

Access Bank II - SNMP

INSTALLATION & USER'S GUIDE

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The information contained in this manual applies to Carrier Access Corporation's Access Bank II - SNMP.

FCC REQUIREMENTS

FCC Requirements, Part 15

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

FCC Requirements, Part 68 Exhibit J1

This equipment complies with Part 68 of the FCC rules. The label attached to the top cover of the housing of the Carrier Access Corporation Access Bank II - SNMP contains, along with other information, the FCC registration number. You must supply this information to the telephone company, if they request it.

FCC Registration Number: 2ZUSA-22437-DD-N

Ringer Equivalence: REN 0.4B

Service Center in the USA:
Carrier Access Corporation
5395 Pearl Parkway
Boulder, CO 80301-2490

The Facility Interface Code (FIC) associated with each private line application represents the type of service that will be provided by the telephone company. The following are currently registered:

Port:	FIC:	SOC:	Jack:
T1 1.544 Mbps	04DU9-BN	6.0n	RJ48C
T1 1.544 Mbps	04DU9-DN	6.0n	RJ48C
T1 1.544 Mbps	04DU9-SN	6.0n	RJ48C

If the Access Bank II - SNMP causes harm to the telephone network, the telephone company will notify you in advance. If advance notice proves impractical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe such action is necessary.

The telephone company may make changes in its facilities, equipment operations, or procedures that could affect the operation of the Access Bank II - SNMP. If this occurs, the telephone company will provide advance notice so that you may make necessary modifications to maintain uninterrupted service.

If you experience trouble with the Access Bank II - SNMP, please first contact the distributor or dealer from which you purchased the product and then, as a second point of contact, contact CAC for repair and/or warranty information.

If the trouble is causing harm to the telephone network, the telephone company may request that you remove

the Access Bank II - SNMP from the network until the problem is resolved. User repairs must not be made. Doing so will void your warranty.

Do not install the Access Bank II - SNMP on public coin service provided by the telephone company. Connection to Party Line service is subject to state tariffs. (Contact your state public utilities commission for further information.)

To minimize damage caused by local lightning strikes and other electrical surges, it is recommended that the customer install an AC surge arrestor in the AC outlet to which the Access Bank II - SNMP is connected.

SAFETY REQUIREMENTS

DANGER! Always exercise caution when installing telephone lines.

Never touch uninsulated telephone wires and terminals unless the telephone line has been disconnected at the Network Interface (NI) as voltage potentials as high as 300 Vac may be present across the transmit and receive pairs.

Never install telephone wiring during a lightning storm.

Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

Refer to the installation chapter in this manual for a safe and proper installation procedure. All wiring external to this equipment should follow the current provision of the National Electrical Code.

NATIONAL ELECTRICAL CODE REQUIREMENTS

The Access Bank II - SNMP is CCL certified and is in compliance with ANSI/UL Std. 1459. The CCL certification number for the product safety listing of the Access Bank II - SNMP is C86-0303.

INDUSTRY CANADA REQUIREMENTS

Load Number: 5

CP-01, Part 1

Section 10.1

“NOTICE: The Canadian Department of Communications 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, users should 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). The customer should be aware that 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.

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

CP - 01, Part I

Section 10.2

“NOTICE: 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 the devices does not exceed 100.”

WARRANTY

Carrier Access Corporation conditionally warrants to BUYER that PRODUCTS are free from substantial defect in material and workmanship under normal use given proper installation and maintenance for the period of five years from the date of shipment by CAC.

BUYER will promptly notify CAC of any defect in the PRODUCT. CAC or its agent will have the right to inspect the PRODUCT or workmanship on BUYER’S or BUYER’S customer premises. CAC has the option to: (a) repair, replace or service at its factory or on the premises the PRODUCT or workmanship found to be defective; or (b) credit BUYER for the PRODUCT in accordance with CAC’s depreciation policy. Refurbished material may be used to repair or replace the PRODUCT. PRODUCTS returned to CAC for repair, replacement, or credit will be shipped prepaid to BUYER.

Limitations of Warranty & Limitation of Remedies

Correction of defects by repair, replacement, service or credit will be at CAC’s option and constitute fulfillment of all obligations to buyer for breach of warranty.

CAC assumes no warranty liability with respect to defects in the PRODUCT caused by:

- (a) modification, repair, installation, operation or maintenance of the PRODUCT by anyone other than CAC or its agent, except as described in CAC’s documentation; or
- (b) the negligent or other improper use of the PRODUCT; or
- (c) handling or transportation after title of the PRODUCT passes to BUYER.

Other manufacturer’s equipment purchased by CAC and resold to BUYER will be limited to that manufacturer’s warranty. CAC assumes no warranty liability for other manufacturer’s equipment furnished by BUYER.

Buyer understands and agrees as follows: the warranties in this agreement replace all other warranties, expressed or implied, and all other obligations or liabilities of CAC, including any warranties of merchantability and fitness for a particular purpose. All other warranties are disclaimed and excluded by CAC.

The remedies contained in this agreement will be the sole and exclusive remedies whether in contract, tort or otherwise, and CAC will not be liable for injuries or damages to persons or property resulting from any case whatsoever, with the exception of injuries or damages caused by the gross negligence of CAC. These limitations apply to all services, software, and products during and after the warranty period. In no event will CAC be liable for any special, incidental, or consequential damages or commercial losses even if CAC has been advised there-

of.

No agent, distributor, or representative is authorized to make any warranties on behalf of CAC or to assume for CAC any other liability in connection with any of CAC's PRODUCTS, Software, or Services.

WARRANTY PRODUCT RETURNS

PRODUCTS may not be returned without prior assignment of a Return Material Authorization (RMA) number from Carrier Access Corporation. Call CAC Customer Support at (800) 495-5455 or (303) 442-5455 to request an RMA number.

PRODUCTS to be returned are subject to CAC inspection and acceptance. PRODUCTS found physically damaged or modified will be returned to BUYER freight collect.

Ship authorized PRODUCT returns to:

Carrier Access Corporation
Attn.: RMA# _____
5395 Pearl Parkway
Boulder, CO 80301 USA

ADVICE TO THE READER

This manual contains information and warnings that must be followed to ensure safe operation of the Access Bank II - SNMP while retaining the equipment in a safe condition.

DANGER! The *DANGER!* sign denotes a hazard to the user and calls attention to a procedure, practice, or the like, which, if not correctly performed, could result in injury or loss of life. Do not proceed beyond a *DANGER!* sign until the noted conditions are fully understood and met.

CAUTION! The *CAUTION!* sign denotes the possibility of network service interruption and calls attention to a procedure or practice, which, if not correctly performed, could result in interruption of network service.

WARNING! The *WARNING!* sign indicates the possibility of equipment damage and calls attention to a procedure or practice, which, if performed improperly, could result in equipment damage.

Note: *The NOTE sign precedes explanatory comments or supplementary instructions.*

HOW TO USE THIS MANUAL

This manual is designed to give you the information needed to install, configure, and operate the Access Bank II - SNMP. Take time to read it through completely in order to become familiar with its contents and overall organization. Then, for quick access to most information, you can simply refer back to the *Table of Contents*.

This manual is organized into chapters as follows:

Chapter 1. Introducing the Access Bank II - SNMP

Provides a general introduction to the Access Bank II - SNMP including summaries of its standard functions, features, and optional enhancements.

Chapter 2. Product Description

Describes the general physical characteristics and layout of the Access Bank II - SNMP, including the Control Panel, digital and analog interface connectors, power connector, DIP switches and LED status indicators.

Chapter 3. Technical Specifications

Summarizes the technical specifications of the Access Bank II - SNMP, including its dual T1 network interfaces, integral Channel Service Units (CSUs), digital data ports, analog line interfaces, network management capabilities, alarms, standards, power sources and environmental operating parameters.

Chapter 4. Physical Installation

Provides procedures for physically installing the Access Bank II - SNMP including checking items required for installation and mounting the chassis and power converter.

Chapter 5. Electrical Installation

Provides procedures for installing the communication interface and power connectors on the Access Bank II - SNMP Control Panel and bringing the unit on line.

Chapter 6. Initialization and Basic Configuration

Describes how to initialize and configure the Access Bank II - SNMP for first time basic operation in the *Local* mode using the System Configuration and T1 Hardware Configuration DIP switches.

Chapter 7.12-Channel FXS Card

Describes how to configure the *Foreign Exchange Station (FXS)* 12-channel voice card for connection to T1 public network services and provides instructions for setting signaling options and channel attenuation levels, and performing voice channel monitoring and testing.

Chapter 8. 12-Channel FXO Card

Describes how to configure the *Foreign Exchange Office (FXO)* 12-channel voice card for connecting the Access Bank II - SNMP to T1 public network services and provides instructions for optioning the *FXO*.

Chapter 9. Diagnostics & Troubleshooting

This Chapter provides instructions for performing self-test loopbacks, network loopbacks, disabling external alarms, as well as fault isolation procedures for troubleshooting typical problems encountered while operating the Access Bank II - SNMP

Chapter 10. Maintenance

Provides procedures for maintaining the Access Bank II - SNMP including “hot swapping” slide-insert voice cards and replacing the Controller card.

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Chapter 1

Introducing the Access Bank II SNMP

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1.1 About This Chapter

This chapter provides a general introduction to Carrier Access Corporation's Access Bank II SNMP and includes summaries of its:

- Physical Characteristics
- Features, Functions, and Optional Enhancements
- Digital and Analog Interfaces and Connectors
- Local and Remote Network Management

1.2 General System Overview

The Access Bank II SNMP is an intelligent dual-port T1 voice and data multiplexer equipped with integrated pairs of Channel Service Units (CSUs) and Data Service Units (DSUs). It supplies up to

3.072 Mbps of synchronous bandwidth capacity for connecting customer premises telecommunications equipment to public and private network DS1 services. An Internet or router V.35 port may be configured for up to 1.5 Mbps on one T1, while all 24 voice channels are terminated on a second T1.

1.3 Features, Functions, and Options

The Access Bank II SNMP combines the functions of an intelligent CSU/DSU, digital access & cross-connect switch (DACS), and channel bank in a single product that includes the following standard features, functions, and options.

1.3.1 Standard Features

- Dual T1 ports with integrated diagnostic ESF CSUs
- 3.08Mbps total available bandwidth
- V.35 DCE data port (to 1.536Mbps)
- Drop and Insert (D&I)
- DS0 Digital Cross-Connect System (DCS)
- Command line interface (CLI) for local or remote management.
- RS-232 Command Line Interface and optional Remote Monitor program.
- Embedded SNMP agent supporting MIB-II and standard MIBS for T1 and V.35 via a TCP/IP and 10base-T Ethernet connection
- 115 Vac to -48 Vdc Power Converter Cube
- Standard 25-pair female telephone cable connector

1.3.2 Software Programmable Functions

- Drop & Insert (D&I): 1 T1/CSU with 1 T1/CSU D&I port
- 2 T1/CSU DS0 Digital Cross-Connect (DCS) with three frames maximum (0.375ms) T1-toT1 delay
- Bandwidth allocations of voice and data
- ESF to D4 (SF) and D4 to ESF conversions for PBXs with T1 interfaces
- Time of day DS-0 mapping to optimize voice and data utilization

1.4 Dual T1/CSU Network Interfaces

Because the dual T1 network interfaces supply over 3 Mbps of useable bandwidth, the Access Bank II SNMP is able to demultiplex the primary incoming T1 signal into 12 or 24 analog telephone circuits for connection to voice, facsimile, and high-speed V.34 modems, leaving the secondary T1 port

available for Internet connection, or for alternate routes or carriers. Doubling the bandwidth capacity of a conventional digital channel bank allows the Access Bank II SNMP to dedicate the built-in V.35 DCE data port to Internet, video, or Wide-Area Network (WAN) applications, while also performing such advanced networking tasks as Drop and Insert (D&I), and DS-0 Digital Access & Cross-connect Switching (DACs). Both diagnostic CSUs are fully integrated, respond to all standard inband and out-of-band network loop codes, and can be polled for ANSI T1.403 one-second Performance Report Messages (PRMs) or AT&T 54016 Maintenance Messages over the 4 Kbps ESF Facility Data Link (FDL).

1.5 Digital Data Ports

1.5.1 V.35 DCE Port

To fully utilize the extra bandwidth supplied by the dual T1 interfaces, the Access Bank II SNMP has a built-in V.35 DCE data port for connection to Wide Area Network (WAN) devices such as Internet routers and Frame Relay Access Devices (FRADs). This high-speed serial interface supports synchronous data connections from 56 Kbps to 1.536 Mbps, all rates. When used in conjunction with the internal BER tester, the V.35 interface is also capable of generating V.54 loop codes for activating and deactivating remote loopbacks in DCE devices at the far-end. The intervening transmission link then can be stress tested using a selectable range of industry standard QRSS patterns (QRSS, All Zeros, All Ones, 511, 2047, 215-1, 220-1, 2023-1, etc.). Use of the V.35 DCE port requires an optional V.35 data cable.

1.5.2 RS-232 Data Port

The Control Panel of the Access Bank II SNMP also contains an RS-232 secondary data port that can be configured to provide a 56/64 Kbps synchronous data channel for connection to SNA cluster controllers, data multiplexers, routers, or SCADA (Supervisory Control and Data Acquisition) links. When configured for asynchronous operation, this same RS-232 data port can also be used, alternately, to implement a point-to-point dedicated communications channel between two Access Bank II units at 1.2, 2.4, 4.8, 9.6, 14.4, 19.2, 28.8, 38.4, or 57.6 Kbps rates. Use of the RS-232 data port requires an optional dual purpose RS-232 user data and management cable.

1.6 Analog Line Interfaces: FXS, & FXO, and 4-Wire E&M

To meet individual site-specific communications requirements, the Access Bank II SNMP can be equipped with a full range of “hot-swappable” slide-insert analog line interface cards. Please contact CAC for details and availability of these and other card options:

- The Foreign Exchange Station (FXS) 12-channel voice card delivers high quality loop-start or ground-start dial tone telephone line connections to key systems, Off Premise Extensions (OPXs), facsimile machines, modems, PBXs and other conventional analog telephone devices.
- The Foreign Exchange Office and Dial Pulse Termination (FXO/DPT) voice card compliments the FXS by supplying 12 standard loop-start or ground-start telephone line con-

nections on a per channel basis from PBX office-end telephone systems to public network T1 (DS1) services using FXO terminations. The DPT feature of this card is especially useful in remote office or campus T1 environments where it can be used to support one-way Direct Inward Dialing (DID) service for voice mail and call center applications.

- A Battery Reversal FXS/Dial Pulse Origination (BRFXS/DPO) voice card is also available that provides twelve 2-wire Loop Start connections with Tip/Ring battery reversal to the digital T1 (DS1 line). The second function of this card is Dial Pulse Origination (DPO), which is the functional complement to Dial Pulse Termination (DPT) provided by the FXO/DPT voice card.
- The 4-wire E&M/Transmission Only (E&M/TO) voice card supplies 12 channels for connecting to private line circuits, such as PBX tie lines and 4-wire modems often found in utility, cellular, and metropolitan area networks (MANs). Each of the twelve E&M channels can be individually programmed to support Signaling Types I, II, IV or V. This card can also be configured to function as Channel Equipment (normal multiplexer mode) or as Switching Equipment for back-to-back Tandem operation sometimes referred to as “Reverse E&M” or “Pulse Link Repeater.” The Transmission Only (TO) operating mode provides dedicated transmit and receive paths to radio and modem equipment uncorrupted by the insertion of A/B robbed bit signaling.

All analog line interface cards greatly exceed the required analog loop range and are proven V.34 modem compatible. Using a special patent-pending feature developed by Carrier Access Corporation, they also perform automatic impedance matching to adapt to various analog modem types and line lengths. Over-voltage and over-current protection are individually handled on the analog interface channel cards, as well as on the Controller. This distributes the power redundantly so that a line fault or over-voltage on one analog channel card does not affect the operation of another.

1.7 Local and Remote Network Management

The Access Bank II SNMP has three network management options. SNMP and CLI management are described in detail in Chapter 14, *SNMP Management and Command Line Interface*, while GUI management software is provided in the *Access Bank II SNMP User Manual*.

- Simple Network Management Protocol (SNMP) for basic network control by a Network Management Station via the Ethernet 10Base-T management port.
- Command Line Interface (CLI) for complete control by a VT-100 terminal via the RS-232 port, or by a Telnet terminal via the Ethernet 10Base-T port.
- Windows®-based GUI software with graphical user interface (GUI) for user-friendly control by a PC or laptop computer via the RS-232 port.

1.7.1 Local/Remote Mode Selection

The Access Bank II SNMP comes equipped with two sets of external DIP switches for selecting local or remote management control. In the local hardware control mode, you can use these DIP switches to perform self-tests for channel alignment, to select basic T1 hardware configuration parameters

(AMI/B8ZS, D4/ESF), and to enable detection of standard D4/ESF inband loop codes by the integral CSUs. In the remote software control mode, you can use SNMP, CLI, or GUI management terminals.

1.7.2 SNMP Management

The Access Bank II SNMP:

- Supports Simple Network Management Protocol version 2 (SNMPv2) through its Ethernet 10Base-T port.
- Complies with RFC standards for for SNMPv2, Ethernet, Internet, TCP/IP, and MIB-II network management, and T1 and RS-232 interfaces.
- Has built-in SNMPv2 Agent software providing network statistics, information retrieval and update, trap thresholds, and automatic transmission of trap data to Network Management Stations.

1.7.2.1 Local and Remote SNMP Management

The Access Bank II SNMP provides SNMP management through its Ethernet 10Base-T port. Remote SNMP management is possible over either of the T1 lines within a V.35 user data segment, as shown in Figure 1-1.

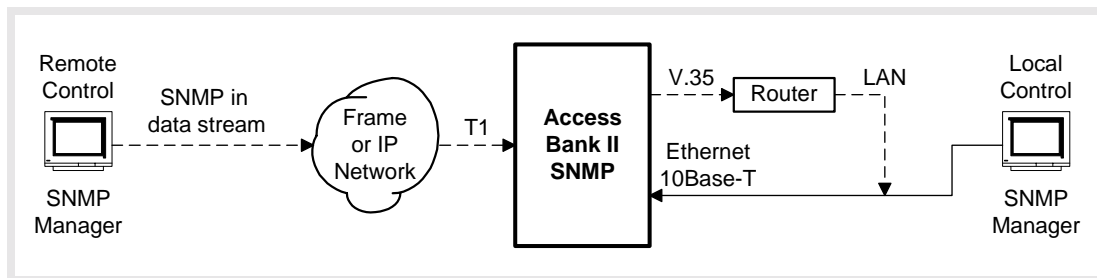


Figure 1-1: Local and Remote SNMP Management

1.7.2.2 SNMP Overview

SNMP is a complete, but simple, mechanism for network management. It works by exchanging information between a *Manager* and an *Agent*. In this case, the Agent is inside the Access Bank II/SNMP. The Manager is a Network Management Station (NMS), which is a computer with SNMP management software such as HP OpenView® or Sun NetManager®.

The Agent stores the information in a Management Information Base (MIB), which contains items such as the current status of the network interface, performance statistics, and alarms.

In general, SNMP is not concerned with controlling every feature of the many different network objects. However, SNMP is flexible enough that it can support a wide variety of private enterprise objects with predefined MIB data structures. The Access Bank II/SNMP uses the Bellcore® standard MIB for T1 interfaces.

Manager operations include simple “get” and “set” commands to retrieve and update MIB data in the

Agent. Normally, the Manager polls the Agent periodically to check traffic statistics. However, the Manager can also set thresholds for traps. Traps specify network events and conditions for which the Agent automatically sends a Telnet alarm message with trap data back to the Manager.

1.7.3 Command Line Interface

The Access Bank II SNMP comes with a built-in Command Line Interface. CLI provides complete management of all Access Bank features through any VT-100 terminal or PC connected to the RS-232 port, or through any Telnet terminal connected to the Ethernet 10Base-T port.

CLI works with a communications terminal, in which you type in text and press the carriage return key to send the message to the host. The host then responds with a log-on message, and the CLI is ready to use.

CLI is easy to use because the Access Bank II SNMP provides a list of menu options to choose from. Furthermore, context sensitive help is available to guide you through the setup process. At any time, you can type in a question mark (?) to obtain information about what to type next or what commands are available. You can also type "help" after any command to get specific help with that command.

1.7.3.1 Local and Remote CLI Management

The Access Bank II SNMP provides CLI management through its RS-232 and Ethernet 10Base-T ports, as shown in Figure 1-2 and Figure 1-3.

For RS-232 CLI control, just connect a PC or laptop computer to the RS-232 management port on the Access Bank II/SNMP. Then use a VT-100 terminal emulation program such as Microsoft Hyper Terminal®. (The default communications port settings are 9600, 8, 1, N.) Press the Escape key to initiate the link. The Access Bank will return a log-on message. If a password is required, the Access Bank will request that you enter a password. (Units shipped from the factory do not have a password defined, but the user is encouraged to use passwords to prevent unauthorized use.) CLI can be used from a remote site by connecting the RS-232 port to a modem and telephone line.

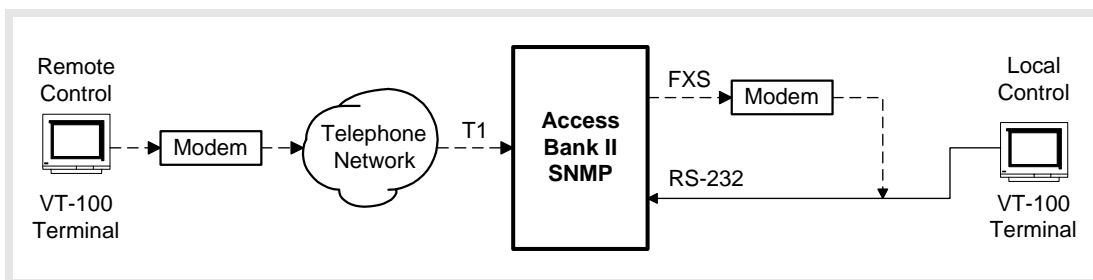


Figure 1-2: Local and Remote RS-232 CLI Management

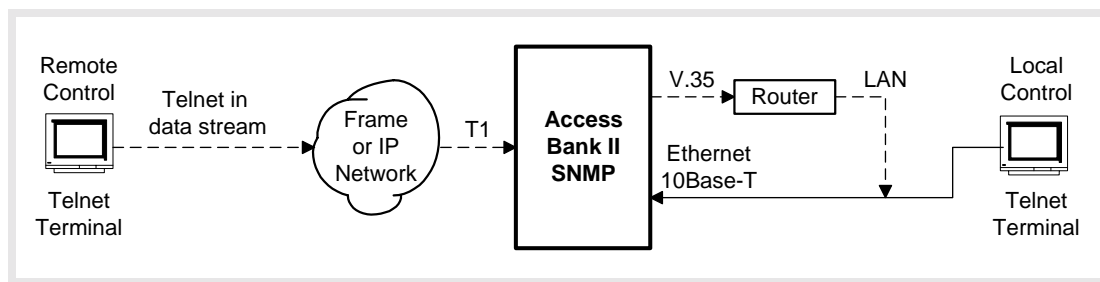


Figure 1-3: Local and Remote Telnet CLI Management

For Telnet CLI management, you can use a Telnet TCP/IP communications program to access CLI through the Ethernet management port. Remote Telnet CLI operation is available using Telnet over Ethernet or using inband T1 via the V.35 data port.

1.7.4 Windows-Based GUI Management Software

The Windows®-based GUI Management software (Figure 1-4) provides a graphical user interface (GUI) that makes management as easy as clicking a mouse button. Pull-down menus and Index Tabs make it easy to find just the function you're looking for. CAC's GUI Management software provides convenient access to most features of the Access Bank II SNMP. For detailed software description, see *Access Bank II SNMP User Manual*.

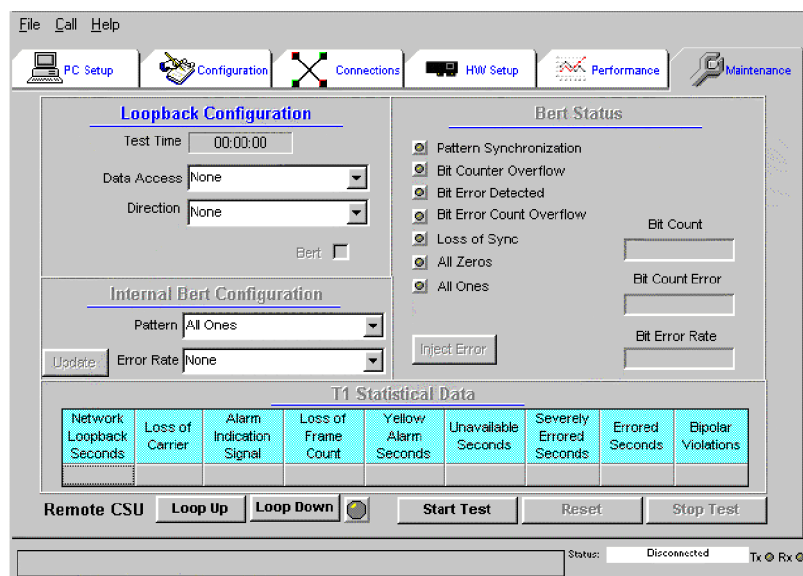


Figure 1-4: Carrier Access Corporation's GUI Management Software

The GUI software follows a top-down hierarchy that organizes Access Bank management functions into six basic groups. Index tabs at the top of the screen give quick access to:

- PC Setup
- Configuration
- Connections
- Hardware Setup
- Performance Statistics
- Maintenance

1.7.5 Local and Remote GUI Management

For configuration, monitoring, and testing purposes, each Access Bank II SNMP is shipped with CAC's Windows®-based GUI management software, backed by a full-featured system of context-sensitive online help. Installed on a local 486 (or higher) IBM-compatible PC equipped with at least 16 MB RAM, Windows 95®, a keyboard and a mouse, this software program provides a convenient user-friendly interface for configuring and monitoring the performance of the Access Bank II SNMP via the RS-232 management port (Figure 1-5).

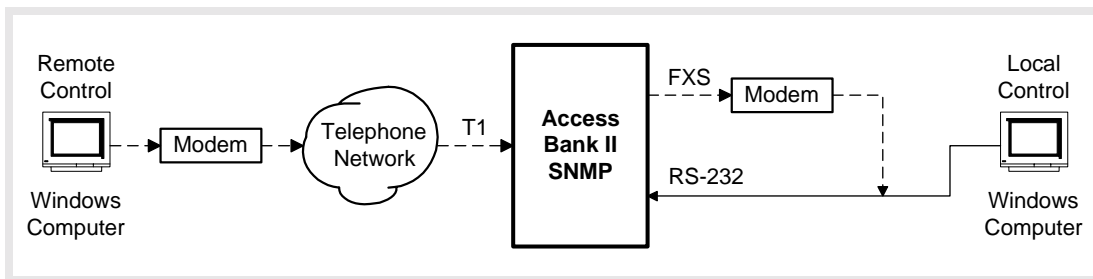


Figure 1-5: Local and Remote GUI Management

The GUI management software can also be installed on a remote Windows® PC for management over a separate PSTN (Public Switched Telephone Network) analog line. In this application, the GUI management software can also be used to poll the Access Bank II SNMP for remote alarms via an external Hayes®-compatible modem attached to the RS-232 management port.

1.8 Design Philosophy

The Access Bank II SNMP is manufactured by CAC according to a design philosophy based on solid-state overvoltage and overcurrent protection without the use of low-current fuses (<1 A) or very high-wattage resistors. Thanks to this advanced new technology, the Access Bank II SNMP complies fully with National Electrical Code and UL 1459 requirements for the safety of equipment attached to telephone wiring without using any fuses, which dramatically improves its long-term reliability, while greatly reducing equipment down time. As an added benefit, all items of equipment connected to the Access Bank II SNMP are protected from transient network voltage or current surges.

Chapter 2

Product Description

Contents of This Chapter:

About This Chapter	1
Physical Characteristics	1
Control Panel Interface Connectors	2
Control Panel DIP Switches	3
LED Test and Status Indicators	3

2.1 About This Chapter

This chapter describes the general physical characteristics and layout of the Access Bank II - SNMP, including its:

- Dual RJ-48C Jacks for T1 Span 1 and Span 2
- V.35 and RS-232 Digital Interface Ports
- Power Source Connector
- Standard 25-pair RJ-21X Tip & Ring Telephony Connector
- T1 Span and System Setup DIP switches
- LED Test and Status Indicators

2.2 Physical Characteristics

The Access Bank II - SNMP consists of a painted sheet steel chassis housing, nickel-plated chassis tray and removable back plate that accepts one (or two) 7.8 inch by 13.16 inch analog line interface daughter card(s). These analog line interface channel cards slide into the rear of the unit along rails that guide a 64-pin DIN connector on each card to mate with a matching connector on an internal

Controller card. The Controller card measures approximately 4 inches by 16.25 inches and functions as a Line Interface Unit (LIU) that integrates the two Channel Service Units (CSUs), the ringing generator, the ringback tone generator, and power converter functions. Separate Dual T1 and SNMP daughter cards measuring 1.75 inches by 6.25 inches are each mounted on the Controller card using support standoffs, plastic washers and screws. The Dual T1 daughter card is equipped with two standard RJ-48C 8-pin connector jacks for connecting to one (or two) T1 carrier network interface(s). The SNMP daughter card is equipped with an RJ-45 modular jack for TCP/IP 10Base-T Ethernet connection.

The Access Bank II - SNMP is 1.75 inches high, 17.75 inches deep, and 17 inches wide and, when fully loaded with two analog line interface daughter cards, weighs approximately 14.5 pounds. The Access Bank II - SNMP is designed to operate at an altitude between 0 and 10,000 feet above sea level and within a temperature range from 32° to 104° F (0° to 40° C) and in environments with a relative humidity from 0 and 95%.

Note: For proper Access Bank II - SNMP operation outside the specified ranges, the unit must be placed in an environmentally controlled enclosure.

2.3 Control Panel Interface Connectors

The Control Panel on the front of the chassis housing contains the following connectors and power connection terminals shown in Figure 2-1:

- Dual T1 Span 1 and Span 2 line connection ports each equipped with standard RJ-48C 8-pin connector jacks.
- V.35 DCE Data port equipped with a 26-pin standard D-type subminiature connector (female) for high-speed digital Internet WAN connections up to 1.536 Mbps.

Note: An optional V.35 data cable is required to utilize the V.35 DCE data port.

- RS-232 Remote Management port equipped with a standard 26-pin D-type subminiature connector (female) for connection to an external PC or Hayes®-compatible modem for local or remote configuration, management, and performance monitoring using the Access Bank II - SNMP Remote Monitor MS Windows-based software interface or command line interface.

Note: An optional Dual Headed Data and Management Cable is required to connect to the primary Management and secondary Data leads for simultaneous local or remote management and asynchronous or synchronous data connections.

Chapter 3

Technical Specifications

Contents of This Chapter:

About This Chapter	1	4-Wire E&M/TO Voice Card	4
Dual T1 Network Line Interfaces	1	Network Management	4
Line Codes	2	Alarms	5
Framing	2	Control Panel I/O Connectors	5
Clock Source	2	Standards Compliance	5
T1-to-T1 Delay	2	Power	6
T1 Channel Service Units (CSUs)	2	Environmental	6
Digital Data Ports	3	Physical Dimensions	6
Analog Line Interfaces	3	Installation	6
FXO/DPT Voice Card	4		

3.1 About This Chapter

This chapter summarizes the technical specifications of the Access Bank II - SNMP including its:

- Dual T1 network interfaces
- Channel Services Units (CSUs)
- Digital data ports
- Analog line interface channel cards
- Network management capabilities
- Alarms
- Standards compliance
- Powering
- Environmental parameters
- Physical Dimensions

3.2 Dual T1 Network Line Interfaces

3.2.1 Total Bandwidth

- 3.072 Mbps

3.2.2 DS-1 Output Signals

- Pulse amplitude: 2.0 V to 3.6 V \pm 60 Hz variations
- Line Rate: 1.544 Mbps \pm 50 bps
- Format: T1 type bipolar (except where intentional BPVs are introduced by B8ZS line coding)

3.3 Line Codes

- AMI or B8ZS and line code conversions between T1 lines

3.4 Framing

- D4 (Superframe) or ESF and framing format conversions between T1 lines

3.5 Clock Source

- Loop Timing: Selectively recovered from incoming T1 Span 1 or Span 2
- Master Clock: Internal Enhanced Stratum 4E Crystal Oscillator \pm 32 ppm accuracy)

3.6 T1-to-T1 Delay

- Latency: 3 frames maximum (0.375 ms)

3.7 T1 Channel Service Units (CSUs)

- Integrated intelligent CSUs support all standard diagnostic functions and DS-1 or DSX-1 signal levels from 0 to -30 dB
- Software programmable Line Build Out (LBO): 0 dB/DSX (0'-133') (default), -7.5 dB, -15 dB, -22.5 dB, DSX (133'-266'), DSX (266'-399'), DSX (399'-533'), DSX (533'-655')
- AT&T 54016 Maintenance Messages or T1.403 Performance Report Messages (PRMs) through 4 Kbps ESF Facility Data Link (FDL)

- Standard inband and out-of-band CSU network loopbacks
- Internal BER tester with selectable industry standard QRSS test patterns

3.8 Digital Data Ports

3.8.1 V.35 Serial Port

- Synchronous V.35 data from 56 Kbps to 1.536 Mbps in Nx56 Kbps or Nx64 Kbps steps, all rates.
- Built-in V.54 loopback code generation and detection for BERT

3.8.2 RS-232 Remote Management/Data Port

- Asynchronous point-to-point RS-232 data at 9.6, 19.2, 28.8, 38.4, and 57.6 Kbps
- Synchronous RS-232 data at 56 or 64 Kbps

3.9 Analog Line Interfaces

- FXS Ground Start/Loop Start voice card
- Battery reversal FXS/DPO voice card
- FXO/DPT voice card
- 4-wire E&M/TO voice card
- Patent-pending automatic analog impedance adjustment adapts to various modems and line lengths
- “Hot-swappable” slide-in channel cards
- 28.8 Kbps V.34 modem compatibility

3.10 FXS Voice Card

- Software-defined functions: E&M Immediate/Wink start to Loop start/ground start conversion with Ringback Tone for carrier services such as Megacom®, Flexpath®, DSS®, VPN®, VNET®, etc.
- Wink Delay for advanced ANI/DNIS 800 number services and Direct Inward Dial (DID) conversion
- Private Line Automatic Ringdown (PLAR) with Ringback Tone
- Calling Party (Forward) Disconnect provides two-second current interruption to disconnect Answering Devices and Modems. (Only available with E&M Immediate software-

-
- defined signaling options.)
- DC Loop Range: 1200 ohms (3 miles on 24 AWG + 300 ohms telephone)
 - Loop Feed: Nominal -48 Vdc with 30 mA current limit
 - Separate Transmit/Receive Gain Settings on a Per Channel Basis
 - All-channel simultaneous ringing power: 85 Vrms at 20 Hz
 - Built-in ringback tones
 - Battery Reversal FXS/DPO Voice Card
 - FXS Loop Start with Battery Reversal or Dial Pulse Originating (DPO) functionality per card
 - Optional Cadenced Ringback Tone (two-seconds on, four seconds off) to the T1 line during incoming calls, synchronized to the ringing voltage present on the loop
 - Optional Cadenced Ringing Voltage applied to CPE loop during an incoming call
 - Supports CLASS® services, including Caller ID

3.11 FXO/DPT Voice Card

- FXO Loop-Start/Ground-Start terminations per channel
- Dial Pulse Termination (DPT) functionality per card
- Separate transmit and receive gain settings per channel
- DID and DNIS carrier services
- CLASS® services, including distinctive ringing and caller ID

3.12 4-Wire E&M/TO Voice Card

- Optioned with on-board jumpers to support E&M signaling types I, II, IV, or V, for each channel
- Supports Transmission Only (TO) for dedicated modems, radio/paging systems, etc.
- Separate gain and loss settings from +10 dB to -21 dB for both transmit and receive paths for each channel
- Maximum analog transmission level of +9.5 dBm

3.13 Network Management

- RS-232 Primary Management Port, Cable, Command Line Interface, and MS Windows-based Remote Monitor Graphical User Interface (GUI) software program included with

Access Bank II - SNMP purchase.

- Control Panel T1 test switches and status LEDs
- Rear panel voice channel option switches, test switches, and status LEDs
- Embedded SNMP agent for performance monitoring and configuration of T1, V.35, and RS-232 data ports

3.14 Alarms

- Alarm dial-out notification over external modem attached to RS-232 Management port
- External alarm contact for visible/audible alarms using pair 25 of RJ-21X standard telephony connector on Control Panel
- Control Panel Alarm Cut-Off (ACO) Switch

3.15 Control Panel I/O Connectors

- T1 Span 1 and Span 2: Standard RJ-48C 8-pin jacks
- V.35 DCE Data Port: 26-pin D-type subminiature V.35 connector (female)
- Management Interfaces:
 - Management: Primary logical RS-232 port for connection to external Hayes-compatible modem or to IBM-PC (or compatible) with MS Windows Hyperterm (or compatible), and MS Windows-based Remote Monitor software program installed
 - Data: Secondary logical RS-232 data port
 - Connector: 26-pin D-type subminiature EIA/TIA RS-232 connector (female)
 - Adapter Cable: Dual RS-232 Management Cable for simultaneous connection to Data and Management RS-232 interface lead
- SNMP RJ-45 jack for 10Base-T Ethernet TCP/IP connection.
- Tip & Ring Interface: Standard 25-pair RJ-21X Telephony Connector (female)

3.16 Standards Compliance

- ANSI/TIA T1.403-1995 One-second Performance Report Messages (PRMs)
- ANSI/TIA 464-A-89 PBX Switching Equipment for Voice Band Applications
- AT&T 54016 Maintenance Messages on the 4 Kbps ESF Facility Data Link (FDL)
- AT&T 62411 Enhanced Stratum 4 Timing Requirements for T1 CPE
- AT&T 62411 Standard T1 Pulse Mask Characteristics
- Bellcore TR-TSY-000057 for Digital Loop Carrier Systems

-
- Bellcore TR-NWT-000499 Generic Transport Requirements
 - FCC Part 15, Class A for Radiated Emissions Control
 - FCC Part 68, CS-03 for T1 CSU Interface, Network Protection, Line Balance, REN
 - National Electrical Code 1996 Safety Requirements
 - NRTL Safety Listed: UL 1459, 2nd Edition concerning Minimum 600 Vrms Lightning Protection, CSA
 - IEEE 802.3 10baseT interface
 - EIA RS-232-D
 - RFC 1213, 1573, 1406, 1659

3.17 Power

- Control Panel DC Power Input Terminal: -48 Vdc with 1 Amp circuit breaker from local battery
- Standard Power Source: 115 Vac to -48 Vdc Power Converter Cube
- Optional Power Source: 220 Vac to -48 Vdc Power Converter Cube
- Input voltage: -42 to -60 Vdc at 1 Amp (constant current power source)

3.18 Environmental

- Altitude: 0 to 10,000' (0 to 3,048 m)
- Humidity: 0 to 95%
- Temperature Range: 32° to 104° F (0° to 40° C)
- Thermal Protection: Automatic cut-off at 104°F (40° C) until lowered below limit

3.18.1 Physical Dimensions

- Height: 1.75 inches (4.45 cm)
- Depth: 17.75 inches (45.1 cm)
- Width: 17 inches (43.2 cm)
- Weight: 14.5 Lbs (6.6 Kg) fully loaded

3.19 Installation

- Wall-mount, surface-mount, or standard EIA 19-inch rack-mount using supplied adapter brackets and screws
- Seven foot standard rack accepts up to 24 Access Bank II - SNMP units

Chapter 4

Physical Installation

Contents of This Chapter:

About This Chapter	1
Installation Check List	1
Chassis Mounting	5
Wall Mounting	6
Rack Mounting	6
Surface Mounting	7
Mounting the Power Converter	7

4.1 About This Chapter

This chapter describes how to physically install the Access Bank II - SNMP and provides procedures for:

- Checking items required for installation
- Mounting the Access Bank II - SNMP chassis
- Mounting the Power Converter

4.2 Installation Check List



Caution: When installing the Access Bank II - SNMP, be sure to observe standard safety procedures for working with hazardous electrical equipment.

This product is shipped as a complete package including the Access Bank II - SNMP equipped (per

order) with 0, 1, or 2 analog interface cards, Access Bank II - SNMP Remote Monitor software for the PC, and a power conversion cube. The package also contains one modular Category 5 T1 network interface cable, a 25-pin local management cable, a 25-pin to 25-pin null modem adapter, a 25-pin to 9-pin straight adapter, and “rabbit ear” adapter brackets with screws for wall or 19-inch rack-mounting. You will also find enclosed a copy of this manual along with a product warranty registration card.

- Check the contents of the shipping carton against the Packing Materials List.
- Inspect the Access Bank II - SNMP for signs of damage, and report any damages to the shipper.
- Retain all packaging materials in case you need to ship or relocate the unit.

Table 4-1: Access Bank II - SNMP Packing Materials List

Description	CAC Part No.
Items Included With Access Bank II - SNMP Purchase	
Access Bank II - SNMP equipped according to customer order with 0, 1 or 2 line interface voice cards	
Access Bank II - SNMP Remote Monitor MS Windows-based Software for the PC (5 Disk Set)	019-0035 Release 2.0
“Rabbit Ear” wall/rack mounting adapter brackets (4) with screws	004-0015
115Vac/60Hz to -48Vdc Power Conversion Cube with 5-foot 16 AWG grounded wall plug power cord and alternate 8-foot DC connector cord	003-0016r
One (1) 10-foot modular category 5 T1 network interface cable, RJ-48C to RJ-48C, for connecting Access Bank II - SNMP to T1 network, or to a PBX D&I port.	005-0009
RS-232 local management cable (10 ft) for managing the Access Bank II - SNMP using a directly attached computer through the RS-232 management port.	005-0003-DCE-MF-10
25-pin male to 25-pin male null modem adapter (10 ft) for connecting Access Bank II - SNMP to an external modem through either the local mgt. cable or the optional dual RS-232 data and mgt. cable.	005-0002-25M-25M-Null Modem
RS-232 25-pin male to 9-pin female straight adapter (10 ft) for directly connecting the Access Bank II - SNMP to a 9-pin computer device through either the local management cable or the optional dual RS-232 management cable.	005-0007-25M-9F-Straight
Access Bank II - SNMP Installation and User’s Manual	002-0071
Warranty registration card	AB-II-WC
Optional Items	
Additional category 5 T1 network IF cables, RJ-48C to RJ-48C, 10 ft	005-0009

Dual RS-232 data and magagement cable (10 ft) for connection to a router, computer, statistical multiplexer, SNA cluster controller, or SCADA equipment. This cable supports both synchronous operation at 56 or 64 Kbps, and asynchronous operation at 9.6, 19.2, 28.8, 38.4, and 57.6 Kbps.	005-0001 - DCE - MFF - 10' - 10'
V.35 data cable - 10 ft	005-0008-DCE-MM-10'
V.35 data cable - 25 ft	005-0009-DCE-MM-25'
V.35 data cable - 50 ft	005-0010-DCE-MM-50'
19" heavy duty rack mounting brackets (2) with sixteen (16) 6-32 x 3/8" phillips pan-head screws	004-0041
23" heavy duty rack mounting brackets (2) with sixteen (16) 6-32 x 3/8" phillips pan-head screws	004-0113
220Vac/50Hz to -48Vdc Power Conversion Cube for international applications with custom wall plug adapter	AB-220Power

In addition, you will need one or more of the following items:

- A standard 25-pair telephone cable with "D" style 50-pin male connector to connect the Access Bank II - SNMP to your punch-down block or RJ-11 "Harmonica."
- If you are wall-mounting the Power Converter Cube, you will need four fasteners appropriate for mounting a seven-pound object.

4.3 Chassis Mounting

The Access Bank II - SNMP can be wall-mounted, rack-mounted, or surface-mounted. Prior to mounting the Access Bank II - SNMP chassis, ensure that the installation site meets the following criteria:

- Adequate clearance for access to control panel DIP switches, cable routing, and ventilation. Leave at least 18 inches behind the back plate for maintenance and accessing the slide-in voice cards.
- Because the cables on the power conversion cube total 13 feet in length, there should be a properly grounded, 110 VAC power outlet within 10 feet of the Access Bank II - SNMP Control Panel.
- A stable environment, clean and free from extremes of temperature, shock, vibration and EMI, with a relative humidity between 0 and 95%.
- An ambient temperature that stays below 40° C (104° F).



Caution: If the operating temperature rises above the 40° C limit an internal thermal protection device will shut off the Access Bank II - SNMP. When the temperature is reduced below this threshold, the Access Bank II - SNMP restarts.

- An installation site below 10,000 feet (3,048 m).
- For operation outside these ranges, the Access Bank II - SNMP must be placed in an environmentally controlled enclosure.



Caution: When you mount the chassis, do not allow the Access Bank II - SNMP to remain in direct contact with any combustible surface.

4.4 Wall Mounting

The adapter brackets attached to the Access Bank II - SNMP are positioned at shipment for wall-mounting. To wall-mount the unit:

1. Select a location that meets the criteria specified above. Leave at least 1/2 inch clearance below the chassis for ventilation. Leave at least 6 inches in front of the Access Bank II - SNMP Control Panel for access to its switches and LEDs and at least 18 inches behind the back plate for maintenance.
2. To create a 3/4 inch offset between the Access Bank II - SNMP chassis and the wall surface for better ventilation, mount a 3/4 inch thick piece of plywood (at least 20 inches vertically by 14 inches horizontally) on the wall using fasteners appropriate for mounting a heavy object (see Figure 4-1).
3. Mount the Access Bank II - SNMP chassis to the plywood with eight #8 x 3/4" pan-head (or larger) wood screws (Figure 4-1).

4.5 Rack Mounting

The Access Bank II - SNMP can be rack-mounted using several different methods. The small adapter brackets shipped with the unit can be used to mount the unit in a standard 19" rack with a typical five-inch offset. Using the recommended heavy-duty brackets, you can mount the Access Bank II - SNMP in either a 19" or 23" rack with a custom offset.

4.5.1 Rack Mounting with Brackets Shipped with Unit

To mount the Access Bank II - SNMP in a standard EIA 19-inch Telco equipment rack using the included adapter brackets:

1. Remove the two front adapter brackets, rotate them 90 degrees and re-attach the brackets so they face toward the unit back plate (Figure 4-2). This creates a standard five-inch offset mounting typical of telecommunications equipment.
2. Select an appropriate location in the rack with at least 1 3/4 inches of clearance above and below the chassis for ventilation. Also ensure that there is at least 6 inches in front of the Control Panel for access to its controls and DIP switches, and at least 18 inches behind the back plate for maintenance.
3. Mount the chassis using 10-32 x 3/4" machine screws appropriate for a Telco rack (Figure 4-3).

Note: The optional heavy-duty rack mounting brackets (see Figure 4-4) can significantly increase static strength and provide a custom front-to-back offset when mounting the units on either 19" or 23" racks (see Figure 4-3).

4.5.2 Mounting with Heavy-Duty Brackets

1. Remove the four small front adapter brackets from the Access Bank II - SNMP.
2. Attach the heavy-duty brackets to the Access Bank II - SNMP using the screws included in the heavy-duty bracket kit (see Figure 4-3).
3. Select an appropriate location in the rack with at least 1 3/4 inches of clearance above and below the chassis for ventilation. Also ensure that there is at least 6 inches in front of the Control Panel for access to its controls and DIP switches, and at least 18 inches behind the back plate for maintenance.
4. Mount the chassis on the rack using 10-32 x 3/4" machine screws appropriate for a Telco rack (Figure 4-3).

4.6 Surface Mounting

To surface-mount the Access Bank II - SNMP as a desktop stand-alone, simply place it on a flat, stable, non-combustible surface with at least 1/2 inch ventilation clearance below the unit. Leave at least 6 inches in front, and 18 inches in back of the chassis for ventilation and access to its controls. Leave at least 3/4" above the chassis for required ventilation.

4.7 Mounting the Power Converter

The Access Bank II - SNMP is normally shipped for US operation with a 115 Vac to -48 Vdc power conversion cube. This cube includes both a 5-foot grounded AC power cord and a 8-foot three-position DC power cable. The Power Converter Cube has four mounting holes for attaching the unit to a wall or other flat surface. To mount the Power Converter Cube on a nearby wall, locate the converter within 7 feet of the Access Bank II - SNMP front Control Panel and use screws or anchors appropriate to the mounting surface. If you are wall mounting the power conversion cube on the same $\frac{3}{4}$ " thick plywood sheet as the Access Bank II - SNMP, the dimensions of the board will have to be at least 25" by 14". Wire tie-downs can be used to keep stray wires to a minimum, but be careful not to damage the wiring in any way.

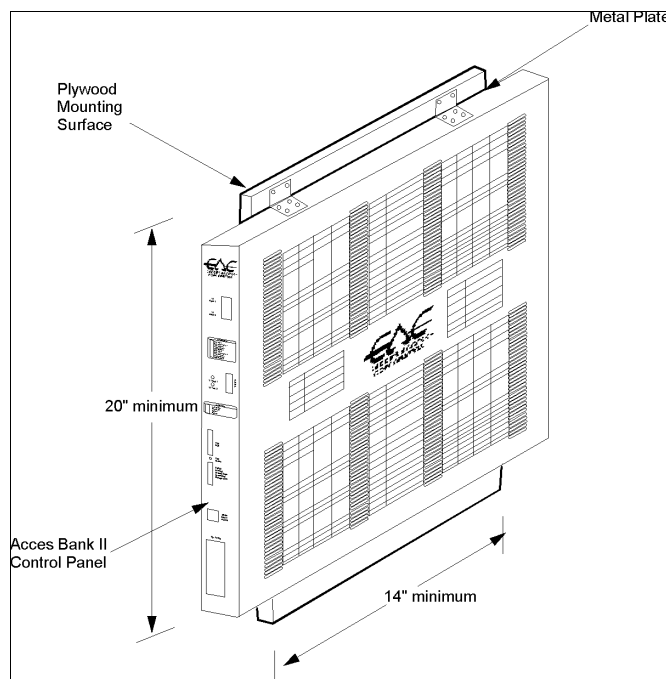


Figure 4-1: Wall-Mounting the Access Bank II - SNMP

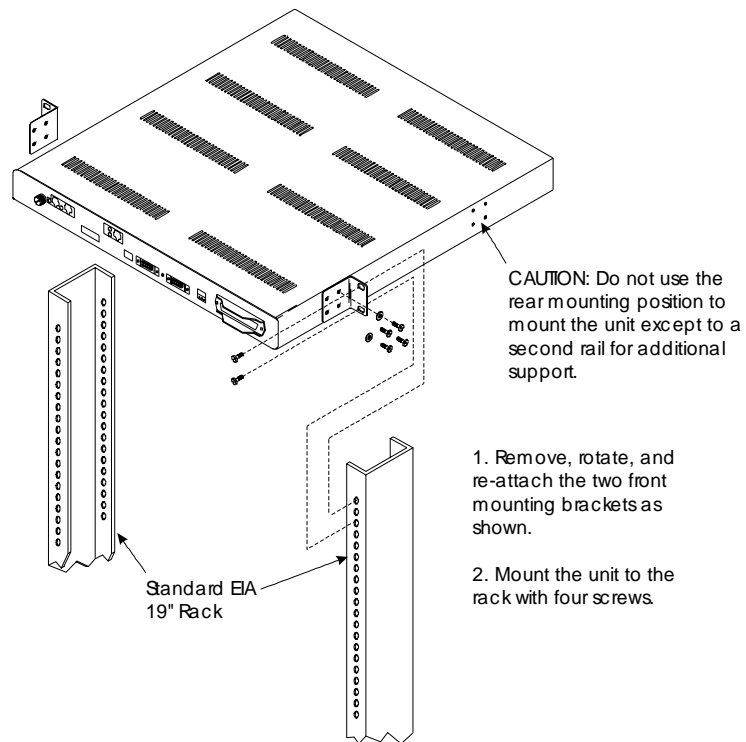


Figure 4-2: Rack Mounting on a 19" Rack Using Small Brackets

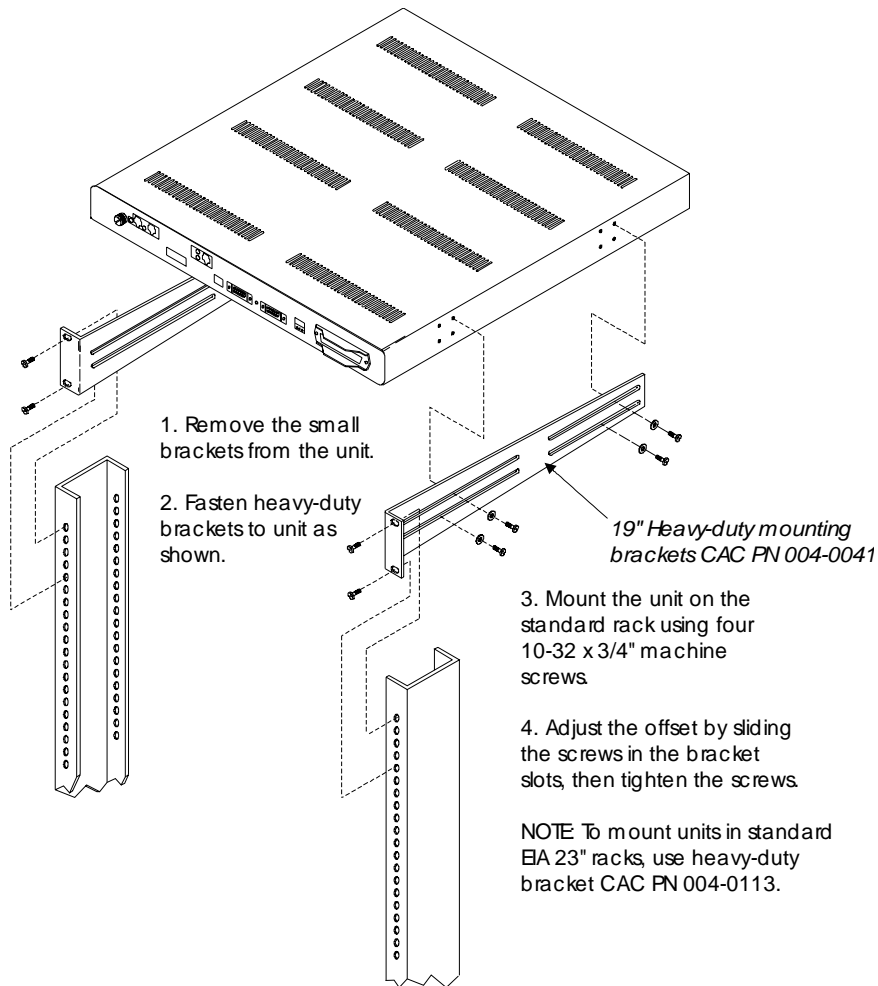


Figure 4-3: Rack Mounting on a 19" Rack Using Heavy-Duty Brackets

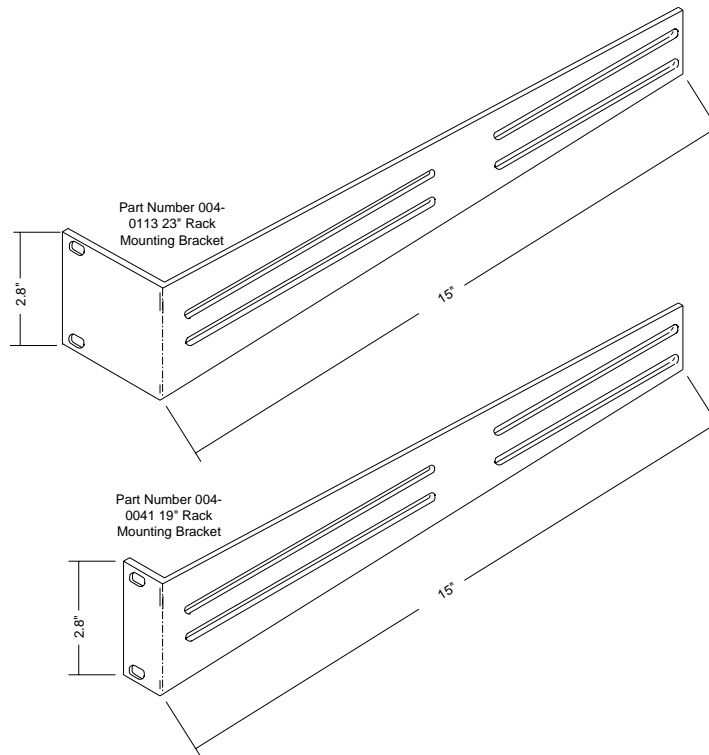


Figure 4-4: Optional Heavy Duty Brackets

Chapter 5

Electrical Installation

Contents of This Chapter:

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Interface and Power Connectors	4
Connecting the Voice Circuits	5
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V.35 DCE Data Port Connections	7
RS-232 Management	12
Connecting the Power and Ground	15

5.1 About This Chapter

This chapter describes how to install the communication interface and power connectors on the Access Bank II SNMP Control Panel and includes procedures for:

- Enabling the internal lithium battery.
- Connecting the voice circuits to the punch-down block.
- Connecting the T1 lines.
- Connecting the RS-232 Management Port.
- Connecting the V.35 DCE data port.
- Using Adapters.
- Connecting the Power and Ground.
- Bringing the Access Bank II SNMP on line.

5.2 Installing Cables and Adapters

After mounting the Access Bank II SNMP chassis and power converter, the next step is connecting the various voice and data interfaces and the power connector using the standard and optional cables and adapters listed below in Table 5-1. Table 5-1 shows where the various T1, V.35 and RS-232 interface and power connector are located on the Access Bank II SNMP front Control Panel.

The Access Bank II SNMP shipping package contains one modular category 5 T1 network interface cable, a 25-pin local management cable, a 25-pin to 25-pin null modem adapter, and a 25-pin to 9-pin straight adapter. Additional optional category 5 T1 network interface cables can be ordered separately from CAC. Optional V.35 data cables are also available from CAC.

Table 5-1: Standard and Optional Access Bank II SNMP Cables and Adapters

Part Number	Cable Length	Application	Connectors
005-0009	10 foot, 3.05 m	T1 Network Cable for connecting the Access Bank II SNMP to the T1 network, or optionally to a PBX D&I port. <i>One of these cables is included with each Access Bank II SNMP purchase. Additional T1 Network Cables must be ordered separately.</i>	RJ-48C to RJ-48C
005-0003-DCE-MF-10'	10 foot, 3.05 m	RS-232 Local Management Cable for managing the Access Bank II SNMP using a directly attached computer through the RS-232 Management Port. <i>This cable is included with each Access Bank II SNMP purchase.</i>	Fine Pitch D-Sub-26 Male to DCE DB-25 Female
005-0002-25M-25M-Null Modem	N/A	RS-232 25-Pin Male to 25-Pin Male Null Modem Adapter for connecting the Access Bank II SNMP to an external modem through either the included Local Management Cable. <i>This adapter is included with each Access Bank II SNMP purchase.</i>	DCE DB-25 Male to DTE DB-25 Male
005-0007-25M-9F-Straight	N/A	RS-232 25-Pin Male to 9-Pin Female Straight Adapter for directly connecting the Access Bank II SNMP to a 9-pin computer device through either the included Local Management Cable. <i>This adapter is included with each Access Bank II SNMP purchase.</i>	DCE DB-25 Male to DTE DB-9 Female
005-0008-DCE-MM-10'	10 foot, 3.05 m	Ten-foot V.35 Data Cable for connecting a router or other digital device to a T1 network using the Access Bank II SNMP's V.35 DCE data port, accommodating high-speed transfers up to 1.536 Mbps. <i>This cable is optional and must be ordered separately.</i>	Fine Pitch D-Sub-26 Male to DCE V.35 Male

005-0009-DCE-MM-25'	25 foot, 7.62 m	Twenty-five-foot V.35 Data Cable for connecting a router or other digital device to a T1 network using the Access Bank II SNMP's V.35 DCE data port, accommodating high-speed transfers up to 1.536 Mbps. <i>This cable is optional and must be ordered separately.</i>	Fine Pitch D-Sub-26 Male to DCE V.35 Male
005-0010-DCE-MM-50'	50 foot, 15.24 m	Fifty-foot V.35 Data Cable for connecting a router or other digital device to a T1 network using the Access Bank II SNMP's V.35 DCE data port, accommodating high-speed transfers up to 1.536 Mbps. <i>This cable is optional and must be ordered separately.</i>	Fine Pitch D-Sub-26 Male to DCE V.35 Male

5.3 Access Bank II SNMP Control Panel Interface and Power Connectors

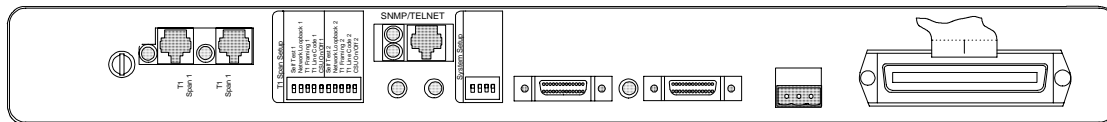


Figure 5-1: Interface and Power Connectors on the Access Bank II SNMP Control Panel.

5.3.1 RJ-48C Jacks for T1 Span 1 and Span 2

One (or two) 10-foot modular Category 5 T1 Network Interface Cables are used to connect the RJ-48C 8-pin connectors to the T1 carrier network RJ-48C jack(s).

5.3.2 SNMP Connector

The Access Bank II SNMP is equipped with an RJ-45 jack for accessing an embedded SNMP agent via a customer provided cable.

5.3.3 V.35 DCE Data Port Connector

The optional CAC V.35 Data Cable (10', 25' or 50') with a micro-D 26-pin (male) to 34-pin Winchester connector (male) connects this 26-pin V.35 DCE data interface connector (female) to customer premise DTE.

5.3.4 DC Power Connector Input

Power connections are made to the DC Power Connector Input with a three-position removable wiring connector on the 8-foot DC power cord from the 115 Vac to -48 Vdc Power Conversion Cube.

5.3.5 Tip & Ring Jack (female)

Tip & Ring connections are made at this connector with an standard 25-pair telephone cable, which also connects to the punch-down block or RJ-11 “Harmonica.”

Note: 4-wire E&M 12-channel voice card requires optional cables to connect to the punch-down block. These cables eliminate the use of the front panel RJ-21X Tip & Ring telephone connector.

5.4 Connecting the Voice Circuits

Voice circuit connections are made at the 50-pin Amphenol™ jack labeled Tip & Ring on the Access Bank II SNMP Control Panel (see Figure 5-1). You will need a standard 25-pair telephone cable with RJ-21X wiring and a D-type mating connector at the Access Bank II SNMP end. The other end connects to either a punch down block or an RJ-11 “Harmonica” for interfacing to analog telephony equipment.

To connect the voice circuits:

1. Connect the telephone cable to the punch-down block or RJ-11 “Harmonica.”
2. Route the cable to the Access Bank II SNMP Control Panel.
3. Remove any screws in the D-type connector that may prevent a flush connection with the Tip & Ring jack.
4. Connect the D-type mating connector to the Tip & Ring connector on the Control Panel.
5. Cinch down the attached Velcro strap to retain the connectors.
6. Use the cable tie down on the unit and elsewhere to avoid accidental disconnection.

Note: If you are connecting an external alarm, note in Table 5-2 that pair 25 of the voice drop cable provides a connection to a set of normally open relay contacts (150 Vrms, 150 mA maximum load) that close when the Access Bank II SNMP enters an alarm state. For more information on external alarm events, see the Remote Monitor section of this manual and the separate [Remote Monitor User’s Guide](#).

Table 5-2 defines the pin functions on the 50-pin Amphenol-type Tip & Ring jack.

Table 5-2: 50-Pin Tip & Ring Jack

Pair	Pin Location	Function
1	26 1	Tip Channel 1 Ring Channel 1
2	27 2	Tip Channel 2 Ring Channel 2
↓	↓	↓
24	49 24	Tip Channel 24 Ring Channel 24
25	50 25	Alarm Tip Channel 25 Alarm Ring Channel 25

5.5 Connecting the Dual T1 Lines

5.5.1 Customer Premises Installations

Connections to the T1 network interfaces are made at the RJ-48C 8-pin modular jacks on the Access Bank II SNMP Control Panel (see Figure 5-1) using one (or two) 10-foot Category 5 T1 cable(s).

Note: Only one T1 network interface cable is provided with each unit. Additional cables (P/N 005-0009) are available from distributors or dealers of CAC products.

The pin assignments for the RJ-48C jacks are defined in Table 5-3.

Table 5-3: T1 Line Interface on RJ-48C—T1 Modular 8-Pin Jack

Pin Number	Signal	Signal Direction
1	Receive Ring	From DS1 Network
2	Receive Tip	From DS1 Network
3	No connection	
4	Transmit Ring	To DS1 Network
5	Transmit Tip	To DS1 Network
6	No connection	
7	Receive Ground	
8	Transmit Ground	

For a customer premise installation, the primary T1 Span 1 and secondary T1 Span 2 network interfaces are cabled to carrier T1 demarcation points on the customer premises. To connect these cables, plug either end into the RJ-48C connector of the desired T1 network interface and the other end into the RJ-48C jack at the carrier T1 demarcation point jack.

5.5.2 ABAM 600 T1 Cable

Table 5-4 defines the characteristics of shielded 22 AWG ABAM 600 T1 cable. Shielded ABAM 600 has better transmission characteristics and less potential for harmful crosstalk than unshielded 24 AWG twisted-pair telephone cable.

Table 5-4: ABAM 600 T1 Cable Specifications

ABAM 600 Cable	Cable Characteristics
Nominal impedance	100 Ω +/- 5% at 772 kHz.
Insertion loss	Better than 7 dB per 1000 feet at 1.544 MHz. Better than 5 dB per 1000 feet at 772 kHz.
Far-end crosstalk	Better than 85 dB per 1000 feet at 1.544 MHz. Better than 90 dB per 1000 feet at 772 kHz.
Near-end crosstalk	Better than 80 dB per 1000 feet at 1.544 MHz. Better than 85 dB per 1000 feet at 772 kHz.
Signal wires	22 AWG solid tinned copper.
Drain wires	24 AWG solid tinned copper.
Shields	Transmit and receive pairs individually with aluminum/ polyester tape.

5.5.3 24 AWG Twisted-Pair

In common use throughout the industry, unshielded 24 AWG twisted-pair telephone cable is an acceptable alternative to shielded ABAM 600 for cabling two Access Bank II SNMPs up to a recommended distance of 3000 feet. The characteristics of 24 AWG twisted-pair are defined in ANSI/EIA/TIA 568A (Oct. 1995), Commercial Building Telecommunications Wiring Standards, which is available from:

American National Standards Institute
11 West 42nd Street
New York, NY 10036

5.6 V.35 DCE Data Port Connections

The V.35 DCE data port connection is made at the 26-pin micro-D female connector on the Access Bank II SNMP Control Panel (see Figure 5-1) using the 10-foot, 25-foot or 50 foot CAC DTE V.35 Data Cable equipped with a 26-pin micro-D male connector and a 34-pin Winchester male connector.

Note: These cables (005-0008-MM-10', 005-0009-MM-25', 005-0010-MM-50') are optional accessories, and can be purchased from distributors and dealers of CAC products.

This cable is used to connect the Access Bank II SNMP V.35 DCE data port (Figure 5-3) to synchronous V.35 DTE data sources up to 1.536 Mbps, all rates (1-24) Nx56 or Nx64 channel-rate progression. The CAC V.35 Data Cables are built according to the pin assignments listed below in Table 5-5. Figure 5-4 shows the pin layout of the standard 34-pin V.35 Winchester connector typically used to connect to Routers and FRADs.

To connect the CAC V.35 data cable to the V.35 DCE data port, connect the end with the 26-pin micro-D male connector to the Access Bank II SNMP V.35 DCE data port and the end with the 34-pin Winchester male connector to the V.35 DTE data source.

Table 5-5: Pin Assignments for CAC V.35 Data Cables

Micro-D 26-pin (male)	Signal	Winchester 34-pin (male)	Paired Signals
1 (+ Shield)	← Protective Ground →	A	
7	← Signal Ground →	B	┘
2	← Transmit Data A →	P	
14	← Transmit Data B →	S	┘
3	← Receive Data A →	R	
16	← Receive Data B →	T	┘
4	← RTS →	C	
20	← DTR →	H	┘
5	← CTS →	D	
6	← DSR →	E	┘
12	← Test Mode →	K	
8	← CD (RLSD) →	F	┘
11	← External Clock A →	U	
24	← External Clock B →	W	┘
10	← Xmit Clock A →	Y	
23	← Xmit Clock B →	AA	┘
15	← Receive Clock A →	V	
17	← Receive Clock B →	X	┘
22	← Local Loopback →	J	
25	← Remote Loopback →	BB	┘
9, 13, 18	Open Pins/No Contact	L, N, NN	
19, 21, 26	Open Pins/No Contact		

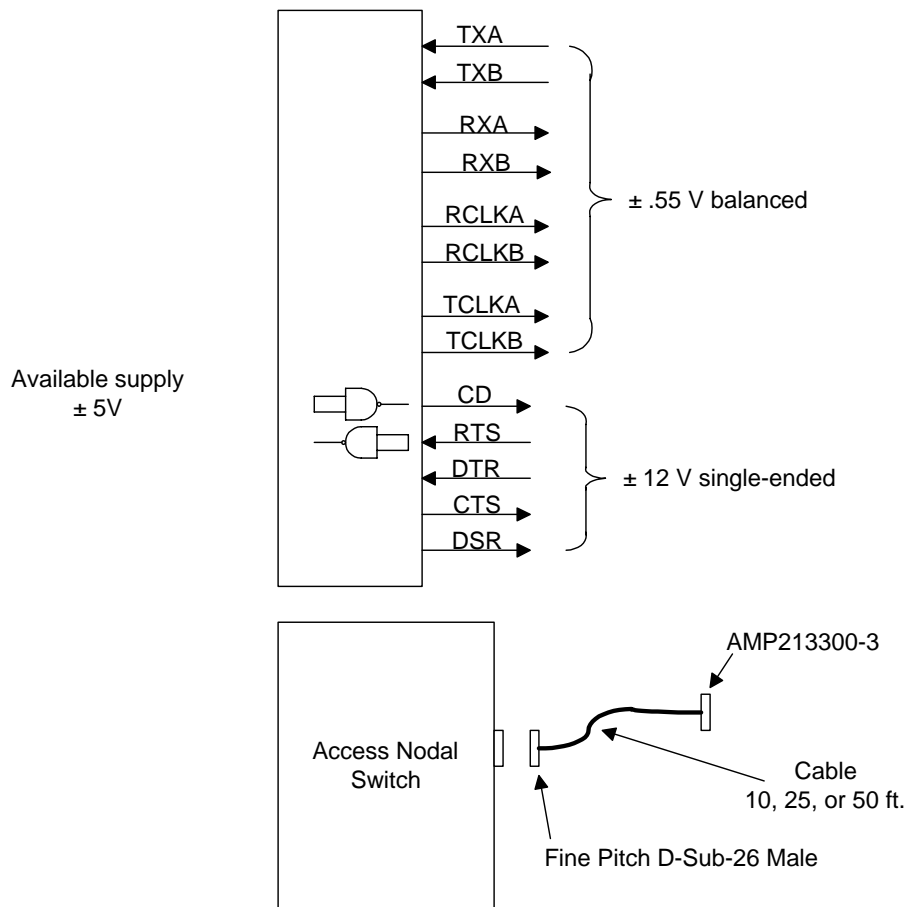


Figure 5-2: Access Bank II SNMP V.35 DCE Data Port Connections

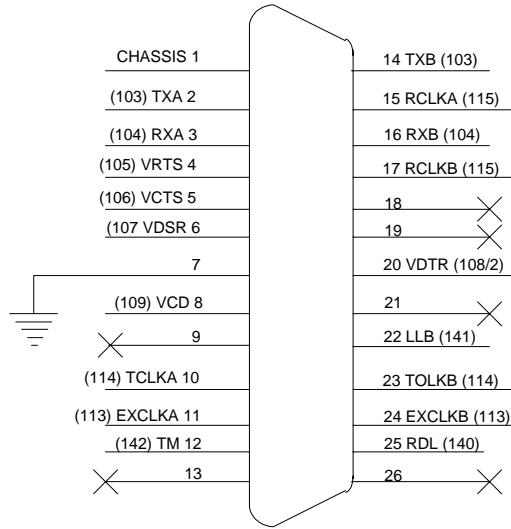


Figure 5-3: Access Bank II SNMP V.35 DCE Port (female)

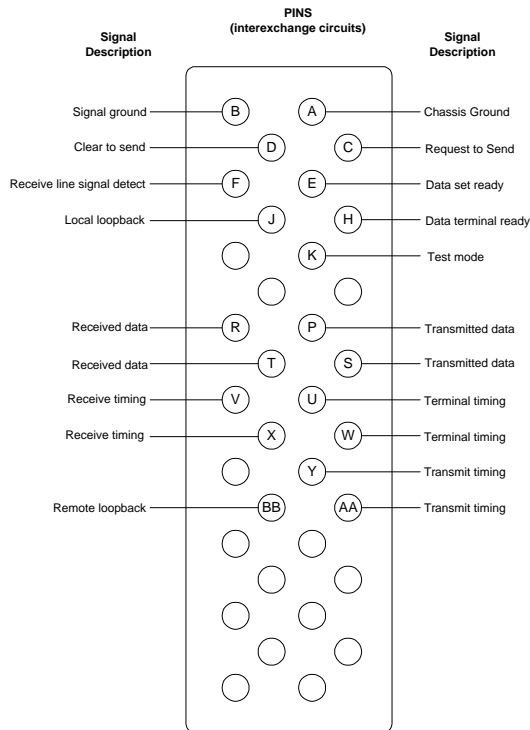


Figure 5-4: 34-pin V.35 Winchester Connector (male)

5.7 RS-232 Management

5.7.1 RS-232 DCE Management Cable

Note: The Dual RS-232 DCE Data and Management Cable (P/N 005-0001) is an optional accessory, and can be purchased from distributors and dealers of CAC products.

5.7.2 Local Management Cable

To perform local or remote management and performance monitoring using the Command Line Interface or MS Windows-based Remote Monitor software installed in a local PC or laptop computer requires using the CAC 25-Pin Local Management Cable (P/N 005-0003). This 10-foot cable is equipped with a 26-pin male D-type subminiature connector on the end that mates with the Access Bank II SNMP RS-232 secondary data port (COM2) and a DB25 female connector on the DCE end for connection to the RS-232 communications interface of the local PC or laptop. Both this cable and a 25-pin to 9-pin “straight adapter” (P/N 005-0007-25M-9F-Straight) are included with the Access Bank II SNMP, permitting attachment to laptop computer DB9 ports.

Figure 5-5 shows these connectors and connection points.

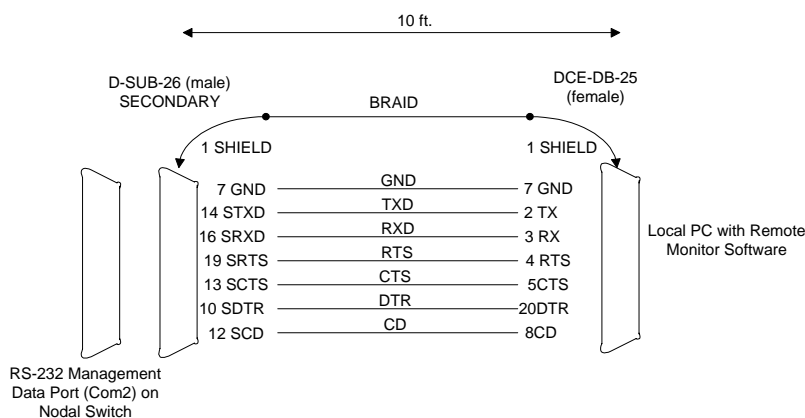


Figure 5-5: CAC Local Management Cable

The CAC Local Management Cable is built according to the pin assignments listed in Table 5-6.

Table 5-6: CAC Local Management Adapter Cable Pin Assignments

Designation	DCE-DB25 (female)	D-Sub-26 (male)	Paired Signals (Not required)
Shield	1+ (shield)	1+ (shield)	
Ground	7	7	
Secondary TXD	2	14	
Secondary RXD	3	16	°
Secondary RTS	4	19	
Secondary CTS	5	13	°
Secondary DTR	20	10	
Secondary CD	8	12	°

5.7.3 Null Modem Adapter

Converting the Access Bank II SNMP from local management to dial-in/dial-out remote management and/or alarm reporting requires using the 25-pin male to 25-pin male CAC Null Modem Adapter (P/N 005-0002) included with each Access Bank II SNMP purchase. The Null Modem Adapter is equipped with a DB25 RS-232 male connector on the DTE end and an RS-232 DB25 male connector on the DCE end. The DTE DB25 male connector can be connected either to the 25-pin DCE female connector on the CAC Local Management Cable described above, or to the 25-pin female connector on the RS-232 data connector on the DCE end of the CAC Dual RS-232 DCE Data and Management Cable. The 25-pin DCE female RS-232 end is for attachment to a Hayes-compatible modem for dial-in/dial-out to a remote printer or pager, or to a remote 486 or higher PC with the MS Windows-based Remote Monitor software or MS Windows Hypterterm (or compatible) VT100 emulation program installed. These programs are included with every Access Bank II SNMP.

Figure 5-6 shows the connection points.

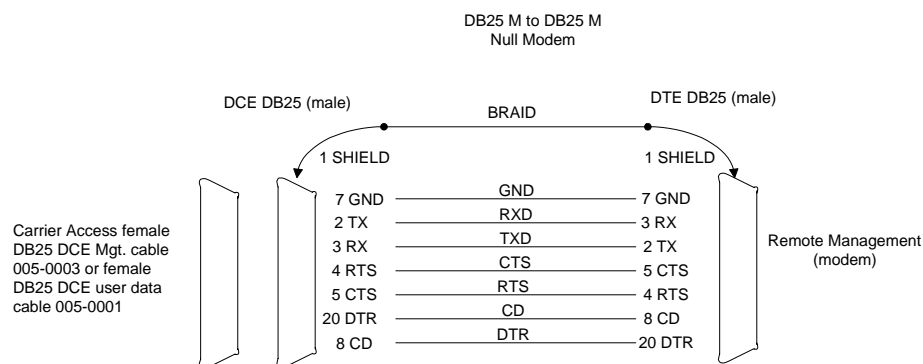


Figure 5-6: CAC Null Modem Adapter

The CAC Null Modem Adapter is built according to the pin assignments defined in Table 5-7.

Table 5-7: Null Modem Adapter Pin Assignments

Designation	DCE DB25 (male)	DTE DB25 (male)	Paired Signals (Not required)
Shield	1+ (Shield)	1+ (Shield)	
Ground	7	7	
Secondary TXD	3	2	
Secondary RXD	2	3	°
Secondary RTS	5	4	
Secondary CTS	4	5	°
Secondary DTR	8	20	
Secondary CD	20	8	°

5.7.4 Straight Adapter

The CAC Straight Adapter (P/N 005-0007-25M-9F-Straight) permits connecting the 9-pin COM1 communication port on a local Laptop computer to the 25-pin DCE data female connector on the Dual RS-232 DCE Data and Management Cable, or to 25-pin female DCE connector on the Local Management Cable. Figure 5-7 shows these connections points.

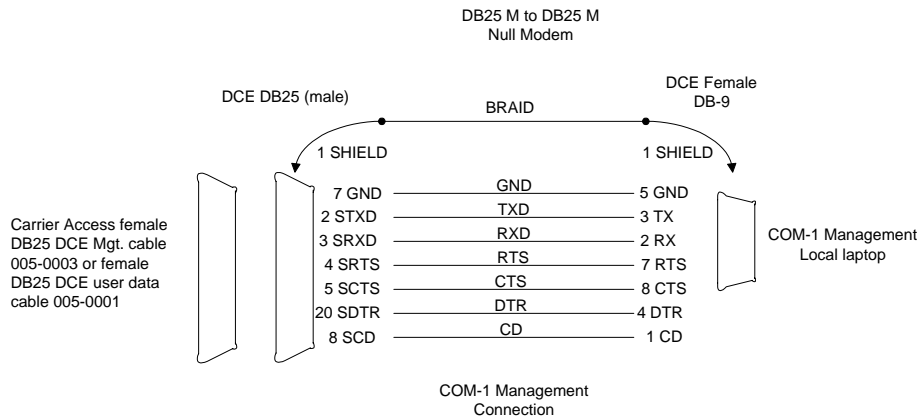


Figure 5-7: CAC Straight Adapter

The CAC Straight Adapter is built according to the pin assignments listed in Table 5-8.

Table 5-8: CAC Straight Adapter Pin Assignments

Designation	DCE DB9 female	DCE DB25 male	Pair Signals (Not required)
Shield	+ (Shield)	1+ (Shield)	
Ground	5	7	
Secondary TXD	3	2	
Secondary RXD	2	3	°
Secondary RTS	7	4	
	6	6	°
Secondary DTR	4	20	
	8	5	°
Secondary CD	1	8	°
	9	22	

5.8 Connecting the Power and Ground

5.8.1 DC Power Connector Input



Warning: Connect only -48 Vdc power to the DC input connector.

The Access Bank II SNMP has a 3-position DC Power Connector Input located on the Control Panel, as shown in Figure 5-1. To conform with UL 1459 and National Electrical Code safety requirements, the Access Bank II SNMP is equipped with solid-state, automatic-resetting, current-limiting devices to protect the -48V Input and +DC Return power inputs on this connector from AC power surges, lightning, or inductive motor spikes. This means there are no internal fuses for you to replace. Pinout assignments for this connector are defined in Table 5-9.

Table 5-9: Power Connector Pinout Assignments

Pin Number	Signal
1	AB115 Power Converter Cube, or -42 to -58 Vdc power source
2	DC return, to power supply + terminal
3	Telco or safety (green-wire) ground

Chapter 6

Initialization and Basic Configuration

Contents of This Chapter:

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6.1 About This Chapter

This chapter describes how to initialize and configure the Access Bank II - SNMP for first time basic operation in Local mode.

6.2 Connecting to the Access Bank

Connect to the Access Bank II - SNMP Management cable using a terminal (or terminal emulation program) set for 9.6 Kbps, 8, 1, None. The steps below guide you from factory defaults through the standard TCG configuration. In this guide, the *italicized* items are what you type in. End each command line with the **Enter** key.

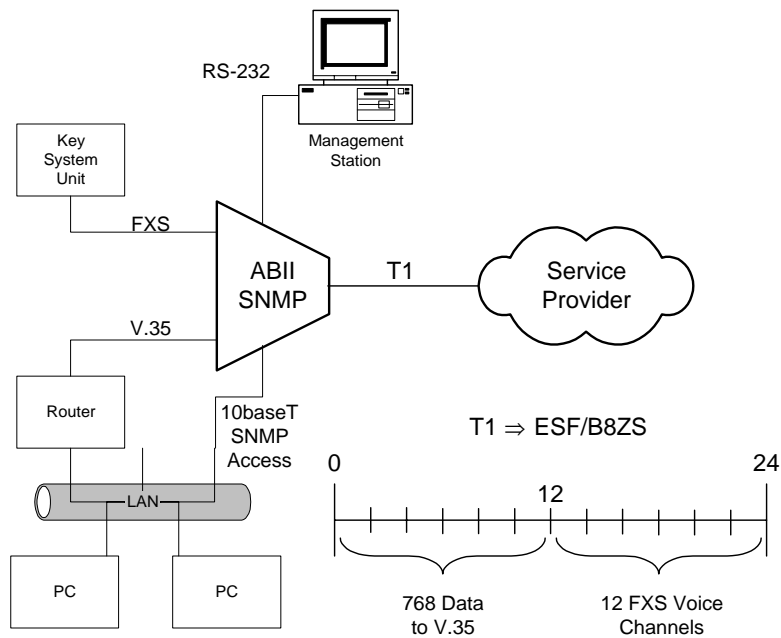


Figure 6-1: The AB-II SNMP in an Example Network

6.3 Configuring the Access Bank

1. Start the system and connect the terminal. The system displays:

```

Booting...
Configuring to restored configuration...
- Setting channel types
- Setting signal types
- Setting connections
- Setting ds1 configuration
- Setting I/O configuration
- Setting V.35 configuration
- Setting RS-232 Data Port
- Setting APS configuration
- Setting APS threshold
- Setting log enables
- Removing any data loopbacks
+++AT&FE1V1X4&D0&S0S=1
  
```

Enter <ESC> to login:

2. Press the <ESC> key. The display then reads:

Access Bank II Version 1.01
Management Version 1.29
Password:

3. Enter the password (default is cac), and press <enter>.

Password: *cac*

Password accepted

Access Bank II
Access Bank II/SNMP

Slot	Card	Revision
-----	-----	-----
LIU	ABII	1.23
FX#1	FXS12	3.03
FX#2	---	---

Span	Name
-----	-----
1) d1	" "
2) d2	"T1 #2"
3) f1	"FX #1"
4) f2	"FX #2"

4. Check the system clocking configuration:

Access Bank II> *clk*

- System Clock
clk primary t11
clk secondary internal

- If this is not the clocking configuration, enter:

Access Bank II> *clk primary t11*

5. Check the date information:

Access Bank II> *date*

- System Time 13:27:10 09/13/1998

- To correct the date (example is January 15, 1998):

Access Bank II> *date 01/15/98*

Access Bank II> *date*

- System Time 13:27:10 01/15/1998

6. Check the time information:

Access Bank II> *time*

- System Time is 13:27:08 01/15/1998

- To correct the time (example is 5:20 PM):

Access Bank II> *time 17:20:00*

Access Bank II> *time*

- System Time is 17:20:05 01/15/1998

7. To change and then recheck the system and circuit names (examples are provided here):

Access Bank II> *name system "Consolidated National Bank"*

Access Bank II> *name circuitid d1 "T1 Circuit AD456-7Y"*

Access Bank II> *name circuitid d2 "T1 Port 2 - Not in Service"*

Access Bank II> *name circuitid f1 "FXS Channels to KSU"*

Access Bank II> *name circuitid f2 "Analog Slot 2 - Not in Service"*

Access Bank II> *name circuitid v1 "V.35 @ 768Kbps to Router"*

Access Bank II> *name*

- Name Configuration

```
name system "Consolidated National Bank"
name circuitid d1 "T1 Circuit AD456-7Y"
name circuitid d2 "T1 Port #2 - Not in Service"
name circuitid f1 "FXS Channels to KSU"
name circuitid f2 "Analog Slot 2 - Not in Service"
name circuitid v1 "V.35 @ 768Kbps to Router"
```

8. Check the configuration of T1 port #1:

```
Access Bank II> ds1 1
```

```
- DS1 d1
  ds1 d1  circuitid "T1 Circuit AD456-7Y"
  ds1 d1          csu on
  ds1 d1          lbo dsx0|csu0
  ds1 d1  linetype d4
  ds1 d1  linecode b8zs
  ds1 d1          prm att
```

- To change the framing and then check the configuration:

```
Access Bank II> ds1 1 linetype esf
```

```
Access Bank II> ds1 1
```

```
- DS1 d1
  ds1 d1  circuitid "T1 Circuit AD456-7Y"
  ds1 d1          csu on
  ds1 d1          lbo dsx0|csu0
  ds1 d1  linetype esf
  ds1 d1  linecode b8zs
  ds1 d1          prm att
```

- To remove all the connections between T1, Analog, and V.35 ports:

```
Access Bank II> kill d1
```

```
Access Bank II> kill d2
```

- To set the connections (example is channels 1-12 of T1 #1 to V.35 port, channels 13-24 of T1 #1 to FXS card in first analog slot):

```
Access Bank II> make v1 d1:1 12
```

```
Access Bank II> make d1:13 f1:1 12
```

```
Access Bank II> connections
```

```
1) Span d1: "T1 Circuit AD456-7Y"
  v1:01 v1:02 v1:03 v1:04 v1:05 v1:06 v1:07 v1:08 v1:09 v1:10 v1:11 v1:12
  f1:01 f1:02 f1:03 f1:04 f1:05 f1:06 f1:07 f1:08 f1:09 f1:10 f1:11 f1:12
```

```
2) Span d2: "T1 Port #2 - Not in Service"
```

```
_____
_____

3) Span f1[FXS12]: "FXS Channels to KSU"
   d1:13 d1:14 d1:15 d1:16 d1:17 d1:18 d1:19 d1:20 d1:21 d1:22 d1:23 d1:24

4) Span f2[---]: "Analog Slot 2 - Not in Service"
   _____
```

- To check the configuration of the V.35 port:

```
Access Bank II> v35
```

```
- V.35 v1 (768000 bps)
  v35 v1  circuitid "V.35 @ 768Kbps to Router"
  v35 v1      clkinv none
  v35 v1      cts high
  v35 v1      datainv none
  v35 v1      rxclk internal
  v35 v1      speed nx64
```

- To set the ip configuration, if required (examples given below):

```
Access Bank II> ip addr 125.164.0.35
```

```
Access Bank II> ip nms1 125.164.0.4
```

```
Access Bank II> ip
  ip      addr 125.164.0.35
  ip      mask 255.255.255.0
  ip      gateway 127.0.0.1
  ip      nms1 125.164.0.4
  ip      nms2
  ip      nms3
  ip      get "public"
  ip      set "public"
  ip      trap "public"
```

- To set SNMP configurations, if required (examples given below):

```
Access Bank II> snmp name "Voice and Data Access Multiplexor"
```

```
Access Bank II> snmp location "Metro Parkway, Wykham"
```

```
Access Bank II> snmp contact "George Abbot, 203-345-8897, PIN #33345"
```

```
Access Bank II> snmp on
```

```
Access Bank II> snmp
```

- SNMP Group

- Access Bank II/SNMP

```
snmp          name "Voice and Data Access Multiplexor"
```

```
snmp          location "East Georgetown"
```

```
snmp          contact "Nicholas Jones, 203-555-8897, PIN #33345"
```

9. **IMPORTANT:** Save the configuration, and exit the command line interface:

Caution: When you complete the following sequence, do not press the <esc> key.

```
Access Bank II> config save
```

```
Access Bank II> exit
```

```
Logging out of Access Bank II
```

```
Enter <ESC>
```

10. You may now disconnect the local terminal, or end the remote login session.

Chapter 7

Remote Monitor

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7.1 About This Chapter

This chapter describes how to initialize and configure the Access Bank II - SNMP for first time basic operation in the *Remote* mode using the MS Windows-based *Remote Monitor* GUI software program installed on an external IBM-compatible Laptop or PC.

Procedures are provided for:

- Installing the Remote Monitor software program
- Logging into the PC database
- Selecting a profile and default configuration
- Modifying Selecting Cross-Connect configurations
- Configuring the Dual T1 Hardware Interfaces
- Configuring the V.35 DCE Data Port
- Configuring the RS-232 Management Port
- Enabling Alarm Reporting to Pagers and Remote Printers

A more detailed explanation of the operation of the Remote Monitor is provided in the Remote Mon-

7.2 Remote Monitor Software Program

7.2.1 Overview

The Access Bank Remote Monitor software interface is used to configure and manage the Access Bank via the RS-232 Management Port. Installed on a local IBM-compatible PC or laptop connected to the RS-232 Management port, Remote Monitor provides a convenient user-friendly software interface for configuring, monitoring, and testing the performance of the Access Bank. The Remote Monitor software can also be downloaded into a remote computer for dial-in/dial-out management over a separate PSTN (Public Switched Telephone Network) analog line. In this application, Remote Monitor can also be used to poll the Access Bank for remote alarms via a Hayes[®]-compatible modem attached to the secondary connectors of the RS-232 Management port. Figure 7-1 illustrates these two different ways of connecting Remote Monitor to the Access Bank.

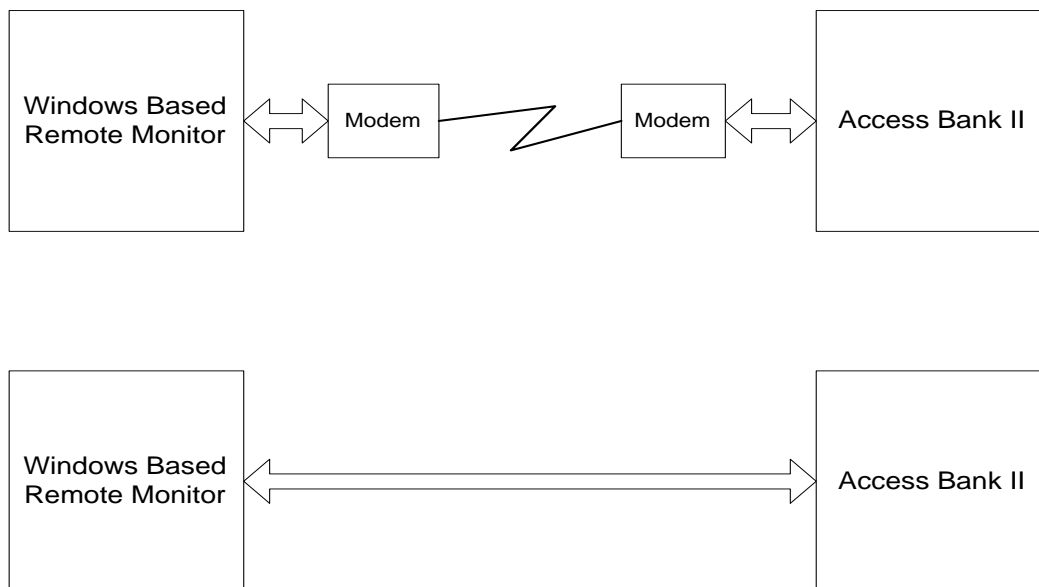


Figure 7-1: Remote Monitor Connections

7.3 Message Traffic

The Remote Monitor software supports three classes of message traffic between the PC and the

Access Bank: configuration traffic between the PC and the Access Bank, status traffic from the Access Bank to the PC, and alarm report messages from the Access Bank to the PC. The X-modem protocol is used to send/receive data from the Access Bank. A low-priority process resides in the Access Bank to process the X-modem packets and update the internal data structures accordingly. Statistical data and error handling are processed by internal processes and sent to the remote monitor via X-modem packets. The Remote Monitor software can also be used to perform V.54 loopback testing to sectionalize and stress test the V.35 remote link using a full array of industry standard QRSS test patterns.

7.4 Online Help

If you need specific information on performing any Remote Monitor operation, press the F1 key from any screen to access a detailed system of context-sensitive online Help. When you place the cursor over certain control fields, Remote Monitor also responds with handy tips for performing that particular task. For step-by-step instructions on all aspects of installing, configuring and operating the Remote Monitor GUI software interface, refer to the separate Remote Monitor User's Guide. If you need information on using Microsoft® Windows™, refer to your Windows™ documentation.

7.5 Hardware Requirements

The PC you use as a Network Management Station (NMS) should meet these minimum requirements:

- 486 66 MHz or Greater (Pentium 100 MHz -preferred) CPU
- 16 MBytes RAM memory
- 10 Mbytes available hard disk space
- VGA monitor with 640 x 480 resolution and 8-bit (256 colors) color
- Windows 3.1/Windows 95
- Keyboard
- Mouse

7.6 Installation

The Remote Monitor software is distributed on four 3 ½ “ diskettes and is designed to operate under both Windows 3.1 or Windows 95 environments. Use the following procedure to load Remote Monitor onto the PC platform you wish to use as a Network Management Station (NMS) to monitor and configure the Access Bank:

1. Place Disk 1 into the 3 ½ “ disk drive and select Run from the Start button of Windows 95 or Windows 3.1.
2. Open the Setup.exe file.

3. The install wizard should execute and be displayed on the screen.
4. Select the location defaults and insert the appropriate diskettes when prompted.

7.7 Remote Monitor Screen Hierarchy

The Remote Monitor software interface consists of a hierarchy of screens or windows. The following figure presents a simplified functional block diagram of this screen hierarchy.

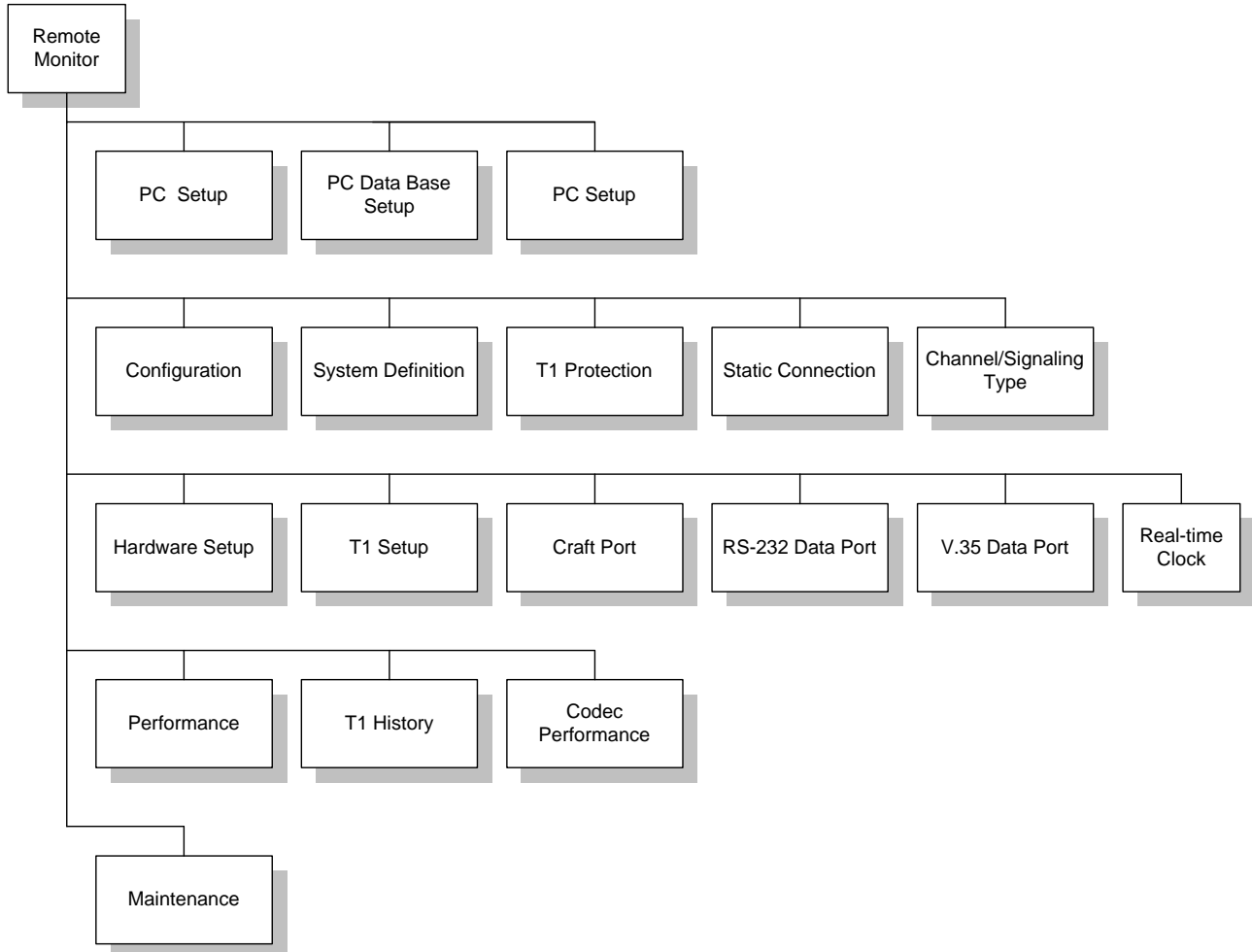


Figure 7-2: Access Bank Remote Monitor Screen Hierarchy

7.8 Initialization for Basic Operation in the Remote Mode

For information about initialization and basic operation of the Access Bank in the Remote Mode and for first time use, see the *Access Bank User's Guide*.

Chapter 8

FXS-ID Configuration

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8.1 About This Chapter

This chapter describes how to configure the Access Bank II - SNMP *Foreign Exchange Station - Caller ID* (FXS - ID) 12-channel voice card for connection to T1 public network services and provides instructions for:

- Setting FXS Transmit and Receive Levels
- Setting FXS Signaling Type Options
- Performing FXS Voice Channel Monitoring and Testing

8.2 FXS-ID Voice Card

The *Foreign Exchange Station - Caller ID* (FXS-ID) 12-channel voice card delivers high quality loop-start or ground-start dial tone telephone line connections to key systems, Off Premise Extensions (OPXs), facsimile machines, modems, PBXs and other conventional analog telephone devices. The FXS - ID card supports the Caller ID CLASSÆ feature. The FXS -ID, is a 7.8” by 13.16” daughter card designed to slide into the back of the Access Bank II - SNMP along rails that guide a 64-pin DIN connector to mate with a matched connector on the internal AB2 Controller. The FXS-ID card receives the T1 signaling, tip and ring pairs, control logic and power through this connector. The back

plate of the FXS-ID card has 12 channel status LEDs and one 4-position DIP switch for selecting from a number of different signaling types. Furthermore, the back plate also contains 12 test switches that can be used to “busy out” each channel individually. On the FXS-ID card itself, each individual channel has a 6-position DIP switch for setting transmit and receive line attenuation.

When equipped with the *Foreign Exchange Station - Caller ID* (FXS-ID) voice card, the Access Bank II - SNMP can support a number of popular signaling types used by dedicated T1-accessed voice service providers, including:

- AT&T Megacom® (E&M Wink-Start)
- NYNEX Flexpath® (E&M Wink-Start)
- US West DSS-
- Long-distance Automatic Number Identification (ANI) and Dialed Number Identification Service (DNIS) from MCI, Sprint, LDDS, and Wiltel.

The FXS circuits automatically perform impedance matching (not to be confused with DS-1 ALBO) to adapt to various PBXs, key systems, telephones and line lengths.

8.3 Signaling Types

The FXS-ID voice card can be configured, using DIP switches on the card, to support the following common signaling types:

- FXO in the Central Office (CO)-to-AB2 FXS A/B Signaling (regular 3-state FXS signaling)
- E&M Immediate Start to Loop-Start/Ground-Start
- Wink-Start to Loop-Start/Ground-Start
- Wink Delay (ANI/DNIS) for Loop-Start/Ground-Start

8.3.1 FXO Switch to AB2 FXS A/B Signaling

Select the default setting to have Access Bank II - SNMP FXS interfaces automatically adapt to loop-start or ground-start signals received from the incoming T1 line on a channel-by-channel basis. This option is used when an FXO voice card is in the Central Office, at the other end of the T1 link opposite the FXS-ID card. It is important to note that in this configuration, the Caller ID CLASS feature can only be supported if the FXD voice card in the CO also supports this feature.

8.3.2 Wink-Start to Loop-Start or Ground-Start

Select Wink-Start to Loop-Start or Ground-Start to translate two-state wink-start signaling from the T1 network (AT&T Megacom, Flexpath, etc.) to loop-start or ground-start ringing at the FXS interface. Ringback tone is supplied on the T1 transmit path during the ringing state of the FXS. This configuration options all 12 FXS channels to appear as E&M wink-start channels to the serving carrier switch, while providing the customer with standard dial tone/ringing telephone line connections.

8.3.3 Wink Delay

Select Wink Delay to translate two-state wink-start signaling toward the T1 network to an FXS ringing with delayed wink for proceed-to-send digit indication. Upon detection of an incoming seizure from the T1 network, the AB2 applies ringing voltage to the FXS channel. When the attached equipment answers by closing the loop, the Access Bank II - SNMP winks the network for “proceed to send,” allowing the attached equipment to receive DTMF digits carrying Automatic Number Identification (ANI) or Directory Number Identification Service (DNIS). This is particularly useful for voice mail, voice response, call distribution, and automatic attendant applications. Standard loop-start PC voice mail and fax cards can be used for ANI and DNIS applications, without the added expense and complexity of installing signaling converters.

8.4 Setting the FXS Transmit and Receive Levels

The transmit and receive attenuation levels for each FXS voice frequency channel can be set between 0 and -9 dB using twelve 6-position DIP switches (CH1 - CH12) on top of the circuit board (see Figure 8-1). Each analog channel uses a bank of six DIP switches, with three for transmit and three for receive. Operation of each set of three switches in additive. For example, setting switch 1 (-2 dB) and switch 2 (-3 dB) to OFF for any given channel selects a receive loss of -5 dB. The default setting for the transmit level is -3 dB; for the receive level it is -6 dB. The default settings are appropriate for most applications.

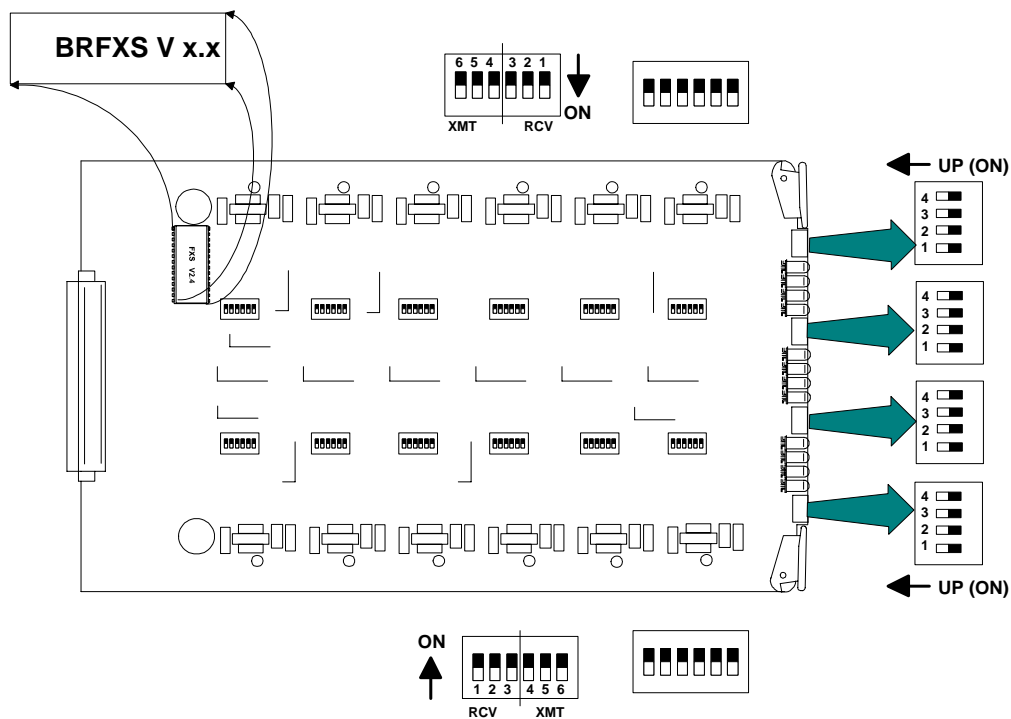


Figure 8-1: FXS Transmit and Receive Level Options

If your FXS voice channels require different attenuation level settings than the factory defaults, proceed as follows:

1. Release the two thumbscrews on the AB2 back plate and remove the plate (see Figure 8-2).
2. To remove the FXS-ID slide-in voice card, pull out the two card ejector latches simultaneously to release the card from the internal connector, then slide the card carefully out from the rear of the AB2 chassis (see Figure 8-2).
3. To set different transmit and/or receive gain or loss levels, refer to Figure 8-1 and Table 8-1.
4. To reinsert the FXS-ID voice card, ensure that the card is positioned correctly in the card rails, then carefully slide the card into the slot until it stops.
5. Press both card ejector latches in towards the FXS-ID card to seat the 64-pin DIN connector in the matching connector on the internal Controller card.
6. After setting the transmit and receive level options, replace the back plate and tighten the thumbscrews.

Table 8-1: FXS Transmit and Receive Level Option Settings

Switch	Function (Switch OFF)
1	-2 dB Receive Loss
2	-3 dB Receive Loss
3	-4 dB Receive Loss
4	-2 dB Transmit Loss
5	-3 dB Transmit Loss
6	-4 dB Transmit Loss

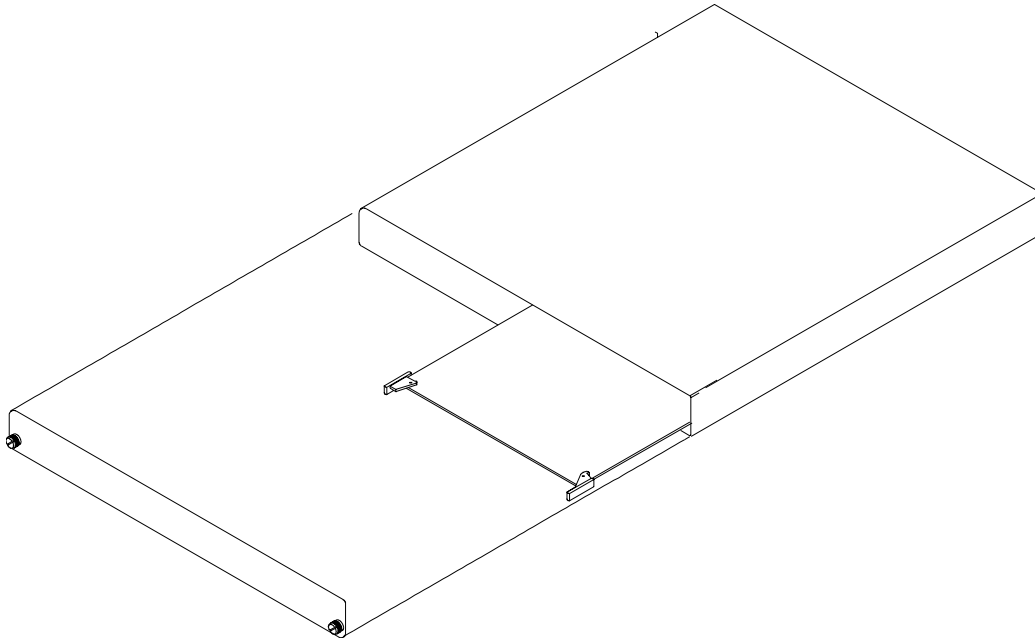


Figure 8-2: Accessing the FXS-ID Cards

Table 8-2: FXS Signaling Summary

Option Number	Switch A	Switch B	Switch C	Signaling Option
0	OFF	OFF	OFF	Normal FXS A&B signaling for loop-start or ground-start; automatic selection based on carrier signal. FXS-ID card default.
1	ON	OFF	OFF	E&M wink-start-to-loop-start conversion with ringback to T1 line and calling party disconnect (Megacom, Notes 1 and 2).
2	OFF	ON	OFF	E&M wink-start-to-ground-start conversion with ringback to T1 line (Megacom, Note 1).
3	ON	ON	OFF	E&M immediate-start-to-loop-start conversion with ringback to T1 line and calling party disconnect (Megacom, Notes 1 and 2). Also known as Private Line Automatic Ringdown (D3 PLAR).

4	OFF	OFF	ON	E&M immediate-start-to-ground-start conversion with ringback to T1 line (Megacom, Note 1).
5	ON	OFF	ON	Wink-start-to-loop-start conversion with ANI/DNIS with 800 ms wink delay and calling party disconnect (Notes 1, 2 and 3).
6	OFF	ON	ON	Wink-start-to-ground-start conversion with ANI/DNIS with 800 ms wink delay (Notes 1 and 3).
7	ON	ON	ON	Custom Signaling Options. Please contact Carrier Access Corporation for specific details (Note 4).
<p>Note 1: Loop release implemented to prevent follow-up calls until the network A/B clears (no timer).</p> <p>Note 2: Calling party disconnect implemented as a 2-second tip-open state when the network A/B clears.</p> <p>Note 3: Wink-out provided after loop answer instead of after network seizure. This is the key difference between options 1 & 2 and options 5 & 6.</p> <p>Note 4: If you select this DIP switch setting with no custom signaling option installed, the 12 channel LEDs on the FXS back plate turn a steady RED and normal service is interrupted.</p>				

8.5 Setting the FXS Signaling Options

Each FXS-ID card contains one 4-position DIP switch that can be used to select signaling options for all twelve channels. As shown in Table 8-2, the AB2 back plate provides openings for accessing these DIP switches, one per FXS-ID card.

8.5.1 Option Switches A, B, and C

The three switches labeled Option A, Option B, and Option C are used as a group to select signaling conversion options for all 12 channels of each FXS-ID card. When all three switches are set OFF (default), the FXS voice circuits will automatically select ground-start or loop-start signaling on a channel-by-channel basis according to the incoming T1 signal. See Table 8-2 for all switch combinations.

TP Idle/Busy Switch

The fourth switch on each DIP switch, labeled *TP Busy/Idle*, selects whether the tip-ground relays are busy (closed) or idle (open) during trunk processing. The default is idle (switch 4 OFF). To change signaling options, refer to Table 8-2 and Figure 8-3. The numbered signaling options listed in Table 8-2 are described in further detail in the next section.

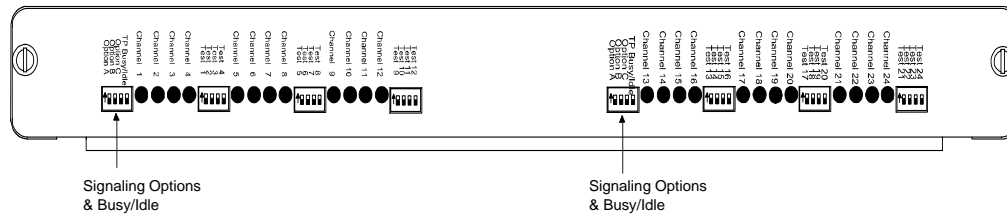


Figure 8-3: FXS Signaling Options

8.6 FXS Signaling Option Descriptions

8.6.1 Option Switches A, B, and C

Signaling options selected by the A, B, and C option switches are discussed below according to the numbered sequence from 0 to 7 in Table 8-2.

8.6.1.1 Option 0. Normal FXS A&B Signaling, Loop-Start or Ground-Start

Switch A	Switch B	Switch C
OFF	OFF	OFF

With this selection, the Access Bank II - SNMP FXS interfaces automatically adapt to loop-start or ground-start signaling received from the T1 line on a channel-by-channel basis. When using this option, order FXS loop-start or FXS ground-start signaling from your service provider.

8.6.1.2 Option 1. E&M Wink-Start-to-Loop-Start Conversion with Calling Party Disconnect

Switch A	Switch B	Switch C
ON	OFF	OFF

The FXS-ID voice card provides Plain Old Telephone (POTS) loop-start interfaces to a PBX or regular telephones. E&M wink-start signaling and per-channel ringback tones are sent to the T1 line. Calling Party Disconnect

Calling Party Disconnect (CDD) is a 2-second, tip-open condition at the FXS-ID when the network releases seizure (the far-end called party hangs up). The battery feed from the FXS-ID returns to idle (tip grounded) after the two-second disconnect. This feature is similar to local telephone service Calling Party Disconnect (CPD), which some Central Office equipment provides for answering machines and PBXs equipped to detect loss of loop current on their line interfaces. This loss of loop current

informs the equipment to hang up.

8.6.1.3 Option 2. Wink-Start to Ground-Start Conversion

Switch A	Switch B	Switch C
OFF	ON	OFF

POTS Interface

This option provides a POTS (Plain Old Telephone Service) ground-start interface between the Access Bank II - SNMP and the PBX or other phone equipment. This avoids both-way call collisions (“glare”) on PBX trunks and gives the PBX a disconnect signal when the far-end party hangs up. E&M wink-start signaling and ringback tones are sent to the T1 line on an individual channel basis. This option is for use with AT&T Megacom®, NYNEX Flexpath® or equivalent E&M services from other service providers.

8.6.1.4 Option 3. E&M Immediate-Start-to-Loop-Start Conversion

Switch A	Switch B	Switch C
ON	ON	OFF

Private Line Automatic Ringdown (D3 PLAR)

Known as D3 Private Line Automatic Ringdown (D3 PLAR), this option provides a “hot-line” ring down function from the near-end telephone to the far-end telephone connected over the same channel of the T1 line. The first telephone to go off-hook seizes the channel with a signaling bit sequence of A/B = 11 and hears a cadenced ringback tone (2 seconds on, 4 seconds off) from the far-end channel bank. The far-end disconnects the ringback tone and sends A/B = 11 to the originating end when its telephone goes off-hook. D4 PLAR is not supported.

To use this option, order E&M immediate-start service from your service provider.

8.6.1.5 Option 4. E&M Immediate-Start-to-Ground-Start Conversion

Switch A	Switch B	Switch C
OFF	OFF	ON

This is the same as the E&M immediate-start-to-ground-start conversion option for services such as AT&T Megacom and NYNEX Flexpath.

To use this option, order E&M immediate-start service from your service provider.

8.6.1.6 Option 5. Wink-Start to Loop-Start Conversion with ANI/DNIS and Calling Party Disconnect

Switch A	Switch B	Switch C
ON	OFF	ON

This option provides a loop-start interface between the AB2 and the PBX for voice mail/phone applications. E&M wink-start signaling and per-channel ringback tones are sent to the T1 line.

Ringing voltage is applied immediately after incoming seizure. The 200 ms outgoing wink “proceed-to-send” signal is not sent to the T1 network until 800 ms after FXS ringing voltage has been tripped (answered). Thus, the voice mail or PBX DTMF or MF register has at least one second to be attached to the line after closing the loop. The network proceeds to automatically send four to ten ANI or DNIS digits.

User also receives a two-second Tip Open condition (loop current turns off) at the FXS-ID when the network releases seizure (the far-end call hangs up). Battery feed from the FXS-ID returns to normal idle (tip grounded) after the two-second disconnect. This feature is similar to local telephone service Calling Party Disconnect (CPD), provided by some Central Office equipment for answering machines and PBXs that are equipped to detect loss of loop current on their line interfaces. This loss of loop current informs the equipment to disconnect the call.

8.6.1.7 Option 6. Wink-Start to Ground-Start Conversion with ANI/DNIS

Switch A	Switch B	Switch C
OFF	ON	ON

This option provides a ground-start interface between the AB2 and the PBX for voice mail/phone applications. E&M wink-start signaling and per-channel ringback tones are provided to the T1 line.

Ringing voltage is applied immediately after incoming seizure. The 200-ms outgoing wink “proceed-to-send” signal is not sent to the T1 network until 800 ms after FXS ringing voltage has been tripped (answered). Thus, the voice mail or PBX DTMF or MF register has at least one second to be attached to the line after closing the loop. The network proceeds to automatically send 4 to 10 ANI or DNIS digits.

8.6.1.8 Option 7. Customized Signaling

Switch A	Switch B	Switch C
ON	ON	ON



Caution: If you use this setting when no customized signaling has been installed, all back plate LEDs turn a steady RED and normal operation of the FXS-ID voice card is interrupted.

Upon request, Carrier Access will provide customized FX signaling options that can include any of the aforementioned options plus others, including answer supervision wink signaling.

Answer Supervision Wink Signaling

Answer supervision wink signaling takes the form of a 200-ms tip-open condition (loop current turns off) from the Access Bank II - SNMP to the voice-mail or phone system when the far end goes off hook (answers the call). Battery feed from the FXS-ID returns to normal (tip grounded) after the 200-ms disconnect. This feature is useful if the calling party switch needs to know when the far end has answered the call.

8.6.2 TP Busy/Idle Switch

ON	OFF
Idle	Busy

Use this switch to select whether the FXS tip-ground relays will be closed (busy) or open (idle) during trunk processing. (Trunk processing occurs when the T1 line is in an alarm or reset state.) The Busy position (OFF) causes the tip-ground relays to be closed during a T1 alarm or reset period. The Idle position (ON) causes the tip-ground relays to be open during a T1 alarm or reset period.

Note: The Busy position (OFF) is recommended for loop-start or ground-start applications where the attached PBX has the ability to re-route calls to different trunks when the T1 line is down.

8.7 FXS Voice Channel Monitoring and Testing

The channel status LEDs on the back plate of the Access Bank II - SNMP allow you to monitor the status of the individual FXS voice lines. Operation of these LEDs is summarized in Figure 8-4.

The channel test switches on the FXS-ID back plate can be used to send a 4 second continuous ringing voltage to the tip and ring pair of each FXS voice channel. You can check the operation of an individual voice channel by attaching a test telephone to the Tip and Ring pair of a particular channel at the punchdown block or RJ-11 Harmonica, then switching ON the appropriate channel test switch to test that channel.

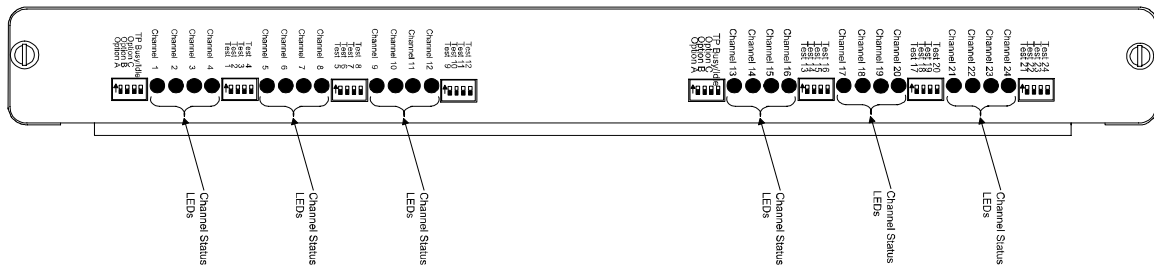


Figure 8-4: FXS-ID Back Plate Controls and LED Indicators

8.7.1 FXS Backplate Switches

Channel Test (12 per FXS card) - Sends four seconds of ringing to voice channel and four seconds of ringback to the T1 channel. After ringing, it will busy out the T1 channel and the voice channel.

TP Busy/Idle (1 per FXS card) - selects busy or idle on tip-ground relays during trunk processing.

8.7.2 FXS Backplate LEDs

Table 8-3

LED State	Condition
OFF	Idle state (FXS ground start, all E&M settings)
GREEN	Idle state (normal FXS loop-start operation): Incoming seizure (ground start operation or E&M conversion)
YELLOW	Call in progress
RED	Outgoing line seizure
All LEDs YELLOW	AB2 in trunk processing
All LEDs flash RED	Unsupported signaling option selected

8.7.3 “Busy Out” Individual FXS Channels

Switching a channel test switch to the ON position has three results on the selected FXS channel:

1. To confirm individual channel circuit integrity, 4 seconds of ringing voltage are sent to the Tip and Ring pair. The Tip is then grounded until the channel test switch is turned to the OFF position (to the right).



Warning: Four seconds of ringing voltage (85 V) will be present at the Tip and Ring pair of the FXS channel-under-test until the test telephone is picked up to trip the ringing.

Requirement: A test telephone connected to the punch down block or RJ-11 Harmonica should ring for 4 seconds.

2. As an aid to network technicians troubleshooting audio problems, 4 seconds of ringback tone are also sent toward the T1 network.
3. After the 4 seconds of ringback tone, the FXS channel will “busy out” toward the T1 network side.

Note: Each channel test switch can provide ringing during Trunk Processing (or even when the T1 line is disconnected).

8.7.4 Self Test Loopbacks

During Self-Test, switching a channel test switch to the ON position has the following result:

The affected FXS channel receives 4 seconds of ringing voltage (85 V) and the LED for that particular channel turns RED. This allows a technician to ring the telephone and verify audio tone when it is answered.

Note: During Self Test, a RED channel LED may come on, but does not indicate a problem.



Warning: The four-second applied ring voltage (85V) can constitute a dangerous shock hazard, and can damage attached low-impedance equipment.

Chapter 9

Battery Reversal FXS & Dial Pulse Origination Card

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9.1 About This Chapter

This chapter describes how to configure the Access Bank II *Battery Reversal Foreign Exchange Station and Dial Pulse Origination* (BRFXS/DPO) 12-channel voice card for connection to T1 public network services and provides instructions for:

- Setting Transmit and Receive Levels
- Setting the FXS with battery reversal and DPO
- Performing Voice Channel Monitoring and Testing

9.2 Description of the BRFXS/DPO Card

The BRFXS/DPO 12-channel voice card can be configured to operate either as a battery reversal FXS card or as a Dial Pulse Origination (DPO) card. In the battery reversal mode, the BRFXS/DPO

provides twelve 2-wire CPE analog loop-start connections to the digital T1 line using the same method used by the FXS voice card, only with the addition of Tip/Ring battery reversal. The FXS interface reverses the polarity of the battery feed towards the customer premise equipment (CPE) in response to the signaling bits coming from the T1 line. Various PBX systems require battery reversal to signal the start of billing, and in certain telephony environments it is needed to provide Line Side Answer Supervision (LSAS). One important application for battery reversal occurs in International Call Back, which allows international callers dialing the US to avoid more expensive inbound rates by taking advantage of cheaper US outbound long distance rates.

Dial Pulse Origination (DPO) is the functional complement to Dial Pulse Termination (DPT) provided by the FXO/DPT voice card. Used in conjunction, the DPO and DPT cards are used mainly for origination and termination of Direct Inward Dial (DID) circuits.

The BRFXS/DPO is a 7.8" by 13.16" daughter card designed to slide into the back of the Access Bank II along rails that guide a 64-pin DIN connector to mate with a matched connector on the internal ABI Controller. The card receives the T1 signaling, tip and ring pairs, control logic and power from the Controller card through this connector. The back plate of the card has 12 channel status LEDs and one 4-position DIP switch for selecting between battery reversal FXS loop-start and Dial Pulse Originating (DPO) modes of operation. Furthermore, the back plate also contains 12 test switches that can be used to "busy out" each channel individually. On the BRFXS/DPO card itself, each individual channel has a 6-position DIP switch for setting transmit and receive line attenuation.

9.3 Overview of Operation

The reversible-battery FXS channel card is designed to provide twelve 2-wire analog interfaces to the digital T1 (DS1) line. Currently, the analog loops (also called CPE loops in this document) must always be loop-start.

One of the main features of the analog interface is that the polarity of the battery feed towards the customer-premise equipment (CPE) can be reversed in response to the signaling bits coming from the T1 line.

- The basic operation is selected by setting Switch A *off* so that no ringing voltage is applied towards the CPE. If desired, Switch B can be turned *on* to give a cadenced (2-second/4-second) ringback tone to the T1 line during incoming calls. The battery to the CPE loop will be reversed to indicate an incoming call. The battery will return to forward polarity again when the call has ended.
- Also included in this channel card is a setting to provide cadenced ringing voltage (if needed by other customer-premise equipment). This option is enabled by setting Switch A *on* so that cadenced ringing voltage will be applied to the CPE loop during an incoming call. The battery is reversed during this time. If desired, Switch B can be turned *on* to give a cadenced (2-second/4-second) ringback tone to the T1 line during incoming calls, that is synchronized to the ringing voltage present on the loop.

Note: During a two-way call, the CPE -loop battery is reversed. To disconnect the call either the CPE loop current ceases or the network sends A/B bits = 0/0. The reversed state of the CPE loop, however, will be maintained until the network terminates (releases) the call.

9.4 BRFXS/DPO Applications

As explained above, the two major applications for the BRFXS/DPO card are FXS with battery reversal “wink” to signal a PBX timer to start billing a call and Dial Pulse Origination (DPO) for transport of Direct Inward Dialing (DID) lines. Refer to Figure 9-1 and Figure 9-2 for pictorial representations of these two applications.

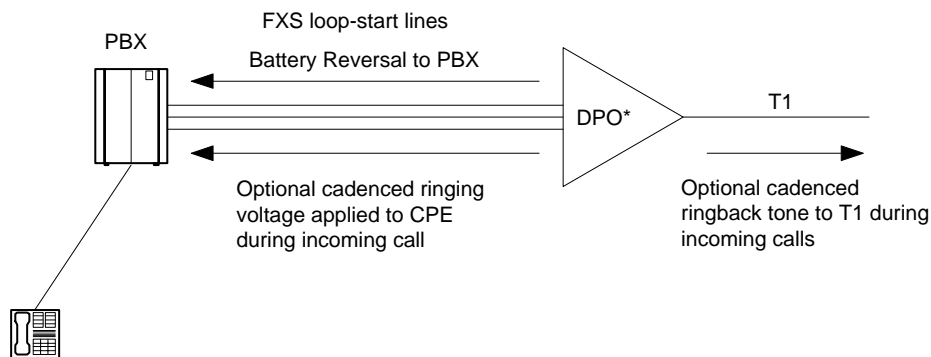


Figure 9-1: Battery Reversal FXS Loop-Start for Starting PBX Billing Timer

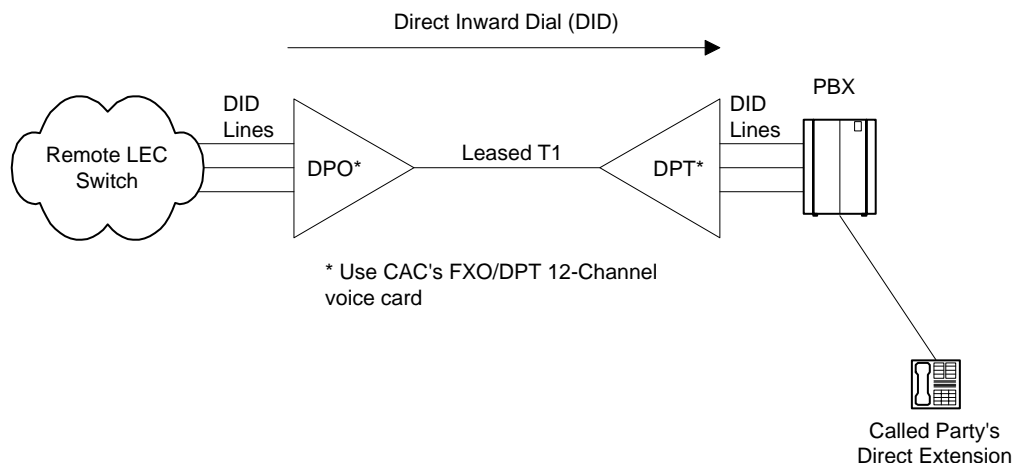


Figure 9-2: Dial Pulse Origination (DPO) for DID Transport

9.5 Setting the Transmit and Receive Levels

The transmit and receive levels for each BRFXS/DPO voice frequency channel can be set between 0 and -9 dB using twelve 6-position DIP switches (CH1 - CH12) on top of the circuit board card (see Figure 9-3). Each analog channel uses a bank of six DIP switches, with three for transmit and three for receive. Operation of each set of three switches in additive. For example, setting switch 1 (-2 dB) and switch 2 (-3 dB) to OFF for any given channel selects a receive loss of -5 dB. The default setting for the transmit level is -3 dB; for the receive level it is -6 dB. The default settings are appropriate for most applications.

Table 9-1: Transmit and Receive Attenuation Switch Values

Switch Setting	Transmit Switch Position Loss			Receive Switch Position Loss		
	1	2	3	4	5	6
On	0	0	0	0	0	0
Off	-2	-3	-4	-2	-3	-4

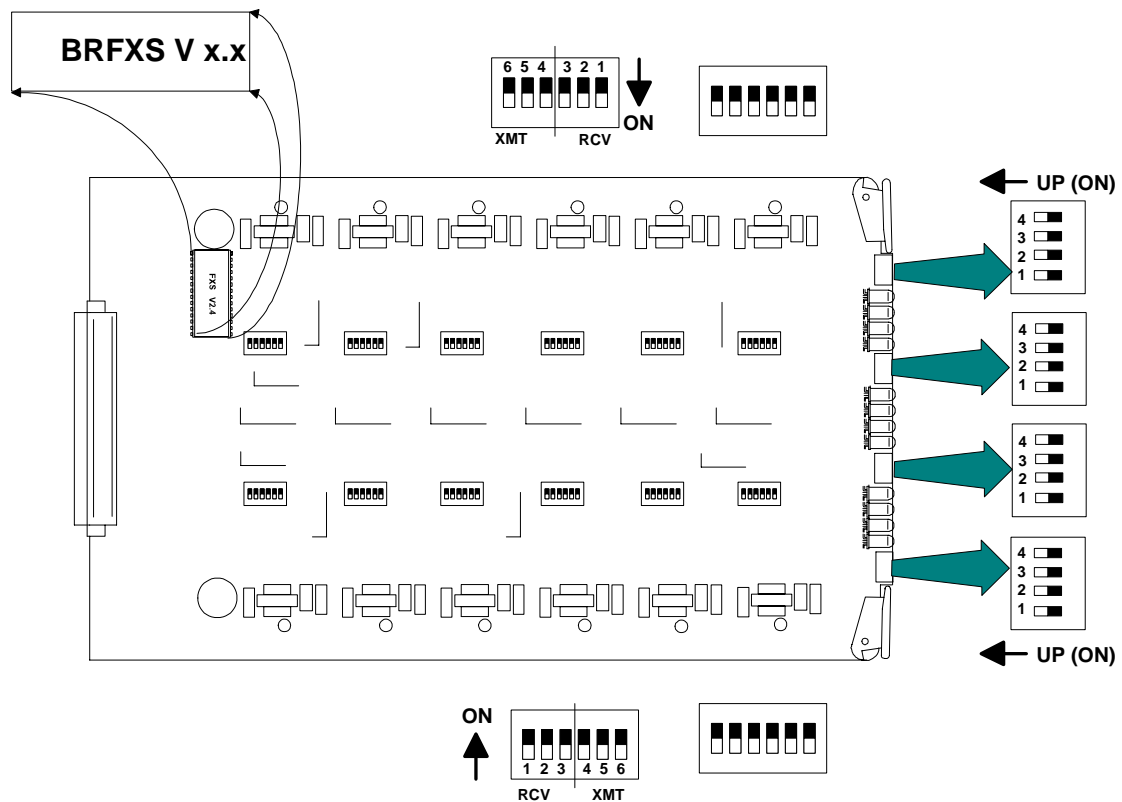


Figure 9-3: BRFXS/DPO Transmit and Receive Level Options

If your voice channels require different attenuation level settings than the factory defaults, proceed as follows:



Caution: Use proper electrostatic discharge (ESD) procedures when removing and handling the analog cards.

1. Release the two thumbscrews on the ABI back plate and remove the plate.
2. Pull out the two card ejector latches simultaneously to release the card from the internal connector, then slide the card carefully out from the rear of the ABI chassis.
3. Set different transmit and receive gain or loss levels (see Figure 9-3 and Table 9-1).
4. Re-insert the BRFXS/DPO voice card, ensuring that the card is positioned correctly in the card rails.

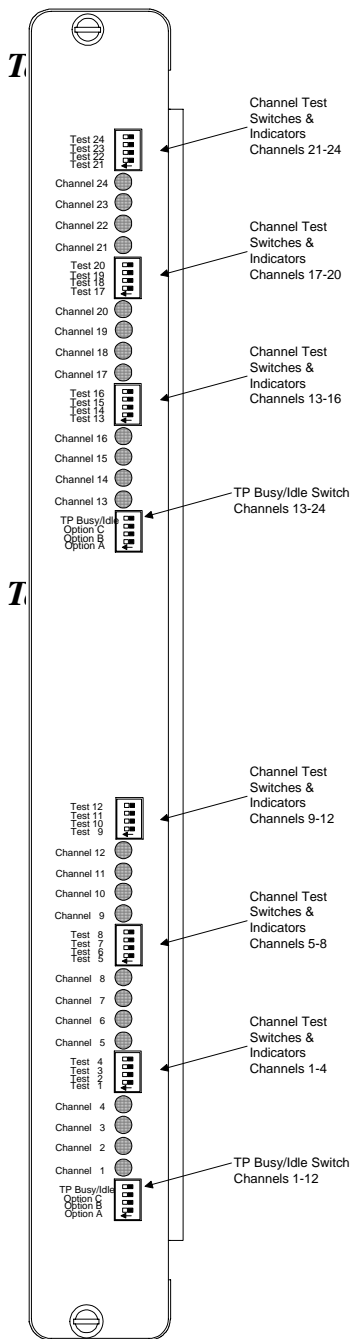
5. Press both card ejector latches in towards the FXS card to seat the 64-pin DIN connector in the matching connector on the internal Controller card.
6. Replace the back plate and tighten the thumbscrews.

9.6 BRFXS/DPO Configuration Settings

The configuration of the Battery Reversal FXS/DPO card is set by a 4-position DIP switch and 12 individual channel test switches accessed through the ABI back plate. The settings for these switches are described in Table 9-2.

Table 9-2: Transmit and Receive Attenuation Switch Values

Switch	Function	OFF	ON
A	Ringing Voltage	DPO Operation Ringing voltage never applied to CPE loop.	2-wire FXS loop-start operation: Cadenced (2-second/4-second) ringing voltage applied to CPE loop during incoming call
B	Ringback Tone	Ringback tone never applied to network.	Cadenced (2-second/ 4-second) ringback tone applied to network during incoming call.
C	<Reserved>	Normal	<Reserved>
TPIdle/Busy	CPE loop state during Trunk Processing (TP)	Forward battery applied to all CPE loops during Trunk Processing.	Reverse battery applied to all CPE loops during Trunk Processing.
Channel Test One switch per channel	Individual channel busy	Normal channel operation	Channel is busy - reverse battery applied to CPE loop; A/B bits to network are forced to 1/1. In addition, if Switch A is ON, 4 seconds of ringing voltage is applied to local loop, and if Switch B is ON, 4 seconds of ringback tone is sent toward network.



BRFXS/DPO Back Plate Switches

Switch	Function
Channel Test (12 per card)	Applies reverse battery to CPE loop and forces A/B bits sent toward network to 1/1
TP Busy/Idle (One per card)	Selects reverse (busy) or forward (idle) battery on tip-ground relays during trunk processing

BRFXS/DPO Back Plate LEDs

LED State	Condition
OFF	Idle state (forward battery)
Green	Incoming call (reverse battery)
Yellow	Call in Progress (reverse battery)
Red	Outgoing line seizure (forward battery)
All LEDs Yellow	AB 1 in trunk processing
All LEDs Flash Red	Unsupported signaling option selected

Figure 9-4: BRFXS/DPO Back Plate Controls and LEDs

9.7 Setting BRFXS and DPO

9.7.1 Battery Reversal FXS Loop-Start

The BRFXS/DPO card includes a setting for 2-wire FXS loop-start operation with battery reversal. To enable this option, set Switch A on the 4-position DIP switch to ON so that cadenced ringing voltage is applied to the CPE loop during an incoming call (See Table 9-2). The battery is reversed during this time. If desired, Switch B can be turned ON also to send a cadenced (2-second/ 4-second) ringback tone to the T1 line during incoming calls.

9.7.2 Dial Pulse Origination (DPO)

The DPO option is selected by setting Switch A to OFF so that no ringing voltage is applied towards the CPE. If desired, Switch B can be turned ON to give a cadenced (2 second/ 4 second) ringback tone to the T1 line during incoming calls (See Table 9-2). To indicate an incoming call, the battery to the CPE loop is reversed. When the call ends, the battery returns to forward.

9.7.3 BRFXS/DPO Voice Channel Monitoring and Testing

The channel status LEDs on the back plate of the Access Bank II allow you to monitor the individual BRFXS/DPO voice lines. The meaning of these LEDs is summarized above in Figure 9-4.

The channel test switches on the BRFXS/DPO back plate can be used to apply reverse battery to the CPE loop and send A/B bits forced to 1/1 toward the T1 network. If Switch A is ON, 4 seconds of continuous ringing voltage (85 V) are sent to the tip and ring pair of each BRFXS/DPO voice channel. In this case, you can check the operation of an individual voice channel by attaching a test telephone to the Tip and Ring pair of that particular channel at the punchdown block or RJ-11 Harmonica, then switching ON the appropriate channel test switch to test that channel. If Switch B is ON, 4 seconds of continuous ringback tone is also sent to the T1 network.

9.8 Busying Out Individual BRFXS/DPO Channels

If Switch A and Switch B are both ON, setting a channel test switch to ON has four results on the selected channel:

1. Reverse battery is applied to the CPE loop and the A/B signaling bits sent to the network are forced to 1/1.
2. To confirm individual channel circuit integrity, 4 seconds of continuous ringing voltage are sent to the Tip and Ring pair. The Tip is then grounded until the channel test switch is turned to the OFF position (to the right).



Danger: Four seconds of continuous ringing voltage (85 V) will be present at the Tip and Ring pair of the channel-under-test until the test telephone is picked up to trip the ringing.

Requirement: A test telephone connected to the punch down block or RJ-11 Harmonica should ring for 4 seconds.

3. As an aid to network technicians troubleshooting audio problems, 4 seconds of continuous ringback tone are also sent toward the T1 network.
4. After the 4 seconds of continuous ringback tone, the FXS channel will “busy out” toward the T1 network side.

Note: Each channel test switch can provide ringing during Trunk Processing (or even when the T1 line is disconnected).

9.9 Self Test Loopbacks

If a Self-Test is in progress and Switch A is ON, setting a channel test switch to the ON position should have the following result:

The affected channel receives 4 seconds of continuous ringing voltage (85 V) and the LED for that particular channel turns RED. This allows a technician to ring the telephone and verify audio tone when it is answered.

Note: During Self Test, a RED channel LED may come on, but does not indicate a problem.

Chapter 10

12-Channel FXO & Dial Pulse Termination Card

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About This Chapter	1
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10.1 About This Chapter

This chapter describes the 12-Channel Foreign Exchange Office (FXO) and Dial Pulse Termination (DPT) card used in the Access Bank II - SNMP, and provides information for configuring the card.

10.2 Description of the FXO Card

The FXO/DPT 12-channel analog card is an “office end” telephone line voice card designed specifically as an interface for Carrier Access Corporation’s family of Access Bank II - SNMP T1 Voice and Data Multiplexers, which are FCC-approved digital Channel Banks and Channel Service Unit/ Data Service Units (CSU /DSUs) for attachment of customer premise telecommunications equipment to public network T1 (DS1) services. The FXO/DPT card provides an interface between the Tip/Ring pair and T1 line for each of the channels on the FXO/DPT to provide FXO and DPT operation. The “rear” end of the FXO/DPT card (opposite the connector to the LIU board in the front of the Access Bank) has 12-channel status LEDs and one 4-pin DIP switch used to select whether the card uses

FXO or DPT termination. Also on the card, each individual channel has a two position switch for the selection of ground start or loop start (see Figure 9-3) and a 6-section DIP switch to control the line attenuation (see *Channel Attenuation Options*).

10.3 Termination Options

The FXO/DPT card can be configured for use as either an FXO or DPT interface card. Further, FXO offers both ground start (GS) and loop start (LS) modes of operation. These options require the setting of one switch per channel (12 per card) and one 4-position Dual Inline Package (DIP) switch per card (see Table 10-1, and Figure 9-3). Note that in the table, a 1 indicates the switch is on, while a 0 indicates the switch is off. The slide switch on the 12-channel analog card for each channel indicates whether that channel is set to GS or LS mode. The DIP switch determines whether the card will use FXO or DPT termination.

Note: When DPT is selected, the large slide switches for each channel must all be set to LS. However, when FXO termination is chosen, either LS or GS can be selected for each channel.

Table 10-1: Termination Options and Switch Settings for the FXO/DPT

Trunk Signaling	4-Position DIP Switch per Card	Slide Switch per Channel
FXO Ground Start	0000	GS
FXO Loop Start	0000	LS
DPT	1000	LS

10.3.1 Foreign Exchange Office (FXO) Termination

The FXO provides private branch exchange (PBX) office end connectivity to public network T1 lines. The FXO acts as a sink for a battery source, detects ringing, provides outgoing seizure, provides and interprets A/B bit signaling to and from the T1 line, and enables two-way voice frequency transmission.

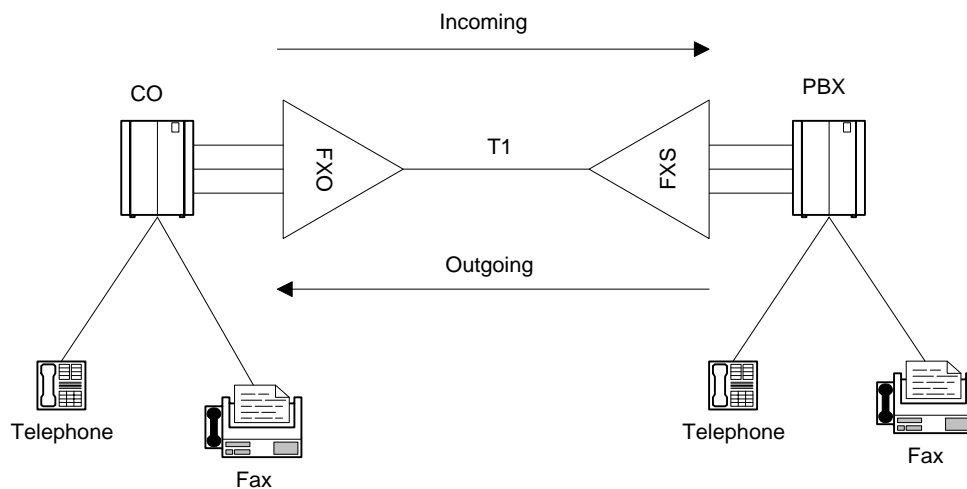


Figure 10-1: FXO Operation

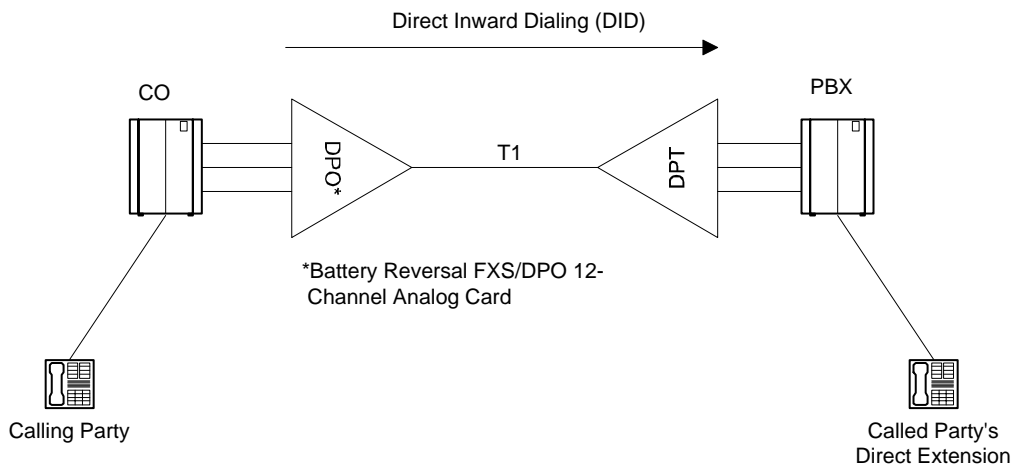


Figure 10-2: DPT Operation

10.3.2 Dial Pulse Termination (DPT)

In DPT mode, the FXO/DPT offers near end termination for one-way Direct Inward Dial (DID). Two-way DID is provided by CAC's 4 wire E&M interface. The DPT card interprets T1 signaling bits to:

- provide incoming seizure
- act as a current sink for a PBX -48V battery source
- establish an audio path

- detect battery reversal from the PBX for call progress and confirmation of call completion.

10.3.3 Channel Attenuation Options

Each of the 12 channels can be configured to attenuate both the transmit and receive audio signal. Each channel has a 6-position dip switch; three positions for transmit attenuation and three positions for receive attenuation. The switch positions apply different values of attenuation, and are additive (if more than one switch is set to apply attenuation for a specific channel, the attenuation value for the channel is the sum of those switches).

The loss is measured in decibels (dB). Note that a 3dB loss implies the average power is reduced by 50%.

The following table shows the values of attenuation applied for each switch position.

Note: Attenuation is applied when the switch is in the OFF position, and is removed when the switch is in the ON position.

Table 10-2: Transmit and Receive Attenuation Switch Values

Switch Setting	Transmit Switch Position Loss			Receive Switch Position Loss		
	1	2	3	4	5	6
On	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB
Off	-2 dB	-3 dB	-4 dB	-2 dB	-3 dB	-4 dB



Caution: Use proper electrostatic discharge (ESD) procedures when handling the analog cards.

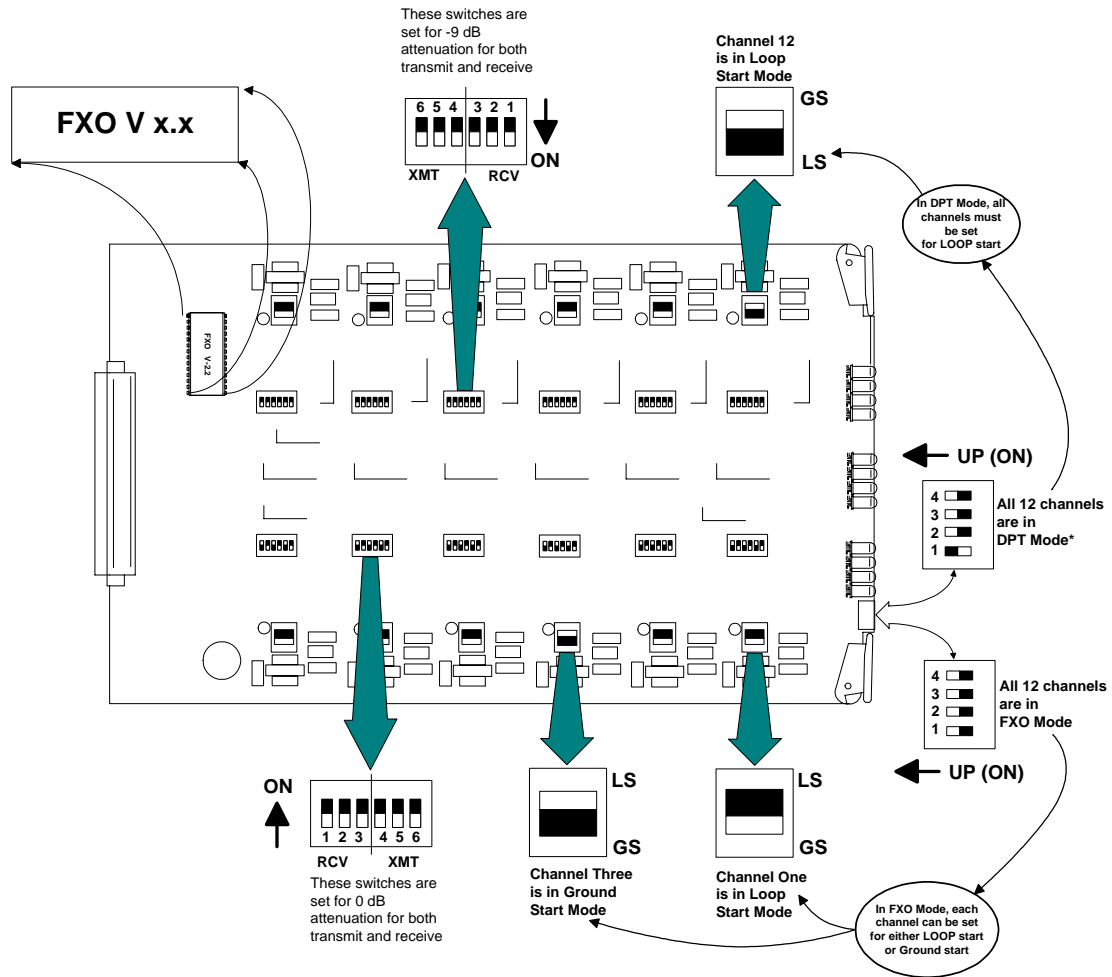


Figure 10-3: FXO/DPT Card Switch Settings

Chapter 11

4-Wire E&M/TO Configuration

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11.1 About This Chapter

This chapter describes how to configure the *4-wire E&M/Transmission Only* (E&M/TO) 12-channel voice card for connecting the Access Bank II - SNMP to T1 private line services that support E&M signaling types I, II, IV and V. Also, cable information and specifications are provided at the end of this section.

11.2 4-Wire E&M/TO Voice Card

11.2.1 Functional Description

The *4-wire E&M/Transmission Only* voice card delivers 12 analog channels for connecting to private line circuits, such as carrier PBX tie lines and 4-wire modems often found in utility, cellular, and met-

ropolitan area networks. Each of the twelve E&M channels can be individually configured to support Signaling Types I, II, IV or V, using up to 4 signaling and transmission pairs per channel (E/M, SG/SB, T/R, and T1/R1). This card can be configured to function as Channel Equipment (normal multiplexer mode) or as Switching Equipment for back-to-back Tandem applications sometimes referred to as Reverse E&M or Pulse Link Repeater (PLR).

11.2.2 Physical Description

Like the FXS and FXO/DPT voice cards, the 4-wire E&M/TO is a 7.8" by 13.16" daughter card that slides into the back of the Access Bank II - SNMP (AB2 - SNMP) along rails that guide a 64-pin DIN connector to mate with a matched connector on the internal ABI Controller. The E&M/TO card receives T1 signaling, control logic, and -48 Vdc power through this connector from the Controller card. Because the RJ-21X Amphenol™ Telco connector on the ABI front control panel fails to provide enough wiring leads, it is bypassed through a 96-pin E&M signaling line connector attached on the opposite end of the card. The E&M signaling lines (E, SG, M, SB, T, R, T1 and R1) are connected to this high-density 96-pin DIN connector. A bank of 12 channel status LEDs are located next to the E&M signaling line connector on the ABI back plate. Each channel has jumpers that allow the channel to be configured for E&M Types I, II, IV and V signaling. Each channel also has a 10-position DIP switch that allows the receive and transmit attenuation to be individually set from -22 dB to +10 dB. There is also a 4-position DIP switch located next to the processor for setting regular or clear channel E&M signaling types and selecting busy or idle during carrier failure.

11.3 Typical Applications

The major applications for the 4-wire E&M/TO voice card are E&M Tie Lines operating in either Normal or Tandem mode. This interface also supports two-way Direct Inward Dial (DID) applications. See Figure 11-1 and Figure 11-2 below for pictorial representations of these typical applications.

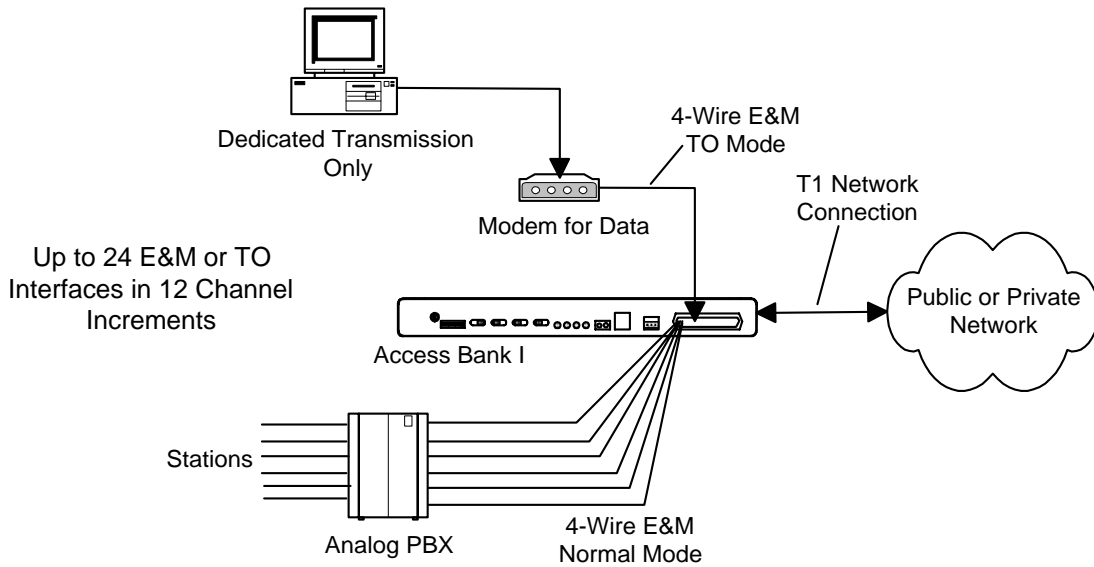


Figure 11-1: Normal Mode E&M Termination

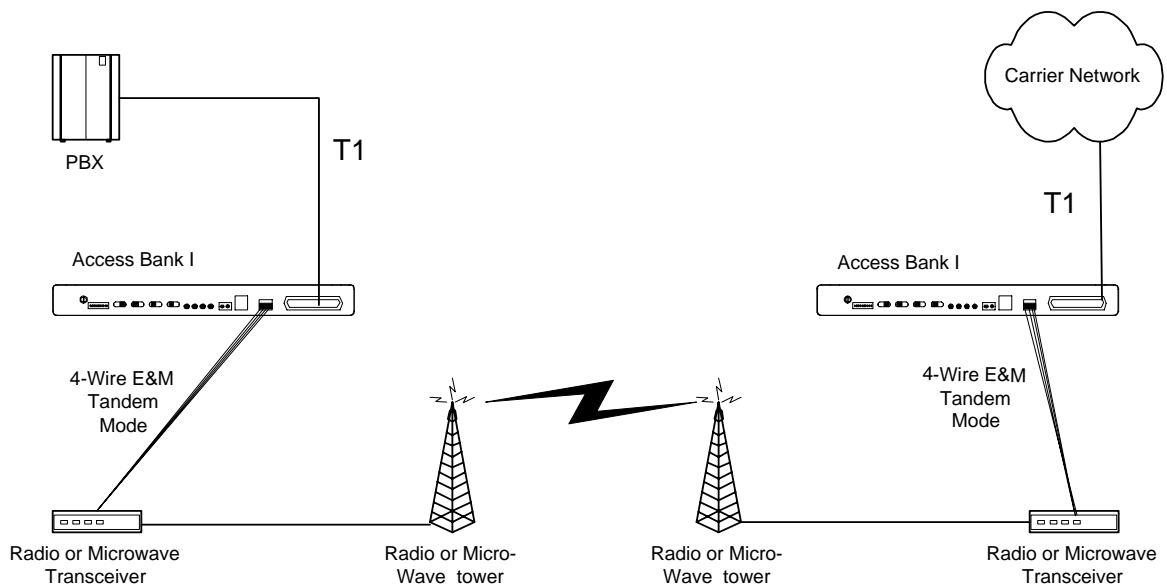


Figure 11-2: Tandem Mode E&M Access to Leased Lines or Carriers

11.4 E&M Signaling Conventions

According to E&M signaling conventions, switching equipment always originates signaling on the M-lead (the “mouth” sending toward the transmission line). The E-lead of the switching equipment

interface incorporates a signaling current detector (the “ear” listening to the line). The multiplexed or carrier channel equipment always originates signaling on the E-lead coming from the transmission line. The signaling current detector is found on the M-lead going toward the transmission line.

The 4-wire E&M/TO voice card can be optioned to operate either as channel equipment or switching equipment. Since the Access Bank II - SNMP typically operates as a voice and data multiplexer, the card is usually configured as channel equipment. This is referred to as tandem operation because the card operates in tandem (i.e. back-to-back) with another transmission device.

Table 11-1 lists the generic functions performed by the Detector/Detector Return and Driver/Driver Return when the 4-wire E&M card is configured to operate as Channel Equipment or Switching Equipment.

Table 11-1: Detector-Driver Functions

Channel Equipment	Detector is on M-lead function Driver is on E-lead function
Switching Equipment	Detector is the E-lead function Driver is the M-lead function

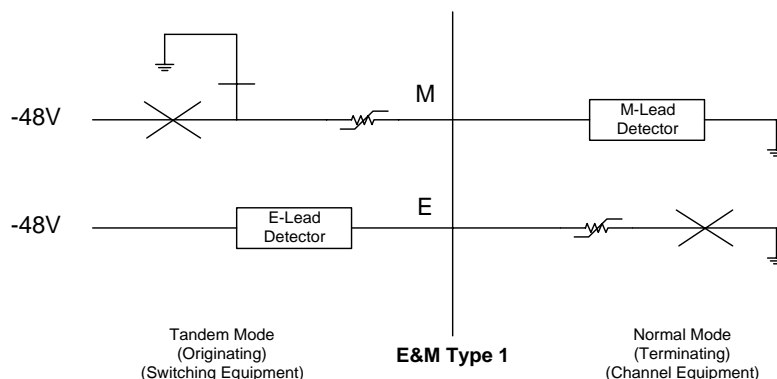


Figure 11-3: E&M Signaling Type 1

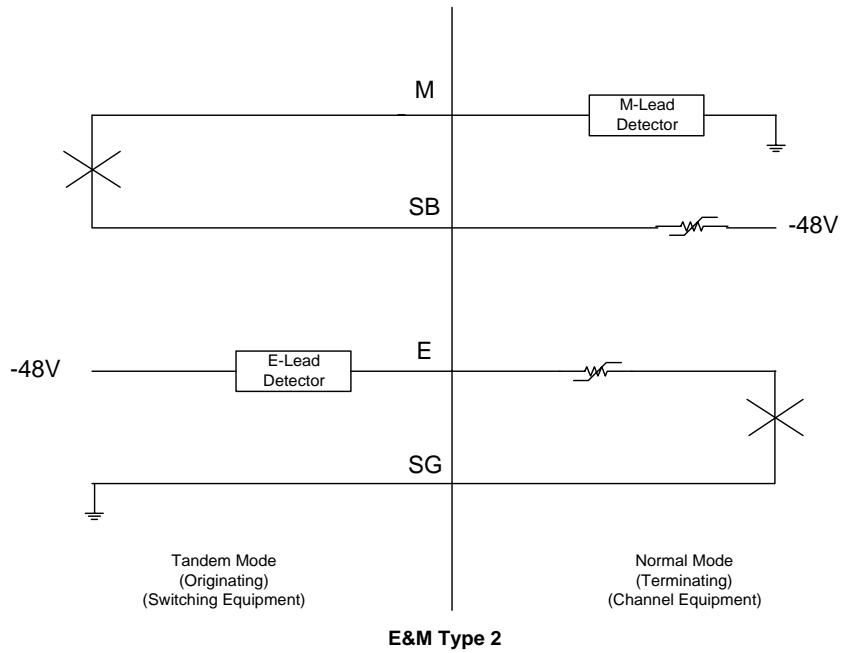


Figure 11-4: E&M Signaling Type 2

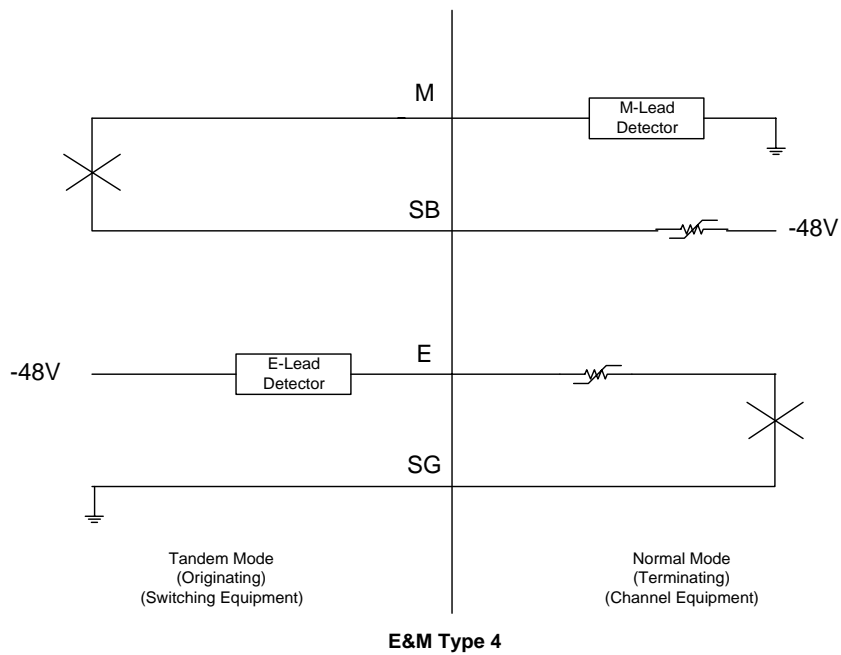


Figure 11-5 E&M Signaling Type 4

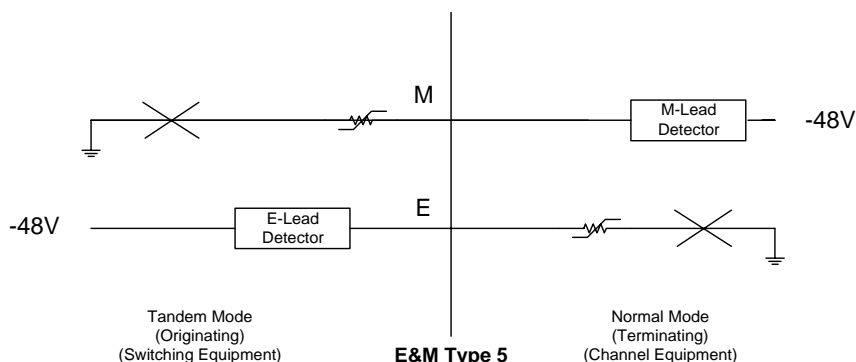


Figure 11-6: E&M Signaling Type 5

11.5 Programming E&M Signaling Types

11.5.1 Jumper Switch Settings

E&M signaling types I, II, IV and V (see Figure 11-3, Figure 11-4, Figure 11-5, and Figure 11-6) are configured by jumpers J1, J2 and J3 located on each channel. Because the signaling types are configured for each channel individually, different E&M types may be mixed on the same card. The entire card, however, must operate in either Normal or Tandem mode, which is determined by the signaling cable used (Section 11.7, *Normal and Tandem Cables*). Table 11-2 (which is also printed on the 4-wire E&M back plate) shows the proper jumper connections for each signaling type and mode.

Table 11-2: Jumper Connections by Type and Mode

E&M Type	Mode	Jumper Placement		
		J1	J2	J3
1	Normal	3-4	5	8-9
1	Tandem	1-2	5	10-11
2	Normal	3-4	6	7-8
2	Tandem	1-2	6	7-8
4	Normal	1-2	6	7-8
4	Tandem	1-2	6	7-8
5	Normal	1-2	5	8-9
5	Tandem	1-2	5	8-9

The jumpers are blocks that make several connections simultaneously. The entire block is moved

between the positions indicated above. This makes configuration easier by changing several connections with one move. The jumper pins are on 0.1" x 0.2" centers, making it impossible for the user to accidentally turn the jumper 90 degrees and short -48V to ground.

Figure 11-7 shows the jumpers as they appear on the 4-wire E&M/TO card. Figure 11-7 also shows each of the eight possible signaling combinations as complete channel setups.

Note: The jumpers do not change the actual interface pin assignments for the E&M signaling line connector. The detector and driver functions always stay on the same pinouts.

11.6 Detector Configuration

Jumper 1 is used to select options for configuring E&M signaling types I, II, IV and V. This jumper connects the detector to -48 Vdc or ground. It is also used to connect the Detector Return to -48 Vdc or ground. An on-hook signal from the far-end equipment does not cause current to flow through the detector. When the far-end equipment applies an off-hook signal, current flows in the detector, causing the detector to be grounded. The processor receives this information and sends E&M signaling bits to the T1 line. The table below summarizes the signaling bits sent for both detector states:

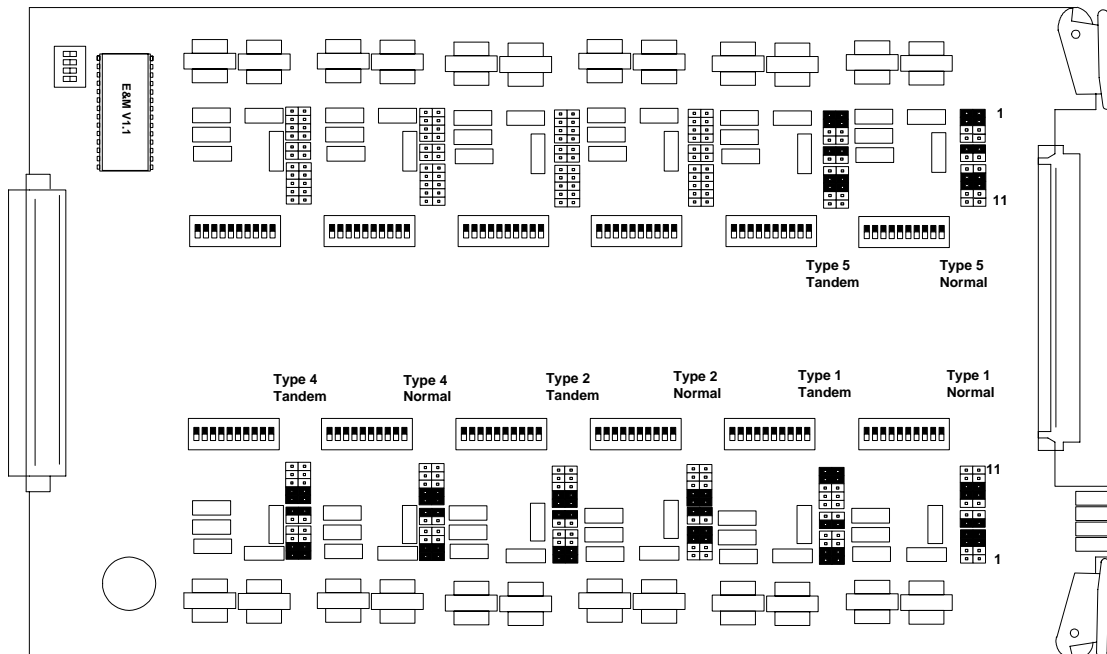


Figure 11-7: 4-Wire E&M Signaling Options

Table 11-3: E&M T1 Signaling

Detector	XMT Signaling Bits		RCV Signaling Bits		Driver
	A	B	A	B	
Off	0	0			
On	1	1			
			0	*	On-Hook
			1	*	Off-Hook

*Don't care (0 or 1)

11.7 Normal and Tandem Cables

Individual E&M/TO voice cards require the purchase of the Normal mode or Tandem mode cables listed below in Table 11-4. The type of cable used with the signaling line connector determines whether all twelve channels of that card operate only in that mode. Physically, the Normal and Tandem cables have one 96-pin DIN connector that plugs into the E&M card. The 96-pin DIN connector has two 50 conductor, 24 AWG cables leading to two 50-pin Telco connectors. The Telco connectors use standard RJ-2HX pinouts for 4-wire E&M, providing six channels per connector (twelve channels per card). Figure 11-8 and Figure 11-9 show the 4-wire E&M/TO cables.

Table 11-4: Normal and Tandem Mode Cables for 4-wire E&M/TO Card

CAC Part Number	Cable Length	Application	Connectors and Wiring	List Price
005-0004-10'	10ft (3.05m)	Normal Mode Cable supporting E&M Types I, II, IV, and V in Normal (Non-Tandem) Operation. Normal operation is typical of channel equipment such as phones, and modems, which are viewed as terminating equipment.	C-Type 96-Pin Male to Dual 50 Pin Telco Male Connectors, 24AWG	\$190
005-0005-10'	10ft (3.05m)	Tandem Mode Cable supporting E&M Types I, II, IV, and V in Tandem Operation. Tandem operation is typical of switching equipment such as PBXs and CO switches which can be said to originate traffic.	C-Type 96-Pin Male to Dual 50 Pin Telco Male Connectors, 24AWG	\$190

11.8 Configuring Signaling Types and Trunk Processing

The 4-wire E&M/TO card is also equipped with a 4-position DIP switch for selecting between regular or clear channel E&M signaling types and setting busy or idle during trunk processing. This switch is located at the front of the circuit board next to the 64-pin DIN connector.

Table 11-5: 4-Position DIP Switch Settings

Switch Number	ON	OFF
1	N/A	Normal E&M
2	N/A	N/A
3	N/A	N/A
4	TP Idle	TP Busy

11.9 TP Busy/Idle Switch

Use switch 4 to select whether the tip-ground relays are closed (busy) or open (idle) during trunk processing. (Trunk processing occurs when the T1 line is in an alarm or reset state.) The Busy position (OFF) causes the tip-ground relays to be closed during a T1 alarm or reset period. The Idle position (ON) causes the tip-ground relays to be open during a T1 alarm or reset period.

11.10 Setting Transmit and Receive Gain

The transmit (analog-to-digital) and the receive (digital-to-analog) gain for each voice channel can be set independently using twelve 10-position DIP switches on top of the 4-wire E&M card circuit board. Each analog channel uses a bank of ten DIP switches, with five for transmit and five for receive. The gain from each switch is additive, with switches 1-5 providing transmit (analog-to-digital) gain of 1, 2, 4, 8 and 16 dB, respectively. Switches 6-10 set receive (digital-to-analog) gains of 1, 2, 4, 8, and 16 dB, respectively. With all five switches off, the gain is -21dB. Because the gain from the switches is additive, any gain level between -21dB and 10dB is possible.

The digital transmission level is limited by the codec to a maximum of 3.17dBm0. The gain stages may be set to apply up to 10dB of gain; however, the maximum level of the codec must not be exceeded or distortion will result.

The analog transmission level may be set to a maximum 9.5dBm before distortion begins to occur.

11.11 Transmit (Analog-to-Digital) Gain

A transformer provides the analog input (T, R) from the 4-wire voice connections to the Access Bank II - SNMP. The gain from each switch on the 10-position DIP switch is additive, with switches 1-5 providing gain of 1, 2, 4, 8 and 16 dB, respectively. To calculate the T1 transmit level, use the following formula:

$$T1 \text{ level} = \text{Analog Input level} + \sum \text{Gain Switches} - 21$$

The following is an example of setting transmit gain:

Suppose the analog input level is at +3dBm. With all switches off, the level at the T1 line is +3dBm - 21db = -18dBm0. To set a 0dBm0 level at the T1 line, switches 2 and 5 (gains 2dB, and 16dB) must be turned on. The level at the T1 line is then:

$$T1 \text{ level} = 3\text{dBm} + 16\text{dB} + 2\text{dB} - 21\text{dB} = 0\text{dBm0}$$

11.12 Receive (Digital-to-Analog) Gain

To calculate the receive level on the T1, R1 pair, use the following formula:

$$T1/R1 \text{ level} = T1 \text{ level} + \sum \text{Gain Switches} - 21\text{dB}$$

The following is an example of setting receive gain:

Suppose the T1 input level to codec is at -1dBm0. With all switches off, the output at the T1, R1 pair is -1dBm -21db = -22dBm. To set a 4-wire transmission level of 0dBm, switches 7, 9 and 10 (gains 2dB, 8dB, and 16dB) must be turned on. The level at the T1, R1 pair is then:

$$T1/R1 \text{ level} = -1\text{dBm0} + 2\text{dB} + 8\text{dB} + 16\text{dB} - 21\text{dB} = 0\text{dBm.}$$

11.13 E&M Voice Channel Monitoring

11.13.1 Call Progress LED Indicators

A bank of LEDs on the ABI back plate are used to monitor the status of incoming or outgoing calls on each of the twelve voice channels. When viewing the LED bank, channel 1 corresponds to the LED in the top left hand corner. Other channels are arranged left to right, row by row (like reading a book), so channel 12 is in the bottom right corner. The meaning of the states of these 12 LEDs are summarized in Table 11-6.

Table 11-6: E&M Channel Status LEDs

LED State	Meaning
Off	Idle state
Green	Analog side is Off Hook
Red	Digital side is Off Hook
Yellow	Analog and Digital sides are both Off Hook

11.14 E&M Normal mode cable

11.14.1 Description

E&M normal mode cable, 96-pin DIN female to two Telco 50-pin males.

11.14.2 Cable Type

Voice grade telephone cable
25 twisted pairs of 24 AWG seven-strand copper.
Outer diameter 0.34"
Two per assembly

11.14.3 Common Connector

Female 96-pin DIN C-type connector (AMP 166873-5).
DIN performance level II
Electrical and environmental properties as per DIN 41612 and IEC 603-2
One per assembly

Backshell Kit
AMP 826196-1
One per assembly

11.14.4 Telco Connectors

Telco or Amphenol type connector (AMP 229974-4)
Two per assembly
Adjustable cable clamp (AMP 552763-2)
Two per assembly
Backshell Kit (AMP 552760-2)
Two per assembly

11.14.5 Markings

Red 1.5" long band on each cable near Telco connector
Silk screen as shown below on DIN connector backshell.

11.14.6 Length

10 feet

11.14.7 Physical Appearance

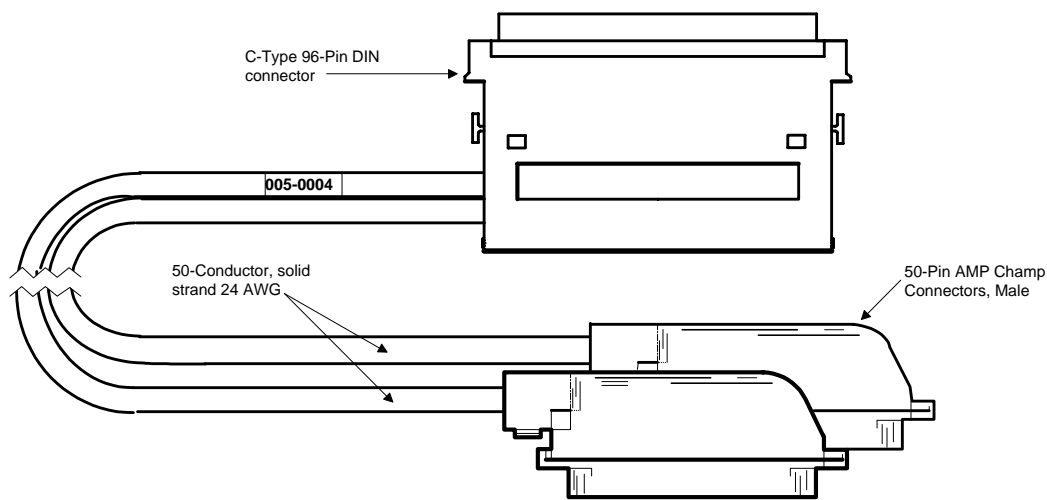


Figure 11-8: E&M Normal Mode Cable

11.15 E&M Tandem Mode Cable

11.15.1 Description

E&M tandem mode cable, 96-pin DIN female to two Telco 50-pin males.

11.15.2 Cable Type:

Voice grade telephone cable
25 twisted pairs of 24 AWG seven-strand copper.
Outer diameter 0.34"
Two per assembly

11.15.3 Common Connector:

Female 96-pin DIN C-type connector (AMP 166873-5).
DIN performance level II
Electrical and environmental properties as per DIN 41612 and IEC 603-2
One per assembly

Backshell Kit
AMP 826196-1
One per assembly

11.15.4 Telco Connectors:

Telco or Amphenol type connector (AMP 229974-4)

Two per assembly
Adjustable cable clamp (AMP 552763-2)
Two per assembly
Backshell Kit (AMP 552760-2)
Two per assembly

11.15.5 Markings:

Blue 1.5" long piece of heat shrink tubing on each cable near Telco connector
Silk screen as shown below on DIN connector backshell.

11.15.6 Length

10 feet

11.15.7 Physical Appearance

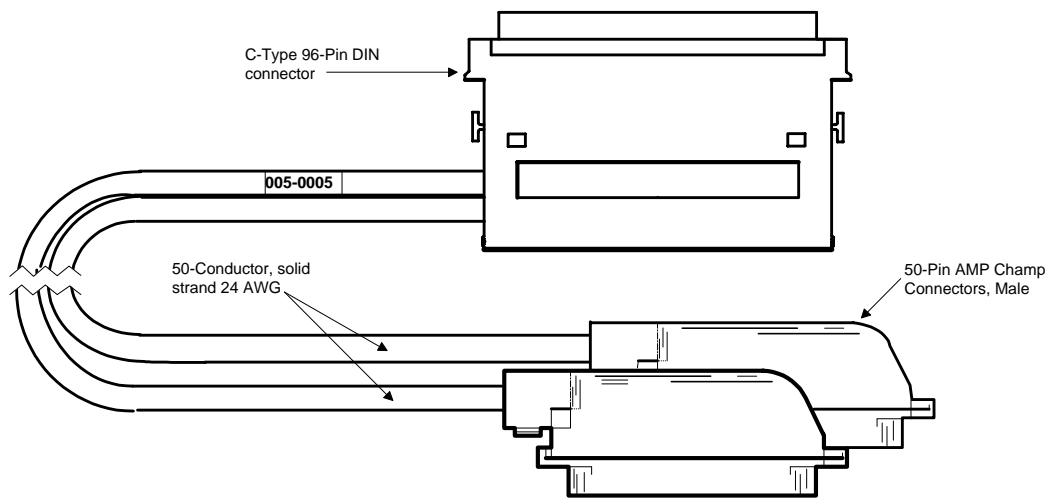


Figure 11-9: E&M Tandem Mode Cable

Table 11-7(Part 1): Connector Pinouts for Cable P/N 005-0004

RJ2HX Punchdown Block									
E&M Type I, II, IV, V									
Normal Mode									
Note: Telco Pinouts 1 & 26, 2 & 27, 3 & 28, etc. are twisted pairs									
Telco Connector A					Telco Connector B				
Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel	Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel
1	R	23C	R-1	1	1	R	4C	R-7	7
2	R1	24C	R1-1	1	2	R1	2C	R1-7	7
3	SG	13A	DRR1	1	3	SG	4B	DRR7	7
4	SB	15A	DETR1	1	4	SB	1B	DETR7	7
5	R	22B	R-2	2	5	R	8C	R-8	8
6	R1	21B	R1-2	2	6	R1	6C	R1-8	8
7	SG	12A	DRR2	2	7	SG	8B	DRR8	8
8	SB	10A	DETR2	2	8	SB	5B	DETR8	8
9	R	25C	R-3	3	9	R	12C	R-9	9
10	R1	26C	R1-3	3	10	R1	10C	R1-9	9
11	SG	17A	DRR3	3	11	SG	12B	DRR9	9
12	SB	19A	DETR3	3	12	SB	9B	DETR9	9
13	R	27C	R-4	4	13	R	16C	R-10	10
14	R1	28C	R1-4	4	14	R1	14C	R1-10	10
15	SG	21A	DRR4	4	15	SG	16B	DRR10	10
16	SB	23A	DETR4	4	16	SB	13B	DETR10	10
17	R	29C	R-5	5	17	R	19C	R-11	11
18	R1	30C	R1-5	5	18	R1	20C	R1-11	11
19	SG	25A	DRR5	5	19	SG	5A	DRR11	11
20	SB	27A	DETR5	5	20	SB	7A	DETR11	11
21	R	31C	R-6	6	21	R	18B	R-12	12
22	R1	32C	R1-6	6	22	R1	17B	R1-12	12
23	SG	29A	DRR6	6	23	SG	4A	DRR12	12
24	SB	31A	DETR6	6	24	SB	2A	DETR12	12
25	--				25	--			

Table 11-7 (Part 2): Connector Pinouts for Cable P/N 005-0004

RJ2HX Punchdown Block									
E&M Type I, II, IV, V									
Normal Mode									
Note: Telco Pinouts 1 & 26, 2 & 27, 3 & 28, etc. are twisted pairs									
Telco Connector A					Telco Connector B				
Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel	Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel
26	T	23B	T-1	1	26	T	3C	T-7	7
27	T1	24B	T1-1	1	27	T1	1C	T1-7	7
28	E	16A	DRV1	1	28	E	2B	DRV7	7
29	M	14A	DETC1	1	29	M	3B	DETC7	7
30	T	22C	T-2	2	30	T	7C	T-8	8
31	T1	21C	T1-2	2	31	T1	5C	T1-8	8
32	E	9A	DRV2	2	32	E	6B	DRV8	8
33	M	11A	DETC2	2	33	M	7B	DETC8	8
34	T	25B	T-3	3	34	T	11C	T-9	9
35	T1	26B	T1-3	3	35	T1	9C	T1-9	9
36	E	20A	DRV3	3	36	E	10B	DRV9	9
37	M	18A	DETC3	3	37	M	11B	DETC9	9
38	T	27B	T-4	4	38	T	15C	T-10	10
39	T1	28B	T1-4	4	39	T1	13C	T1-10	10
40	E	24A	DRV4	4	40	E	14B	DRV10	10
41	M	22A	DETC4	4	41	M	15B	DETC10	10
42	T	29B	T-5	5	42	T	19B	T-11	11
43	T1	30B	T1-5	5	43	T1	20B	T1-11	11
44	E	28A	DRV5	5	44	E	8A	DRV11	11
45	M	26A	DETC5	5	45	M	6A	DETC11	11
46	T	31B	T-6	6	46	T	18C	T-12	12
47	T1	32B	T1-6	6	47	T1	17C	T1-12	12
48	E	32A	DRV6	6	48	E	1A	DRV12	12
49	M	30A	DETC6	6	49	M	3A	DETC12	12
50	--				50	--			

Table 11-8 (Part 1): Connector Pinouts for Cable P/N 005-0005

RJ2HX Punchdown Block									
E&M Type I, II, IV, V									
Normal Mode									
Note: Telco Pinouts 1 & 26, 2 & 27, 3 & 28, etc. are twisted pairs									
Telco Connector A					Telco Connector B				
Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel	Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel
1	R	23C	R-1	1	1	R	4C	R-7	7
2	R1	24C	R1-1	1	2	R1	2C	R1-7	7
3	SG	15A	DETR1	1	3	SG	4B	DETR7	7
4	SB	13A	DRR1	1	4	SB	1B	DRR7	7
5	R	22B	R-2	2	5	R	8C	R-8	8
6	R1	21B	R1-2	2	6	R1	6C	R1-8	8
7	SG	10A	DETR2	2	7	SG	5B	DETR8	8
8	SB	12A	DRR2	2	8	SB	8B	DRR8	8
9	R	25C	R-3	3	9	R	12C	R-9	9
10	R1	26C	R1-3	3	10	R1	10C	R1-9	9
11	SG	19A	DETR3	3	11	SG	9B	DETR9	9
12	SB	17A	DRR3	3	12	SB	12B	DRR9	9
13	R	27C	R-4	4	13	R	16C	R-10	10
14	R1	28C	R1-4	4	14	R1	14C	R1-10	10
15	SG	23A	DETR4	4	15	SG	13B	DETR10	10
16	SB	21A	DRR4	4	16	SB	16B	DRR10	10
17	R	29C	R-5	5	17	R	19C	R-11	11
18	R1	30C	R1-5	5	18	R1	20C	R1-11	11
19	SG	27A	DETR5	5	19	SG	7A	DETR11	11
20	SB	25A	DRR5	5	20	SB	5A	DRR11	11
21	R	31C	R-6	6	21	R	18B	R-12	12
22	R1	32C	R1-6	6	22	R1	17B	R1-12	12
23	SG	31A	DETR6	6	23	SG	2A	DETR12	12
24	SB	29A	DRR6	6	24	SB	4A	DRR12	12
25	--				25	--			

Table 11-8 (Part 2): Connector Pinouts for Cable P/N 005-0005

RJ2HX Punchdown Block									
E&M Type I, II, IV, V									
Normal Mode									
Note: Telco Pinouts 1 & 26, 2 & 27, 3 & 28, etc. are twisted pairs									
Telco Connector A					Telco Connector B				
Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel	Telco Pinouts	Telco Label	C type DIN pinouts	Card Label	Card Channel
26	T	23B	T-1	1	26	T	3C	T-7	7
27	T1	24B	T1-1	1	27	T1	1C	T1-7	7
28	E	16A	DETC1	1	28	E	3B	DETC7	7
29	M	14A	DRV1	1	29	M	2B	DRV7	7
30	T	22C	T-2	2	30	T	7C	T-8	8
31	T1	21C	T1-2	2	31	T1	5C	T1-8	8
32	E	11A	DETC2	2	32	E	7B	DETC8	8
33	M	9A	DRV2	2	33	M	6B	DRV8	8
34	T	25B	T-3	3	34	T	11C	T-9	9
35	T1	26B	T1-3	3	35	T1	9C	T1-9	9
36	E	18A	DETC3	3	36	E	11B	DETC9	9
37	M	20A	DRV3	3	37	M	10B	DRV9	9
38	T	27B	T-4	4	38	T	15C	T-10	10
39	T1	28B	T1-4	4	39	T1	13C	T1-10	10
40	E	22A	DETC4	4	40	E	15B	DETC10	10
41	M	24A	DRV4	4	41	M	14B	DRV10	10
42	T	29B	T-5	5	42	T	19B	T-11	11
43	T1	30B	T1-5	5	43	T1	20B	T1-11	11
44	E	26A	DETC5	5	44	E	6A	DETC11	11
45	M	28A	DRV5	5	45	M	8A	DRV11	11
46	T	31B	T-6	6	46	T	18C	T-12	12
47	T1	32B	T1-6	6	47	T1	17C	T1-12	12
48	E	30A	DETC6	6	48	E	3A	DETC12	12
49	M	32A	DRV6	6	49	M	1A	DRV12	12
50	--				50	--			

If your voice channels require different attenuation level settings than the factory defaults, proceed as follows:

Chapter 12

Diagnostics & Troubleshooting

Contents of This Chapter:

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12.1 About This Chapter

This chapter provides instructions for performing:

- Self Test Loopbacks.
- Network Loopbacks.
- Disabling external alarms.
- Fault isolation procedures for troubleshooting problems encountered while operating the Access Bank II - SNMP.

12.2 Diagnostic Switches

The Access Bank II - SNMP System Setup and T1 Span Setup DIP switches on the Control Panel include settings for running the self test loopbacks, enabling network loopbacks, and enabling alarm cut-off.

Note: These tests as well as additional test functions can be performed using the MS Windows-based Remote Monitor software. For directions on performing Self Test loopbacks and tone transmission, enabling network loopbacks, and activating automatic Alarm Cut-Off (ACO) via the software, see the separate [Remote Monitor User's Guide](#).

12.3 Self Test 1 and 2



Caution: Because Self Test is a service-disrupting procedure. Disconnect all attached telephones prior to initiating Self Test.

12.3.1 Local Mode: OFF = No Test Tone, ON = Ringback Tone

In the *Local* mode, when the Self Test DIP switch 1 or 2 is set to ON and the Trunk Processing Busy/Idle switch on each equipped FX voice card is set to Busy, the T1 output signal from T1 Span 1 or Span 2 is disconnected from the network and looped back into the appropriate T1 receiver. See Figure 9-1. The specified T1 signal is checked internally for framing, line coding, and bipolar violations (BPV) errors, which verifies proper operation of the Controller card. The T1 signal from the specified span is isolated at the T1 line connection point through relay contacts to ensure that all T1 transmit and receive circuits are tested.

The Controller then runs a card level test and injects an internally generated ringback dual tone (440 Hz +480 Hz) into all attached PCM codec channels on the T1 span specified. This allows you to verify operation of the voice channels at the punchdown block or RJ-11 Harmonica with a telephone “buttinsky” set. For normal Access Bank II - SNMP operation, the Self Test switch must always be left in the factory default OFF position.

The self test takes up to 16 seconds. The T1 Test 1 or 2 LED turns red during the self test sequence. When the self test is complete, the LED should turn green. (If the Test LED remains red for longer than 16 seconds, the unit has failed the self test.) For the self test to be valid, the Access Bank II - SNMP must be equipped with the Controller card and at least one voice card.

To start Self Test 1 or 2 in the *Local* mode:

1. Locate the Self Test 1 or Self Test 2 switch on the 10-position T1 Span Setup DIP switch on the Access Bank II - SNMP Control Panel, and set it to the Self Test position (ON).

2. Verify that T1 Test 1 or T1 Test 2 LED turns green after approximately 16 seconds.

12.3.2 Card Self Test

At the start of the self test sequence, when the Controller asserts the self test bit toward the voice card, the following events occur on a per channel basis:

- The voice card reads from the Controller and sees the self test flag at logic 1 (active).
- The received A/B signaling bits are not processed since the signaling state machine is skipped in software.
- The outputs of the signaling state machine are forced to:

Table 12-1: Card Self Test Signaling States

Signaling	Output
Ringing voltage	OFF
Tip Lead	GROUNDING
Quiet Channel	OFF
Ringback	ON
A bit to network	ZERO
B bit to network	ONE
T1 Test 1 LED	RED (failure)
T1 Test 2 LED	RED (failure)

12.4 Self Test Fault Indications

12.4.1 Voice Channel LED is RED during Self Test

During Self-Test, a red channel LED may come on, but does not indicate a problem.

12.4.2 No Test Tone During a Self Test

If no ringback tone is present at the drop for a particular voice channel during a self test, there may be an open or broken pair in the voice cable. If no test tone is present on any channel during a self test, the voice cable may be disconnected. To correct the problem:

1. Check the voice cable for a loose connection.
2. Check the voice cable for a broken/open pair.
3. If no test tone is present on a set of 12 channels during a self test, the associated voice card may be faulty. Try replacing the voice card.

12.4.3 Remote Mode: Ringback Tone or 1 Digital Milliwatt

When the Access Bank II - SNMP is powered up in *Remote* mode, the tone sent during the Self Test can consist either of the same Ringback dual tone (440 Hz +480 Hz) sent in the *Local* Mode or a standard 1 kHz digital milliwatt test signal. In *Remote* mode, Ringback tone is the default setting.

12.5 1 kHz Digital Milliwatt Test Signal

The 1 kHz digital milliwatt signal test is used to check proper DS0 channel alignment and for isolating transmission failure problems between the Access Bank II - SNMP and connected switching equipment.

As specified in AT&T PUB 43801, the transmission of the following repetitive eight byte pattern (1E/0B/0B/1E/9E/8B/8B/9E) in a given channel should be decoded in a properly aligned receiving terminal as a 0dBm0, 1 kHz sine wave signal:

Table 12-2: Standard Digital Milliwatt Signal

Digit No.	1	2	3	4	5	6	7	8
	0	0	0	1	1	1	1	0
	0	0	0	0	1	0	1	1
	0	0	0	0	1	0	1	1
	0	0	0	1	1	1	1	0
	1	0	0	1	1	1	1	0
	1	0	0	0	1	0	1	1
	1	0	0	0	1	0	1	1
	1	0	0	1	1	1	1	0

12.6 Network Loopback 1 and 2

12.6.1 Local Mode: No Network Loopback or Network Loopback Enabled

In the *Local* mode, setting Network Loopback 1 or 2 switch to ON causes the T1 signal received from T1 network interface 1 or 2 to be looped back toward T1 line 1 or 2 by connecting the T1 receiver to the T1 transmitter before the framer chip. See Figure 9-2. T1 signals are sent back to the network exactly as they were received. No pulse stuffing, BPV correction, or framing is performed that would corrupt T1 test patterns (such as a QRSS) received from the far end. Channel interfaces are held in the Trunk Processing state when the Network Loopback switch is activated. The T1 Test 1 or T1 Test 2 LED on the Control Panel shows continuous yellow. All voice channel operations are suspended and the channel status LED indicators on the back plate show continuous yellow.

12.7 Remote Mode: Remote T1 Line or Payload Loopbacks

In *Remote* mode, if the T1 line is ANSI T1.403 ESF formatted and *Network Loopback detect* and *ESF ANSI detect* both has been enabled, the two types of loopback codes the Access Bank II - SNMP can be configured to detect are Remote T1 Line and Remote Payload Loopback. The default setting in *Remote* mode is Remote T1 Line Loopback.

12.8 ANSI T1.403 Remote T1 LLB

In a Remote T1 Line Loopback, upon receipt of a bit-oriented loopup command message consisting of 0000111011111111 repeated at least 10 times toward the Access Bank II - SNMP in the Facility Data Link (FDL), data recovered off the T1 line is transmitted back onto that T1 span specified with no changes in bit sequence integrity, framing format or removal of BPVs. The Access Bank II - SNMP should maintain the Remote LLB when it receives a loopback retention signal of 0010101011111111 sent continuously from the far-end. The loopback retention code word should be present in the returned T1 signal. The Remote T1 LLB is released upon receipt of the bit-oriented command message consisting of 0011100011111111, repeated at least 10 time in the FDL toward the Access Bank II - SNMP. See ANSI T1.403-1995, Section 9.3.2.2-3 and Table 4.

12.8.1 ANSI T1.403 Remote Payload Loopback

In a Remote Payload loopback, upon receipt of a bit-oriented loopup command message consisting of 0001010011111111 repeated at least 10 times toward the Access Bank II - SNMP in the FDL, the payload of the received T1 signal (192 information bits of a DS1 frame) is returned with no changes in bit sequence integrity and newly generated ESF framing. The T1 Framer will correct the BPVs in the 192 bits of payload data and re-transmit the data. The FPS framing pattern, CRC-6 calculation, and the FDL bits are not looped back, but are instead, reinserted by the Framer. The remote PLB is released upon receipt of the bit-oriented command message consisting of 0011001011111111, repeated at least 10 times in the FDL.

12.9 Illustrations of Loops and Self-Tests

The following illustrations show how the loop-back tests and self-tests work. See the descriptions above for more information about specific tests.

Figure 12-1 shows how to read the illustrations that follow.

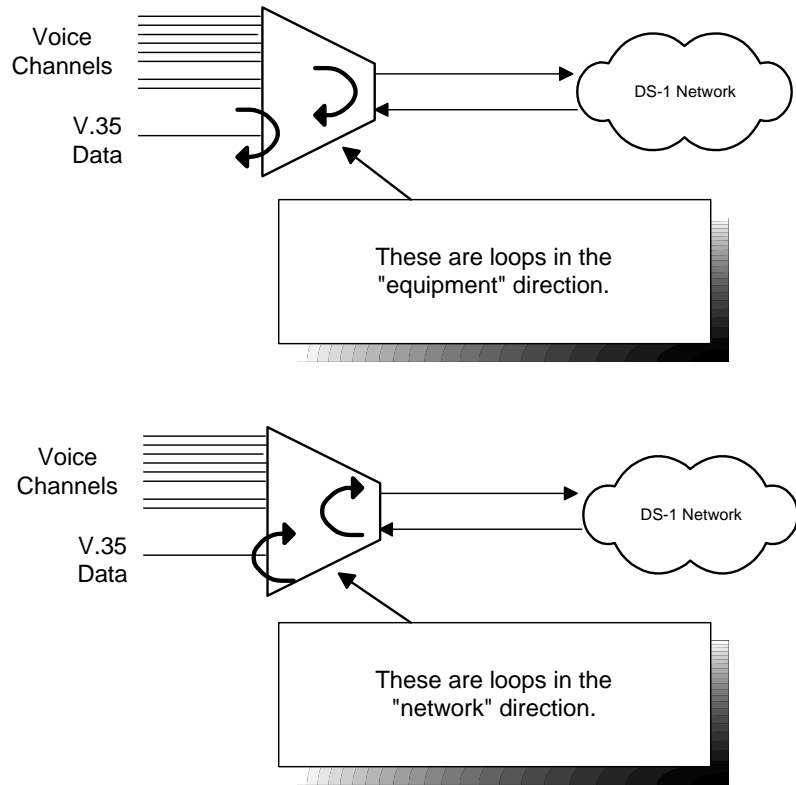


Figure 12-1: Loopback Legend

12.9.1 Self-Test

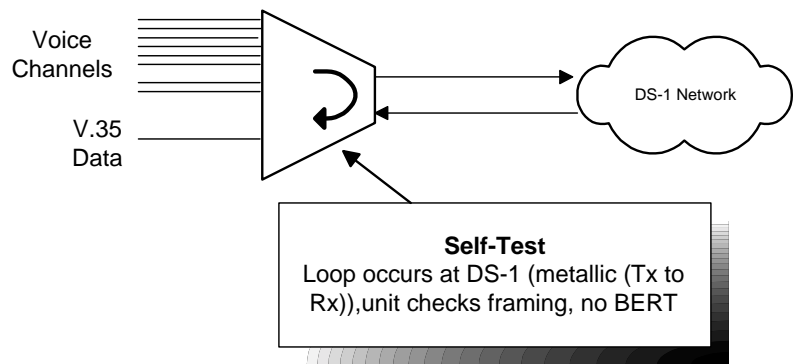


Figure 12-2: Self-Test

12.9.2 Equipment Loopback

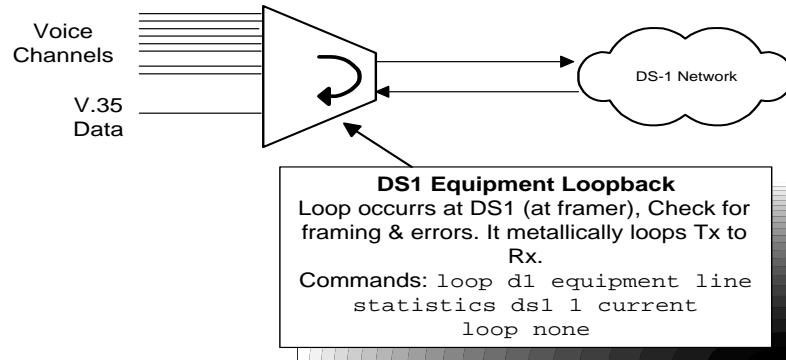


Figure 12-3: Equipment Loopback

12.9.3 Equipment Loopback - Payload

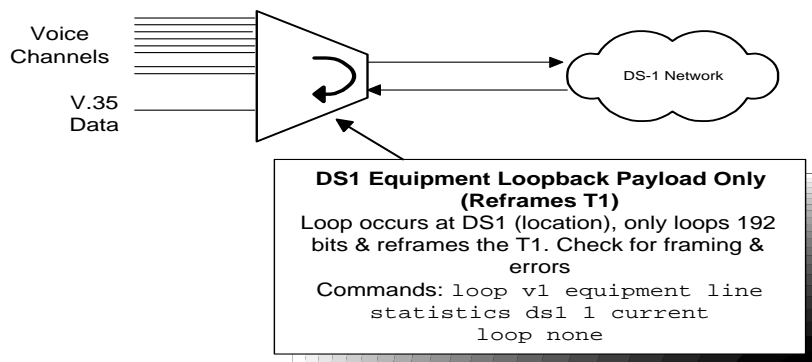


Figure 12-4: Equipment Loopback - Payload

12.9.4 DS-1 Network Loopback

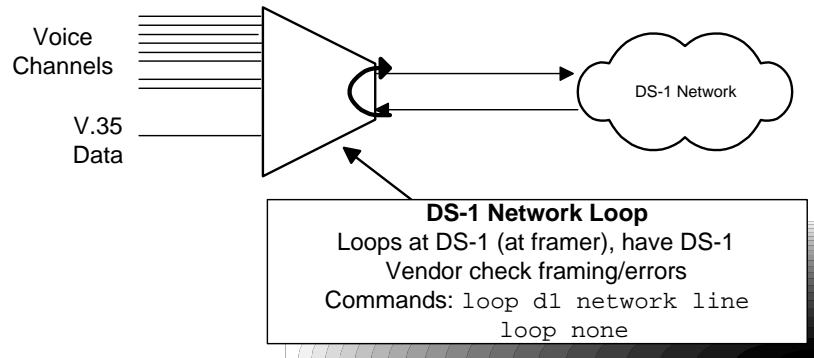


Figure 12-5: DS-1 Network Loopback

12.9.5 : DS-1 Network Loopback - Payload

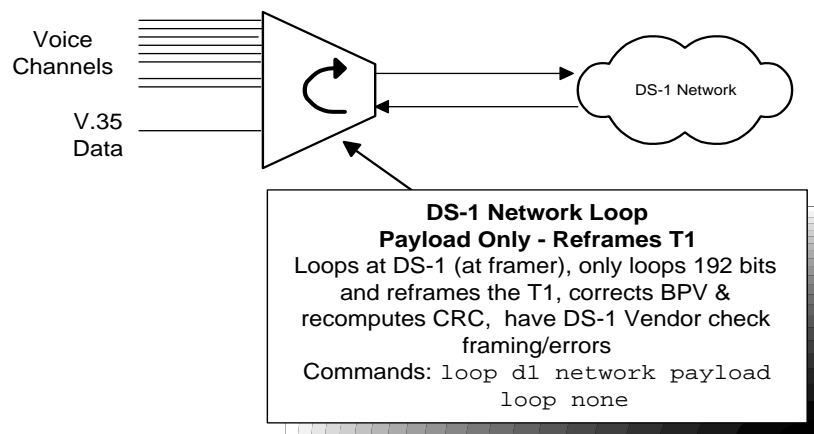
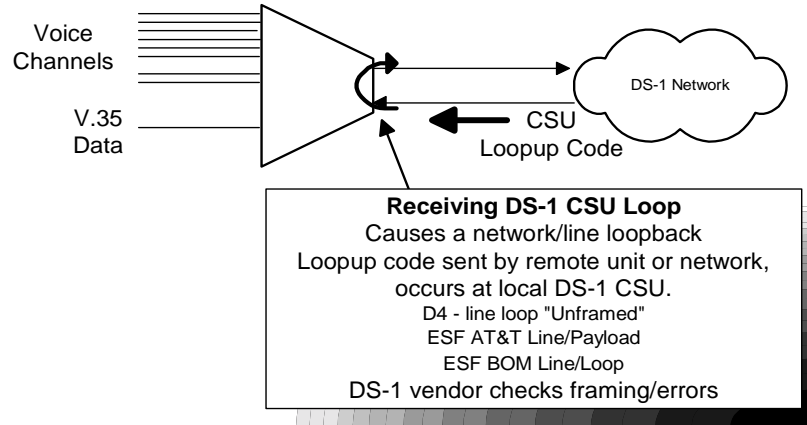


Figure 12-6: DS-1 Network Loopback - Payload

12.9.6 Receiving DS-1 CSU Loopback



12.9.7 Sending DS-1 CSU Loopback

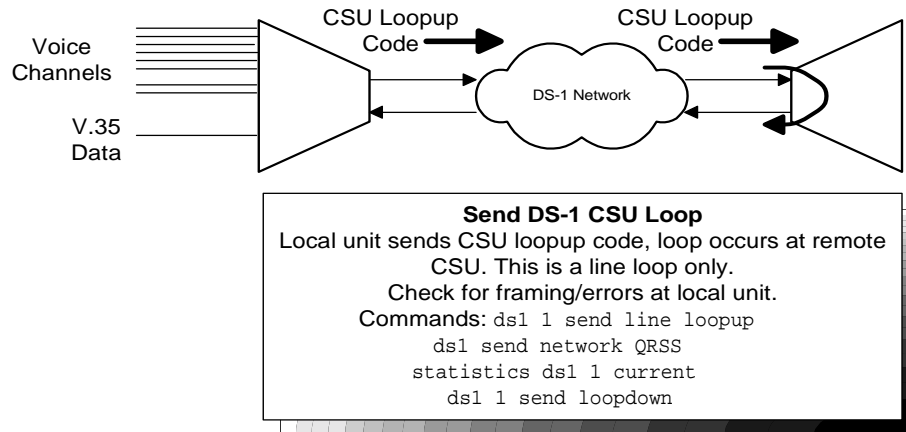


Figure 12-7: Sending DS-1 CSU Loopback

12.9.8 Sending DS-1 BERT Pattern

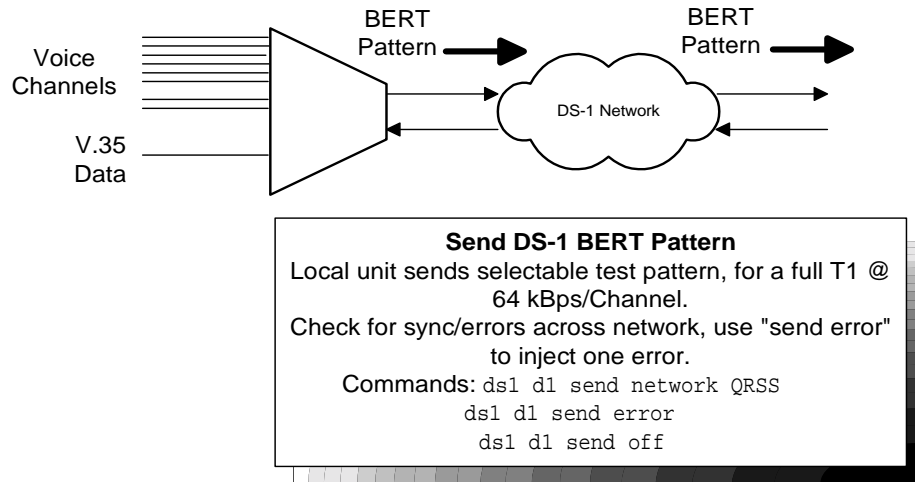


Figure 12-8: Sending DS-1 BERT Pattern

12.9.9 V.35 Equipment Loopback

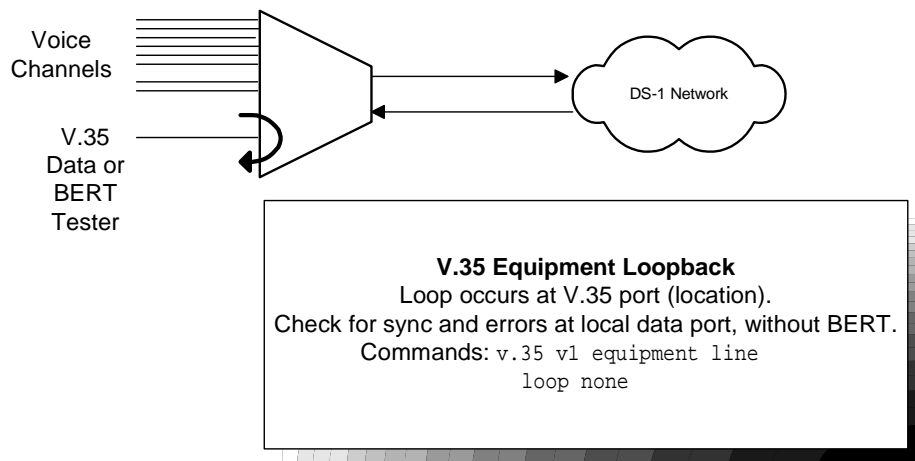


Figure 12-9: V.35 Equipment Loopback

12.9.10 V.35 Network Loopback

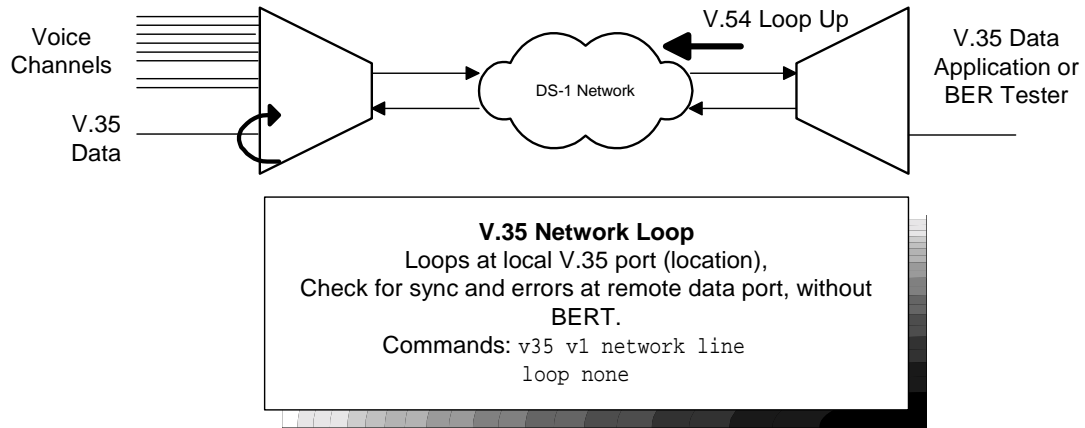


Figure 12-10: V.35 Network Loopback

12.9.11 Sending V.54 Loopback

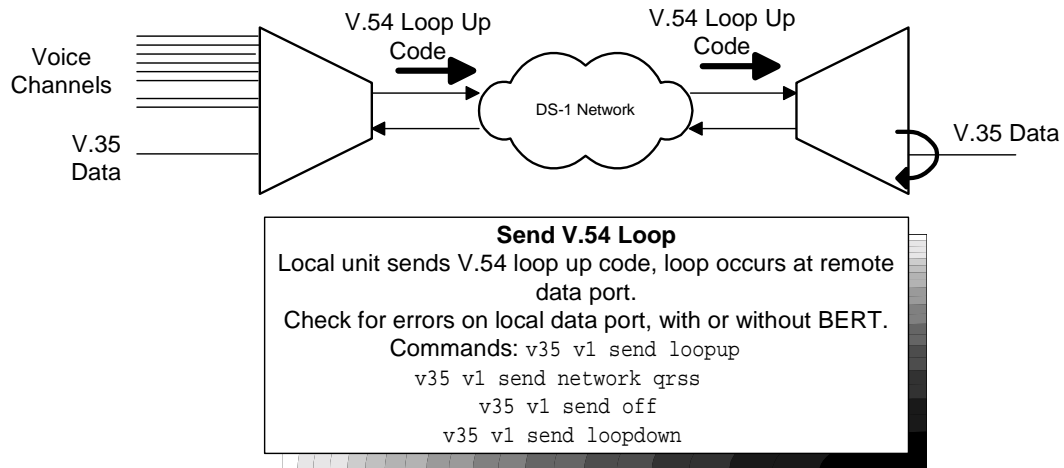


Figure 12-11: Sending V.35 Loopback

12.9.12 Receiving V.54 Loopback

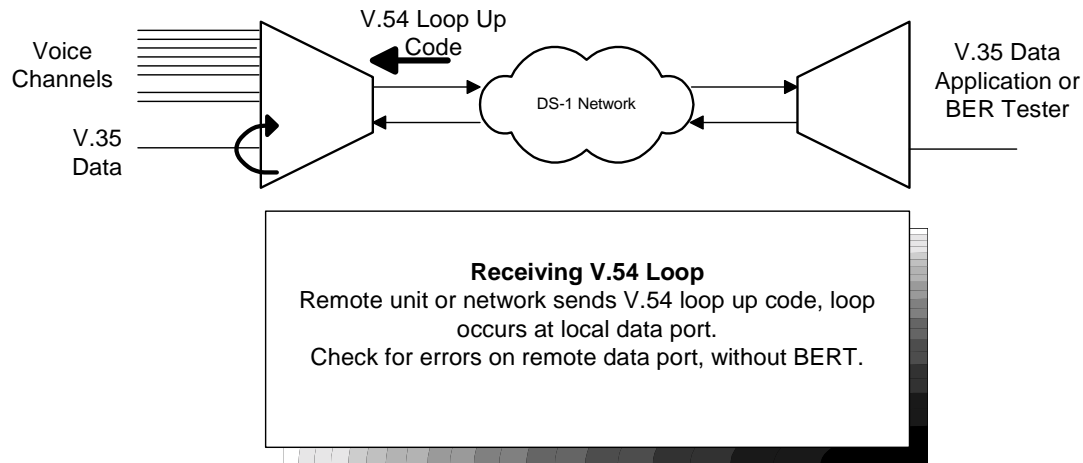


Figure 12-12: Receiving V.54 Loop

12.9.13 Sending FX Ring or Tone

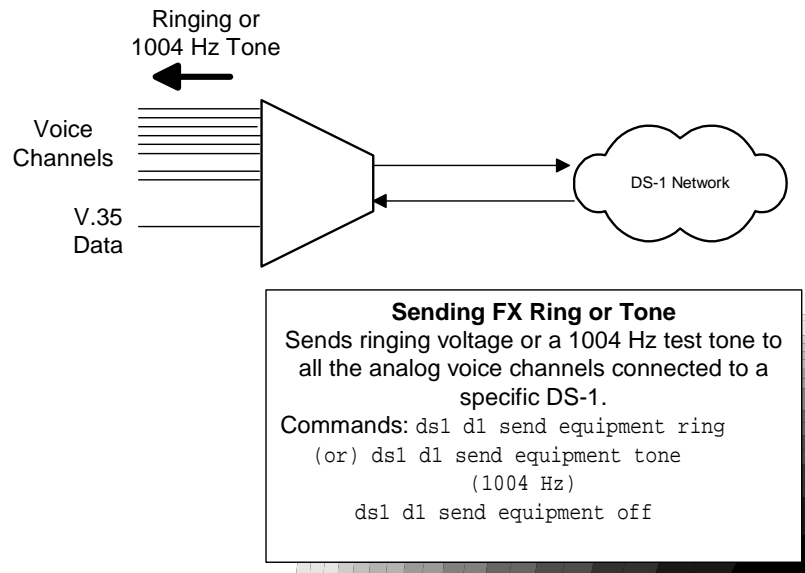


Figure 12-13: Sending FX Ring or Tone

12.10 Disabling an External Alarm

The 4-position System Setup DIP switch contains a switch labeled Alarm Cut-Off that allows you to disable an external alarm connected to pair 25 of the 50-pin Tip & Ring jack on the Access Bank II -

SNMP Control Panel. Setting this switch to the Alarm Cut-Off position (ON) opens the alarm relay contacts (150 Vrms, 150 mA maximum load) that close when the Access Bank II - SNMP enters an alarm state.

Table 9-3 defines the pin functions on the 50-pin Tip & Ring jack.

Table 12-3: 50-Pin Tip & Ring Jack

Pin Location	Function
26 1	Tip Channel 1 Ring Channel 1
27 2	Tip Channel 2 Ring Channel 2
↓	↓
49 24	Tip Channel 24 Ring Channel 24
50 25	Alarm Tip Channel 25 Alarm Ring Channel 25

12.11 LED Test and Status Indicators

Five test and status LED indicators on the Access Bank II - SNMP Control Panel provide a visual means of identifying system, T1 line and V.35 interface troubles.

Table 12-4: T1 Line Status LEDs for T1 Span 1 and T1Span 2

State	Meaning
OFF	Loss of T1 signal, no pulses received.
GREEN	Access Bank II - SNMP is in frame with a frame-bit error rate <10E-5.
FLASHING GREEN	Access Bank II - SNMP is in frame, but frame-bit error rate exceeds 10E-5.
RED	AIS (Unframed All Ones Signal) received from the incoming T1 span.
FLASHING RED	Access Bank II - SNMP is not synchronized to the incoming T1 line, but no AIS is being received.
YELLOW	BPV errors received on the T1 line that are not due to B8ZS line coding.
FLASHING YELLOW	Yellow Alarm received from the T1 line.

Table 12-5: T1 Test LEDs for T1 Span 1 and 2

State	Meaning
GREEN	Normal operations. Trunk processing, self test, and network loopback inactive.
FLASHING GREEN	T1 Self Test local loopback passed.
RED	T1 Self Test local loopback failed due to one or more of the following conditions: T1 Loss of Signal, Out of Frame, Improper Line Code Received, ESF or BPV errors received.
YELLOW	Channels held in Trunk Processing for this T1 span.
FLASHING YELLOW	Network loopback active for this T1 span.

Table 12-6: V.35 Status LED

State	Meaning
OFF	No T1 channels assigned to V.35 port.
GREEN	CD (RLSD) and RTS leads active. T1 channels assigned and operative.
FLASHING GREEN	V.35 in loopback to equipment.
RED	CD (RLSD) lead is inactive because assigned T1 is inoperative.
YELLOW	CD (RLSD) lead active. RTS lead inactive.
FLASHING YELLOW	V.35 in loopback to T1 line.

12.12 Fault Isolation Procedures

This section lists typical trouble symptoms that may occur while operating the Access Bank II - SNMP and suggests appropriate corrective actions to take. Fault symptoms are organized into three groups:

- Control Panel LED indications (system, T1 or V.35 faults)
- Back Plate LED indications (voice circuit faults)
- Other fault indications

Table 12-7: Control Panel LED Indications

Symptom	Corrective Action
All LED test and status indicators are OFF.	<p>Indicates a loss of power or excessive voltage to the Access Bank II - SNMP. To correct the problem:</p> <ol style="list-style-type: none"> 1 Verify that the Power Conversion Cube is plugged into an active AC outlet and the power switch on the power converter is turned on. 2 Check the circuit breaker on the Power Conversion Cube. 3 If you are using an external -48 Vdc power source, check the applied voltage. If the applied voltage is incorrect (e.g., greater than -70 Vdc), disconnect the external voltage source and correct its voltage output level. The Access Bank II - SNMP circuitry will automatically reset. 4 If the problem persists, the Access Bank II - SNMP power supply on the Controller card has failed. Replace the Controller card following the procedure given in the Maintenance section.
T1 Span 1 or 2 LED is RED.	<p>The Access Bank II - SNMP is not receiving a T1 signal from the line indicated. To correct this condition:</p> <ol style="list-style-type: none"> 1 Check the T1 interface cable at the RJ-48C jack and at the carrier demarcation jack. Ensure that the cable is properly plugged in. If so, go to Step 2. 2 Run a Self Test. If the affected T1 Test LED comes up green, replace the T1 cable. If the problem persists contact the service provider.

Table 12-8: Control Panel LED Indications (continued)

Symptom	Corrective Action
T1 Span 1 or 2 LED is YELLOW.	<p>. Bipolar Violations (BPVs) are being received from the network. A 1-second flash indicates that at least one BPV was received during a 1-second interval. To correct this problem:</p> <ol style="list-style-type: none"> 1 Verify the T1 Line Code 1 or 2 option selected matches the line coding sent by the carrier. 2 If the Line Code option is set correctly and the problem persists, contact your service provider.

T1 Test 1 or 2 LED is RED.	<p>If the T1 Test LEDs remain red for more than 16 seconds after a Self Test is initiated, the Access Bank II - SNMP has failed the Self Test. To correct the problem:</p> <ol style="list-style-type: none"> 1 Verify that the Controller card and at least one voice card are in place. 2 Power down the Access Bank II - SNMP for 60 seconds, power it up again, and repeat the Self Test. 3 If the Access Bank II - SNMP fails the Self Test again, replace the Controller card using the procedure given in the Maintenance section.
T1 Test 1 or 2 LED flashes YELLOW.	<p>The Access Bank II - SNMP is in Network Loopback. If this condition persists, the Access Bank II - SNMP may not have received a loop down code to end the network loopback To clear this condition:</p> <ol style="list-style-type: none"> 1 Be sure the Network Loopback switch is set to OFF. 2 Set the Self Test switch to the Self Test ON position, then back to OFF.

12.13 Back Plate Indications

12.13.1 Voice Channel LED is RED (during a Self Test)

During a Self-Test, a RED voice channel LED may appear, and does not indicate a particular problem.

12.13.2 All Voice Channel LEDs flash RED

This usually indicates that an unsupported signaling option has been selected. Reconfigure the FXS card to a supported signaling type.

12.14 Other Fault Indications

12.14.1 No Ringing During a Self Test

If no ringing signal is heard at the drop for a particular channel during a Self Test, there may be an open or broken pair in the voice cable. If no ringing signal is heard on any channel during a self test, the voice cable may be disconnected. To correct the problem:

1. Check the voice cable for a loose connection.
2. Check the voice cable for a broken/open pair.
3. Use Remote Monitor software to run a Self Test Loopback with the Ringback tone. If no ringing tone is heard at the drop, the ringback generator on the Controller card may be faulty. Replace the Controller card using the procedure given in the Maintenance section.

12.15 Access Bank II - SNMP Shuts Down for No Apparent Reason

Internal thermal protectors automatically shut down Access Bank II - SNMP operation if the operating temperature rises above 140° F (60° C). To correct this problem:

Verify that the Access Bank II - SNMP is properly ventilated to allow for heat dissipation, and reduce the ambient temperature if necessary. The Access Bank II - SNMP resets automatically when the temperature is reduced below 104° F (40 C).

Chapter 13

Maintenance

Contents of This Chapter:

About This Chapter	1
Replacing a Voice Card	2
Replacing the Controller Card	3

13.1 About This Chapter

This chapter provides procedures for maintaining the Access Bank II - SNMP, including:

- “Hot swapping” individual voice cards
- Replacing the Controller card

All Access Bank II - SNMP circuits are contained on one internal Controller card and two 12-channel voice card(s). The voice cards can be “hot swapped” with the power on, if necessary. However, power must be disconnected before replacing the Controller card.

Procedures for replacing the card assemblies are given on the pages that follow.



Caution: Use proper electrostatic discharge (ESD) procedures when removing and handling the Access Bank II - SNMP Controller and FXS and FXO voice cards.

13.2 Replacing a Voice Card

To replace a voice card while the Access Bank II - SNMP is *hot*, refer to Figure 13-1, then follow these steps:

1. Release the two thumb screws on the back plate of the Access Bank II - SNMP and remove the plate.
2. On the voice card you wish to remove, lift the card ejector latches to release the card from its internal connector.
3. Carefully slide the card out of the back of the Access Bank II - SNMP.
4. Check the channel attenuation loss and gain option settings on the replacement voice card and verify they are set correctly for your intended application. If necessary, reset the channel attenuation option settings.
5. Ensure that the replacement voice card is positioned correctly in the guide rails, then carefully slide the card into the slot.
6. Press the card ejector latches in towards the card until the 64-pin DIN connector on the card mates with a matching connector on the Controller card.
7. Replace the back plate and tighten the thumbscrews.



Caution: “Hot swapping” an FXS card will cause all 24 channels to go through Trunk Processing for 16 seconds. All calls will be disconnected and must be dialed again after the Access Bank II - SNMP returns to its normal operating state.

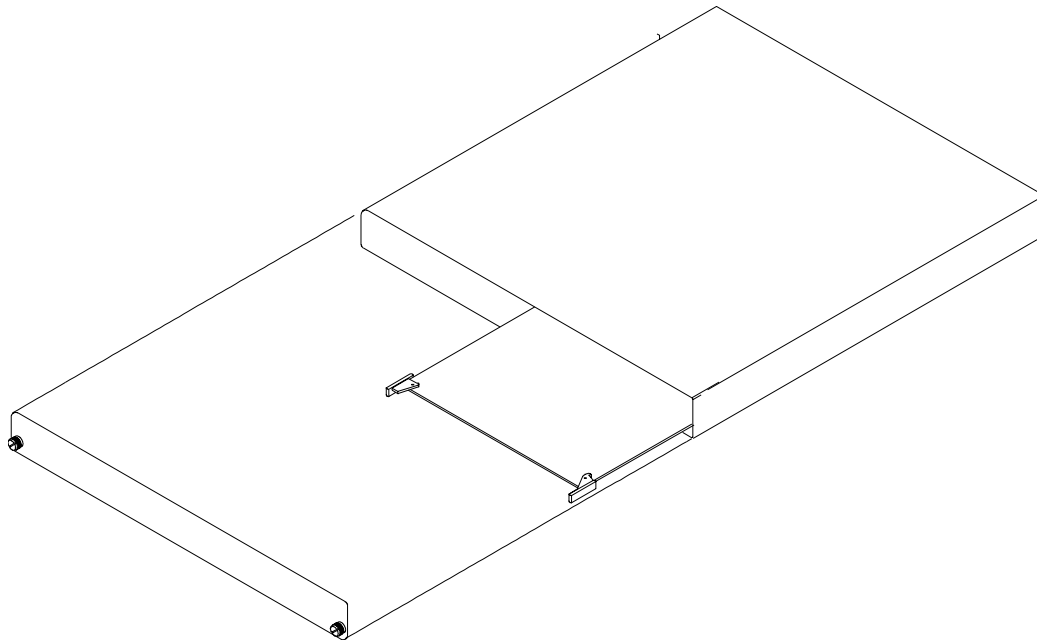


Figure 13-1: Accessing the Voice Cards

13.3 Replacing the Controller Card

To replace the Access Bank II - SNMP Controller card, follow these steps:

1. Power down the Access Bank II - SNMP.
2. Disconnect power and interface cables
3. Refer to Figure 13-2 to locate the back plate of the Access Bank II - SNMP that identifies the voice channels and any corresponding test switches. Loosen the two thumb screws and remove the back plate.
4. Remove the chassis tray using the procedure outlined in Figure 13-2.



Warning: While sliding out the chassis tray, ensure that the components on the circuit cards clear the Access Bank II - SNMP chassis without damage.

5. Remove the voice cards by lifting the card ejector latches and sliding the cards out of the back of the chassis housing.
6. Remove the five screws fastening down the Controller card (see Figure 13-3) and remove the

card.

7. Insert the new Controller card and secure it with the five screws removed in Step 7.
8. Insert the voice card(s) and slide the chassis tray back into place.
9. Replace the back plate and tighten the two thumbscrews.
10. Tighten the thumbscrews on the front Control Panel, then reattach the power and interface cables.
11. Apply power to the Access Bank II - SNMP.

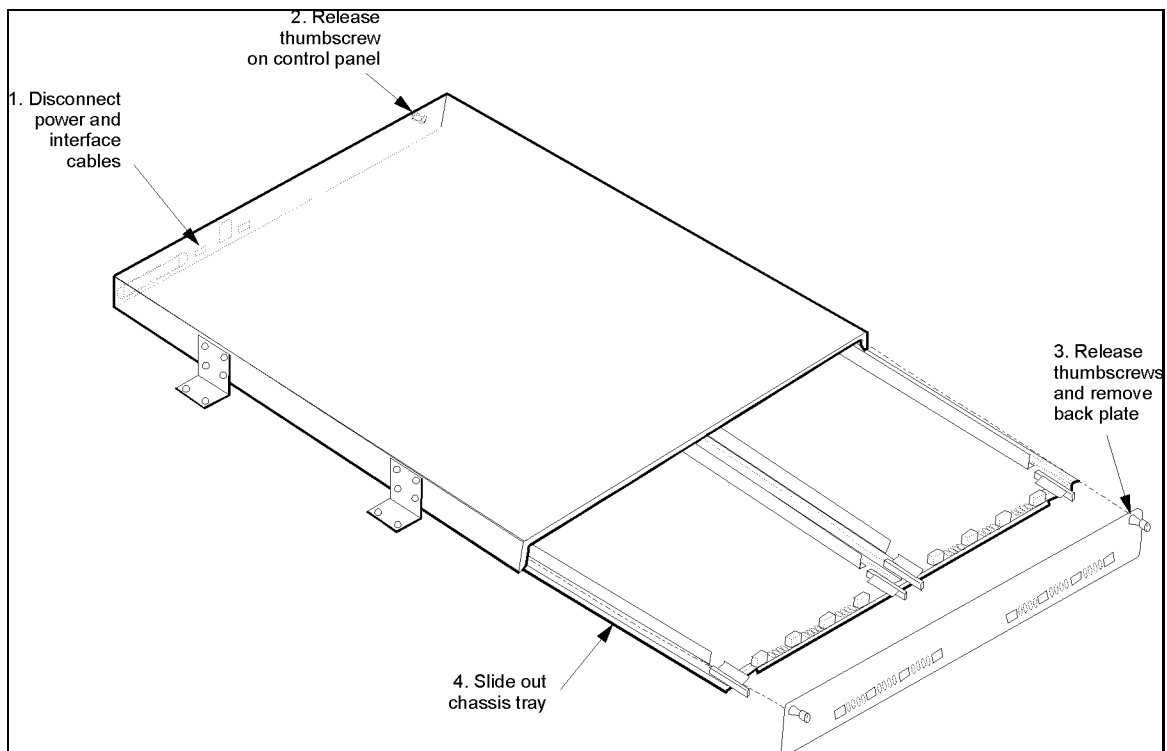


Figure 13-2: Removing the Chassis Tray

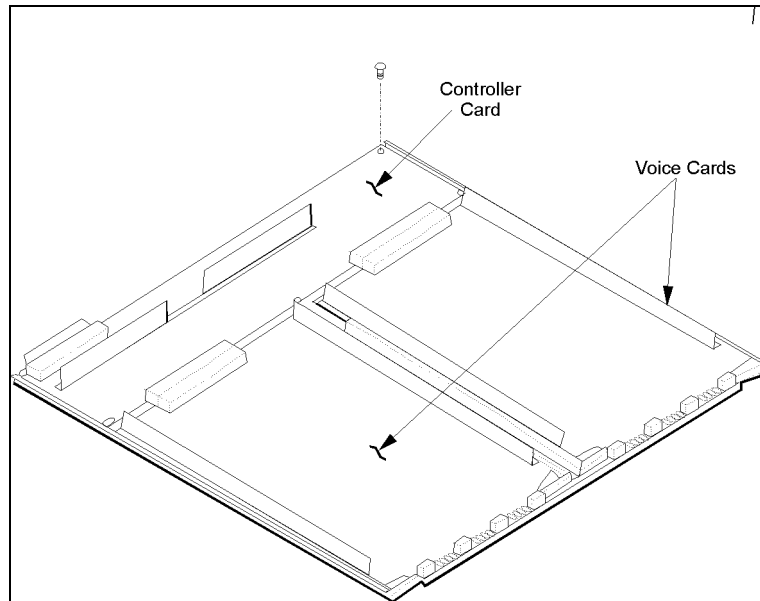


Figure 13-3: Replacing the Controller Card

Chapter 14

SNMP Management & Command Line Interface

Contents of This Chapter:

About This Chapter	1
Local/Remote Mode Selection	1
SNMP Management	2
Command Line Interface (CLI)	7
Context Sensitive Help	9
Configuration Commands	19
Status Commands	29

14.1 About This Chapter

This chapter provides a general introduction to Carrier Access Corporation's Access Bank II SNMP and includes summaries of its:

- Simple Network Management Protocol (SNMP) Management
- Command Line Interface (CLI) Management

14.2 Local/Remote Mode Selection

The Access Bank II SNMP comes equipped with two sets of external DIP switches for selecting local or remote control. The DIP switches must be set to the remote software control mode in order to use SNMP, CLI, or GUI management terminals.

In the local hardware control mode, you can use these DIP switches to perform self-tests for channel alignment, to select basic T1 hardware configuration parameters (AMI/B8ZS, D4/ESF), and to enable detection of standard D4/ESF inband loop codes by the integral CSUs.

14.3 SNMP Management

The Access Bank II SNMP provides:

- Built-in SNMPv2 Agent software providing network statistics, information retrieval and update, trap thresholds, and automatic transmission of trap data to Network Management Stations.
- Application Support for Simple Network Management Protocol (SNMP) and Telnet, per RFC 1902 through 1907. Management Information Base (MIB), per RFC 1573.
- Transport Support for Transport Control Protocol (TCP) and User Datagram Protocol (UDP), per RFC 1213.
- Internet Support for Internet Protocol (IP) version 4, Internet Control Message Protocol (ICMP), Address Resolution Protocol (ARP), and Reverse ARP (RARP), per RFC 1213.
- Managed Object Support for T1 interfaces, per RFC 1406. Serial RS-232 and V.35 interfaces for SNMPv2, per RFC 1659.

14.3.1 Local and Remote SNMP Management

The Access Bank II SNMP provides SNMP management through its Ethernet 10Base-T port. Remote SNMP management is possible over either of the T1 lines within a V.35 user data segment, as shown in Figure 14-1.

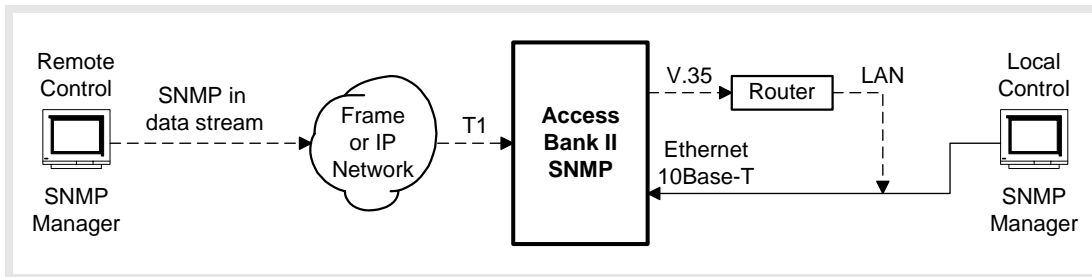


Figure 14-1: Local and Remote SNMP Management

14.3.2 SNMP Overview

SNMP is a complete, but simple, mechanism for network management. It works by exchanging information between a *Manager* and an *Agent*. In this case, the *Agent* is inside the Access Bank II/SNMP. The *Manager* is a Network Management Station (NMS), which is a computer with SNMP management software such as HP OpenView® or Sun NetManager®.

The *Agent* stores the information in a Management Information Base (MIB), which contains items such as the current status of the network interface, performance statistics, and alarms.

In general, SNMP is not concerned with controlling every feature of the many different network objects. However, SNMP is flexible enough that it can support a wide variety of *private enterprise*

objects with predefined MIB data structures. The Access Bank II/SNMP uses the Bellcore® standard MIB for T1 interfaces.

Manager operations include simple “get” and “set” commands to retrieve and update MIB data in the Agent. Normally, the Manager polls the Agent periodically to check traffic statistics. However, the Manager can also set thresholds for traps. Traps specify network events and conditions for which the Agent automatically sends a Telnet alarm message with trap data back to the Manager.

The Access Bank II SNMP Agent’s principle benefits are the proactive management of V.35 and DSX-1 alarms, performance statistics, and line tests.

14.3.3 Protocols

The Manager and Agent are software applications. They communicate with each other through several protocol layers (Figure 14-2) that are normally transparent to the user. The Access Bank II/SNMP uses Ethernet as the physical link between the Manager and Agent. The Ethernet data can, in turn, be carried over either of the T1 lines within a V.35 user data segment.

SNMP is an application-level protocol intended to work with the User Datagram Protocol (UDP) and Internet Protocol (IP) suite, which includes BootP, Internet Control Message Protocol (ICMP), Address Resolution Protocol (ARP), and Reverse ARP (RARP). The advantage of UDP is that each message is independent; no network connections are maintained between the Manager and Agent.

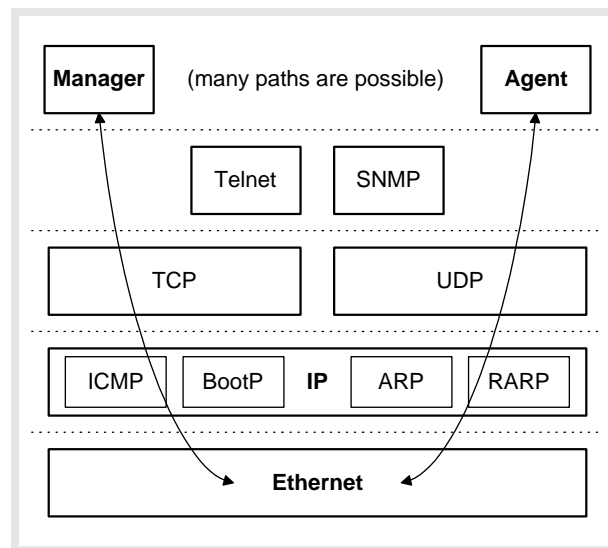


Figure 14-2: Protocol Hierarchy Used In Access Bank II SNMP

14.3.4 Management Information Bases

The SNMP agent on Access Bank II SNMP supports the following standard MIB object groups:

Table 14-1: Supported Management Information Bases

MIB RFC	Description
RFC1213	Management Information Base for Network Management of TCP/IP-based: Internet MIB-II
RFC1406	Definitions of Managed Objects for the DS1 and E1 Interface Types
RFC1573	Evolution of the Interfaces Group of MIB-II
RFC1659	Definitions of Managed Objects for RS-232-like Hardware Devices using SNMPv2
RFC 1902-1907	Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)

14.3.5 Commands

The Access Bank II SNMP supports commands for the following operations described in RFC 1902 through 1907.

- GetBulkRequest
- GetNextRequest
- GetRequest
- Inform
- Report
- Response
- SNMPv2-Trap
- SetRequest

14.3.6 Statistics

The Access Bank II SNMP agent maintains statistics for the following network interface and TCP/IP protocols:

- Ethernet Media Access Control (MAC)
- Address Resolution Protocol (ARP) for 10 entries
- Internet Control Message Protocol (ICMP)
- Internet Protocol (IP)
- User Datagram Protocol (UDP)
- Simple Network Management Protocol (SNMP)

- T1 interface statistics, per RFC 1406

14.3.7 Traps

The Access Bank II SNMP agent supports the following standard SNMPv2 defined traps. In the future, enterprise specific traps will be added. Interpretations of the trap values are:

coldStart Trap

A coldStart(0) trap signifies that the sending protocol entity is reinitializing itself such that the agent's configuration or the protocol entity implementation may be altered.

warmStart Trap

A warmStart(1) trap signifies that the sending protocol entity is reinitializing itself such that neither the agent configuration nor the protocol entity implementation is altered.

linkDown Trap

A linkDown(2) trap signifies that the sending protocol entity recognizes a failure in one of the communication links represented in the agent's configuration. The Trap-PDU of type linkDown contains as the first element of its variable-bindings, the name and value of the ifIndex instance for the affected interface.

linkUp Trap

A linkUp(3) trap signifies that the sending protocol entity recognizes that one of the communication links represented in the agent's configuration has come up. The Trap-PDU of type linkUp contains as the first element of its variable-bindings, the name and value of the ifIndex instance for the affected interface.

authenticationFailure Trap

An authenticationFailure(4) trap signifies that the sending protocol entity is the addressee of a protocol message that is not properly authenticated. While implementations of the SNMP must be capable of generating this trap, they must also be capable of suppressing the emission of such traps via an implementation-specific mechanism.

egpNeighborLoss Trap

not supported

enterpriseSpecific Trap

A enterpriseSpecific(6) trap signifies that the sending protocol entity recognizes that some enterprise-specific event has occurred. The specific-trap field identifies the particular trap, which occurred. (to be implemented in the future)

14.3.8 Maintenance

The Access Bank II SNMP provides maintenance functions for the following SNMPv2 operations.

- Loopback operations: T1 remote line and payload. Loopback operations verify and segment operating network interface circuits.
- Fault isolation: BERT QRSS test patterns in conjunction with loopback operations.

The user may also employ standard Internet PING function tests to check the connectivity at the IP layer.

All features of the Access Bank II SNMP are manageable through the Command Line Interface (CLI) using a VT-100 terminal via the RS-232 port, or using a Telnet terminal session over the Ethernet port.

All product configurations specified in RFC1406 and RFC1659 are controllable through SNMP Network Management Stations, with the following exceptions: DSX-1 metallic loopback, bit error pattern generation and detection, and advanced redundancy options. In future software releases, it will be possible to add *private enterprise* objects that represent information specific to these Carrier Access Corporation product features.

14.4 Command Line Interface (CLI)

The Command Line Interface gives the user the most complete management capability. The Command Line Interface is accessible via the 10BaseT Ethernet connection using the Telnet protocol or via the RS-232 management port.

14.4.1 Local and Remote CLI Management

The Access Bank II SNMP provides CLI management through its RS-232 and Ethernet 10Base-T ports, as shown in Figure 14-3 and Figure 14-4.

For RS-232 CLI management, a cable is connected from the RS-232 port on the Access Bank II SNMP to a PC or laptop computer. You can use a VT-100 terminal emulation program such as Microsoft Hyper Terminal®. CLI can also be used from a remote site by connecting the RS-232 port to a modem and telephone line.

For Telnet CLI management, you can use a Telnet TCP/IP communications program to access CLI through the Ethernet management port. Remote Telnet CLI operation is available using Telnet over Ethernet or using inband T1 via the V.35 data port.

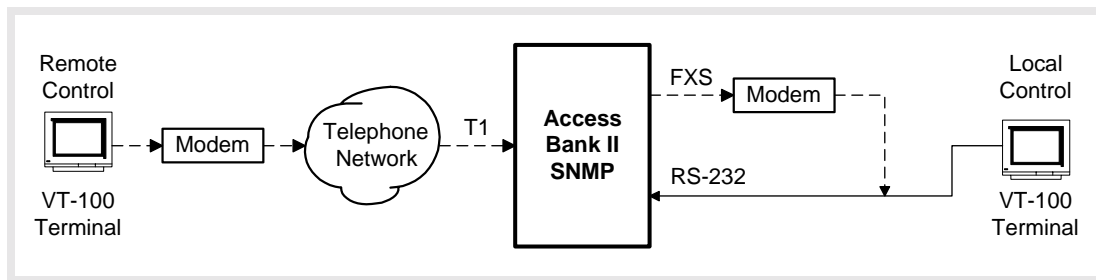


Figure 14-3: Local and Remote RS-232 CLI Management

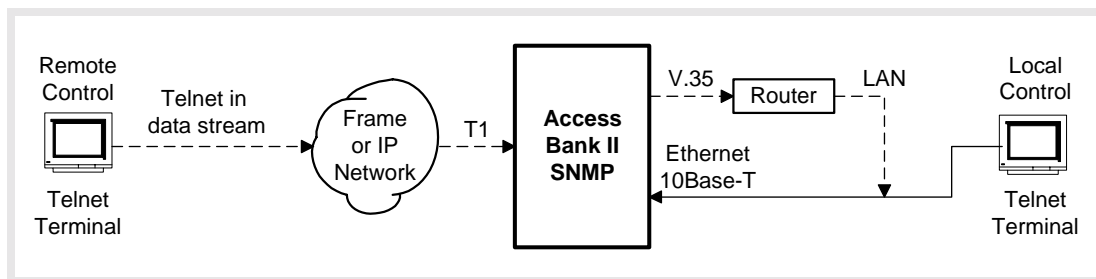


Figure 14-4: Local and Remote Telnet CLI Management

14.4.2 RS-232 CLI Operation

To use the Command Line Interface (CLI) with an RS-232 connection to a VT-100 terminal:

1. Connect the RS-232 cable to RS-232 management port of the Access Bank II - SNMP. The default settings are 9600,8,1,N.
2. From your PC, run a Microsoft Hyper Terminal® session and press carriage return.
3. The Access Bank II - SNMP should display the following:

```
Access Bank
Boot Version 1.00
Management Version 1.29 08:38:48 12/22/1997
```

```
password:
```

4. Log into the management session by typing default password **CAC**

```
password: xxx
```

```
Password accepted.
```

```

Slot          Card          Revision
-----
LIU           AB-II SNMP 1.02
FX#1         FXS12          3.03
FX#2         FXS12          3.03

Span          Name
-----
1) d1        "Long Distance Carrier"
2) d2        "ABI To Customer Equipment"
3) f1        "FXS To Customer Equipment"
4) f2        "Local Equipment Carrier"

```

Access Bank >

5. If there is no Password defined, then the following screen should be displayed.

```

Access Bank
Boot Version 1.00
Management Version 1.29 08:38:48 12/22/1997

```

Automatic Login to Access Bank :

```

Access Bank
Carrier Access Corporation Access Bank

```

```

Slot          Card          Revision
-----
LIU           AB-II SNMP 1.02
FX#1         FXS12          3.03
FX#2         FXS12          3.03

Span          Name
-----
1) d1        "Long Distance Carrier"
2) d2        "ABI To Customer Equipment"
3) f1        "FXS To Customer Equipment"
4) f2        "Local Equipment Carrier"

```

Access Bank >

14.4.3 Context Sensitive Help

The Command Line interface has a context sensitive help feature that tells the operator what the command options are, and what options are available. Typing a question mark (?) at the prompt provides a complete list of commands at the top level. Typing a question mark after a command name provides a list of the command options at the top level. Typing help at the prompt provides a complete list of

commands, including all levels of options for each command. Typing help after a command name provides a list of the command options at all levels.

1. Type ? at the prompt to list all of the commands, as shown below.

```
Commands .....Command Line Interface Help. For immediate
                    context sensitive help, type ? at any time.
                    For full command help, type "help" after
                    any partial command.
\ .....Enter \ to go to the top command level
aco .....Display/Set Alarm Cutoff
alarms .....Display/Set current alarms
aps .....Display/Set Automatic Protection Switching
boot .....(Re)Boot the system... all connections
                    will be dropped during initialization
clk .....Display/Set T1 Clock
config .....Set/Restore Configuration
connections .....Display Connections
craft .....Display/Set Craft Port
date .....Display/Set Date: date mm/dd/yyyy
dni .....Display/Set DNI (DS1 to DS1) properties
dialout .....Display/Set dialout alarm enables
ds1 [n|all] .....Display/Set DS1 n=1..2 or all DS1s
equipment .....Display the Equipment List
event .....Display the next 18 events
exit .....Exit Command Line Interface
ip .....Display/Set IP Parameters
kill .....Kill Connection Assignments
log .....Display/Set log enables
loop .....Display/Set Loopback State
mac .....Display 6 byte MAC addr in Hex
make .....Display/Make Connection Assignments
name .....Display/Set Name Configuration
password .....Change password
ping ipaddr [n] [d] Send IP Ping to ipaddr up to n times
                    with d ms delay between pings
rs232 .....Display/Set Optional Data RS-232 Port
screen height [width]Display/Set CRT screen size
snmp .....Display/Set SNMP System Group Settings
statistics .....Display Statistics
status .....Display Status of Interface(s)
telnet .....Set Telnet Session Configuration
time .....Display/Set Time: time hr:mm:ss
trap .....Send Warm Start Trap to SNMP
v35 .....Display/Set V.35
verbose .....Display/Set Command Fill Verbose Mode
version .....Display Version Numbers in System
```

-
2. Type help at the prompt to list all of the commands and options, as shown below.

```
Commands ..... CommandLineInterfaceHelp.Forimmediate
                    context sensitive help, type ? at any
                    time.
                    Forfullcommandhelp,type "help" after
                    any partial command.
\ ..... Enter \ to go to the top command level
aco ..... Display/Set Alarm Cutoff
  off ..... Disable alarm
  on ..... Enable alarm
alarms ..... Display/Set current alarms
  all on|off ..... Set all alarms
  sys ..... Display/Set system alarms
    power on|off .. Hard reset or power on detected
    brownout on|off .. Brown out detected
    reset on|off .. Soft reset detected
vn ..... Display/Set alarms for V.35 #n
  rts on|off .. Loss of V.35 RTS
  llb on|off .. Local Loop Back detected
  v54 on|off .. Remote V.54 Loop Back detected
dn ..... Display/Set alarms for dsl #n
  carrier on|off .. Loss of carrier detected
  csuloop on|off .. CSU loop code received
  unframed on|off .. Unframed, all 1's received
  sync on|off .. Loss of sync
  yellow on|off .. Yellow alarm received
  bpv on|off .. BPVs exceed 1544 in 15 min period
  ses on|off .. SES exceed 10 in 15 min period
  unavail on|off .. Unavailable seconds in 15 min period
  fdlline on|off .. FDL line loop request received
  fdlpay on|off .. FDL payload loop request received
aps ..... Display/Set Automatic Protection Switching
  off ..... Disable APS mode
  primary dn ..... Set either d1 or d2 as primary span
  threshold n ..... Set BPV switch threshold to 10^-n, 4<=n<=6
boot ..... (Re)Boot the system... all connections
                    will be dropped during initialization
clk ..... Display/Set T1 Clock
  primary ..... Set T1 Primary Clock Source
    t11 ..... Set Clock Source to T1 #1
    t12 ..... Set Clock Source to T1 #2
  internal ..... Set Clock Source to internal
  secondary ..... Set T1 Secondary Clock Source
```

```

t11.....Set Clock Source to T1 #1
t12.....Set Clock Source to T1 #2
internal.....Set Clock Source to internal
config .....Set/Restore Configuration
code ipaddr "path" .Loadappcode "path" from TFTP server;
                    Specify the ipaddr and the path including
                    filename; System will reboot new code
download .....(Diagnostic) Download current configura-
                    tion
factory .....Initialize and Download Factory Defaults
from [ipaddr "path"]Loadconfiguration FROM XModem or TFTP
                    server; XModem is reliable for 19200 baud
                    or less; For the TFTP server, specify the
                    ipaddr and the path including filename
restore .....Restore/download last saved configuration
save .....Save current configuration
to .....Send configuration TO XModem server
                    XModem is reliable for 19200 baud or less
connections .....Display Connections
clear .....Display Clear Channel Connections
dynamic .....Display Dynamic Connections
voice .....Display Voice Channel Connections
craft .....Display/Set Craft Port
baud .....Set Baud Rate
    b1200.....1200 baud
    b2400.....2400 baud
    b4800.....4800 baud
    b9600.....9600 baud
    b19200.....19200 baud
    b38400.....38400 baud
    b57600.....57600 baud
data .....Set Data Size
    bit7.....7 bit data
    bit8.....8 bit data
dial "string" .....Set Modem Dialout String
hangup "string" .....Set Modem Hang Up String
init "string" .....Set Modem Initialization String
parity .....Set Parity
    even.....Even Parity
    none.....No Parity
    odd.....Odd Parity
stop .....Set Stop Bits
    bit1.....One Stop Bit
    bit2.....Two Stop Bits
date .....Display/Set Date: date mm/dd/yyyy
dni .....Display/Set DNI (DS1 to DS1) properties
signal .....Display DNI Signal Type
    s:c [n] opt.....Set Signal Type for [n] channels from s:c

```

```

0: FXS Loop or Ground Start
1: FXS Ground Start
2: FXS Loop Start
3: FXO Loop or Ground Start
4: FXO Ground Start
5: FXO Loop Start
6: E&M Immediate Start
7: E&M Wink Start
8: E&M Wink Start ANI/DNIS
9: E&M DPT
type ..... Display DNI Channel Type
  s:c [n] opt ..... Set Channel Type for [n] channels from s:c
                        clear -- for data or bypass
                        voice -- for voice signaling
dialout ..... Display/Set dialout alarm enables
  all on|off ..... Set all alarm enables
  pager ..... Display/Set pager device strings
    "" "" ..... Disable pager device
    "phone" "msg" .... Dial phone and msg (blanks ignored)
  printer ..... Display/Set printer device strings
    "" "" ..... Disable printer device
    "phone" "notify" . Dial phone, report for "notify"
    "DIRECT" "notify" Direct connect report for "notify"
  sys ..... Display/Set system alarms
    power  on|off .. Hard reset or power on detected
    brownout on|off .. Brown out detected
    reset  on|off .. Soft reset detected
  vn ..... Display/Set alarm enables for V.35 #n
    rts    on|off .. Loss of V.35 RTS
    llb    on|off .. Local Loop Back detected
    v54    on|off .. Remote V.54 Loop Back detected
  dn ..... Display/Set alarm enables for ds1 #n
    carrier on|off .... Loss of carrier detected
    csuloop on|off .... CSU loop code received
    unframed on|off .... Unframed, all 1's received
    sync    on|off .... Loss of sync
    yellow  on|off .... Yellow alarm received
    bpv     on|off .... BPVs exceed 1544 in 15 min period
    ses     on|off .... SES exceed 10 in 15 min period
    unavail on|off .... Unavailable seconds in 15 min period
    fdlline on|off .... FDL line loop request received
    fdlpay  on|off .... FDL payload loop request received
  ds1 [n|all] ..... Display/Set DS1 n=1..2 or all DS1s
    circuitid "id" ..... DS1 Circuit ID
    csu ..... Set DS1 CSU
      off ..... Do not respond to CSU code
      on  ..... Respond to CSU code
    lbo ..... Set DS1 Line Build Out

```

```

dsx0|csu0.....DSX ( 0'-132') or CSU 0.0 db
dsx133.....DSX (133'-265')
dsx266.....DSX (266'-398')
dsx399.....DSX (399'-532')
dsx533.....DSX (440'-550')
csu7.....CSU 7.5 db
csu15.....CSU 15.0 db
csu22.....CSU 22.5 db
linetype .....Set DS1 Line Type
  esf.....ESF Line Type
  d4.....D4 Line Type
linecode .....Set DS1 Coding Type
  ami.....AMI Line Coding
  b8zs.....B8ZS Line Coding
prm .....Set DS1 Performance Monitor Message Type
  ansi.....ANSI T1.403 ESF PRM
  att.....AT&T 54016 ESF PRM
send .....Send Test Data on Port
  clear.....Clear Test Data Statistics
  error.....Inject Single Error on Port
  off.....Stop Send for Normal Operations
  loopdown.....Send In-Band Remote Loop Down
  loopup.....Send In-Band Remote Loop Up
  statistics.....Display Send Statistics
  network.....Send Pattern Toward Network
    [p] [r].....p - optional pattern
      alt - alternating 1/0
      d4up - D4 loopup: 00001
      d4dn - D4 loopdown: 001
      ones - all ones
      plin8 - 00000001
      p511 - 0.153
      p2047 - 0.152
      p2to15 - 0.151
      p2to20 - QRSS w/o bit stuffing
      p2to23 - 0.151
      qrss - QRSS pattern (default)
      zeros - all zeros
    r - optional error rate
      0 - disable errors (default)
      r=1-7 - error rate of 10^-r
  QRSS to net.....ds1 d1 send network > ds1 d1 send network
    QRSS
  p511 to net.....ds1 d2 send network p511 4
equipment .....Send Tones to Equipment connected to ds1
[o].....Equipment Send Usage:
  o - Option for FX PCM
  off - turn off test tones

```

```

ring      - ringback to fx chans (def)
tone     - 1KHz tone to fx chans
ringback to fx ... > ds1 d1 send equipment
..... > ds1 d1 send equipment ring
tone to fx ..... > ds1 d2 send equipment tone
equipment ..... Display the Equipment List
event ..... Display the next 18 events
all ..... Display the entire Event Log
clear ..... Clear the Event Log
first ..... Display the first 18 events
exit ..... Exit Command Line Interface
ip ..... Display/Set IP Parameters
addr ipaddr ..... Set IP Addr ddd.ddd.ddd.ddd
dhcp on|off ..... Set DHCP Enable
gateway ipaddr ..... Set Gateway Addr ddd.ddd.ddd.ddd
get "string" ..... Set Get Community String
mask ipaddr ..... Set Subnet Mask ddd.ddd.ddd.ddd
nms1 ipaddr ..... Set NMS1 Trap Addr ddd.ddd.ddd.ddd
nms2 ipaddr ..... Set NMS2 Trap Addr ddd.ddd.ddd.ddd
nms3 ipaddr ..... Set NMS3 Trap Addr ddd.ddd.ddd.ddd
set "string" ..... Set Set Community String
trap "string" ..... Set Trap Community String
kill ..... Kill Connection Assignments
s:c|vm|r1 [n] [i] .. All Span Connection Definitions:
s      - span name: T1 = d1,d2...and FX = f1,f2...
c      - channel number: 1...
n      - number of channels to kill, default 1 for a single
        channel
i      - channel increment, default 1,
        2 means every other channel, etc.
vm     - V.35 span, m = 1...
r1     - User Data RS-232 span
s:c    - half cnct, T1 or FX channel
All connections .... > kill all
FX0 on f2 ..... > kill f2
Second half T1#1 ... > kill d1:13 12
All V.35#1 ..... > kill v1
log ..... Display/Set log enables
all on|off ..... Set all log enables
sys ..... Display/Set system log enables
power  on|off .. Hard reset or power on detected
brownout on|off .. Brown out detected
reset  on|off .. Soft reset detected
vn ..... Display/Set log enables for V.35 #n
rts    on|off  . Loss of V.35 RTS
llb    on|off  . Local Loop Back detected
v54    on|off  . Remote V.54 Loop Back detected
dn ..... Display/Set log enables for ds1 #n

```

```

carrier on|off ..Loss of carrier detected
csuloop on|off ..CSU loop code received
unframed on|off ..Unframed, all 1's received
sync on|off ..Loss of sync
yellow on|off ..Yellow alarm received
bpv on|off ..BPVs exceed 1544 in 15 min period
ses on|off ..SES exceed 10 in 15 min period
unavail on|off ..Unavailable seconds in 15 min period
fdlline on|off ..FDL line loop request received
fdlpay on|off ..FDL payload loop request received
loop .....Display/Set Loopback State
none .....Disable any Current Loopback
a d t .....General Loopback Usage:
    a - Access Port:
        vn - for V.35 port #n
        dn - for DS1 port #n
    d - Direction of Loopback:
        equipment - towards customer equip
        network - towards network
    t - Type of Loopback:
        line - line loopback
        payload - payload loopback
D1 toward Net .....> loop d1 network line
.....> loop d1 network payload
V1 toward Router ..> loop v1 equipment line
.....> loop v1 equipment payload
mac .....Display 6 byte MAC addr in Hex
make .....Display/Make Connection Assignments
s:c|vm|r1 s:c [n] [i]Connection Definitions:
    s - span name: d1,d2...,f1,f2,...
    c - channel number: 1...
    n - number of channels to connect,
        default 1 for a single channel
    i - channel increment, default 1,
        2 means every other channel, etc.
    vm - V.35 span, m = 1...
    r1 - User Data RS-232 span
    s:c - half cnct, T1 or FX channel
D1 to FX1 .....> make d1:1 f1:1 12
V.35 to D1 .....> make v1 d1:23 2
name .....Display/Set Name Configuration
circuitid s "id" ...Display/Set Circuit ID for span s:
    d1, d2, f1, f2, v1, etc
session "prompt" ...Display/Set Session Prompt Name
system "name" .....Display/Set System Name
password .....Change password
ping ipaddr [n] [d] ..Send IP Ping to ipaddr up to n times
    with d ms delay between pings

```

```

rs232 ..... Display/Set Optional Data RS-232 Port
  baud ..... Set Async Subrate Baud Rate
    b9600 ..... 9600 baud
    b19200 ..... 19200 baud
    b38400 ..... 38400 baud
    b57600 ..... 57600 baud
  data ..... Set Async Subrate Data Size
    bit7 ..... 7 bit data
    bit8 ..... 8 bit data
  parity ..... Set Parity
    even ..... Even Async Subrate Parity
    none ..... No Parity
    odd ..... Odd Parity
  speed ..... Set Synch Speed
    k56 ..... 56Kpbs
    k64 ..... 64Kpbs
  stop ..... Set Async Subrate Stop Bits
    bit1 ..... One Stop Bit
    bit2 ..... Two Stop Bits
  type ..... Set User RS-232 Port Type
    subrate ..... Asynchronous Subrate
    sync ..... Synchronous
screen height [width] Display/Set CRT screen size
snmp ..... Display/Set SNMP System Group Settings
  contact "name" ..... Set Contact Name
  location "name" ..... Set System Location Name
  name "name" ..... Set System Name
  off ..... Set SNMP Get/Set Communities private
  on ..... Set SNMP Get/Set Communities public
statistics ..... Display Statistics
  ds1 ..... Display ds1 Performance Statistics
    [n|all] [ ..... n - span number or name, e.g. d1
      t ..... t - time interval, default 15 minute
        min15 = 15 minute intervals
        min30 = 30 minute intervals
        hour = 1 hour intervals
        hour2 = 2 hour intervals
        hour4 = 4 hour intervals
        hour8 = 8 hour intervals
        hour12 = 12 hour intervals
        day = 1 day interval
    current ..... Display ds1 Current Statistics
    totals ..... Display ds1 Total Statistics
status ..... Display Status of Interface(s)
  dip ..... Dip Switches
  ethernet ..... Ethernet Interface
  fx ..... FX Channel Status
  icmp ..... ICMP Interface

```

```

interface .....IP Interface
leds .....Leds on unit
signal .....FX Signal Type by Channel
snmp .....SNMP Interface
tcp .....TCP Interface
udp .....UDP Interface
xmodem .....XMODEM Interface
telnet .....Set Telnet Session Configuration
echo .....Echo Telnet output on serial line
  off.....Disable echo
  on.....Enable echo
time .....Display/Set Time: time hr:mm:ss
trap .....Send Warm Start Trap to SNMP
  n up|down .....Send Link Up or Link Down for I/F #n
v35 .....Display/Set V.35
  circuitid .....V.35 Circuit ID
  clkinv .....Clock Inversion
    none.....No Clocks Inverted
    rx .....Receive Clock Inverted
    rxtx.....Both Clocks Inverted
    tx.....Transmit Clock Inverted
  cts .....CTS Signal Control
    cd.....CTS Follows CD Signal
    high.....CTS Always High
    low.....CTS Always Low
    rts.....CTS Follows RTS Signal
  datainv .....Data Inversion
  invert .....Data Inverted
    none.....Data Not Inverted
  rxclk .....Receive Clock Source
    internal .....Internal Clock (same as TX)
    external .....External Clock
  send .....Send Test Data on Port
    clear .....Clear Test Data Statistics
    error .....Inject Single Error on Port
    off .....Stop Send for Normal Operations
    loopdown .....Send In-Band Remote Loop Down
    loopup .....Send In-Band Remote Loop Up
    statistics .....Display Send Statistics
    network .....Send Pattern to Network
      [p] [r] .....p - optional pattern
        alt      - alternating 1/0
        d4up     - D4 loopup: 00001
        d4dn     - D4 loopdown: 001
        ones     - all ones
        plin8    - 00000001
        p511    - 0.153
        p2047   - 0.152
  
```

```

        p2to15    - 0.151
        p2to20    - QRSS w/o bit stuffing
        p2to23    - 0.151
        qrss      - QRSS pattern (default)
        zeros     - all zeros
    r - optional error rate
        0         - disable errors (default)
        r=1-7     - error rate of 10^-r
QRSS to net ..... v35 v1 send network
> v35 v1 send network qrss
equipment ..... Send Pattern to Equipment
  [p] [r] ..... p - optional pattern
                    alt         - alternating 1/0
                    d4up       - D4 loopup: 00001
                    d4dn       - D4 loopdown: 001
                    ones       - all ones
                    plin8      - 00000001
                    p511       - 0.153
                    p2047      - 0.152
                    p2to15     - 0.151
                    p2to20     - QRSS w/o bit stuffing
                    p2to23     - 0.151
                    qrss       - QRSS pattern (default)
                    zeros      - all zeros
    r - optional error rate
        0         - disable errors (default)
        r=1-7     - error rate of 10^-r
  p511 to router ..> v35 v1 send equipment p511
speed ..... Single Channel Speed
  nx56 ..... 56Kb per Channel with 7 Bit Data
  nx64 ..... 64Kb per Channel with 8 Bit Data
dsu ..... DSU V.54 Remote Loopback Protocol
  off ..... Do not respond to in-band V.54 signals
  on ..... Respond to V.54 in-band signals (default)
verbose ..... Display/Set Command Fill Verbose Mode
  off ..... Disable command fill suggestions
  on ..... Enable command fill suggestions (def)
version ..... Display Version Numbers in System

```

14.4.4 Configuration Commands

14.4.4.1 **aco**

Use the **aco** command to display, or turn on and off, the Alarm Cutoff feature.

Operations	Type	Comments
To turn the Alarm Cutoff on	aco on	
To turn the Alarm Cutoff off	aco off	
To display the status of the Alarm Cutoff	aco	

14.4.4.2 alarms

Use the **alarms** command to turn on and off, the Access Bank alarms.

Operations	Type	Comments
To set all alarms on	alarms all on	
To set all alarms off	alarms all off	
To set a specific alarm on or off	alarm [sys vn dn][alarm]on off	To see all options for alarms, type alarm help
To display alarms	alarms	

14.4.4.3 aps

Use the **aps** command to set or display the status of the Automatic Protection Switching.

Operations	Type	Comments
To set either d1 or d2 as the primary span	aps primary dn	
To set BPV switch threshold to 10 ⁿ , 4 ≤ n ≤ 6	aps threshold n	
To display APS status	aps	

14.4.4.4 boot

Use the **boot** command to reboot the system. All calls and connections are dropped during the reboot.

There are no options for this command. To initiate a reboot, type `boot` and press return.

14.4.4.5 *clk*

Use the **clk** command to set the system clock sources. The Access Bank II - SNMP allows the user to configure a primary and secondary clock source.

Operations	Type	Comments
To set primary clock source to T1 #1	clk primary T1 1	This sets the primary system to clock to be derived from T1 #1. For Access Bank II - SNMP applications, this should be the T1 that is being received from the Long Distance carrier.
To set secondary clock source to T1 #2	clk secondary T1 2	
To display Help	clk ?	

14.4.4.6 *config*

Use the **config** command to save/restore the connections configuration. The Access Bank II - SNMP allows the user to save one configuration in addition to the factory defaults in battery backed RAM.

Operations	Type	Comments
To restore factory configuration	config factory	Resets all configurations to the factory defaults.
To save current configuration	config save	Saves current configuration to battery backed RAM.
To display Help	config ?	

14.4.4.7 *connections*

Use the **connections** command to save or display the current connections between spans and groups. This command allows the user to display all static connections and group definitions being utilized by the system.

Operations	Type	Comments
To display all connections	connections	Displays all connections and group definitions.
To display bypass connections	connections bypass	Displays only bypass connections between spans. A Bypass connection is a nailed up configuration and doesn't utilize the switch state logic.

14.4.4.8 *craft*

Use the **craft** command to set and display all options of the craft port. This command allows the user to customize the craft (management) interface for communication parameters and for remote and dial-out access.

Operations	Type	Comments
To set the baud rate to 9.6	craft baud b9600	Sets the Baud rate to 9.6 KBps
To set bit data size 7 bit data	craft data bit7	Sets the data size to 7 bits
To set parity to even	craft parity even	Sets the parity to Even
To display Help	craft ?	

14.4.4.9 *date*

Use the **date** command to set date in the format shown: This date is used for time stamping alarms and events in the system.

Operations	Type	Comments
To configure the clock for the current date	date 10:13:97	

14.4.4.10dnl

Use the **dnl** command to set the DNI properties for voice channels.

Operations	Type	Comments
To set signal type for n channels from s:c	dnl s:c [n] opt	
To display signal type	dnl signal	
To set DNI channel type	dnl type s:c [n] opt	
To display DNI channel type	dnl type	

14.4.4.11dialout

Use the **dialout** command to set and display enabling for the dialout alarms.

Operations	Type	Comments
To set all dialout alarms enabled	dialout all on	To see all dialout alarm enabling options, type dialout help
To display dialout alarm enabling	dialout	

14.4.4.12 ds1

Use the **ds1** command to setup one or all the DS1 interfaces. The command specifies the interface number (1-2) and the setting to apply. The ds1 command followed by the interface number will display the current configuration.

Operations	Type	Comments
To display the current settings of ds1 1	ds1 1	Displays the current setting for T1 #1.
To display Help	ds1 ?	

14.4.4.13 event

Use the **event** command to display or clear the event log.

Operations	Type	Comments
To display the next 18 events	event	
To display the entire event log	event all	
To display the first 18 events	event first	
To clear the event log	event clear	

14.4.4.14 exit

Use the **exit** command to end the current management session.

Operations	Type	Comments
To end current session	exit	Ends current session

14.4.4.15 ip

Use the **ip** command to set and display the ip addresses for an SNMP management session This command is used to configure the system for SNMP and Telnet access.

Operations	Type	Comments
To configure the Access Bank SNMP parameters	ip addr 192.168.0.220	Configures the IP address
To verify configuration using the show command	ip	Displays all current IP related parameters.
To show Help	ip ?	

14.4.4.16 *kill*

Use the **kill** command to remove time slot connections. This command is used to kill static connections and group definitions.

Operations	Type	Comments
To remove a bypass connection on T1 #1	kill bypass d1:24	Kills the connection for slot 24 on T1 #1
To display command Help	kill ?	

14.4.4.17 *loop*

Use the **loop** command to display, disable and enable loopbacks.

Operations	Type	Comments
To set a line loopback towards the network on ds1 1	loop d1 network line	Puts T1 #1 in network line loopback.
To verify loopback status	loop	
To display Help	loop ?	

14.4.4.18 *mac*

Use the **mac** command to display the six-byte MAC address in hexadecimal.

14.4.4.19 *make*

Use the **make** command to configure static connections and group definitions.

Operations	Type	Comments
To make bypass for group v1 in ds1 #2 channels 1 and 2	make bypass v1 d2:1 2	Configures a v.35 data connection on channels 1 and 2 of T1 #2
To make group assignment for group b in fxs #2 channels 1 to 12	make group b f2:1 12	Configures voice card channels 1..12 to group B.
To display Help	make ?	

14.4.4.20 name

Use the **name** command to set or display names of circuit IDs, session prompt, and system name.

Operations	Type	Comments
To set circuit id for span s	name circuitid s "id"	d1, d2, f1, f2, v1, etc.
To set the session prompt to a required string	name prompt "prompt"	
To set the system name	name system "name"	

14.4.4.21 password

Use the **password** command to change the password.

Operations	Type	Comments
To change the password	password "password"	

14.4.4.22 ping

Use the **ping** command, to test whether or not the management node or other network devices are reachable on the network.

Operations	Type	Comments
To validate that a node on the network can be reach via the Access Bank II - SNMP	ping 192.127.20.10	Sends one Ping to the indicated ipaddr
To send IP ping 4 times with 50 ml delay between pings	ping 192.127.20.10 4 50	Sends 4 Pings to the indicated ipaddr with 50 ms delay between pings
To display Help	ping?	

14.4.4.23 rs232

Use the **rs232** command to configure the RS232 port. To see all the options for this command, type `rs232 help`.

14.4.4.24 screen height

Use the **screen height** command to set or display the current display parameters.

Operations	Type	Comments
To display current screen parameters	screen height	

14.4.4.25 snmp

Use the **snmp** command to configure the SNMP system group settings. To see all the options for this command, type `snmp help`.

14.4.4.26 telnet

Use the **telnet** command to configure the echo for the telnet session. The echo can be turned on and off.

14.4.4.27 time

Use the **time** command to set time in the format shown: The time is used to accurately time stamp

event and alarm logs.

Operations	Type	Comments
To configure the clock for the time	time 08:04:00	
To display date & time	date	

14.4.4.28 trap

Use the **trap** command to send a warm start trap to SNMP, or to send a link up or down trap to an interface.

Operations	Type	Comments
To send a warm start trap to SNMP	trap	
To send a link up trap to an interface	trap n up	n is the interface number (1 or 2)
To send a link down trap to an interface	trap n down	

14.4.4.29 snmp

Use the **snmp** command to set and display SNMP System Group settings for RFC-1213.

Operations	Type	Comments
To set the system contact string to your name	snmp contact "John Doe"	Sets system contact name to John Doe.
To set the location identifier	snmp location "CAC : 5395 Pearl Parkway, Boulder CO 80301"	Sets system locations
To set the node name identifier	snmp name "Access Bank "	
To display Help	snmp	

14.4.4.30 v35

Use the **v35** command to configure parameters for the V.35 data port to be accessed by the SNMP manager via RFC-1659.

Operations	Type	Comments
To set the circuit ID to "V.35 - 1"	v35 circuitid "V.35 - 1"	Sets the Circuit Id for the V.35 port
To set clock inversion to receive clock inverted	v35 clkinv rx	Sets the receive clock to be inverted.
To set CTS to follow RTS signal	v35 cts rts	Sets CTS to follow RTS signal
To set data inversion	v35datainv invert	Sets the V.35 data to be inverted.
To set receive clock source to be internal	v35 rxclk internal	Sets thte system to use the Internal Clock.
To set the speed to be nx56	v35 speed nx56	Sets the data raste to Nx56 KBps
To display Help	v35 ?	

14.4.5 Status Commands

14.4.5.1equipment

Use the **equipment** command to display the hardware equipment configuration within the Access Bank.

Operations	Type	Comments
To display the equipment list	equipment	Displays a list of the current installed hardware and Firmware revision levels.

14.4.5.2 log

Use the **log** command to display the current alarm history log.

Operations	Type	Comments
To display the alarm history log	log	Index Time Date Alarm
		1 00:03:06 01/01/96 Log in
		0 00:00:00 01/01/96 Power on

14.4.5.3 statistics

Use the **statistics** command to display ds1, channel and group performance.

Operations	Type	Comments
To display the ds1 1 performance	statistics ds1 1	Displays 15 minute interval statistics for DS1 #1
To display the channel utilization of stack 1, channel 2	statistics channel d1:2	Displays current state of channel 2 on T1 #1
To display the group utilization of group 2	statistics group 2	
To display Help	statistics ?	

14.4.5.4 status

Use the **status** command to display the status and performance data of the different interfaces supported by the Access Bank.

Operations	Type	Comments
To display the status of the interfaces	status all	Displays the status of all the interfaces
To display the status of the Ethernet Interface	status ethernet	Displays status and performance numbers for the ethernet Interface
To display the status of the IP interface	status interface	Displays the current performance and status for the IP layer of the Management protocol stack.
To display the status of the SNMP interface	status snmp	
To display Help	status ?	

GLOSSARY

10Base-T: 10Base-T is an IEEE standard for operating Ethernet local area networks (LANs) on twisted-pair cabling using the home run method of wiring (the same as the phone company uses) and a wiring hub that contains electronics performing similar functions to a central telephone switch. The full name for the standard is IEEE 802.3 10Base-T.

AIS (Alarm Indication Signal): Also known as a “Blue Alarm Signal” or “All Ones Keep Alive,” an AIS is an unframed all ones bit pattern sent by equipment at the far end to indicate that an alarm condition exists upstream in a circuit leading to the downstream equipment. Keep-alive signals are required by the network facilities to prevent oscillation of the line repeaters which causes interference (i.e. cross-talk and bleeding) within adjacent channels.

AMI (Alternate Mark Inversion): An AMI encoded signal is a bipolar pseudo-ternary signal conveying binary digits (bits) in which successive “marks” are normally of alternating, positive and negative, polarity. This is the traditional method of line encoding used with bipolar DS1 (T1) signals. However, use of AMI does not preclude long strings of zeros being sent in the signal entering the public network from the DTE in violation of the pulse density requirements mandated in Part 68 of the FCC Rules and/or AT&T Publication 62411.

ANI (Automatic Number Identification): ANI is a service available from the telephone company on certain links that identifies the phone number of the caller to an attached computer telephony system.

B8ZS(BINARY 8-ZERO SUBSTITUTION): This line coding scheme is one of the methods used to avoid long strings of zeros in a bipolar DS1 signal entering the network from the DTE. Every string of eight zeros is replaced by a special code (token) for transmission over networks that are sensitive to long strings of zeros. The code contains a pattern of bipolar violations that is identified by the recipient and then removed in the decoding process to recreate the original string of zeros. This particular method of line coding is the evolving standard, but one that is not yet fully supported by all carriers.

BIT ERROR RATE (BER): The ratio of bits received in error to total bits transmitted. The time over which this rate is calculated is not inherent to the definition of BER and, therefore, can be separately specified.

BERT (BIT ERROR RATE TESTER): A test instrument for performing Bit Error Rate testing on a T1 line. See BER.

BLUE ALARM SIGNAL: See AIS.

BPV (BIPOLAR VIOLATION): A violation of the T1 bipolar AMI transmission pattern in which succeeding “ones” (pluses) are sent at opposite polarities. A BPV normally indicates a transmission error. However, B8ZS patterns contain bipolar violations, which are not counted as errors.

CENTRAL OFFICE (CO): Telephone company facility where subscribers’ lines are joined to switching equipment for connecting other subscribers to each other, locally and long distance.

CHANNEL SERVICE UNIT: See DSU/CSU

CONNECTION: A connection is a logical linkage between timeslots on a span or between spans.

CROSSTALK: Crosstalk occurs when you can hear someone you did not call talking on your telephone line to another person you did not call. You may also only hear half the other conversation (i.e. just one person speaking). There are several technical causes for crosstalk relating to cable placement, shielding and transmission techniques.

CUSTOMER PREMISES EQUIPMENT (CPE): Items of telecommunications equipment, such as key systems, PBXs, answering machines, and CSU/DSUs, which reside on the customer's premises past the network interface.

CYCLICAL REDUNDANCY CHECK (CRC): A check sum indicator based on the remainder of a polynomial calculation performed on the transmitted data that is used to verify, with some fixed probability of correctness, whether that data was transmitted.

D4 SUPERFRAME (SF) FRAMING FORMAT: The most popular framing format in the T1 environment. Its name stems from the way framing is performed in the D-series of channel banks from AT&T. There are 12 separate 193-bit frames in a superframe. The D4 framing bit is used to identify both the channel and the signaling frame. In D4 framing, signaling for voice channels is carried inband by every channel along with the encoded voice. "Robbed bit signaling" is a technique used in D4 channel banks to convey signaling information. With this technique, the eighth bit (least significant bit) of each of the 24 8-bit timeslots is "robbed" every sixth frame to convey voice related signaling information (on-hook, off-hook, etc.) for each voice channel.

DATA SERVICE UNIT: See DSU/CSU

DATA TERMINAL EQUIPMENT: See DTE

DCE (DATA CIRCUIT-TERMINATING EQUIPMENT):

DIRECT INWARD DIALING (DID): The ability for a caller outside a company to call an internal extension without having to pass through an operator or attendant. In large PBX systems, the dialed digits are passed down the line from the Central Office (CO). The PBX then completes the call.

DIGITAL ACCESS & CROSS-CONNECT SYSTEM (DACS): A digital switch for routing and switching T1 lines (and individual DS0 channels within T1 lines), among multiple T1 ports. It performs all the functions of a normal switch, except connections are typically set up in advance of a call, not together with a call, as in most, low bandwidth voice-band and data communications systems. A DACS is basically a manual T1 switch. The Windows-based Remote Monitor software program can be used to implement DS-0 DACS functionality in the Access Bank II.

DIP (DUAL INLINE PACKAGE) SWITCH: A tiny switch attached to a printed circuit board with semi-permanent settings that usually requires a ball point pen or small screwdriver to change. There are only two settings - ON or OFF (1 or 0). In the case of the ABII, configurations set by the DIP switches can be modified later through the MS Windows Remote Monitor software installed on a PC.

DIRECT OUTWARD DIALING (DOD): The ability to dial directly from an extension without having to go through an operator or attendant. In PBX and hybrid phone systems, you dial 9, listen to a dial tone, and then dial the outside number you want to reach.

DNIS (DIRECTORY NUMBER IDENTIFICATION SERVICE): DNIS is a feature of 800 and 900 lines that provides the number of the caller dialed to reach the attached computer telephony system. Using DNIS capabilities, one trunk group can be used to serve multiple applications. The DNIS number can be provided in a number of ways, inband or out-of-band, ISDN or via a separate dedicated data channel.

DPO (DIAL PULSE ORIGINATION) CHANNEL UNIT

DPT (DIAL PULSE TERMINATING) CHANNEL UNIT

DROP & INSERT (D&I): As applied to T1, D&I refers to the process whereby one DS-0 channel is demultiplexed out of the DS-1 synchronous bit stream at one port of a digital channel bank and another DS-0 inserted back in. The Windows-based Remote Monitor software program can be used to perform D&I on individual channels between two T1 lines connected to the Access Bank II.

DSU/CSU (DATA SERVICE UNIT/CHANNEL SERVICE UNIT): A device terminating a digital channel on a customer's premises where it performs line coding, line conditioning and equalization functions while responding to the receipt of loopback codes sent from the Central Office (CO). A DSU/CSU sits between the digital line coming in from the CO and devices such as channel banks or data communications devices.

DSX (DIGITAL SYSTEM CROSS-CONNECT frame): A bay or panel to which T1 lines and DS1 circuit packs are wired that permits cross-connections by patch cords and plugs. A DSX panel is used in small office applications where only a few digital trunks are installed.

DTE (DATA TERMINAL EQUIPMENT): In the EIA/TIA 232E standard specification, the RS232 interface is connected between the DCE (Data Circuit-Terminating Equipment) and the DTE. The main difference between the DCE and the DTE is the pins two and three are reversed. The ABII uses an RS-232 port for management and asynchronous and synchronous data transmission.

DTMF (DUAL TONE MULTIFREQUENCY SIGNALING): A method of signaling in which a combination of two frequencies out of a possible eight are used to transmit numerical address information. The eight possible frequencies are 697 Hz, 770 Hz, 852 Hz, 941 Hz, 1209 Hz, 1336 Hz, 1477 Hz, and 1633 Hz.

E&M SIGNALING: A signaling arrangement that uses separate leads, called respectively the E lead and the M lead, for the signaling and voice signals. The M lead (derived from 'Mouth') transmits ground or battery to the distant end of the circuit, while incoming signals are received as either a grounded or open condition on the E (derived from 'Ear') lead. The E&M tie trunk interface functions as a *de facto* standard in the PBX - T1 multiplexer Telco environment.

ESF (EXTENDED SUPERFRAME FORMAT):

FACILITY DATA LINK (FDL): The 4 Kbps channel used to transmit supervisory

FOREIGN EXCHANGE CHANNEL UNIT - OFFICE END (FX0)

FOREIGN EXCHANGE CHANNEL UNIT - STATION END (FXS)

FRAME RELAY ACCESS DEVICE (FRAD):

FXSDN (FXS SOFTWARE-DEFINED):

LINE INTERFACE UNIT (LIU): Typically, a controller device in a D-type channel bank, such as the CAC

Access Bank II, that incorporates a controller, channel service unit (CSU), ringing generator and power converter on a single card to interface between the T1 network and the analog functions of the channel bank.

PBX (PRIVATE BRANCH EXCHANGE):

PERFORMANCE REPORT MESSAGE (PRM):

PLAR (PRIVATE LINE AUTOMATIC RINGDOWN): A leased voice circuit that connects two single telephone handsets together. Whenever either handset is lifted, the other instrument automatically rings.

PSTN (PUBLIC SWITCHED TELEPHONE NETWORK): As used by the ITU-T, PSTN is simply an abbreviation for the local phone company

QRSS (QUASI-RANDOM SIGNAL SEQUENCE): A standard test pattern generated by a 20-bit linear feedback shift register used during loopback and BER testing to stress test the continuity and integrity of a T1 circuit by simulating live data traffic. Generates every combination of 20-bit words, repeats every 1,048,575 bits, and suppresses consecutive zeros to no more than 14. Contains high density sequences, low density sequences, and sequences that change from low density to high density and vice versa.

RING BACK TONE: An interrupted low tone indicating that the called telephone is ringing. This tone is generated by a device at the Central Office (CO) and may bear no relationship to the sound the phone at the other end is emitting - or not emitting.

RING GENERATOR: A component of virtually all phone systems, including the Access Bank II, that supplies the power to ring the bells inside phones, typically 90 volts AC at 20 Hz.

RINGER EQUIVALENCY NUMBER (REN): Part of the FCC certification number approving a telephone terminal product for direct sale to the end user as not doing harm to the network. The REN consists of a number and a letter which indicates the frequency response of that telephone's ringer. The number indicates the quantity of ringers which may be connected to a single telephone line and still all ring. The total of RENs of the telephones connected to the one line must not exceed the value 5 or some or all of the ringers may not operate.

SCADA (SUPERVISORY CONTROL AND DATA ACQUISITION):

SLC[®]96 (SUBSCRIBER LOOP CARRIER 96): A short-haul multiplexer manufactured by AT&T Technologies that enables up to 96 telephone customers to be served on three pairs of wires.

SNMP (SIMPLE NETWORK MANAGEMENT PROTOCOL): SNMP is an application layer connection-less protocol, running over UDP (User Datagram Protocol), that functions as TCP's stack network management protocol between a management station and a SNMP agent resident in a managed device. For managing TCP/IP-based networks, SNMP is the *de facto* standard. SNMP is designed to implement an automated network-management system for controlling and performance monitoring managed devices such as hosts, bridges, routers, CSU/DSUs, and channel banks in networks and distributed processing systems.

SPAN: A span is a logical name for an access port into the Access Bank II. A span carries Voice/Data information to/from the Access Bank.

TIMESLOT: 64Kbyte/s channels on a T1 span. A T1 span contains 24 timeslots.

TRANSMISSION ONLY (TO): An operating mode on a 4-wire E&M card that provides dedicated one-way transmission paths to radio and modem equipment uncorrupted by the insertion of A/B robbed bit sig-

naling.

TRUNK PROCESSING (TP):

WINK: A signal sent between two telecommunications devices as part of a handshaking protocol. It is a momentary interruption in SF (Single Frequency) tone, indicating that the distant Central Office (CO) is ready to receive the digits that have just been dialed. In telephone switching systems, a wink is signaled by a single supervisory pulse. On a digital connection such as a T1 circuit attached to an Access Bank II, a wink is signaled by a brief change in the A and B signaling bits. On an analog line, a wink is signaled by a brief change in polarity (electrical + and -) on the line.

WINK OPERATION: A timed off-hook signal normally of 140 milliseconds, which indicates the availability of an incoming register for receipt of digital information from the calling office.

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