



SlimLine

PRODUCT BOOK

VERSION 1.0

1. SlimLine Product Overview

- 1.1 INTRODUCTION
- 1.2 PREMISYS CORPORATE BACKGROUND

1.3 SLIMLINE HIGHLIGHTS

- 1.3.1 COMPACT CHASSIS
- 1.3.2 EASY AND LOW-COST INSTALLATION
- 1.3.3 SEAMLESS ADDITION TO CARRIER INFRASTRUCTURE
- 1.3.4 EASE OF TROUBLESHOOTING/MAINTENANCE

1.4 PREMISYS PRODUCT FAMILY

2.	SlimLine Applications	5
3.	SlimLine Architecture Overview	8
	3.1 CHASSIS	
	3.2 PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS	
	3.3 POWER SUPPLY	
	3.4 SYSTEM SYNCHRONIZATION AND CLOCKING	
	3.5 T1 NETWORK INTERFACE	
	3.6 DATA INTERFACE	
	3.7 FXS INTERFACE	
	3.8 MAINTENANCE AND DIAGNOSTICS	

- 3.8.1 T1 ALARM/PERFORMANCE MONITORING
- 3.8.2 LOOPBACKS
- 3.8.3 T1 AND DATA TEST PATTERNS

4. SlimLine Specifications

SLIMLINE IS A WIN-WIN

solution



1. SlimLine[®] Product Overview

1.1 INTRODUCTION

The Telecommunications Act of 1996 has given rise to competition in the local loop. The Incumbent LECs (ILECs) are being required to "unbundle" the local loop and make their facilities available to Competitive LECs (CLECs) on a "non-discriminatory" basis.

This has provided a chance for service providers to target new opportunities with new business customers while trying to retain the loyalties of their existing customers. They can achieve this only by providing topquality services on a cost-effective basis. For both the customers and the service providers, this translates to fewer, cheaper, access lines; less hardware, and easy installation and maintenance.

The Premisys SlimLine⁻ is the entry-level Integrated Access Device (IAD) of choice that enables service providers to effectively address this customer need by providing a single platform to deploy bundled voice and data services at small and remote locations. The SlimLine allows cost-effective and quick deployment of these services on a single T1 access line.

By deploying Premisys SlimLine at the customer's premises to offer bundled services over a single T1 link, the service provider (typically a CLEC) can save, on average, \$3,600 per customer per year on the recurring costs of leasing an extra T1 link for separate voice and data services. This consolidation will also enable the end-user to save an average of \$4,000/year on their recurring telecommunications costs.

The SlimLine sports a sleek, low profile chassis and is configured via DIP switches, eliminating the need for a PC based craft interface and specialized training. LEDs are provided for monitoring the status of SlimLine under normal operation as well as under test conditions. Maintenance and diagnostics are further enhanced via loopbacks and test patterns, all configurable from the DIP switches. Additionally, network loopbacks can be used to test from a central office.

SlimLine addresses access needs for sites requiring economical adaptation of FXS analog voice based key systems and PBXs to T1 services. SlimLine supports TR-008 as well as ESF and D4 framing. Additionally, SlimLine provides two high speed EIA530A/V.35 ports for insertion of routers or other data traffic in bundled service arrangements. For sites needing up to 24 analog lines, with or without data requirements, Premisys SlimLine is an ideal solution.

SlimLine is complementary to Premisys' leading StreamLine and IMACS (Integrated Multiple Access Communication Server) access devices. The SlimLine is available in two models - a 12 FXS port model (Premisys product number 240212) and a 24 FXS port model (Premisys product number 240224). The two data ports come standard in both models.

1.2 SLIMLINE HIGHLIGHTS

1.2.1 COMPACT CHASSIS

The SlimLine's pizza-box sized chassis offers a compact foot-print that enables it to be installed in space-constrained locations such as a telco closet. It occupies 1 vertical rack unit (1.75 inches) on a standard 19 inch or 23 inch telco rack. Weighing less than 10 lbs (4.5 Kg), it is also easily wall-mountable or can sit on a desk-top.

1.2.2 EASY AND LOW-COST INSTALLATION

A key design objective of the SlimLine product is speed and ease of installation. SlimLine is intended for mass deployment at small/medium enterprise premises and does not require highly trained technicians for installation and deployment. For this reason, all parameters on the SlimLine are set-able using DIP switches. In addition, the DIP switches are clearly marked for functionality and are easy to see and change even after the unit is installed. There is a silk-screened diagram on top of the chassis which describes the DIP switches and possible settings for easy reference.

1.2.3 SEAMLESS ADDITION TO CARRIER INFRASTRUCTURE

Premisys SlimLine product enables the Competitive Local Exchange Carriers (CLECs) and Competitive Access Providers (CAPs) to offer services in a very cost-effective and efficient manner. SlimLine is a feature-rich, very low cost entry level product fitting the cost, space, and configuration requirements of CLECs and CAPs to provide bundled voice/data deployments for small access sites. In addition, it bears the Premisys stamp of quality, innovation and customer service.

The economy of installation makes SlimLine ideal for mass deployment of bundled services to remote sites which cannot afford high capital expenditures. In the same manner it allows CLECs and CAPs to venture into new territories to capture new customers and retain them without being strapped by huge capital outlays.

SlimLine with its integral CSU/DSX can be added seamlessly to the existing carrier infrastructure to be operational. No forklifting or addition of other equipment (such as an external CSU) is necessary.

1.2.4 EASE OF TROUBLESHOOTING/MAINTENANCE

SlimLine comes with a wealth of diagnostics including power-up self test, loopbacks, test pattern generation and detection, external alarm contact for visible or audible alarms, and LEDs. Such a comprehensive capability takes the guesswork out of trouble-shooting and maintenance and enables high quality of service at a lower cost.

Upon power-up, the SlimLine performs a comprehensive set of tests to ensure that all the components are functioning. These include the microprocessor, memory, T1 Line Interface Unit (LIU), and internal registers.

LEDs located in the front of the unit are used to indicate normal operation, test results and error conditions.

1.3 PREMISYS CORPORATE BACKGROUND

Premisys Communications, Inc. was founded in 1990 with the mission of finding quick, inexpensive ways for telephone exchange carriers around the globe to affordably provide their business customers a comprehensive array of new and existing services. This is a vision born of the telecommunications revolution when network service providers around the world would be vying for a share of newly deregulated market-places. Competitors in these new markets would not have the capital or the time to construct complex network infrastructures. Yet, to be successful, they would need "a bag" with a full portfolio of voice and data services from POTS to ATM to whatever is over the horizon.

The idea is simple – a single, cost-efficient platform that could combine a disparate variety of services onto a single line.

The first manifestation of this quest for the perfect vehicle for the new telecommunications world is Premisys' Integrated Multiple Access Communication Server, known today throughout the industry as simply the IMACS. Although many other companies have followed with their versions, the IMACS maintains its position as the world's leading integrated access solution. Even as the IMACS has evolved with new technology, the formula has remained constant: one inexpensive platform offering a variety of services. In one box the IMACS offers POTS, analog private lines, high- and low-speed data services, ISDN, frame relay and ATM. More than 25,000 of these units are now in use worldwide.

As a part of its on-going corporate strategy to keep ahead of its competition, Premisys rolled out its second product in January 1998, the StreamLine. The StreamLine is aimed at small business environments, particularly those removed from major communications-rich metropolitan hubs, but in no less need of the latest telecommunications services. The StreamLine integrates a variety of services, including voice, high and low-speed data, ISDN and IDSL, on a single T1.

Premisys will soon unveil the Q-Broadband Series, which will take the concept that inspired the IMACS to the next level. The Q-155 combines the bandwidth from an array of transport services-T1/E1, T3/E3, xDSL, Frame Relay and ATM, and carries them as appropriate, via TDM or ATM on a SONET/SDH network. Premisys designed the Q-Broadband Series to meet the global need for an integrated access platform that could efficiently manage a world transitioning from TDM and copper to one based on ATM and fiber. The Q-Broadband Series promises an easy-to-implement, cost-efficient bridge for this transition.

Along the way, the company outgrew its facility in Palo Alto, California and moved across San Francisco Bay to Fremont in the heart of the Silicon Valley. One building became two and soon the first will be expanded. Meanwhile, sales offices opened across the nation. Internationally, Premisys has established offices in Birmingham, England, from where it provides for the needs of network service providers in Europe, the Middle East and Africa; in Hong Kong and Singapore, to serve Asia; in Davie, Florida, for Latin America operations; and, most recently, in Ottawa, where a new research and development center opened recently.

To support the sale and distribution of its products, Premisys has assembled a network of strategic partners from around the world, including ADC Telecommunications, Alcatel, DSC Communications, ECI Telematics, Ericsson, Lucent, Motorola, Nortel, Paradyne, Pulsecom, Rockwell, Telsource, UT Starcom and XEL Communications.

More information about Premisys Communications and its products is available on its Worldwide Web site (www.premisys.com) and by contacting its Fremont headquarters (510-353-7600).



1.4 PREMISYS PRODUCT FAMILY

The SlimLine is a component of a complete line of integrated access solutions from Premisys Communications. The diagram above shows how the service provider can deliver a complete suite of fast, efficient and reliable business communication services to the customers by deploying the Q, the Integrated Multiple Communications Server (IMACS), the StreamLine and the SlimLine.

• Q-SERIES

The Q-Broadband series efficiently combines the best features of ATM and Frame Relay concentrators, TDM and cross-connects, and SONET/SDH Add/Drop Multiplexers to effectively address all access networking needs of a service provider network. Q's multi-fabric bus-based technology provides the high performance required by the most demanding multi-service applications. Its open standards-based SONET/SDH and TDM designs protect investments in existing network infrastructures.

• IMACS

The Integrated Multiple Access Communications Server (IMACS) is a highly flexible and intelligent integrated access device (IAD) that enables service providers worldwide to offer a wide variety of business communication services efficiently and cost-effectively. This includes Plain Old Telephone Service (POTS), analog private lines, Digital Data Networks (DDN), Frame Relay, Integrated Services Digital Network (ISDN) and Asynchronous Transfer Mode (ATM) based services. The IMACS supports T1, E1, fractional T1, fractional E1, DS3, OC3c, STM1, V.35 and X.21 network interfaces. For user connectivity, a gamut of interfaces are available to support analog and digital devices.

The IMACS can be fully managed either via a local craft interface using a VT100 or PC or via a remote network management station using an industry-standard implementation of SNMP.

• STREAMLINE

The StreamLine addresses the need for an entry level Integrated Access Device to provide T1 Drop & Insert for digital voice and data applications. It is expandable to a fully featured T1 multiplexer providing POTS, DDN, and ISDN-BRI.

The StreamLine can also be fully managed either via a local craft interface using a VT100 or PC or via a remote network management station using an industry-standard implementation of SNMP.

tion between the Data port under test and the T1 interface is broken and a 2047 pattern is transmitted on the T1 interface. The 2047 detector is turned on to monitor the received pattern. An LED will light GREEN to indicate that synchronization has taken place.

2. SlimLine Applications

The burgeoning market for the Premisys SlimLine product can be attributed to two major developments that have contributed synergistically to increase the need for this product.

The first one is the Telecommunications Act of 1996 that has given rise to competition in the local loop. The Incumbent LECs (ILECs) are being required to "unbundle" the local loop and make their facilities available to Competitive LECs (CLECs) on a "non-discriminatory" basis. This has provided an excellent business opportunity for the service providers, by sizably increasing their market and by increasing the demand for additional services for their existing customers. They can achieve their growth only by providing top-quality services on a cost-effective basis relative to what the ILECs offer. This translates to offering differentiating services and more efficient bandwidth utilization of T1 access links with better and cheaper Operations, Administration, Maintenance and Provisioning (OAM&P).

Secondly, the Internet/Intranet phenomenon has given rise to an explosion in the business communication needs of small-to-medium enterprises. These business customers represent one of the fastest growing segments of the U.S. telecommunications services market. The current pool of small-to-medium enterprises totals about 7 million with up to approximately \$70 billion in sales. To be viable and competitive, these businesses are looking to establish a Web presence so they can participate in electronic commerce and can provide support for tele-commuters and external business partners. In order to optimize their investment, they rely on cost-efficient and reliable voice, Intranet and Internet data services.

The Premisys SlimLine product effectively addresses the needs of both the service provider and their customers by providing a single, integrated platform for bundling voice, data, and Internet services in an economical fashion over a single T1 span. It is a feature rich, very low cost entry level product fitting the cost, space, and configuration requirements of CLECS and CAPs to provide such service deployments for small and remote access sites.

The figure below is an illustration of how a service provider can install and maintain the SlimLine at the customer location to provide integrated voice/data/Internet services over a single T1 span. A solution without SlimLine would require use of separate access links for voice and data, resulting in inefficient usage of both. Also, this implementation is not easily reconfigurable or scalable if the user needs change. With SlimLine the voice and data traffic can use a single T1 access link and all it takes is re-programming a couple of DIP switches by someone



with limited skills to effect a reconfiguration when needed. SlimLine also enables the T1 access line to be utilized efficiently, leading to significant cost savings for the service provider who does not need to provision and maintain additional access links. This translates to lower cost for the end-user also.

SlimLine comes with a wealth of diagnostics including power-up self test, loopbacks, test pattern generation and detection, and LEDs. Such a comprehensive suite takes the guesswork out of trouble-shooting and maintenance and enables high quality of service at a lower cost.

The economy of installation and maintenance makes SlimLine an ideal choice for mass deployment of bundled services to remote sites which cannot afford high capital expenditures. It can be added seamlessly to the existing service provider infrastructure to be operational. No fork-lifting or addition of other equipment is necessary. This feature enables CLECs and CAPs to venture into remote territories to capture and lock-in new customers without being strapped by huge capital outlays.

In order to capture new business of a small office/remote office (SORO), a CLEC typically sells voice and data services directly at a discount compared to the ILEC tariff. Without Premisys SlimLine, the CLEC typically will lease two T1 lines from an ILEC (one for voice and another for data). The average lease rate for CLECs is \$3600/T1/year. By deploying SlimLine, the CLEC can bundle voice and data on a single T1, thereby saving on leasing the second T1. For a sample customer base of 2000 SORO subscribers, this translates to a recurring savings of \$7.2M/year.

By subscribing to services from a CLEC, the SORO saves an average of 15-20% on comparable ILEC services (SBC Warburg Dillion Read CLEC Industry Report 9/97). This translates to an average annual saving of \$4-5K per SORO.

Before Slimline, to satisfy its communication requirements, a SORO would have had separate access lines for voice and data/internet services from the ILEC. Typically, this would have been a 128K or higher Frame Relay based Internet access (such as FasTrak Frame Relay Internet Access from Pacific Bell) and 16 analog lines for voice. Over a 12 month period using typical cost figures, the charges to the subscriber are:

16 CENTREX LINES INSTALLATION	= \$1,120 (@70/line)
16 CENTREX LINES ఐ \$17/LINE/MONTH	= \$3,200
LONG-DISTANCE THROUGH ILEC	= \$9,600 (@\$800/mo)
LOCAL TOLL THROUGH ILEC	= \$2,400 (@\$200/mo)
FRAME RELAY SERVICE INSTALLATION	= \$1,000
FRAME RELAY ROUTER COST	= \$3,000
FRAME RELAY ACCESS CHARGES	= \$3,420 (@285/mo)
128K INTERNET ACCESS CHARGE	= \$8,640 (@\$720/mo)
TOTAL CHARGES FOR 1 YEAR	= \$32,380

With Slimline installed at the customer premises by a major CLEC the sample charges are:

16 CENTREX + INTERNET ACCESS INSTALLATION	= \$1,400 (20% off ILEC charges)
16 CENTREX LINES ఐ 17/LINE/MONTH	= \$3,200
LONG-DISTANCE THROUGH CLEC	= \$7,700 (20%off ILEC charges)
LOCAL TOLL THROUGH CLEC	= \$1,500 (20% off ILEC charges)
INTERNET ROUTER COST	= \$1,500

128K INTERNET ACCESS OVER FRAME RELAY= \$12,000 (@\$1000/mo from CLEC)TOTAL CHARGES FOR 1ST YEAR= \$27,300

The subscriber thus saves more than \$5,000 over a year's time. Additional revenue for the CLEC over that year is more than \$24,000. In addition, the CLEC does not have to lease a second T1 trunk from the ILEC. This amounts to recurring annual savings of approximately \$3,600 per year per subscriber. So SlimLine at less than \$5,000 (U.S. List Price) has an excellent Return On Investment (ROI). This proves that *SlimLine is a win-win solution*!

The service provider can offer a winning solution to the subscriber while winning immediate revenue and fast ROI.

Additional applications for the SlimLine include but are not limited to:

- an ILEC using the SlimLine can either to directly match the competitive edge of the CLEC by writing a tariff or using it in its CLEC subsidiary
- an end-user using SlimLine as a Customer Premise Equipment (CPE) for its efficiency and subscribing services through a CLEC.

In conclusion, SlimLine is yet another significant addition to the Premisys product portfolio which will further strengthen the company's capability to offer a complete product line for service providers seeking solutions to local loop access efficiency. As a result, few of Premisys' competitors can compete across the integrated access product line.

SlimLine enjoys the Premisys organization's strengths including:

- pioneering the concept of integrated access worldwide
- maximizing the customer's access investment both in current efficiency and the ability to offer new services inexpensively
- commitment to industry standards including BellCore, ANSI, ITU, ETSI, UL/CSA
- ISO 9001 high quality standards for all its products and HALT testing
- a distribution system via strategic partnerships with the leading telecommunications giants
- proven track record of continual development of leading-edge products to meet the marketplace requirements
- commitment to growth in its international presence.

3. SlimLine Architecture Overview

3.1 CHASSIS

The SlimLine chassis is a compact metal box enclosure with a small footprint. The external dimensions are 1.75" H X 17.25" W X 12" D. The installation options include mounting it on an EIA 19" (482 mm) or 23" (584 mm) standard open rack or enclosed cabinet, or on a wall or placing it on a desk top. The entire unit weighs less than 10 lbs. The front panel of the chassis sports the Premisys logo, slide switches for T1 and data port testing and diagnostics, and LED indicators for test, status and alarms. The rear panel has the power inlets, the T1, Data, and FXS interface external connectors, and DIP switches for configuration of T1, Data and FXS ports and FXS loopbacks. In addition, there are internally located DIP switches which provide easy configuration of FXS Modes and Transmission Level Point (TLP) for individual FXS ports.

The chassis dimensions are tabulated as below:

CHASSIS	HEIC	бнт	WI	ОТН	DEPTH				
MODEL	IN	СМ	IN	СМ	IN.	СМ			
12 FXS PORTS (240212)	1.75	4.5	17.25	43.8	12.0	30.5			
24 FXS PORTS (240224)	1.75	4.5	17.25	43.8	12.0	30.5			

SLIMLINE FRONT PANEL



SLIMLINE REAR PANEL



SLIMLINE- MAIN/ AUXILIARY BOARD SWITCHES



FRONT PANEL

3.2 PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

The SlimLine units are air-cooled by an internal fan. Thus, they can be stacked one on top of another provided the feet are fixed on the units and all the standard operating conditions are satisfied. This can be a boon for installation in space-constrained locations.

In all cases, the unit must be installed in an environment that meets the following specifications:

• AC POWER (120 VAC):	108 VAC to 132 VAC
• DC POWER (-48, +24, -24 VDC):	22.5 VDC to 57 VDC
NOMINAL POWER CONSUMPTION:	40 Watts
• OPERATING TEMPERATURE:	0°C to 40°C (32°F to 104°F)
• STORAGE TEMPERATURE:	-40°C to 66°C (-40°F to 151°F)
• OPERATING REL. HUMIDITY:	5% to 95% Non-condensing

The SlimLine chassis conforms to the applicable sections of following compliance standards:

ANSI 310-D , IEC 297-1	(Racks, Panels, and Associated Equipment)
ANSI 1459	Telephone Equipment
U L 1 9 5 0	
CSA C22.2	Safety of information technology equipment including electrical
	business equipment
FCC PART 68	Requirements for Connection of Terminal Equipment Systems and Protective
	Apparatus to the Telephone Network
FCC PART 15 CLASS A	Radio Frequency Devices

3.3 POWER SUPPLY

The Premisys SlimLine can be powered from either 120 VAC, or -48, -/+ 24 VDC source. An internal power supply unit generates the supply voltages of +5V, -28V. The Ringing signal for the FXS lines is generated by integrated Ringing Modules that serve groups of 12 line interfaces. The power requirements are minimized by the use of lower battery and ringing voltages, which is optimized for short loop applications.

INPUT VOLTAGE:	108 VAC to 132 VAC at 60 Hz 22.5 to 57 VDC
INPUT CURRENT:	0.6 Amp max. for AC; 1.8 Amp max. for DC
INPUT FREQUENCY:	50 to 60 Hz for AC
INRUSH SURGE CURRENT:	8 Amps for AC Input
OUTPUT POWER:	Continuous 40 W
	Peak 72 W
EFFICIENCY:	minimum 75%
HOLD UP TIME:	25 milliseconds
MAX. NO. PER SYSTEM	1
PROTECTION	Unit is fused and protected from short circuits and over-voltage
APPROVALS:	UL 1950
	CSA-C22.2 No. 950

3.4 SYSTEM SYNCHRONIZATION AND CLOCKING

A 1.544 MHz clock is required by the Line Interface Unit (LIU) in order to drive the T1 transmit line out of the SlimLine. The 1.544 MHz clock is generated in one of two ways depending on whether the SlimLine is in LINE or INTERNAL mode. In LINE mode, the clock is recovered from the T1 receive line and drives the LIU's transmit T1 clock. In INTERNAL mode, the 1.544MHz LIU transmit clock is generated by an on-board Stratum IV oscillator. These modes of operation are set through external an DIP switch.

In the case of a T1 reception failure (i.e. there is no incoming T1 signal), the LIU will automatically switch to the on-board Stratum IV clock to drive the T1 transmit clock line.

3.5 T1 NETWORK INTERFACE

The T1 network interface on the SlimLine consists of a T1 Framer and a Line Interface Unit (LIU) chip, two transformers and front-end protection circuitry. This circuitry will protect against over-voltage / lightning which can be introduced on the T1 line. This will prevent hazardous voltages that enter the T1 line from being conducted onto the FXS Tip/Ring pairs, the data port lines or the power supply lines.

The physical T1 interface is provided by an RJ48 connector and supports both CSU and DSX functionality. DSX option is optimal for direct connection to co-located DS1 equipment. Some examples are PBX, DACS or a Fiber/DS3 Multiplexer with DS1 interface. DSX can also connect to an external CSU. In addition, there is a dual bantam jack for bridged access to T1 transmit and receive signal pairs. This jack is used for in-session monitoring purposes only.

• T1 SIGNAL FORMAT		
ELECTRICAL INTERF	A C E	ANSI T1.403
FRAME FORMAT		D4 (SF), ESF, TR008 as per ANSI T1. 403
CODING		AMI or B8ZS
VOICE CHANNEL SIG	NALING	Robbed-bit signaling as per Annex C of ANSI T1.403
ERROR DETECTION		CRC-6 (ESF framing only)
ALARM INDICATION		ANSI T1.403
BIT RATE & TOLERA	NCE	1.544Mbps +/- 50 bits/sec. Jitter complies w/ ITU G.823/G.824
FDL REPORTING		T1 - ESF mode only - AT&T TR62411 and ANSI T1.403 $$
• STANDARDS CONFORM	ANCE	
AT&T TR43801		Digital Channel Bank Requirements & Objectives
AT&T TR54016		Requirements for Interfacing Digital Terminal Equipment to
		Service Employing the Extended Superframe Format
AT&T TR62411		Accunet 1.5 Service, Description and Interface Specifications
BELLCORE TR-TSY-0	00008 ISSUE 2 08/87	Digital Interface Between the SLC 96 Digital Loop Carrier System
		and a Local Digital Switch

Functional criteria for Digital Loop Carrier Systems

Network-to-Customer Installation - DS1 Metallic I/F

Digital Hierarchy - Formats Specifications

Synchronization Interface Standards for Digital Networks

BELLCORE TR-TSY-000057 1993 ANSI T1.101 ANSI T1.107 1988 ANSI T1.403 1995

3.6 DATA INTERFACE

Both models of the SlimLine provide two (2) high-speed data ports as a standard feature. Each data port can be DIP switch configured independently. DIP switch configurable parameters include V.35 or EIA530A mode; Nx56Kbps or Nx64 kbps mode (N = 1 to 24); starting time slot on the T1 frame and number of contiguous time slots. The data port physical interface is a DB25F connector and the SlimLine always works in DCE mode. All connecting DTEs (i.e. V.35 and EIA530A) must conform to the selected DB25F pin out on the SlimLine. The data interfaces provide connectivity for high-speed Internet routers, frame relay access devices (FRADs), video codecs, Front-End Processors (FEPs), SNA Controllers and other WAN DTEs.

NOTE: There are differences between EIA530 and EIA530A modes in the data terminal ready (DTR), data set ready (DSR) and the remote loop back (RL) signals. The DTR and DSR signals are balanced in EIA530 mode but unbalanced in the EIA530A mode. Care should be taken when connecting DTE equipment since EIA530 and EIA530A are not compatible without hardware modifications to the DTE.

DATA SPEEDS PHYSICAL INTERFACES ELECTRICAL INTERFACES DATA FORMAT DATA PROTOCOL N x 56k and N x 64k, where N = 1 to 24 2 female 25-pin DB25 D-connectors ITU-T V.35, EIA-530A synchronous transparent

3.7 FXS VOICE INTERFACE

The SlimLine is available in two models which provide a choice of either 12 FXS ports (Model number 240212) or 24 FXS ports (Model number 240224). The physical interface in both models is one 50-pin female amphenol connector. The Ringing signal for the FXS lines is generated by Ringing Modules that serve groups of 12 FXS line interfaces. These 12 line groups are mapped onto the T1 in either the time slots 1-12 or 13-24 under switch control. The microprocessor will read the switch settings and configure the T1 and FXS interfaces accordingly. The power requirements are reduced by the use of lower battery and ringing voltages which is made possible because the SlimLine will be used in intra-building short loop applications. The parameters that can be DIP switch configured include the FXS Supervision mode, the FXS signaling mode, and the TLP. The FXS interface provides high quality dial-tone lines to analog key systems, modems and facsimile devices.

NOTE: When a T1 port is configured for TR-008 format, the voice channels assigned to this port are identified by channel number (according to the TR-TSY-000008 document), which may be different from the T1 time slot number. The SlimLine supports only Group A. The relation between a channel number

CHANNEL NUMBERS	1	2	3	4	5	6	7	8	9	1 0	1 1	1 2	1 3	1 4	1 5	1 6	1 7	1 8	1 9	2 0	2 1	2 2	2 3	2 4
TIME SLOTS	1	3	5	7	9	1	1 3	1 5	1 7	1 9	2 1	2 3	2	4	6	8	1 0	1 2	1 4	1 6	1 8	2 0	2 2	2 4

and corresponding slot number for TR-008 is shown in Table 1.

Table 1. Channel Numbers Conversion to Time Slots for TR-008.

PHYSICAL	One 50-pin Female Amphenol
FXS SUPERVISION MODE	FXS, FXS-DN, FXS-DN-Wink, TR-008
FXS SIGNALING MODE	Loop Start, Ground Start, Loop Start w/ forward Disconnect, Ground Start Immediate,
	Ground Start Automatic, Universal Voice Grade, Universal Voice Grade Automatic,
	Single-Party
TLP	Choice of 3 dB or 9 dB Attenuation on Transmit (Analog to T1) and Receive (T1 to
	Analog), Supports loops up to 800 Ohms external resistance including set On Hook
	transmission for Caller ID support
TERMINATION IMPEDANCE	600 Ohms
LONGITUDINAL BALANCE	Nominal > 46 dB
PCM ENCODING	μ-law

RINGING VOLTAGE 50 Vrms

3.8 MAINTENANCE AND DIAGNOSTICS

The SlimLine comes with a rich suite of diagnostics including power-up self test, loopbacks, test pattern generation and detection, external alarm contact for visible and audible alarms and status LEDs. Such a comprehensive suite takes the guesswork out of trouble-shooting and maintenance and enables high quality of service at a lower cost.

Upon power-up, the SlimLine performs a comprehensive set of tests to ensure that all the components are functioning. These include the microprocessor, memory, T1 Line Interface Unit (LIU), and internal registers.

LEDs located in the front of the unit are used to indicate normal operation, test results and error conditions.

3.8.1 T1 ALARM/PERFORMANCE MONITORING The SlimLine's T1 interface is continually monitored for performance. It reports the results depending on the T1 framing format (SF, ESF, TR-008).

In SF Framing format, performance monitoring messages are transmitted in-band. There are two performance monitoring actions available in SF framing format:

- When the incoming signal is lost, SlimLine transmits a Remote Alarm Indication (RAI) yellow alarm.
- When the outgoing signal is lost, or when an action is taken that would cause a loss of outgoing signal, such as line loopback, the Alarm Indication Signal (AIS) is sent on the T1.

In TR-008 Framing format, In TR-008 framing format, performance monitoring messages are transmitted via the 4 Kbps Facility Data Link (FDL). The SlimLine performs the following actions:

- Sends a constant ORB-16 framing pattern over the FDL link.
- Allows far end loopback (CSU Loopback) to be initiated and terminated.

In ESF Framing format, performance monitoring messages are transmitted via the 4 Kbps Facility Data Link (FDL). The SlimLine sends out on the T1 a performance report once per second as per TI.403-1995. This performance report contains performance information for each of the four previous one-second intervals. The SlimLine also detects, organizes, and stores performance data in 15 minute and 24 hour intervals and transmits this data over the T1 interface on receipt of a request message on the T1 ESF data link as per TR54016.

3.8.2 LOOPBACKS

Loopbacks can be performed on the T1, Data and FXS interfaces through slide-switches located on the front-panel of the SlimLine. In addition, the SlimLine can respond to network generated loopback requests over the FDL (also called CSU Loopback requests).

T1 Network Loopback breaks the transmit and receive path between the CPU and the T1 Framer and loops the T1 receive signal onto the T1 transmit within the T1 Framer.

T1 Local Loopback breaks the receive path between the Line Interface Unit (LIU) and the T1 line and loops the T1 transmit signal onto the T1 receive within the LIU.

The SlimLine will respond to *CSU Loopback* requests over the FDL if the corresponding DIP switch is set. The loopback is disabled automatically after 10 minutes.

Data Port Network Loopback breaks the transmit signal on the network side between the data port and the T1 interface and loops the data port receive signal onto the transmit side.

Data Port Local Loopback breaks the receive signal on the network side between the data port and the T1 interface and loops the data port transmit signal onto the receive side.

FXS Port Network Loopback breaks the transmit and receive signals from the FXS port and loops the T1 receive stream onto the T1 transmit stream. When a loss of T1 line is declared, all FXS



T1 NETWORK LOOPBACK



T1 LOCAL LOOPBACK





DATA PORT NETWORK LOOPBACK





FXS PORT NETWORK LOOPBACK



duration of the failure. This condition is automatically removed upon successful restoration of the T1 link. The IDLE/BUSY states during Trunk Conditioning are configured by a DIP switch.

3.8.3 T1 AND DATA TEST PATTERNS

Specific test patterns can be generated on the T1 interface and Data ports of the SlimLine. These tests can be initiated through slide-switches located on the front-panel.

The T1 interface on the SlimLine supports the generation of the Quasi-Random Sequence Signals (QRSS) test pattern on a framed T1 link. All connections between either the Data ports or the FXS ports and the T1 interface are broken and a QRSS pattern is transmitted on the T1 interface. An LED will light GREEN to indicate that the QRSS signal pattern is being sent towards the network. When operating the QRSS switch the T1 Loopback switch will be inoperative.

The Data ports on the SlimLine support the generation and detection of the 2047 test pattern. This pattern is sent in the time slots allocated to the data port(s) in Nx56K or Nx64K format. The connec-



SLIMLINE

4. SlimLine Specifications

Height	1.75 inches (4.5 cm)
Width	17.25 inches (43.8 cm)
Depth	12 inches (30.5 cm)
Weight	10 lb (4.5 Kg)
	Desktop
	Wall Mount
	19' and 23'' Rackmount option
AC	120 V
DC	-48V, -24V, or +24V
	Integrated AC/DC converter and Ringing Generator
Operating Temperature	0°C to 40°C
Storage Temperature	-40°C to 66°C
Relative Humidity	5 to 95% Humidity, Non-Condensing
	FCC Part 15 Class A
	UL 1950 and CSA
	FCC Part 68 and Industry Canada CS-03
240212	12 FXS ports, 2 EIA530A/V.35 data ports
240224	24 FXS ports, 2 EIA530A/V.35 data ports
Physical	One RJ48 (supports CSU/DSX)
Frame Format	D4, ESF, TR08
Line Coding	AMI, B8ZS
Line Build Out (LBO)	0 dB, -7.5 dB, -15.0 dB
Clocking	Internal Stratum 4, Line
TR08 Support	Universal Voice Grade (UVG) Single-party (SP) signaling modes
FDL	Per ANSI T1.403 and AT&T TR62411
Physical	One 50-pin Female Amphenol
FXS Supervision Mode	FXS, FXS-DN, FXS-DN-Wink, TR08
FXS Signaling	Loop Start, Ground Start, Loop Start w/ forward Disconnect,
	Ground Start Immediate, Ground Start Automatic, Universal
	Voice Grade, Universal Voice Grade Automatic, Single-Party
TLP	Choice of 3 dB or 9 dB Attenuation on Transmit (Analog to T1
	and Receive (T1 to Analog). Supports loops up to 800 Ohms
	external resistance including set
Ringing Voltage	50 Vrms, On hook transmission for Caller ID support
Physical	Two (2) EIA530A/V.35 ports (DIP switch selectable)
Data Rate	Nx56K, Nx64K (N = 1 to 24)
	Extensive power-up self test
	LED Indicators
	QRSS Test Pattern on T1
	2047 Test Pattern on Data ports
	Loopbacks for FXS, T1, and Data ports
	CSU Loopback detection
	Performance statistics over FDL
	Bantam jacks for in-session T1 monitoring and line testing
	FXS, T1, Data port Loopbacks. CSU Loopback Detection.
	Clocking, T1 Frame Format. T1 LineCoding. T1 Line Build Ou
	FXS TLP, FXS Supervision, FXS Signaling. Trunk Conditioning
	Test Patterns Data rate Data electrical mode
	HeightWidthDepthWeightACDCOperating TemperatureStorage TemperatureRelative Humidity240212240224PhysicalFrame FormatLine CodingLine Build Out (LBO)ClockingTR08 SupportFDLPhysicalFXS Supervision ModeFXS SignalingTLPRinging VoltagePhysicalData Rate



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