IP Options IP Options Protocol Management Quick Setup	ation/Network Line Mode Dial Line Leased Line	Options Leased [*] [*]			
DSL1: Down	DSL2: Dow	n DSL	3: Down	DSL4: Do Z	wn =help

Figure 6-2. Network Options Menu

### **Network Options/Line Mode**

This submenu sets the mode the ISDN line is in. If connecting to the public network, select **DIAL** (def). If connecting to a 2B1Q leased digital service that provides a permanent connection between endpoints, select **LEASED**.

### **Network Options/Dial Line**

This submenu provides access to the parameters required for configuring the device to connect to the public network.

### **Dial Line/ISDN Menu**

### **ISDN Menu/Switch Protocol**

Find out what kind of ISDN switch protocol the local CO is using by asking the local telephone administrator or the telephone company representative. The ISU 512e can be configured for the following:

LUCENT 5ESS	LUCENT 5ESS <sup>®</sup> Custom
DMS-100	Northern Telecom DMS-100 <sup>™</sup> Custom
NATIONAL ISDN1 (def)	National ISDN-1 (could be a NorTel, LUCENT, or Siemens EWSD)
NI-1 ENBLOC	National ISDN-1 with enbloc digit format

#### ISDN Menu/Area Code

Enter the 3-digit area code when using Expert ISDN.

#### ISDN Menu/SPID

The service profile identifier (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; the SPID looks like the phone number. Obtain SPIDs from the telephone administrator or local telephone representative.

The number of SPIDs required (up to eight) depends on how the ISDN line is configured. For instance, there are no SPIDs for a point-to-point line. Multipoint lines may have one or two SPIDs. The ISU 512e uses the presence of SPID 1 to determine whether the line is multipoint. If the line has only one SPID, then it must be entered in SPID 1, SPID 3, SPID 5, and SPID 7, depending on the number of lines being installed.



Since several of the SPIDs may have a similar format, using the copy and paste functions provided by the terminal menu interface may prove convenient.

SPID numbers correspond to the IFC connector on the rear of the ISU 512e as follows:

IFC #1 SPID 1 (pair with LDN 1) and SPID 2 (pair with LDN 2) IFC #2 SPID 3 (pair with LDN 3) and SPID 4 (pair with LDN 4) IFC #3 SPID 5 (pair with LDN 5) and SPID 6 (pair with LDN 6) IFC #4 SPID 7 (pair with LDN 7) and SPID 8 (pair with LDN 8)

From the front panel, use the up and down arrows to select the SPID to enter. Press **Enter** to select the SPID and use the keypad to enter the SPID number. While keying/editing a SPID, the down arrow allows backspacing through the number string to correct mistakes. The up arrow scrolls back to the last digit entered. To cancel a number, use the down arrow to backspace through the number; then press **Enter**. After entering each SPID, press **Enter**.

#### ISDN Menu/LDN

The local directory number (LDN) is used when placing or receiving BONDING calls or when using MPPP with BACP enabled. The LDN is the local phone number assigned to the line. This option allows the entry of up to eight LDNs.

LDNs correspond to the IFC connectors on the rear of the ISU 512e as follows:

IFC #1LDN 1 (pair with SPID 1) and LDN 2 (pair with SPID 2) IFC #2LDN 3 (pair with SPID 3) and LDN 4 (pair with SPID 4) IFC #3LDN 5 (pair with SPID 5) and LDN 6 (pair with SPID 6) IFC #4LDN 7 (pair with SPID 7) and LDN 8 (pair with SPID 8)

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

If only one SPID is provided for each line, enter the LDN(s) as follows:

IFC #1 LDN 1 and LDN 2 (pair with SPID 1) IFC #2 LDN 3 and LDN 4 (pair with SPID 3) IFC #3LDN 5 and LDN 6 (pair with SPID 5) IFC #4 LDN 7 and LDN 8 (pair with SPID 7)

#### Dial Line/ExpertISDN

This option allows automatic determination of the SPIDs when the correct LDNs and area code are entered. The line must be active when ExpertISDN is started. The progress of ExpertISDN can be viewed in the Status buffer. The message **ExPISDN PASSED** appears when ExpertISDN has determined the SPIDs for each line. See Appendix B *Status Buffer Messages* on page B-1 for additional messages and their explanations

Chapter 6. Configuration Menu



Since the unit determines not only the appropriate SPIDs, but also the switch protocol, ExpertISDN should be used prior to placing active calls and transferring data.

### ExpertISDN/Line

This field identifies the specific line for which ExpertISDN is to be run. **DSL1-DSL4** are used when ExpertISDN is to be run on one line at a time. The **ALL** selection is used to run ExpertISDN on all lines at once. ExpertISDN will skip any lines that are not active when the process is started.



Using the **EXPERTISDN ALL** selection may take several minutes to complete.

#### ExpertISDN/Start/Stop

This field activates the ExpertISDN process if it is not active, or stops ExpertISDN if it is currently in progress.

#### **Dial Line/SPID Download**

The **SPID DOWNLOAD** feature allows the automatic detection of LDNs and SPIDs on switches running the NI-1 protocol that are so configured. The default for this field is **ENABLED**. Some NI-1 switches may not have this feature or the switch protocol may not be NI-1; therefore, this feature can be **DISABLED**.

### **Dial Line/Call Type**

The **CALL TYPE** can be configured four different ways, depending on the type of service used.

#### Call Type/Speech

**SPEECH** directs the call control software to request a Mu-law/ A-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.

#### Call Type/Audio

**AUDIO** directs the call control software to request a 3.1 kHz audio circuit as the bearer capability for outgoing calls. The **AU-DIO** 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.

#### Call Type/Data 56 kbps

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

#### Call Type/Data 64 kbps

DATA 64 KBPS is the default call type for ISDN service. This directs the call control software to request an unrestricted 64 kbps data circuit.

#### **Dial Line/Dial Options**

#### **Dial Options/Mode**

The ISU 512e can be configured to dial using the **FRONT PANEL** (def), **EIA-366** parallel dialing port, or **V.25**. To establish and disconnect calls manually using the front panel or terminal menu, configure the unit for **FRONT PANEL**. To establish and disconnect calls using the EIA-366 parallel dialing port, configure the unit for **EIA-366** dialing. This enables the EIA-366 port on the rear of the unit. To select in-band dialing, configure the unit for **V.25** dialing, which is used primarily by data terminal equipment with synchronous interfaces (HDLC/SDLC or BSC/BISYNC), not supporting the AT command set commonly used by asynchronous devices.

#### **Dial Options/V.25 Options**

Configuring the ISU 512e for **HDLC (MARKS)** enables in-band dialing over a DTE interface using standard synchronous HDLC V.25 bis commands with Mark Idle. Configuring the ISU 512e for **HDLC (FLAGS)** enables in-band dialing over a DTE interface using standard synchronous HDLC V.25 bis commands with 7E HEX idle.

The ISU 512e 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 512e supports the following V.25 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

<b>NOTE</b> When using stored numbers, V.25 bis accesses stored numbers 1 through 9 used by front panel dialing.	
--	--



When **V.25** dialing is selected, several recommended changes are made automatically:

- **CTS** is set to **FOLLOW RTS**.
- CD is set to NORMAL.
- DTR is set to IDLE WHEN OFF.
- DSR is set to OFF IDLE OR TEST.

These can be changed to other values if required by a particular application.

#### **Dial Options/EIA-366 Timing**

EIA-366 dialers can end a string of dialed numbers by sending the end of number (EON) to alert the ISU 512e that the entire number has been sent. Another method is to stop sending numbers and allow the ISU to time out, then dial the number. Use the following options to fine-tune the dialed number termination.

1 SEC OR EON	The ISU 512e assumes the dial string is fully entered if more than 1 second elapses since input of the last digit, or the unit receives the EON command.
2 SEC OR EON	The ISU 512e assumes the dial string is fully entered if more than 2 seconds elapse since input of the last digit, or the unit receives the EON command.
5 SEC OR EON (DEF)	The ISU 512e assumes the dial string is fully entered if more than 5 seconds elapse since input of the last digit, or an EON command is received. This is the factory default setting.

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10 SEC OR EON	The ISU 512e assumes the dial string is fully entered if more than 10 seconds elapse since input of the last digit, or the unit receives the EON command.
20 SEC OR EON	The ISU 512e assumes the dial string is fully entered if more than 20 seconds elapse since input of the last digit, or the unit receives the EON command.
WAIT FOR EON	The ISU 512e assumes the dial string is fully entered only if the unit receives the EON command.

#### **Dial Options/EIA-366 Security**

This option should remain disabled for all normal commercial applications. It is designed for use with only a few specialized military applications and is not described in this manual. For more information on this option, contact ADTRAN Technical Support (see the last page of this manual).

### **Dial Line/Auto Answer**

The ISU 512e can be configured to automatically answer or not answer.

#### Auto Answer/Disabled

When **DISABLED** is selected, the ISU 512e does not answer incoming calls. The ringing call can be dumped using the **HANG UP LINE** command. Disable **AUTO ANSWER** if V.25 bis is in control of answering incoming calls with the **CIC/DIC** commands; other settings override V.25 control of the answer function.

#### Auto Answer/Enabled (def)

When **ENABLED** is selected, the ISU 512e accepts incoming calls.

#### Auto Answer/Dump all calls

When **DUMP ALL CALLS** is selected, the ISU 512e does not accept any incoming calls, keeping the line clear for outgoing calls.

#### **Dial Line/Connect Timeout**

This option sets the length of time that the ISU 512e waits for a far-end unit to answer an outgoing call. The default is 30 seconds.

#### **Dial Line/Call Screening**

**CALL SCREENING** allows the ISU 512e to answer all incoming calls by selecting **ANSWER ANY** (def). It can also be configured to answer only calls originating from phone numbers stored in the **DIAL** menu as stored numbers SN0 through SN9 by selecting **ANSWER IF SN 0...9**. See *Store/Review Number* on page 7-3 for information on reviewing and storing numbers.

When **CALL SCREENING** is set to **ANSWER IF SN 0...9**, an incoming call is not answered if the Call ID received from the switch does not match a stored number. Depending on the switch protocol, the Call ID may be presented in either a seven-digit or ten-digit format. The ISU 512e displays the Call ID for all dumped calls in the Status buffer. See *Appendix B Status Buffer Messages* on page B-1 for more information on the Status Buffer.

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

- 1. Select ANSWER IF SN 0...9.
- 2. Store your multi-digit number in SN0.
- 3. Place a call to the ISU 512e with the stored number to see if it answers.
- 4. If the ISU 512e 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 or the switch does not provide Call ID.
- 5. Store the number in SN0 as it is displayed in the Call ID message and test **CALL SCREENING** again.

#### **Dial Line/Line Passwords (Remote Access)**

#### **RDL Password (Remote Download)**

The ISU 512e has the ability to download the contents of Flash Memory (software) to another ISU 512e over a dial-up connection. By using a smart dial string with a #7 suffix, the originating ISU 512e transfers its Flash Memory contents to the remote unit. This allows software updates using only the ISDN connection.

The ISU 512e can be protected from illegal software loads by using the password protection built into the remote protocol. The smart dial string format for this type of call is as follows:

#### <number>#7#<password>

For example, the dial string **9224323#7#1234** would place a remote download call to the remote unit and send the **1234** string as the RDL password. If the remote unit's RDL password is **1234**, the request is accepted and the transfer is completed. If the password does not match, the call is terminated by the remote unit. The remote unit places **INV PASSWORD** in the Status buffer.

The password may be up to six alphanumeric characters in length. If no RDL password is entered, the unit is unprotected and all attempts to update are accepted.

NOTE	The second generation ISU 512 also contains the <b>REMOTE DOWNLOAD</b> feature. <b>Do not</b> download software from an ISU 512 to an ISU 512e or vice versa. The unit will not function properly.
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#### SPV Password (Remote Supervision)

The ISU 512e has the ability to be remotely accessed and configured from another ISU 512e. The originating ISU 512e can remotely access another ISU 512e using a smart dial string with a **#6** suffix. The ISU 512e can be protected from illegal access by using the password protection built into the remote protocol. The smart dial string format for this type of call is as follows:

<number>#6#<password>

For example, the dial string **9224323#6#4321** places a remote supervisory call to the remote unit and sends the **4321** string as the SPV password. If the remote unit's SPV password matches, the request is accepted. If the password does not match, the call is terminated by the remote unit. The remote unit places **INV PASSWORD** in the Status buffer.

During remote SPV, the remote unit can be accessed via the front panel or the terminal menu interface. Press **Control-R** to bring up the remote terminal menu. The VT 100 screens change to signify any configuration changes being passed to the remote unit. The originating unit's configuration is not changed while a remote SPV is in progress.

The password may be up to six alphanumeric characters in length. If no SPV password is entered, the unit is unprotected and all attempts at remote configuration are accepted.



### **Dial Line/Call Number ID**

When **CALL NUMBER ID** is set to **ENABLED** (def), the ISU 512e will send the caller ID INFO setup message to the ISDN switch. When **CALL NUMBER ID** is set to **DISABLED**, the caller ID INFO setup message will not be sent to the ISDN switch.

### Network Options/Leased Line

Selecting the **LEASED LINE** mode configures the unit for leased line service or service that provides a permanent connection between end points such as limited distance modem or LDM service; see Figure 6-3.



Figure 6-3. Limited Distance Modem Application



#### Leased Line/Clock Mode

By configuring the ISU 512e for **MASTER** timing, the ISU 512e can provide clocking for both ends of the phone line. This **MASTER** option is intended to be used at one end of a limited distance modem application, where two ISU 512e units are directly connected without the use of channel banks. The far-end unit should be configured for **SLAVE** (def) timing, deriving its clocking from the ISU 512e configured for **MASTER** timing.

If two ISU 512e units are connected through channel banks, one unit should be configured for **SLAVE** mode and the other for **SLAVE** (**MASTER**) or **MASTER** depending on the channel bank and its configuration; see Figure 6-4 on page 6-14. To easily configure ISU 512e's for this application, all three leased mode configurations are available on the **QUICK SETUP** menu. For more information, see *Quick Setup Configuration* tion on page 6-32.



Figure 6-4. Leased Application with Channel Banks

### Leased Line/Channel Rate

In **LEASED LINE** operation, the channel rate for the ISU 512e can be configured for 56 kbps or 64 kbps. When **64 KBPS** is selected, bandwidth of 1x64 kbps to 8x64 kbps can be selected by setting the maximum bit rate. When **56 KBPS** is selected, bandwidth from 1x56 kbps to 8x56 kbps is selected. See *V.35 Options/Maximum Bit Rate* on page 6-15 for more information.



### Leased Line/Test Remote

When the **TEST REMOTE** option is **ENABLED**, the unit performs an automatic 2047 BERT of the line(s) immediately following BONDING connection. When set to **DISABLED** (def), no test is performed after initialization.
# **CONFIGURATION/V.35 OPTIONS**

The **V.35 Options** menu (see Figure 6-5) is used to select the configuration parameters that control the operation of the DTE interface port of the ISU 512e.

ISUST2e/Configu Network Uptions U-35 Uptions IP Uptions Protocol Nanagement Quick Setup	ation/U.35 Opt Max Bit Rate CTS Options CD Options DTR Options DTR Options	ions 2x64K 128K Follow RTS Normal Idle when Off Off Idle or Test	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down ^Z=help

Figure 6-5. V.35 Options Menu

# V.35 Options/Maximum Bit Rate

This field sets the maximum bit rate at which the V.35 operates. There are eight multiples of 64K (64K through 512K) and eight multiples of 56K (56K through 448K). Selecting a 64K rate changes the CALL TYPE setting to DATA 64K; selecting a 56K rate changes the CALL TYPE to DATA 56K.

# V.35 Options/CTS Options

Selecting **FORCED CTS** causes the CTS signal on the DTE connector to be continually asserted. **FOLLOW RTS** (def) causes the CTS signal to follow the state of the RTS lead. **FOLLOW CD** causes the CTS signal to follow the state of the CD lead. **OFF V.25 ANSR** drives CTS off while answering a call with V.25 bis dialing enabled. This setting is used for Panasonic video-conferencing equipment with V.25 bis dialing enabled.

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# V.35 Options/CD Options

Selecting **CD** FORCED ON causes the carrier detect signal to always be asserted. Selecting **NORMAL** (def) causes the carrier detect signal to be asserted when a call has been successfully established. Selecting **OFF LINK DOWN** causes the carrier detect signal to be disasserted when the U-interface is not present.

## V.35 Options/DTR Options

Selecting **IGNORE DTR** (def) causes the ISU 512e to disregard the state of the DTR pin. **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, front panel dialing is also possible. When DTR goes inactive, any outgoing call present is disconnected. **OFF>ON DIAL #0** uses the phone number in the stored number register 0 to establish the call.

To store a number for automatic dialing, see *Store/Review Number* on page 7-3. 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** allows the unit to answer an incoming call only if the DTR signal is asserted.

# V.35 Options/DSR Options

Selecting **DSR FORCED ON** (def) causes the DSR signal on the DTE connector to always be asserted. Selecting **OFF IDLE + TEST** causes DSR to be disasserted if the network interface is in test or there is not an active call. **OFF LINK DOWN** causes DSR to be disasserted if the network interface is disrupted.

# **CONFIGURATION/IP OPTIONS**

The ISU 512e contains an IP stack to host SNMP and Telnet through the 10BaseT Ethernet port. The IP menu is used to set up the IP parameters for the ISU 512e. Any general IP-related configuration item is under this menu. Figure 6-6 shows the **CONFIGURATION/IP OPTIONS** menu as it appears on the terminal screen.

150512e/Configur Network Options U-35 Options IP Uptions Protocol Management Quick Setup	ation/IP Options IP Address Subnet Mask Default Gateway Static Routes RIP Utilities	10.7.254.82 255.255.255.0 10.7.254.254 [+] [+] [+]	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down ^Z=help

Figure 6-6. Configuration/IP Options Menu

### **IP/IP Address**

The IP address assigned to the ISU 512e's Ethernet port is set here. This address must be unique within the network. The factory default is **10.0.0.1**.

# **IP/Subnet Mask**

The IP network mask to be applied to the ISU 512e's Ethernet port is set here. The factory default is **255.255.255.0**.

# **IP/Default Gateway**

The default gateway is used by the ISU 512e for sending IP packets whose destination address is not found in the route table. If the address entered is not on the Ethernet segment, then an "idle route" entry is added to the route table.

# **IP/Static Routes**

Static routes can be inserted under this menu.



#### Static Routes/Active

Adds this static route entry to the IP routing table when set to **YES** (def) and removes it (if it was previously added) if set to **NO**.

#### Static Routes/IP Address

This is the IP address of the host or network address of the network.

### Static Routes/Subnet Mask

This mask determines the bits in the previous IP address that are used. If this is to be a host route, it must be set to all ones (255.255.255.255).

### Static Routes/Gateway

This is the IP address of the router to receive the forwarded IP packet.

### Static Routes/Hops

This is the number of router hops required to get to the network or host. Maximum distance is 15 hops.

### IP/RIP



The Routing Information Protocol (RIP) is supported by the ISU 512e. However, since the ISU 512e only hosts IP traffic, RIP advertisements are listened to but never transmitted. The following parameters are required for setting up RIP on the Ethernet port:

### **RIP/Mode**

This option turns RIP **ON** (def) or **OFF**.

### **RIP/Protocol**

Version can be V1 (def) or V2.

### **RIP/V2 Secret**

This is a text string used for authenticating advertised routes.

# **IP/Utilities**

The ISU 512e has utilities embedded in it to help manage and test the network and to facilitate software upgrades.

### **Utilities/Ping**

The **PING** submenu is used to send Internet Control Message Protocol (ICMP) ping messages to hosts. This submenu offers the following selections:

Start/Stop	Activator to start and cancel a ping test.
Host Address	IP address or domain name (if DNS is configured) of device to receive the ping.
SIZE	Total size of ping to send. Range is 40 (def) to 1500 bytes.
# OF PACKETS	Total packets to send every two seconds.
# OF TRANSMITS	Total packets sent (read only).
# OF RECEIVES	Total packets received (read only).
% Loss	Percentage loss based on ping returned from host (read only).

### **Utilities/Upgrade**



The ISU 512e's firmware can be upgraded using this menu.

### Upgrade/Transfer Method

**TFTP** (Trivial File Transfer Protocol) requires a TFTP server running somewhere on the network. The ISU 512e starts a TFTP client function which gets the upgrade code from the TFTP server.

### **Upgrade/TFTP Host**

This is the IP address or domain name (if DNS is configured) of the TFTP server.

### Upgrade/Filename

This is the case-sensitive file name which is the upgrade code.

#### **Upgrade/Status**

This displays the status of the transfer as it happens. Any error or success message will be displayed here.

#### **Upgrade/Start Transfer**

This activator is used when the configurable items in this menu are complete.

#### **Upgrade/Abort Transfer**

Use this activator to cancel any TFTP transfer in progress.

### **CONFIGURATION/PROTOCOL OPTIONS**

The ISU 512e communicates with many different types of telecommunication equipment. The ISU 512e supports both the IETF standards for the Multilink Point-to-Point protocol (MPPP) and the BONDING Mode 1 (Bandwidth on Demand Interoperability Group) adaptation protocol. A transparent (clear channel) mode is also supported. Figure 6-7 shows the Protocol Menu.

II SII 512e/Configur	ation/Prot	1000			
Network Options	Protocol	Multilink	PPP		
V.35 Options	BONDING	[+]			
I <u>P Options</u>	MPPP	[+]			
Protocol					
Nanagement Dujek Setup					
QUICK SECUP					
DSL1: Down	DSL2:	Down	DSL3: Down	DSL4:	Down
					^Z=help

Figure 6-7. Protocol Menu

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# Protocol/BONDING

The BONDING Mode 1 protocol allows the ISU 512e to communicate at synchronous bit rates of 64 kbps up to a maximum of 512 kbps, providing high-speed communication between ISU 512e's, ISDN TE/ TA's, and inverse multiplexing equipment supporting the BONDING protocol. When the ISU 512e uses the BONDING Mode 1 protocol, up to eight separate ISDN phone calls are placed to seize control of all required ISDN bearer channels. The protocol corrects any delays existing between the bearer channels and presents a single high-speed data channel to the DTE. For successful high-speed operation, both the near and far-end DCEs need to be configured to use the BONDING Mode 1 protocol. The BONDING Mode 1 protocol negotiation phase has numerous timers to allow transmission delays due to satellite hops, international calls, etc.

### 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 sec-ONDS**. Select from values of **1**, **2**, **5**, **10** (def), **20**, **50**, **100**, and **200 sec-ONDS**.

### 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** (def), **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** (def), **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 SEC-ONDS**. Values of **1**, **2**, **5**, **10**, **20**, **50** (def), **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** (def), **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. This timer default setting is **5 SECONDS**. Values of **1**, **2**, **5** (def), **10**, **20**, **50**, **100**, and **200 SEC-ONDS** can be selected.

### **Call Stagger**

This option specifies the amount of delay placed between calls. The default setting is **0** MS (no delay). Values of **0** MS (def), **100** MS, **200** MS, **500** MS, **1** SECOND, and **2** SECONDS can be selected.

# Protocol/MPPP

The PPP provides a standard method for transporting multi-protocol datagrams over point-to-point links. It comprises a Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connection and a family of Network Control Protocols (NCPs) for establishing and configuring the higher layer protocols. MPPP is an extension of Point-to-Point protocol (PPP). It provides a method for splitting, recombining, and sequencing datagrams across multiple logical data links. In the case of the ISU 512e, the eight ISDN bearer channels constitute the MPPP logical data links.



### Max Config

This value is the number of unanswered configuration requests that should be transmitted before giving up on a call. The possible values are **5**, **10** (def), **15**, and **20**.

### Max Timer

This value is the number of seconds to wait between unanswered configuration requests. The possible values are **1**, **2** (def), **3**, **5**, and **10 SEC-ONDS**.

#### Max Failure

Due to the nature of MPPP, configuration options may not be agreed upon between two peers. This value is the number of configuration NAKs that should occur before an option causes a configuration reject. This allows a connection to succeed that might otherwise fail. The possible values are **5**, **10** (def), **15**, and **20**.

#### Fragment

When this item is set to **YES** (def), outgoing packets greater than 128 bytes will be split into fragments. The number of fragments is the same as the number of active B-channels such that each fragment is simultaneously transmitted over each B-channel. The receiving MPPP peer reassembles the fragments. This process decreases transport delay. However, some legacy equipment might have trouble handling fragmented packets, in which case this option should be set to **No**.

#### BACP

The Bandwidth Allocation Control Protocol (BACP) and Bandwidth Allocation Protocol (BAP) are used to enhance MPPP. Together, they form the primary means for the ISU 512e to exchange phone numbers to gain additional bandwidth. When this option is set to **ON**, BACP is negotiated with the peer. If successful, the ISU 512e will use BACP/ BAP to request additional phone numbers until the network data rate is equal to the DTE rate set by the user.

If this option is set to **OFF**, or if BACP is not negotiated with the peer, the ISU 512e will dial the original number to gain the additional bandwidth. If the ISU 512e is unsuccessful three times in gaining additional bandwidth, the DTE rate will be set to equal the network data rate for the duration of the call. If this occurs, the message **MP SET DTE RATE** appears in the status buffer.

#### **MPPP** Authentication

The method by which MPPP peers are authenticated is selected from two menus: **NETWORK AUTHENTICATION** and **DTE AUTHENTICATION**. Both the DTE and the Network are considered MPPP peers that can be authenticated by, and allowed to authenticate, the ISU 512e separately. The configuration options are similar except for the **RECEIVE AUTH TIMING**, which is only a Network option.

#### MPPP Authentication/Receive Auth Type

The method for authenticating the peer is selected here. The possible values are:

None (def)	No attempt is made to authenticate the peer.
PPP	The peer is authenticated according to the Receive Auth Method.

#### **MPPP** Authentication/Receive Auth Method

The peer can be authenticated using three standard methods: **PAP** (Password Authentication Protocol), **CHAP** (Challenge Handshake Authentication Protocol), and **EAP** (Extensible Authentication Protocol). **EAP** is the strongest of the three authentication methods, and **PAP** is the weakest. **PAP** is a cleartext protocol, which means it is sent over the link in a readable format. Care must be taken not to allow highly sensitive passwords to become compromised using this method. **CHAP** and **EAP** use a one-way hashing algorithm, which makes it virtually impossible to determine the password by monitoring the link. **EAP** has other capabilities, which allow more flexibility than **CHAP**. The following selections are possible:

PAP, CHAP, OR EAP (DEF)	The ISU 512e will request EAP during the first LCP negotiation and allow the peer to negotiate down to CHAP, then PAP.
CHAP OR EAP	The ISU 512e will request EAP during the first LCP negotiation and allow the peer to negotiate down to CHAP, but not PAP.
EAP	The ISU 512e will only allow EAP to be negotiated. If the peer is not capable of EAP, then the connection is terminated.

#### **MPPP** Authentication/Receive Auth Timing

The ISU 512e can be configured to authenticate the peer (using the above method) for incoming calls using **ANSWER ONLY** (def), or for outgoing and incoming calls using **ORIGINATE AND ANSWER**.

#### **MPPP** Authentication/Receive Username

This is the username that is used to match the peer's username. If the name does not match, the call is terminated.

#### **MPPP Authentication/Receive Password**

This is the password or secret that is used to authenticate the peer.

#### **MPPP** Authentication/Transmit Auth Type

This parameter specifies how the ISU 512e is to be authenticated by the peer. The possible values are:

None	The ISU 512e will not allow the peer to authenticate it.
PPP	The peer is authenticated according to the Transmit Auth Method.

#### **MPPP** Authentication/Transmit Auth Method

The ISU 512e can be authenticated using the same three methods described above for **RECEIVE AUTH METHOD**.

#### **MPPP** Authentication/Transmit Username

This is the username that is used when being authenticated by the peer.

#### **MPPP Authentication/Transmit Password**

This is the password or secret that is used when being authenticated by the peer.

### **Protocol/Transparent**

The unit can also be configured for 56K or 64K Clear Channel mode. **TRANSPARENT** provides the entire bearer channel to the DTE without regard to data format or protocol. Chapter 6. Configuration Menu

# **CONFIGURATION/MANAGEMENT**

The ISU 512e can be managed using Telnet, Simple Network Management Protocol (SNMP), or the maintenance port. SNMP support is limited to MIB definitions. See Appendix E *SNMP* on page E-1 for a description of the MIBs supported by the ISU 512e. Each of the three methods can be protected using authentication. Figure 6-8 shows the Management Menu.

ISUS12c/Configur Network Options U-35 Options IP Options Protocol Innecement Quick Setup	ration/Wanager Telnet SNMP Maint Port	nen t [+] [+] [+]			
DSL1: Down	DSL2: Do	มา	DSL3: Down	DSL4: Down ^Z=h	elp

Figure 6-8. Management Menu

**NOTE** For security reasons, only the maintenance port asynchronous mode parameters are available from the front panel.

# Management/Telnet

Any Telnet client application can bring up a session to the ISU 512e's Telnet server using the standard Telnet TCP port. Only one session is supported at a time. All sessions require a user name and password.

#### **Telnet/Server Access**

This option must be set to **ON** (def) to access the ISU 512e via Telnet. Turning it **OFF** means that access is denied.

#### Telnet/User List

Up to four users can be configured for access to the ISU 512e. Each user can be assigned a privilege and time out.

#### User List/Name

A text string of the user name for this session.

#### **User List/Password**

This text string is the password associated with the user name.

#### **User List/Idle Time**

When set to **NON-ZERO**, the session is automatically logged out when no activity occurs for this amount of time. The range is **0** to **255** and is in minutes. The default is **10 MINUTES**, and a setting of **0** will never time out the session.

### Management/SNMP

The ISU 512e is an SNMP agent. It can respond to Get-Requests and generate traps. These two lists set up the manager, communities, and levels. See Appendix E *SNMP* on page E-1 for more information on SNMP.

#### **SNMP Access**

When set to **OFF**, SNMP access is denied. When set to **ON** (def), the ISU 512e will respond to SNMP managers based on the following lists.

#### **SNMP/Communities**

This list is used to set up to eight SNMP communities names that the ISU 512e will allow.

#### **Communities/Name**

This is a text string for the community name.

#### **Communities/Privilege**

The access for this manager can be assigned three levels.

None	No access is allowed for this community
	or manager.
Get	Manager can only read items.
GET/SET	Manager can read and modify items.

#### **Communities/Manager IP**

This is the IP address of SNMP manager. If set to **0.0.0.0**, any SNMP manager can access the ISU 512e for this community.

### SNMP/Traps

The ISU 512e can generate SNMP traps. See Appendix E *SNMP* on page E-1 for trap types supported. This list allows up to four managers to be listed to receive traps.

#### **Traps/Manager Name**

This is the text string describing the name of the entry. It is intended for easy reference and has no bearing on the SNMP trap function.

#### **Traps/Manager IP**

This is the IP address of the manager that is to receive the traps.

## Management/Maint Port

The ISU 512e has an **EIA232 MAINT PORT** connector on the back of the unit. The setup for that port is under this menu.

### **Maint Port/Password Protect**

When set to **OFF**, the maintenance port is not password protected. When **ON** (def), the ISU 512e will prompt for a password upon startup.

#### Maint Port/Password

This is the text string that is used for comparison when password protecting the maintenance port. By default, no password is entered.



The following MAINT PORT options can be accessed from the front panel by selecting **3=CONFIG**, then **5=MAINT SETUP**.

#### Maint Port/Baud Rate

This is the asynchronous rate that the maintenance port will run. The possible values are **300**, **1200**, **2400**, **4800**, **9600** (def), **19200**, **38400**, **57600**, **115200**.

### Maint Port/Data Bits

This is the number of data bits per byte that the maintenance port will use. The possible values are **7** or **8** (def) bits.

#### **Maint Port/Parity**

This is the asynchronous parity that the maintenance port will run. The possible values are **NONE** (def), **ODD**, or **EVEN**.

### Maint Port/Stop Bits

This is the stop bit used for the maintenance port. The possible values are 1 (def) or 2.

### **CONFIGURATION/TERMINAL MODE**

This activator places the ISU 512e terminal session into a command prompt mode. Type **exit** to leave the terminal mode and return to the menus. This feature is *only available from the terminal menu*. The available commands are as follows:

save	saves the configuration to non-volatile RAM (flash)
mac	returns the MAC address for the ISU 512e
version	returns the firmware version and routing stack version
reset	resets the unit
exit	leaves the terminal mode and returns to menus
pppmon on/off	sends a decode of the MPPP negotiation to the terminal screen

## QUICK SETUP CONFIGURATION

To aid in configuring the V.35 options for the ISU 512e, many common configurations are preset for QUICK SETUP. These include various dial and leased options. Figure 6-9 shows the QUICK SETUP menu.

ISUSIZE/Configu Network Options U 35 Options IP Options Protocol Management Quick Setup	ation/Uuick Setup Factory Default 572K MP 448K MP 572K BONDING 384K BONDING 384K BONDING 448K BONDING Leased Slave Leased Master Leased Slave (Master)	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down *Z=help

Figure 6-9. Quick Setup Menu

Chapter 6. Configuration Menu



## **Factory Default**

This option resets all settings to factory defaults except **SWITCH PRO-TOCOL**, **AREA CODE**, **SPIDS**, and **LDNS**.



# 512K MP

When the ISU 512e is configured for **512K MP**, the following parameters are automatically preset:

Service type	ISDN dial line	
Automatic answering	Enabled	
ISDN call type	64 kbps data	
Dial options	Front Panel	
Maximum bit rate	512 kbps	
DTR options	Ignore	
Protocol	MPPP	

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### 448K MP

When the ISU 512e is configured for **448K MP**, the following parameters are automatically preset:

Service type	ISDN dial line	
Automatic answering	Enabled	
ISDN call type	64 kbps data	
Dial options	Front panel	
Maximum bit rate	448 kbps	
DTR options	Ignore	
Protocol	MPPP	

# **512K BONDING**

When the ISU 512e is configured for **512K BONDING**, the following parameters are automatically preset:

Service type	ISDN dial line
Automatic answering	Enabled
ISDN call type	64 kbps data
Dial options	Front panel
Maximum bit rate	512 kbps
DTR options	Ignore
Protocol	BONDING Mode 1

# **384K BONDING**

When the ISU 512e is configured for **384K BONDING**, the following parameters are automatically preset:

Service type	ISDN dial line	
Automatic answering	Enabled	
ISDN call type	64 kbps data	
Dial Options	Front panel	
Maximum bit rate	384 kbps	
DTR Options	Ignore	
Protocol	BONDING Mode	

# 448K BONDING

When the ISU 512e is configured for **448K BONDING** the following parameters are automatically preset:

1

Service type	ISDN dial line	
Automatic answering	Enabled	
ISDN call type	56 kbps data	
Dial options	Front panel	
Maximum bit rate	448 kbps	
DTR options	Ignore	
Protocol	BONDING Mode 1	

## 336K BONDING

When the ISU 512e is configured for **336K BONDING** the following parameters are automatically preset:

Service type	ISDN dial line	
Automatic answering	Disabled	
ISDN call type	56 kbps data	
Dial options	Front panel	
Maximum bit rate	336 kbps	
DTR options	Ignore	
Protocol	BONDING Mode 1	

# Leased Slave

When the ISU 512e is configured for **LEASED SLAVE**, the following parameters are automatically preset:

Service type	Leased Line	
Automatic answering	Enabled	
Maximum bit rate	512 kbps	
DTR options	Ignore	
Clock mode	Slave	
Channel rate	64K Bearer	
Protocol	BONDING Mode 1	

# Leased Master

When the ISU 512e is configured for **LEASED MASTER** the following parameters are automatically preset:

Service type	Leased Line	
Automatic answering	Enabled	
Maximum bit rate	512 kbps data	
DTR options	Ignore	
Clock mode	Master	
Channel rate	64K Bearer	
Protocol	BONDING Mode 1	

# Ldm SlvMstr

When the ISU 512e is configured for LDM SLVMSTR (limited distance modem slavemaster) the following parameters are automatically preset:

Service type	Leased Line	
Automatic answering	Enabled	
Maximum bit rate	512 kbps	
DTR options	Ignore	
Clock mode	Slave (Master)	
Channel rate	64K Bearer	
Protocol	BONDING Mode 1	

Chapter 6. Configuration Menu

# Chapter 7 Dial Menu

The **DIAL** menu is used to manually establish a connection to a remote device. Figure 7-1 shows the selections available from the front panel for the **DIAL** menu. (From the top-level menu, press **4** and then press **Enter** to display the **DIAL** menu options on the front panel LCD.) Figure 7-2 shows the **DIAL** menu as it appears on the terminal screen. Descriptions of the menu selections follow these figures. Items not accessible through the front panel or items located in a different position through the front panel are specifically identified.

```
4=DIAL
```

```
1=HANG UP LINE
2=DIAL NUMBER
3=REDIAL LAST#
4=ANSWER CALL
5=DIAL STORED #
6=STORE/REVIEW #
```

Figure 7-1. Dial Front Panel Menu

ISU512e/Dial Status Test Configuration Dial	Enter Number Dial Hang up Redial Last Answer Call Dial Stored Number SN to Dial Store Number	<pre> &lt;+&gt; &lt;+&gt; &lt;+&gt; &lt;+&gt; &lt;+&gt; &lt;+&gt; SN 0 [+]</pre>	
DSL1: Down	DSL2: Down	DSL3: Down	DSL4: Down ^Z=help

Figure 7-2. Dial Terminal Menu

Chapter 7. Dial Menu

## ENTER NUMBER

This field stores the number to be dialed. This is not available from the front panel.

### HANG UP

Terminates current call.

# **DIAL NUMBER**

From the terminal menu, pressing **Enter** when the **DIAL** field is selected (highlighted) causes the number shown in **ENTER NUMBER** to be dialed.



From the front panel, selecting **2=DIAL NUMBER** allows a new number to be entered for dialing. If an error is made while entering a number, press **Cancel** to erase and reenter the number. Press **Cancel** twice consecutively to exit without dialing a number. Press **Enter** after entering a number to dial the number

# **REDIAL LAST NUMBER**

Allows redial of the last number called or attempted.

# **ANSWER CALL**

Allows selective answer of incoming calls when  $\ensuremath{\mathsf{AUTO}}\xspace$  Answer is disabled.

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# DIAL STORED NUMBER

Allows the dialing of one of ten stored phone numbers. From the terminal menu, the stored number to dial is selected on the **SN to DIAL** field.



On the front panel, upon pressing Enter, the up and down arrows permit viewing and selection of stored numbers. Press Enter to dial the number.

# STORE/REVIEW NUMBER

Enter and review stored numbers. On the terminal menu, the numbers are entered and viewed on the **STORE NUMBER** screen.



On the front panel, press the up and down arrows to scroll through the 10 stored numbers (SN0 - SN9). To store a number, scroll to the desired stored number location, enter the number, and press Enter to save. If a mistake is made, press Cancel to clear the line and allow another attempt. Press Cancel twice in succession to exit without changing the selected stored number. Chapter 7. Dial Menu

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Chapter 8

# Troubleshooting

# **IF SELF TEST FAILS**

When the ISU 512e powers up, it performs an internal self test. This takes approximately 10 seconds. At the end of the test, the front panel displays **SELF TEST PASSED**. If **SELF TEST PASSED** is not displayed, perform the following procedure to verify whether the problem can be solved locally:

- 1. Ensure the ISU 512e is receiving power and is switched ON.
- 2. Turn **OFF** the ISU 512e; while holding the **0** key, power up the ISU 512e. Continue holding **0** for approximately 30 seconds, until the unit powers up. This resets all the internal settings to factory defaults except **SWITCH PROTOCOL**, **AREA CODE**, **LDN**s, and **SPID**s.
- 3. If the ISU 512e still does not pass self test, call ADTRAN Technical Support (see the last page of this manual).

# IF AN ISDN NETWORK LINE READS DOWN

When the ISU 512e has been set up and connected to ISDN lines, and the front panel displays **DOWN** for any of the network ISDN lines, use the following troubleshooting procedure:

- 1. Cycle power on the ISU 512e, leaving it **OFF** for a minimum of 2 seconds.
- 2. If **READY** is not displayed after waiting another full minute, disconnect the ISU 512e from the ISDN line. Using a functioning voice phone, call the local directory number(s) provided with the ISDN line. Calling a good ISDN line with nothing connected usually results in a ring or fast busy tone. If the call is completed or a

not-in-service intercept is received, then there is probably something wrong with the translation of the ISDN line. Contact the phone service provider for help.

- 3. If the ISU 512e continues to read **Down**, there is a physical problem with the ISDN line (probably Layer 1 setup). The problem is one or more of the following:
  - The ISU 512e software setup
  - The ISU 512e hardware
  - CPE wiring
  - Wiring from the telephone service provider
  - Hardware of the telephone service provider
  - Software setup of the telephone service provider

To isolate the problem, perform the following procedure:

- A. Ensure the ISDN line is plugged into the correct IFC connector on the back of the ISU 512e.
- B. Ensure the ISU 512e is configured for DIAL LINE service. CONFIG, NETW. OPTIONS, and DIAL LINE should be selected from the menu.
- C. Connect another piece of functioning ISDN equipment to the ISDN line.
- D. Contact the service provider and ensure that you have an ISDN Basic Rate U-Interface with 2B1Q line coding (wrong options are an S or T interface or AMI line coding).
- E. Ensure the ISDN phone lines are connected to the actual ISDN telephone line (Basic Rate interface) provided by the telephone company. Ensure the ISDN line is not connected through another piece of equipment in a wiring closet.
- F. Ensure nothing else is bridged across the ISDN line pair.
- G. With a minimum of extra wiring, try connecting to the line pair at the point where service provider's wiring ends.
- H. With the ISU 512e connected to the ISDN line and powered up, contact and inform the service provider's repair group that your ISDN basic rate line has a Physical Layer 1 problem. Request that the ISDN line be checked.

# IF THE DISPLAY READS TEI1

If the ISU 512e reads **TEI1**, then the ISU 512e is physically connected to the local telephone service provider but is unable to establish Logical Layer 2. The problem is in one or more of the following places:

- The ISU 512e software setup
- The telephone service provider's software setup
- Hardware configuration if the line is extended from the switch

To isolate the problem, use the following procedure:

- 1. Ensure the ISU 512e is set up for the correct switch protocol.
- 2. Ensure ISDN line quality is satisfactory by checking for near- and far-end block errors (NEBEs and FEBEs).



NEBE/FEBE count may indicate a non-zero number during test initialization. Press **0** on the front panel **NEBE/FEBE** screen and wait for several minutes.

If the counts are non-zero, there may be a physical link problem (probably Layer 1 setup) caused by one or more of the following:

- The ISU 512e software setup
- The ISU 512e hardware
- CPE wiring
- Wiring from the telephone service provider
- Hardware of the telephone service provider
- Software setup of the telephone service provider
- 3. Connect another piece of functioning ISDN equipment to the ISDN line.
- 4. With the ISU 512e 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 OK but has no terminal endpoint identifier (TEI). Ask them to check the 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 ISDN line.

### IF THE DISPLAY READS TEI2

If the ISU 512e continues to read **TEI2**, the ISU 512e has completely initialized the first phone number but is unable to establish Logical Layer 2 for the second phone number. The problem is in one or more of the following places:

- The ISU 512e software setup
- The software setup of the telephone service provider

To isolate the problem, use the following procedure:

- 1. Make sure that the ISU 512e is set up with the correct SPID and LDN.
- 2. Try swapping SPID1 with SPID2 and LDN1 with LDN2, SPID3 with SPID4 and LDN3 with LDN4, SPID5 with SPID6 and LDN5 with LDN6, and SPID7 with SPID8 and LDN7 with LDN8. Determine whether the problem is the second phone number or the quantity of phone numbers.
- 3. Connect another piece of functioning ISDN equipment to the ISDN line.
- 4. With the ISU 512e connected to the ISDN line and powered up, talk to your service provider's repair group and inform them you have an ISDN basic rate line that appears physically OK 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. Inform them that an NT1 and terminal adapter device are connected to the ISDN line.

# IF THE DISPLAY READS SPID<1,3,5, OR 7>

If the ISU 512e reads **SPID1**, then the ISU 512e is physically connected to the local telephone service provider and has established Logical Layer 2. The ISU 512e is unable to establish Layer 3. The problem is with one or more of the following:

- The ISU 512e software setup
- The software setup of the telephone service provider

To isolate the problem, use the following procedure:

- 1. Ensure the ISU 512e is set up for the correct switch protocol.
- 2. Ensure that the ISU 512e is set up with the correct SPIDs and LDNs. Review *ISDN Menu/SPID* on page 6-3.
- 3. Connect another piece of functioning ISDN equipment to the ISDN line.
- 4. With the ISU 512e connected to the ISDN line and powered up, talk to your service provider's repair group and inform them you have an ISDN basic rate line that appears physically OK but has no Terminal Endpoint Identifier (TEI). Ask them to check the ISDN line translation and ensure that the line supports dynamic TEI allocation. Inform them that an NT1 and terminal adapter device are connected to the ISDN line.

# IF THE DISPLAY READS SPID<2,4,6, OR 8>

If the ISU 512e continues to read **SPID2**, the ISU 512e has completely initialized the first phone number but is unable to establish Logical Layer 3 for the second phone number. The problem is with one or more of the following:

- The ISU 512e software setup
- The software setup of the telephone service provider

To isolate the problem, perform the following procedure.

- 1. Ensure that the ISU 512e is set up with the correct SPIDs and LDNs.
- 2. Try swapping SPID1 with SPID2 and LDN1 with LDN2, SPID3 with SPID4 and LDN3 with LDN4, SPID5 with SPID6 and LDN5 with LDN6, and SPID7 with SPID8 and LDN7 with LDN8. Determine whether the problem is the second phone number or the quantity of phone numbers.
- 3. Connect another piece of functioning ISDN equipment to the ISDN line.
- 4. With the ISU 512e connected to the ISDN line and powered up, talk to your service provider's repair group and inform them you have an ISDN basic rate line that appears physically OK but has no Terminal Endpoint Identifier (TEI). Ask them to check the ISDN line translation and ensure that the line supports dynamic TEI allocation. Inform them that an NT1 and terminal adapter device are connected to the ISDN line.

# Chapter 9 Specifications Summary

# SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the ISU 512e.

### **Network Interface**

Four RJ-45s for ISDN Basic Rate Interface

### **DTE Interface**

V.35

### **Dialing Selections**

- Manual or automatic stored number dialing from the front panel
- DTR assertion
- V.25 bis in-band DTE dialing
- EIA-366 dial interface
- VT 100 menu interface

### Data Rates

- Network: up to four BRIs (maximum of eight 56/64 kbps B channels)
- DTE: 56 kbps to 512 kbps synchronous

### **Protocols Supported**

- Multilink PPP
- BONDING Mode 1
- 56K/64K Clear Channel

### D Channel Switch Compatibility

- LUCENT 5ESS
- NTI DMS-100
- National ISDN-1
- NI-1 Enbloc

### Display

2-line x 16-character LCD

### Environmental

- Operating temperature: 0 to 50 °C (32 to 122 °F)
- Storage temperature: 20 to 70 °C (- 4 to 158 °F)
- Relative humidity: Up to 95%, non-condensing

### Physical

2.25" H, 8.75" W, 11.00" D

### Power

90-250 VAC, 50-60 Hz, 8-15, 5W maximum dissipation
# Appendix A

# Pinouts



Figure A-1. RJ-45 ISDN Line Interface



Figure A-2. V.35 Connector (See Table A-1 on page A-2.)

10 BASE T	Pin 1	RX1	
/ ጠጠር አ	Pin 2	RX2	
	Pin 3 Pin 6	TX1 TX2	

Figure A-3. 10BaseT Connector

Table	A-1.	V.35	Pino	uts
-------	------	------	------	-----

Pin	Name	I/O	Description
А	Shield	I/O	Shield for cable
В	SG	I/O	Signal Ground
С	RTS	1	Request To Send
D	CTS	0	Clear To Send
Е	DSR	0	Data Set Ready
F	CD	0	Carrier Detect
Н	DTR	1	Data Terminal Ready
J	RI	0	Ring Indicator
Р	SD-A	1	Send Data
R	RD-A	0	Receive Data
S	SD-B	1	Send Data (return)
Т	RD-B	0	Receive Data (return)
U	TC-A	1	External Transmit Clock
V	RC-A	0	Receive Clock
W	TC-B	1	External Transmit Clock (return)
Х	RC-B	0	Receive Clock (return)
Y	ST-A	0	Send Timing
AA	ST-B	0	Send Timing (return)
K,L	NC	N/A	No Connection
M,N	NC	N/A	No Connection
BB	NC	N/A	No Connection
CC	NC	N/A	No Connection
DD	NC	N/A	No Connection
EE	NC	N/A	No Connection
FF	NC	N/A	No Connection
HH	NC	N/A	No Connection
JJ	NC	N/A	No Connection
KK	NC	N/A	No Connection
LL	NC	N/A	No Connection
MM	NC	N/A	No Connection
NN	NC	N/A	No Connection
=  r	nput, O= O	utput, N/A	= Not Applicable

See Figure A-2 on page A-1.



# **Figure A-4. EIA-232 and RS-366 Connector** (See Table A-2 on page A-3 and Table A-3 on page A-4.)

#### Table A-2. EIA-232 Pinouts

Pin	Name	I/O	Description
1	Shield	I/O	Shield for cable
2	TD-A		Transmitted Data
3	RD-A	0	Received Data
4	RTS-A	1	Request to Send
5	CTS-A	0	Clear to Send
6	DSR-A	0	Data Set Ready
7	SG	I/O	Signal Ground
8	CD-A	0	Carrier Detect
9	NC	N/A	No Connection
10	NC	N/A	No Connection
11	NC	N/A	No Connection
12	NC	N/A	No Connection
13	NC	N/A	No Connection
14	NC	N/A	No Connection
15	TC	0	Transmit Clock
16	NC	N/A	No Connection
17	RC	0	Receive Clock
18	NC	N/A	No Connection
19	NC	N/A	No Connection
20	DTR	1	Data Terminal Ready
21	NC	N/A	No Connection
22	NC	N/A	No Connection
23	NC	N/A	No Connection
24	ETC-A	1	External Transmit Clock
25	NC	N/A	No Connection
l= Ir	nput, O= O	utput, N/A	Not Applicable

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Pin	Name	I/O	Description
1	Shield	I/O	Shield for cable
2	DPR		Digit Present
3	ACR	0	Abandon Call and Retry
4	CRQ	Ι	Call Request
5	PND	0	Present Next Digit
6	PWI	0	Power Indication
7	SG	I/O	Signal Ground
13	DSC	0	Distant Station Connect
14	NB1		Digit LSB
15	NB2		Digit bit 2
16	NB4		Digit bit 3
17	NB8	1	Digit MSB
22	DLO	0	Data Line Occupied
l= Ir	nput, O= Ou	utput, N/A	= Not Applicable

Table A-3.	RS-366	Dialing	Port	Pinouts
------------	--------	---------	------	---------

# Appendix B Status Buffer Messages

# ACCESS\_INFO\_DISC

The network was unable to deliver access information to the far end.

# **Active Call**

ExpertISDN was activated while a call was in progress. Since ExpertISDN determines not only SPIDs but also Switch Protocol, no calls can be active during this process.

# Answer <1,2,3,4,5,6,7,8>

The ISU answered a call on either the first or second channel. The calling phone number is displayed if available.

# Area Code Req'd

ExpertISDN was activated without entering the area code.

### Authen failed

The PPP peer has rejected the ISU 512e's username and/or password used for authentication. Make sure the **TX USERNAME** and **TX PASS-WORD** are correctly entered.

# AutoSwitch DMS

ExpertISDN has determined that the switch protocol is Nortel DMS-100.

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# AutoSwitch LUCENT

ExpertISDN has determined that the switch protocol is LUCENT 5E custom.

### AutoSwitch NI-1

ExpertISDN has determined that the switch protocol is National ISDN 1.

## Bad call type

ISU 512e placed a call with an improper call type.

## **Bad DTE mode**

The DTE bit rate does not match a valid bit rate for the protocol selected.

# **Bad DTE bps**

Bonding negotiation determined that the chosen DTE bit rate is invalid.

# BAD\_INFO\_ELEM

Call control error.

### Bad phone number

ISU 512e attempted to call an invalid phone number.

# BEAR\_CAP\_NOT\_AVA

The bearer channel requested by the user is not available.

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#### **Bearer mode**

Incoming call is not of a type the ISU 512e can accept.

#### **Bearer info**

Incoming call information transfer capability is not known.

# BONDING (+/- XXX)

The amount of bytes of corrected delay between the B2 and B1 Bearer channels (XXX can range from -8000 to +8128 bytes).

### **BPS** mismatch

Bonding negotiation found a bit rate mismatch.

## **BUSY**

The called number is busy.

# CallID 1 in use

ISU 512e tried to place a call using SPID 1 though SPID 1 was already in use.

### CallID 2 in use

ISU 512e tried to place a call using SPID 2 though SPID 2 was already in use.

# **Call not ringing**

User executed an answer command (A) but there was not a call present.

# CALL\_REJECTED

The call has been rejected by the ISDN Network.

# CAP\_NOT\_IMPLEMENT

The network or far end does not support the bearer capability requested.

# CHAN\_DOES\_NOT\_EXI

The user asked for a bearer channel that is not present.

# CHAN\_NOT\_IMPLEME

The bearer channel requested by the user has not been implemented.

# CHANNEL\_UNACCEPT

The user is asking for a channel that has not been subscribed.

# CID>0 rcvd

Received an incoming call from a third party during negotiations with a far end BONDING unit on the use of the second Bearer channel.

# **DEST NOT ISDN**

The number called is not ISDN (warning only).

# DEST\_OUT\_OF\_ORDER

The called number is out of order.

# Dial<1,2,3,4,5,6,7,8>

The ISU 512e placed a call on either the first or second channel. The number called is displayed following the message.

# Disconn<1,2,3,4,5,6,7,8>

The call on either the first or second channel was disconnected from the network. The far-end phone number is displayed if available.

## **Disconnect Req**

Far-end unit disconnected during BONDING negotiation.

# **DPUMP END RCVD**

Indication of a hang-up or disconnect occurring during BONDING. Does not indicate an ERROR condition has occurred.

# DTE not set V25

The DTE equipment is not optioned for the same bit rate as the ISU 512e for V.25 bis dialing.

### DTR not up

ISU 512e tried to place a call in a dialing mode that requires DTR to be in an active state but it is not.

# Dump call

ISU 512e could not accept an incoming call because it was already involved in a call.

# Dump<1,2,3,4,6,7,8>

An incoming call on either the first or second channel was discarded by the ISU. The calling number is displayed if available.

#### **ExpISDN** Active

Expert ISDN is currently in the process of determining the line's ISDN format.

## **ExpISDN Failed**

ExpertISDN has failed trying to determine the ISDN line's SPID format. This can occur if the telephone company is not using standard SPID formats.

# **ExpISDN Passed**

Expert ISDN has finished and has determined the ISDN line's SPID format.

# **ExpISDN Retry**

Expert ISDN is attempting another SPID format.

# **ExpertISDN Stop**

The ExpertISDN process was stopped by the user.

# FACILITY\_NOT\_IMP

The network does not support the requested supplementary service.

# FACILITY\_REJECTED

A facility requested by the user cannot be provided by the network.

# FACILITY\_NOT\_SUB

The channel type requested has not been subscribed by the user.

### **FBW** disconnected

BONDING negotiation failed due to a disconnect on a B-Channel.

### **Flash Failed**

Writing to or erasing flash memory caused an error.

## Hangup1/2

The call on either the first or second channel was disconnected by the ISU. The far-end phone number is also displayed.

# INCOMING\_CALL\_BA

Incoming call barred. The network will not allow an incoming call.

# INCOMPATIBLE\_DEST

The called number cannot accept the type of call that has been placed.

# **INTRWORKING\_UNS**

A message was sent by a far-end network that was not understood.

# INVALID\_CALL\_REF

Call control error.

# INVALID\_ELEM\_CON

Call control error.

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# INVALID\_MSG\_UNSP

Invalid message, protocol error.

### INVALID\_NUMBER\_F

The dialed number has an invalid format.

#### **Inv Password**

Invalid remote access password received.

### L1 not up

The network interface is not active.

#### L2 not up

The data link layer interface is not active.

### L3 not up

The call control interface is not active.

### L2 #<1- 8> not up

The data link layer interface for the call number shown (BONDING) is not active.

### L3 #<1- 8> not up

The call control layer interface for the call number shown (BONDING) is not active.

# LDNs <1-4> Req'd

ExpertISDN was activated without entering the applicable LDNs.

# LDN TOO LONG

The entered Local Directory Number has too many digits.

### MANDATORY\_IE\_LEN

Mandatory information element length error.

# MANDATORY\_IE\_MIS

Mandatory information element missing.

#### MP opts not same

Differing multilinkk PPP options were negotiated for links in the same bundle.

# **MP Set DTE Rate**

After three tries to increase network bandwidth to match the DTE bit rate, the protocol set the DTE rate to match the network rate.

# **Negotiation fail**

The BONDING negotiation has failed.

# **NETWORK BUSY**

The ISDN switch is busy and unable to process a call.

Appendix B. Status Buffer Messages

# **NETWORK\_CONGESTI**

The phone network is currently congested.

# NETWORK\_OUT\_OF\_O

The phone network is out of order.

# NO\_CIRCUIT\_AVAIL

The requested bearer channel is not available.

## NONEXISTENT\_MSG

Nonexistent message was sent by the ISU.

## **NO\_ROUTE**

The phone network was unable to find a route to the destination number.

# NO\_USER\_RESPONDI

The dialed number is not responding.

# NORMAL\_CLEARING

The network is disconnecting the current call.

# NOT end2end ISDN

The path that the call was routed over is not ISDN from end-to-end (warning only).

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## NUMBER\_CHANGED

The number dialed has been changed.

# OUTGOING\_CALL\_BA

The network will not allow the outgoing call to be placed.

#### Peer failed authen

The PPP peer's reported username and/or password does not match the ISU 512e's authentication parameters. This is most likely caused by the peer sending an incorrect username and/or password. Make sure that the **Rx USERNAME** and **Rx PASSWORD** are correctly entered.

# **PRE-EMPTED**

The network pre-empted the call.

# PROTOCOL\_ERROR

Call control error.

### **RamSum Failed**

The checksum of a remotely downloaded flash update file was incorrect. The flash memory was not updated with the new file.

# **REQ\_CHANNEL\_NOT\_**

The channel type requested is currently not available.

### Remote not ISU

Bonding negotiation determined the far-end unit is not another ISU 512e.

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Appendix B. Status Buffer Messages

# **RESP\_TO\_STAT\_ENQ**

Response to status enquiry.

# **Ring 1/2**

An incoming call on either the first or second channel entered the Ring state. The calling phone number is displayed if available.

# SERVICE\_NOT\_AVAIL

The service requested by the user is not available.

# SOURCE NOT ISDN

The incoming calling party is not ISDN (warning only).

# SPID DL Pass <1-4>

Lucent SPID download feature has successfully installed the SPIDs on this dsl.

# SPID DL Stop <1-4>

Lucent SPID download was disabled.

# **SPID DL Unavail**

Lucent SPID download is not available from this ISDN switch.

# SPID SL <1-4>

Lucent SPID download feature has started on this dsl.

# **TANULL** expired

Bonding timer TANULL expired; non BONDING equipment attempted to call into the ISU 512e while optioned for BONDING.

# TEMPORARY\_FAILURE

The network has temporarily failed; try the call again.

## TIMER\_EXPIRY

Call control error.

## **TXADD01** expired

Bonding timer TXADD01 expired, probably making a long distance call to a foreign country; adjust timer value to correct.

## **TXFA1** expired

Bonding timer TXFA1 expired; other vendor's BONDING equipment did not operate properly.

### **TXFA2** expired

Bonding timer TXFA1 expired; other vendor's BONDING equipment did not operate properly.

### **TXINIT** expired

Bonding timer TXINIT expired; called non-BONDING equipment.

### UNASSIGNED\_NUMBER

The phone number dialed does not exist.

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Appendix B. Status Buffer Messages

# UNSPECIFIED\_CAUSE

Received a cause message from the network that is not understood.

## **USER\_BUSY**

The dialed number is busy.

### WRONG\_MESSAGE

The ISU 512e received a message that does not match the valid messages defined for the switch.

# WRONG\_MSG\_FOR\_ST

The ISU 512e received a message that is not appropriate for the state of the call.

# Appendix C Loop Status Messages

Messages in all caps are generated by the ISDN network. Messages with lower case letters are generated by the ISU 512e.

# <1-4>:DLPBK

The DTE is in loopback mode.

#### <1-4>:down

The network interface is not active.

# <1-4>:NEOC

The ISU 512e has received an ISDN embedded operations channel (EOC) loopback command from the network.

### <1,2,3,4>:Ready

The ISU 512e has completed protocol negotiation with the network switch and is ready to place/receive calls.

# <1,2,3,4>:PLBBK

The ISU 512e has been set to perform a loopback in the network direction after letting the incoming data pass through the BONDING protocol.

### <1-4>:SPID1

The ISU is registering its first SPID with the network.

# <1-4>:SPID2

The ISU is registering its second SPID with the network.

# <1,2,3,4>:Sync

The ISU 512e has successfully activated to the network but is still waiting for the switch to issue the ACT bit.

# <1-4>:TEI1

The ISU is receiving the first Terminal Endpoint Identifier (TEI) from the network.

### <1-4>:TEI2

The ISU is getting its second TEI from the network.

# BONDING <xxxx>

BONDING Mode 1 rate adaption has entered data mode at the bit rate specified by <xxxx>.

# **BONDING** Quitting

BONDING Mode 1 rate adaption protocol is turning off.

# **BONDING Ready**

BONDING Mode 1 rate adaption protocol has completed negotiation and is entering data mode.

# **BONDING Setup**

BONDING Mode 1 rate adaption protocol is negotiating with the far end unit.

## CALL <xxxxxx>

The ISU 512e is calling phone number <xxxxxx>.

# **Call Connect B1**

Bearer channel 1 connected and is currently active.

# Call Connect B2

Bearer channel 2 connected and is currently active.

# Disconnecting

The current phone call is being disconnected (hung up).

# MPPP <0-8>B

Multilink PPP is running and has bundled the specified number of links.

# RINGING

The phone number just dialed is ringing.

Appendix C. Loop Status Messages

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# Appendix D Front Panel Configuration Menu

3=CONFIG **1=NETW. OPTIONS** 1=DIAL LINE 1=ISDN MENU **1=Switch Proto 1=LUCENT 5ESS** 2=DMS-100 **3=NATIONAL ISDN1** 4=NI-1 ENBLOC 2=AREA CODE 3=SET LDN 4=SET SPID 2=EXPERTISDN 1=LINE 1=DSL 1 2=DSL 2 3=DSL 3 4=DSL 4 5=ALL 2=START/STOP 3=SPID DOWNLOAD 1=ENABLED 2=DISABLED 4=CALL TYPE 1=SPEECH 2=AUDIO 3=DATA 56KBPS 4=DATA 64KBPS

Figure D-1. Config/Netw. Options/Dial Line Front Panel Menu

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Appendix D. Front Panel Configuration Menu

3=CONFIG **1=NETW. OPTIONS** 1=DIAL LINE 5=DIAL OPTIONS **1=FRONT PANEL** 2=EIA366 1=EIA366 TIME 1=1 SEC OR EON 2=2 SEC OR EON 3=5 SEC OR EON 4=10 SEC OR EON 5=20 SEC OR EON 6=WAIT FOR EON 2=SECURITY 3=V.25 1=HDLC (MARKS) 2=HDLC (FLAGS) 6=AUTO ANSWER 1=DISABLED 2=ENABLED 3=DUMP ALL CALLS 7=CONNECT TIMOUT 1=15 SEC 2=30 SEC 3=1 MINUTE **4=2** MINUTE 5=4 MINUTE 8=CALL SCREENING **1=ANSWER ANY** 2=ANSR IF SN0...9 9=PASSWORDS 1=SPV PASSWORD 2=RDL PASSWORD 0=CALL NUMID 1=ENABLED 2=DISABLED

Figure D-1. Config/Netw. Options/Dial Line Front Panel Menu (continued)

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Appendix D. Front Panel Configuration Menu

3=CONFIG 1=NETW. OPTIONS 1=LEASED LINE 1=CLOCK MODE 1=SLAVE 2=MASTER 3=SLAVE (MASTER) 2=CHANNEL RATE 1=56K BEARER 2=64K BEARER 3=TEST REMOTE 1=ENABLED 2=DISABLED

Figure D-2. Config/Netw. Options/Leased Line Front Panel Menu

Appendix	D.	Front Panel	Configuration	Menu
,			o o mga a a a o n	

1=04K 04K
2=64K 128K
3=64K 192K
4=64K 256K
5=64K 320K
6=64K 384K
7=64K 448K
8=64K 512K
2=56K MODE 1
1=56K 56K
2=56K 112K
3=56K 168K
4=56K 224K
5-56K 280K
6-56K 336K
7-56K 302K
2-56K 112K
3=CD OPTIONS
1=CD FORCED ON
3=OFF LINK DOWN
4=DTR OPTIONS
1=IGNORE DTR
2=IDLE WHEN OFF
3=OFF>ON DIAL=0
4=DIAL # 0 IF ON
5=Answer if On
5=DSR OPTIONS
1=DSR Forced On
2=OFF IDLE + TEST
3=Off Link Down

Figure D-3. Config/V.35 Options Front Panel Menu

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Appendix D. Front Panel Configuration Menu

3=Config 3=IP Options 1=IP Address 2=Subnet Mask 3=Def Gateway

Figure D-4. Config/IP Options Front Panel Menu

3=CONFIG 4=PROTOCOL OPTIONS 1=MULTILINK PPP 2=BONDING 1=TXINT 2=TXFA 3=TXADD01 4=TXDEQ 5=TANULL 6=TCID 7=CALL STAGGER 3=TRANSPARENT

Figure D-5. Config/Protocol Options Front Panel Menu





#### Figure D-6. Config/Maint Setup Options Front Panel Menu



Figure D-7. Configuration/Quick Setup Options Front Panel Menu

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# Appendix E SNMP

### UNDERSTANDING SNMP

As Local Area Network (LAN) environments became standardized over the past ten years, multi-vendor equipment grew with competition. It became necessary to manage the various vendor equipment from a single control console. Thus, the Simple Network Management Protocol (SNMP) emerged as the *de facto* standard for managing commercial Transmission Control Protocol/Internet Protocol (TCP/IP) networks.

The term *SNMP* broadly refers to the message protocols used to exchange information between the network and the managed devices, as well as to the structure of network management databases. SNMP has three basic components:

- Network Manager: This is a control program that collects, controls, and presents data pertinent to the operation of the network devices. It resides on a network management station.
- Agent: This is a control program that responds to queries and commands from the network manager and returns requested information or invokes configuration changes initiated by the manager. It resides in each network device connected.
- **MIB**: This is an index to the organized data within a network device. It defines the operating parameters that can be controlled or monitored.

When requesting the network manager to retrieve or modify a particular piece of information about a network device, the network manager transmits the request to that network device. The agent in that device interprets the incoming request, performs the requested task, and sends its response to the network manager. The network manager collects all the data from the various network devices and presents it in a consistent form.

Using SNMP Version 1, the network manager can issue three types of commands:

- **GetRequest**: This command retrieves a single item or the first in a series from a network device.
- **GetNextRequest**: This command retrieves the next item in a series from a network device.
- **SetRequest**: This command writes information to a network device.

The network device issues two types of messages:

- **GetResponse**: This message is the response to a network manager **GetRequest** or **GetNextRequest** command.
- **Trap**: This is an unsolicited message issued by a network device to report an operational anomaly or an alarm condition to the network manager.

These messages are typically encased within informational packets and transported over the LAN or WAN.

### SNMP EMBEDDED AGENT

The ISU 512e supports the following groups from MIB-II (RFC 1213):

- System Group
- UDP Group
- ICMP Group
- Address Translation Group
- IP Group
- TCP Group

Also, an enterprise specific MIB is available.

The following manager requests are supported:

- Get object
- Get next object
- Set object

### Communities

The ISU 512e permits up to eight communities to be defined. The privilege level of each community can be set. The default community is public with read-only privileges. When the IP address is all zeros, any manager of the community can access the ISU 512e.

#### Traps

Up to four hosts can be set to receive traps. Each host entry requires an IP address of the manager.

In addition to the cold start trap, the ISU 512e sends traps each time a link is brought up or down.

Appendix E. SNMP

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# Acronyms

AMI	Alternate Mark Inversion
ANI	Automatic Number Identification
ARP	Address Resolution Protocol
BONDING	.Bandwidth On Demand Interoperability Group
BRI	.Basic Rate Interface
CCITT	.Consultative Committee for International Telegra-
	phy and Telephony
CD	.Carrier Detect
со	.Central Office
CIC	.Carrier Identification Code
CSMA/CD	.Carrier Sense Multiple Access Collision Detect
CTS	.Clear to Send
D-Delta	.Signalling Channel
DCE	.Data Communications Equipment
DMS	.Digital Multiplex Switching
DN	.Directory Number
DSR	.Data Set Ready
DTE	.Data Terminal Equipment
EIA	Electronic Industries Association.
EKTS	Electronic Key Telephone Service.
ESS	.Electronic Switching System
FAX	.Facsimile
FEBE	.Far End Block Errors
FX	.Foreign Exchange
ICMP	Internet Control Message Protocol
ID	.Identification
IETF	Internet Engineering Task Force.
I/O	.Input/Output
IOC	.ISDN Ordering Codes
IP	.Internet Protocol

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Acronyms-1

IPCP	Internet Protocol Control Protocol
ISDN	Integrated Services Digital Network
ISU	ISDN Service Unit
kbps	kilobits per second
LAN	Local Area Network
LDM	Limited Distance Modem
LDN	Local Directory Number
LED	Light Emitting Diode
MAC	Media Access Control
MIB	Management Information Base
MLHG	Multiline Hunt Group
MPPP	Multilink Point-to-Point Protocol
MRU	Maximum Receivable Unit
MRRU	Maximum Receivable Reconstructable Unit
NEBE	Near-End Block Errors
NI-1	National ISDN-1
NT	Network Termination
PC	Personal Computer
POTS	Plain Old Telephone Service
RFC	Request for Comments
RIP	Routing Information Protocol
SNMP	Simple Network Management Protocol
SPID	Service Profile Identifier
ТА	Terminal Adapter
ТЕ	Terminal Equipment
TEI	Terminal Endpoint Identifier
<b>TFTP</b>	Trivial File Transfer Protocol
WAN	Wide Area Network

# Glossary

#### 2 B+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 signaling. 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*.

#### 2B1Q

Two binary, one quarternary. An ISDN line encoding technique which uses two bits to represent four variations in amplitude and polarity.

#### 10BaseT

IEEE 802.3 specification, using unshielded twisted-pair cabling and running at 10 Mbps.

#### 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.

#### 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 protocol**

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

Glossary-1

#### 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 phone company switching facility or center, usually a Class 5 end office, at which subscriber's local loops terminate. Handles a specific geographic area, identified by the first three digits of the local telephone number. Usually the facilities of the local BOC.

#### channel bank

Equipment in a telephone central office that performs multiplexing of lower speed digital channels into a higher speed composite channel. The channel bank also detects and transmits signaling information for each channel, transmitting framing information so that time slots allocated to each channel can be identified by the receiver.

#### clear channel

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

#### CPE

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

#### CSMA/CD

Carrier Sense Multiple Access Collision Detect. A channel access mechanism where devices check the channel for a carrier before transmitting. If no carrier is sensed for the specified period of time, the device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays their retransmissions for a random length of time. CSMA/CD is used by Ethernet and IEEE 802.3.

#### **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 signaling 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 loopback

Technique for testing the digital processing circuitry of a communications device. May be initiated locally or remotely via a telecommunications circuit. Device being tested will echo back a received test message after first decoding and then encoding it. The results are compared with the original message (compare with analog loopback).

# **DSU**

Data service unit. A device providing an 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.

# EIA-232

An EIA-specified physical interface with associated electrical signaling between DCE and DTE. The most commonly employed interface between computer devices and modems.

# EIA-366

An EIA interface standard for autodialing.

# **Ethernet**

A local area network used for connecting computers, printers, workstations, terminals, servers, etc., within the same building or campus. Ethernet operates over twisted wire and coaxial cable at speeds up to 10 Mbps. Ethernet specifies a CSMA/CD.

#### 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 comprise a television picture (usually 525 in the U.S.).

# four-wire circuits

Telephone lines using two wires for transmitting and two wires for receiving offering much higher quality than a 2-wire circuit. All long distance circuits are 4-wire. Almost all local phone lines and analog phones are 2-wire.

# hop count

A routing metric used to measure the distance between a source and a destination. Particularly used by RIP.

hub

(1) Communications center, (2) Major routing station for connecting channels, (3) DDS connecting center.

# IEEE

Institute of Electrical and Electronic Engineers. Professional organization that defines network standards. IEEE LAN standards are the predominant LAN standards today and include protocols similar or virtually equivalent to Ethernet and Token Ring.

#### IEEE 802.1d

An algorithm used to prevent bridging loops by creating a spanning tree.

# IEEE 802.2

An IEEE LAN protocol that specifies an implementation of the LLC sublayer of the data link layer. It handles errors, framing, flow control, network layer (Layer 3) service interface, and is used in LANs.

# IEEE 802.3

A physical layer standard specifying a linear bus network LAN with a CSMA/CD access method on a bus topology. Ethernet follows the 802.3 standard, transmitting at 10 megabits per second. This is the most common local area network specification. Physical variations of IEEE 802.3 include 10Base2 and 10BaseT.

#### in-band signaling

Signaling 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 signaling (request for service, dialing, disconnect, etc.) in the U.S. is in-band signaling. Most of that signaling is MF (multi-frequency) dialing. The more modern form of signaling 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 intersystem communication occurs.

#### **Internet Protocol**

A TCP/IP protocol describing software that tracks the Internet address of nodes, routes outgoing message, and recognizes incoming messages. Used in gateways to connect networks at OSI network Level 3 and above.

# **ISDN**

Integrated services 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.

#### jabber

An error condition in which a network device continually transmits garbage onto the network. In IEEE 802.3, a data packet whose length exceeds that prescribed in the standard.

# jitter

The slight movement of a transmission signal in time or phase that can introduce errors and loss of synchronization for high-speed synchronous communications. See phase jitter.

# leased line

A telecommunication facility or link reserved for the exclusive use of one customer. Also called a dedicated line.

# leased service

The exclusive use of any channel or combination of channels designated to a subscriber.

# local loop

In telephony the wire pair that connects a subscriber to a phone company end office, typically containing two wires. Four-wire local loops are common, however, especially with leased voice grade circuits.

# 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.

#### Media Access Control (MAC)

As defined by the IEEE, the lower of the two sublayers of the OSI reference model data link layer. The MAC sublayer is concerned with media access issues, such as whether token passing or contention is used.

#### message

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

# 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.

# netmask

A 32-bit bit mask which shows how an Internet address is to be divided into network, subnet, and host parts. The netmask has ones in the bit positions in the 32-bit address which are to be used for the network and subnet parts, and zeros for the host part. The mask should contain at least the standard network portion (as determined by the address's class), and the subnet field should be contiguous with the network portion.

# non-ISDN line

Any connection from a CPE to a SPCS that is not served by D-Channel signaling.

# non-ISDN trunk

Any trunk not served by either SS7 or D-Channel signaling.

#### 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 exists). A type of connection that links two logical entities (i.e., phone-line circuit).

#### *point-to-point protocol (PPP)*

An implementation of TCP/IP which is intended for transmission using telephone lines. PPP provides router-to-router and host-tonetwork connections over both synchronous and asynchronous circuits.

# RIP

Routing Information Protocol. A protocol used to exchange routing information among a set of computers connected by a LAN. RIP uses hop counts as a routing metric.

# S interface S reference point

The interface that connects an ISDN terminal (TEI) or terminal adapter (TA) to the NT2 reference point as defined in the I.411 Recommendation.

#### **SNMP**

Simple Network Management Protocol. SNMP provides a means to monitor and set network configuration and runtime parameters.

#### 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.

# TCP/IP

Transmission Control Protocol/Internet Protocol. A set of protocols developed by the Department of Defense to link dissimilar computers across many kinds of networks.

# Telnet

The TCP/IP standard protocol for remote terminal connection service. Telnet allows a user at one site to interact with a remote timesharing system at another site as if the user's terminal were connected directly to the remote machine.

# *T* interface *T* reference point

Performs the same function as the S interface but uses an NT1 rather than an NT2.

# trunk

A single transmission path connecting two switching system. Trunks can be shared by many users, but serve only one call at a time.

# 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 cable can be and still get acceptable conversation quality. However, the thicker it is, the more it costs.

# two-wire circuit

A transmission circuit composed of two wires, signal and ground, used to both send and receive information. In contrast, a 4-wire circuit consists of two pairs. One pair is used to send. One pair is used to receive. All trunk circuits (long distance) are 4-wire. A 4wire circuit delivers better reception, but also costs more. All local loop circuits (those coming from a Class 5 central office to the subscriber's phone system) are 2-wire, unless a 4-wire circuit is requested.

#### **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.35

CCITT standard for trunk interface between a network access device and a packet network that defines signaling for data rates greater than 19.2 kbps.

#### videoconferencing

The real-time, usually two-way, transmission of digitized video images between two or more locations. Teleconferencing requires a wideband transmission facility. Transmitted images may be freeze-frame (where television screen is repainted every few seconds to every 20 seconds) or full motion. Bandwidth requirements for two-way videoconferencing range from 6 MHz for analog, full-motion, full-color, commercial grade TV to 56 kbps for digitally-encoded freeze-frame to 1.544 kbps for very good quality, full-color, full-motion TV.

Glossary-9

# **XMODEM**

An error-correcting file transfer, data transmission protocol used to transmit files between PCs. The XMODEM protocol sends information in 128 byte blocks of data. Some sums (check sums) are done on each block and the result is sent along with the block. If the result does not check out at the other end, the computer at the other end sends a request (a NAK - negative acknowledgment) to retransmit that block once again. If the block checks out, the computer sends ACK (an acknowledgment). In this way, relatively error-free transmission can be accomplished.

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# **Product Support Information**

# **Presales Inquiries and Applications Support**

Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

# Post-Sale Support

Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support (888) 4ADTRAN

# **Repair and Return**

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Customer and Product Service (CAPS) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact CAPS directly at the following number:

CAPS Department (256) 963-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN, Inc. CAPS Department 6767 Old Madison Pike Progress Center Building #6, Suite 690 Huntsville, AL 35807

RMA # \_\_\_\_\_