

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Larscom Access-T-201* at our website: ***Click HERE***

LARSCOM

Access-T 100, 200, 400, & 1500

Multi-port DSU/CSU System

Installation and Operation Manual

ACST-0351-005
June 1996

NOTICE

Specifications and performance characteristics described in this document are subject to change without notice.

Access-T is a trademark of Larscom Incorporated.

❖

Larscom Incorporated
4600 Patrick Henry Drive
Santa Clara, CA 95054

Telephone: (408) 988-6600
Customer Service: (408) 988-6627
Fax: (408) 986-8690
World Wide Web: http://www.larscom.com

❖

Copyright © 1996
Printed in U.S.A.

Notice to U.S. Users

When using Access-T as an interface to a public T1 or Fractional T1 (FT1) service, ensure compliance with FCC Rules, Part 68, as follows:

1. All direct connections to T1/FT1 lines must be made through standard plugs and jacks furnished by the telephone company. No connection can be made to party lines or coin lines.

2. Before connecting a unit, tell your local phone company that you have an FCC registered device that you wish to connect to the company's lines. Provide them with the following information, as requested:
    - The FCC registration number, GRPUSA-73975-DE-N (Series 100/200/400) or GRPUSA-75029-DE-N (Series 1500), listed on the Access-T label.
    - The service code: 6.0N.
    - The facility code: 04DU9-B, 04DU9-C, 04DU9-S.
    - The jack arrangement needed: RJ48C. After the telephone company has been notified and has installed any necessary jacks, connect Orion to the Network Interface.

3. If Access-T appears to be malfunctioning, disconnect it from the telephone line until it is determined whether the Access-T or the line is the source of the trouble. If Access-T needs repair, do not reconnect it to the line until the repair has been completed.

4. Access-T has been designed to prevent disruption of the T1/FT1 network. If Orion is not meeting performance requirements, the telephone company can temporarily disconnect service (giving advance notice, if possible).

5. The telephone company must give advance notice before altering equipment or operations in a way that will affect operation of Access-T or other customer equipment.

6. Under FCC rules, the customer is not authorized to repair Access-T, regardless of whether the unit is under warranty or not. Always return Access-T to the factory if repair is required.

7. Do not remove equipment housing unless you are a qualified installer. There are no user-servicable parts inside. The Larscom Access-T must be installed by a qualified technician.

Notice to Canadian Users

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

Before installing this equipment, 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.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulation of the Industry of Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépasant les limites applicables aux appareils numériques de la class A prescrites dans le Réglement sur le brouillage radioélectique édité par le ministére des Communication du Canada.

FCC Rules, 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 FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instructions in this 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 his own expense.

Warning

Changes or modifications to this unit not expressly approved by Larscom could void the user's authority to operate the equipment.

1 Introduction

Access-T refers to a DSU/CSU product family consisting of three groups:

- **Access-T 01/02 DSU/CSUs**. Older software version; no Aux port; 2 DTE ports.
- **Access-T Series 100, 200, and 400 DSU/CSUs**. Current software version; Aux port option; integral SNMP; 1, 2, or 4 DTE ports.
- **Access-T Series 1500 Multi-Port Network Access DSU/CSU.** Same software as Series 100/200/400; rack-mountable chassis holding up to 15 Access-T modules; each module provides 2 DTE ports, Aux port, and T1 CSU (and thus is equivalent to an Access-T Series 200); integral SNMP; one supervisory connection serves all modules.

This manual describes the functions and capabilities of the Larscom Access-T Series 100, 200, 400, and 1500 products. Although identical in software, these two versions of the product have significant physical differences, which are noted throughout this manual as appropriate.

When the term "Access-T" is used in this manual, it refers to the Access-T 100, 200, 400, and 1500 products collectively. When the text refers to one product version in particular, the full product name will be used.

> **Note:** The Access-T Series 100, 200, and 400 are sometimes referred to as the Access-T 1-Port, 2-Port, and 4-Port models.

Access-T installers and operators should be familiar with the information presented in this manual, which is divided into the following 10 chapters:

Chapter 1. Introduction — This chapter provides general technical information about T1 and FT1 networks and the Simple Network Management Protocol (SNMP).

Chapter 2. Access-T Functional Overview — This chapter provides information about Access-T's data and line interfaces, supervisory ports and interfaces, performance monitoring, loopbacks, and specifications.

Chapter 3. Installation — This chapter provides Access-T installation procedures, including all mounting, powering, and wiring instructions.

Chapter 4. Front-Panel Controls and Indicators — This chapter provides a detailed description of Access-T's front-panel status indicators and connectors.

Chapter 5. The Terminal Interface — This chapter provides a structural overview of Access-T's configuration and operation menus. It describes each menu path and its associated options and parameters.

Chapter 6. Configuration Procedures — This chapter provides procedures for configuring Access-T through the Terminal Interface.

Chapter 7. Alarms, Reports, and Tests — This chapter describes the Access-T displays and commands used to monitor the performance and status of the communication links and the procedures for performing all diagnostics functions, including loopbacks, test pattern transmission, and alarm monitoring.

Chapter 8. Using Access-T as a Master — This chapter describes how to operate an Access-T which is configured as the master for a chain of slave Access-Ts.

Chapter 9. Maintenance — This chapter provides a description of the maintenance support available for Access-T.

There are also several appendices which provide the following supplementary materials:

Appendix A. Cable Drawings — This appendix contains drawings and part numbers for each of the cables that can be used with Access-T.

Appendix B. Glossary — This appendix provides a list of T1, SNMP, and Access-T terms and definitions.

Appendix C. CP01 Chain Port Expander — This appendix describes the Larscom CP01 Chain Port Expander, which can link the RS485 facilities connecting multiple Access-Ts to the supervisory master via RS232 ports.

Appendix D. Access-T Operator Messages — This appendix lists all Access-T status and error messages.

Appendix E. Access-T 1500 Accessory Kits — This appendix describes the four accessory kits for use with the Access-T 1500 Line/Aux Port connectors.

Appendix F. Standard MIB-II Definitions —This appendix describes the implementation of the SNMP MIB-II (RFC 1213).

Appendix G. Access-T DS1 MIB Support — This appendix lists the DS1 MIB commands supported by Access-T (RFC 1406).

Appendix H. SNMP Trap Support — This appendix describes the implementation of the Larscom Private MIB, including trap support.

Appendix I. Point-to-Point Protocol — This appendix provides supplementary information about PPP as is pertains to Access-T.

T1 Networks

The T1 digital transmission system, carrying DS1 signals, is the primary digital communication system in North America. A T1 facility provides full-duplex transmission at 1.544 megabits per second (Mbps). Bandwidth is divided into 8 kbps of overhead and 1.536 Mbps of user information. For digitized voice applications, the information bandwidth typically consists of 24 multiplexed 64-kbps channels. For the transmission of data, a T1 facility may be channelized as for voice, or it may carry from one to as many as several hundred multiplexed signals on an unchannelized basis.

Today's T1 networks are typically multinodal, with multiple T1 line terminations at each node. Nodes can be located at customer premises or at a carrier's Central Office, creating a hybrid public/private networking environment. The high capacity of T1 facilities allows integration of previously separate voice, data, facsimile, and image networks into high-speed backbone networks.

Currently, the T1 environment is in the midst of a major change in framing format. The D4 or Superframe (SF) format is being supplanted by the Extended Superframe (ESF) format. ESF allows performance monitoring of live traffic with no decrease in information bandwidth.

Customer Premises Equipment

Various types of equipment are employed at the customer's location. Digital Terminating Equipment (DTE) provides the source for the transmitted signal and the destination for the received signal. DTE includes such equipment as:

- Multiplexers.
- PBXs.
- T1 Channel Banks.
- Front-End Processors.
- Computers.

A Data Service Unit (DSU) converts one or more subrate signals (i.e., signals transmitted at a subfrequency of the 1.544-Mbps T1 signal) to a T1 signal. Finally, a Channel Service Unit (CSU) interfaces the customer's T1 DTE or DSU to the public T1 network. The CSU provides various termination and interface functions as specified by AT&T Publication 62411 and FCC Rules, Part 68, including:

- Electrical interface.
- Surge and lightning protection.
- Signal regeneration and pulse density assurance.
- Keep-Alive and Yellow Signal.
- Loopback to the line controlled from the network.

T1 Signal Characteristics

The T1 signal is a bipolar pulse train. Data is encoded using pulse code modulation (PCM) and time-division multiplexing (TDM). In other words, the signal is divided into time slots of 648 nanoseconds each (1,544,000 time slots per second), with data encoded by the presence or absence of a pulse in each time slot. A pulse, if it exists, will have one-half the duration of the time slot and an amplitude of three volts. When a pulse is present, the time slot data is a ONE; when no pulse is present, the time slot contains a ZERO.

T1 signals employ Alternate Mark Inversion (AMI) line coding, in which consecutive pulses are expected to be of opposite polarity. Consecutive pulses of the same polarity (called a "bipolar violation" or BPV) indicate a transmission error. Figure 1-1 shows an example of AMI line coding.

Transmission Facilities

T1 signals are transmitted primarily over standard twisted-pair copper wire. Signal loss on the wire is approximately 5 or 6 dB per 1000 feet. Repeaters are employed every 6000 feet along the transmission facility to compensate for the signal losses and to ensure an adequate signal level at the Network Interface (the termination of the T1 line at the customer premises). AT&T specifies the maximum distance between the CSU and the last repeater to be 3000 feet; Access-T CSUs accurately regenerate a -27 dB signal (equivalent to the attenuation over 5000 feet of cable). Figure 1-2 shows one end of a typical T1 link.

T1 may also be transmitted via satellites, digital microwave radios, fiber optic systems, and coaxial cable modems. In the carrier networks, T1 signals may be multiplexed into even higher-speed signals (e.g., T3).

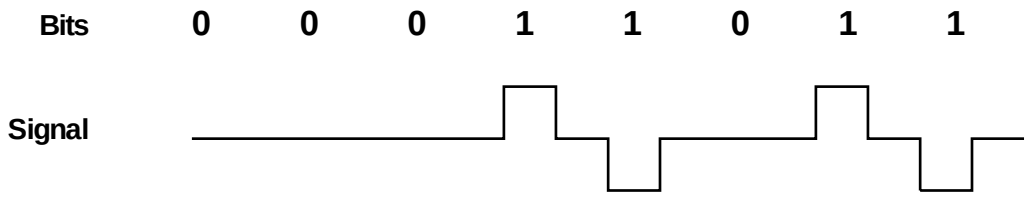


Figure 1-1. AMI Line Coding

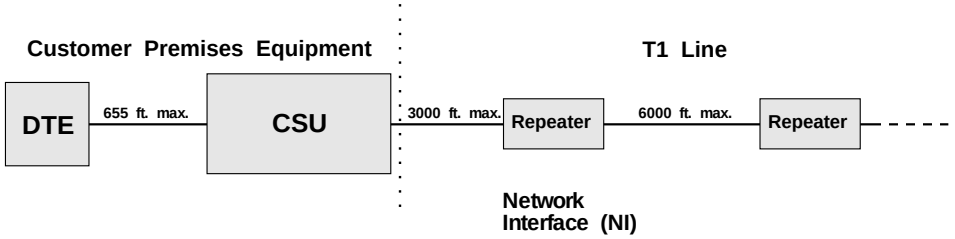


Figure 1-2. One End of a Typical T1 Link

Pulse Density

To interpret and regenerate a T1 signal, repeaters and other T1 equipment must be able to determine time slots based on the pulses in the received signal. Since pulses occur only when ONES are transmitted, signals with too many consecutive ZEROS cause timing problems.

The minimum frequency of ONES pulses (called pulse density) that is necessary to ensure reliable timing varies with the equipment involved. However, a standard pulse density requirement has been defined by AT&T:

N pulses in every 8(N+1) bits, where N = 1, 2, . . . 23

One of the corollaries of this formula is that no more than 15 ZEROS may be transmitted consecutively. (If N = 1, there must be at least 1 pulse in every 16 bits.) This requirement was very important in the past, when repeaters would tend to oscillate if they received more than 15 consecutive ZEROS, and an oscillating repeater required manual resetting. However, most repeaters currently being deployed on T1 facilities can handle up to 80 consecutive ZEROS.

Pulse density requirements may be enforced by either the DTE or the DSU/CSU, depending on the particular application. Pulse density may be guaranteed in various ways:

- A particular bit position (generally, bit 7 or 8 of each data byte) may be reserved for the transmission of a pulse.
- A pulse may be "stuffed" in the data stream (i.e., a ZERO may be overwritten with a ONE) to ensure that pulse density is maintained.
- Data may be bundled or encoded in a way that guarantees an acceptable pulse frequency.

Another pulse density issue involves the transmission of a keep-alive signal to the T1 line whenever signal is lost from the DTE. The keep-alive signal is a fixed bit pattern (usually unframed ALL-ONES) which provides required pulses to the network while notifying the far end that a failure has occurred.

> **Note:** Where dc power is available from the T1 span, a CSU may be required to transmit a keep-alive signal to the network in the event of a local power failure. Currently, however, the implementation of dc-powered ("wet") spans is decreasing.

Clear Channel Capability

The primary drawback of pulse stuffing is that it corrupts the original data. This is not a problem with voice transmissions, where the effect on the sound reproduced at the receiving end is negligible. In data transmissions, however, changing a single bit can have serious consequences. To eliminate the possibility of data corruption, part of the bandwidth (for example, every eighth bit) must be dedicated to pulses, or a method of data encoding must be employed that ensures pulse density while allowing the entire bandwidth to be used for data.

Availability of the entire bandwidth for data is called "clear channel" capability. The primary method for achieving clear channel capability in the T1 environment is a data-encoding scheme called B8ZS (Bipolar 8-Zero Substitution). A modification of AMI line coding, B8ZS replaces any eight consecutive ZEROS with a fixed code containing two bipolar violations (BPVs), as illustrated in Figure 1-3.

There are two requirements for the use of B8ZS:

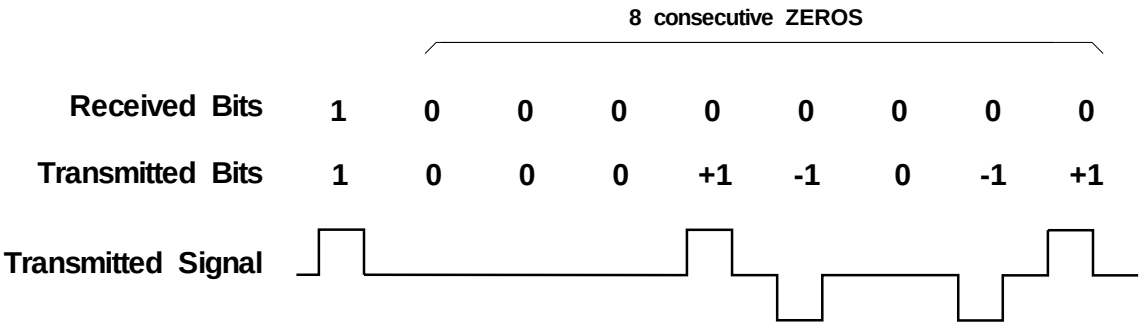
- The CSUs or DTE at each end of the T1 link must be able to encode and decode B8ZS.
- Network equipment through which the signal passes must be transparent to B8ZS—in other words, must not "correct" the BPVs in the B8ZS code.

The latter requirement prevents the current implementation of B8ZS in many T1 networks.

Framing Synchronization

T1 data is grouped into "frames" of 192 information bits plus 1 framing bit. Framing bits occur in a fixed pattern of ONES and ZEROS. Network equipment is able to synchronize on these patterns, and thus to identify frames properly. An Out of Frame (OOF) event occurs whenever 5 consecutive framing bits contain 2 or more errors.

As described in AT&T Publication 62411, a CSU declares Loss of Sync if an OOF condition persists for at least 2.5 seconds. A CSU which loses sync on the signal received from the T1 line declares a Red Alarm condition and transmits a defined bit pattern called Yellow Signal to the T1 line.



Notes: Transmitted polarities are reversed if last ONE received was negative.
Bipolar violations always occur at 4th and 7th bit positions.

Figure 1-3. B8ZS Encoding

Framing Formats

Two framing formats are used in today's T1 networks: D4 and ESF. Both are based on the "frame" described above: 192 information bits preceded by a framing/overhead bit. Thus, 8 kbps of the 1.544 Mbps is reserved for overhead, leaving 1.536 Mbps for user information.

In the older D4 or Superframe (SF) format, a Superframe is defined as twelve 193-bit frames (2316 bits total). Figure 1-4 illustrates the D4 framing format. All 12 overhead (F) bits in each Superframe are used for frame synchronization.

As more T1 networks were deployed, a primary deficiency in D4—the inability to monitor live data—became significant. To monitor performance on a D4 circuit, live traffic must be halted and test signals transmitted on the line. When improvements in synchronizing circuits reduced the requirements for framing synchronization to considerably less than 8 kbps, the Extended Superframe (ESF) format was developed to allow performance monitoring of live data without loss of information bandwidth.

With ESF, the D4 Superframe is extended from 12 to 24 frames (4632 bits). The 8 kbps of overhead is divided into three separate channels:

- A 2 kbps channel for framing.
- A 2 kbps channel for CRC-6, a six-bit Cyclic Redundancy Check code for each ESF which is separately calculated by the transmitter and the receiver and then compared to detect bit errors “on the fly”.
- A 4 kbps channel, called the Facility Data Link (FDL), for diagnostic control and transmission of performance statistics.

Table 1-A shows bit-by-bit use of the 24 overhead bits and the “robbed” signaling bits in each ESF.

Currently, there are two standards for ESF. The first was developed by AT&T and is described in AT&T Publication 54016. More recently, the Exchange Carriers Standards Association developed the ANSI T1.403 (T1E1) standard, which differs from the AT&T standard primarily in the way the facility data link is employed.

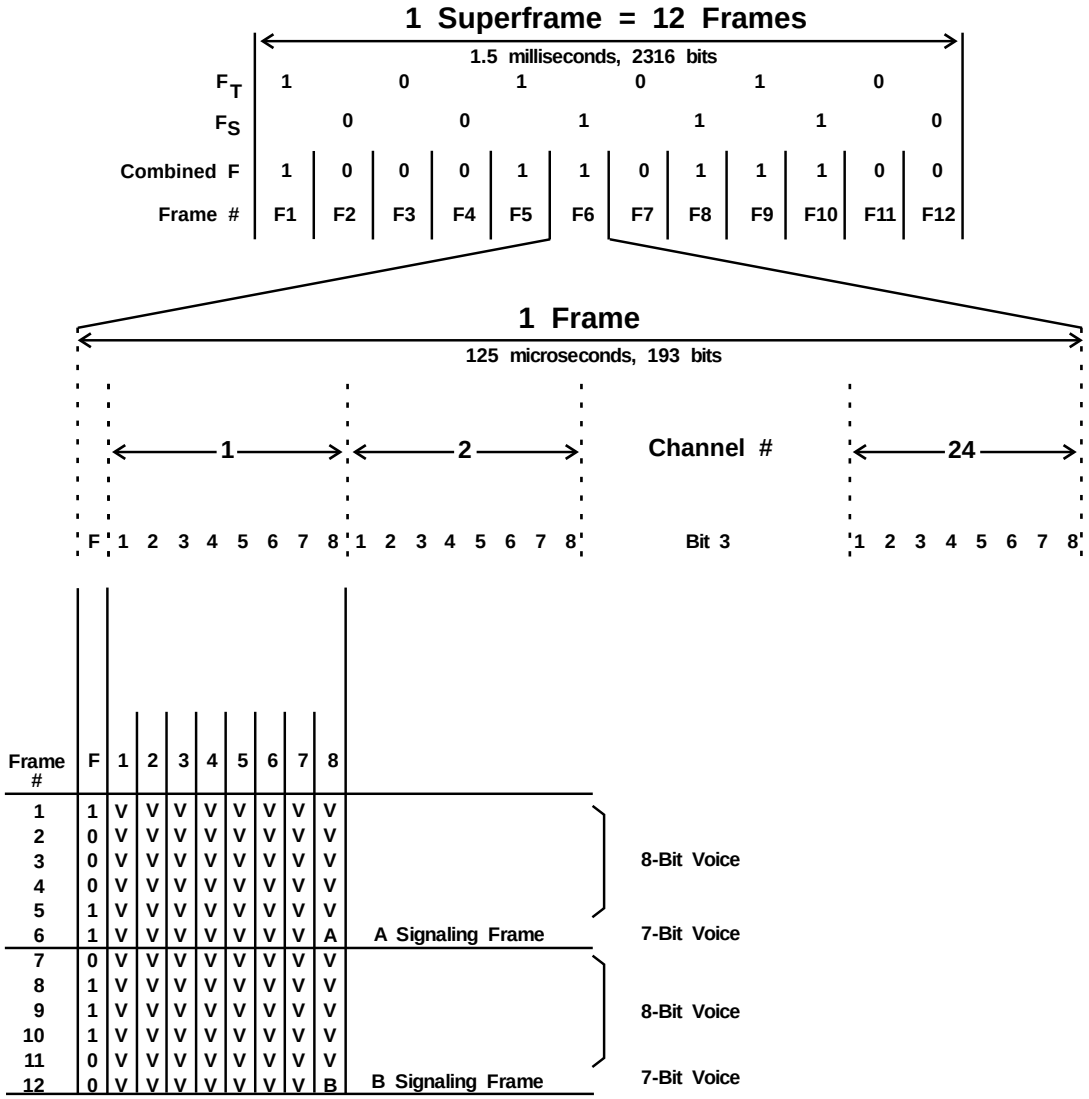


Figure 1-4. D4 Format and Channelization

Table 1-A. ESF Format

	Overhead Bits (1 bit per frame)			Bit Use, All 24 Channels (192 bits per frame)		Signaling Bit Use Options (see Notes below)			
Frame Number	**Fe**	**FDL**	**CRC**	**Traffic**	**Signaling**	**T**	**2**	**4**	**16**
1	—	m	—	Bits 1-8					
2	—	—	C1	Bits 1-8					
3	—	m	—	Bits 1-8					
4	0	—	—	Bits 1-8					
5	—	m	—	Bits 1-8					
6	—	—	C2	Bits 1-7	Bit 8	—	A	A	A
7	—	m	—	Bits 1-8					
8	0	—	—	Bits 1-8					
9	—	m	—	Bits 1-8					
10	—	—	C3	Bits 1-8					
11	—	m	—	Bits 1-8					
12	1	—	—	Bits 1-7	Bit 8	—	A	B	B
13	—	m	—	Bits 1-8					
14	—	—	C4	Bits 1-8					
15	—	m	—	Bits 1-8					
16	0	—	—	Bits 1-8					
17	—	m	—	Bits 1-8					
18	—	—	C5	Bits 1-7	Bit 8	—	A	A	C
19	—	m	—	Bits 1-8					
20	1	—	—	Bits 1-8					
21	—	m	—	Bits 1-8					
22	—	—	C6	Bits 1-8					
23	—	m	—	Bits 1-8					
24	1	—	—	Bits 1-7	Bit 8	—	A	B	D

Notes:
Fe = ESF Framing Bits (. . . 001011 . . .)
FDL = 4 kbps Facility Data Link (message bits m)
CRC = CRC-6 Block Check (check bits C1-C6)
Option T = Transparent (bit 8 for traffic)
Option 2 = 2-State Signaling (Channel A)
Option 4 = 4-State Signaling (Channels A, B)
Option 16 = 16-State Signaling (Channels A, B, C, D)

The AT&T Standard for ESF

AT&T Publication 54016 (revised 1989) defines the performance-monitoring and data-link requirements for ESF CSUs. Per the latest revision of Publication 54016 (September 1989), the following performance parameters must be monitored:

- **ESF Error Event—**Any ESF in which an OOF event or CRC-6 error occurs.
- **Errored Second (ES)—**A second with one or more CRC errors or Out-of-Frame (OOF) conditions.
- **Severely Errored Second (SES)—**A second with 320 or more CRC errors or one or more Out-of-Frame (OOF) conditions.
- **Bursty Errored Second (BES)—**A second with more than one but less than 320 CRC errors.
- **Unavailable Second (UAS)—**A second during which Unavailable Signal State is in effect. Unavailable Signal State is declared after 10 consecutive seconds of SES; it is cleared after 10 consecutive seconds which are not SES.
- **Loss of Frame Count (LOFC)—**The number of times Loss of Frame is declared. Loss of Frame is declared when a device loses sync on the framing pattern for approximately 2.5 seconds. Loss of Frame is cleared when a device maintains sync for about 15 milliseconds.
- **Controlled Slips (CS)—**Monitored and reported by devices which perform controlled timing slips, optional.

ES, BES, SES, and UAS counts are to be kept in 24-hour registers divided into 96 intervals of 15 minutes each. In addition, a running total count of ESF errors is to be kept. All ESF performance statistics can be requested, transmitted, and cleared via the data link.

AT&T Publication 54016 defines two loopbacks which can be controlled from the network. Line loopback (near the CSU's line interface) is controlled by in-band codes. Payload Loopback (near the CSU's DTE interface) is controlled by data link codes. These loopbacks correspond to Access-T's LS Line and DS Line loopbacks, respectively.

The ANSI Standard for ESF

The ANSI T1-403 standard (informally called T1E1 after the committee involved in its formulation) defines performance-monitoring and data-link features which are significantly different than those defined by AT&T in Publication 54016. The chief difference is that ANSI T1.403 replaces polled performance registers with performance reports broadcast toward the network every second. These one-second reports include various information about the received signal (i.e., the signal from the network) over one second. Each second, the responsible network element (DTE or CSU) broadcasts a report containing performance data for each of the four pervious seconds.

As shown in Figure 1-5, one-second reports include the following information:

- CRC Errors.
- Framing Errors.
- Bipolar Violations (BPVs).
- Slip events.
- Loopback status.

ANSI T1.403 defines two loopbacks, Line Loopback and Payload Loopback, which are the same as the loopbacks defined in AT&T Publication 54016. However, under ANSI T1.403 both loopbacks are controlled via the data link.

Channelization and Robbed Bit Signaling

As shown in Figure 1-4, the 192 information bits in each frame may be divided into twenty-four 8-bit channels for the transmission of digitized voice. This channelization allows the multiplexing of twenty-four 64-kbps voice signals onto a single T1 line. At each end of the T1 line, the DTE provides the multiplexing and demultiplexing of the individual voice signals.

In addition to the overhead bits, bits are "robbed" from the information bandwidth for special signaling in voice applications. Specifically, "robbed bit signaling" employs the least significant bit in each channel in frames 6 and 12 (plus frames 18 and 24 in ESF), as indicated in Figure 1-4 and Table 1-A. Signaling bits are used to indicate such conditions as on-hook and off-hook.

Bits	8	7	6	5	4	3	2	1
Word 1	G3	LV	G4	U1	U2	G5	SL	G6
Word 2	FE	SE	LB	G1	R	G2	Nm	N1

G1 = 1	1 CRC Error Event
G2 = 1	2 to 5 CRC Error Events
G3 = 1	6 to 10 CRC Error Events
G4 = 1	11 to 100 CRC Error Events
G5 = 1	101 to 319 CRC Error Events
G6 = 1	320 or more CRC Error Events
FE = 1	At least 1 Framing Bit Error; no SE
SE = 1	At least 1 Severely Errored Framing Event
LV = 1	At least 1 Line Code Violation (BPV)
SL = 1	At least 1slip event
LB = 1	Payload loopback activated
U1, U2	Usage under study
R	Reserved
Nm, N1	Identifies second (previous, previous -1, etc.)

Since for each channel only the least significant bit of every six frames is affected, robbed bit signaling has a negligible effect on the quality of voice transmission.

Figure 1-5. Format of One-Second Reports per ANSI T1.403

Fractional T1 Services

In a traditional T1 network, the customer leases a T1 link between two locations. The entire T1 bandwidth of 24 DS0s is transmitted from one customer location to another. In a Fractional T1 (FT1) network, a customer can lease a subset of the 24 DS0s on a T1 link. Thus, for an application requiring 8 DS0s (512 kbps), the customer might lease DS0s 1 through 8 of a T1 link. Because customers contract only for the bandwidth needed, FT1 can provide substantial cost savings.

FT1 networks also allow the switching of DS0s within the network, giving customers greater flexibility and economy when configuring multipoint networks (i.e., networks serving three or more customer locations). Multiplexed communication channels originating at one customer location may be switched to two different destinations within the network, as shown in Figure 1-6. Switching is performed by a DACS (Digital Access Cross-Connect Switch) at each network office.

FT1 is used with DTEs operating at less than the full T1 rate. Thus, a DSU is required to convert the lower-rate signals to the T1 rate and format. A DSU may serve a single DTE, or it may multiplex the signals from two or more DTEs. In addition, a DSU may provide "drop-and-insert" capability for T1 DTEs. This feature allows data from another DTE to be inserted into unused DS0s in the output of a T1 PBX or channel bank.

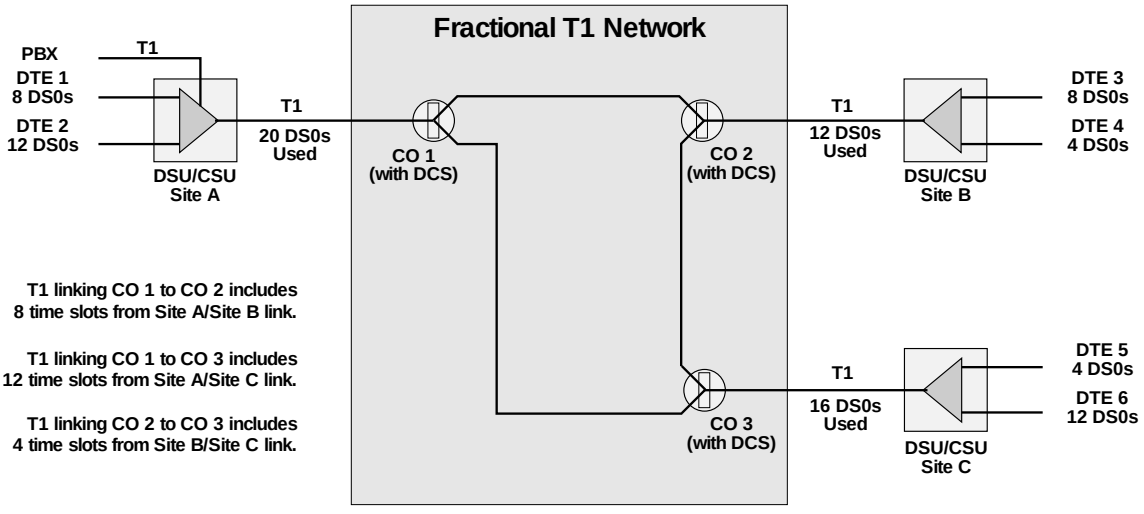


Figure 1-6. Multipoint Networking Using Fractional T1

Simple Network Management Protocol (SNMP)

In recent years, SNMP has become a popular means for managing multi-vendor wide area network (WAN) devices. Originally developed for the management of TCP/IP local area networks (LANs), SNMP allows different managed devices, such as workstations connected to a LAN, bridges, or routers, to communicate with a Network Management System (NMS) using a standard protocol.

The incorporation of SNMP into wide area network interface devices, such as Access-T, takes advantage of SNMP's virtues:

- It is a standard protocol.
- It takes up few system resources in the managed device.
- It operates in multi-vendor environment.

This section contains a brief overview of SNMP along with a short description of the TCP/IP protocol suite and IP addressing modes. A more detailed discussion of these topics can be found in many TCP/IP and SNMP reference books, including *Internetworking with TCP/IP* by Douglas E. Comer.

Figure 1-7 illustrates a typical use of SNMP to manage wide-area network interfaces. In this application, the SNMP manager is managing Larscom's Access-Ts, which provide an interface to a T1 network. The SNMP manager could be the Larscom EMS™, the HP OpenView™, or the SunNet Manager™.

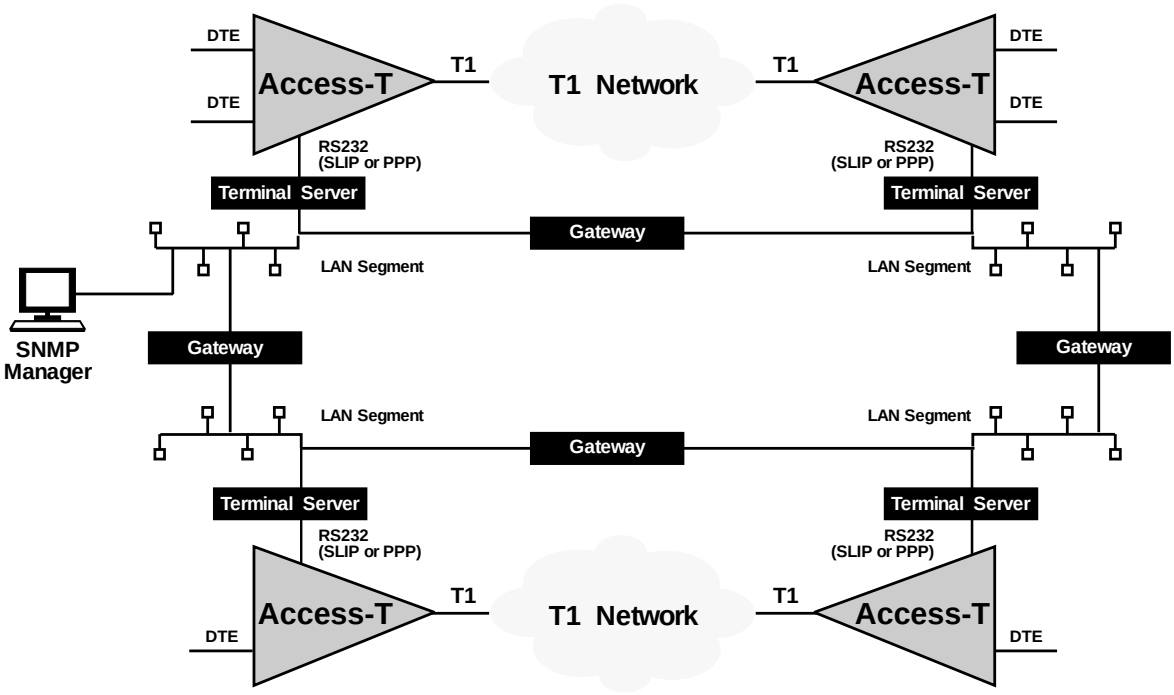


Figure 1-7. SNMP Managing Wide Area Network

SNMP Interface

Typically, there are two methods of employing SNMP to manage a network interface device:

- **Using a Proxy Agent** which translates SNMP commands and responses back-and-forth between an SNMP-speaking client (i.e., SNMP manager) and a managed device which speaks another language over its management interface. Obviously, the translation process between SNMP and a different management language (or protocol) is cumbersome. However, this method is sometimes cost effective where there is already a large installed base of equipment that does not support SNMP.
- **Using Integral SNMP** where the managed device already speaks SNMP over its management interface. This more efficient method is used by Access-T. In Figure 1-7, SNMP operates over Access-T's RS232 Supervisory Ports configured for the serial link interface protocol (SLIP) or point-to-point protocol (PPP) to carry the packetized SNMP messages.

SNMP Operation

SNMP uses the TCP/IP protocol suite to exchange packetized messages between a management Client, the SNMP manager, and an Agent, residing in a network node, such as the Access-T. These packetized messages are transferred, as IP datagrams, over a packet-network, referred to as an internet.

> **Note:** The term *internet* carries two meanings in this manual. The lowercase *internet* is a generic term describing multiple networks connected together, using a common protocol. The uppercase *Internet* refers to the specific collection of hosts world-wide that can communicate with each other using the TCP/IP protocol suite. The *Internet*, which is also an *internet*, functions as a single, cooperative virtual network.

SNMP encompasses three main areas:

- Management operation.
- Definitions of manageable variables.
- Data representation.

Most SNMP management operations are achieved through **GET** and **SET** commands. The **GET/SET** structure is a simple request/reply protocol; typically, the SNMP manager sends a request and the managed device (i.e., the Access-T) sends back a reply. These commands operate on variables that exist in network nodes. Variables are the information, such as T1 performance registers or framing format, that is queried and set in the managed device. SNMP variables are defined using the OSI Abstract Syntax Notation One (ASN.1). ASN.1 also specifies how a variable is encoded in a transmitted data frame.

This **GET/SET** structure provides several advantages, including:

- **Stability:** SNMP's definition remains fixed, even though new data items are added and new operations are defined.
- **Simplicity:** SNMP is simple to implement, understand, and debug because it avoids having special cases for each command.
- **Flexibility:** SNMP can accommodate arbitrary commands in an elegant framework.

SNMP-Managed Devices

Managed devices with integral SNMP, such as Access-T, contain two components for processing SNMP information:

- The Agent, which executes SNMP commands.
- The Management Information Base (MIB), which is a collection of all management related information for a particular type of managed device.

Management Information Base (MIB)

The set of variables that each node supports is called the Management Information Base (MIB). The MIB for a particular device is typically composed of several components:

- **A Standard MIB** which contains a set of objects (or variables) useful for Internet management. The current Standard MIB supported by Access-T, MIB II, is specified in Request for Comments (RFC) 1213.

  > **Note**: RFCs are Internet Engineering documents that specify and describe Internet protocols.

- **An Application-Specific MIB** which contains the objects (or variables) for such applications as different types of network interfaces. For instance, there are Application-Specific MIBs, defined by different RFCs, for both DS1 and DS3 network interfaces. Access-T supports the DS1-application MIB specified by RFC 1406.
- **An Enterprise-Specific MIB** which is defined by the hardware manufacturer to manage their specific equipment. For instance, Larscom has defined a set of enterprise-specific (i.e., Access-T) SNMP traps. Traps are "autonomous" (i.e., unsolicited) SNMP messages from an SNMP-managed device to the SNMP manager to report an event or an alarm condition.

Larscom provides a DOS-formatted disk that includes the Larscom private MIB and the standard 1406 MIB.

Refer to Appendices F, G, and H for more information about the different MIB components supported by Access-T.

TCP/IP Protocol Suite

As stated previously, SNMP is part of the TCP/IP protocol suite. Therefore, to understand how SNMP messages (i.e., GET or SET requests or replies) are exchanged between an SNMP manager (i.e., the client) and an SNMP-managed device (i.e., the agent, such as Larscom's Access-T), it is helpful to know something about the TCP/IP protocol suite.

The TCP/IP protocol suite is a set of layered protocols for inter-computer communication. It provides a connectionless, packet delivery system. Each layer of the protocol is responsible for different communication functions. Figure 1-8 provides an example of TCP/IP protocol layers for an SNMP application.

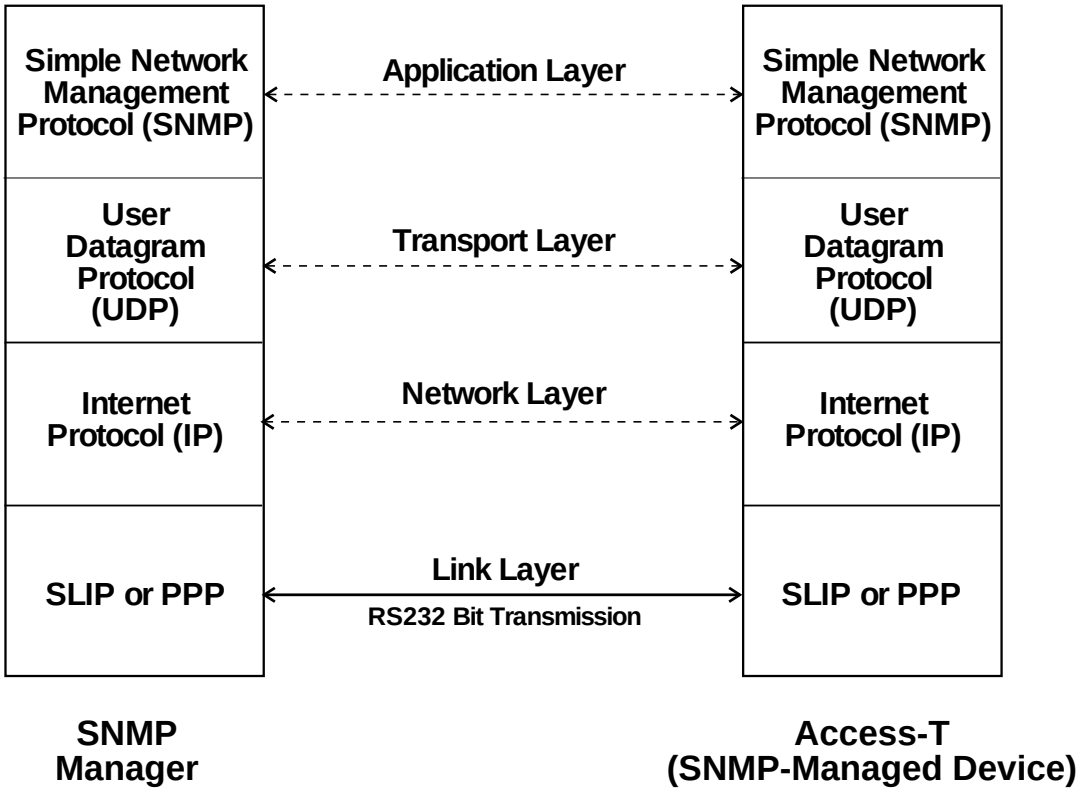


Figure 1-8. TCP/IP Protocol Layers for an SNMP Application

In the Figure 1-8, an SNMP message (i.e., a GET or SET request) from the SNMP manager to the Access-T device, is passed down through the protocol stack, across the link layer and up through the protocol stack at the Access-T. On the message's way down through the protocol stack, each layer adds information to the message by prepending headers (and sometimes trailers). On the message's way up through the protocol stack, each layer extracts information relevant to its layer from the headers (and sometimes trailers). In this way, each protocol layer effectively communicates with its peer on the same layer, which is indicated in Figure 1-8 by the dotted lines.

In general, TCP/IP layers provide the following functions:

- **Application Layer** handles the details of different TCP/IP applications, such as SNMP. Other TCP/IP applications include Telnet, File Transfer Protocol (FTP), or Simple Mail Transfer Protocol (SMTP).
- **Transport Layer** provides a flow of data between two hosts, for the application layer above. SNMP uses UDP, a simple non-reliable service, as a transport layer protocol. Other TCP/IP applications use Transmission Control Protocol (TCP) as the transport layer.
- **Network Layer** handles the movement of packets around a network.
- **Link Layer** handles the physical interface to a transmission system. Access-T uses SLIP or PPP over an RS232 interface, but there are other possible link layers. Ethernet is a widely used link layer.

This is only a simplified example of the TCP/IP layers; the complete TCP/IP protocol suite contains more than one protocol at each layer. The transport layer, for instance, also contains the Transmission Control Protocol (TCP), which is not used by the SNMP application.

IP Addressing

The goal of TCP/IP is to provide a virtual network that offers a connectionless IP datagram delivery service. To understand how this is achieved, it is important to understand how a TCP/IP internet addresses each IP datagram and routes it through the network.

Internet equipment can be divided into two basic categories: hosts and gateways. *Hosts* typically connect directly to one physical network; however, it is possible to have multi-homed hosts. *Gateways*, on the other hand, have connections to two or more physical networks. Each host on a TCP/IP internet is assigned a unique 32-bit address, sometimes referred to as the IP address, that is used in all communications with that host. *It is important to remember that these addresses do not specify a specific machine, but a connection to the network.*

Each address can be imagined to have two parts, a ***netid*** and ***hostid***. Per their names, *netid* identifies a network while *hostid* identifies a host on that network. Figure 1-9 shows a breakdown of the five classes of IP addresses. Classes can be determined from the three high-order bits, with two bits being sufficient to distinguish the three primary forms: *Classes A*, *B*, and *C*. These classes differ in the number of hosts that can exist on a given network. For example, *Class B* addresses can support more than 2^{16} (65,536) hosts, while *Class C* addresses allow only 2^{8} (256) hosts. The *netid* is used by gateways to route datagrams through the network as described in the section **Internet Routing**. *Classes D* and E are special-case forms not covered in this overview.

> **Note:** The Network Information Center (NIC) at SRI International in Menlo Park, California, assigns Internet addresses to an organization. The NIC assigns only *netid*s; the local system administrator is responsible for assigning *hostid*s.

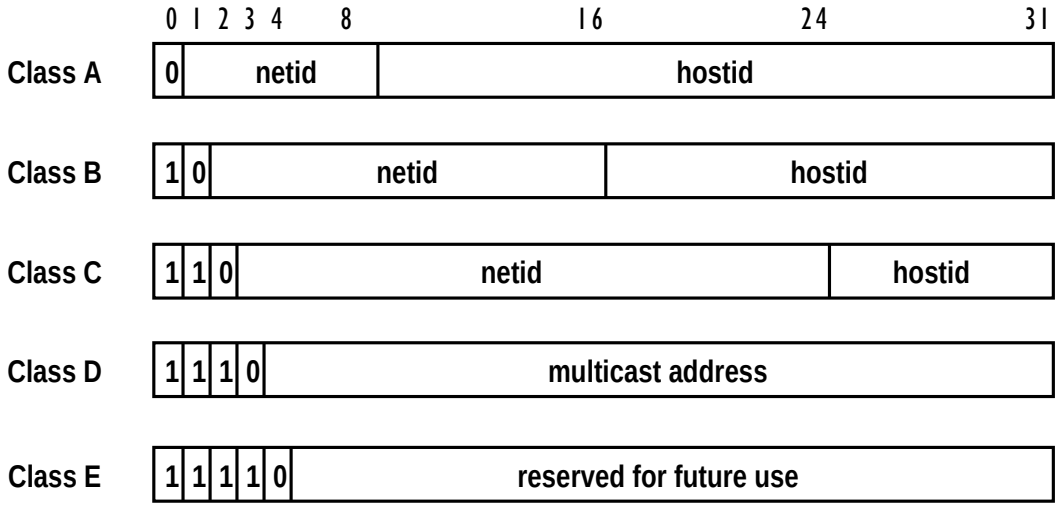


Figure 1-9. Five Forms of Internet Addresses

Subnet Addressing

Class B addresses, for instance, can support 2^{16} (65,536) hosts. Since this many hosts are rarely attached to a single physical network, RFC 950 describes a scheme for arranging hosts on a single physical network into a hierarchy. This scheme, known as subnetting, divides the *hostid* field of an IP address into a *subnetid* field and a *hostid* field. Local system administrators are responsible for subnetting, which can be performed on Class A, B, or C addresses.

A typical subnetting scheme will divide a16-bit Class B *hostid* field into an 8-bit *subnetid* and an 8-bit *hostid*. In subnet addressing, the *subnetid* and the *hostid* do not have to be separated on byte boundaries.

Subnet Mask

When subnetting is used, hosts on the network need to be able to determine which IP address bits are used for the *subnetid* and which bits are used for the *hostid*. The host will already have determined the class of the address from the **netid** field. The subnet mask distinguishes the *subnetid* bits from the *hostid* bits, by masking the *netid* and *subnetid* fields with 1s (ONEs) and the *hostid* field with 0s (ZEROs). By using the mask, a host can determine where the *subnetid* field ends and where the *hostid* field begins for an IP address.

Figure 1-10 shows a subnet mask for a Class B address. In the figure, the *subnetid* and the *hostid* fields are not separated on byte boundaries. The *subnetid* field is 10 bits, and the hostid field is 6 bits.

Dotted Decimal Notation

When IP addresses are used in application programs or technical documentation, they need to be written in a form users can understand. To accommodate this need, IP addresses are written as four decimal numbers (i.e., integers) separated by decimal points (or dots). Each decimal number gives the value of one octet (i.e., byte) of the IP address. For example, the 32-bit (4-byte) binary internet address

10000000 00001010 00000010 00011110

is written in dotted decimal notation as

128.10.2.30

Each decimal number can range from 0 to 255, which corresponds to the range of one octet (or byte).

As another example, the IP address subnet mask, shown in Figure 1-10, is written as **255.255.255.192** in dotted decimal notation.

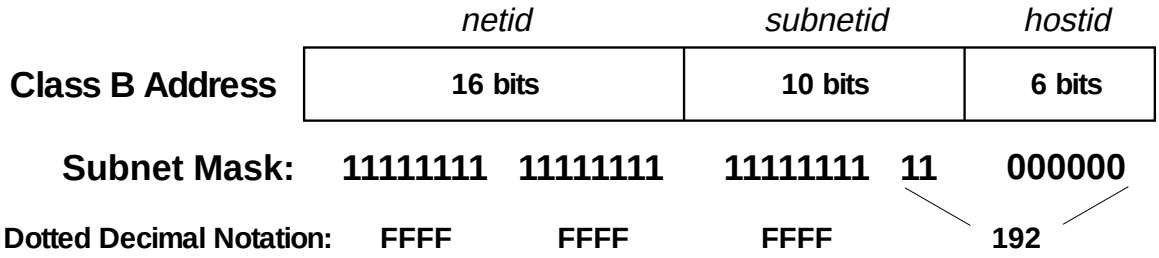


Figure 1-10. IP Address Subnet Mask

Internet Routing

In a packet switching system, *routing* refers to the process of choosing a path over which to send packets (IP datagrams), and *router* refers to a computer making such a choice. Both hosts and gateways participate in IP routing, which can be divided into two forms: *direct routing* and *indirect routing*. Direct routing involves the transmission of IP datagrams from one machine directly to another. Direct routing can occur only if the two machines are attached to the same physical transmission system (e.g., a single Ethernet). Indirect routing is necessary when the destination is not on a directly attached network, requiring the sender to pass the datagram through a gateway for delivery.

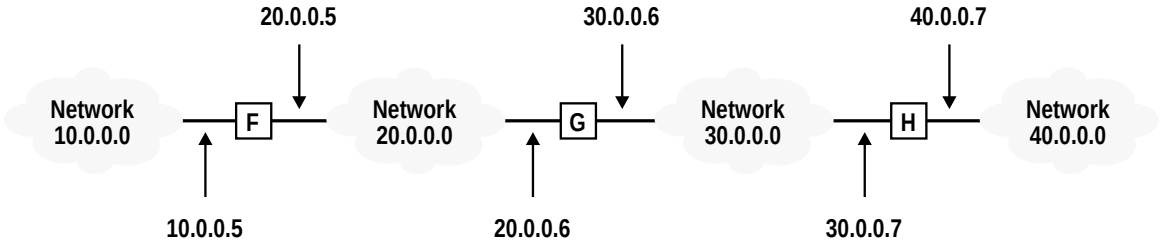
To transfer an IP datagram over a single network, the sender encapsulates the IP datagram in a physical frame, maps the destination IP address to a physical address, and uses the network hardware to deliver it. To see if a destination lies on one of the directly connected networks, the sender extracts the network portion of its own IP address(es). A match indicates that the IP datagram can be sent directly. If no match is made, the sender passes the IP datagram to a gateway. The IP datagram will continue from gateway to gateway until it reaches a gateway that can deliver the IP datagram directly.

Table-Driven IP Routing

Each host or gateway uses a table-driven routing algorithm to determine where an IP datagram should be sent. The IP routing algorithm employs an Internet routing table (or IP routing table) that stores information about possible destinations and how to reach them.

Figure 1-11 shows an example of how routing tables are used. In the figure, the routing table gives the routes that gateway *G* uses. Because *G* connects directly to networks *20.0.0.0* and *30.0.0.0*, it can reach any host on those networks directly. Given an IP datagram destined for a host on network *40.0.0.0*, *G* routes it to address *30.0.0.7* (gateway *H*). *H* will then deliver the IP datagram directly. *G* can reach address *30.0.0.7* because both *G* and *H* attach directly to network *30.0.0.0*.

This routing technique keeps routing tables small (since each gateway need not have every host's individual address) and makes routing decisions efficient.



To reach hosts on network	Route to this address
20.0.0.0	Deliver Directly
30.0.0.0	Deliver Directly
10.0.0.0	20.0.0.5
40.0.0.0	30.0.0.7

Figure 1-11. Using a Routing Table to Send IP Datagrams Between Networks

Constraints of Operating Access-T with SNMP

The following constraits exist when operating Access-T when SNMP management is implemented:

- Access to the normal terminal interface screen may be denied depending on the type of device attached to the Supervisory port.
- Access-T processes only one request at a time, in the order received. Although the input buffer (1500 bytes capacity) can store additional requests, it is recommended that an SNMP manager not make another request until a response is received or a timeout occurs.
- Access-T does not support fragmentation of IP packets on either transmit or receive.
- On the SNMP manager, the timeout for requests depends on the following:
    - Tranmission delays between the manager and Access-T.
    - Whether the request is for the master Access-T or a slave on the chain.
    - Whether the request is for far-end information.
    - The number of SNMP variables reqeusted.
    - User activity on the Craft Port.
    - Whether polling is enabled for non-existent or non-reporting slave nodes.

Access-T Functional Overview 2

The Larscom Access-T combines the features of a multiplexer, a multi-port DSU, and a T1 CSU to help you take full advantage of today's T1 and Fractional T1 (FT1) networks. A T1 network interface (and an auxiliary T1 DTE), multiplexed DTE ports (up to 4), user-controlled DS0 bundling, and integral SNMP agent make Access-T ideally suited for your continuously growing network needs.

Access-T also includes advanced monitoring and alarm functions, built-in diagnostics, and downloadable software upgrades.

Equipment Architecture

The Access-T Series 100, 200, 400, and 1500 differ in physical design. These differences are highlighted in the following lists, and documented in greater detail in the following sections.

The Access-T Series 100, 200, and 400 provide:

- 1, 2, or 4 DTE ports.
- Supervisory Port.
- Craft Port.
- Chain Port.
- Optional auxiliary T1 DTE port.
- T1 line interface.
- Power connections for an ac ***or*** dc source.

The Access-T 1500 provides:

- One chassis which can house up to two power supplies and 15 Access-T modules (cards).
- Two DTE ports (per module).
- Supervisory Port (per chassis).
- Craft Port (per chassis).
- Chain Port (per chassis).
- Auxiliary T1 DTE port (per module).
- T1 line interface.
- Power connection options for ac ***and*** dc sources.

A fully-loaded Access-T 1500 is equivalent to a "chain" of 15 Access-T 200s. *(Chaining is described later in this chapter.)*

Access-T includes two separate operating softwares: Multiplexer (Mux) software and Network Interface Module (NIM) software. To simplify field upgrades, the Access-T features downloadable software. New software can be transmitted to the Access-T from a local or remote PC. Software downloads are performed without removing or replacing any hardware and with a minimal disruption of service.

The rear panel is described in more detail in Chapter 3. For more information about the front panel, refer to Chapter 4.

Access-T Applications

Access-T combines unique features and flexibility to help simplify networking and decrease costs. Access-T interfaces Digital Terminating Equipment (DTE) to a T1 or Fractional T1 (FT1) network. Applications include:

- Interconnecting LANs.
- Networking CAD/CAM/CAE systems.
- Video teleconferencing.
- Linking various other high-speed terminals and hosts.
- Tail circuits.

Up to four DTE ports support equipment communicating at any multiple of 56 or 64 kbps, to a total of twenty-four 56 or 64 kbps channels.

Access-T makes networking simpler and more economical in many ways:

- On the network side, Access-T supports fractional T1 services, lowering costs for applications requiring less than the full T1 bandwidth.
- On the DTE side, Access-T interfaces multiple devices to a network facility, allowing users to employ available bandwidth more economically while minimizing the cost of interface equipment.
- Access-T offers an integral SNMP support for management via a SNMP-based management system.

Access-T can be used in point-to-point and multipoint applications. In point-to-point applications, a single T1 or FT1 link connects equipment at two locations. In multipoint applications, an FT1 network routes communication channels (groups of DS0s) to three or more locations through DCS nodes. Figure 2-1 shows a typical multipoint application.

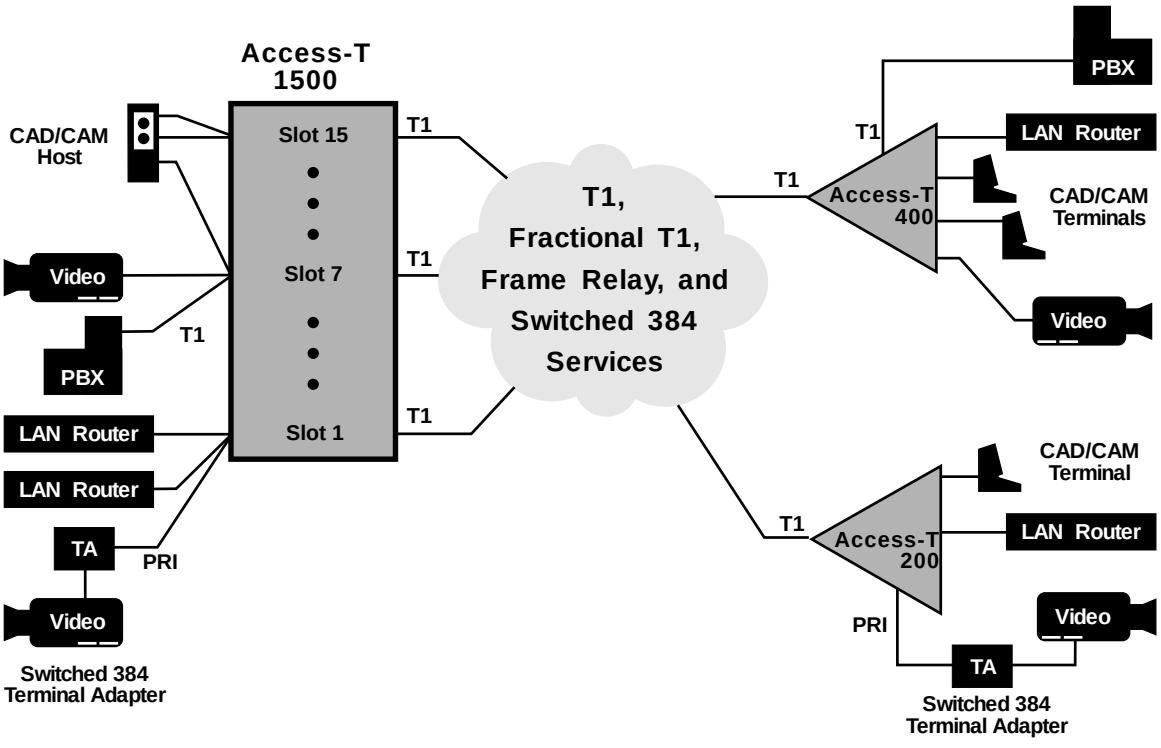


Figure 2-1. Typical Access-T Application

Master/Slave Operation

Each Access-T is configured by the user to operate in one of two modes:

- Master.
- Slave.

When two or more Access-Ts are "chained" (via the RS485 Chain Port, described later in this chapter), all units can be controlled from a single terminal (or NMS) connected locally or remotely to a Supervisory or Craft Port. The Access-T to which the terminal or NMS is connected must be configured for master mode; the other Access-Ts in the chain must be configured for slave mode. The master Access-T polls the slave Access-Ts for status, receives alarm notification from the slaves, and performs alarm dialout for all Access-Ts on the chain. Slave Access-Ts cannot dial out to report alarms directly; in fact, their Supervisory Ports will not support modem connections.

> **Note 1:** An Access-T which is not chained to other Access-Ts must be configured to master mode.
>
> **Note 2:** The Access-T module configured as the master in an Access-T 1500 chassis must be installed in slot 15. See Chapter 3 for more information.

To facilitate management of the chained units or "nodes", a master Access-T supports additional features and commands not available in slave mode.

- The operator can specify the addresses of the slaves to be polled by the master Access-T, and which slaves will cause alarm dialout by the master if they do not respond to polls.
- The operator can view status and alarm summaries for the entire chain.
- The operator can establish a virtual connection with any slave Access-T to perform configuration, monitoring, and diagnostic functions at the slave.
- The operator can communicate via SNMP to any unit on the chain, allowing a network manager to receive traps on user-defined status conditions. *To provide SNMP support on the chain, the operator must enable SNMP support not only on the master unit but also for each of the slaves.*

Chapters 3, 6, and 8 discuss the special procedures and rules which should be followed when installing, configuring, and operating Access-Ts in a master/slave relationship.

Command Ports and Interfaces

Access-T provides a variety of command ports and interfaces to provide complete management control. Definitions for port and interface are as follows:

- A **port** consists of the physical connector hardware and a minimal amount of I/O software.
- An **interface** combines a port with operator interface software.

Command interfaces allow operators and installers to configure Access-T, obtain status and performance information, receive alarm information, and execute diagnostics. Access-T provides four command (or user) interfaces: Terminal, TABS, SLIP, and PPP.

- The user-friendly, menu-driven Terminal Interface offers a visual display on a VT100 or TV 925 terminal.
- The modified Telemetry Asynchronous Bipolar Serial (TABS) Interface is a machine-to-machine protocol allowing a computer to exchange request and response packets with Access-T. TABS commands are typically issued from a Network Management System (NMS).
- Serial Line Interface Protocol (SLIP) is an Internet protocol used to run IP over serial lines, such as RS232 cables, interconnecting two systems.
- Point-to-Point Protocol (PPP) is an Internet protocol used to provide router-to-router and host-to-network connections over both synchronous and asynchronous circuits.

Each Access-T ***chassis*** is equipped with three different communication ports:

- Supervisory.
- Craft.
- Chain.

The Terminal Interface is available via the Craft and Supervisory Ports. The SLIP and PPP Interface are only available via the Supervisory Port. The TABS Interface is available via all three ports. And using the Protocol Search Mode, Access-T can easily switch between these command interfaces (automatically or by user command) via the Supervisory Port. *Refer to Chapter 6 for more information on the Protocol Search Mode and switching between interfaces.*

A detailed description of each of these interfaces and ports is provided in the following sections.

Terminal Interface

Access-T can be controlled via a VT100 or TV 925 terminal. The ASCII Terminal Interface features a Title Bar, Main Menu Line, and Menu and Report Display Area. The Title Bar is a one-line, 80-character-wide status bar at the top of the terminal display. Below the Title Bar are the Main Menu Line and the Menu and Report Display Area. From the Main Menu Line, a series of drop-down menus can be called up and displayed in the Menu and Report Display Area. The operator uses single keys on the terminal keyboard to move up and down the menu branches, select parameters, scroll through options, and enter choices.

By selecting commands from the Terminal Interface menus, operators can configure Access-T, display performance and alarm reports, clear registers, define passwords, perform diagnostics, etc. Performance and alarm displays fit within one 21-line screen, always displayed below the Title Bar and Main Menu Line.

The Terminal Interface, described in detail in Chapter 5, can be accessed via the Supervisory and Craft Ports. Automatic dialout to report alarms is supported only via the Supervisory Port.

TABS Interface

The modified TABS Interface allows an NMS to control configuration, performance reporting, and diagnostics, and to receive unsolicited alarm reports from Access-T. It also allows a master Access-T to control slave Access-Ts as described later in this chapter.

The TABS Interface is supported by the Craft and Supervisory Ports as well as the Chain Port. The Craft and Supervisory Ports automatically distinguish between TABS and Terminal Interface commands.

The TABS commands for this "machine-to-machine" interface are described in the *Access-T TABS Interface Manual, ACST-0731-00x*.

Serial Line Interface Protocol (SLIP)

The Supervisory Port can be configured as a SLIP interface. The SLIP interface, which is described in RFC 1055, is responsible for encapsulating SNMP (i.e., IP) datagrams. In other words, SLIP defines a sequence of characters that frame SNMP datagrams on an RS232 serial line. The maximum SLIP packet size is 1006.

Using SNMP over the SLIP interface, an SNMP manager can configure, operate, and monitor the performance of a Access-T. Access-T with SNMP also supports SNMP traps, which are autonomous (i.e., unsolicited) alarm (or change-of-state) notification messages.

> **Note:** Access-T does not support fragmentation of IP packets. If the SNMP request (or response) exceeds the 1500-byte information buffer, it will not be processed. The manager must ensure that requests and possible responses fit this criterion.

Chapter 1 contains general information about SNMP, and Appendix H contains more information about Access-T SNMP trap support.

Point-to-Point Protocol (PPP)

The Supervisory Port can be configured as a PPP interface. The PPP interface, which is described in RFC 1331, is responsible for encapsulating SNMP (i.e., IP) datagrams. In other words, PPP defines a sequence of characters that frame SNMP datagrams on an RS232 serial point-to-point line. Besides the encapsulation scheme, PPP also provides a Link Control Protocol (LCP) for establishing, configuring, and testing the data- link connection and a family of Network Control Protocols (NCPs) for establishing and configuring different network-layer protocols.

Using SNMP over the PPP interface, an SNMP manager can configure, operate, and monitor the performance of a Access-T. Access-T with SNMP also supports SNMP traps, which are autonomous (i.e., unsolicited) alarm (or change-of-state) notification messages.

> **Note:** Access-T does not support fragmentation of IP packets. If the SNMP request (or response) exceeds the 1500-byte information buffer, it will not be processed. The manager must ensure that requests and possible responses fit this criterion.

Chapter 1 *contains general information about SNMP.* ***Appendix H*** *contains more information about Access-T SNMP trap support.* ***Appendix I*** *provides supplementary information about PPP support specific for Access-T.*

Supervisory Port

The Supervisory Port supports direct or modem connection to a terminal or Network Management System (NMS). Located on the rear panel and labeled **SUPV PORT**, the Supervisory Port is intended for permanent installations.

Operating parameters for the Supervisory Port are user-selected via the Access-T software. If software settings do not correspond to those used by the connected device, communication will not be successful. Access to the Supervisory Port can be restricted by using the password protection feature. Software settings for the Supervisory Port should be changed via the Craft or Chain Ports. For instructions on how to configure the Supervisory Port, consult Chapter 6.

Craft Port

The Access-T is equipped with a Craft Port, which is intended for the temporary connection of a terminal for use by a craft person.

The Craft Port (labeled **CRAFT PORT**) supports only direct connections to a VT100 or TV 925 terminal. Also, the Craft Port does not require a password, enabling you to perform first-time configurations and troubleshooting easily. Communication parameters are fixed at 8 data bits, 1 stop bit, and no parity. A pushbutton accessible through the front panel (rear panel on the Access-T 1500 chassis) lets you select the terminal type and initiate automatic baud rate detection. See Chapter 6 for details.

Chain Port

Up to 30 Access-T DSU/CSUs can share a single supervisory connection to an NMS or terminal via the Chain Port. The Chain Port (labeled **CHAIN PORT** on the rear panel) conforms to RS485 and operates in half-duplex mode; connection is made via a pair of male Molex connector pins for input and output.

Access-T Series 100, 200, 400, and 1500 units and Access-T 01/02 units can all operate together on the same chain. When using the Access-T 1500, you must remember that ***each module*** counts as one of the 30 chained units. Therefore, a fully-loaded Access-T 1500 chassis is equivalent to 15 chained units.

Figure 2-2 shows some typical Chain Port implementations. Figure 2-2A shows a chain of Access-T Series 100, 200, and 400 units, in any combination. Figure 2-2B shows a chain between two fully loaded Access-T 1500 chassis. Finally, Figure 2-2C shows a mixed chaining configuration.

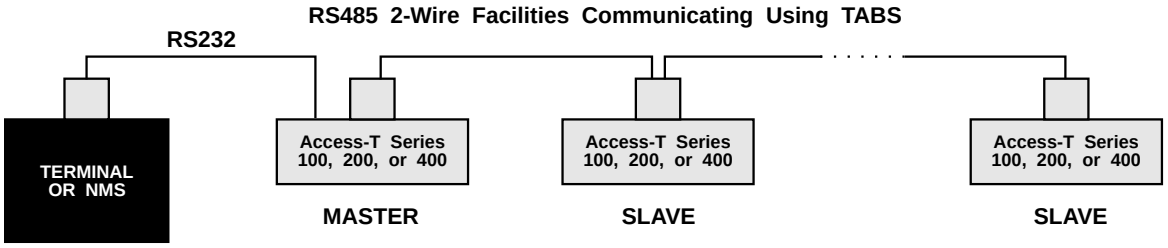
The Chain Port supports a TABS (NMS) interface at 9600 baud. Access-T is equipped with special chaining connectors that can be unplugged from a unit in the chain without breaking the chain or interrupting the operation of other Access-Ts. More detailed applications and Chain Port connections are illustrated in Chapters 3 and 8.

Note: The Chain Port does not support modem connections.

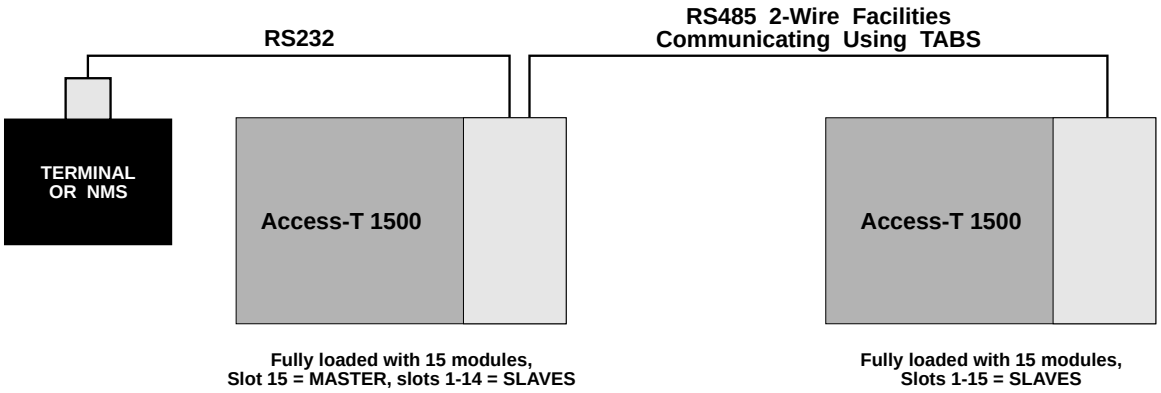
The Chain Port can also be used to connect an NMS directly to a master Access-T or to a chain of slave Access-Ts. In the latter case, the NMS must poll the slaves; there will be no master Access-T, and no alarm dialout. For these unusual applications, a Larscom CP01 Chain Port Expander can be used to convert the RS485 port to RS232. See Appendix C for more information on the Larscom CP01.

Expander Port

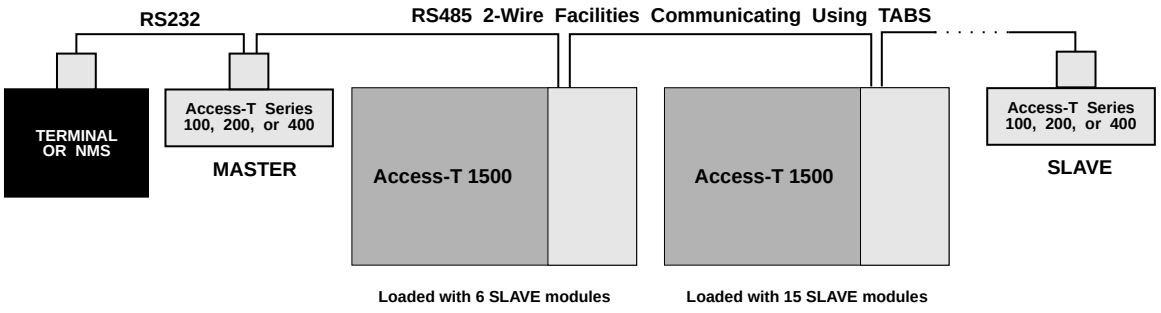
The Expander Port (**EXPANDER PORT** on the rear panel of the Access-T Series 100, 200, and 400) is not yet supported.



A. Interconnecting Access-T 100, 200, and/or 400 Units Using the RS485 Chain Port



B. Interconnecting Access-T 1500 Units Using the RS485 Chain Port



C. Interconnecting Access-T 100, 200, 400, and 1500 Units Using the RS485 Chain Port

Figure 2-2. Typical Access-T Chaining Configurations

DTE Interfaces

Access-T provides up to four DTE ports for equipment operating at T1 subrates. Each DTE port can be configured for the following parameters:

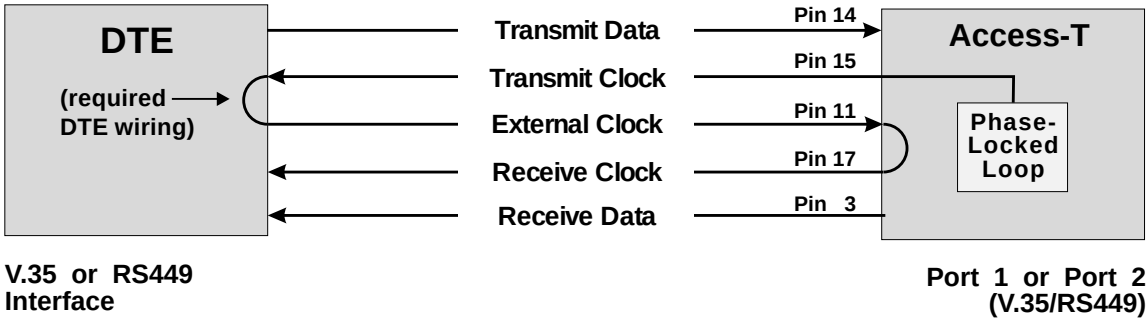
- **DTE interface:** V.35 or RS449.
- **Data rate:** Nx56 or Nx64 kbps, where N equals 1 to 24.
- **Data and clock signals:** Normal or inverted.
- **RTS:** Normally active or permanently asserted.
- **Terminal timing:** Prevents data loss due to phase shifts caused by long DTE cables. As in normal timing, Access-T supplies both the transmit clock and the receive clock to the DTE. However, when Terminal Timing is enabled, Access-T clocks data in using the External Clock, as shown in Figure 2-3.

Each port employs a female DB25 connector supporting the EIA 530 standard. Larscom offers adapter cables to convert to DC37 (RS449) or MS34 (V.35) connectors.

The pulse density required for T1 transmissions can be assured in several ways:

- Transmitting data at a rate of Nx56. (The least significant bit will always be a ONE.)
- Using B8ZS line coding.
- Inverting HDLC-formatted data.
- Mapping data transmitted at a rate of Nx64 into alternate DS0s (with idle code in the intervening DS0s).
- Forcing bit 7 (the next-to-least-significant bit) to be a ONE in any DS0 with eight ZEROS. (The data rate must be Nx64.)

If the data from the DTE meets network pulse density requirements, the Nx64 DTE data rate may be used. This data rate provides clear channel operation—i.e., the full bandwidth is used for data—unless bit 7 stuffing is selected.



In terminal timing mode, Transmit Data is clocked into the Access-T by the External Clock. Receive Data is clocked into the DTE by the Receive Clock.

Note that Access-T removes the Receive Clock if the External Clock is inactive.

Figure 2-3. Terminal Timing Mode

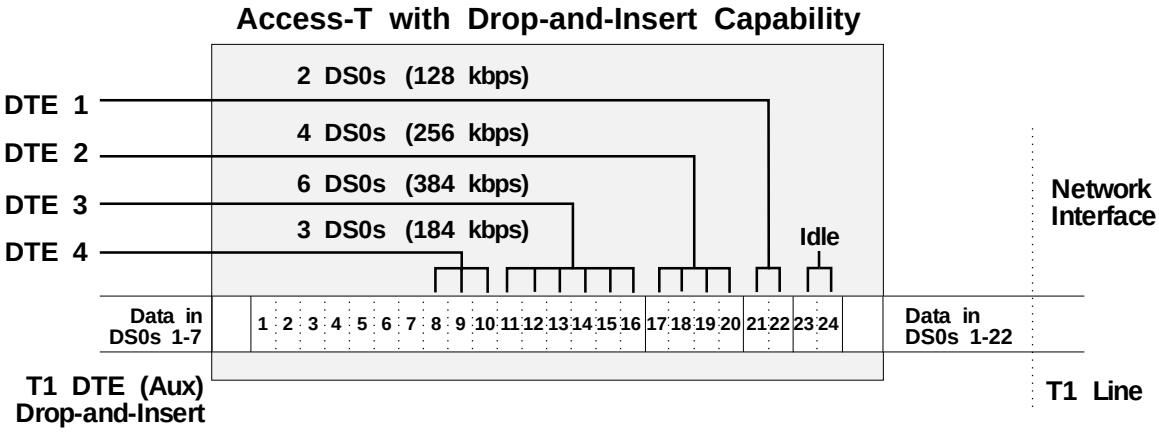


Figure 2-4. T1 Drop-and-Insert

Auxiliary T1 DTE Interface (Drop-and-Insert)

Some Access-T models include an auxiliary port for a T1 DTE. (Table 2-B identifies the models having an auxiliary T1 DTE interface.) Unused DS0s in the T1 DTE signal can be dropped, and signals from the other DTE ports can be inserted in their place (hence the term "drop-and-insert"). Figure 2-4 shows how the drop-and-insert function works.

The auxiliary T1 DTE interface supports any equipment providing a D4- or ESF-framed T1 signal with data channellized in DS0s.

> **Note:** The auxiliary port does not support a hardwired loopback or a back-to-back connection with another Access-T auxiliary port.

The auxiliary T1 DTE port can be configured for the following parameters:

- **Format:** D4 or ESF.
- **Line coding:** AMI or B8ZS.
- **Equalization (Distance from DTE to Access-T):** Up to 655 feet.
- **Pulse stuffing:** Forcing bit 7 always to be a ONE (toward the network only).
- **Alarm Indication Signal:** Generation of AIS to the line (or Aux port) when LOS or LOF occurs at the auxiliary port (or line). *At least one DS0 must be assigned to the aux port for AIS to be generated.*
- **Yellow transcoding:** Whether Yellow Signal is transcoded from a D4 auxiliary port to an ESF line or vice versa. *At least one DS0 must be assigned to the aux port for AIS to be generated.*

The auxiliary port physical interface is as follows:

Access-T 1-Port, 2-Port, and 4-Port units employ a female DA15 connector. An adapter is available to convert to an RJ48 jack.

Access-T 1500 units employ two 50-pin male RJ48H connectors. Larscom offers an accessory kit that consists of two standard 50-pin female AMP CHAMP connectors. You must connect the leads for each Aux connection to support your cabling configuration. *Refer to Chapter 3 and Appendix E for more information on Aux port connectors and accessory kits.*

Network Interface

On the network side, Access-T provides a T1 signal composed of the multiplexed DTE signals. The interface meets all requiments for a T1 CSU in D4 and ESF formats.

The line interface can be configured for the following parameters:

- **Format:** D4 or ESF.
- **Line coding:** AMI or B8ZS.
- **Line build-out:** 0, -7.5, or -15 dB.
- **Yellow Signal:** Whether Access-T transmits Yellow Signal to the network when it declares Loss of Sync.
- **In-band codes:** Whether Access-T responds to or ignores in-band loopback codes.
- **Data link ID:** Whether Access-T responds to FDL commands as a CSU or a DTE.
- **T1.403:** Whether Access-T supports the ANSI T1.403 standard for ESF.
- **Bit 7 stuffing:** Enabled/disabled on a per bundle basis.

The line physical interface is as follows:

> ***Access-T 1-Port, 2-Port, and 4-Port units*** employ a female DA15 connector. An adapter is available to convert to an RJ48 jack.
>
> ***Access-T 1500 units*** employ two 50-pin female RJ48H connectors. Each connector provides network access for specific Access-T modules (slot positions). Larscom provides a separate RJ48C connector for each T1 line interface via a Patch Converter Panel accessory kit, as described in Appendix E.

In ESF mode, Access-T responds to standard FDL commands (as described in AT&T Publication 54016, Issue 2, September 1989), as well as CSU-type and Larscom-proprietary FDL commands. In addition, Access-T can transmit one-second performance reports to the network as specified in the ANSI T1.403 standard for ESF.

DS0 Bundling

DS0s from the DTE can be "bundled" as desired. In other words, each 56 or 64 kbps time slot from a DTE can be assigned to any DS0 from 1 to 24 on the network. For example, if DTE 1 is configured for 224 kbps (4 x 56), any four DS0s on the network can be assigned to DTE 1. This allows you to bundle DTE data in consecutive or alternate DS0s, or in any other pattern, as required for a particular FT1 service or application. A standard idle code (All ONES) will be transmitted in unused DS0s. An example of DS0 bundling is illustrated in Figure 2-5.

> **Note:** A signal pattern of 175 ± 75 consecutive ZEROS causes Loss of Signal declaration. If a DTE port rate is set to Nx64 kbps and AMI line coding is used, consecutive DS0s should not be mapped to that DTE port. This precaution reduces the possibility of excessive ZERO transmissions.

A DS0 bundling arrangement is called a "map". Access-T allows you to create two different DS0 maps. Switching between the two maps is performed on command or automatically.

In point-to-point applications, the currently-active map can be transmitted via the ESF data link to the far-end Access-T. This allows the near-end Access-T to control the DS0 map at the far-end Access-T. Thus, rebundling does not require a modem connection or visit to the far-end Access-T.

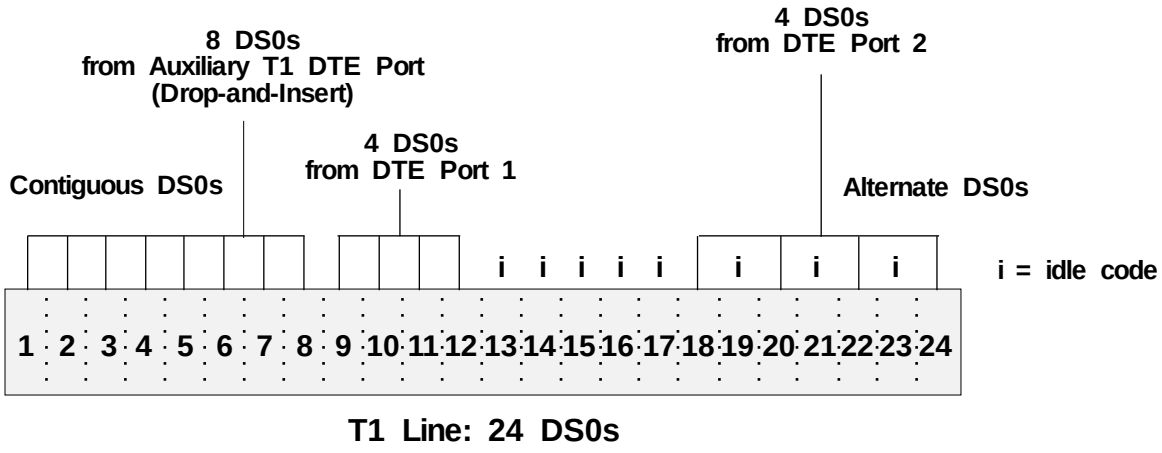


Figure 2-5. DS0 Bundling

Performance Monitoring

Access-T maintains several 24-hour registers, including those required by AT&T Publication 54016. Via the Access-T command interfaces, you can examine the register contents for the following performance parameters:

- Errored Second (ES).
- Severely Errored Second (SES).
- Bursty Errored Second (BES).
- Unavailable Seconds (UAS).
- Loss of Frame Count (LOFC).
- Bipolar Violations (BPV).
- ESF Errors.

In D4 mode, Access-T uses BPVs instead of CRC errors to derive Errored Seconds (1 BPV in a second), Bursty Errored Seconds (2 to 1543 BPVs in a second), and Severely Errored Seconds (1544 or more BPVs in a second).

For all of the above parameters except BPVs and ESF errors, Access-T maintains and reports separate user and telco registers for the network (line) interface, plus a full set of registers for the auxiliary T1 DTE interface. (There is no telco BPV register, per AT&T Publication 54016.) Separate user and telco registers for the line interface allow the user and the telco to clear registers without affecting each other.

> **Note:** Access-T and other DSU/CSUs do not perform controlled slips. Therefore, Access-T does not count Controlled Slip Seconds (CSS). Access-T can display CSS register contents received from the far end via the FDL; however, the counts will usually be 0.

Other performance reports available via the Access-T command interfaces include:

- A statistical summary of 24-hour registers, excluding BPVs, over the last hour.
- A count of ESF errors.
- A line availability percentage—i.e., the percentage of monitored seconds which are not UAS (based on the user UAS register).
- The alarm status for each node in a chain (master only).
- The polling status (whether a unit is responding or not) for each node in a chain (master only).

In ESF mode, Access-T can obtain telco register contents from the far-end Access-T (or other ESF device) via the FDL. These register contents can be reported via the command interfaces.

Alarms

Access-T allows the operator to enable alarm generation individually for up to 23 conditions. These alarm conditions, defined in the following sections, can be divided into three groups:

- Line/Aux.
- Chassis.
- DTE.

The Terminal Interface provides several screen displays giving the history and state of all alarms. This alarm history is cleared at power-up as well as on command.

When using a modem, Access-T provides automatic dialout to report changes-of-state for user-specified alarms as they occur. Alarm reporting can occur, via the Supervisory Port, in three different ways:

- **Terminal Interface Mode:** Access-T sends a one-line **ALERT** banner (identifying the Access-T) to an ASCII terminal. The operator must then request an alarm history to identify the particular alarm.
- **TABS (Unsolicited) Mode:** Access-T sends a complete alarm listing report in a modified TABS format to a network management system (NMS). The NMS must be programmed to interpret the report, which is defined in the *Access-T TABS Interface Manual, ACST-0731-00x.*
- **SLIP/PPP Trap Mode**: Access-T sends a trap message to an SNMP-based manager. The SNMP manager must have the proper MIBs compiled to interpret the message to be logged.

The alarm dialout reporting method is determined by the operator via the menu options as described in Chapter 6.

Special alarm functions when Access-T is master of an Access-T chain are described in Chapter 8.

Line/Aux Alarms

Alarms for the Line and Aux ports are:

- **Bipolar Violations (BPVS):** A bipolar violation occurs when consecutive ONES pulses have the same polarity. This alarm is registered at the Access-T when the BPV threshold, defined by the operator, is exceeded. The threshold is a user-specified BPV rate over a 15-minute period. The **BPVS** alarm ends when a 15-minute interval has an error rate better than the specified threshold.
- **Receiving Yellow Signal (YELLOW):** Access-T is receiving Yellow Signal (indicating that far-end equipment has declared Loss of Sync).
- **Receiving Alarm Indication Signal (AIS):** Access-T is receiving unframed All ONES (AIS, also known as Blue Signal), generally indicating a T1 DTE loss of signal at the far end).
- **Unavailable Signal State (USS):** Access-T declares an Unavailable Signal State after 10 consecutive seconds of Severely Errored Seconds (SES). The **USS** alarm ends after 10 consecutive seconds which are not SES.
- **Loss of Signal (SIGNAL LOSS):** Access-T declares Loss of Signal if it receives 175 ± 75 consecutive ZEROS. A Loss of Signal alarm ends when a single ONE is detected.
- **Errored Seconds (ES):** An ES alarm occurs when the user-specified ES threshold is exceeded. The threshold is a user-specified number of Errored Seconds (1 to 399) over a user-specified period of 1 to 15 minutes.
- **Loopback Override (LOOP):** Access-T is in loopback and receives an overriding loopback command from the network (*LINE only*).
- **Loss of Sync (SYNC LOSS):** Access-T declares Loss of Sync if it loses framing sync (2 out of 5 consecutive framing bits in error) on the received T1 signal for at least 2.5 seconds. Access-T transmits Yellow Signal to the network during Loss of Sync (unless Yellow Signal generation is disabled). Resynchronization (which requires detection of a valid 10-bit framing pattern) takes under 10 milliseconds once a properly framed signal is received. A Loss of Sync alarm ends when resync occurs.

Chassis Alarms

Chassis alarms pertain to failures that affect the overall operation of Access-T. There are three chassis alarms:

- **Loss of Master Clock (MSTR CLK LOSS):** Access-T has lost its master clock signal. *Access-T cannot detect master clock loss when the clock source is the Aux port; thus Access-Twill not declare Loss of Clock in this case.*
- **Internal Communication Failure (INT COMM LOSS):** Access-T cannot communicate between the lower and upper boards (*4-port unit only*).
- **Loss of Network Interface Module (NIM LOSS A or B): NIM LOSS A** indicates that the NIM software is not responding. **NIM LOSS B** refers to NIM loss on the upper board (*4-port unit only*).

DTE Alarms

The DTE alarms (**PORT *n* LOSS)** indicate that Access-T has lost the Request to Send (RTS) signal input at DTE Port ***n***, where ***n*** = 1 to 4.

Loopbacks

To help you quickly isolate problems within the network, Access-T provides several basic loopback modes illustrated in Figure 2-6. These loopbacks assist in diagnosing problems that occur along the various portions of the end-to-end communication links.

The loopbacks are divided into local and remote groups. Remote loopbacks are loopbacks commanded to the far-end through the FDL or in-band codes. Each remote loopback corresponds to a local loopback. Note that all the remote loopbacks loop back the signal (as indicated by the curved arrow in the figure) toward the local Access-T.

To understand the loopbacks, it is necessary to think of Access-T as functionally divided into two halves: the DTE side and the line side. For the most part, the names of the loopbacks consist of two parts: the functional position with Access-T and the direction in which the signal is looped (toward the DTE or toward the line). For example, a CS DTE loopback is positioned in the DTE side of the Access-T and the received signal from the DTE is looped back (redirected) toward the DTE.

All Access-T loopbacks are bridged, which means that the normal signal path is not broken. Therefore, when a CS-DTE loopback is active, the signal from the DTE continues toward the far-end Access-T, as well as being looped back toward the local DTE. Naturally, the signal path toward the local DTE is broken at the point where the looped signal is sent back to the DTE. This prevents the signal from the far-end Access-T from conflicting with the looped signal.

Loopback Verification

To test whether the far-end Access-T (or other device) is looped back to the network, Access-T provides a "remote loop verify" command. This command can test for a loopback in the full T1 bandwidth, in the DS0s assigned to a selected DTE, line, or in idle time slots. Testing in the idle channel prevents the interruption of data during the test. Automatic verification after transmission of a loopback command to the far end can be enabled if desired.

> **Note:** Verification of far-end CS Line loopbacks require that the looped DTE channel be configured for Nx64 data.

Each loopback is described more completely in the following sections.

Refer to Chapter 7 for instructions on establishing and removing loopbacks.

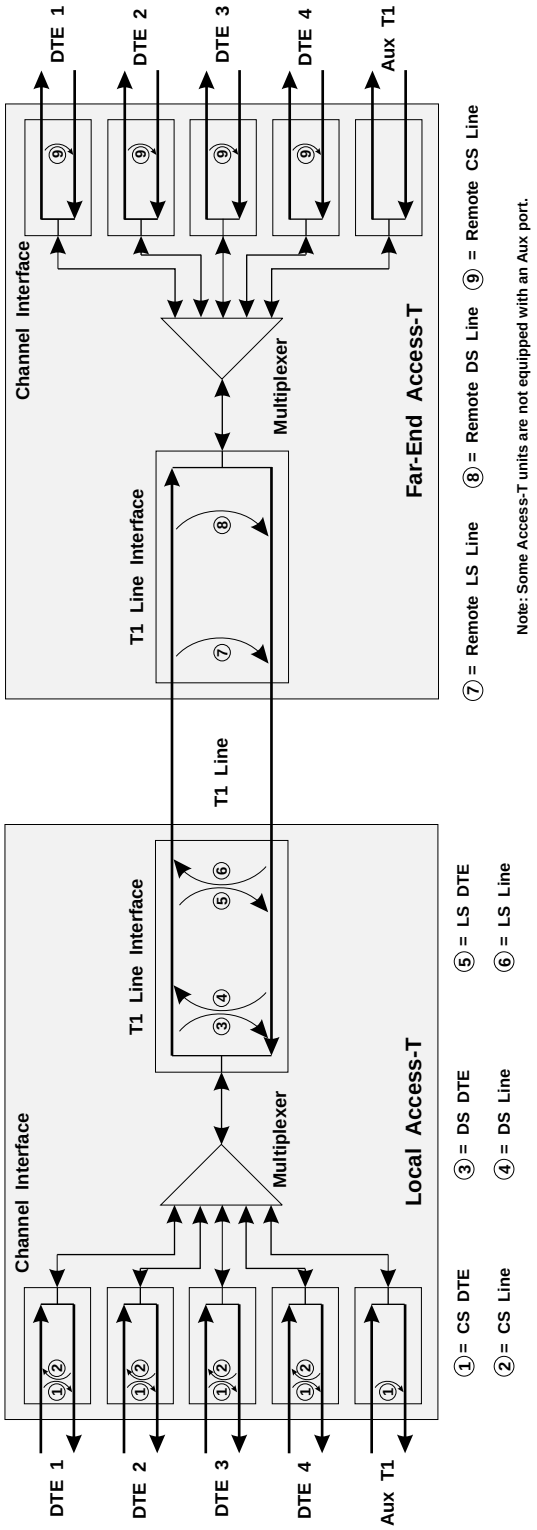


Figure 2-6. Access-T Loopback Paths

DTE Channel Loopbacks

This section describes the loopbacks available at the individual DTE channels. ***The circled number corresponds to the loopback path illustrated in Figure 2-6.***

Channel-Side DTE (CS DTE) Loopback ①

When a CS DTE loopback is in effect, the signal from the DTE is looped back to the DTE at the Channel Interface connector. Since the looped signal does not pass through Access-T, this signal is useful in testing the operation and connection of the DTE.

When a CS DTE loopback is activated, the transmit clock replaces the receive clock. Then, when the loopback is removed, the receive clock switches back to its original source.

Channel-Side Line (CS Line) Loopback ②

When a CS Line loopback is in effect, the signal from the line is looped back at the Channel Interface connector. Since the DTE data includes all the mapped time slots, CS Line loopbacks provide end-to-end testing which includes the line-side functions of the Access-T.

When a CS Line loopback is in effect, the receive DTE data and clock replace the transmit DTE data and clock. When the loopback is released, the transmit clock switches back to its original source.

CS Line loopbacks can be activated either locally or remotely.

Line Loopbacks

Various loopbacks of the T1 circuitry can be controlled directly at the near-end (local) Access-T or indirectly, via in-band or data link codes, at the far-end (remote) Access-T. The loopback commands sent to the far end are standard and thus will control loopbacks at any CSU or DSU supporting standard in-band or data link loopback commands.

Data-Side DTE (DS DTE) Loopback ③

When a DS DTE loopback is in effect, the T1 payload is redirected toward the DTE just before entering the network. DS DTE loopbacks are useful for testing the local Access-T's multiplexed data.

Data-Side Line (DS Line) Loopback ④

When a DS Line loopback is in effect, the T1 payload is re-framed and transmitted to the network using the recovered clock. (DS Line is often referred to as the payload loopback.) DS Line loopbacks provide for end-to-end testing, including Access-T's line interface.

DS Line loopbacks are activated by user request or an FDL request from the far-end.

> **Note:** When a DS Line loopback is established (or removed), CS DTE loopbacks are also established (or removed).

Line-Side DTE (LS DTE) Loopback ⑤

When a LS DTE loopback is in effect, Access-T loops the line side of Access-T to the DTE. Since the LS DTE loopback is implemented at the T1 interface, LS DTE loopbacks are useful in distinguishing a Access-T failure from a line failure. During LS DTE loopbacks, any data from the line is ignored by Access-T.

> **Note:** During LS DTE loopback, Access-T must be connected to an T1 line or Access-T's T1 line output must be terminated with 100 ohms. If there is no closed connection or termination at the line interface during LS DTE Loopback, spurious errors will be introduced in the loopback circuit.

Line-Side Line (LS Line) Loopbacks ⑥

When an LS Line loopback is in effect, Access-T loops the line signal back to the line, and the data is propagated to the DTEs. LS Line loopbacks are useful for testing end-to-end communications, exclusive of the Access-T at the looped end. During LS Line loopbacks, any data from the DTE is ignored by Access-T

LS Line loopbacks can be initiated by the local user or by the detection of an in-band code.

Remote Loopbacks

Remote loopbacks are commanded to the far-end through the FDL or in-band codes. Each remote loopback corresponds to a local loopback. Loopbacks commanded via the FDL are not available in the D4 framing mode.

Remote Line Loopback ⑦

The Remote Line loopback corresponds to the LS Line loopback at the local Access-T. These are separate in-band codes to actuate and release the Remote Line loopback.

Remote Payload Loopback ⑧

The Remote Payload loopback corresponds to the DS Line loopback at the local Access-T.

Remote CS-Line Loopback (V.54) ⑨

The Remote CS Line loopback corresponds to the CS Line loopback at the local Access-T. The DTE in-band loopback is based on the T1E1 committee and the CCITT V.54 description.

The loop or unloop code is transmitted and received in the time slot bundle assigned to the port to be looped back. Transmission of loop codes on a given DTE port does not affect the operation of the rest of the bandwidth. Only the data bits are used. If the bundle is configured for Nx56, only seven bits are scanned for the code; if Nx64 is used, all eight bits are scanned.

The loop or unloop code is sent for approximately 2.5 seconds, followed by a two-second All ONES signal. When a Remote CS Line loopback is set, CTS is de-asserted at the far end.

Disabling In-Band Codes

Access-T allows you to enable or disable the recognition of in-band line loopback codes. In both D4 and ESF modes, specific patterns in the T1 data bits are used to establish and clear LS Line Loopback. If both Access-T and an external CSU respond to in-band loopback commands, confusing situations can result. For this reason, Access-T allows disabling of in-band loopback code recognition as described in Chapter 7.

Test Pattern Monitoring

Access-T provides a framed QRSS test pattern for testing looped or end-to-end circuits. QRSS (Quasi-Random Signal Source) is a repeating pattern of 2^{20}-1 (1,048,575) bits which simulates "live" data.

The QRSS test pattern can be transmitted over the entire T1 bandwidth, mapped into the DS0s assigned to a specified DTE port or aux port, or mapped into all idle DS0s.

Whenever it is transmitting QRSS, Access-T will monitor the received DS0s for the QRSS pattern, indicating whether pattern synchronization has been achieved and displaying the number of bit errors detected during pattern sync. If no loopback is in effect, testing in both directions can be accomplished by transmitting QRSS in the same DS0s from the Access-T at each end of the T1 link.

When used with a CS Line Loopback at the far-end Access-T, channelized QRSS transmission allows testing of a circuit without interrupting data flow in the DS0s which are not looped back or carrying QRSS. For example, the DTE Port 1 channel could be looped back and tested without affecting data in the other DTE Port channels.

> **Note:** Within a DS0, the QRSS test signal always uses the full 64 kbps (8 bits per channel per frame).

Service Ordering

When ordering T1 service, provide the telephone company with the information given in Table 2-A.

Models and Specifications

Access-T model numbers and specifications are provided in Table 2-B.

Table 2-A. Service Ordering Information

Service Code	**6.0N**
Facility Interface Code	**04DU9-B** for 1.544 Mbps, D4 **04DU9-C** for 1.544 Mbps, ESF **04DU9-S** for 1.544 Mbps, ESF with B8ZS
Network Interface Jack	**RJ48C**, **RJ48X**, or **DB15**
CSA File Number (Canada)	**LR 98938**
CSA Standard Connecting Arrangement Code	**CA31A**
FCC Registration Number	**GRPUSA-73975-DE-N** (Series 100, 200, and 400) **GRPUSA-75029-DE-N** (Series 1500)
UL File Number (Recognized)	**E112000**
UL File Number (Listed)	**E162950**

Table 2-B. Specifications

Model Numbers	
ACST-101	Chassis with 1 DTE Port, ac power
ACST-102	Chassis with 1 DTE Port, dc power
ACST-111	Chassis with 1 DTE Port, with drop-and-insert, ac power
ACST-112	Chassis with 1 DTE Port, with drop-and-insert, dc power
ACST-201	Chassis with 2 DTE Ports, ac power
ACST-202	Chassis with 2 DTE Ports, dc power
ACST-211	Chassis with 2 DTE Ports, with drop-and-insert, ac power
ACST-212	Chassis with 2 DTE Ports, with drop-and-insert, dc power
ACST-401	Chassis with 4 DTE Ports, ac power
ACST-402	Chassis with 4 DTE Ports, dc power
ACST-411	Chassis with 4 DTE Ports, with drop-and-insert, ac power
ACST-412	Chassis with 4 DTE Ports, with drop-and-insert, dc power
ACST-1500B-xxxx	Chassis for up to 15 Access-T DSU/CSU modules; up to 2 ac and/or dc power supplies
087-2101-001-xx	Access-T 1500 module, 2 DTE ports, with drop-and-insert
PWR-PS01	AC power supply
PWR-PS03	DC power supply
A87-AK01-001	Accessory Kit, 19-inch mounting brackets for Access-T 1500 chassis
A87-AK02-001	Accessory Kit, 23-inch mounting brackets for Access-T 1500 chassis
T1 (Aux) Interface	
Line Rate	1.544 Mbps ±50 ppm
Line Codes	Bipolar Return to Zero: Alternate Mark Inversion (AMI) or B8ZS
Framing Options	ESF (per AT&T Publication 54016, Issue 2, and ANSI T1.403) or D4
Pulse Characteristics	Per AT&T Publication 62411
Surge Protection	1000 V pulse per AT&T PUB 43601; cross-voltage protection per UL 1459 (Issue 2) using self-healing poly switches
Input/Output Levels	Per AT&T Publication 62411
CSU Line Build-Out	0 dB, -7.5 dB, or -15 dB
Distance to T1 DTE	Up to 655 feet
Connector	DA15 male (Series 100, 200, and 400); 50-pin, RJ48H female (Series 1500)
DTE Data Ports	
Interface Types	Up to four ports: CCITT V.35 and/or EIA RS449 (compatible), DB25 connectors; adapters for MS34 (V.35) and DC37 (RS449) connectors
Data Rates	Nx56 or Nx64 kbps (N = 1 to 24)
Clock Source	Internal, DTE Ports, Line, Station, or Aux
Station Clock Input	TTL levels; 50 ohms impedance
Channel Multiplexing	
Time Slot Options	User-mapped in any pattern; supports contiguous or alternate DS0s.
Bundling	1 to 24 DS0s
Idle Pattern	All ONES (per AT&T Publication 54019)

Table 2-B. Specifications (cont'd)

Supervisory Access	
Craft/Supervisory Port	
100, 200, and 400 units	RS232 ASCII, 600 to 9600 baud, TABS; DE9 connector
Access-T 1500	RS232 ASCII, 600 to 9600 baud, or TABS; DB25 connector
Chain Port	RS485, to link up to 30 Access-Ts sharing a single TABS connection (9600 baud only); CP01 adapter for RS232
SNMP Interface	Superviory port may be configured as a SLIP or PPP interface for integral SNMP support
Diagnostics and Monitoring	
Self-Test	System
Test Pattern	Framed QRSS, by DTE Port or T1
Loopbacks	Per AT&T Publication 62411, plus DTE and aggregate loopbacks
Performance Registers	Per AT&T Publication 54016 (1989), plus additional 24-hour registers
T1 Line	Monitored for red, yellow, and blue (AIS) alarms
DTE Ports	Monitored for loss of RTS, loss of clock (if port is master source)
Alarm Reporting	Auto dialout (ASCII or TABS-like packet); SNMP traps
Electrical and Environmental	
AC Power	
100, 200, and 400 Units	Standard 115 V ac, Standard 230 V ac, 0.5 A (1-Port / 2-port) or 1 A (4-port); 50 to 60 Hz Fuse: 1 A (1-Port / 2-port), 2 A (4-port) Fast-Blo, 5 AG
1500 Units	Standard 115 V ac, 2 A; Fuse: 5 A, 250 V
DC Power	
100, 200, and 400 Units	-48 V dc office battery (-43 to 53 V dc), 1 A (1-Port / 2-port) or 2 A (4-port)
1500 Units	-48 V dc office battery (-43 to 53 V dc); Fuse: 1 A (1-Port / 2-port), 2 A (4-port) Slo-Blo, 3 AG; Fuse: 7 A, 125 V
Access-T 1500 Power Consumption	Full chassis: 172 Watts, 587 BTU/hr Single module: 9.7 Watts, 33.1 BTU/hr
Dimensions, Mounting	
Access-T 100, 200 and 400	1.75 x 17 x 12 inches (1-Port / 2-port) or 3.5 x 17 x 12 inches (4-port); Brackets for 19- or 23-inch rack, or table-top
Access-T 1500	10.5 x 17 x 18 inches (H x W x D); Brackets for 19- or 23-inch rack
Temperature, Humidity	0^{o} to 50^{o} C; Up to 95% relative humidity, noncondensing
Regulatory Compliance	Meets FCC requirements, Parts 15 and 68 FCC registration number: **GRPUSA-73975-DE-N** (Access-T Series 100, 200, and 400); **GRPUSA-75029-DE-N** (Access-T 1500)

3 Installation

This chapter describes Access-T wiring connections and equipment mounting. Most system configuration is performed through the Craft, Supervisory, and/or Chain Ports as described in Chapters 6 and 8. However, Access-T also includes some user-configurable switches, which are defined later in this chapter. ***When necessary, different installation procedures are given for the different Access-T products.***

Mixing Software Versions in Access-T Chains

The 3B version of software for Access-T includes features not available in previous versions. Therefore, if you have a chain of Access-Ts with multiple versions of software running concurrently, be aware that these new features will not be supported on Access-Ts with the older software.

Furthermore, this new software includes support for the new single-port Access-T hardware. If you are planning to install a single-port Access-T onto an existing chain with a 2-port or 4-port master (running pre-3B software), do not attempt to configure the single-port unit via the Chain Port. *The older software does not recognize the new hardware option.*

To configure a single-port Access-T to operate on a chain, you can do one of the following:

- Download the 2-port or 4-port master with the new 3B software. Then, you can configure your 1-port slave via the Chain Port.
- Configure your single-port unit locally (not over the Chain Port) and then install it as a slave onto the chain.
- Configure your single-port unit as the master of the chain.

Access-T Models

Access-T is available in several different hardware configurations:

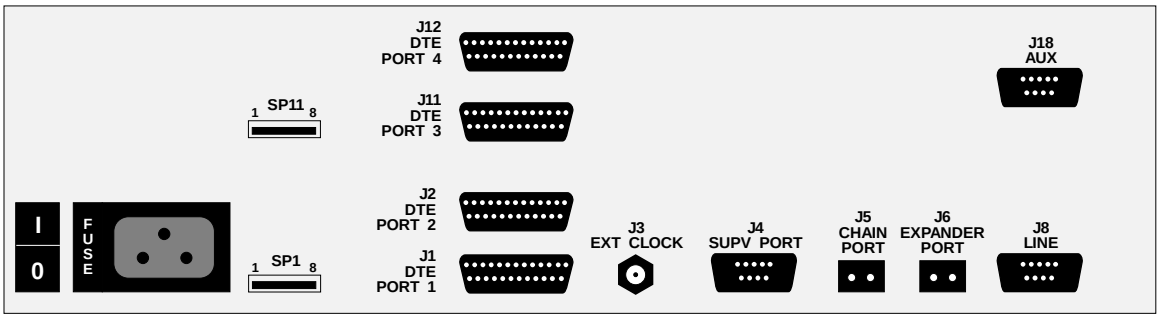
- **Access-T 100:** 1 DTE Port
  - ac or dc power
  - with or without Aux (drop-and-insert) port
- **Access-T 200:** 2 DTE Ports
  - ac or dc power
  - with or without Aux (drop-and-insert) port
- **Access-T 400:** 4 DTE Ports
  - ac or dc power
  - with or without Aux (drop-and-insert) port
- **Access-T 1500:** Shelf-based DSU/CSU system.

Figure 3-1 illustrates the rear-panel for each of the 200 and 400 models. *(The rear panel for the Access-T 100 is the same as the Access-T 200, but with only 1 DTE port.)*

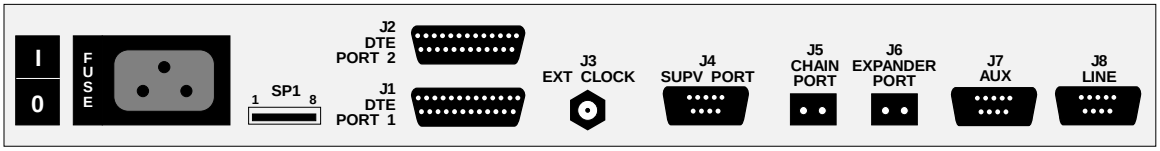
The Access-T 1500 is a DSU/CSU system capable of housing up to 15 plug-in Access-T modules in one chassis. Each Access-T 1500 module has 2 DTE ports and an Aux port. The Access-T 1500 chassis can be equipped with 1 or 2 power supplies. Power supplies may be ac or dc, or one of each. When two power supplies are installed into the Access-T 1500 chassis, one supply acts as a redundant power source in case the primary power source is lost or removed.

Figure 3-2 illustrates the Access-T 1500 rear-panel.

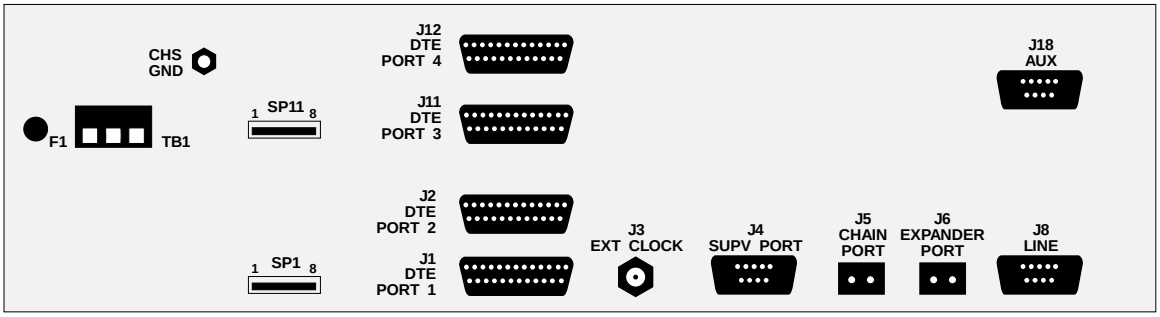
Table 2-B lists all available Access-T units by model number.



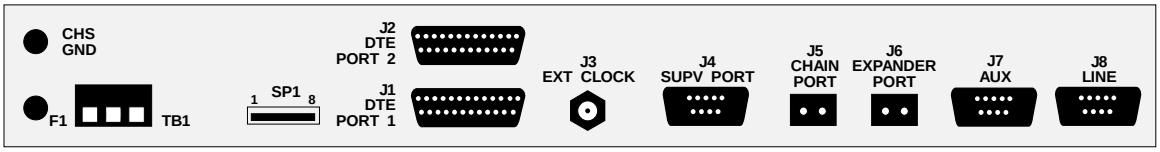
A. Series 400, AC Power



B. Series 200, AC Power



C. Series 400, DC Power



D. Series 200, DC Power

Figure 3-1. Access-T Series 200 and 400 Units, Rear Panel

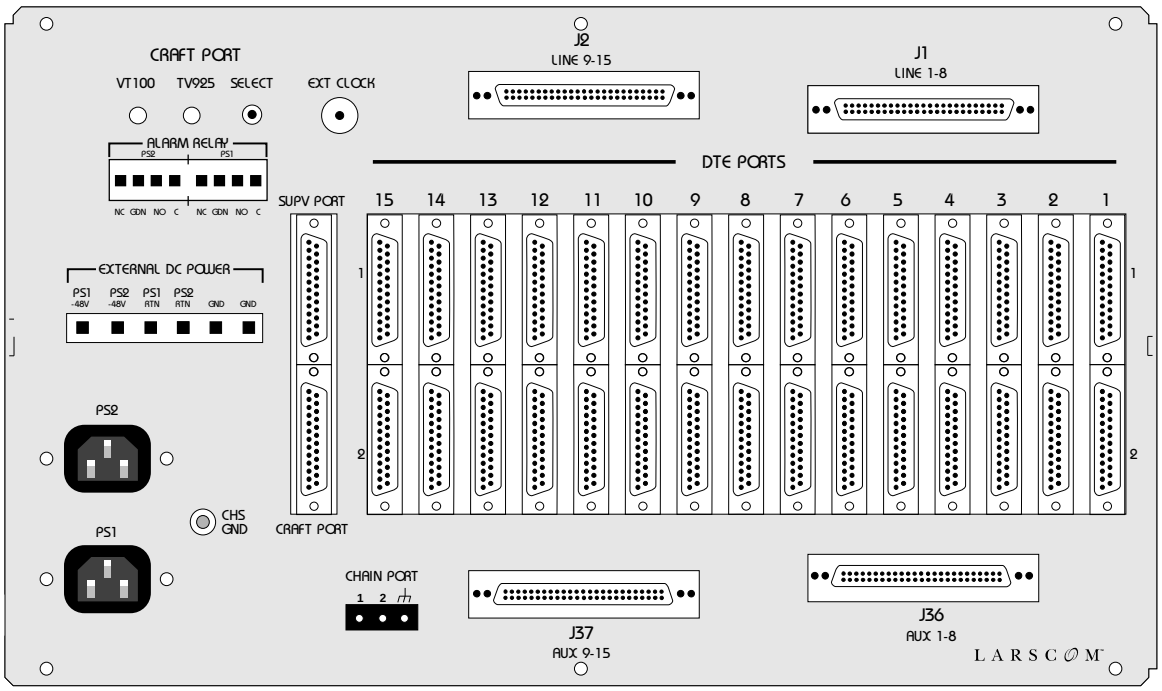


Figure 3-2. Access-T 1500 Chassis, Rear Panel

Receiving, Unpacking, and Inspection

Upon receipt of equipment, examine the shipping containers. If signs of damage or rough handling are evident, have an agent of the carrier present when the equipment is unpacked.

Unpack the equipment carefully. Inspect it for scratches, dents, cracks, etc. If the equipment is damaged, save all packing materials and notify both Larscom Incorporated and the carrier immediately.

Installation and Site Requirements

Larscom recommends that the Access-T 100/200/400 units as well as the Access-T 1500 units be installed in a restricted access area, such as a telecommunications equipment room, and that the installation be performed by trained installation engineers.

These units are designed and tested to operate reliably at an ambient temperature range of 0 to 50 °C (32 to 122 °F). To maintain this range, certain installation requirements need to be considered:

- Air temperature surrounding the equipment must remain within the specified range.
- Air flow around the equipment, particularly rack-mounted units, must be sufficient to maintain proper operating temperatures.

If you are in doubt about the site temperature, measurements should be taken. If measured temperatures fall outside the defined ambient temperature range, steps must be taken to bring the temperature within the defined range.

Storage temperature for the units must remain between -20 and 70 °C (-4 to 158 °F).

Mounting

Brackets are provided for mounting Access-T in a standard 19-inch or 23-inch equipment rack. Access-T can also be wall-mounted or placed on a table top.

To rack-mount Access-T:

1. Determine the desired location. Different Access-T models require different vertical clearance. A single-height, Series 100 or 200 unit requires 1.75 vertical inches of rack space. A double-height, Series 400 unit requires 3.5 vertical inches of rack space. The Access-T 1500 chassis requires 10.5 vertical inches of rack space. **To prevent overheating, Access-T 1500 requires a minimum of 1.75 vertical inches of space above and below the unit.**
2. Access-T includes a pair of universal mounting ears which support both 19-inch and 23-inch equipment racks. Three sets of holes allow Access-T to project from the rack by various amounts. Using the hardware provided, install the mounting ears on the sides of Access-T in the appropriate orientation for the rack width and desired projection.
3. Mount Access-T securely in the rack.

CAUTION 1: Ensure that sufficient airflow exists around the Access-T chassis. Overheating of the Access-T unit may cause corruption of data or other malfunctions.

CAUTION 2: Ensure proper strain relief on all connections to Access-T, and on DTE and Line connections in particular.

Removing and Inserting Access-T 1500 Modules

Access-T modules can be removed and inserted without disconnecting any rear-panel wiring connections or powering down the unit. To remove a module, loosen the thumbscrew at the top of the module; then grasp the extractor handle at the bottom of the module and pull. To insert the module, carefully align it with the card guides in the chassis, slide it all the way into the chassis until it mates with the connector on the chassis backplane, and tighten the thumbscrew at the top of the module.

Power

Access-T can be equipped with an ac or dc power supply. To establish power, follow the procedure applicable to your unit. Precise power specifications are provided in Table 2-B.

Access-T Series 100, 200, and 400 Units

AC Power

Access-T 100/200/400 units equipped with an ac source are powered from a standard 115, 230 V ac supply. To power-up the Access-T, follow these steps:

1. Plug the power cord into the three-prong opening on the rear panel.
2. Plug the other end of the power cord into a wall or power strip outlet.
3. Push the power switch to the on position.

Fuse

AC-powered Access-T 100/200/400 units provide overcurrent protection with a Fast-Blo fuse. The fuse is mounted in the rear panel. The Access-T Series 400 uses a 2 amp fuse (part number 250-120-95); the Access-T Series 100 or 200 uses a 1 amp fuse (part number 250-120-75). If the fuse blows, replace it with a new one, as described in Chapter 10.

If the fuse blows continuously, there is a problem either in the power source or in the Access-T internal power supply.

DC Power

For a Centralized DC Power connection, follow the site requirements detailed in the **Installation and Site Requirements** section at the beginning of Chapter 3. Access-T 100/200/400 units equipped with a dc source are powered from a -48 volt dc source, such as an office battery.

WARNING: Access-T must be properly grounded to prevent possible equipment damage or service interruption.

Power connections are made to a connector that plugs into TB1 on the Access-T rear panel. Required connections are illustrated in Figure 3-3.

To apply -48 volt dc power to the Access-T, perform the following steps:

1. Remove the three-slot black plug from connector TB1 on the Access-T rear panel. (Contact Larscom if this plug has been lost.)
2. Using #14 AWG (minimum) wire, connect the -48 volt dc power, return, and ground leads to the plug as illustrated in Figure 3-3. To make a wiring connection to the plug:
   a. Turn the screw corresponding to the desired wire slot counter-clockwise until the slot accepts the wire.
   b. Insert the wire into the slot.
   c. Turn the screw clockwise until the wire is held firmly.
3. Insert the plug into the TB1 connector on the Access-T rear panel.
4. Install the retaining bracket for the power plug using the 4-40 pan-head Phillips screw and flat washer provided. This retainer prevents accidental removal of the power plug, per UL specifications.

Fuse

DC-powered Access-T 100/200/400 units provide overcurrent protection with a Slo-Blo fuse. The fuse is mounted in the rear panel. The Access-T Series 400 uses a 2 amp fuse (part number 250-110-50); the Access-T Series 100 or 200 uses a 1 amp fuse (part number (250-110-90). If the fuse blows, insert a new one, as described in Chapter 9.

If the fuse blows continuously, there is a problem either in the power source or in the Access-T internal power supply.

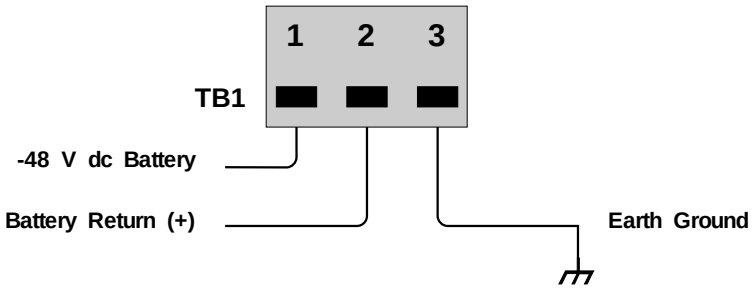


Figure 3-3. DC Power Connections

Access-T 1500 Units

The Access-T 1500 supports redundant (loadsharing) dual power supplies. Any combination of 115 V ac and/or -48 V dc power supplies may be installed. If two power supplies are installed and connected to different 115 V ac and/or -48 Vdc sources, the unit will remain powered in the event of the failure of either power source. Power supplies are labeled as **AC** or **DC** behind the removable front panels. Power specifications are given in Table 2-B.

WARNING: The Access-T 1500 chassis must be properly grounded to prevent possible equipment damage or service interruption.

The Access-T 1500 is shipped with the power supplies already installed in the chassis. To apply power to the Access-T 1500, follow these steps:

1. For **ac power**, plug one end of the three-prong power cord(s) into a 115 Vac outlet(s) and the other end into the appropriate ac connector(s) on the Access-T 1500 rear panel. Go to step 3.
2. For a Centralized DC Power connection, follow the site requirements detailed in the **Installation and Site Requirements** section at the beginning of Chapter 3. For **dc power**, connect the battery leads and a good earth ground to the appropriate terminals at the rear of the Access-T 1500 chassis as follows:

   Using #14 AWG (minimum) wire, connect the -48 volt dc power, return, and ground leads. (Terminal block locations are shown in Figure 3-2.) To make a wiring connection to the plug:

   a. Turn the screw corresponding to the desired wire slot counter-clockwise until the slot accepts the wire.

   b. Insert the wire into the slot.

   c. Turn the screw clockwise until the wire is held firmly.
3. The power supply indicator light on the front panel will illuminate green if power has been successfully established. If the LED is red, either the power connection or power supply is faulty. If the LED does not illuminate at all, either the power supply is either not receiving power, or there is not a power supply loaded in the chassis.

4. To remove an installed power supply and/or insert a new power supply into the chassis, follow these steps:

   a. Remove the screws and faceplate covering the power supplies. Then, grasp the extractor handle at the bottom of the faceplate and pull.

   b. Remove the power supply by pulling on the handle.

   c. Insert a new ac or dc power supply, carefully aligning the power supply in the guiding card slots. Be sure the card is oriented so that the plug on the rear of the power supply mates with the connector in the chassis. Push the power supply into the slot until it is securely mated to the rear of the chassis.

Access-T 1500 employs loadsharing power supplies. Thus, when two supplies are installed, they share the load and both the front-panel LEDs illuminate green. When one power supply fails, the other power supply will assume the entire load of the unit, and the failed unit's power LED will illuminate red.

Installer Wiring

All wiring connections, except those to the Craft Port on Series 100, 200, and 400 units, are made to connectors at the rear of the Access-T. Figures 3-1 and 3-2 show the Access-T rear panel layouts.

DTE Ports (V.35 and RS449 Interface)

Access-T provides up to four ports for DTEs operating at subrates of the 1.544 Mbps T1 rate. Each employs a female DB25 (EIA 530) connector. Figure 3-4 shows pinouts for the EIA 530 connector. Figures 3-5 and 3-6 show connector pinouts for an RS449 interface and a V.35 interface, respectively.

The ports are configured as DCE devices; thus, straight-through cables are required to connect to DTE devices. Larscom offers cables for connection to EIA 530, RS449, and V.35 interfaces. *See Table 9-A for part numbers.*

> **Note 1:** The acronym DTE has two meanings. In most cases in this manual, DTE refers to the Digital Terminal (or Terminating) Equipment for which Access-T provides the network interface. In the context of port configuration, however, DTE refers to Data Terminal Equipment as opposed to Data Communications Equipment (DCE). Normally a DTE port is cabled to a DCE port. For DCE-to-DCE or DTE-to-DTE connections, special "cross-over" cables are required.
>
> **Note 2:** If an EIA 530 interface is used, configure the Access-T DTE port for an RS449 interface via the Terminal Interface.

To connect a DTE to an Access-T DTE port, follow these steps:

1. Determine the appropriate cable to be connected between each DTE and its respective port.
2. Install the appropriate cable between the DTE Port connector and the DTE, making sure that each connector is oriented properly and mated securely.

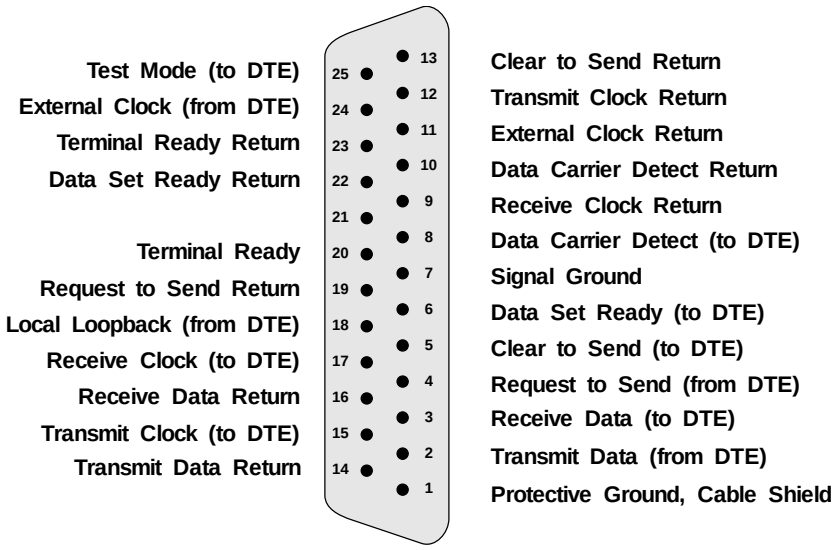


Figure 3-4. DTE Connector Pinouts, EIA 530 (DB25)

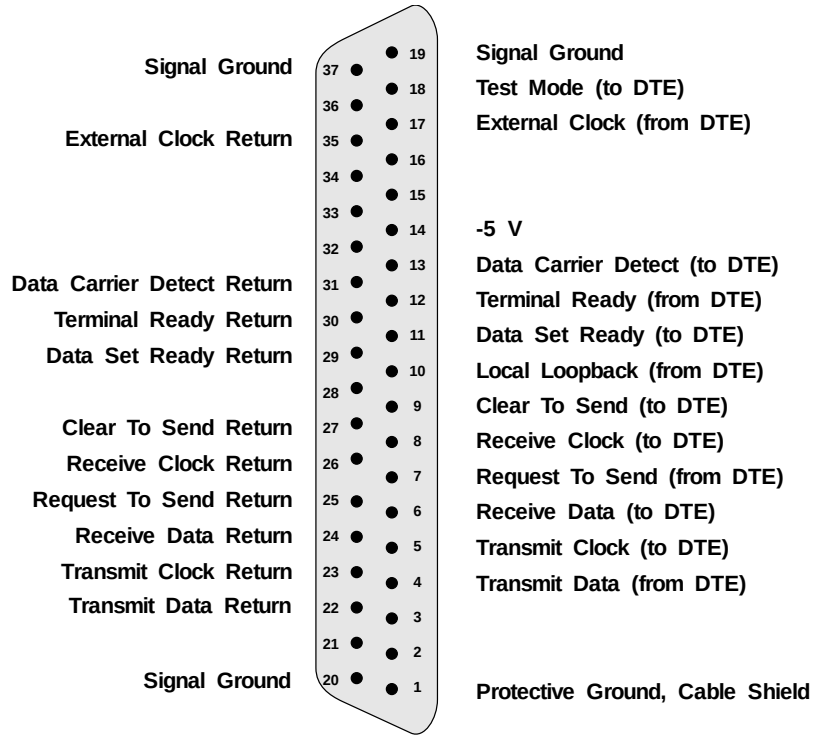


Figure 3-5. RS449 Interface Pinouts (DC37)

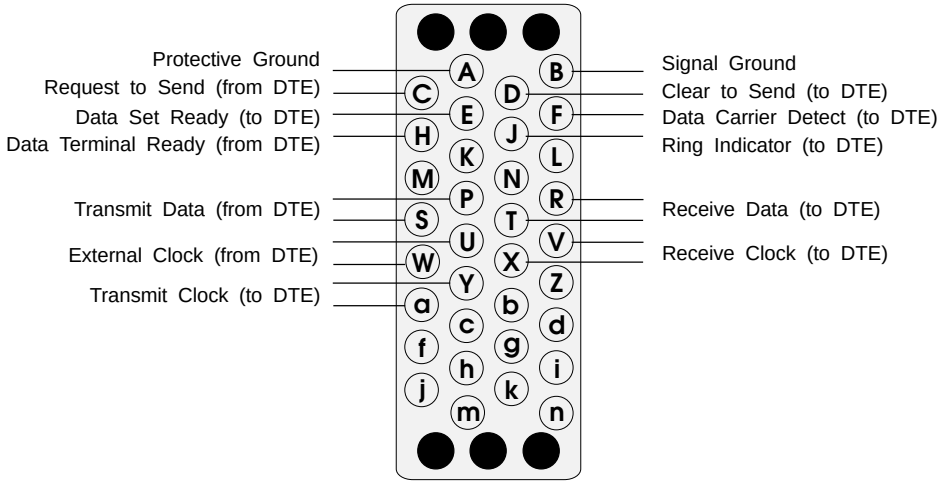


Figure 3-6. V.35 Interface Pinouts (MS34)

Auxiliary Port (T1 DTE)

Access-T provides a port for connection to a PBX, channel bank, or other T1 DTE that provides D4 or ESF framing. The auxiliary port includes drop-and-insert capability as described in Chapter 1.

Access-T Series 100, 200, and 400 Units

The **AUX PORT** connector for the Access-T Series 100, 200, and 400 units is a standard DA15 female connector. Figure 3-7 shows the required wiring to the **AUX PORT** connector.

To connect Access-T to the T1 or FT1 DTE, follow these steps:

1. Determine the cable to be used to connect the **AUX** connector and the T1 DTE.
2. Install the appropriate cable between the **AUX** connector and the T1 DTE connector on the DTE, making sure that each connector is oriented properly and mated securely.

Refer to Table 9-A for a complete list of all Larscom cables and part numbers.

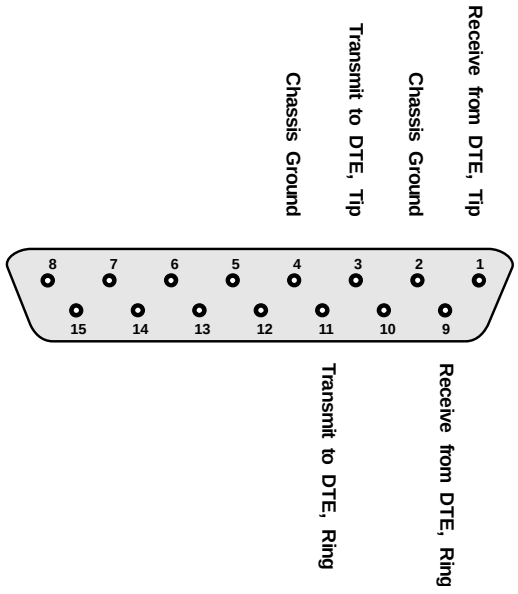


Figure 3-7. Auxiliary T1 DTE Port Connections, Access-T 100, 200, and 400

Access-T 1500 Units

The **AUX PORT** connectors for the Access-T 1500 are standard 50-pin male RJ48H connectors. Larscom provides a separate RJ48C connector for each aux interface via an accessory kit, as described in Appendix E. Alternatively, Larscom provides an accessory kit with two standard 50-pin female AMP CHAMP connectors which mate to the rear-panel connectors. Refer to Appendix E for pinout and connection information.

Figures 3-8 and 3-9 show the pinouts for the Aux port connectors. Connect the leads for each Aux connection to the supplied female 50-pin connectors as shown in Figures 3-8 and 3-9. Then plug the female connectors to the male connectors on the rear panel.

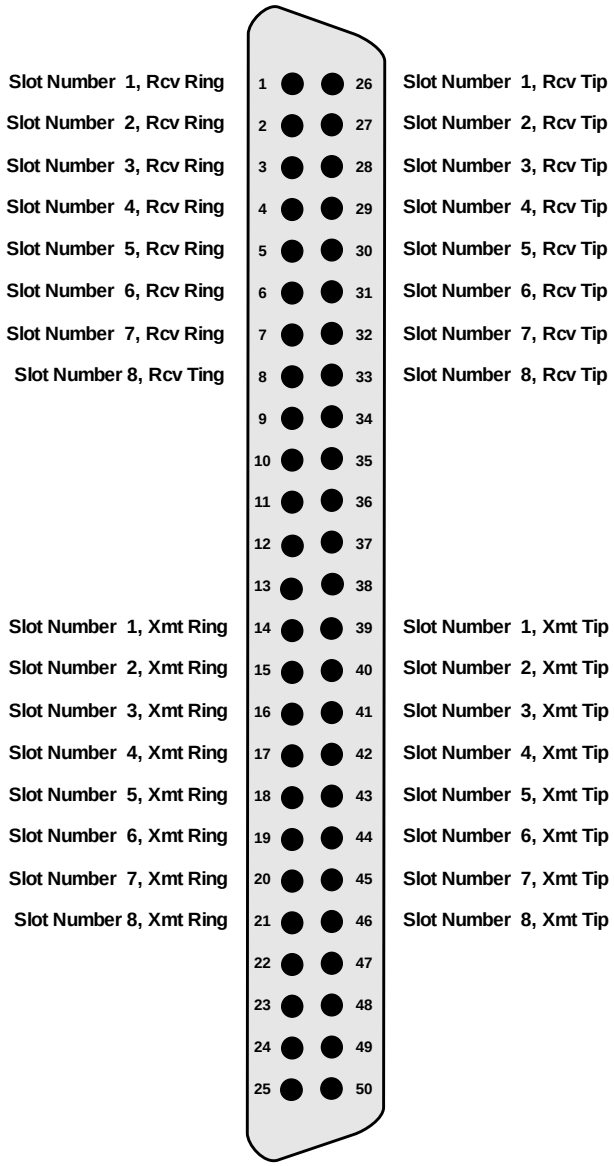


Figure 3-8. Auxiliary T1 DTE Port and Line Connections, Access-T 1500 Modules (Slot Positions) 1-8

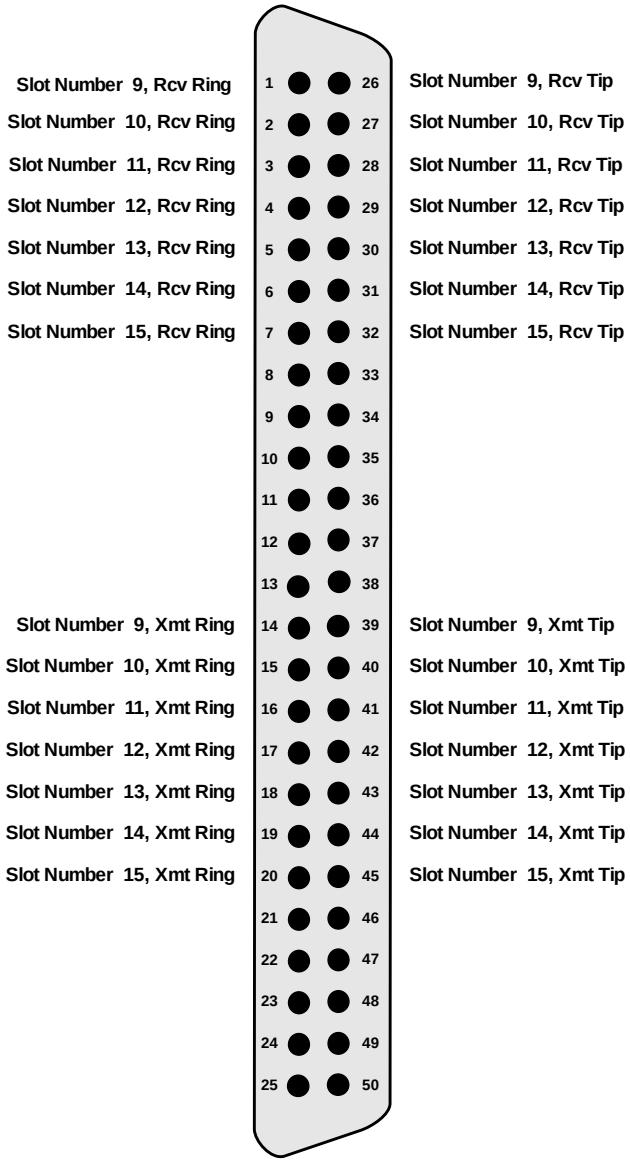


Figure 3-9. Auxiliary T1 DTE Port and Line Connections, Access-T 1500 Modules (Slot Positions) 9-15

Line (T1 or FT1 Network)

Access-T Series 100, 200, and 400 Units

The **LINE** connector is a standard DA15 male connector. Figure 3-10 shows the required wiring to the **LINE** connector.

Larscom offers cables using DA15 or RJ48 connectors, plus a DA15-to-RJ48 adapter. See Table 9-A for the part numbers of all Larscom cables and adapters. See Appendix A for the illustrations of all Larscom cable connections.

NOTICE: Before connecting to a public T1 or FT1 service, read the *Notice to Users* (page xiv). Do not make any connection to the T1 line until the telephone company has been given the required notice. Notification must be in the form of a notarized affidavit and is generally required at least ten days prior to connection to the network. Details of the notification requirements are available from your telephone company.

CAUTION: Be careful whenever installing or modifying telephone lines. Specifically:

- ***Never install telephone wiring during a lightning storm.***
- ***Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.***
- ***Never touch uninsulated telephone wire or terminals unless the telephone line has been disconnected at the network interface.***

To connect Access-T to the T1 or FT1 network, follow these steps:

1. Determine the cable to be used to connect the **LINE** connector and the Network Interface (NI).
2. Install the appropriate cable between the **LINE** connector, **J8**, and the Network Interface (NI), making sure that each connector is oriented properly and mated securely.

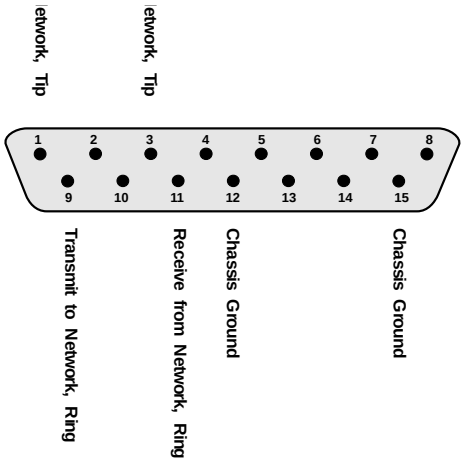


Figure 3-10. T1 Line Connections, Access-T Series 100, 200, and 400

Access-T 1500 Units

The **LINE** connectors are standard 50-pin female RJ48H connectors. Each connector provides network access for specific Access-T modules (slot positions). Figure 3-8 and 3-9 show the pinouts for the **LINE** connectors. Larscom provides a separate RJ48C connector for each T1 line interface via an accessory kit, as described in Appendix E. Alternatively, Larscom provides an accessory kit with two standard 50-pin male AMP CHAMP connectors (A87-AK05-001) which mate to the rear-panel connectors. Refer to Appendix E for pinout and connection information.

Chain Port Connection

The Chain Port can be used to interconnect multiple Access-Ts as described in Chapter 2. The Chain Port supports a two-wire half-duplex connection conforming to RS485. Figure 3-11 shows the Chain Port connector.

> **Note:** Chaining connections between Access-T modules are permanent within the Access-T 1500 chassis. The Chain Port on the rear panel is for chaining to another Access-T 1500 chassis or to an Access-T 100/200/400 unit.

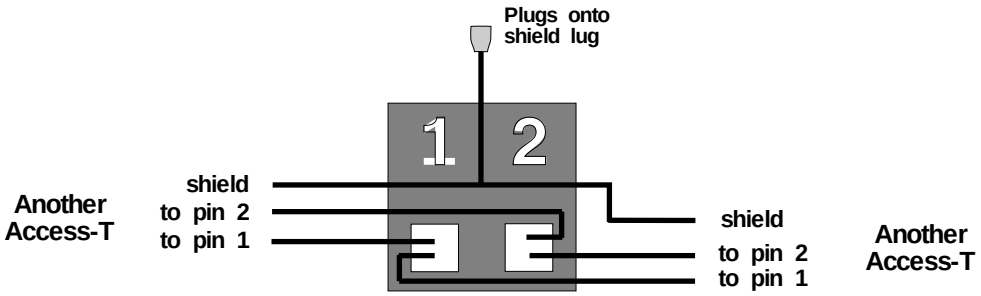


Figure 3-11. Chain Port Connections

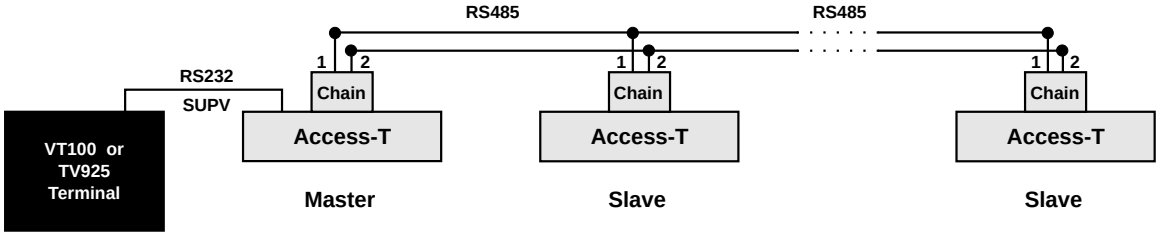


Figure 3-12. Typical Chaining Configuration

Figure 3-12 shows a standard Chain Port implementation. Each Access-T can be a Series 200, 400, or 1500 unit. Chain limits are:

- Up to 30 Series 100/200/400 units.
- Two fully loaded Series 1500 units.
- Any number of Series 100, 200, 400, and 1500 units, so long as the total number of Access-T 1500 ***modules***, Series 100, Series 200 units, and Series 400 units does not exceed 30.

> **Note:** The Chain Port can also be used for an RS485 TABS-Interface connection to a single Access-T or to a chain of slave Access-Ts, if desired. Modem connections *are not* supported.

The Chain Port is configured for the following communication parameters:

- 9600 baud.
- 8 data bits.
- 1 stop bit.
- No parity.

To interconnect Access-T units via the Chain Port, perform the following steps:

1. Remove the two-slot black Molex plug from the Chain Port connector on the Access-T rear panel. (Contact Larscom if this plug has been lost.)
2. Provide the required lengths of wire, preferably #22 or #24 AWG braided wire.
3. Connect the wires to the Molex plugs of all chained Access-Ts so that all pin 1's are wired to each other and all pin 2's are wired to each other, as shown in Figure 3-11. (If an Access-T is at the end of a chain, it will have one wire in each slot; otherwise, it will have two wires in each slot.) To make a wiring connection to a Molex plug:
   a. Turn the screw corresponding to the desired wire slot (1 or 2) counterclockwise until the slot is open enough to accept the wire(s).
   b. Insert the wire(s) into the slot.
   c. Turn the screw clockwise until the wire(s) are held firmly.
4. Insert the Molex plugs into the Chain Port connector.

Disconnecting a properly-wired Molex plug from an Access-T will not affect communications between other units on the chain.

Chain Port Expander (RS485 to RS232)

The Larscom CP01 Chain Port Expander provides an interface between an RS232 device and the RS485 Chain Port. *Applications and installation of the CP01 are described in Appendix C.*

External (Station) Clock

If a station clock is to be used as the reference clock, connect the clock cable to the **EXT CLOCK** female BNC connector on the rear panel of Access-T.

> **Note:** The **EXT CLOCK** input employs TTL logic levels and has an impedance of 50 ohms.

Supervisory Port Connection

For permanent supervisory connection to the Access-T, install an appropriate cable between the **SUPV PORT** connector and the RS232 connector on the supervisory or communication equipment (TV 925 or VT100 terminal).

> **Note:** The Access-T supports only software emulation packages that are 100% compatible with TV 925 or VT100 terminals. Set the ACSII terminal for the same attributes as the Supervisory Port it is connected to. The Access-T does not support the use of the **BREAK** key.

Access-T provides a Supervisory Port as follows:

Access-T 100/200/400 units: 9-pin DE male connector and RS232 DTE interface. Figure 3-13 shows the pinouts for the 9-pin D-type Supervisory Port connector.

Access-T 1500 units: 25-pin D-type female connector and RS232 DTE interface. Figure 3-14 shows the pinouts for the 25-pin Supervisory Port connector.

The **SUPV PORT** connector on the Access-T 1500 is hardwired to communicate directly with the DSU/CSU module in slot 15. Therefore, you can use the chassis supervisory connection to talk with other modules or chained units ***only*** if the module in slot 15 is configured as the master. When the module in slot 15 is configured as a slave, you will be able to talk only to the module in slot 15 via the chassis **SUPV PORT**.

> **Note:** If the module in slot 15 in an Access-T 1500 chassis is configured as a slave, communication with all cards in the chassis can be achieved via the RS485 chain connections from another Access-T configured as a master.

Recommended Larscom cables and part numbers are listed in Table 9-A.

To establish a supervisory connection to Access-T via the Supervisory Port, follow these steps:

1. Obtain an appropriate cable.
2. Install the cable between the Supervisory Port and the communication terminal (TV 925 or VT100), making sure the connector is oriented properly and mated securely.
3. Set the communication parameters as described in Chapter 6.

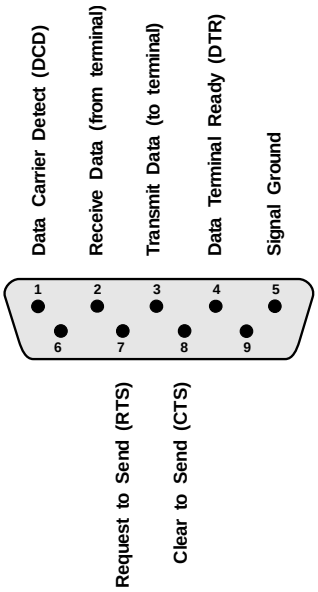


Figure 3-13. Supervisory Port Pinouts (RS232), Access-T 100/200/400 Units

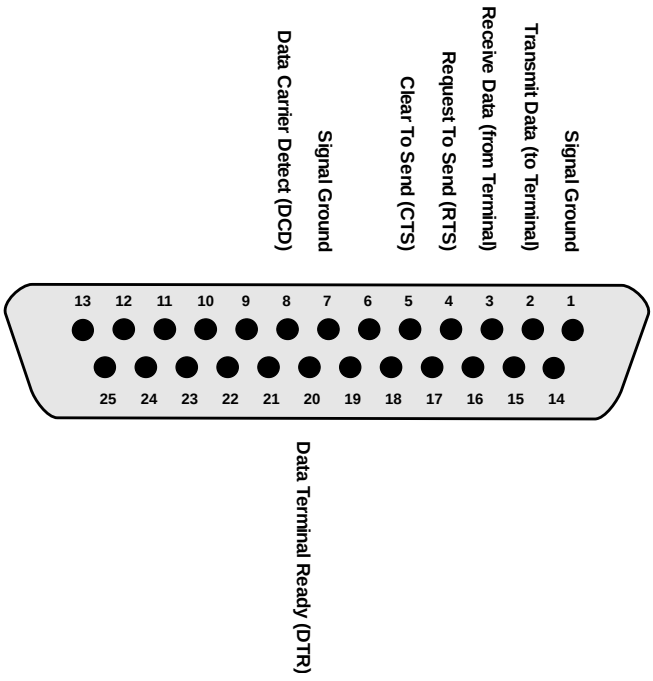


Figure 3-14. Supervisory Port Pinouts (RS232), Access-T 1500 Unit

Craft Port Connection

The Access-T is equipped with a Craft Port. Configured as a DTE, the Craft Port is intended for temporary supervisory connections.

> **Note:** Access-T supports only software emulation packages that are 100% compatible with TV 925 or VT100 terminals. Set the ACSII terminal for the same attributes as the Craft Port it is connected to.

Access-T provides a Craft Ports as follows:

Access-T 100/200/400 Units: 9-pin DE male connector and RS232 DTE interface. Figure 3-15 shows the pinouts for the 9-pin D-type Craft Port connector.

Access-T 1500: 25-pin D-type female connector and RS232 DTE interface. Figure 3-16 shows the pinouts for the 25-pin Craft Port connector.

The **CRAFT PORT** connector on the Access-T 1500 is hardwired to communicate directly with the DSU/CSU module in slot 15. Therefore, you can use the chassis supervisory connection to talk with other modules or chained units ***only*** if the module in slot 15 is configured as the master. When the module in slot 15 is configured as a slave, you will be able to talk only to the module in slot 15 via the chassis **CRAFT PORT**.

> **Note:** If the module in slot 15 in an Access-T 1500 chassis is configured as a slave, communication with all cards in the chassis can be achieved via the RS485 chain connections from another Access-T configured as a master.

Recommended Larscom cables and part numbers are listed in Table 9-A. The Craft Port does not support modem hook-ups.

To establish a temporary supervisory connection to Access-T via the Craft Port, follow these steps:

1. Obtain an appropriate cable.
2. Install the cable between the Craft Port and the communication terminal (TV 925 or VT100), making sure the connector is oriented properly and mated securely.
3. Set the communication parameters as described in Chapter 6.

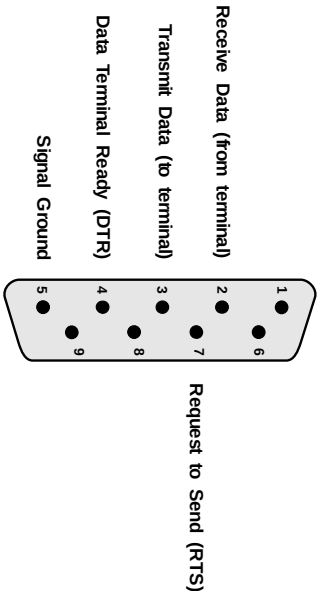


Figure 3-15. Craft Port Pinouts (RS232), Access-T 100/200/400 Units

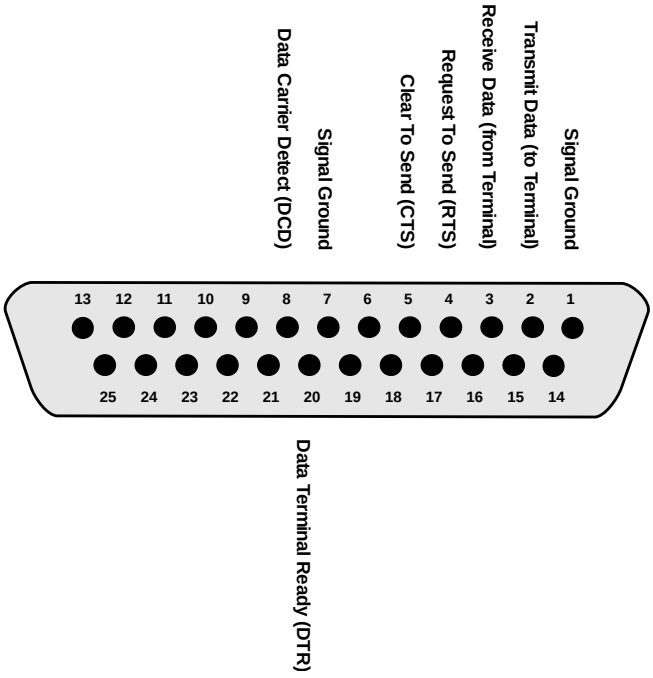


Figure 3-16. Craft Port Pinouts (RS232), Access-T 1500 Unit

Alarm Relay

Access-T 1500 provides form C relays for each power supply to drive external alarm annunciation devices, such as bells or lights. The larm Relay is activated whenever a power supply loses power.

The Alarm Relay is “dry” (i.e., does not carry current from Acess-T 1500). Therefore, any annunciation device connected to either relay must be externally powered. The relays support both normally open and normally closed circuits for the annunciation devices.

Alarm Relay connections are made to the **ALARM RELAY** connector on the Access-T 1500 rear panel. Pinouts for the **ALARM RELAY** are shown in Figure 3-17. Make connections to annunciation devices as follows:

1. For each power supply, insert the annunciator leads into the appropriate connector plug openings (**NO** and **C** for a normally open circuit, or **NC** and **C** for a normally closed circuit). Then tighten the corresponding screws on the top of the connector plug until the leads are secured to the plug.
2. Mate the connector plug with the **PS1** or **PS2** alarm relay socket on the Access-T 1500 rear panel.
3. Provide strain relief by installing the strain relief bracket on the rear panel.

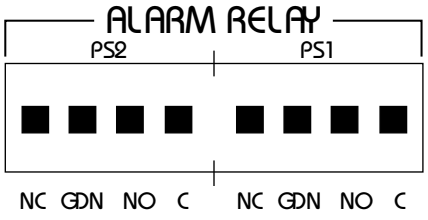


Figure 3-17. Alarm Relay Connections

DIP Switches

Before operating Access-T, you must set the DIP switches for the hardware configuration, node address, and desired software operation mode. All possible configuration options are defined in Tables 3-A and 3-B and in the following sections.

The DIP switches for the Access-T 100, 200, and 400 units are accessible through holes in the rear panel. Figure 3-1 shows the location of the switches. DIP switches for the Access-T 1500 module are accessible on the side of the card. (You need to only partially remove the Access-T 1500 plug-in module to set the DIP switches.) Figure 3-18 shows the location of the switches.

Setting DIP Switches

Use the following procedure to configure DIP switches:

1. If you are configuring a Series 100, 200, or 400 unit, verify that the unit is not powered up.
2. Locate the 8 position DIP switches, shown in Figure 3-1 (Series 100, 200, and 400) or Figure 3-18 (Series 1500). If setting DIP switches on an Access-T 1500 module, partially remove the module from the chassis as described under **Removing and Inserting Access-T 1500 Modules**.
3. Using a small screwdriver or other tool, set DIP switches 1 through 8 for the desired configuration as indicated in Table 3-A or Table 3-B. **Open** indicates the up position; **closed** indicates the down position.

   WARNING: Do not use a graphite (lead) pencil to operate the switches. Graphite particles may short the switches, damaging the unit.

   Verify your switch settings before powering up the unit. Invalid switch settings could cause your unit to reset its default settings, or produce other problems.

4. If you have removed the Access-T 1500 module from the chassis, re-insert it in the chassis as described under **Removing and Inserting Access-T 1500 Modules**. Power up the unit to intiate the new DIP switch settings.

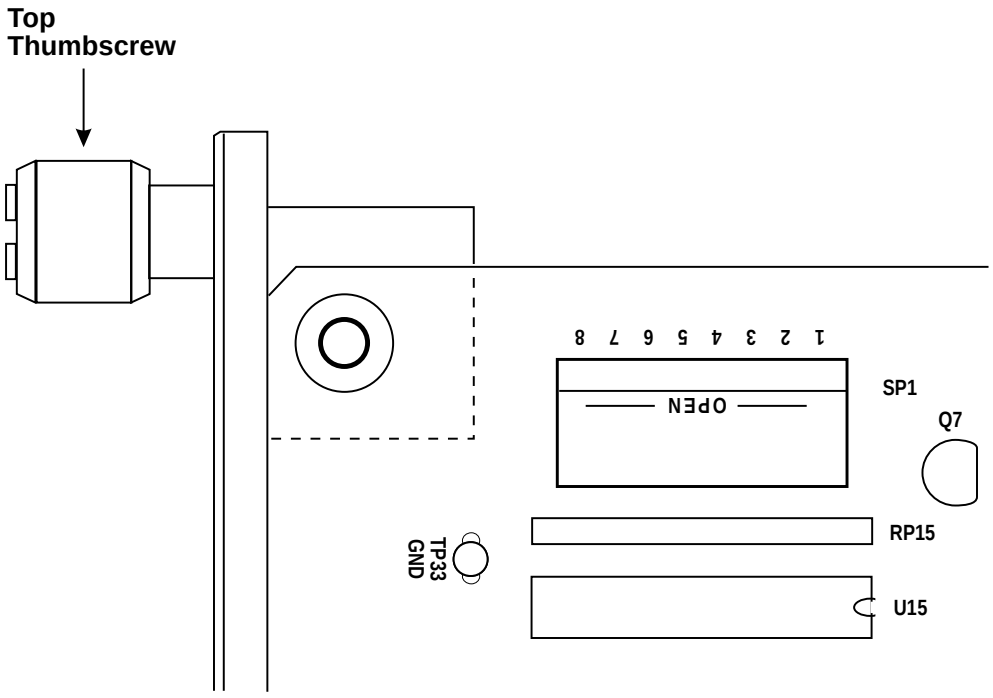


Figure 3-18 Access-T 1500 Module (Side View), DIP Switch Location

Hardware Configuration/Operation Mode

Before power-up, Access-T must be configured for the number of DTE ports and the operation mode via the DIP switches on the rear panel of the unit. The Access-T software can be configured to operate with a 1-port, 2-port, or 4-port unit in either master or slave mode. For a more detailed explanation on master and slave modes, consult Chapter 8.

DIP switch settings for all hardware configuration/operation mode combinations are provided in Table 3-A. Set DIP switches according to the procedure described in **Setting DIP Switches**.

CAUTION*: *Series 400 units have a second set of DIP switches on the rear panel* (SP11). *Verify that all these DIP switches are* CLOSED *(down) except switch 8, which must be* OPEN *(up).

Node Address

Each Access-T must be given a unique node address. The node address is used to identify the nodes in the chain for polling, alarm reporting, and command forwarding. Node addresses are also used in the sending and receiving of TABS commands; see the *Access-T TABS Interface Manual, ACST-0731-00x*.

To specify the node address, follow the procedure under **Setting DIP Switches** and refer to Table 3-B.

Table 3-A. DIP Switch Settings for Operation Mode/Hardware Configuration

Hardware Configuration / Operation Mode	Switch 6	Switch 7	Switch 8
1 Port, slave	Closed	Open	Open
2 Ports, slave	Closed	Closed	Closed
4 Ports, slave	Open	Closed	Closed
1 Port, master	Open	Closed	Open
2 Ports, master	Closed	Open	Closed
4 Ports, master	Open	Open	Closed
Note: OPEN = UP and CLOSED = DOWN.			

Table 3-B. DIP Switch Settings for Node Addresses

Node Address	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
1	Open	Closed	Closed	Closed	Closed
2	Closed	Open	Closed	Closed	Closed
3	Open	Open	Closed	Closed	Closed
4	Closed	Closed	Open	Closed	Closed
5	Open	Closed	Open	Closed	Closed
6	Closed	Open	Open	Closed	Closed
7	Open	Open	Open	Closed	Closed

Table 3-B. DIP Switch Settings for Node Addresses (cont'd)

Node Address	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
8	Closed	Closed	Closed	Open	Closed
9	Open	Closed	Closed	Open	Closed
10	Closed	Open	Closed	Open	Closed
11	Open	Open	Closed	Open	Closed
12	Closed	Closed	Open	Open	Closed
13	Open	Closed	Open	Open	Closed
14	Closed	Open	Open	Open	Closed
15	Open	Open	Open	Open	Closed
16	Closed	Closed	Closed	Closed	Open
17	Open	Closed	Closed	Closed	Open
18	Closed	Open	Closed	Closed	Open
19	Open	Open	Closed	Closed	Open
20	Closed	Closed	Open	Closed	Open
21	Open	Closed	Open	Closed	Open
22	Closed	Open	Open	Closed	Open
23	Open	Open	Open	Closed	Open
24	Closed	Closed	Closed	Open	Open
25	Open	Closed	Closed	Open	Open
26	Closed	Open	Closed	Open	Open
27	Open	Open	Closed	Open	Open
28	Closed	Closed	Open	Open	Open
29	Open	Closed	Open	Open	Open
30	Closed	Open	Open	Open	Open

Note: OPEN = UP and CLOSED = DOWN.

Modem Configuration

Access-T will operate with the Ven-Tel 2400, Hayes 2400 Smartmodem, and Maxwell 2400 VP modems. The Access-T Supervisory Port requires a 7-wire (including ground) interface to the modem; handshaking protocols (i.e., RTS, DCD, DTR, DSR, and CTS) are used.

To configure the modem, follow these steps:

1. Consult the modem manual for configuration procedures.
2. Configure the modem to the following settings:
   - Auto answer (**S0=1**).
   - DTR enabled (**&D2**).
   - Quiet mode (**Q1**)
   - DCD enabled (**&C1**)
   - Echo off (**E0**).
   - Auto Seek command: **AT&%C1&%D2&%W** (Hayes 2400 Smartmodem only).
3. Via the Terminal (or TABS) Interface, configure the Access-T Supervisory Port for modem operation.

The communication parameters (**baud rate, stop bits, parity**) must be set to the desired values, and the **INTERFACE** parameter must be set for **MODEM** or **DATAKIT**. See Chapter 6 for instructions.

Downloading Access-T Software

Instructions for downloading new Access-T operation software can be found in Larscom publication: *Access-T Software Downloading Instructions,* ***ACST-6331-00x***.

4 Front-Panel Controls and Indicators

The front panels of the Access-T Series 100, 200, and 400 and the Access-T Series 1500 are illustrated in Figure 4-1 and 4-2, respectively. Each unit includes the following status LEDs:

- DTE interfaces.
- Network interfaces
- Hardware failure.

In addition the Access-T Series 100, 200, and 400 front panels include:

- a Craft Port connector.
- a **SELECT** button and LEDs for setting terminal emulation.

> **Note:** The Access-T 1500 is also equipped with the Craft Port and **SELECT** button (and its related LEDS). However, this hardware is located on the rear panel of the Access-T 1500 chassis. The equipment operates the same on both products.

The LEDs and Craft Port are described in this chapter, as is the power-up self-test.

Status Indicators

Figure 4-1 shows the location of the status LEDs on the Access-T 100, 200, and 400 unit's front panel. These LEDs indicate interface status, system failures, alarm conditions, and emulation configuration as described in Table 4-A.

Figure 4-2 shows the location of the status LEDs on the Access-T 1500. These LEDs indicate interface status, Access-T failures, and alarm conditions.

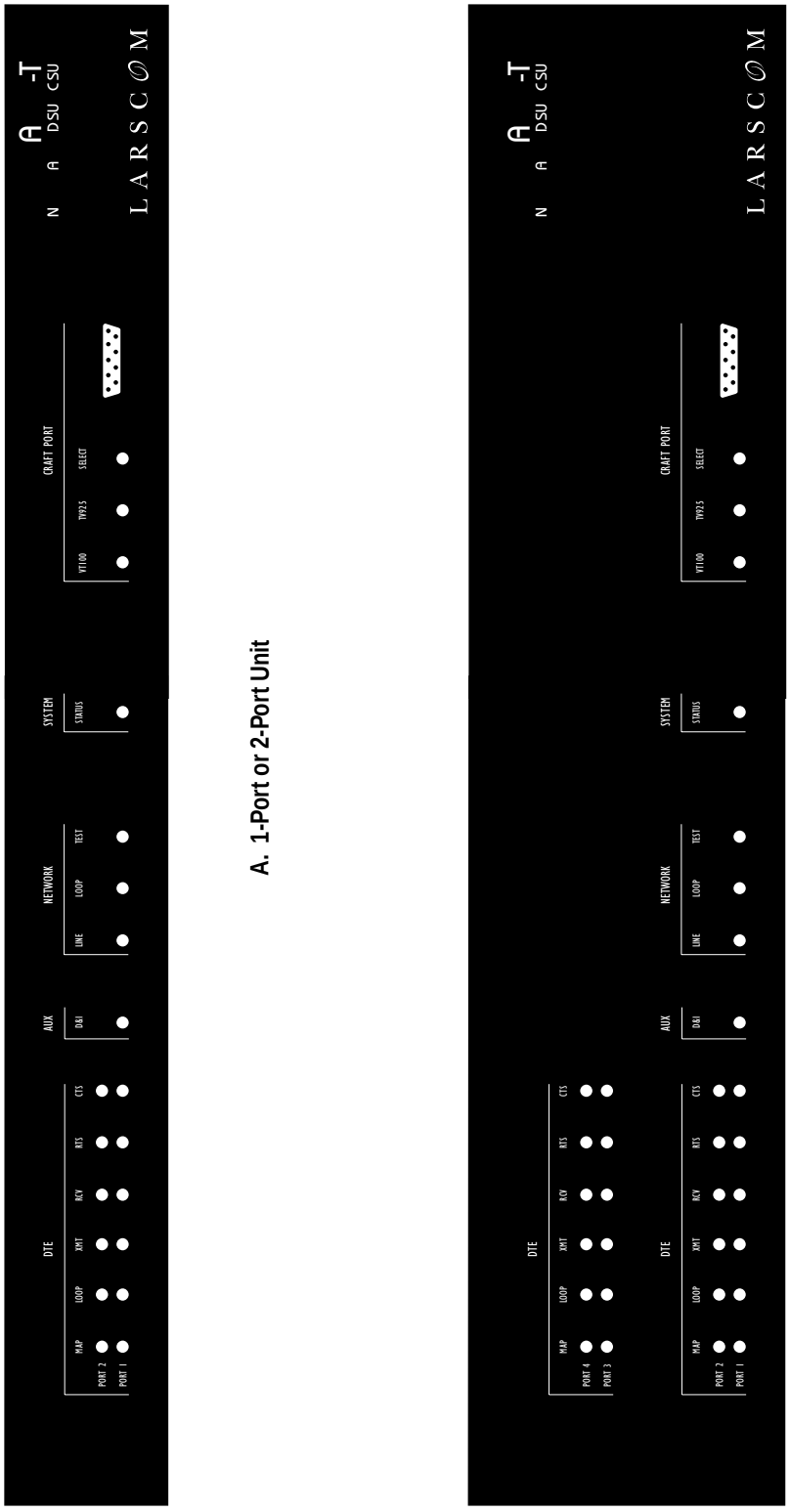


Figure 4-1. Access-T Series 100, 200, and 400 Front Panels

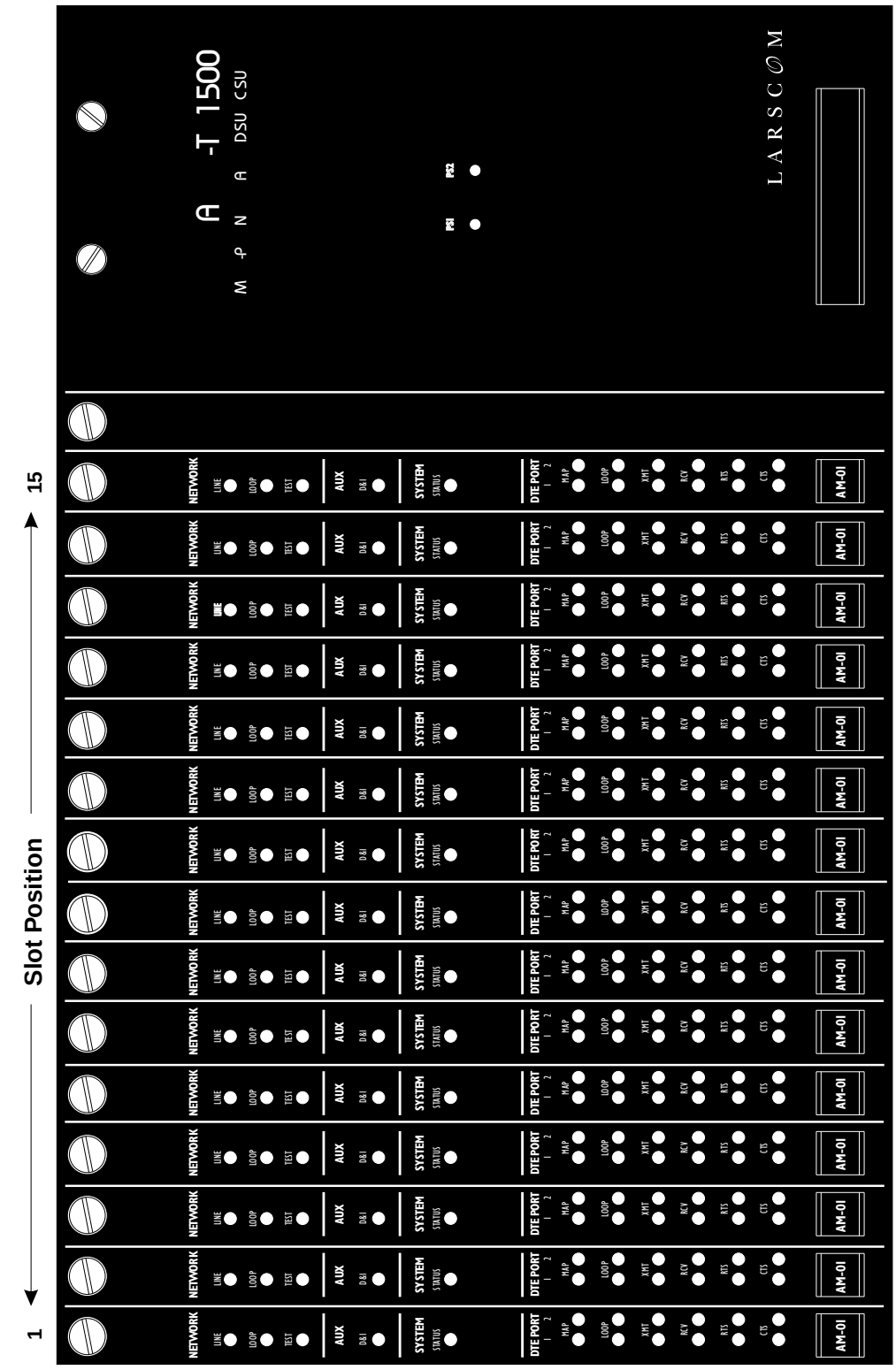


Figure 4-2. Access-T 1500 Chassis with Modules Installed

Table 4-A. Front-Panel Status Indicators

GROUP	INDICATOR	COLOR	CONDITION
SYSTEM	STATUS	Red	Self-test failure, or NIM or Main processor operating in boot mode
		Amber	DCD active (modem connection and terminal session established)
		Green	Normal operation
NETWORK	LINE	Red	Loss of sync or Loss of Signal on input from the T1 line (or NIM failure)
		Amber	Yellow Signal being received from the T1 line
		Green	Normal signal present from T1 line
	LOOP	Amber	Either LS Line, LS DTE, DS Line, or DS DTE loopbacks are active
	TEST	Amber	QRSS test is active
DTE PORT 1, 2, 3, and 4	MAP	Green	Port is mapped onto the network
	LOOP	Amber	CS DTE or CS Line loopback is active
	XMT	Green	Data signal is being transmitted to Access-T
	RCV	Green	Data is being transmitted from Access-T
	RTS	Green	RTS is being received
	CTS	Green	Normal data transmission
AUX	D&I	Red	Loss of Signal or Loss of Sync on Aux T1 DTE
		Amber	Yellow Signal being received from the T1 line
		Green	Normal Operation
		Off	Auxiliary T1 DTE Port is not assigned to any DS0s
CRAFT * PORT	VT100	Green	On indicates VT100 type terminal emulations selected; Blinks when auto baud function is active
	TV925	Green	On indicates TV 925 type terminal selected; Blinks when auto baud function is active
POWER SUPPLY ** (not labelled)	PS1, PS2	Green	On indicates normal operation
		Red	On indicates one or more supply voltages out of range, no input to power supply, or other power failure
		Off	Off indicates that no power supply is loaded into the slot, failure of the monitor card, or failure of the LED

* For the Access-T 1500, the Craft Port and its related LEDs are located on the rear panel.
** The PS1 and PS2 LEDs are applicable only for the Access-T 1500.

Power-Up Self-Test

Upon power-up, Access-T performs a self-test. During the self-test, the **STATUS** light on the front panel will turn red. After about seven seconds, when Access-T has successfully completed the self-test, the light turns green.

If Access-T does not pass the self-test, the **STATUS** LED will remain red. *Call Larscom Customer Service.*

Power Supply Indicators

The power supplies in Access-T 1500 are mounted behind the first panel at the right of the chassis. If one power supply fails, the other (if installed) will provide power for the entire unit. Two indicators, **PS1** and **PS2**, indicate the status of the corresponding power supplies.

There is no power supply indicator on Access-T 100, 200, and 400 units.

Craft Port

Access-T is equipped with a Craft Port. Configured as a DTE, the Craft Port can be used to connect to the Access-T without having to interrupt operation at the Supervisory Port. The different Access-T models provide the Craft Port as follows:

Access-T 100, 200, and 400 Units: 9-pin DE male connector and RS232 DTE interface on the front panel. Figure 3-14 shows the pinouts for the 9-pin D-type Craft Port connector.

Access-T 1500: 25-pin D-type female connector and RS232 DTE interface on the rear panel. Figure 3-15 shows the pinouts for the 25-pin Craft Port connector.

The pinouts for this port are illustrated in Chapter 3.

Associated with the Craft Port connector are two LEDs (**VT100** and **TV 925**) and one pushbutton (**SELECT**), which are used to select the type of terminal connected to the Craft Port and to initiate auto-bauding. Changes made using the **SELECT** pushbutton affect the Craft Port only; the Supervisory Port located on the rear panel is not affected.

> **Note:** The **SELECT** pushbutton is recessed behind the front panel of the Series 200 and 400 units and requires a pointed implement to reach it.

Intended for a first-time or a temporary installation (by craft personnel, for example), the Craft Port does not require a password. Also, the Craft Port is intended for local use only and therefore does not support modem dial out. Refer to Chapter 6 for instructions on how to establish communications via the Craft Port.

Automatic Baud Rate Detection

The Craft Port is equipped with an auto-baud configuration feature. This feature aids in establishing communications between the Craft Port and a terminal.

The auto-baud feature is activated by pressing the **SELECT** pushbutton, as described in **Setting the Communication Parameters Via the Craft Port** in Chapter 6. Pressing the **Enter** key repeatedly while auto-baud is active enables Access-T to calculate and lock on to the terminal's baud rate.

Using Multiple Command Ports Concurrently

It is possible to use the Craft, Supervisory, and Chain Ports simultaneously. When using more than one port, take the following precautions:

1. Once the Supervisory Port has been configured via the Terminal Interface, do not change the configuration (terminal option, baud rate, stop bits, or parity). Changes to these options will cause Supervisory Port communication to fail.
2. A configuration option set via one port can be superseded by a subsequent configuration command from another port. The last option entered from any port becomes the active configuration option.
3. Be careful when setting system passwords. Although the Craft and Chain Ports do not require password identification when accessing the unit, they can be used to change the password. If password protection is enabled or the password is changed, the terminal connected to the Supervisory Port will require the new password.

5 The Terminal Interface

This chapter describes the general operation of the Terminal Interface: what appears in the display, how the menus are structured, how to move through the menus, and how to select options. Specific configuration procedures are described in Chapter 6; report and register commands and diagnostic procedures are outlined in Chapter 7. Instructions and procedures for using an Access-T as a master can be found in Chapter 8.

Terminal Display

The Terminal Interface display, illustrated in Figure 5-1, includes a Title Bar, Main Menu Line, and a Menu and Report Display Area. The Title Bar appears at the top of the terminal display at all times and contains the following information:

Node Address

Depending on the operating mode, one of two node number combinations are displayed at the far left of the Title Bar. If the terminal is connected *directly* to a slave Access-T (i.e., not through a master), the unit's node address is displayed as **n=XX**. If the terminal is connected to a master Access-T, **m=XX** is the node address of the master and **n=XX** is the node address of the Access-T with which the terminal is currently communicating. (See Chapter 8 for details of master mode operation.)

ALERT Indication

If **ALERT** appears to the right of the node address in the Title Bar, there is an uncleared change-of-state at an enabled alarm. The change may be from normal to alarm *or from alarm to normal*. In master mode, **ALERT** indicates an uncleared change-of-state at any of the chained Access-Ts, as described in Chapter 8.

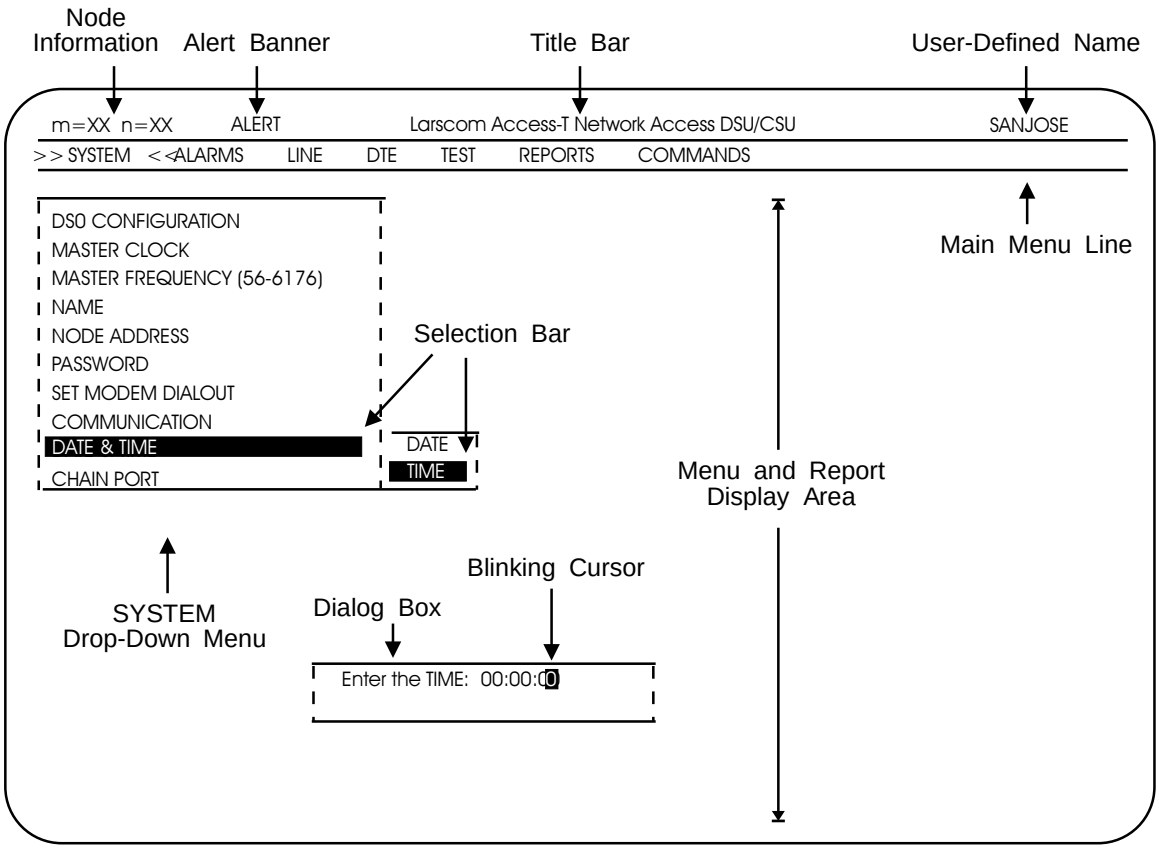


Figure 5-1. Typical Access-T Terminal Display

Product Name

The center of the Title Bar is reserved for the product name.

System Name

The user-defined system name for Access-T appears at the far right of the Title Bar. In master mode, this name applies to the Access-T with which the terminal is currently communicating (node address **n=XX**).

The Main Menu Line is a one-line, 80-character-wide area directly under the Title Bar. The Main Menu Line serves as the top level for all the menu paths available via the Terminal Interface. The menus allow operators to configure Access-T, view alarms and reports, and execute diagnostics. Keyboard controls for the Main Menu Line and subsequent drop-down menus are identified in Table 5-A.

Table 5-A. Terminal Interface Control Keys

TERMINAL KEY	FUNCTION
↓	Moves the cursor down one item in a drop-down menu.
	Moves the cursor up one item in a drop-down menu.
→	Moves the cursor one item to the right along the Main Menu Line.
←	Moves the cursor one item to the left along the Main Menu Line.
Enter	Selects the displayed menu option or registers a new parameter for a selected option. Must be used anytime an option is to be changed.
Esc or Tab *EXIT function*	Displays the previous menu selection or exits the operator from a report display or dialog box.
?	Redraws the screen and displays the Access-T start-up menu. If Access-T is operating as a master, the **?** key always takes the operator back to the master node's start-up display.

The Menu and Report display area is a 21-line, 80-character-wide area beneath the Main Menu Line where all drop-down menus, dialog boxes, and reports are displayed.

> **Note:** Due to hardware differences between the Access-T products, drop-down menus and subsequent options (i.e., **PORT3** and **PORT4**) may not be available to your unit. If you select a menu path or option that is not available, Access-T will alert you via an operator message.

When you reach the end of a menu path and the selected option requires specific input, a small window, or dialog box, appears in the lower portion of the terminal display. You are prompted to supply the necessary information via the terminal keyboard. All entries are terminated with the **Enter** key.

The Menu and Report Display Area also displays operator messages and error messages. These messages vary in length and cover such topics as inappropriate user entries for specific parameters, software parameter conflicts, system errors, etc. A detailed list and explanation of all operator messages can be found in Appendix D.

Logging On and Off

Access to the Terminal Interface via the Supervisory Port can be restricted with the password protection feature. When enabled, password protection prevents unauthorized users from logging on the Access-T system. Logon and logoff procedures are given at the end of Chapter 6.

Navigating Through the Menu Paths

To navigate through the various menus, select options, and enter choices, you can use single keys on the terminal keyboard. Moving from the Main Menu Line through a series of drop-down menus to a particular parameter for which options can be selected defines a menu path. The *arrow keys* (,↓, →, ←) allow you to step up, down, and sideways through various menus, while the **ENTER** key selects a lower level menu or option. The **Esc** or **Tab** key returns you to the previous menu (except when the prompt "**Press EXIT Key to Continue**" appears at the bottom of a display, in which case it returns you to the previous screen display or exits a dialog box). A blinking cursor indicates the current position.

Table 5-B indicates the possible menu paths and option selections. (Access-T system defaults are indicated with bold type.) Table 5-C defines the terms and abbreviations used in the drop-down menus.

After initialization of the Access-T, the Title Bar, the Main Menu Line, and the **SYSTEM** Menu are displayed. It appears at the top of the terminal display as illustrated in Figure 5-2. The reverse video and blinking box (arrows on VT100 terminals) on **DS0 CONFIGURATION** designate the default menu selection and current cursor position, respectively.

EXIT Function (Esc and Tab Keys)

Normally, the **Esc** key acts as the "exit" key for the Terminal Interface. However, you can assign the exit function to the **Tab** key instead of the **Esc** key. This option is provided because when you use a VT100 terminal emulation to communicate over a network, the **Esc** key should not be used.

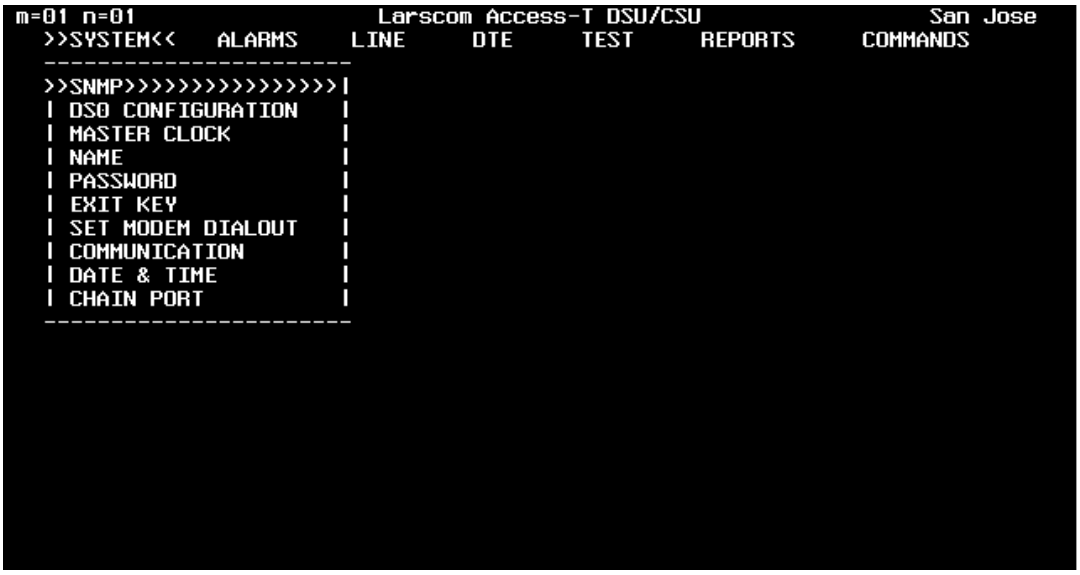


Figure 5-2. Access-T Initial Terminal Display

Larscom recommends that you use the **Esc** key for the exit function unless the Access-T is being used in such a configuration. Instructions for changing from **Esc** to **Tab** are provided in Chapter 6.

> **Note:** All procedures in this manual instruct you to use the **Esc** key to back up through the menu paths.

Moving Across the Main Menu Line

To move across the Main Menu Line, use the right and left arrow (→ and ←) keys. As each new item is selected, the previous drop-down menu disappears and a new one appears. For example, pressing the → key three times moves the cursor bar to DTE displays the screen shown in Figure 5-3.

> **Note:** The Main Menu Line, drop-down menus, and dialog boxes are all equipped with a wrap-around feature. Thus, you can use the up (or left) arrow key to move from the first option to the last, or you can use the down (or right) arrow key to move from the last option to the first.

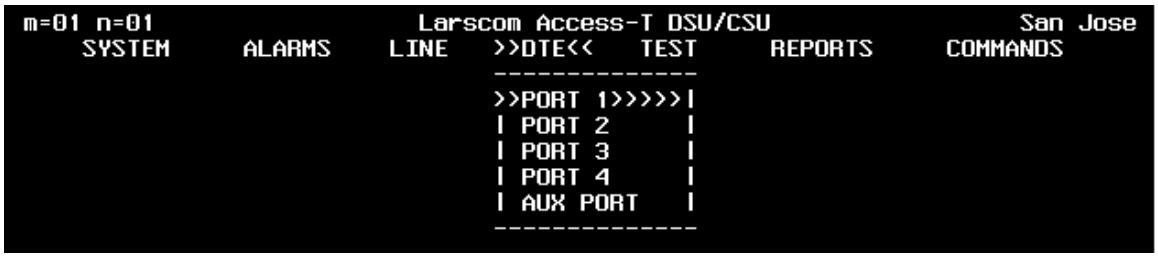


Figure 5-3. Access-T DTE Drop-Down Menu

Moving Up and Down the Menu Paths

To move up or down the menu path, press the up or down (or ↓) arrow key. After an up or down arrow is pressed, the selection bar moves to reflect the new position in the menu path. For example, if the current menu selection is **DTE** and ↓ is pressed, the drop-down menu in Figure 5-3 would change to the following:



To continue down a selected menu path, press the **Enter** key when the selection bar highlights the desired option. After the **Enter** key is pressed, a new drop-down menu appears next to the existing menu. When this happens, a second selection bar (with blinking cursor) appears to show your current menu path position. The selection bar in the parent menu remains displayed to indicate the path taken to reach the current position. Access-T displays all drop-down menus along a your selected path so that you can easily trace the path. For example, if you select the **ALARMS—SETUP—LINE—ES—DIAL** menu path, you will see the display in Figure 5-4.

> **Note:** All drop-down menus have a memory feature associated with the menu selection bar. Whenever a drop-down menu is exited (via the **EXIT** or arrow keys), Access-T notes the last location of the selection bar in that menu and when the drop-down menu is again requested, the selection bar highlights the same selection. This is the case until the **RESET SYSTEM DEFAULTS** command is issued, in which case Access-T will reset all the menus.

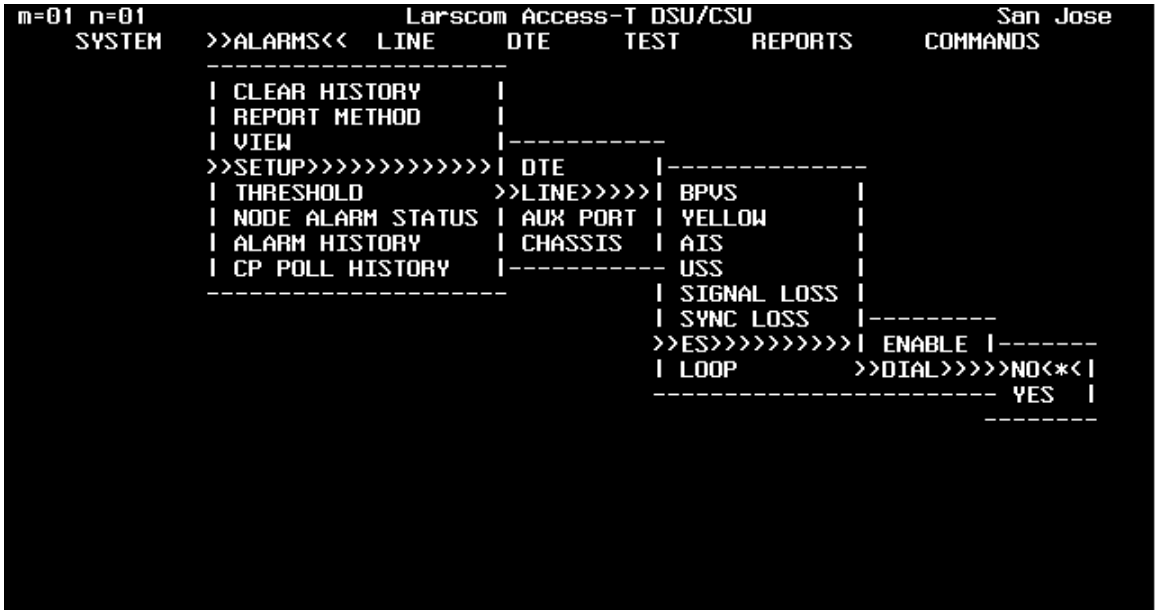


Figure 5-4. Typical Menu Path

The Question Mark (?) Key

Use the question mark (**?**) key to redraw the screen and display the Access-T start-up menu.

If Access-T is operating as a master, the **?** key always takes you back to the master node's initial display.

Table 5-B. Access-T Menus, Parameters, and Options

MENU PATH	OPTIONS / RESULTS
SYSTEM → SNMP → MANAGEMENT	NO, YES
SYSTEM → SNMP → SETS DISABLED	**NO**, YES
SYSTEM → SNMP → IP ADDRESS	15 ASCII characters, **0** is the default
SYSTEM → SNMP → TIME-TO-LIVE	1 to 255**, 5** is default
SYSTEM → SNMP → TRAP IP ADDRESS	15 ASCII characters, **0** is the default
SYSTEM → SNMP → TRAP PROTOCOL	**SLIP**, PPP
SYSTEM → SNMP → AUTHENTICATION TRAP	NO, **YES**
SYSTEM → SNMP → PPP → PPP SUPPORT	**NO**, YES
SYSTEM → SNMP → PPP → RESTART TIMER	1 to 20, **3** is default
SYSTEM → SNMP → PPP → MAX TERMINATE	1 to **20**
SYSTEM → SNMP → PPP → MAX CONFIGURE	1 to 20, **10** is default
SYSTEM → SNMP → PPP → MAX FAILURE	1 to 20, **10** is default
SYSTEM → SNMP → SLIP SUPPORT	**NO**, YES
SYSTEM → SNMP → INTERBYTE TIMEOUT	1 to 20, **5** is default
SYSTEM → SNMP → CIRCUIT ID	10 ASCII characters
SYSTEM → SNMP → SET COMMUNITY NAME	10 ASCII characters
SYSTEM → SNMP → SETS ALLOWED ADDRESSES → IP ADDRESS 1 (2)	15 ASCII characters, **0** is the default
SYSTEM → SNMP → VIEW	Displays current SNMP parameters
SYSTEM → DS0 CONFIGURATION → CURRENT	**MAP1**, MAP2, TIME
SYSTEM → DS0 CONFIGURATION → CHANGE MAP1	For each DS0: **Idle**, Port # (1-4), Aux
SYSTEM → DS0 CONFIGURATION → CHANGE MAP2	For each DS0: **Idle**, Port # (1-4), Aux
SYSTEM → DS0 CONFIGURATION → TIME → START TIME	Sets MAP1's activation time, **00:00**
SYSTEM → DS0 CONFIGURATION → TIME → STOP TIME	Sets MAP1's deactivation time, **00:00**
SYSTEM → DS0 CONFIGURATION → SEND	Transmits current map and DTE port configuration to the far end
SYSTEM → DS0 CONFIGURATION → VIEW	Displays the mapping configurations and currently-active map
SYSTEM → MASTER CLOCK → SOURCE	**INTERNAL**, LINE, STATION, AUX, PORT1, PORT2, PORT3, PORT4
SYSTEM → MASTER CLOCK → FREQ (56-6176)	56 to 6176 kbps, **1544** is default (alterable only if SOURCE = STATION)
SYSTEM → NAME	8-character ASCII entry, **[no entry]**
SYSTEM → PASSWORD → ENABLE	**NO**, YES
SYSTEM → PASSWORD → SET	7-character ASCII entry, **<Enter>**
SYSTEM → EXIT KEY	**ESC**, TAB

Table 5-B. Access-T Menus, Parameters, and Options (cont'd)

MENU PATH	OPTIONS / RESULTS
SYSTEM → SET MODEM DIALOUT → PRIMARY (ALTERNATE) → DIAL STRING	36-character entry, **[no entry]**
SYSTEM → SET MODEM DIALOUT → PRIMARY (ALTERNATE) → START TIME	Hour : Minute, **00:00**
SYSTEM → SET MODEM DIALOUT → PRIMARY (ALTERNATE) → STOP TIME	Hour : Minute, **00:00**
SYSTEM → SET MODEM DIALOUT → WAIT FOR CONNECT	**030** -120
SYSTEM → SET MODEM DIALOUT → INACTIVITY TIMEOUT	**000** -**255**
SYSTEM → SET MODEM DIALOUT → DIALPORT BACKOFF	**15 - 240; 060** is default
SYSTEM → SET MODEM DIALOUT → VIEW	Displays current dialout parameters
SYSTEM → COMMUNICATION → BAUD RATE	600, 1200, 2400, 4800, **9600**
SYSTEM → COMMUNICATION → STOP BITS	**1**, 2
SYSTEM → COMMUNICATION → PARITY	**NONE**, EVEN, ODD
SYSTEM → COMMUNICATION → XON-XOFF	**DISABLE**, ENABLE
SYSTEM → COMMUNICATION → INTERFACE	**TERMINAL**, MODEM, DATAKIT
SYSTEM → COMMUNICATION → TERMINAL	**TV925**, VT100
SYSTEM → DATE & TIME → DATE	Month / Day / Year (xx-xx-xx)
SYSTEM → DATE & TIME → TIME	Hour : Minute : Second (xx:xx:xx)
SYSTEM → CHAIN PORT → CONFIG → POLL	ENABLE, **DISABLE**
SYSTEM → CHAIN PORT → CONFIG → DIAL	ENABLE, **DISABLE**
SYSTEM → CHAIN PORT → CONFIG COPY	*source*:*destination* (1 to 30)
SYSTEM → CHAIN PORT → SELECT	2-digit address entry
SYSTEM → CHAIN PORT → VIEW	Displays the chaining configuration for all units (1-30) **All No's**
ALARMS → CLEAR HISTORY → VIEWED	Clears viewed alarms from local alarm history and chain port poll history
ALARMS → CLEAR HISTORY → FORCE	Clears all alarms from local alarm history and chain port poll history
ALARMS → REPORT METHOD	**ALERT MESSAGE**, SNMP TRAPS, UNSOLICITED, NONE
ALARMS → VIEW → DTE (LINE, AUX PORT, CHASSIS)	Displays local alarm setup, **All No's**

Table 5-B. Access-T Menus, Parameters, and Options (cont'd)

MENU PATH	OPTIONS / RESULTS
ALARMS → SETUP → DTE → ALARM TYPE † → ENABLE ALARMS → SETUP → DTE → ALARM TYPE † → DIAL ALARMS → SETUP → LINE → ALARM TYPE † → ENABLE ALARMS → SETUP → LINE → ALARM TYPE † → DIAL ALARMS → SETUP → AUX → ALARM TYPE † → ENABLE ALARMS → SETUP → AUX → ALARM TYPE † → DIAL ALARMS → SETUP → CHASSIS → ALARM TYPE † → ENABLE ALARMS → SETUP → CHASSIS → ALARM TYPE † → DIAL	**NO**, YES **NO**, YES **NO**, YES **NO**, YES **NO**, YES **NO**, YES **NO**, YES **NO**, YES
ALARMS → THRESHOLD → LINE→ BPV ALARMS → THRESHOLD → LINE → ES INTERVAL ALARMS → THRESHOLD → LINE → ES ERRORS	**5 - 9 (negative exponent of BPV rate**) 1 - 15 minutes, default is **6** 1 to 399 errors, default is **100**
ALARMS → THRESHOLD → AUX PORT→ BPV ALARMS → THRESHOLD → AUX PORT → ES INTERVAL ALARMS → THRESHOLD → AUX PORT → ES ERRORS	**5 - 9 (negative exponent of BPV rate**) 1 - 15 minutes, default is **6** 1 to 399 errors, **100** is default
ALARMS → NODE ALARM STATUS	Display showing which nodes are in a state of alert
ALARMS → ALARM HISTORY → DTE ALARMS → ALARM HISTORY → LINE ALARMS → ALARM HISTORY → AUX PORT ALARMS → ALARM HISTORY → CHASSIS	Local alarm history display Local alarm history display Local alarm history display Local alarm history display
ALARMS → CP POLL HISTORY → 1-15 (16-30)	Polling history for nodes 1-15 (16-30)
LINE → FRAMING LINE → CODING LINE → LINE BUILD OUT LINE → T1.403 LINE → YELLOW LINE → DATA LINK ID LINE → INBAND	**D4**, ESF **AMI**, B8ZS **0,** -7.5, -15 dB **OFF**, ON **OFF**, ON **CSU,** DTE **ON**, OFF
DTE → PORT1 (2, 3, 4) → RATE DTE → PORT1 (2, 3, 4) → CLOCK DTE → PORT1 (2, 3, 4) → DATA DTE → PORT1 (2, 3, 4) → INTERFACE DTE → PORT1 (2, 3, 4) → RTS DTE → PORT1 (2, 3, 4) → TTM DTE → PORT1 (2, 3, 4) → BIT 7	**Nx64**,Nx56 **NORMAL**, INVERTED **NORMAL**, INVERTED **RS449**, V.35 **ACTIVE**, PERMANENT **OFF**, ON **OFF**, ON

Table 5-B. Access-T Menus, Parameters, and Options (cont'd)

MENU PATH	OPTIONS / RESULTS
DTE → AUX PORT → FRAMING DTE → AUX PORT → CODING DTE → AUX PORT → EQUALIZATION DTE → AUX PORT → BIT 7 DTE → AUX PORT → YELLOW TRANSCODING DTE → AUX PORT → AIS TO DTE DTE → AUX PORT → AIS TO LINE	**D4**, ESF **AMI**, B8ZS **0-133**, 133-266, 266-399, 399-533, 533- 655 **OFF**, ON **DISABLE**, ENABLE **DISABLE**, ENABLE **DISABLE**, ENABLE
TEST → LINE LOOP → LOCAL TEST → LINE LOOP → REMOTE-UP TEST → LINE LOOP → REMOTE-DOWN TEST → LINE LOOP → REMOTE-VERIFY	**OFF**, LSLINE, LSDTE, DSLINE, DSDTE T1E1P, T1E1L, FDL, LINE T1E1P, T1E1L, FDL, LINE FULL, PORT1, PORT2, PORT3, PORT4, AUX PORT, IDLE
TEST → PORT LOOP → PORT1 (2, 3, 4)	**OFF**, REMOTE-UP, REMOTE-DOWN, CSLOOP (OFF, CS LINE, CS DTE)
TEST → AUX LOOP	**OFF**, CSDTE
TEST → AUTO-VERIFY	**OFF**, ON
TEST → QRSS	**OFF**, FULL, PORT1, PORT2, PORT3, PORT4, AUX PORT, IDLE
TEST → BIT ERRORS	Displays bandwidth in which QRSS is being transmitted,whether Access-T is synced on received QRSS, and number of bit errors in received QRSS
REPORTS → CONFIGURATION → LOCAL REPORTS → CONFIGURATION → FAR END	Local configuration display Far-end configuration display
REPORTS → DESCRIPTION	Local system description display
REPORTS → STATUS	Local system status display
REPORTS → 24-HOUR REGISTERS → TELCO → REGISTER $^{\Delta}$ REPORTS → 24-HOUR REGISTERS → USER → REGISTER $^{\Delta}$ REPORTS → 24-HOUR REGISTERS → AUX → REGISTER $^{\Delta}$ REPORTS → 24-HOUR REGISTERS → FDL TELCO → REGISTER $^{\Delta}$ REPORTS → 24-HOUR REGISTERS → FDL USER → REGISTER $^{\Delta}$	Display showing the 24-hour count of the specified register type in 96 15-minute time intervals.

Table 5-B. Access-T Menus, Parameters, and Options (cont'd)

MENU PATH	OPTIONS / RESULTS
REPORTS → ONE-HOUR STATISTICS → TELCO REPORTS → ONE-HOUR STATISTICS → USER REPORTS → ONE-HOUR STATISTICS → AUX PORT REPORTS → ONE-HOUR STATISTICS → FDL TELCO REPORTS → ONE-HOUR STATISTICS → FDL USER	Display showing the one-hour count of the specified register type in 4 latest 15-minute intervals.
REPORTS → LINE AVAILABILITY	Display showing the line availability
REPORTS → ESF ERROR COUNT → TELCO REPORTS → ESF ERROR COUNT → USER REPORTS → ESF ERROR COUNT → AUX PORT REPORTS → ESF ERROR COUNT → FDL TELCO REPORTS → ESF ERROR COUNT → FDL USER	Displays the number of recorded ESF errors received at the specified register.
REPORTS → MIB-II COUNTS → VARIABLE *	Displays the number of recorded MIB-II counts received for the specified group variables.
COMMANDS → CLEAR REGISTERS →USER (AUX PORT, FDL USER) COMMANDS → CLEAR ESF ERRORS → USER (AUX PORT, FDL USER) COMMANDS → RESTART NIM COMMANDS → RESTART MUX COMMANDS → RESET SYSTEM DEFAULTS COMMANDS → BUFFER ERROR COUNT → CLEAR COMMANDS → BUFFER ERROR COUNT → VIEW COMMANDS → CHANGE PROTOCOL COMMANDS → LOG OFF	Clears specified registers Clears specified ESF error count Restarts the NIM software Restarts the Mux software Resets system parameters to their default values Clears the User Buffer Error Count Displays the Buffer Error Count Initiates Protocol Search Mode Exits the Access-T software (if passwords enabled)

† One of 23 alarm types:
DTE: PORT1 LOSS, PORT2 LOSS, PORT3 LOSS, PORT4 LOSS
LINE: BPVS; YELLOW; AIS; USS; SIGNAL LOSS; SYNC LOSS; ES; LOOP
AUX PORT: BPVS; YELLOW; AIS; USS; SIGNAL LOSS; SYNC LOSS; ES
CHASSIS: MASTER CLOCK LOSS, NIM LOSS A, NIM LOSS B, INT COMM LOSS

Δ One of the following register types: Errored Seconds, Bursty Errored Seconds, Severely Errored Seconds, Unavailable Seconds, Loss of Frame Count, and Controlled Slip Seconds (FDL Only), (Bipolar Violations and ESF Errors included in User and Aux Port choices)

* One of the following variable types: UDP, ICMP, IP, INTERFACE, or SNMP

Note: See Table 5-C for definitions of the terms and abbreviations used in the Access-T menus. All definable options are retained upon power loss except those for local loopbacks and generated test patterns. **Default options given in boldface.**

Table 5-C. Glossary of Terms and Abbreviations in Menus

TERM	MEANING
ACTIVE	Configures a port's RTS under PORT to be controlled by the DTE.
ADDRESS	Access-T address, used for TABS interface and node selection.
AIS TO DTE	Generates Alarm Indication Signal toward the Aux port when LOS or LOF occurs from the line (at least one DS0 must be dedicated to the Aux port).
AIS TO LINE	Generates Alarm Indication Signal toward the line when LOS or LOF occurs from the Aux port (at least one DS0 must be dedicated to the Aux port).
ALARM HISTORY	A detailed history of all change of states for all alarm conditions.
ALARMS	General configuration and commands associated with alarm parameters.
ALERT MESSAGE	Enables the Terminal Interface alarm reporting method.
ALTERNATE	Secondary dialstring used in modem dialout.
AUTHENTICATION TRAP	Enables or disables authentication traps which are generated if the community name on GET/SET commands is incorrect.
AUTO VERIFY	Automatic check sent after Access-T has issued a far-end loopback command to discover if far-end Access-T is looped back to the line.
AUX LOOP	A loopback established at the Aux Port of the local Access-T.
AUX PORT	The T1 drop-and-insert port. Under SOURCE, a master clock derived from the T1 input to this port. Under QRSS and LOOP, a test signal or loopback command transmitted in DS0s mapped to the AUX Port.
BAUD RATE	The baud rate used for communication via the supervisory or craft ports.
BIT ERRORS	The number of bit errors (logically incorrect bits) in a received QRSS pattern.
BIT 7	Forcing of Bit 7 of each all-ZERO byte to ONE to ensure required pulse density.
BPV	BPV alarm threshold, (specified as negative exponent).
BUFFER ERROR COUNT	Tally of the clock alignment errors at the Line, Port1/2/3/4, and auxiliary interfaces.
CHAIN PORT	Communication options for the rear-panel RS485 chain port.
CHANGE MAP1	Primary map assigning DTE ports to specific DS0s.
CHANGE MAP2	Secondary map assigning DTE ports to specific DS0s.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
CHANGE PROTOCOL	Engages Access-T's Search Mode; Access-T waits to receive either a SLIP/PPP packet, TABS command, or Terminal escape sequence ($USERMODE$).
CHASSIS	Under ALARM HISTORY, VIEW, and SETUP, alarms that refer to internal software performance (NIM, Clock, and Expander).
CIRCUIT ID	User-defined name to describe the end-to-end circuit path.
CP POLL HISTORY	Under ALARMS, provides the status of each Access-T node along a chain.
CLEAR HISTORY	Clearing of all alarm history information (FORCE) or only the viewed alarms (VIEWED).
CLEAR ESF ERRORS	Clearing of User or Aux ESF error count.
CLEAR REGISTERS	Resets to zero all error and interval counts for the User or Aux 24-hour registers, one-hour statistics, and line availability percentage.
CLOCK	The clock signal received from DTE Port 1, 2, 3, or 4 or the auxiliary port. It may be normal (clocks on transition from ON to OFF) or inverted (clocks on transition from OFF to ON).
CODING	The line coding of a T1 signal, either AMI or B8ZS.
CONFIGURATION	Under REPORTS, displays the current Access-T configuration settings.
CONFIG	Under CHAIN PORT, used to enable a node and/or its dialout function.
CONFIG COPY	Copies the current system configuration from one node to another.
CSDTE	Loopback of T1 DTE Port 1, 2, 3, or 4 to DTE.
CSLOOP	A CS Line or CS DTE loopback of DTE port 1, 2, 3, or 4.
CSU	Under DATA LINK ID, configures Access-T to respond to FDL commands addressed to CSUs.
CURRENT	Identifies the active DS0 map.
DATA	Under PORT1, 2, 3, or 4, the data received from and transmitted to the DTE port, which may be normal (ON state equals ONE) or inverted (ON state equals ZERO).
DATAKIT	Under SYSTEM—COMMUNICATION—INTERFACE, configures Access-T to communicate with a Datakit network.
DATA LINK ID	Data link identification of Access-T, either CSU or DTE.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
DATE	The Access-T system date.
DATE & TIME	The Access-T system date and time.
DESCRIPTION	Under REPORTS, displays the description of the Access-T software and hardware.
DIAL	Whether dialout is enabled for the specified alarm type.
DIAL STRING	One of two 36-character phone numbers used for modem dialout of Access-T alarms.
DIALPORT BACKOFF	Under SET MODEM DIALOUT, the time (15 - 240 minutes) Access-T waits after it is disconnected due to inactivity before redialing to report an alarm which has been reported but has not been cleared.
DS0 CONFIGURATION	The assignment of DTE channels to specific DS0s.
DTE	Under DATA LINK ID, configures Access-T to respond to FDL commands addressed to DTE.
ENABLE	Under ALARM → SETUP, whether alarms are reported for a specific alarm type.
EQUALIZATION	The equalization of a transmitted DSX-1 signal from the auxiliary port, for cable length.
ES ERROR COUNT	Number of ES in the user-specified interval which will cause an ES alarm.
ES INTERVAL	Interval during which the user-specified ES will cause an ES alarm.
EXIT KEY	Under SYSTEM, option to define whether Access-T will recognize the Escape or Tab key for maneuvering through the menus and displays.
FAR END	Access-T at the other end of a T1 link.
FDL	Payload Loopback (DS Line) as specified in AT&T Pub 54016, commanded via the ESF data link.
FRAMING	The framing mode for a T1 signal, either ESF or D4.
FREQ	The frequency of the master clock, user-selectable only for a station clock.
FULL	Test signal transmitted across the full T1 bandwidth.
IDLE	Under DS0 CONFIGURATION, an All-ONES code transmitted in unused DS0s. Under REMOTE-VERIFY and QRSS, all unused (i.e., unmapped) DS0s.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
INACTIVITY TIMEOUT	Under MODEM DIALOUT, amount of time (0 - 255 minutes) Access-T will keep a connection to an inactive line before hanging up (ending a sesion). This value applies to modem and SLIP/PPP sessions.
INBAND	Recognition of in-band loopback control codes, which may be enabled or disabled.
INTERBYTE TIMEOUT	Number of seconds allowed between bytes when Access-T is in Protocol Search Mode or receiving characters using SLIP or PPP over the supervisory port.
INTERNAL	A crystal clock source internal to the Access-T.
INTERFACE	Under SYSTEM → COMMUNICATION, determines the interface type (terminal or modem) for the supervisory or craft ports. Under DTE, determines the interface to the DTE device: either RS-449 or V.35.
INVERTED	Under DATA, an inverted signal, where ONES are replaced with ZEROS, and vice versa. Under CLOCK, an inverted clock, where Access-T transmits on the falling edge of the clock instead of the rising edge (NORMAL).
IP ADDRESS	Defines Access-T's IP address in dotted notation (eg. 192.203.128.186).
LINE	The T1 line (network), or the interface to the T1 line. Under SOURCE, a clock derived from the signal received from the T1 line. Under REMOTE-UP or REMOTE-DOWN, remote LS Line Loopback commanded using in-band code.
LINE AVAILABILITY	Percentage of seconds which were not unavailable seconds, based on current interval and valid intervals in the User 24-hour UAS.
LINE BUILD OUT	The amplitude adjustment of the signal transmitted to the line.
LOCAL	Access-T to which you are connected.
LOG OFF	When password protection is enabled, exits the operator from Access-T.
LINE LOOP	A loopback established at the local Access-T (DS Line, LS Line, DS DTE, or LS DTE).
MANAGEMENT	Enables or disables SNMP management.
MAP 1	Primary map assigning DTE ports to specific DS0s.
MAP 2	Secondary map assigning DTE ports to specific DS0s.
MASTER CLOCK	Defines the master clock source and frequency used by Access-T for transmitting and receiving.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
MAX CONFIGURE	Maximum number of configure requests that can be sent from Access-T without receiving an acceptable ACK response. (PPP only)
MAX FAILURE	Maximum number of unacceptable configure requests that can be received before Access-T gives up. (PPP only)
MAX TERMINATE	Maximum number of terminate requests that can be sent from Access-T without receiving an ACK. (PPP only)
MIB-II COUNTS	Displays counts of specific MIB-II variables.
NAME	8-character, user-defined system name displayed in the Title Bar.
NODE ALARM STATUS	A display indicating which nodes (master and slaves) are in a state of alarm.
NONE	Disables all alarm reporting.
NORMAL	A normal (non-inverted) signal, in which a pulse represents a ONE.
ONE-HOUR STATISTICS	Under REPORTS, refers to the one-hour breakdown of error counts for specific performance parameters.
PARITY	The parity mode used for communication via the supervisory ports.
PASSWORD	Password protection of the terminal interface, which can be enabled or disabled via the supervisory, craft, or chain port of a master Access-T.
PERMANENT	Permanent assertion of the RTS input from the DTE.
PORT1 (2, 3, 4)	DTE Port 1 (2, 3, 4). Under SOURCE, a master clock derived from the input to this port. Under REMOTE-VERIFY and QRSS, test signal transmitted only in DS0s mapped to DTE Port 1 (2, 3, 4).
PORT LOOP	A loopback established at one of the DTE Ports.
PPP SUPPORT	Under SNMP, defines variables required for Point-to-Point Protocol support.
PRIMARY	Primary dialstring used for modem dialout.
QRSS	Under TEST, the bandwidth (channel) in which Access-T is transmitting QRSS.
QSYNC	Whether Access-T is in sync on a received QRSS pattern.
RATE	Whether data is transmitted in 56 kbps (7 bits) or 64 kbps (8 bits) per DS0.
RESTART MUX	Re-initiates the Mux software.
RESTART NIM	Re-initiates the NIM software.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
REMOTE-DOWN	Clearing of a loopback at the remote Access-T, via FDL or in-band codes.
REMOTE-UP	Establishment of a loopback at the remote Access-T, via FDL or in-band codes.
REMOTE-VERIFY	Check of whether far-end Access-T is looped back to the line.
REPORT METHOD	Determines what type of alarm reporting method (ALERT MESSAGE, SNMP TRAPS, or UNSOLICITED) Access-T enables.
RESET SYSTEM DEFAULTS	Resets user-settable parameters to their default values.
RESTART TIMER	Maximum timeout value (in seconds) for acknowledging configure or terminate requests. (PPP only)
RTS	The Request-To-Send handshaking signal from the DTE.
SELECT	Under CHAIN PORT, specifies a specific node with which to communicate.
SEND	Transmits current DS0 map and DTE port configuration to the far-end Access-T.
SET	Under PASSWORD, defines the 7-character password.
SET COMMUNITY NAME	Defines the Access-T community name for SET requests.
SETUP	Enabling of alarm detecting and dialout.
SETS DISABLED	Under SNMP, disables Access-T's ability to SET parameters via the SNMP interface.
SETS ALLOWED ADDRESSES	Under SNMP, allows you to configure Access-T to execute only those SET commands received from specific IP addresses.
SLIP SUPPORT	Enables support of the Serial Line Interface Protocol.
SNMP TRAPS	Selects SNMP trap support as the current alarm reporting method.
SOURCE	Defines the master clock source used by Access-T for transmitting and receiving.
START TIME	Under SET MODEM DIALOUT, defines the start time of the primary or alternate dial strings. Under DS0 CONFIGURATION, defines Map 1s start time for timed mapping.
STATION	A station clock input to the Access-T via a rear-panel BNC connector.
STATUS	Displays the status of the T1 and DTE interfaces.

Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
STOP BITS	The number of stop bits per word transmitted via the Supervisory Port.
STOP TIME	Under SET MODEM DIALOUT, defines the stop time of the primary or alternate dial strings. Under DS0 CONFIGURATION, defines Map 1s stop time for timed mapping.
SYSTEM	General configuration applying to the Access-T as a whole.
T1.403	Conformance with the ANSI T1.403 (T1E1) specification for ESF, including transmission of one-second performance reports.
T1E1L	ANSI T1.403 Line Loopback (LS Line), commanded via the ESF data link.
T1E1P	ANSI T1.403 Payload Loopback (DS Line), commanded via the ESF data link.
TELCO	Under REPORTS, the error and register information for the T1 line.
TERMINAL	The type of terminal (TeleVideo 925 or VT100) connected to the supervisory or craft port.
TEST	Diagnostic test options.
THRESHOLD	Threshold for BPV and ES alarms from the Line and Aux.
TIME	Under DATE & TIME, the system time. Under DS0 CONFIGURATION, sets automatic time-of-day map switching.
TIME-TO-LIVE	Defines the default time-to-live values (in seconds) which is inserted into all outgoing IP datagram packets. Time-to-live detemines how long the IP datagram will be passed until it is silently discarded.
TRAP IP ADDRESS	Defines the IP address of the Trap manager in dotted notation.
TRAP PROTOCOL	Defines the protocol (SLIP or PPP) used when transmitting traps after dial-out.
TTM	Terminal Timing Mode, which may be on or off as described in Chapter 7.
UNSOLICITED	Unsolicited alarm history reports transmitted via the supervisory port. (If disabled, alarms are requested by an ASCII terminal.)
USER	Access-T's register set not under telco control, including BPV and ESF reports.
VIEW	Under CHAIN PORT, displays the configuration of up to 30 Access-Ts. Under ALARMS, displays the configuration of up to 23 alarm conditions. Under SET MODEM DIALOUT, displays the current dialout parameters.
WAIT FOR CONNECT	Amount of time Access-T will wait before an attempted dialing connection will be discontinued.

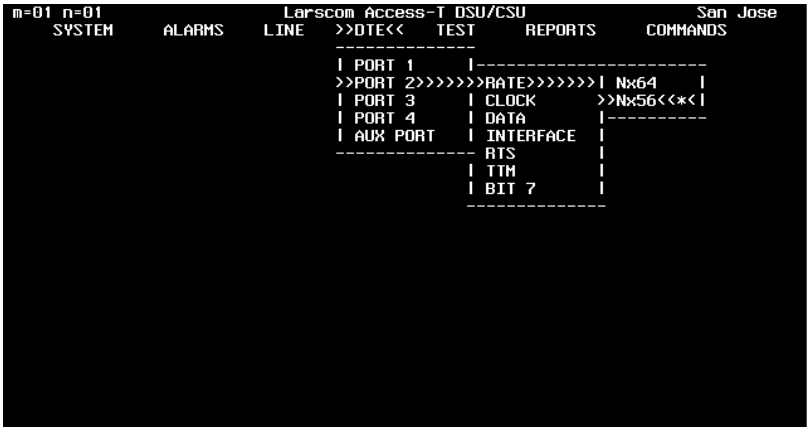
Table 5-C. Glossary of Terms and Abbreviations in Menus (cont'd)

TERM	MEANING
XON-XOFF	Whether XON-XOFF handshaking is used for communication via the supervisory port.
YELLOW	Transmission of Yellow Signal when Access-T loses sync on the T1 line signal.
YELLOW TRANSCODING	Passing of Yellow Signal from D4-ESF via the auxiliary (T1 DTE) Port, only if at least one DS0 is mapped for the Aux Port.
1-15 (16-30)	Under CP POLL HISTORY, displays the current status of nodes 1-15 (16-30) on the Access-T chain.
24-HOUR REGISTERS	Displays counts of specific 24-hour performance registers.
Nx56 (64)	A data rate which is a multiple of 56 kbps (64 kbps).

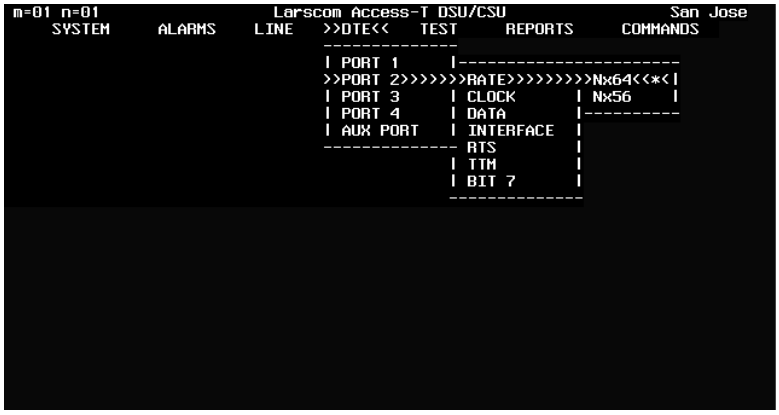
Selecting Options

You have reached the end of a menu path when pressing the Enter key produces a report, a dialog box, or a drop-down menu with an asterisk next to one of the selections. A parameter in a drop-down menu with an asterisk next to it signifies the current state or setting for a particular option. To select a different parameter, use the up and down arrow keys (and ↓) to move the selection bar to the desired parameter. When the desired parameter is selected, press the Enter key. An asterisk will appear next to the selected option to indicate the new selection. To return to the top-level menu from any point in a menu path, press the **Esc** key repeatedly or press the **?** key.

In the display shown below, the **RATE** parameter for Port 2 has been selected, and the currently specified option is **Nx56**.



To change the rate selection to **Nx64**, you must press the down or up arrow followed by the Enter key. The display changes to the following:



Dialog Boxes

Dialog boxes appear at the end of a menu path when more than an **Enter** keystroke is required to set a parameter. When a dialog box appears, the cursor blinks at the point where the operator should key-in the needed information. Pressing the **Enter** key confirms the entry, as illustrated below:



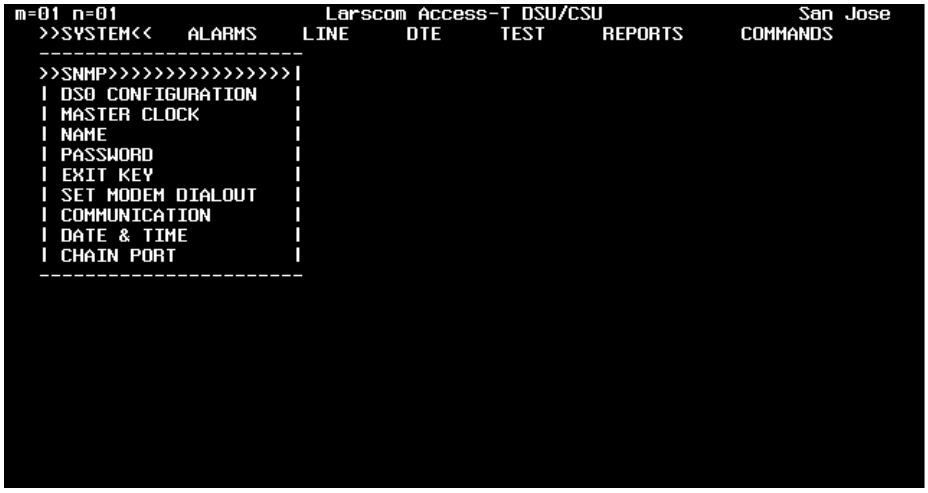
To exit a dialog box, press the **Esc** key.

Menu Path Example

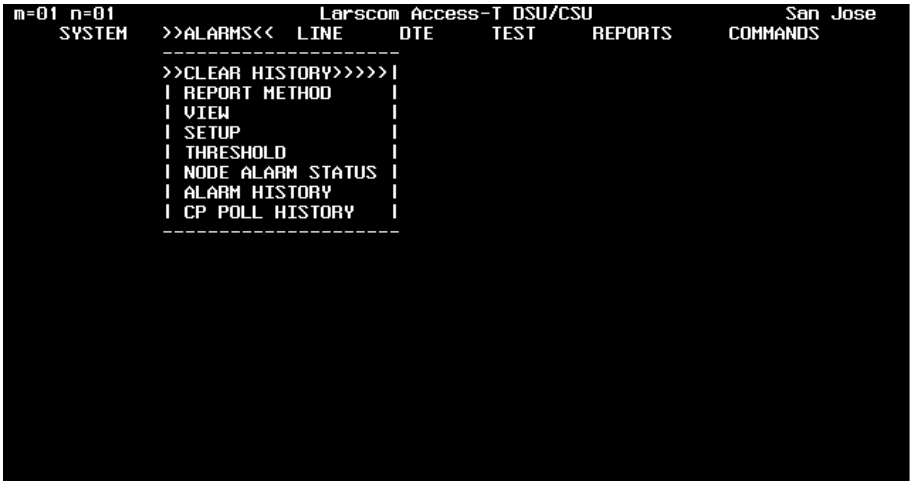
The term "menu path" refers to the course you take through the various drop-down menus available via the Terminal Interface. Navigation through the menu paths is performed primarily using the arrow keys, the **Enter** key, and the **Esc** key.

This section provides the screen-by-screen steps for defining the line threshold parameters: BPVs, ES interval, and ES errors. The displays in this section reflect a TV 925 display; VT100 displays will be slightly different.

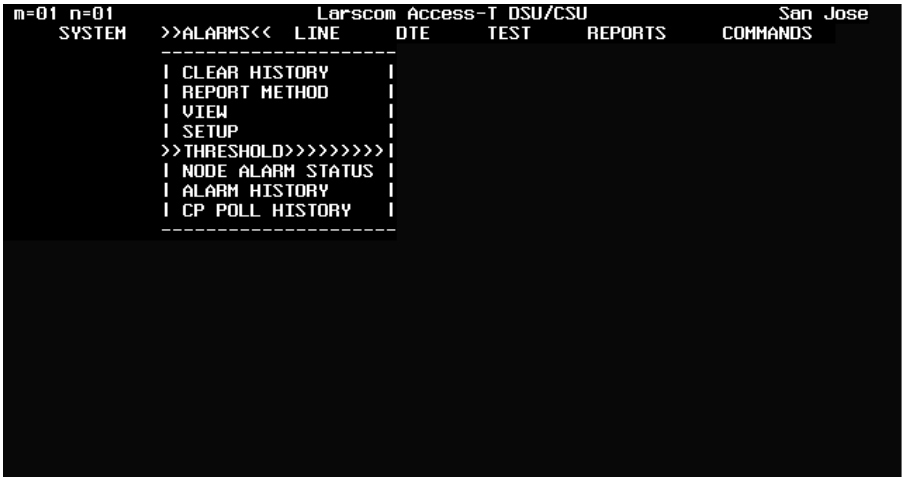
1. Press the **?** key to return to the top-level menu:



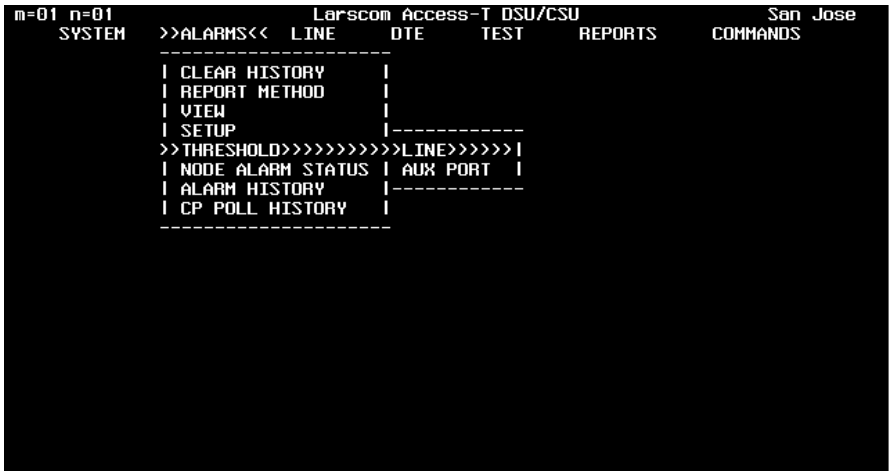
2. Move the cursor to the **ALARMS** option by pressing the → key once. Notice that the **<<** and **>>** markers identify the current Main Menu Line selection. The display reads:



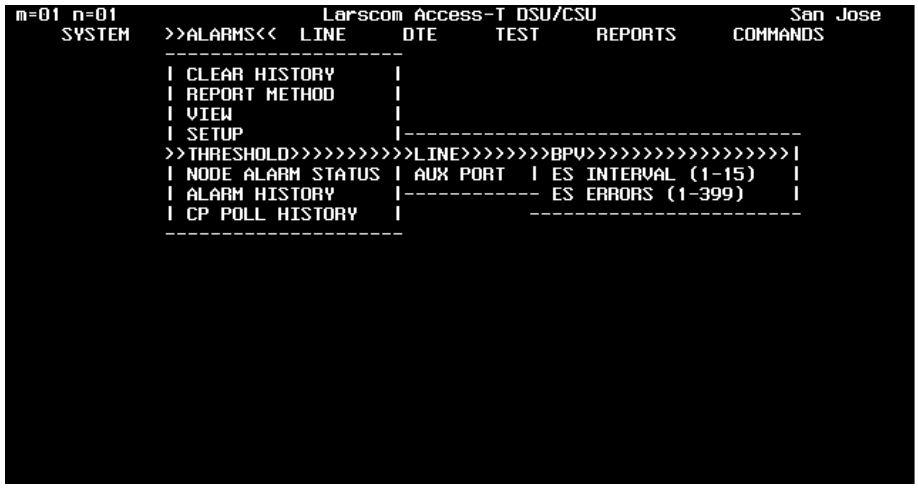
3. Use the ↓ key to move the selection bar to THRESHOLD. The display changes to:



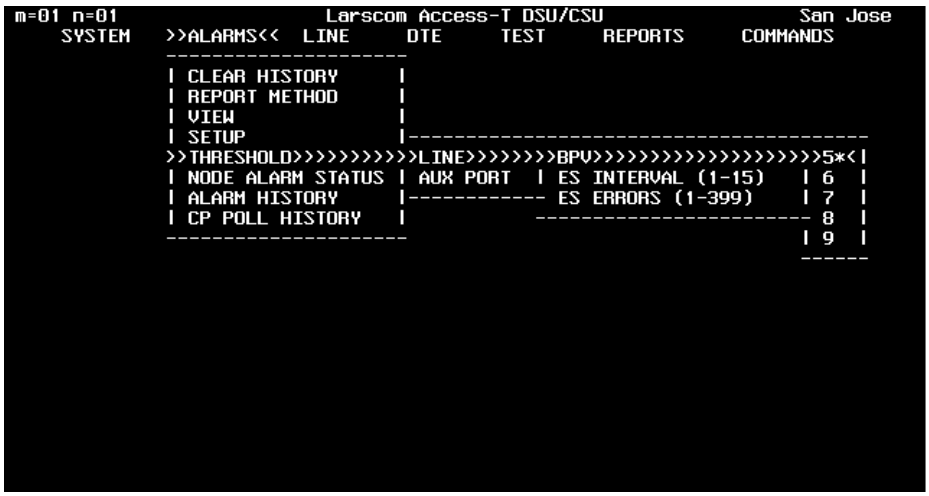
4. Press the **Enter** key. The display changes to show additional line options:



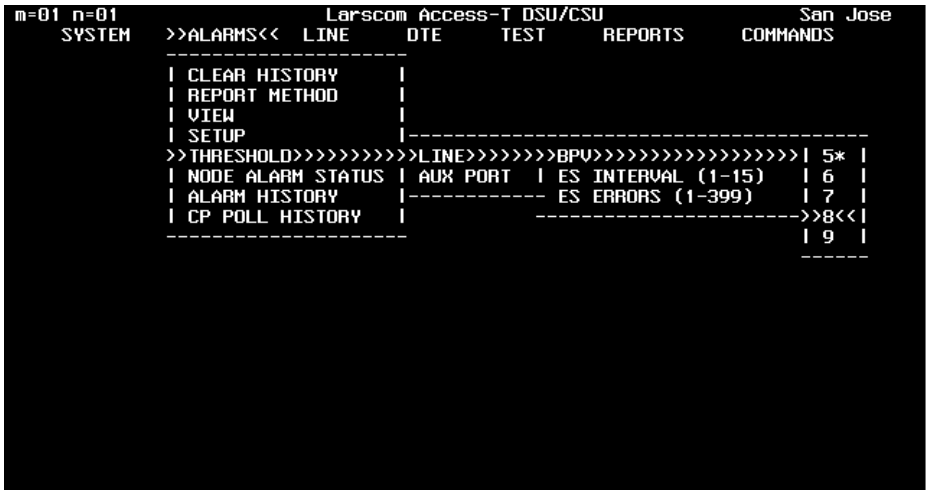
5. Press the ↓ key until the selection bar highlights the **LINE** option as shown in the previous display. Press the **Enter** key.



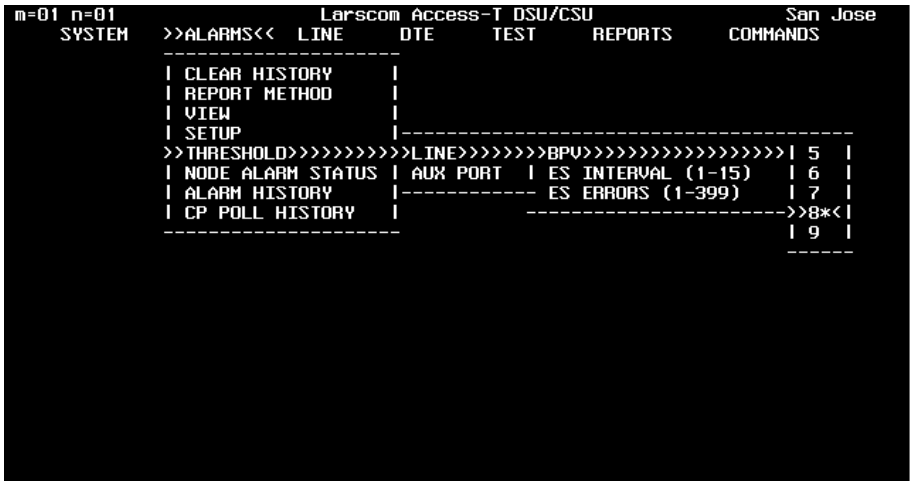
6. Press the ↓ key until the selection bar highlights the **BPV** option as shown in the previous display. Press the **Enter** key. The display lists the possible values for this parameter. An asterisk appears next to the currently selected value, as follows:



7. To change the BPV threshold to 10^{-8}, press the ↓ key until the **8** is highlighted. The display changes to:

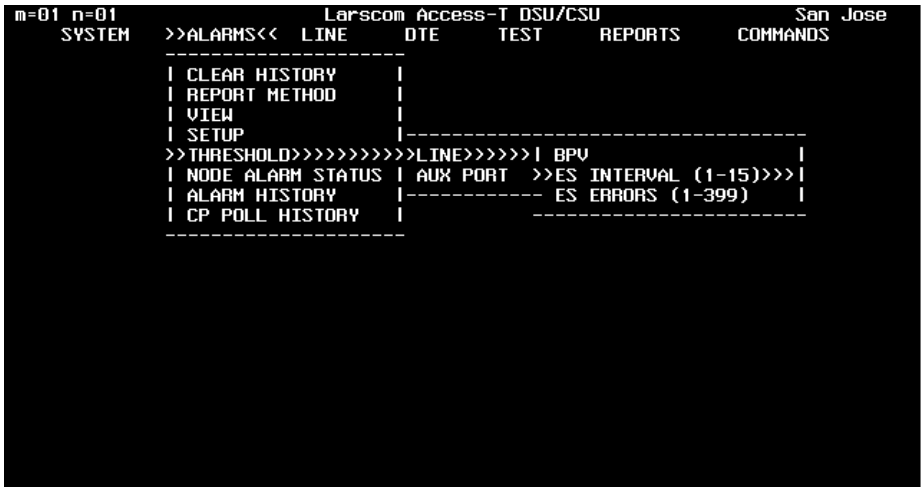


8. Press the **Enter** key. The asterisk appears next to the **8**, verifying the new selection:

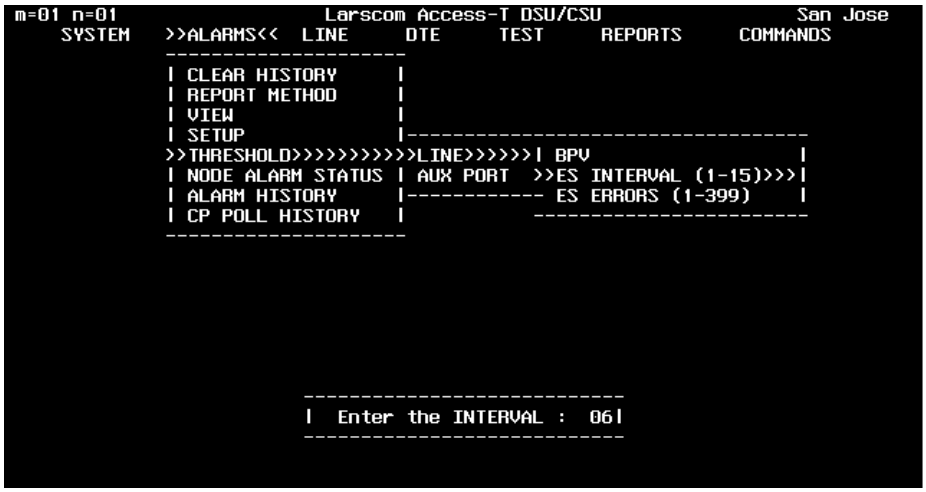


9. Press the **Esc** key to return to the previous menu.

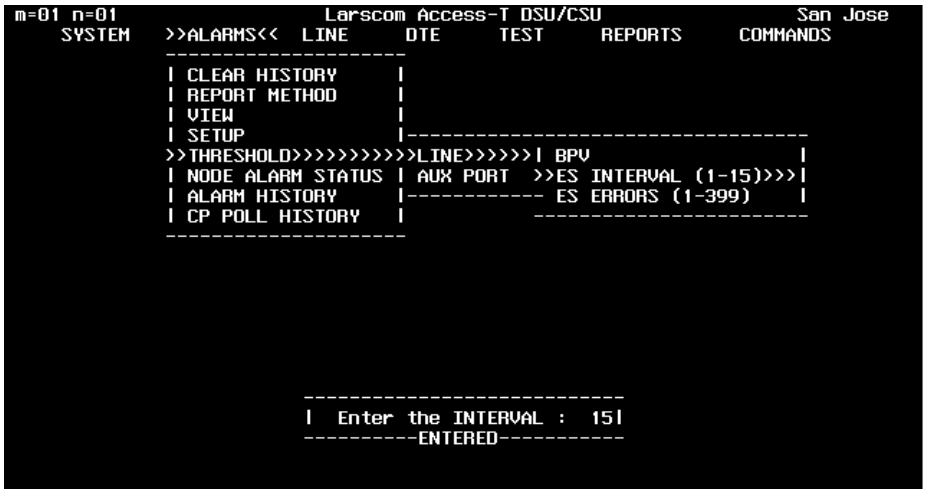
10. Press the ↓ key until the selection bar highlights the **ES INTERVAL** option. The display reflects the new selection:



11. Press the **Enter** key. A dialog box appears at the bottom of the display, prompting the operator for input:



12. Key-in **15** and press the **Enter** key. The display responds with ENTERED to verify that the new value was accepted:



13. Press the **Esc** key to exit the dialog box and return to the previous menu.

14. Repeat Steps 10 through 13 for the **ES ERRORS** parameter.

15. Press the **Esc** key repeatedly to return to the Main Menu Line.

All the line threshold parameters have now been set.

6 Configuration Procedures

This chapter provides specific procedures for configuring the Access-T, including the DTE and network interfaces and the RS232 ports.

Access-T retains configuration settings (except tests and certain loopbacks) in non-volatile memory. Thus, no configuration settings are lost if power is disconnected. However, registers do get reset to zero.

System Configuration

Access-T system configuration parameters include the system name, the date and time, the clock source, the password, the operation mode, and the terminal interface communication parameters.

Setting the Communication Parameters Via the Craft Port

To perform configuration or diagnostics via the Craft Port, the Access-T and the terminal must be configured for the same communication parameters. Access-T supports VT100 or TeleVideo 925 (or compatible) terminals via an RS232 DTE interface.

The Craft Port has the following basic configuration:

- Data Bits: **8**.
- Stop Bits: **1**.
- Parity: **None**.
- Interface: **Terminal**.
- XON-XOFF: **Enabled**.

The only Craft Port communication parameters which can be defined by the user are:

- Baud Rate: **600, 1200, 2400, 4800,** or **9600**.
- Terminal Type: **TV 925** or **VT100**.

Access-T is equipped with an automatic baud rate detection feature to help you establish communications between your terminal and the Access-T.

> **Note:** The Craft Port connector and autobaud pushbutton are located on the front-panel of the Access-T 200 and 400 units and the rear panel of Access-T 1500 chassis.

To configure the Craft Port's baud rate and terminal type for use with your terminal, perform the following steps:

1. Connect the terminal to the Access-T Craft Port connector. For a direct connection, Larscom recommends using DE-9 interface cable 080-2383-0xx for an Access-T 100, 200, and 400 units and DB25 interface cable (080-2603-0xx) for an Access-T 1500.
2. Ensure that power is turned on at the terminal and Access-T.
3. Select the appropriate terminal type using the **SELECT** pushbutton on the front panel (Series 100, 200, and 400) or rear panel (Series 1500). The pushbutton on the Series 100, 200, and 400 units is accessible through the small hole in the front panel. A pointed implement such as a ballpoint pen is required to reach the pushbutton. Press the pushbutton until the desired Craft Port LED (VT100 or TV925) illuminates ***and blinks***.
4. Press the **Enter** key on the terminal interface keyboard repeatedly until the message "**LINKUP <baud> Hit the space bar to continue**" appears. The **Enter** key should be pressed at a rate of about 4 times per second to ensure that the auto baud linkup occurs.
5. Press the space bar.

Setting the Communication Parameters for the Supervisory Port

With communications established via the Craft Port, communication options for the Supervisory Port can be configured to match the equipment (modem, terminal, NMS, or SNMP manager) that will be connected to it.

CAUTION: Changing communication parameters (e.g., baud rate) can disrupt Supervisory Port communications.

To configure the Supervisory Port, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **COMMUNICATION** option.
3. Select **TERMINAL TYPE** and specify the appropriate terminal type: TV 925 or VT100. Press the **Esc** key.
4. Select **BAUD RATE** and the appropriate value (600 to 9600). Press the **Esc** key.
5. Select **STOP BITS** and choose the stop bit value (1 or 2). Press the **Esc** key.
6. Select **PARITY** and choose the parity mode (**NONE**, **EVEN**, or **ODD**). Press the **Esc** key.
7. Select **XON-XOFF** and enable XON-XOFF handshaking as appropriate. (Generally, XON-XOFF is not required. If TABS is used, XON-XOFF must be **DISABLED**. Press the **Esc** key.

   CAUTION: When XON-XOFF is disabled, Access-T will buffer terminal keystrokes. When XON-OFF is re-enabled, these keystrokes will be executed in sequence.

8. Select **INTERFACE** and choose the mode of communication, either **MODEM , TERMINAL**, or **DATAKIT**. Press the **Esc** key. The Datakit® Virtual Circuit Switch (VCS) is a high-performance packet switch designed to interconnect computers, terminals, data-processing peripherals, and networks. **IINTERFACE** must be set to **DATAKIT** for Access-T to dial out and receive calls on the Datakit network. *(For more information on Datakit and its applications, consult AT&T publication 255-113-700, Issue 1, Release 3, 1991.)*

   Note 1: The **DATA BITS** parameter for the Supervisory Port is preset to **8**.

Note 2: An Access-T configured as a slave can only have its **INTERFACE** option set to **TERMINAL**.

9. Configure the terminal for the same baud rate, data word format, and handshaking as Access-T. If the terminal is software-configured, save the configuration so that the correct communications parameters are the terminal's start-up defaults. Refer to the terminal manual for configuration procedures.

10. Set the modems (if used) for the following, if applicable:

    - Auto answer (**S0=1**).
    - DTR enabled (**&D2**).
    - Quiet mode (**Q1**).
    - DCD enabled **(&C1).**
    - Echo off (**E0**).
    - Auto Seek command: **AT&%C1&%D2&%W** (Hayes 2400 Smartmodem only).

Access-T Operating Modes

Access-T can be configured to operate in one of two modes:

- *Master.*
- *Slave.*

If Access-Ts are interconnected via their Chain Ports, one must be configured for master mode and the others must be configured as slaves. The Access-T to which the controlling terminal or NMS is attached must be configured as the master. If an Access-T 1500 module is to act as the master, you must configure the module in slot 15 as the master. No other slot position can act as the master. In master mode, Access-T performs various chain management functions. In slave mode, Access-T responds to the master Access-T, retaining all software functions except alarm dialout and SNMP communication.

The operation mode for chained Access-Ts must be set locally (as described in Chapter 3) before communication via the Chain Port can occur. When using Access-Ts from different product groups (detailed in Chapter 1) in the same chain, you must be careful as to which unit you configure as the master. Table 6-A illustrates the possible master-slave configuration combinations.

Refer to Chapter 8 for additional information on using Access-T as a master.

Table 6-A. Rules for Configuring Access-Ts as Master and Slave

MASTER	SLAVE		
	Access-T01/02 DSU/CSU	Access-T Series 100, 200, & 400 DSU/CSU	Access-T 1500 DSU/CSU System
Access-T 01/02 DSU/CSU	X		
Access-T Series 100, 200, & 400 DSU/CSU	X	X	X
Access-T 1500 DSU/CSU System	X	X	X

An "X" indicates which Access-Ts may be used as slaves to the master Access-T in the first column. A shaded box indicates an illegal configuration.

Before attemping to connect and configure an Access-T 100 via the Chain Port, read the **Mixing Software Version in Access-T Chains** section at the beginning of Chapter 3.

Connecting to an SNMP Manager

Before connecting Access-T to an SNMP manager, you must define all the necessary SNMP settings on Access-T, including its IP address, trap manager address, interface type, etc.

> **Note:** Please read the **Contraints of Operating Access-T with SNMP** section at the end of Chapter 1 before connecting to an SNMP manager.

If Access-T is configured as a slave, the following SNMP parameters do not apply: **Time-to-Live, Trap IP Protocol, PPP Support (and options), SLIP Support, Interbyte Timeout, Sets Disabled,** and **Sets Allowed Addresses.**

To setup Access-T to communicate with an SNMP manager, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **SNMP** option.
3. Select the **MANAGEMENT** option. Select **YES** to activate SNMP management. (Select **NO** to deactivate SNMP mangement.) Press the **Enter** key.
4. Select the **SETS DISABLED** option. Select **YES** to disable Access-T's ability to perform SET commands via the SNMP interface. (Select **NO** to allow SET command to be sent.) Press the **Enter** key.

5. Select the **IP ADDRESS** option. A dialog box appears, prompting you for the unique 15-character Internet address for this Access-T. Key-in the IP address in dotted notation form (xxx.xxx.xxx.xxx). Press the **Enter** key.

   Note: Larscom recommends that you define all slaves to have the same network address as the master.

6. Select the **TIME-TO-LIVE** option. A dialog box appears, prompting you for the amount of time, in seconds, that an out-going IP datagram packet should be passed through the Internet. Key-in a value between 1 to 255. The default is 5. Press the **Enter** key.

7. Select the **TRAP IP ADDRESS** option. A dialog box appears, prompting you for the unique 15-character Internet address for the Access-T trap manager. Key-in the trap manger's IP address in dotted notation form (xxx.xxx.xxx.xxx). Press the **Enter** key.

8. Select the **TRAP PROTOCOL** option. The trap protocol option determines what internet protocol (SLIP or PPP) Access-T uses when transmitting traps ***after dial-out***. Select **SLIP** or **PPP**, as approrpiate. Press the **Enter** key.

9. Select the **AUTHENTICATION TRAP** option. The authentication trap option enables or disables Access-T's ability to transmit an authitication trap if the community name on GET or SET requests is incorrect. Select **YES** or **NO**, as approrpiate. Press the **Enter** key.

10. Select the **PPP** (Point-to-Point Protocol) option.

11. Select the **PPP SUPPORT** option. To enable Access-T to recognize PPP, select **YES**. Otherwise select **NO**. Press the **Enter** key. **(PPP and SLIP support may be enabled at the same time.)** *If you enabled PPP support, go to step 11; if you did not enable PPP support, go to step 15.*

12. Select the **RESTART TIMER** option. The restart timer value defines the maximum amount of time (in seconds) that Access-T will wait for the acknowledgement of a configure or terminate request. At the prompt, key-in a value between 1 and 20. Press the **Enter** key.

    Note: To guarentee your desired timeout period, set your timer value to be at least one second greater than your minimum requirement.

13. Select the **MAX TERMINATE** option. The max terminate value defines the maximum number of terminate requests that Access-T can send without receiving an ACK. At the prompt, key-in a value between 1 and 20. Press the **Enter** key.

14. Select the **MAX CONFIGURE** option. The max configure value defines the maximum number of unacceptable configure requests that Access-T can send without receiving an ACK. At the prompt, key-in a value between 1 and 20. Press the **Enter** key.

15. Select the **MAX FAILURE** option. The max failure value defines the maximum number of unacceptable configure requests that Access-T can receive before giving up. At the prompt, key-in a value between 1 and 20. Press the **Enter** key. Press the **Esc** key.

16. Select the **SLIP SUPPORT** option. To enable Access-T to recognize SLIP (Seriel Line Interface Protocol), select **YES**. Otherwise select **NO**. Press the **Enter** key.

17. Select the **INTERBYTE TIMEOUT** option. A dialog box appears, prompting you to enter the number of seconds to insert between bytes when Access-T is in Protocol Search Mode or receiving characters in SLIP or PPP from the supervisory port. Key-in a value between 1 and 20. Press the **Enter** key.

    Note: To guarentee your desired timeout period, set your timer value to be at least one second greater than your minimum requirement.

18. Select the **CIRCUIT ID** option. A dialog box appears, prompting you for the 10-character (text string) "dsx1CircuitIdentifier" value which will be used for troubleshooting purposes. Press the **Enter** key.

19. Select the **SET COMMUNITY NAME** option. A dialog box prompting for the 10-character string appears. Any SET command sent to Access-T must have the proper SET community name in order for the SET request to be processed by Access-T. *(When qualifying names, Access-T ignores trailing spaces in the Set Community Name.)* Key-in the desired community name and press the **Enter** key.

20. elect the **SETS ALLOWED ADDRESSES** option. Select **IP ADDRESS 1** or **IP ADDRESS 2**, as appropriate. A dialog box appears, prompting you for the unique 15-character Internet address. Key-in the IP address in dotted notation form (xxx.xxx.xxx.xxx). Press the **Enter** key.

    Access-T allows you to control which IP addresses are permitted to send Access-T SET commands to be processed. If both **IP ADDRESS 1** and **IP ADDRESS 2** are set to **000.000.000.000**, then SET commands will be honored from ***all*** IP addresses. However, if you enter specific IP addresses into these fields, Access-T will honor SET commmands *from those IP addresses only*.

21. Press the **Esc** key.

22. Select the **SET MODEM DIALOUT** option.

23. Select the **INACTIVITY TIMEOUT VALUE**. When communicating via SLIP or PPP, the inactivity timer is reset each time a proper IP packet is received. When the inactivity timer expires, a logout or connect termination occurs.

    > **Note:** The Inactivity Timeout value also controls the amount of time Access-T will accept inactivity on a modem connection before disconnecting, prompting the user for a password (if passwords are enabled), or refreshes the terminal display (direct connection).

    Key-in the desired value (in seconds). A setting of zero (0) disables timeout. Press the **Esc** key.

Access-T has been fully configured to communicate with an SNMP manager. For instructions on how to switch Access-T's interface mode for SLIP or PPP, refer to **Changing Interface Protocols** section at the end of this chapter.

Selecting the TABS (Node) Address

Whenever Access-Ts are chained (i.e., interconnected via their Chain Ports), each Access-T on the chain must be given a unique *node address*. The node address is used to identify the nodes in the chain for polling, alarm reporting, and command forwarding.

In addition, since TABS commands include a node address, an Access-T which will be receiving TABS commands from an NMS must be given a node address. The Access-T node address is set via DIP switches, as described in Chapter 3. For more information on the use of the node address in TABS commands, see the *Access-T TABS Interface Manual, ACST-0731-00x*.

Setting the System Name

Access-T allows specification of a name which identifies the specific Access-T on various Terminal Interface displays. Each Access-T can be given a name of up to eight ASCII characters. This name is displayed in the right corner of the Title Bar, which is included in every report.

To set the system name, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **NAME** option.
3. Enter the name (or make no entry to retain the current name).

   Note: Use only alphanumeric characters (letters and numbers), punctuation marks, or spaces in the system name. Do not use control characters or any non-printable characters or special keys.

4. Press the **Enter** key.
5. Press the **Esc** key.

Setting the Date and Time

Access-T tags alarms and events with the date and time of the occurrence. To set the system date and time, perform the following steps:

1. Select **SYSTEM f**rom the Main Menu Line.
2. Select the **DATE & TIME** option.
3. Select the **DATE** parameter. The date dialog box will appear at the bottom of the display area.
4. Key-in the desired date in the following format:

   XX-XX-XX: Month-Date-Year

5. Press the **Enter** key followed by the **Esc** key.
6. Select the **TIME** parameter. The time dialog box will appear at the bottom of the display area.
7. Key-in the desired time in the following format:

   XX:XX Hour:Minute

8. If desired, restart the NIM software (**COMMANDS—RESTART NIM**) to correct the reset time in the ESF Errors Count display.

Setting the Clock Source

Access-T can derive its clock from any of eight sources:

- An internal crystal-controlled clock (with a frequency of 1.544 Mbps).
- A station clock connected to the Access-T rear panel.
- The signal received via the T1 network (line).
- The clock received via DTE port 1, 2, 3, or 4.
- The T1 DTE auxiliary port

To select the Access-T clock source, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **MASTER CLOCK** option
3. Select the **SOURCE** option and then select the desired clock source (**INTERNAL**, **LINE**, **STATION**, **PORT1**, **PORT2**, **PORT3**, or **PORT4**).

   Note: If terminal timing mode is selected for a DTE port, that port cannot be the master clock source.

4. Press the **Esc** key.
5. *If the station clock option is selected in step 3*, the frequency must be specified. Select the **FREQUENCY** option and press the **Enter** key. Possible frequency values will appear on screen. Enter the desired clock frequency and press the **Esc** key.

   Note: If any clock other than **STATION** is selected, that clock's frequency is displayed under **FREQUENCY**. The displayed frequency can be changed but the change cannot be entered.

Changing the Exit Key

If an Access-T is to be managed over a network and you are using a VT100 terminal emulation, you must change the key used to perform the "exit" function for the Terminal Interface from **Esc** to **Tab**. Larscom recommends that you do not make this change except for communication in such a configuration.

Note: All Access-Ts on the same chain must have the same EXIT key configuration.

To toggle the exit key from **Esc** to **Tab**, and vice versa, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **EXIT KEY**.
3. Select **ESC** or **TAB**, depending on which key you wish to activate.
4. Press the **Enter** key.

Network Interface Configuration

Perform the following steps to configure the interface to the T1 network (line):

1. From the Main Menu Line, select **LINE**.
2. Move the selection bar to **FRAMING** and press the **Enter** key. Select the desired framing format (D4 or ESF). Press the **Esc** key.
3. Move the selection bar to **CODING** and press the **Enter** key. Select the desired line coding (AMI or B8ZS). Press the **Esc** key.
4. Move the selection bar to **LBO** and press the **Enter** key. Select the desired line build-out. The telco should provide information about line build-out requirements. Press the **Esc** key.
5. Move the selection bar to **T1.403** and press the **Enter** key. If other network equipment monitors ANSI T1.403 one-second performance reports, enable them by selecting **ON**. Otherwise, select **OFF**. Press the **Esc** key.

   Note: T1.403 can be enabled only when **FRAMING**= **ESF**.

6. Move the cursor to **YELLOW** and press the **Enter** key**.** To enable Access-T to generate Yellow Signal on Red Alarm conditions, select **ON**. Otherwise, select **OFF**. Press the **Esc** key.
7. Move the cursor to **DATA LINK ID** and press the **Enter** key**.** If Access-T functions as the CSU, select **CSU**. If there is an external CSU responding to ESF data link commands, select **DTE**. (The **DATA LINK ID** option has no effect if ESF framing mode is not used.) Press the **Esc** key.
8. Move the cursor to **INBAND** and press the **Enter** key. If Access-T is to recognize in-band loopback control codes, select **ON**. If Access-T is to ignore in-band loopback control codes, select **OFF**. (Generally, recognition of in-band codes is desirable in D4 mode, but not desirable in ESF mode, where FDL commands are available.) Press the **Esc** key.

DTE Port Configuration

To configure a DTE port, perform the following steps:

1. From the Main Menu Line, select **DTE**.
2. Select **PORT1**, **PORT2**, **PORT3**, or **PORT4**.
3. With the cursor on **RATE**, specify whether the DTE rate is a multiple of 56 or 64 kbps. When a rate of Nx56 is selected, bit 8 (the least significant bit) is always ONE, guaranteeing a pulse density of 1 in 8. A rate of Nx64 allows clear channel operation; pulse density may be guaranteed by the DTE, by bit 7 stuffing, by B8ZS encoding, by alternate-DS0 mapping, or by inversion of HDLC-formatted data. Press the **Esc** key.
4. Move the selection bar to **CLOCK** and press the **Enter** key. Select a normal or inverted clock. Press the **Esc** key.
5. Move the selection bar to **DATA** and press the **Enter** key. Select normal or inverted data. Press the **Esc** key.
6. Move the selection bar to **INTERFACE** and press the **Enter** key. Specify the interface type (**V.35** or **RS449**). Select **RS449** for an EIA 530 interface. Press the **Esc** key.
7. Move the cursor to **RTS**. If the DTE does not support the RTS handshaking signal, select **PERMANENT**. Otherwise, select **ACTIVE** (RTS controlled by the DTE). Press the **Esc** key.

   Note 1: If the DTE cable is disconnected while **RTS=PERMANENT**, ZEROS may be transmitted in the DS0s assigned to the DTE port. If the DTE cable is disconnected while **RTS=ACTIVE**, all ONES will be transmitted in the DS0s assigned to the DTE port.

   Note 2: If **RTS = PERMANENT**, the Status report will not reflect RTS loss; however, RTS loss will be registered in the Alarm History.

8. Access-T provides a "**terminal timing**" mode to eliminate the effects of propagation delays when longer-than-normal cables are used. Terminal timing should be used for cable lengths of from 30 to 200 feet.

   In the standard timing mode, data is clocked into the Access-T or DTE based on clock(s) transmitted by one device or the other. For example, if the DCE is the clock source, transmit and receive clock from the

DCE is used to clock data in both directions. If the cable is too long, propagation delays may cause data received by the DCE to be out of phase with the clock transmitted to the DTE. Thus, data may be corrupted.

In terminal timing mode, data from the Access-T is clocked into the DTE by a clock from the Access-T, and data from the DTE is clocked into the Access-T by a clock from the DTE. In other words, each data path has its own clock, transmitted in the same direction as the data (as illustrated in Figure 2-2). This eliminates the problems created by propagation delays when standard timing is used. Note, however, that if there is no signal on External Clock from the DTE to the Access-T, Access-T removes Receive Clock.

Terminal timing may not be enabled for a DTE port which is the master clock source for the Access-T. For example, **TTM=YES** for Port 1 is not valid if **MASTER=PORT1**.

> **Note:** If no DTE is connected to a DTE port, ensure that **TTM=OFF** before initiating a local CS DTE or remote CS Line loopback.

Both the Access-T and the DTE must be configured for the same timing mode. Thus, terminal timing should be enabled at the Access-T only if the DTE is configured to transmit in phase with External Clock and to receive in phase with a Receive Clock.

Determine the timing mode. Move the cursor to **TTM** and specify whether terminal timing mode is to be **ON** or **OFF**.

9. Move the cursor to **BIT 7** and press the **Enter** key. If Bit 7 stuffing is to be enabled, select **ON**. If Bit 7 stuffing is to be disabled, select **OFF**. (Bit 7 stuffing is recommended for voice channels when the rate is Nx64 and minimum pulse density is not assured in any other way—e.g., B8ZS encoding.) Press the **Esc** key.

> **Note:** Bit 7 stuffing and B8ZS coding cannot be enabled at the same time.

10. Press the **Esc** key repeatedly to return to the Main Menu Line.

Sending the DTE Port Configuration to the Far End

The **SEND** command (**SYSTEM–DS0 CONFIGURATION–SEND**) lets you transmit all near-end DTE port configurations to the far-end Access-T.

> **Note**: The **SEND** command should be used only between units that have identical DTE port and aux port hardware (i.e., both ends of the link have two DTE ports and one aux port).

> ***CAUTION: The SEND command also transmits the currently-active map to the far-end, overwritting the far-end's currently-active map. This command should only be used if you wish to send DTE port* and *mapping configurations to the far end. Refer to* Sending the DS0 Map to the Far End *for more information.***

The following DTE port settings will be written to the far-end's DTE ports:

- **Rate** (Nx56 or Nx64).
- **Data** (normal or inverted).
- **Bit 7 stuffing** (on or off).

This procedure works only in ESF point-to-point applications**.**

To send the active DS0 map and DTE port configuration to the far-end Access-T, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **DS0 CONFIGURATION**.
3. Select **SEND**.
4. Press the **Enter** key.

Auxiliary T1 Port Configuration

To configure the auxiliary drop-and-insert port, perform the following steps:

1. From the Main Menu Line, select **DTE**.
2. Select **AUX PORT**.
3. Move the selection bar to **FRAMING** and press the **Enter** key. Select the appropriate framing format: **D4** or **ESF**. Press the **Esc** key.
4. Move the selection bar to **CODING** and press the **Enter** key**.** Select the appropriate coding format: **AMI** or **B8ZS**. Press the **Esc** key.
5. With the cursor on **EQUALIZATION** and press the **Enter** key**.** Select the equalization for the line length between the T1 device and the Access-T (**0-133, 133-266, 266-399, 399-533, 533-655** feet). Press the **Esc** key.
6. Move the selection bar to **BIT 7** and press the **Enter** key. Define Bit 7 stuffing (toward the network only) to be **ENABLED** or **DISABLED**. Bit 7 stuffing is recommended for voice channels when the rate is Nx64 and minimum pulse density is not assured in any other way (e.g., B8ZS encoding).

   Note: Bit 7 stuffing causes errors in a transmitted QRSS signal.

Yellow Signal Transcoding

When at least one DS0 is mapped to the Aux port and you wish to pass Yellow Signal between two devices (one using D4, the other ESF), **Yellow Transcoding** must be enabled. With **Yellow Transcoding** enabled, Yellow Signal is passed (transcoded) from the Aux Port to the line as follows:

- **D4 (AUX) to ESF (LINE)**—Yellow is transcoded from bit 2 suppression to an ESF overhead code and vice versa.
- **ESF (AUX) to ESF (LINE)**—Yellow Signal is passed in both directions. *(The Yellow Signal transmitted in the ESF-to-ESF mode is actually a regenerated signal because the data link is not passed from the auxiliary port to the line or vice versa.)*
- **ESF (AUX) to D4 (LINE)**—Yellow Signal is not transcoded in either direction.
- **D4 (AUX) to D4 (LINE)**—Yellow Signal (bit 2 suppression) is passed in both directions.

Figure 6-1 shows an example of Yellow Signal being transcoded.

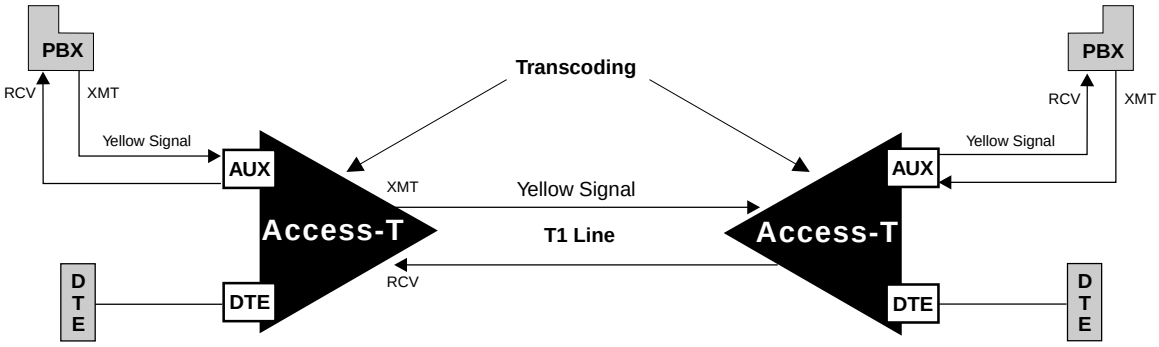


Figure 6-1. Yellow Signal Transcoding

To enable Yellow Signal transcoding between the auxiliary port and the line, follow these steps:

1. From the Main Menu Line, select **DTE**.
2. Select **AUX PORT**.
3. Select **YELLOW TRANSCODING**.
4. Select **ENABLE**.

> **Note:** If the line is configured as D4 and less than 24 DS0s are mapped to the auxiliary port, propagating the Yellow Signal will corrupt data in the DS0s asigned to the DTE ports.

AIS to DTE

When at least one DS0 is assigned to the auxiliary port and you want Access-T to generate AIS toward the aux port, **AIS TO DTE** must be enabled. With **AIS TO DTE** enabled, a Loss of Sync (LOS) or Loss of Frame (LOF) event from the line causes Access-T to generate AIS (unframed ALL ONES) to the aux port, as illustrated in Figure 6-2.

To enable AIS generation to the aux port, perform the following steps:

1. From the Main Menu Line, select **DTE**.
2. Select **AUX PORT**.
3. Select **AIS TO DTE**.
4. Select **ENABLE**.

AIS to LINE

When at least one DS0 is assigned to the auxiliary port and you want Access-T to generate AIS toward the line, **AIS TO LINE** must be enabled. With **AIS TO LINE** enabled, a Loss of Sync (LOS) or Loss of Frame (LOF) event at the aux port causes Access-T to generate AIS (unframed ALL ONES) to the line and Idle code (All ONES) is returned to the aux port, as illustrated in Figure 6-3. Note that data from the DTE port is over wirtten by the AIS.

To enable AIS generation to the line, perform the following steps:

1. From the Main Menu Line, select **DTE**.
2. Select **AUX PORT**.
3. Select **AIS TO LINE**.
4. Select **ENABLE**.

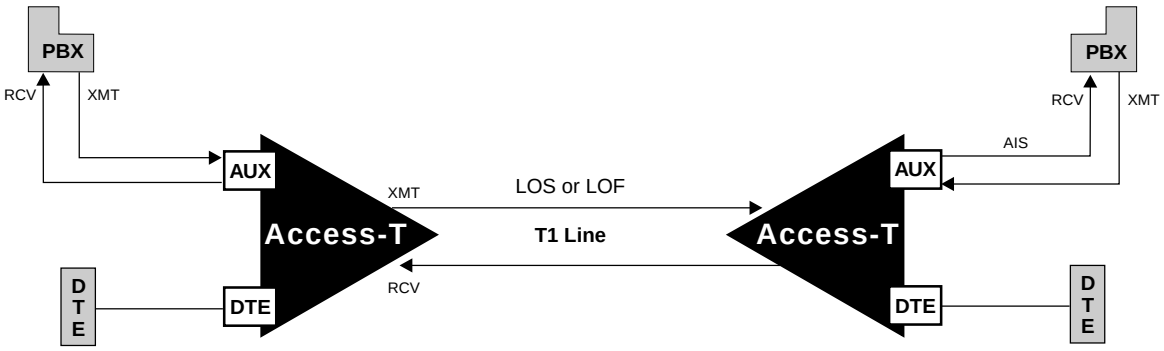


Figure 6-2. AIS-to-Aux Implementation

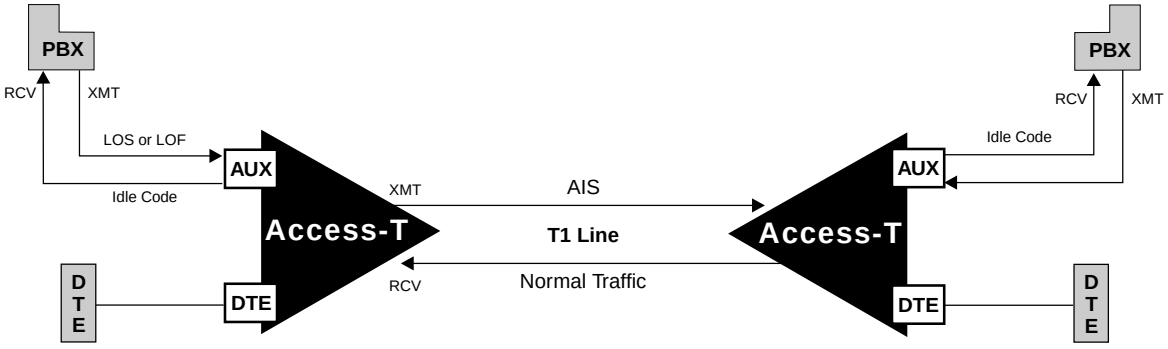


Figure 6-3. AIS-to-Line Implementation

DS0 Bundling

Assigning DS0s from the DTE ports to specific DS0s in the network signal is called "bundling." Access-T lets you define two bundling configurations, MAP1 and MAP2. Select either map to be active. The active map is displayed under **SYSTEM—DS0 CONFIGURATION—CURRENT**.

To define the DS0 bundling maps, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **DS0 CONFIGURATION**.
3. Select the map to be defined (**CHANGE MAP1** or **CHANGE MAP2**).
4. A dialog box will appear, showing the 24 DS0s between angle brackets. Each DS0 is represented by a single character. The characters represent the contents of each DS0 (**i** = Idle code, **1** = DTE Port 1, **2** = DTE Port 2, **3** = DTE Port 3, **4** = DTE Port 4, **A** = auxiliary T1 DTE port). Pressing the ← and → keys moves the cursor along the line of DS0s.

   As you move across the DS0 selection bar, Line 1 of the dialog box displays which DS0 is currently selected. Line 1 also displays how much bandwidth is designated to each port, as illustrated in Figure 6-4.
5. To assign DS0 1, make sure that the cursor is under the first character in the DS0 string and key-in the appropriate character: **i**, **1**, **2**, **3**, **4**, or **A**.

   As you assign DS0s, Line 1 of the dialog box automatically updates to reflect the new bandwidth values for each port.
6. Repeat steps 4 and 5 for DS0s 2 through 24.

> **Note:** To save time, the **i**, **1**, **2**, **3**, **4**, and **A** key can be pressed down and held, causing a repeat entry.



Figure 6-4. DS0 Bundling Dialog Box

7. Verify that the appropriate bandwidths are shown on line 1 when all 24 DS0s are bundled as desired. (Besides misassignment of DS0s, a possible cause of incorrect bandwidth numbers is improper selection of DTE rates, which may be Nx56 or Nx64 kbps.)
8. Press the **Enter** key if the DS0 assignments and bandwidth numbers are correct.
9. Verify that **ENTERED** appears at the left end of line 2.
10. Press the **Esc** key.

Time-of-Day Switching of DS0 Maps

Access-T can switch automatically between the two DS0 maps at user-specified times each day. Setting Access-T for automatic switching is a two-stage process. First, the switching times must be defined, and second, **TIME** must be enabled as the current mapping option.

> **Note:** Access-T must be in an ESF point-to-point application, and only one Access-T can be configured for **TIME** mode at a time.

To define the map-switching time, follow these steps:

1. Select **SYSTEM** from the Main Menu.
2. Select **DS0 CONFIGURATION**.
3. Select **TIME**.
4. Select **START TIME**. This value will determine the time that Map 1 becomes the active map, and Map 2 becomes inactive.
5. Key-in the desired start time.
6. Select **STOP TIME**. This value will determine the time that Map 1 becomes inactive, and Map 2 becomes the active map.
7. Key-in the desired stop time.
8. Verify that the start and stop times are as desired.
9. Press the **Esc** key to return to the Main Menu.
10. Enable timed switching of DS0 maps as described in the next procedure.

Selecting the Current Map

Access-T lets you activate either of the two DS0 maps, or enable automatic switching of the maps as described in the previous procedure. To select which DS0 map is currently active, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **DS0 CONFIGURATION**.
3. Select **CURRENT**.
4. Move the selection bar to **MAP1**, **MAP2**, or **TIME** and press the **Enter** key. Selecting **MAP1** or **MAP2** sets the chosen map as always active. Selecting **TIME** enables automatic switching between maps 1 and 2 based on the user-specified start and stop times, as described in the previous procedure. The active map will always have an asterisk (*****) next to it.

CAUTION: Do not leave a test active for an extended period while in time switching mode. If a test is running when the selected start and stop time occurs, switching of the DS0 map will not occur until the test is turned off.

Sending the DS0 Map to the Far End

The **SEND** command (**SYSTEM–DS0 CONFIGURATION–SEND**) lets you transmit the currently-active DS0 map to the far-end Access-T, rewriting the currently-active map. (For example, if the near end has MAP1 active and the far end has MAP2 active, MAP1 from the near end will rewrite MAP2 at the far end.) You cannot change the far-end's inactive map until it becomes active.

Note: The **SEND** command should be used only between units that have identical DTE port and aux port hardware (i.e., both ends of the link have two DTE ports and one aux port).

CAUTION: The SEND command also transmits the current configuration of all the DTE port, overwritting the far-end's DTE port settings. This command should only be used if you wish to send DTE port* and *mapping configurations to the far end. Refer to* Sending the DTE Port Configuration to the Far End *for more information.

This procedure works only in ESF point-to-point applications**.**

To send the active DS0 map and DTE port configuration to the far-end Access-T, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **DS0 CONFIGURATION**.
3. Select **SEND**.
4. Press the **Enter** key.

Alarm Configuration

Access-T monitors up to 23 different alarm conditions, each of which can be individually enabled. Alarm conditions include:

- Performance parameters for the T1 line interface. (For BPVs and ES, alarm thresholds are user-specified.)
- Loss of RTS at the DTE ports.
- Loss of master clock.
- Internal communication failure.
- Access-T NIM failure.

When a user-enabled alarm occurs, the following things happen:

- **ALERT** appears in the Title Bar.
- Access-T updates its alarm history data.
- Depending on the selected alarm reporting method, Access-T dials out (if so configured by the operator) and transmits either:
    - an **ALERT** banner to an ASCII terminal,
    - an alarm history to a network management system (NMS), or
    - an SNMP trap to an SNMP-based management system.

You can view alarm information via the Terminal Interface as described in Chapter 7.

Alarm Reporting Method

As stated earlier, Access-T can be configured to dial-out alarms in three ways:

- **Alert Message:** In Terminal Interface Mode, Access-T sends a one-line **ALERT** banner (identifying the Access-T) to an ASCII terminal. The operator must then request an alarm history to identify the particular alarm.
- **Unsolicited Alarm Reports**: Access-T can be configured to send unsolicited alarm reports to a network management system (NMS) in a modified TABS format. (Information on this report is included in the *Access-T TABS Interface Manual, ACST-0731-00x*.)
- **SNMP Traps:** Access-T sends a trap message (either SLIP or PPP, depending on which interface is currently enabled) to an SNMP-based manager. The SNMP manager must have the proper MIBs compiled to interpret the message to be logged.

The format of the ALERT banner and other information about reporting to an ASCII terminal, NMS, or SNMP-based manager are given under **Principles of Alarm Reporting** in Chapter 7.

> **Note:** In order for alarm dialout to occur, you must configure your modem as described under **Modem Dialout Configuration** later in this chapter.

To select the alarm reporting method that will be used for alarm dialout, or to disable alarm dialout by selecting **NONE**, perform the following steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **REPORT METHOD**.
3. Select the type of alarm reporting method: **ALERT MESSAGE**, **SNMP TRAPS**, **UNSOLICITED**, or **NONE** and press the **Enter** key.

> **Note:** The selected alarm reporting method applies only to alarm dialout. Regardless of which method is enabled, including **NONE**, *enabled* alarms will still be accumulated and stored and ALERT will appear in the Title Bar of the Menu Window.

Enabling Alarms

For each alarm type, there are two enabling options:

- Alarm declaration (**ENABLE**).
- Automatic dialout when the alarm occurs (**DIAL**).

If alarm declaration is enabled for a specific alarm type, you can independently select whether Access-T will dial out to report the alarm. If alarm declaration is disabled, dialout will not occur.

> **Note:** If the **DIAL** function is turned on for an enabled alarm after an alarm condition arises, Access-T will immediately dial out to report the alarm. Similarly, if an alarm is disabled after an alarm condition has been reported, the **ALERT** indication will be erased from the Title Bar.

To enable an alarm, perform the following steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **SETUP**.
3. Alarms are monitored at different points in the system. Select the type of alarm group: **DTE**, **LINE**, **AUX PORT**, or **CHASSIS** and press the **Enter** key.
4. Scroll through the alarm option list until the desired alarm condition appears.
5. Press the **Enter** key.
6. Select the **ENABLE** option and press the **Enter** key.
7. Select **YES** to enable the alarm condition; select **NO** to disable the alarm condition.
8. Press the **Esc** key to return to the previous menu.
9. Select the **DIAL** option and press the **Enter** key.
10. Select **YES** to enable automatic alarm dialout for this alarm condition; select **NO** to disable dialout. (This option has no effect if **ENABLE = NO**.)
11. Press the **Esc** key repeatedly to return to the Main Menu Line.

Setting the BPV and ES Thresholds

Two alarm conditions, Bipolar Violations and Errored Seconds, feature user-settable thresholds. The BPV threshold is specified as a negative exponent of 10 and is monitored over 15-minute intervals. A BPV threshold of 6, for example, is exceeded when a fifteen-minute period has an average BPV rate exceeding 1 BPV per million bits (i.e., when the BPV rate exceeds 10^{-6}).

The Errored Seconds (ES) parameter consists of a user-specified error count over a user-specified time interval. The number of Errored Seconds can be between 0 and 399. The interval over which Errored Seconds are counted can be between 1 and 15 minutes. For example, if **ES ERRORS = 100** and **ES INTERVAL = 6**, Access-T will declare an alarm if it counts 100 Errored Seconds within the six-minute interval.

To set the BPV and ES thresholds, perform the following steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **THRESHOLD**.
3. Select **LINE** or **AUX**.
4. Select **BPV**.
5. Select the appropriate threshold (5 to 9, for error rates from 10^{-5} to 10^{-9}). Press the **Enter** key and the **Esc** key.
6. Select the **ES ERRORS** parameter.
7. Key-in the desired three-digit number. Press the **Enter** key and the **Esc** key.
8. Select the **ES INTERVAL** parameter.
9. Key-in the appropriate threshold interval (from 1 to 15 minutes).
10. Press the **Enter** key.
11. Press the **Esc** key repeatedly to return to the Main Menu Line.

Modem Dialout Configuration

Access-T can dial out to report alarms automatically to an ASCII terminal, network management system (NMS), or SNMP-based manager. The type of dialout depends on the setting of the **REPORT METHOD** parameter as described under **Alarm Reporting Method** earlier in this chapter.

Remember that dialout occurs on changes from the alarm state to the normal state, as well as on changes from normal to alarm.

The Set Modem Dialout Menu

The Set Modem Dialout drop-down menu (**SYSTEM—SET MODEM DIALOUT**) lets you set the following dialport parameters:

- Two dialstrings— primary and alternate (default equals no dialstring).
- Start and stop times for each dialstring (default equals 00:00).
- Wait-for-Connect time, in seconds (default equals 30).
- Inactivity Timeout, in minutes (default equals 0).
- Dialport Backoff, in minutes (default equals 60)

> **Note:** The dialout function operates only while the Access-T **SYSTEM—COMMUNICATION—INTERFACE** option is set to **MODEM** or **DATAKIT**.

Access-T allows two dialstrings, primary and alternate, to be defined for alarm dialout. Each dialstring can contain up to 36 characters. Modem dialstrings must begin with the Hayes command component, ATDT or ATDP, followed by the phone number. **Datakit dialstrings *do not* require the Hayes command component.**

A start time and stop time are defined for each dialstring. A dialstring is active for the period from its start time to its stop time. **(If the start and stop times are the same, the dialstring will remain inactive and no dialout will occur.)** When an alarm occurs for which dialout is enabled, Access-T will dial out using the currently-active dialstring. If no dialstring is active, dialout does not occur. If both dialstrings are active, Access-T will first use the primary dialstring, and then if no connection is made, will use the alternate dialstring.

If, after the active dialstring has been sent, no connection is established (e.g., if the line is busy), Access-T will hang up and dial again. This cycle will repeat until

either a connection is established or each active dialstring has been dialed 15 times. If no connection has been established following 15 attempts, Access-T will wait for 15 minutes and then begin the dialing cycle again.

Three other dialport parameters are user-specified, as follows:

- **Wait-for-Connect** time is the length of time (30 to 120 seconds) that Access-T will wait for a connection to be established once dialing has occurred.
- **Inactivity Timeout** controls a variety of parameters depending on which operation mode it is in, as follows:
    - When modems are used, the timeout controls the length of time (0 to 255 minutes) that Access-T will maintain the connection of an inactive line before automatically hanging up (a value of 0 disables automatic disconnection). Activity is defined as the reception of a valid ASCII character, except if communicating via SLIP/PPP.
    - When communicating via SLIP or PPP, the inactivity timer is reset each time a proper IP packet is received. When the inactivity timer expires, a logout or connect termination occurs.
    - When communicating directly, the timer refreshes the terminal display or logs you off (if passwords are enabled).
- **Dialport Backoff** is the time Access-T waits after it disconnects due to inactivity before redialing to report an alarm which has been reported but not cleared (15 to 240 minutes).

The current modem dialout parameter settings can be viewed in a single display, as described in Chapter 7.

Setting Modem Dialout

To define dialout parameters, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **SET MODEM DIALOUT** option.
3. Select the **PRIMARY** option.
4. Select the **DIAL STRING** option. The dial string dialog box will appear at the bottom of the screen.

5. Enter the primary dialstring at the flashing cursor. Preface the telephone number with the Hayes code: ATDT. The dialstring may contain up to 36 characters. Erroneous entries can be corrected using the **Backspace** key, spacebar, or the left and right arrow keys. Terminate the entry by pressing the **Enter** key. Press the **Esc** key to exit the dialog box.

6. Select **START TIME**. The Start Time dialog box will appear at the bottom of the screen.

7. Enter the Start Time (the time at which the primary dialstring becomes active). Access-T uses a 24-hour clock format; the hour and minute entries must be separated by a colon. For example, a Start Time of 2:00 p.m. would be entered as 14:00. Terminate the entry by pressing the **Enter** key. Press the **Esc** key to exit the dialog box.

8. Select **STOP TIME**. The Stop Time dialog box will appear at the bottom of the screen.

9. Enter the Stop Time (the time at which the primary dialstring becomes inactive). Terminate the entry by pressing the **Enter** key. Press the **Esc** key twice.

   Note: The Start and Stop times must be different for dialout to occur. If the user wants a dialstring to be active at all times, the stop time should be 1 minute behind the start time:

   Start Time: 00:01
   Stop Time: 00:00

10. Enter the alternate dialstring and its start and stop times as described in steps 2 through 7. If no alternate dialstring is desired, leave the dialstring entry area blank and the start and stop times as zeroes.

11. Select **WAIT FOR CONNECT.**

12. Enter the Wait-for-Connect value. (The value is the length of time, in seconds, that the Access-T waits for a connection to be established before it automatically hangs up and dials the next active dial string). Acceptable values range from 30 to 120 seconds. Terminate the entry by pressing the **Enter** key. Press the **Esc** key twice.

    Note: When entering the Wait-for-Connect, Inactivity Timeout, and Dialport Backoff values, it is simplest to enter the three-digit value, though leading zeros may be omitted.

13. Select **INACTIVITY TIMEOUT**.

14. Enter the Inactivity Timeout value. (The Inactivity Timeout is the length of time, in minutes, that Access-T waits before hanging up an inactive line. Inactivity is defined as no characters received by the Access-T.) Acceptable timeout values range from 1 to 255 minutes; an entry of 0 (zero) disables the Inactivity Timeout function. Terminate the entry by pressing the **Enter** key. Press the **Esc** key twice.

    Note: To minimize the time that the phone line is in use, an Inactivity Timeout of 1 minute is recommended when **UNSOLICITED=ON**.

    CAUTION: If an Inactivity Timeout of 0 is specified, the dialed connection will remain in effect until the dialed device (or modem) disconnects.

15. Select **DIALPORT BACKOFF**.

16. Enter the Dialport Backoff value. (This value is the time that Access-T will wait, after Access-T disconnects from inactivity, before dialing to report an already-reported alarm which has not been cleared. Acceptable values range from 15 to 240 minutes.) Terminate the entry by pressing the **Enter** key.

17. Set the Access-T baud rate to match that of the modem. To set the Access-T baud rate, select the **BAUD RATE** option under **SYSTEM—COMMUNICATION**. Also, verify that the **SYSTEM—COMMUNICATION—INTERFACE** option is set to **MODEM**.

Resetting System Defaults

The Access-T Reset System Default command (**COMMANDS—RESET SYSTEM DEFAULTS**) resets all the system configuration options. The default values are listed in bold type in Table 5-B.

> **Note 1:** The **RESET SYSTEM DEFAULTS** command does not reset the Aux Port alarm history report or deactivate a CS DTE loopback at the Aux Port.
>
> **Note 2:** System defaults will not be reset if a QRSS test is running.

To reset the Access-T to the system default values, perform the following steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select the **RESET SYSTEM DEFAULTS** option.
3. At the confirmation prompt, select **YES** to reset to the defaults, or **NO** to return to the **COMMANDS** menu list.

Changing Interface Protocols

Access-T provides a simple method to switch between the Terminal/TABS, SLIP, and PPP Interfaces on the Supervisory Port. Briefly, this feature, accessed via the **COMMANDS—CHANGE PROTOCOL** command, puts Access-T into a Protocol Search Mode, in which it waits for a terminal command, TABS command, or valid SLIP or PPP packet before dedicating itself to an interface mode. Upon receiving such a command or packet, Access-T invokes the requested interface.

> **Note:** For the Protocol Search Mode to operate, you must make sure that SNMP Management and SLIP and/or PPP support are enabled. Otherwise, Access-T will remain in the Terminal/TABS Interface.

To invoke the protocol search mode from the Terminal Interface, perform the following steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select **CHANGE PROTOCOL**.
3. Select **YES**. Access-T blanks the terminal screen, enters search mode, and waits for a Terminal/TABS Interface command or valid SLIP/PPP packet. While in this search mode, the terminal displays: "**Awaiting TABS, PPP, or SLIP packet; type <$>USERMODE<$> to exit.**"

While in the protocol search mode, several different scenarios can occur, depending on:

- what command or packet is received while in search mode,
- whether inactivity timeout occurs or not,
- whether password protection is enabled or disabled, and
- whether modem connections are used.

Figure 6-5 provides a flow chart of the possible scenarios when using the Protocol Search Mode. Briefly, the flow chart can be summarized into the following scenarios:

1. Access-T is in protocol search mode. One of the following can occur:
    - Access-T receives a valid SLIP/PPP packet. ***Go to 2a.***
    - A TABS command is received or you key-in the Terminal Interface escape sequence ($USERMODE$). ***Go to 3.***
    - When inactivity timeout expires, one of the following will occur:
    - *If modems are enabled*, Access-T disconnects.
    - *If passwords are enabled*, logout occurs. Go to step 4.
    - *If passwords are disabled*, Access-T stays in Protocol Search Mode.
    - Access-T loses modem connection and waits for carrier (DCD). ***Go to 5.***
2. If Access-T processes a valid SLIP/PPP packet while in protocol search mode, Access-T activates the appropriate interface protocol. This SLIP/PPP session remains active until:
    a. SLIP/PPP packets are no longer received and the inactivity timeout expires, returning Access-T to the protocol search mode, a password prompt or a modem disconnect; or

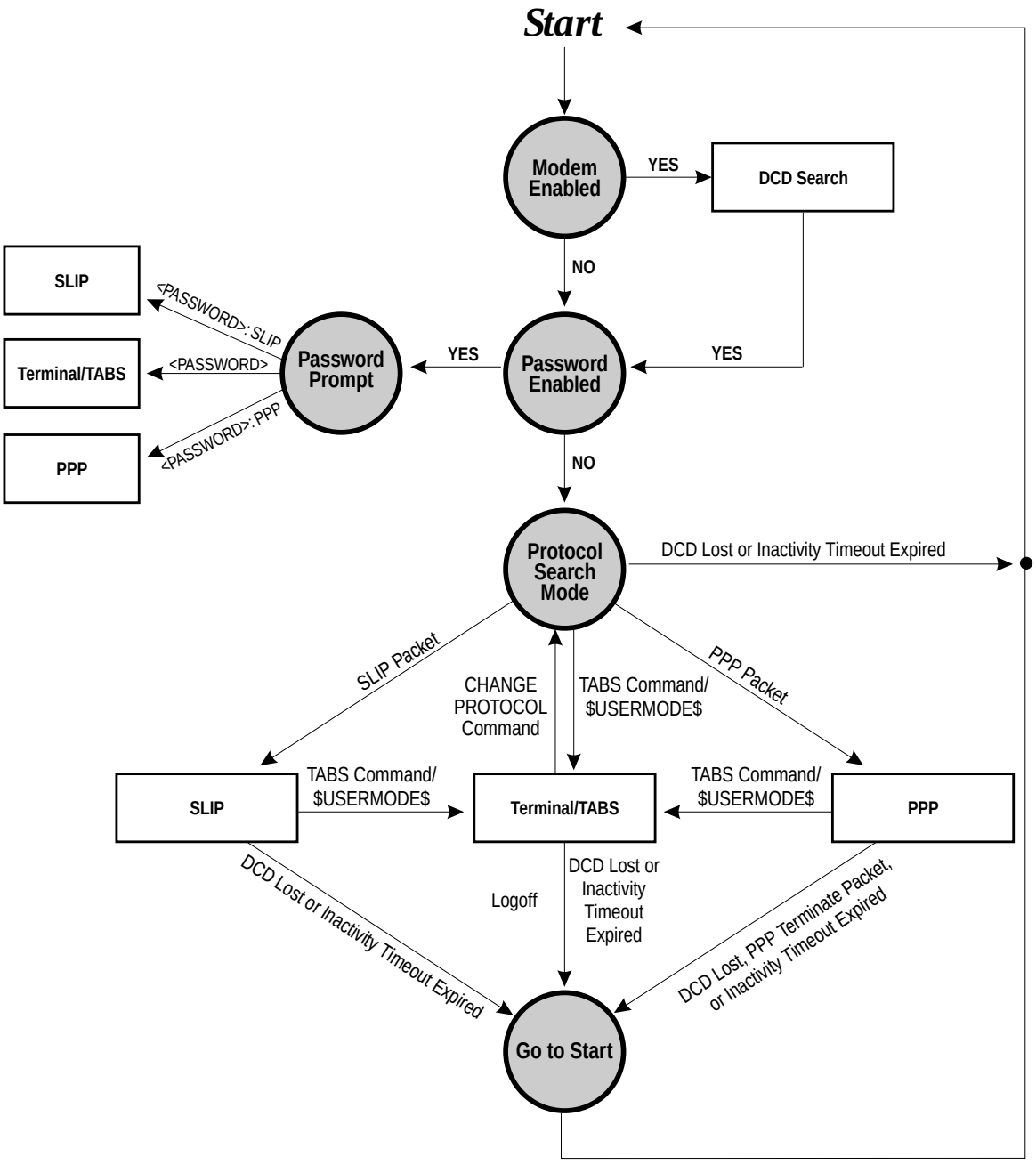


Figure 6-5. Protocol Search Mode Flow Chart

b. a valid TABS command is processed or the user keys-in an escape sequence to return to the Terminal/TABS Interface; or

c. modem connection is lost.

3. If Access-T processes a TABS command, Access-T activates the TABS/Terminal Interface. The user menu screen appears.

4. If Access-T prompts for a password, you can key-in one of the following:

   - **PASSWORD** (invokes Terminal/TABS Interface).
   - **PASSWORD:SLIP** (invokes SLIP Interface).
   - **PASSWORD:PPP** (invokes PPP interface).

   Note: Passwords are not equivalent to the authentication protocol.

5. Access-T regains its carrier (DCD) and invokes protocol search mode (if passwords are disabled) or displays the password prompt (if passwords are enabled).

As long as Access-T is not currently receiving a SLIP/PPP packet, you can always return to the Terminal/TABS Interface by sending a TABS command or keying-in the escape sequence "**$USERMODE$**". *(You must use all capital letters.You need not press the **Enter** key.)*

Enabling and Specifying Passwords

Access-T provides password protection to limit access via the Supervisory Port. (Connections via the Craft Port and Chain Port cannot be password-protected.) Passwords can be defined, enabled, and disabled via the Terminal Interface.

The password may consist of up to seven characters. These characters may be any of the standard ASCII keyboard characters, except for the carriage return (CR) which is used to terminate the password's keyboard entry. Characters may include such keys as **Alt**, **Ctrl**, **Backspace**, **Escape**, **Tab**, etc.

To set a password, follow these steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **PASSWORD** option.
3. Select **SET**. The password dialog box appears at the bottom of the display.
4. Enter the new password name, as prompted. The password will not be echoed on the screen. Terminate the password with by pressing the **Enter** key.
5. At the "RE-ENTER THE SEVEN (7) CHARACTER PASSWORD" prompt, re-enter the same password for confirmation. Terminate the password by pressing the **Enter**. If the two password entries match, the display will read **ACCEPTED**. If there is a discrepancy between the two passwords, the display will read **NOT ACCEPTED**.

> **Note:** If the password is lost, forgotten, or misplaced, it will be necessary to specify a new password via the Craft Port.

CAUTION: If passwords are enabled and a SLIP/PPP server is brought on-line, any incoming SLIP/PPP packet will be interpreted by Access-T as an invalid password, possibly resulting in the user being locked out from the unit for exceeding the number of password attempts.

To enable or disable password protection, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select the **PASSWORD** option.
3. Select the **ENABLE** option.
4. Select **YES** to enable password protection, or **NO** to disable password protection.
5. Press the **Enter** key.

> **Note 1**: If password protection is enabled and you have not defined a password, the system default password (pressing the **Enter key**) will be used.
>
> **Note 2**: Password protection should be disabled before downloading software to Access-T.
>
> **Note 3:** When operating on a slave Access-T, you cannot enable/disable password protection.

Logging On

Logging on is required only for connections to the Supervisory Port and only when password protection is enabled.

If password protection is enabled and the terminal has been logged off, follow these steps to log on:

1. Press any key on the keyboard. The prompt **Enter Password >** will appear on the screen.
2. Enter the current Access-T password and press the **Enter** key. Depending on which interface you wish to invoke, you can enter one of three login options:

   - **PASSWORD** (invokes Terminal/TABS Interface).
   - **PASSWORD:SLIP** (invokes SLIP Interface).
   - **PASSWORD:PPP** (invokes PPP interface).

   If the password is accepted, the Terminal Interface screen with the Menu Window at the top will be shown. No menu will appear for SLIP/PPP interfaces.

Access-T will allow only five logon attempts via the terminal or modem. After five consecutive failed logon attempts, the Access-T will hang up (if connected to a modem) and not allow any logon attempts for 5 minutes.

Logging Off

The Log Off command (**COMMANDS—LOG OFF**) exits the Terminal Interface *when Access-T is operating in password-protected mode.*

To log off the Terminal Interface, perform the following steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select the **LOG OFF** option.
3. At the confirmation prompt, select **YES** to log off, or **NO** to return to the Commands Menu.

If Access-T is connected to a modem when it is logged off, Access-T will hang up. If a terminal is connected to the Access-T Supervisory Port while logged off, pressing any key will return the prompt, **Enter Password>**. The Craft Port will still be operational.

> **Note:** Only Supervisory Ports on master Access-Ts can have password protection enabled.

7 Alarms, Reports, and Tests

This chapter describes three features that are used to monitor and test the performance and status of the communication links. It consists of three sections:

- Alarms.
- Performance and Status Reports.
- Test Procedures.

These sections explain the **ALARMS**, **REPORTS**, and **TEST** menu paths.

Alarms

Access-T alarms, which are defined and described in Chapter 2, can be:

- Setup.
- Viewed.
- Cleared.
- Displayed as history reports.

This section describes how alarms are reported, how to view and clear alarms, and how to display history reports. *Refer to Chapter 6 for instructions on setting up alarms.*

Principles of Access-T Alarm Reporting

Access-T supports three types of alarm dialout reporting methods:

- Terminal Interface Alert Messages.
- UnsolicitedTABS Messages.
- SNMP Traps.

The following sections describe each of these reporting methods. *Refer to Chapter 6 for instructions on enabling an alarm reporting method via the Terminal Interface.*

Terminal Interface Alert Messages

Access-T can be configured to dial out to report alarms via the Supervisory Port. When a user-specified alarm occurs, Access-T dials to connect with the terminal and transmits a one-line **ALERT** banner. The **ALERT** banner includes the date, time, system name, TABS address, serial number, and alert message, as follows:

```
*_* 03/29/94 16:12:45 Access-T:Name (ADD:01, SN:000267) IS IN ALERT *_*
```

The following conditions apply to alarm dialout:

- **INTERFACE** must be set to **MODEM**.
- Dialout occurs only for alarm types specified by the user.
- Access-T dials out only if DCD is inactive (no connection).
- Access-T automatically disconnects a dialout connection after a user-specified period of inactivity. (This feature can be disabled.)
- Clearing the alarm history cancels dialout for alarms in the cleared report.
- If an outstanding alarm is not cleared and the connection is terminated abruptly without the alarm being cleared, Access-T will immediately dial out to report the alarm. If connection is terminated due to inactivity timeout, Access-T will wait a user-specified "backoff" period before attempting to dial out again.

Dialout parameters (including wait-for-connect, inactivity, and backoff times) are specified using the Set Modem Dialout command described in Chapter 6. Special alarm dialout conditions arise when Access-T is used as a master.

After receiving the **ALERT** banner, you should view the Alarm History to identify the new alarm(s). Then you should clear the Alarm History. Clearing the Alarm History prevents continued dialouts to report the alarm. Procedures for viewing and clearing Alarm History are presented later in this chapter. Special procedures for locating, viewing, and clearing Alarm History for an Access-T configured as a master are presented in Chapter 8.

Local Terminal Alert Indication

When a user-enabled alarm has experienced a change-of-state, an alert indication (ALERT) will appear in the Title Bar of the Terminal Interface until the user clears the alert. This change-of-state may be from normal to alarm or from alarm to normal.

> **Note:** The Alert indicator will not be displayed for alarm conditions that exist before the alarm type was enabled.

Unsolicited TABS Messages

Access-T can be configured to send unsolicited alarm reports to a network management system in a modified TABS format. For a more detailed description of the unsolicited TABS alarm reports, refer to the *Access-T TABS Interface Manual*, ACST-0731-00x.

SNMP Trap Messages

When SNMP management is enabled, Access-T can be configured to dial out to report alarms as SNMP trap messages via the Supervisory Port. When a user-specified alarm occurs, Access-T's integral SNMP agent converts the alarm to an equivalent SNMP trap message and dials to connect with the SNMP-based management system.

> **Note:** The alarm dialout flag does not need to be enabled for an SNMP trap to be sent. Once a dialout connection is established, traps will be sent for *all* enabled alarms.

For SNMP trap messages to operate properly, the following conditions must exist:

- All SNMP configuration options (IP Address, Trap Manager IP Address, SLIP/PPP support, etc.) must be properly defined as described under **Connecting to an SNMP Manager** in Chapter 6.
- If using modems, **INTERFACE** must be set to **MODEM**.

Viewing Alarms

This section describes how to view the alarm setup options from the terminal interface. Access-T alarms can be divided into the following types:

Chassis alarms:

- Loss of Master Clock (**MSTR CLK LOSS**).
- Internal Communication Failure (**INT COMM LOSS**).
- Loss of Network Interface Module (**NIM LOSS A or B**).

Line/Aux alarms:

- Bipolar Violations (**BPVS**).
- Receiving Yellow Signal (**YELLOW**).
- Receiving Alarm Indication Signal (**AIS**).
- Unavailable Signal State (**USS**).
- Loss of Signal (**SIGNAL LOSS**).
- Errored Seconds (**ES**).
- Loopback Override (**LOOP**).
- Loss of Sync (**SYNC LOSS**).

DTE alarms:

- Loss of RTS input to DTE Port ***n*** (**PORT *n* LOSS**), where ***n*** = 1-4.

To view a particular alarm's configuration, follow these steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **View**.
3. Select the type of alarm group: **CHASSIS**, **DTE**, **LINE**, or **AUX PORT** and press the **Enter** key. A report will be displayed on the screen providing for each alarm type the following configuration information:
    - Alarm declaration (**ENABLE**).
    - Automatic dialout when the alarm occurs (**DIAL**).
4. Press the **Enter** key to exit this report.

Alarm History

The Alarm History report (**ALARMS—ALARM HISTORY**) displays the status and occurrences of up to 23 Access-T alarms. Access-T can provide up to four separate alarm histories: DTE, LINE, AUX PORT, and CHASSIS. The following information is displayed for each of the alarm conditions.

- The date and time of the alarm's first change of state.
- The date and time of the alarm's last (most recent) change of state.
- The initial status (at the most recent system startup or clearing).
- The current status.
- A count of the times the alarm has changed state.

Figure 7-1 illustrates an example of the Line Alarm History display.

To view an alarm history report, follow these steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **ALARM HISTORY**.
3. Select the specific history you wish to view (**DTE**, **LINE**, **AUX PORT**, or **CHASSIS**). The alarm history report appears on the screen.
4. Press the **Esc** key to exit the display.

Clearing the Alarm History

The alarm history can be cleared in two ways. To clear the *entire* alarm history, use the **ALARMS—CLEAR HISTORY—FORCE** command; alternatively, you can clear only the *viewed* alarms via the **ALARMS—CLEAR HISTORY—VIEWED** command. Both commands will clear the **CP Poll History**, too. When either of the **ALARMS—CLEAR HISTORY** commands is issued, the following occurs.

- The **ALERT** indication is removed from the Menu Window. (When using the **VIEWED** option, the indicator is cleared only if all current alarms at the master and slave have been previously viewed and cleared).
- Each alarm history display (**DTE**, **LINE**, **AUX PORT**, *and* **CHASSIS**) will have zeros in the time and count fields, and the initial and current states will be the state at the time of clearing.

```
  — USER LINE ALARM HISTORY                    date and time

Type              First      Last    Initial Current Count

 BPVS          date-time date-time NORMAL  ALARM      3
 YELLOW        date-time date-time NORMAL  NORMAL     6
 AIS           date-time date-time NORMAL  ALARM      9
 USS           date-time date-time NORMAL  ALARM      1
 SIGNAL LOSS   date-time date-time NORMAL  DISABLED   0
 SYNC LOSS     date-time date-time NORMAL  DISABLED   0
 ES            date-time date-time NORMAL  DISABLED   0
 LOOP          date-time date-time NORMAL  NORMAL     4

 Press EXIT Key to Continue.
```

Figure 7-1. Alarm History Display

Access-T will dial out to report an alarm again if the Alarm History is not cleared within the specified Dialport Backoff time. (The Dialport Backoff time can range from 15 to 240 minutes, as described in Chapter 6 under the heading **Setting Modem Dialout**.) To prevent repeated dialouts of the same alarm, clear the Alarm History before the Dialport Backoff period elapses.

To clear the alarm history of viewed alarms, perform the following steps:

1. Select **ALARMS** from the Main Menu Line.
2. Select **CLEAR HISTORY**.
3. Select **VIEWED** or **FORCE**.
4. Select **YES** or **NO**.
5. Press the **Enter** key.
6. Press the **Esc** key to return to the Main Menu Line.

Special procedures must be followed when handling alarms at a master Access-T. For a detailed explanation of how to view and clear alarms on a master unit, refer to Chapter 8.

Performance and Status Reports

Access-T provides the following summaries of performance and status information:

- Description.
- Configuration.
- Status.
- Modem Dialout Parameters.
- 24-Hour Registers.
- One-Hour Statistics.
- ESF Error Counts.
- Line Availability.
- Buffer Error Count.
- SNMP Parameters.
- MIB-II Counts.

Access-T Description

The Access-T Description report (**REPORTS—DESCRIPTION**) displays hardware part and serial numbers, software part numbers, and start-up times for Access-T Multiplexer and Network Interface Module (NIM).

To display the Access-T Description, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **DESCRIPTION**.
3. The report will be displayed on the terminal screen.
4. Press the **Esc** key to return to the Main Menu Line.

Figure 7-2 illustrates the Access-T Description display. Note that displayed part numbers on your unit will not necessarily match those shown in Figure 7-2.

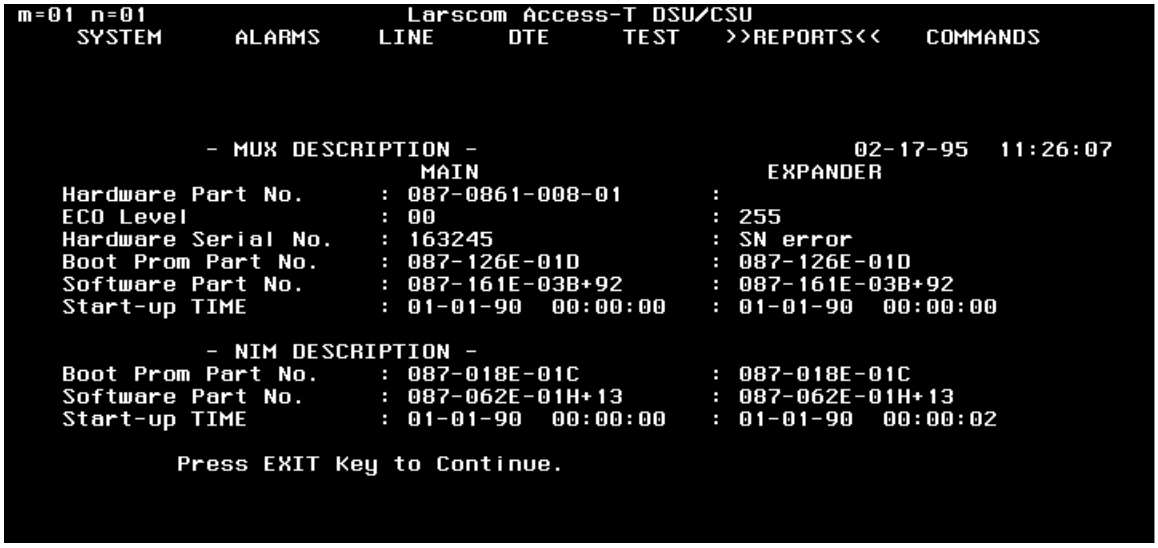


Figure 7-2. Access-T Description Display

Access-T Configuration

The Access-T Configuration report (**REPORTS—CONFIGURATION**) displays the Access-T's current configuration.

To display the Access-T Configuration, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **CONFIGURATION**.
3. Select **LOCAL** or **FAR-END** report, as appropriate.

   Note: The far-end configuration is available only in point-to-point ESF framing mode.

4. The report will be displayed on the terminal screen.
5. Press the **Esc** key twice to return to the Main Menu Line.

Configuration settings will be displayed as illustrated in Figure 7-3.

The display presents the following information:

- **Name:** The user-defined system name.
- **Map:** The DS0 bundling configuration for the currently active map, either MAP1 or MAP2.
- **Master Clk:** The clocking source for Access-T, which can be one of eight sources.
- **Master Freq:** The frequency of the master clock.

The following information applies to the T1 line interface.

- **Framing:** Whether the framing mode is set for superframe (D4) or extended superframe (ESF).
- **Coding:** Whether line coding is set for Bipolar 8-Zero Substitution (B8ZS) or Alternate Mark Inversion (AMI).
- **LBO:** The line build-out for the transmitted signal.
- **T1.403:** Whether Access-T supports the ANSI T1.403 standard.
- **Yellow:** Whether Access-T sends Yellow Signal when it has lost sync on the received signal.
- **Loopback:** Whether Access-T is in a DS DTE, DS Line, LS DTE, or LS Line loopback.
- **QRSS:** Whether Access-T is transmitting QRSS to the line, and what portion of the bandwidth is being tested: PORT1, PORT2, PORT3, PORT4, AUX, FULL, IDLE.

The following information applies to the T1 DTE (Aux Port) interface.

- **Framing:** Whether the framing mode is set for superframe (D4) or extended superframe (ESF).
- **Coding:** Whether line coding is set for Bipolar 8-Zero Substitution (B8ZS) or Alternate Mark Inversion (AMI).
- **EQU:** The equalization value for the transmitted signal.
- **Bit 7:** Whether the auxiliary port employs Bit 7 stuffing.
- **Yellow Transcoding:** Whether Access-T transcodes Yellow Signal from the auxiliary T1 DTE port. (At least one DS0 must be mapped to the aux port.)
- **AIS TO DTE:** Whether Access-T generates AIS in case of LOS or LOF. (At least one DS0 must be mapped to the aux port.)
- **AUX LOOP:** Whether a CS DTE loopback is currently in effect.

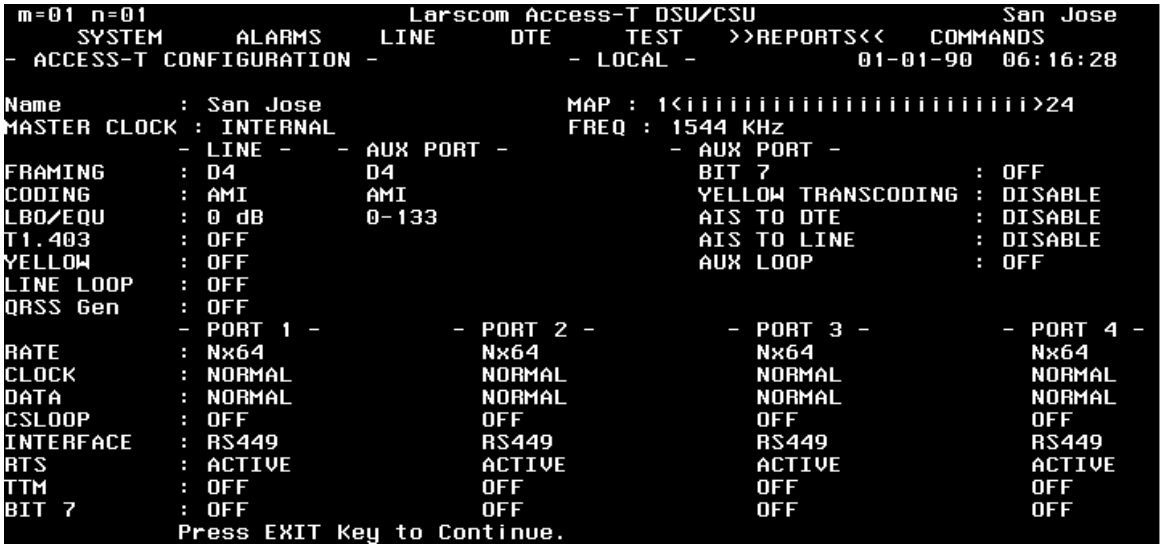


Figure 7-3. Access-T Configuration Display (4-Port Unit with Aux T1 DTE)

The following information applies to DTE Ports 1, 2, 3, and 4.

- **Rate:** Whether the DTE baud rate is Nx56 or Nx64 kbps.
- **Clock:** Whether the clocking signal is inverted or normal.
- **Data:** Whether the data is inverted or normal.
- **Loopback:** Whether a CS Line or CS DTE loopback is in effect.
- **Interface:** Whether the DTE port interface is V.35 or RS449.
- **RTS:** Whether Request To Send (RTS) is permanently asserted, or controlled by the DTE (active).
- **TTM:** Whether terminal timing mode is enabled.
- **Bit 7:** Whether Bit 7 coding is in effect or not.

All configuration is performed via the Terminal Interface's drop-down menus. Configuration options are described in detail in Chapter 6.

Access-T Status

The Access-T Status report (**REPORTS—STATUS**) displays the status of the Access-T T1 and DTE interfaces, as illustrated in Figure 7-4.

To display the Access-T Status report, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **STATUS**.
3. The report will be displayed on the terminal screen.
4. Press the **Esc** key to return to the Main Menu Line.

The display presents the following information:

- **Signal Loss:** Whether Access-T is receiving a valid signal from the T1 line. (Loss of Signal is declared if Access-T receives 175 ± 75 consecutive ZEROS.)
- **Sync Loss:** Whether Access-T has lost framing synchronization on the signal received from the T1 line.
- **USS:** Whether an Unavailable Signal State exists.
- **Rcv Yellow:** Whether Access-T is receiving Yellow Signal from the T1 line. If so, the far-end CSU has lost sync on the signal from the line.
- **Rcv AIS:** Whether Access-T is receiving Alarm Indication Signal (AIS), an unframed All ONES signal.
- **Master Clk Loss:** Whether Access-T is receiving a valid master clock signal. If the Access-T loses its master clock, it will use its own internal clock until the selected master clock is regained. (If the Aux port is serving as the master clock and clock source is lost, Access-T will not register Master Clock Loss; however, it will fall back on its internal clock.)
- **Port1 RTS Loss:** Whether the RTS input to DTE Port 1 is present.
- **Port2 RTS Loss:** Whether the RTS input to DTE Port 2 is present.
- **Port3 RTS Loss:** Whether the RTS input to DTE Port 3 is present.
- **Port4 RTS Loss:** Whether the RTS input to DTE Port 4 is present.
- **Aux Port Sync Loss:** Whether Access-T has lost synchronization on the T1 input to the auxiliary (drop-and-insert) port.

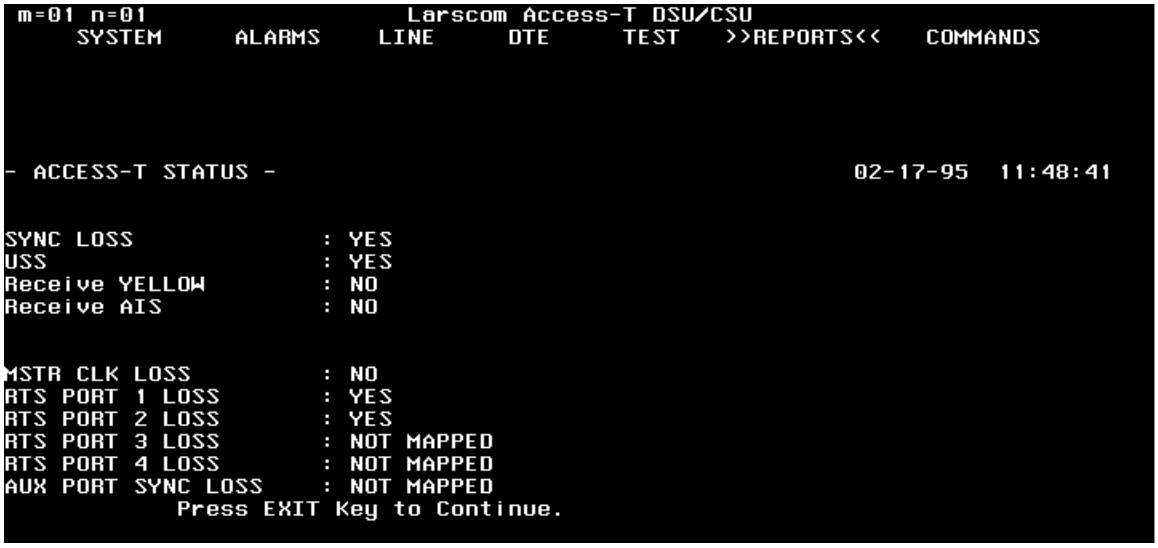


Figure 7-4. Access-T Status Display

DS0 Configuration Report

The DS0 Configuration report (**SYSTEM—DS0 CONFIGURATION—VIEW**), illustrated in Figure 7-5, displays the configuration for the user-defined mapping parameters, including:

- The current mapping option (MAP 1, MAP 2, or TIME).
- The DS0 bundling configuration for MAP1 and MAP2.
- The start and stop times for MAP 1 and MAP 2.
- The currently active map (indicated by an asterisk in front of the bundling string).

To view the DS0 Configuration Report, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **DS0 CONFIGURATION**.
3. Select **VIEW**.
4. The report will be displayed on the terminal screen.
5. Press the **Esc** key to return to the Main Menu Line.



Figure 7-5. DS0 Configuration Display

Access-T Modem Dialout Parameters

The Access-T Modem Dialout Parameters report (**SYSTEM—SET MODEM DIALOUT—VIEW**), illustrated in Figure 7-6, displays the following information:

- Primary and alternate dialstrings, with respective start and stop times.
- Wait for connect time.
- Inactivity timeout.
- Dialport backoff.

Definitions of each of these parameters can be found in Chapter 6 under **Modem Dialout Configuration**.

To display the Access-T Modem Dialout Parameters report, perform the following steps:

1. Select **SYSTEM** from the Main Menu Line.
2. Select **Modem Dialout Setup**.
3. Select **View**.
4. The report will be displayed on the terminal screen. Press the **Enter** key to exit the display.
5. Press the **Esc** key repeatedly to return to the Main Menu Line.

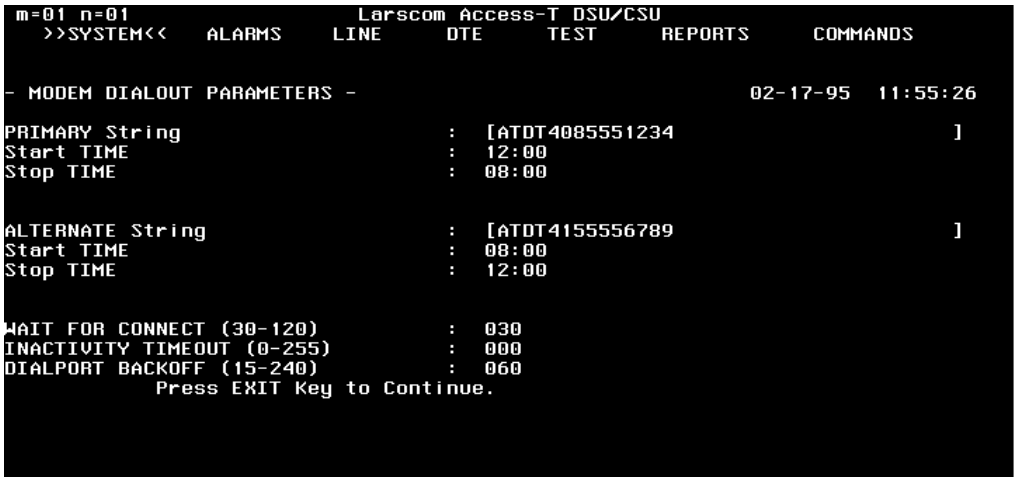


Figure 7-6. Access-T Modem Dialout Parameters Display

24-Hour Registers

The 24-Hour Registers report (**REPORTS—24-HOUR REGISTERS**) displays the contents of a selected 24-hour performance register. As described in Chapter 2, Access-T maintains three independent sets of 24-hour performance registers:

- **Telco registers** record performance of the input from the T1 line. They can be accessed from the network as well as the command ports, but can be cleared only from the network (i.e., by the telephone company), by restarting the NIM, by changing the framing, or by powering down then up. These registers meet telco monitoring requirements as presented in AT&T Publication 54016.
- **User registers** record performance of the input from the T1 line. They can be accessed from the supervisory interfaces as well as the network and FDL, and can be cleared from the supervisory interfaces and the FDL. Thus, they allow you to monitor and document network performance independent of the telco.
- **Aux (T1 DTE) registers** record the performance of the input to the Aux port from a T1 DTE. These registers cannot be accessed from the network. Aux registers can be cleared locally.

When ESF framing is used, telco registers at the far-end Access-T (or other device conforming to AT&T Publication 54016) can also be reported. The near-end Access-T requests and receives register contents via the facility data link (FDL); hence, registers retrieved in this way are referred to as FDL registers.

Access-T maintains and displays 24-hour registers for:

- Errored Seconds (ES)—maximum value of 65,535.
- Severely Errored Seconds (SES)—maximum value of 65,535.
- Unavailable Seconds (UAS)—maximum value of 65,535.
- Bursty Errored Seconds (BES)—maximum value of 65,535.
- Loss of Frame Count (LOFC)—maximum value of 255.
- Controlled Slip Seconds (CSS)—maximum value of 255 (only available via the FDL when supported by far-end equipment).
- Bipolar Violations (BPV)—maximum value of 65,535; User and Aux.
- ESF Errors—maximum value of 65,535; User and Aux.

Display Format

The 24-hour register contents are displayed as shown in Figure 7-7. The 24-hour period is divided into 15-minute intervals. The top line of the report gives the register type (User, Telco, Aux, FDL Telco, or FDL User), parameter type, system name, and time. The report header gives:

- The number of seconds (maximum 900) in the current incomplete interval.
- The number of valid complete intervals (maximum of 96; reset at power-up or when register is cleared).

Error counts for the total of valid intervals over the last 24-hour period and the current interval for all registers except BPV and ESF.

The body of the report gives error counts for the 15-minute intervals in a matrix, with intervals 1 (most recent) through 8 on the line beginning 01, etc.

> **Note:** BPV and ESF errors for the 24-hour and current counts are displayed only in their respective reports.

Errors continue to be counted while a diagnostic is in progress (i.e., the Access-T is in loopback or is transmitting a test signal). All registers are cleared at power-up or when the framing mode is changed (from D4 to ESF or vice versa). User and Aux statistics are also cleared by the Clear Registers command (**COMMANDS—CLEAR REGISTERS**), as described later in this chapter. Telco statistics can be cleared by a command from the network (i.e., by the telco).

```
 — USER ERRORED SECONDS                    date and time

CURRENT INTERVAL : 79 seconds
VALID INTERVALS  : 96
                    ES     UAS     BES     SES     CSS    LOFC
24-HOUR TOTAL     1573       0       0       0       0       0
CURRENT COUNT        0       0       0       0       0       0

                        LAST 96 INTERVALS
01|  0       0       0       0       0       0       0       0
09|  0     632     900      41       0       0       0       0
17|  0       0       0       0       0       0       0       0
25|  0       0       0       0       0       0       0       0
33|  0       0       0       0       0       0       0       0
41|  0       0       0       0       0       0       0       0
49|  0       0       0       0       0       0       0       0
57|  0       0       0       0       0       0       0       0
65|  0       0       0       0       0       0       0       0
73|  0       0       0       0       0       0       0       0
81|  0       0       0       0       0       0       0       0
89|  0       0       0       0       0       0       0       0

Press EXIT Key to Continue.
```

Figure 7-7. 24-Hour Register Display

To display a 24-hour Register report, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **24-HOUR REGISTERS.**
3. Select the desired register type (**User**, **Telco**, **Aux**, **FDL Telco**, or **FDL User**).
4. Select the desired register (parameter). Available registers vary based on the register type selected.
5. The report will be displayed on the terminal screen.
6. To return to the monitored parameter prompt, press the **Esc** key. Select another parameter option as described in step 3, or press the **Esc** key to return to the register type prompt.
7. Select another register type as described in step 2, or, press the **Esc** key repeatedly to return to the Main Menu Line.

One-Hour Statistics

The One-Hour Statistics command (**REPORTS—ONE-HOUR STATISTICS**) displays in a single report the 24-hour error count and a 1-hour error breakdown for six performance parameters:

- Errored Seconds (ES)—maximum value of 65,535.
- Unavailable Seconds (UAS)—maximum value of 65,535.
- Bursty Errored Seconds (BES)—maximum value of 65,535.
- Severely Errored Seconds (SES)—maximum value of 65,535.
- Controlled Slip Seconds (CSS)—maximum value of 255 (only available via the FDL when supported by the far-end equipment).
- Loss of Frame Count (LOFC)—maximum value of 255.

Like the 24-Hour Register report, the One-Hour Statistics report can display Telco, User, or Aux register contents from the local Access-T, or Telco and User register contents from the far-end Access-T or other device via the FDL.

Display Format

The one-hour statistics report is shown in Figure 7-8. The one-hour period is divided into 15-minute intervals. The top line of the report gives the register type (User,Telco, Aux Port, FDL Telco, or FDL User), parameter type, name of the unit, and time. Line 2 of the report gives the number of seconds (maximum 900) in the current (incomplete) interval. Line 3 identifies the number of valid complete intervals (reset at power-up or register clearing). The balance of the report gives error counts for the current interval, the last hour (i.e., the valid intervals), and intervals 1 (most recent) through 4.

Errors continue to be counted while a diagnostic is in progress (i.e., the Access-T is in loopback or is transmitting a test signal). Statistics are cleared on power-up or when the framing mode is changed. User statistics are also cleared by the Clear Registers command (**COMMANDS—CLEAR REGISTERS**). Telco statistics can be cleared by a command from the network (i.e., by the telco).

To display a one-hour report, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **ONE-HOUR STATISTICS**.
3. Select the desired register type (**User**, **Telco**, **Aux**, **FDL Telco**, or **FDL User**).
4. The report will be displayed on the terminal screen.

```
— TELCO ONE-HOUR STATISTICS                    date and time

CURRENT INTERVAL      251 seconds
VALID INTERVALS        96
                ES     UAS     BES     SES     CSS    LOFC
 24-HOUR TOTAL: 51       9      20      36       0       2
 CURRENT COUNT:  3       0       0       0       0       0

 Interval 1      0       0       0       0       0       0
 Interval 2      0       0       0       0       0       0
 Interval 3      7       0       5       2       0       0
 Interval 4      0       0       0       0       0       0

 Press EXIT Key to Continue.
```

Figure 7-8. One-Hour Statistics Display

5. Press the **Esc** key to return to the register type prompt.
6. Select another register type as described in step 2, or press the **Esc** key to return to the Main Menu Line.

Clearing the Registers

The Clear Registers command (**COMMANDS—CLEAR REGISTERS**) resets to zero all error and interval counts for the following:

- The User, FDL User, or Aux 24-hour registers and one-hour statistics.
- The line availability percentage (based on the User UAS register).

The Telco registers, one-hour statistics, and ESF error count are unaffected by the Clear 24-Hour Registers command.

> **Note:** When FDL User is selected, Access-T sends an FDL command and does not wait for a response. To verify that the far-end registers have been cleared, you must display the registers via the report menu.

To clear the 24-hour registers, follow these steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select **CLEAR REGISTERS**.
3. Select the register count to be cleared: **USER, AUX PORT**, or **FDL USER**.

4. Select **YES** to confirm your request to clear the registers; select **NO** to abandon this command.

ESF Errors

The ESF Errors report (**REPORTS—ESF ERRORS**) displays the count of ESF errors. In ESF framing mode, an ESF error is defined as either a CRC error or an Out-of-Frame event. In D4 framing mode, the ESF error count is always 0.

Access-T lets you display an ESF Errors report for the Telco, User, Aux Port, FDL Telco, or FDL User register type.

Display Format

Access-T displays the near-end ESF error count as shown in Figure 7-9a. After the error count, the report gives the date and time when the count was last cleared. The maximum count is 65,535. (The count does not roll over.)

The ESF Error Count for the far end (FDL) offers a slightly different display. Instead of the reset time, it displays USS and LOOP status, as displayed in Figure 7-9b.

Errors continue to be counted while a diagnostic is in progress (i.e., the Access-T is in loopback or is transmitting a test signal).

```
  — USER ESF ERRORS                date and time
ESF ERRORS: 0        06-25-92  12:15:00
```

A. User ESF Error Display

```
  — FDL ESF ERRORS                 date and time
         * Far-End    Loop : NO    USS : NO   *
FDL ESF ERRORS: 0
```

B. FDL Telco (or User) ESF Error Display

Figure 7-9. ESF Error Displays

To display an ESF Error Count, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **ESF ERROR COUNT**.
3. Select the desired register type (**USER**, **TELCO**, **AUX**, **FDL TELCO**, or **FDL USER**).
4. The report will be displayed on the terminal screen.
5. Press **EXIT** to return to the register type prompt.
6. Select another register type as described in step 2, or press **EXIT** to return to the Main Menu Line.

> **Note:** ESF Error Count is only meaningful if operating in ESF mode.

Clearing ESF Errors

The User and Aux ESF error count can be cleared using the Clear ESF Errors command (**COMMANDS—CLEAR ESF ERRORS**). The Telco ESF error count can be cleared from the network (i.e., by the telco). All ESF error counts are cleared at power-up or when the framing mode is changed.

> **Note:** When FDL User is selected, Access-T sends an FDL command and does not wait for a response. To verify that the far-end ESF errors have been cleared, you must display the ESF error counts via the report menu.

To clear the ESF error count, follow these steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select **CLEAR ESF ERRORS**.
3. Select the desired register type to clear (**USER**, **AUX**, or **FDL USER**).
4. Select **YES** to confirm your request to clear the ESF error count; select **NO** to abandon this command.

Line Availability

The Line Availability command (**REPORTS—LINE AVAILABILITY**) displays the percentage of seconds which were *not* Unavailable Seconds. The percentage is based on the current interval and the valid intervals in the User 24-Hour Unavailable Seconds register.

Line availability is displayed as illustrated in Figure 7-10. The display gives the availability percentage and the number of seconds on which the calculation is based. Line availability continues to be calculated while a diagnostic is in progress (i.e., the Access-T is in loopback or is transmitting a test signal).

Line availability is cleared when the User 24-hour registers are cleared.

To display the Line Availability, perform the following steps:

1. Select **REPORTS** from the Main Menu Line.
2. Select **LINE AVAILABILITY**.
3. The Line Availability percentage is displayed on the terminal screen.
4. Press the **Esc** key to return to the Main Menu Line.

> **Note:** If the UAS count exceeds 65,534, the message **Availability not calculable —Excessive errors / Press EXIT Key to Continue** will be displayed.

```
—  LINE AVAILABILITY —                    date and time
Availability 98.1% over the last 86,439 seconds
           Press EXIT Key to Continue.
```

Figure 7-10. Line Availability Display

Buffer Error Count

The Access-T Buffer Error Count View command (**COMMANDS—BUFFER ERROR COUNT—VIEW**) provides a tally of clock alignment errors at the Line, Port 1, Port 2, Port 3, Port 4, and Aux Port interfaces. The primary use of the Buffer Error Count command is to troubleshoot the system and pinpoint where a problem is occurring. Although the count value is not critical, whether a count is incrementing or not is important. If the error count is escalating at Port 1, for example, the operator can deduce that a problem exists in this portion of the network. A buffer error is usually associated with a faulty Access-T master clock. Figure 7-11 illustrates the Buffer Error Count display.

> **Note:** Buffer Error Count will *not* increment due to Loss of Clock Source.

To see if the Buffer Error Count is escalating, follow these steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select **BUFFER ERROR COUNT**.
3. Select **CLEAR**.
4. Select **YES**. (**Cleared the Buffer Error Count** is displayed.)
5. Press the **Esc** key twice.
6. Select **VIEW**. If the values for each of the parameters (**Line, Port1, Port2, Port3, Port4**, or **Aux Port**) do not equal zero, buffer errors are being registered. If all parameter values equal zero, Access-T has not received any buffer errors since the count was last cleared.

> **Note:** Loss of clock source does not increment the buffer error count

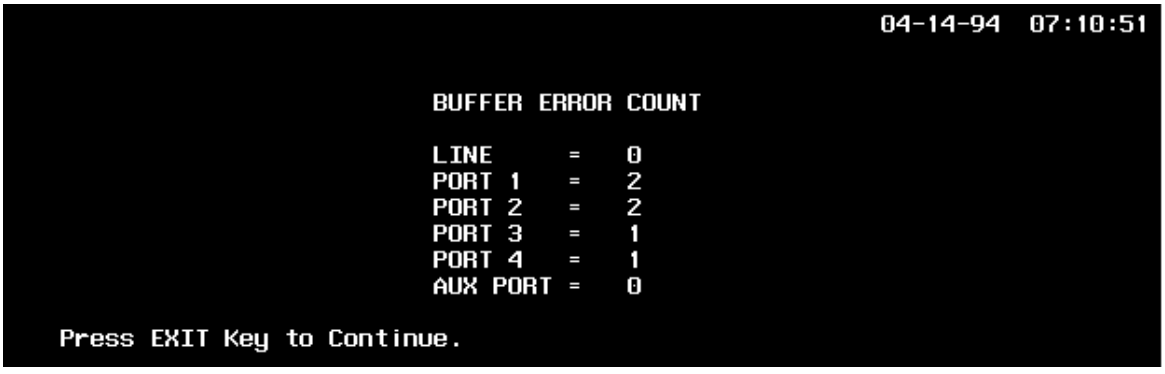


Figure 7-11. Buffer Error Count Display

SNMP Parameters

The SNMP Parameters report (**SYSTEM—SNMP—VIEW**), illustrated in Figure 7-12, displays the configuration for the user-defined SNMP parameters, including:

- **Management:** Whether SNMP support is enabled or disabled.
- **SETS Disabled:** Whether the ability to perform SET commands is enabled or disabled.
- **IP Address:** The IP address for Access-T.
- **Time-to-Live:** The amount of time, in seconds (up to 255), an out-going IP datagram will be passed until it is silently discarded.
- **Trap IP Address:** The IP address for Access-T's trap manager.
- **Trap Protocol:** The trap protocol used by Access-T when reporting traps during alarm dialout. (**SLIP** or **PPP**).
- **Authentication Trap**: Whether Access-T's ability to transmit an authentication trap is enabled or disabled.
- **PPP Support:** Whether PPP support for Access-T is enabled or disabled.
    - **PPP Restart Timer:** The maximum timeout value, in seconds, for acknowledging PPP configure or terminate requests.
    - **PPP Max Terminate:** The maximum number of PPP terminate requests that can be sent without receiving an ACK.
    - **PPP Max Configure:** The maximum number of PPP configure requests that can be sent without receiving an ACK.
    - **PPP Max Failure:** The maximum number of unacceptable PPP configure requests that can be received before giving up.
- **SLIP Support:** Whether SLIP support for Access-T is enabled or disabled.

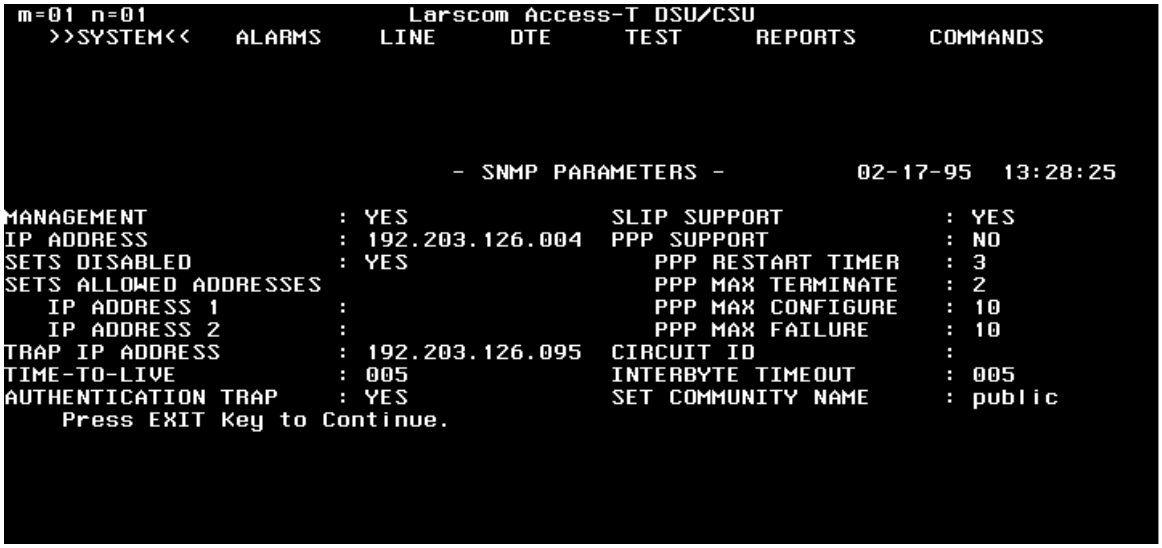


Figure 7-12. SNMP Parameters Report

- **Interbyte Timeout:** The number of seconds allowed between bytes when receiving a SLIP or PPP packet.
- **Circuit ID:** User-defined text string which identifies the line. Used in trouble shooting.
- **SET Community Name:** User-defined string required on SNMP SET requests.
- **SETS Allowed Addresses:** Defines up to two IP addresses from which Access-T will accept SET commands. SET commands from any other IP address will not be honored. *However, if both SETS Allowed Addresses are set to* ***000.000.000.000****, then Access-T will process SET commands from* ***any*** *IP address.*

MIB-II Counts

The MIB-II Counts report (**REPORTS–MIB-II COUNTS**) provides counts for several MIB-II variables in five different reports:

- UDP Counts.
- ICMP Counts.
- IP Counts.
- Interface Counts.
- SNMP Counts.

An explanation for each variable's counter can be found in RFC 1213. Variables not listed in these reports either always report a value of zero or are not supported by Access-T. Figure 7-13 illustrates and example of the SNMP Group counts. *Refer to Appendix F for more information about RFC 1213 as it pertains to Access-T.*

```
m=01 n=01                  Larscom Access-T DSU/CSU                    San Jose
    SYSTEM     ALARMS    LINE     DTE     TEST   >>REPORTS<<   COMMANDS

     MIB-II SNMP COUNTS                                  04-14-94  09:04:10

        snmpInPkts                    0
        snmpOutPkts                   0
        snmpInBadVersions             0
        snmpInBadCommunityNames       0
        snmpInBadCommunityUses        0
        snmpInASNParseErrs            0
        snmpInTotalReqVars            0
        snmpInTotalSetVars            0
        snmpInGetRequests             0
        snmpInGetNexts                0
        snmpInSetRequests             0
        snmpOutTooBigs                0
        snmpOutNoSuchNames            0
        snmpOutBadValues              0
        snmpOutReadOnlys              0
        snmpOutGenErrs                0
        snmpOutGetResponses           0
        snmpOutTraps                  0
           Press EXIT Key to Continue.
```

Figure 7-13. SNMP Group MIB-II Variable Counts

Master Mode Reports

When Access-T is configured as a master, another set of reports becomes available to the operator. These reports include Node Alarm Status, Chain Port Poll History, and Chain Port View. For information on these master-mode reports, refer to Chapter 8.

Tests

Access-T provides the following types of test and diagnostic functions:

- Loopbacks.
- Test patterns.

Loopbacks

Access-T loopbacks, *which are described in detail in Chapter 2*, are divided into DTE side and line side loopbacks. Loopbacks can be set for individual ports or lines. This section provides instructions for establishing and removing local and remote loopbacks.

> ***CAUTION:*** *Before attempting to activate a loopback, review the precautions listed in the next section:* ***Special Loopback Configuration Conditions.***

Figure 7-14 illustrates the local and remote loopback paths available on Access-T.

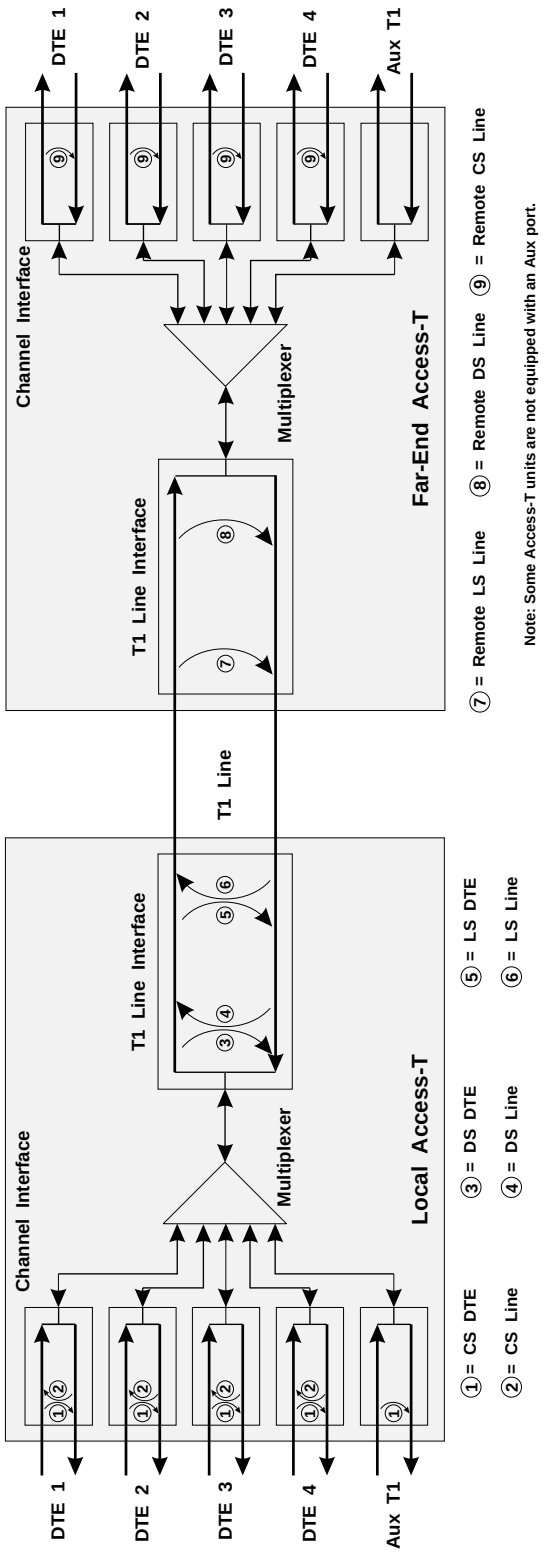


Figure 7-14. Access-T Loopback Paths

Special Loopback Configuration Conditions

This section describes all the special configuration settings that must be enabled or disabled for certain loopbacks to operate properly. Other special loopback rules are also provided in this section.

Remote CS Loopbacks

1. T1 unloop codes will remove a CS Line loopback only if a DS Line loopback currently exists.

2. The Aux (drop-and-insert) port is unaffected by this function.

3. Terminal Timing Mode (described in Chapter 6) must be **OFF**, if there is no DTE connected to the local port.

4. **CSLOOP=CSLINE** and **CSLOOP= CSDTE** are valid only if the port has been mapped to at least one DS0.

Near-End Loopbacks

1. LS DTE and DS DTE Loopbacks require that the Access-T *not* be timed from the network (i.e., **MASTER≠LINE**). (During an LS DTE or DS DTE loopback, the received data path is disconnected from the network.) Likewise, when an LS DTE or DS Line loopback is established, the Access-T cannot be the timing source (**MASTER=LINE .)**

2. When DS Line Loopback is initiated (locally or remotely), CS DTE Loopbacks are also initiated at all mapped DTE ports.

3. During LS DTE loopback, Access-T must be connected to a T1 line or Access-T's T1 line output must be terminated with 100 ohms. If there is no closed connection or termination at the line interface during LS DTE loopback, spurious errors may be introduced in the looped circuit.

4. Before a Line Loopback can be established, any existing Line Loopbacks must first be removed.

5. Access-T does not support DS Line loopbacks when all DS0s are mapped to the Aux Port *and* no DTE equipment is attached to the Aux Port.

Far-End Loopbacks

1. Far-end loopbacks are not available on a Fractional T1 line. However, remote CS Loops (V.54) are available.

2. **FDL**, **T1E1P**, and **T1E1L** commands require that **FRAMING = ESF** at both ends. In addition, to receive or transmit **T1E1P** and **T1E1L**, **T1.403** must be set to **ON.**

3. Loopbacks established via FDL codes have priority over locally-established loopbacks (except LS DTE loopbacks, which prevent Access-T from receiving the network signal). In-band codes have priority over loopbacks established via FDL codes.

4. The RS449 interface includes a pin which allows the DTE to initiate a CS DTE loopback at Access-T. A CS DTE loopback enabled by an external DTE will always remove an active CS Line loopback and insert the CS DTE loopback.

Activating Loopbacks

To establish a loopback from a terminal, perform the following steps:

1. Select **TEST** from the Main Menu Line.
2. Select the appropriate loopback group: **PORT LOOP** or **LINE LOOP**.
   - If you select **PORT LOOP**, *go to step 3*.
   - If you select **LINE LOOP**, *go to step* 6.
3. Select the appropriate port number (**PORT #).**
4. Select the port loopback option:
   - **CSLOOP** brings up the following loopback options: **CSLINE** or **CSDTE**. *Go to step 5.*
   - **REMOTE-UP** places the far-end Access-T into a CS Line loopback through a V.54 command. *Go to step 9.*
   - **REMOTE-DOWN** removes CS DTE or CS Line loopback in progress at the far-end Access-T. *Go to step 9.*
5. Select the desired channel-side loopback option:
   - **CSLINE** loops received line-side data toward the far end.
   - **CSDTE** loops received DTE-side data toward the DTE.

   Go to step 9.

6. Select the desired line loopback group:

   - **LOCAL** selects the loopback group with options that will place the near-end Access-T into a loopback. *Go to step 7.*
   - **REMOTE-UP** selects the loopback group which places the far-end Access-T into a loopback through an FDL command. Go to step 8.
   - **REMOTE-DOWN** selects the loopback group which removes a loopback in progress at the far-end Access-T. *Go to step 8.*

7. Select the desired **LOCAL** line loopback:

   - **LSLINE** loops the received clock and data on the line back toward the far end.
   - **LSDTE** loops the clock and data on the user side back toward the local DTE.
   - **DSDTE** loops the payload on the user side back toward the local DTE.
   - **DSLINE** loops the payload on the line back toward the far end.

8. Select the desired **REMOTE-UP** or **REMOTE-DOWN** line loopback:

   - **LINE**: LS Line loopback controlled by in-band code.
   - **T1E1P**: Payload Loopback as defined in ANSI T1.403 (DS Line loopback).
   - **T1E1L**: Line Loopback as defined in ANSI T1.403 (LS Line loopback).
   - **FDL**: Payload Loopback as defined in AT&T Pub 54016 (DS Line loopback).

   Go to step 9.

9. Press the **Enter** key to activate the desired loopback. Active loopbacks have an asterisk next to them in the menu. (The loopback will be indicated by a front-panel LED as described in Table 4-A.)

10. To de-activate local loopbacks, select the active loopback again. The loopback will be removed. In some cases, the drop-down menu includes an **OFF** option. In such cases, select **OFF** to deactivate the loopback.

11. To verify a loopback toward the line has been established or removed at the far end, perform a Remote Loop Verify command as described later in the next section.

Remote Loop Verify

Access-T provides a Remote Loop Verify command so the near end can easily determine if the far end is in loopback toward the line. The command causes Access-T to transmit QRSS for about five seconds and to monitor the received signal for QRSS; if a loopback to the line exists, the QRSS signal will be returned.

The Remote Loop Verify test can be performed in the full T1 bandwidth or in the Port #, Aux, or idle channels. Each option detects different loopbacks, as follows:

- **FULL**—Detects LS Line and DS Line.
- **IDLE**—Detects LS Line and DS Line.
- **PORT1, 2, 3,** or **4**—Detects CS Line of selected channel.
- **AUX**—Detects external CS Line loops.

Testing in the idle channel prevents interruption of data. However, to determine whether a CS Line loopback exists at the far end, tests must be performed in the specific port channel.

To perform the Remote Loop Verify test, follow these steps:

1. From the Main Menu Line, select **TEST**.
2. Select **LINE LOOP**.
3. Select **REMOTE-VERIFY**.
4. Select the desired bandwidth option (**FULL**, **PORT1**, **PORT2**, **PORT3**, **PORT4**, **AUX PORT**, or **IDLE**).
5. Press the **Enter** key. After the **Enter** key is pressed, Access-T sends QRSS for about 5 seconds. During this time, the words **WAITING FOR VERIFICATION** appears in the Menu and Report Display Area. The test lasts about ten seconds, after which time the display will show **LOOP VERIFIED** or **NO LOOP VERIFIED**.

> **Note:** Do not activate the Remote Loop Verify command while a local loopback is active or while QRSS is being generated. Results may be inaccurate.

Automatic Verification of Remote Loopback Commands

Access-T can be configured to execute a Remote Loop Verify test after any remote loopback command (**REMOTE-UP** or **REMOTE-DOWN** under **TEST—LINE LOOP** or **TEST—PORT LOOP**). If this feature is enabled, a loop status message, indicating the success or failure of a loopback command, will be indicated in the Header Line.

To enable automatic verification, perform the following steps:

1. Select **TEST** from the Main Menu Line.
2. Select **AUTO-VERIFY**.
3. Select **ON**.
4. Press **Enter**.
5. Send **REMOTE-UP** or **REMOTE-DOWN**.
6. Press the **Enter** key. After the **Enter** key is pressed, Access-T sends QRSS for about 5 seconds. During this time, the words **FAR LOOP SENT WAITING FOR VERIFICATION** appears in the Menu and Report Display Area. The test lasts about ten seconds, after which time the display will display **LOOP VERIFIED** or **NO LOOP VERIFIED**.

> **Note 1:** Automatic verification of remote loopbacks requires the use of the entire bandwidth.
>
> **Note 2:** If you perform a remote loopback command while automatic verification is enabled, the loop status message will appear only at the terminal issuing the command. For example, if **REMOTE-UP** is issued through the Supervisory Port, the terminal attached to the Craft Port would not receive the message **"LOOP VERIFIED"** or **"NO LOOP VERIFIED".**
>
> **Note 3:** Automatic loopback verification may not operate correctly when a local loopback is in effect or when QRSS is being transmitted.

Test Patterns

To test looped or unidirectional circuits, Access-T can transmit a framed QRSS test pattern toward the T1 line. QRSS (Quasi-Random Signal Source) is an industry-standard pattern of 2^{20}-1 bits which simulates normal traffic.

The QRSS test pattern can be inserted in the entire bandwidth (24 DS0s), in the DS0s assigned to a specified DTE channel, in the DS0s assigned to the Aux port, or in the DS0s carrying idle code (i.e., unassigned DS0s). The QRSS pattern is transmitted over the full 64 kbps (8 bits) of each DS0, and thus will be corrupted if transmitted through equipment supporting only 56 kbps per DS0.

> **Note 1:** Bit 7 stuffing will cause errors in a QRSS signal.
>
> **Note 2:** When transmitting a test pattern while a DTE is sending the same QRSS pattern, invalid results can occur. This rule applies to Remote Loop and Automatic Loop Verification also.
>
> **Note 3**: Do not issue other commands, such as Restart NIM, Restart Mux, or loopbacks, while transmitting a test pattern; doing so may produce inaccurate displays.

To transmit a test pattern, perform the following steps:

1. From the Main Menu Line, select **TEST**.
2. Move the cursor to **QRSS**.
3. Select the portion of the T1 bandwidth in which the QRSS signal will be transmitted:

FULL	The entire T1 bandwidth.
PORT 1	The DS0s mapped to DTE Port 1.
PORT 2	The DS0s mapped to DTE Port 2.
PORT 3	The DS0s mapped to DTE Port 3.
PORT 4	The DS0s mapped to DTE Port 4.
AUX	The DS0s mapped to the Aux Port.
IDLE	The unused DS0s assigned to transmit idle code.

4. Press the **Enter** key to begin transmitting the pattern.
5. To stop transmitting the pattern, position the cursor on QRSS and select **OFF**.

Bit Error Testing

When the Access-T is transmitting a QRSS test pattern toward the network, it monitors the signal coming from the network for the QRSS pattern. If the QRSS pattern is looped back toward the Access-T (either locally, in the network, or at the far end), the Access-T will sync on the QRSS pattern and report any bit errors detected.

> **Note:** The QRSS pattern is always transmitted in the full 8 bits (64 kbps) of each DS0. If equipment in the looped path is transparent to only 7 bits (56 kbps) per DS0, numerous bit errors will occur.

Use the following procedure to perform a bit error test:

1. Ensure that the desired loopback is in effect and that a QRSS test pattern is being transmitted. Procedures are given in the section entitled **Transmitting a Test Pattern**.
2. From the Main Menu Line, select **TEST**.
3. Move the cursor to **BIT ERRORS** and press the **Enter** key.
4. To inject errors into the transmitted QRSS signal, press the **Space Bar**. Detected errors are indicated under **BIT ERRORS**.

The error count maintains a dynamic display (refreshed every second) of detected errors. The test will continue as long as the QRSS signal is being transmitted.

To clear the bit error count, follow these steps:

1. Ensure that the desired loopback is in effect and that a QRSS test pattern is being transmitted. Procedures are given above.
2. From the Main Menu Line, select **TEST**.
3. Move the cursor to **BIT ERRORS** and press the **Enter** key.
4. Press **0** to clear the bit error count.
5. Press the **Esc** key to return to the Main Menu Line.

Restarting the NIM

The Restart NIM command (**COMMANDS—RESTART NIM**) causes the Network Interface Module to re-initialize without powering the Access-T down and up again. All performance registers are cleared (including telco registers). Any DS DTE, DS Line, LS DTE, or LS Line loopback will also be cleared. CS Line, CS DTE, and far-end loopbacks are unaffected. QRSS tests (and counters) are not cleared but will receive a burst of errors while the traffic is interrupted.

To re-initialize the NIM, perform the following steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select the **RESTART NIM** option.
3. At the confirmation prompt, select **YES** to re-initialize the NIM, or **NO** to return to the **COMMANDS** menu.

CAUTION: Restarting the NIM interrupts traffic through the Access-T. The interruption will last for less than five seconds.

Note: One use of the **Restart NIM** command is, after power-up, to make sure that a valid reset time is presented in the ESF Error Count display. If the Access-T time and date at power-up are invalid, the reset time in the ESF Error Count display will also be invalid. Restarting the NIM after the Access-T date and/or time have been corrected will ensure that a valid reset time will be displayed.

Restarting the Mux

The Restart Mux command (**COMMANDS—RESTART MUX**) causes the Mux module to re-initialize without powering the Access-T down and up again. During re-initialization, Access-T updates its operating mode and examines all validation bytes. If any errors are found in the validation bytes, Access-T resets the configuration to the system default values.

To re-initialize the Mux, perform the following steps:

1. Select **COMMANDS** from the Main Menu Line.
2. Select the **RESTART MUX** option.
3. At the confirmation prompt, select **YES** to re-initialize the Mux, or **NO** to return to the **COMMANDS** menu.

8 Using Access-T as a Master

This chapter describes the operation and configuration commands and the polling capabilities that are exclusive to a master Access-T. Master commands include node configuration, node selection, and alarm history viewing and clearing.

Master and Slave Modes

As described in Chapter 2, each Access-T is user-configured to operate in one of two modes: master or slave.

When Access-Ts are chained via the Chain Port, a master manages up to 29 slaves. ***Only one Access-T in a chain—the Access-T to which the controlling terminal or NMS is connected—can be in master mode. All others must be in slave mode.*** Refer to Figure 2-5 for chaining options.

> **Note 1:** When configuring Access-T modules for the Access-T 1500, the module in slot 15 ***must*** be the master (if the chassis is to have a master). Refer to Chapter 3 for more information.
>
> **Note 2:** When different Access-T product groups are used in the same chain, the Access-T 01/02 units can never be configured as the master. Any other master/slave combination is permitted.

The master Access-T manages slave Access-Ts as follows:

- The master Access-T polls all node addresses designated by the user *at the maste*r. Slaves which are not specified for polling are not polled.
- If a polled slave does not respond, the master declares an alarm and displays an ALERT indication in the Terminal Interface Title Bar, as demonstrated in Figure 8-2.
- If an *enabled* alarm occurs at a slave, *and dialout is enabled for that alarm at the slave*, the master dials out to report the alarm.

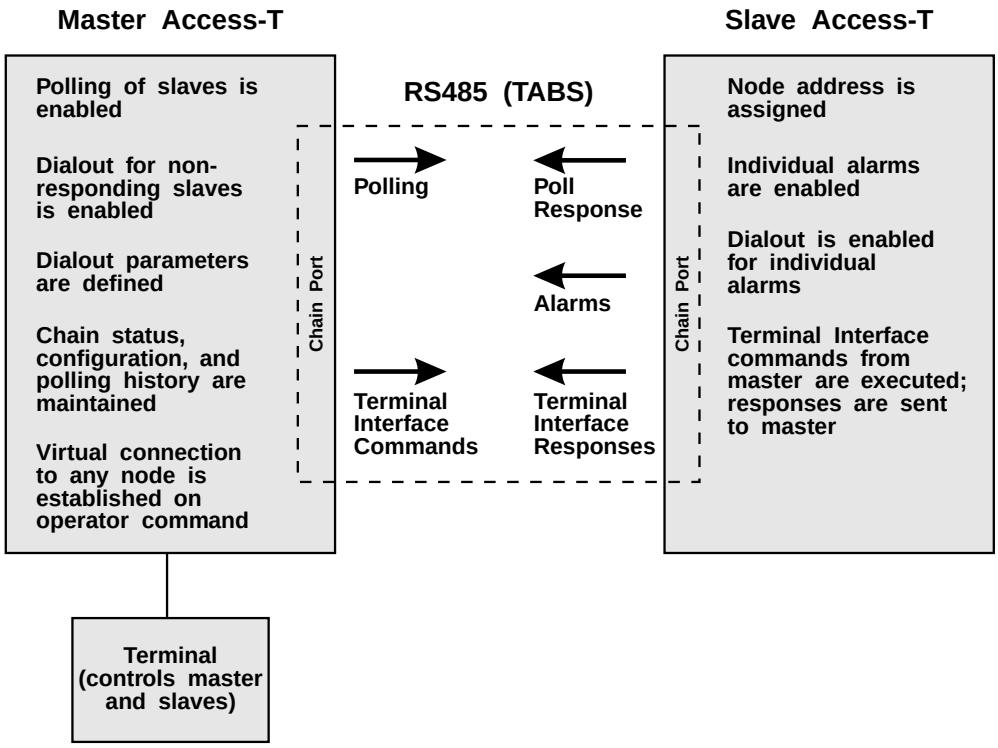


Figure 8-1. Summary of Master and Slave Functions

- If an *enabled* alarm occurs at a slave, the slave reports it to the master, and the terminal connected to the master displays the ALERT indication in its Title Bar.
- If a slave is not responding, and dialout for non-responding alarms at that node is enabled at the master, the master dials out and transmits an alert banner (via the Supervisory Port) or sends out SNMP traps.

In master mode, Access-T also lets you establish a virtual connection to any slave Access-T on the chain. Once a connection to a slave is established, you can execute any Terminal Interface commands at the selected Access-T. For example, you can call up a 24-hour register report for the selected Access-T.

Figure 8-1 summarizes the master and slave functions.

Node Addresses and Alert Indications in the Title Bar

In master mode, the Title Bar displays two node addresses in the upper left corner, as shown in Figure 8-2. The first, **m=XX**, is the address of the master—i.e., the Access-T to which the terminal is attached. The second, **n=XX**, is the node address of the currently-selected Access-T—i.e., the Access-T with which the terminal is currently communicating. The node name at the right end of the Title Bar is also that of the currently-selected Access-T.

Looking at the Title Bar, you can easily tell if the terminal is communicating with the master or a slave. If the value in *n=XX* is equal to the value in **m=XX**, the terminal is communicating directly with the master. Otherwise, the terminal is communicating with a slave.

When an **ALERT** indication appears after the node addresses in the Title Bar, there is an uncleared alarm change-of-state somewhere in the chain. This could be a performance alarm at the master or one of the slaves, or a communication alarm between the master and a slave. Details of alarm announcement and identification in master mode are given later in this chapter.

> **Note:** The **ALERT** indication always applies to the entire chain, independent of whether the terminal is currently communicating with the master or a slave. (This is not true if you are talking directly to a slave via its Craft or Supervisory Port.)



Figure 8-2. Access-T Title Bar in Master Mode

Setting Node Addresses and Operating Modes

When Access-Ts are chained via the RS485 Chain Ports, you must ensure that each node is configured for the proper mode and has a unique address. The mode and address must be set via DIP switches on the rear panel of the unit. Each node must be given a unique address on the chain.

Refer to Chapter 3 for the address-setting and mode-selection procedure.

Configuring the Master for Polling

In order for the master Access-T to manage the slave Access-Ts in a chain, the master Access-T must be configured with the polling address and dialout option for each slave node. When polling is enabled for a particular slave, the master Access-T includes that slave in its polling cycle. When dialout is enabled for a particular slave, the master Access-T dials out to report changes in polling status (responding or not responding) for that slave.

To communicate to slave units on the chain using SNMP, you must make sure that the master unit has polling enabled for that slave and that the proper SNMP parameters are enabled on the master as well as the slave.

You should enable polling only for nodes which exist and are expected to respond. For one thing, the length of the polling cycle depends on the number of slaves for which polling is enabled; if the master polls slaves which do not exist, the time between polls of existing slaves will be unnecessarily lengthened. Also, since the master Access-T declares an alarm when a slave does not respond, polling non-existent slaves will result in superfluous alarms.

To configure the master for polling, perform the following steps:

1. Press **?** to make sure that the master is selected (i.e., **m=00** in the Title Bar). Do not perform the following procedure when communicating with a slave.
2. Select **SYSTEM** from the Main Menu Line.
3. Select *CHAIN PORT*.
4. Select *CONFIG*.

5. Specify the slaves to be polled as follows:

   a. Select *POLL*.

   b. Select *ENABLE* to specify a slave to be polled (or *DISABLE* to specify a slave which is no longer to be polled).

   c. Enter the two-digit node address (**01** to **30**) of the slave. Then press the **Enter** key, followed by the **Esc** key.

   d. Repeat substeps 5b and 5c for additional slaves as desired.

6. Enable or disable alarm dialout or changes of polling status as follows:

   a. Press the **Esc** key to return to the *POLL/DIAL* menu and select *DIAL*.

   b. Select **ENABLE** if a change of the slave's polling status is to cause an alarm dialout by the master (or **DISABLE** if a dialout on the change of polling status is no longer desired).

   c. Enter the two-digit node address (**01** to *30*) of the slave. Then press the **Enter** key, followed by the Esc key.

   d. Repeat substeps 6b and 6c for additional slaves as desired.

7. Press the Esc key repeatedly to return to the Main Menu Line.

8. Verify the polling configuration as described under Viewing the **Chain Port Polling Configuration** later in this chapter.

> **Note 1:** Dialout for polling status alarms occurs only if the **DIAL** and *POLL* features are both enabled. If polling is enabled but **DIAL** is disabled, alerts will occur at the terminal connected to the master's Craft Port, but no dialout will occur on the master's Supervisory Port.
>
> **Note 2:** For modem dialout to operate properly, the master Access-T must have a legal dialstring defined, and the Start and Stop times must be different.
>
> **Note 3:** The master's node address need not be enabled for polling.

Selecting a Node

Via the master Access-T, you can communicate with any Access-T in the chain by "selecting" its address. When you select a particular node, its address appears in the Title Bar after "**n=**" and its name appears at the far right, as shown in Figure 8-2. You can select the master Access-T by selecting its valid address in the range of 01 to 30.

When you select a node other than the master, the Terminal Interface displays the same menus and reports that would be displayed if you were connected directly to the slave, and any configuration or diagnostics you select from the menus will be executed by the slave.

You continue to communicate with the selected node until you select another node or until you enter a question mark (?). When you enter a question mark, you are returned to the master (node address m=xx) and to the beginning of the top-level menu.

To select a particular node, perform the following steps:

1. Select *SYSTEM* from the Main Menu Line.
2. Select *CHAIN PORT*.
3. Select *SELECT*. A dialog box appears at the bottom of the display.
4. Key-in the 2-digit node address and press the Enter key.
5. Press the **Esc** key twice to return to the Main Menu Line.

Copying a Node's Configuration

Via a master, you can copy the configuration of one node to another node over the Chain Port. When this command is requested, Access-T downloads the following configuration information:

- Map configuration (map 1, map 2, current mode, and switch time).
- All alarm configurations (enable and dialout) except chain polling.
- System clock information (source clock and frequency).
- DTE port configuration (rate, clock, data, interface, RTS, TTM, and Bit 7).
- Line/Aux framing and coding and equalization.
- Line Build-Out and Equalization.
- Yellow Signal generation.
- T1.403.
- Line BPV/ES threshold configuration (threshold and interval).
- Aux ES threshold configuration (threshold and interval).
- Bit 7 stuffing.
- In-band loopback recognition.
- Yellow Signal transcoding.
- AIS-to-DTE and AIS-to-Line.
- Data Link ID.

To copy the configuration of one node to another, perform the following steps:

1. Select *SYSTEM* from the Main Menu Line.
2. Select **CHAIN PORT**.
3. Select **CONFIG COPY**. A dialog box appears at the bottom of the display.
4. Key-in the 2-digit node address of the source node (node with configuration to be duplicated) followed by the 2-digit node address of the destination node (node which will receive the copies configuration) and press the Enter key.
5. Press the Esc key twice to return to the Main Menu Line.

Master Mode Reports

Various reports which are supported only in master mode let you examine the configuration and status of the chained Access-Ts. Among other uses, these reports help you identify the node at which an alarm has occurred, so you can select that node and examine it for detailed alarm information.

Viewing the Chain Port Polling Configuration

In master mode, Access-T lets you display polling configuration for all nodes in the chain, as shown in Figure 8-3. The display lists all 30 node addresses by name and IP address, and for each address indicates whether polling is enabled (**YES** or **NO** under **POLL**) and whether dialout will occur when the node does not respond (**YES** or **NO** under **DIAL**).

To view the master polling configuration for a chain, perform the following steps:

1. Make sure that the master Access-T is selected, and not one of the slaves. (You can do so by typing ?.)
2. Select **SYSTEM** from the Main Menu Line.
3. Select *CHAIN PORT*.
4. Select **VIEW**. The Chain Port View display appears on screen.
5. Press the **Esc** key to exit the display.

   Note 1: Although this display can be generated at a slave Access-T, it will contain invalid information.

   Note 2: The information under the master's node address is not applicable due to the fact that the master does not poll itself.

6. Press the **Esc** key to return to the Main Menu Line.

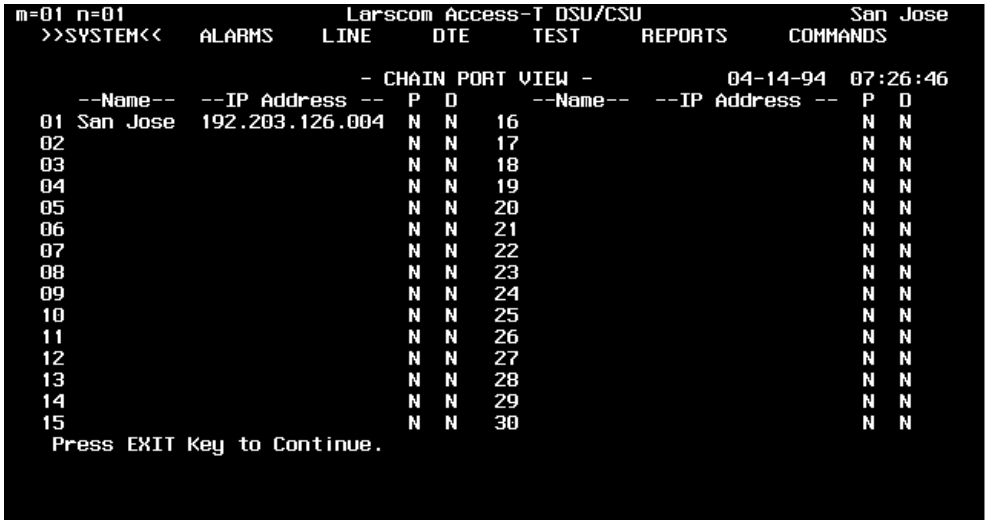


Figure 8-3. Access-T Node Configuration Display

Viewing Polling Status and History

In master mode, Access-T lets you display a Chain Port Polling History, as shown in Figure 8-4. This report records changes in responding status (from responding to not responding, or vice versa) for all nodes in the chain. The report includes:

- The address of each node.
- The date and time of the first and the most recent changes of responding status.
- The initial and current responding status: **NORMAL** for a responding node**, ALARM** for a non-responding node, and **DISABLED** when polling is not enabled for the node.
- A count of the times the polling status has changed state.

> **Note:** The Chain Port Polling History consists of two parts, the first giving the history of nodes 1 through 15 and the second giving the history of nodes 16 through 30.

To view the Chain Port Polling History, perform the following steps:

1. Make sure that the master Access-T is selected, and not one of the slaves. (You can do so by typing **?**.)
2. Select **ALARMS** from the Main Menu Line.
3. Select **CP POLL HISTORY**.
4. Select **1-15** or **16-30**, depending on which group of nodes you wish to view.
5. Press the **Esc** key to exit the display.
6. Press the **Esc** key to return to the Main Menu Line.

```
- CHAIN PORT POLL HISTORY -                    date and time

Type
              First       Last       Initial Current Count

01        date & time  date & time  NORMAL NORMAL     0
02        date & time  date & time  NORMAL DISABLED   0
03        date & time  date & time  NORMAL NORMAL     2
04        date & time  date & time  NORMAL ALARM      1
05        date & time  date & time  NORMAL NORMAL     0
06        date & time  date & time  NORMAL NORMAL     0
07        date & time  date & time  NORMAL NORMAL     0
08        date & time  date & time  NORMAL NORMAL     0
09        date & time  date & time  NORMAL NORMAL     0
10        date & time  date & time  NORMAL DISABLED   0
11        date & time  date & time  NORMAL DISABLED   0
12        date & time  date & time  NORMAL DISABLED   0
13        date & time  date & time  NORMAL DISABLED   0
14        date & time  date & time  NORMAL DISABLED   0
15        date & time  date & time  NORMAL DISABLED   0

Press EXIT Key to Continue.
```

Figure 8-4. Access-T Chain Port Polling History Display

The Chain Port History is cleared when you execute the *ALARMS—CLEAR HISTORY—FORCE (VIEWED)* command at the master Access-T (as described in Chapter 7).

> **Note 1:** When an alert indication appears in the Title Bar, the operator should check the Chain Port Polling History first to verify that all nodes are still in communication before exploring other options.
>
> **Note 2:** To clear the alert indicator for *viewed* alarms, you must view both the **1-15** and **16-30** displays if the alert is caused by state changes at nodes within both address ranges.

Viewing Node Alarm Status

In master mode, Access-T provides a report indicating which nodes currently have alarms. As shown in Figure 8-5, the Node Alarm Status display lists each node by number, identifies which nodes have uncleared alarms (**YES** under **ALARMS**), and indicates whether dialout is enabled for any of the uncleared alarms (**YES** under **DIAL**).

> **Note:** Dialout for specific alarms is enabled or disabled at the individual Access-Ts.

To view the Node Alarm Status display, perform the following steps:

1. Make sure that the master Access-T is selected, and not one of the slaves. (You can do so by typing **?**.)
2. Select **ALARMS** from the Main Menu Line.
3. Select **NODE ALARM STATUS**. The **Node Alarm Status** display appears on the screen.
4. Press the **Esc** key to return to the previous display.
5. Press the **Esc** key to return to the Main Menu Line.

```
                - NODE ALARM STATUS -    date and time

    ACCESS-T  ALARMS  DIAL        ACCESS-T  ALARMS  DIAL
       01      YES     YES           16       NO      NO
       02      YES     YES           17       NO      NO
       03      YES     NO            18       NO      NO
       04      NO      NO            19       NO      NO
       05      NO      NO            20       NO      NO
       06      NO      NO            21       NO      NO
       07      NO      NO            22       NO      NO
       08      NO      NO            23       NO      NO
       09      NO      NO            24       NO      NO
       10      NO      NO            25       NO      NO
       11      NO      NO            26       NO      NO
       12      NO      NO            27       NO      NO
       13      NO      NO            28       NO      NO
       14      NO      NO            29       NO      NO
       15      NO      NO            30       NO      NO

Press EXIT Key to Continue.
```

Figure 8-5. Access-T Node Alarm Status Display

Summary of Alarm Identification in Master Mode

You can learn of an alarm in an Access-T chain in several ways:

- If you are directly connected to the master Access-T, you will see the ALERT indication appear in the Title Bar.
- If you are connected to the master Access-T via modems, Access-T will dial a connection, and you will receive either a one-line alarm banner, a TABS report, or a trap message, as described under **Alarm Reporting Method** in Chapter 6.

In either case, the procedure for locating the alarm via the Terinal Interface is as follows:

1. Make sure that the master Access-T is selected, and not one of the slaves. (You can do so by typing **?**.)
2. View the Chain Port Polling History. Determine whether the alarm has been caused by a slave which is not responding.

   If not, go to step 3.

   If so, take whatever action is necessary to allow the master to poll the non-responding slave. The problem may be caused by a faulty connection to the slave or by a failure of the slave.
3. View the Node Alarm Status. Determine the node(s) at which an uncleared alarm exists by looking for **YES** in the column headed **ALARMS**.
4. Once you have determined that an alarm exists at a node, you can view and clear the alarm just as you would at the master Access-T. The basic procedure is as follows:
   a. Select the node at which the alarm exists. (Selecting nodes is described earlier in this chapter.)
   b. View the Alarm History as described in Chapter 7.
   c. Clear the Alarm History as described in Chapter 7.

      Note: As an alternative to substeps 4b and 4c, you can issue the **CLEAR—ALARM HISTORY—FORCE** command which will clear *all* alarms (viewed or unviewed) in the requested history.

9 Maintenance

The Access-T DSU/CSU is not field-repairable. It should be returned to Larscom Incorporated for any required repairs. Preventive maintenance is not required for the Access-T.

Replacing the Fuse

Access-T Series 100, 200, and 400 Units, AC Power

Access-T 100, 200, and 400 units powered by an ac source come equipped with a spare fuse to be used in the event that the primary fuse blows. The spare fuse is stored behind the rear panel, inside a small plastic casing. To remove the blown fuse and install the spare fuse, follow these steps:

1. Turn off power and remove the power cord from the rear of the Access-T 100, 200 or 400 unit.
2. Use a small, flathead screwdriver to remove the fuse assembly from the rear of the unit. Insert the screwdriver head into the notch (location A in Figure 10-1) and pry the fuse assembly (B) out. Be careful to fit the screwdriver head firmly in place before prying the assembly out, or the plastic could chip.
3. Remove the blown fuse (marked C in Figure 9-1) from the casing.
4. Using the screwdriver head, push the top of the rectangular section of the fuse assembly (marked D in Figure 9-1). A small box will protrude from the bottom of the assembly.
5. Remove this smaller box from the assembly.

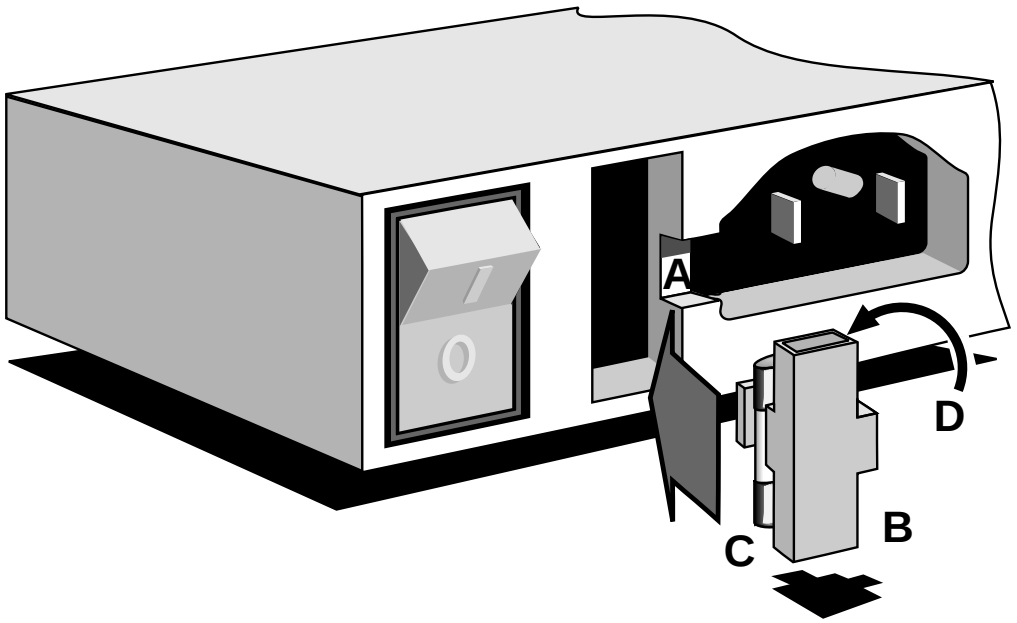


Figure 9-1. Partial View of Access-T Series 100, 200, and 400 Rear Panel with Fuse Assembly Removed (AC Power)

6. Remove the spare fuse and insert it where you removed the blown fuse in step 3.
7. Replace the spare fuse box in the fuse assembly.
8. Re-install the fuse assembly into Access-T 200 or 400 rear panel.
9. Re-insert the power cord and restore power to the unit.

> **Note:** If no spare fuse is inside the fuse assembly or if you wish to order extra fuses, call Larscom and ask for part number 250-120-75 (1-port or 2-port) or 250-120-95 (4-port).

Access-T Series 100, 200, and 400 Units, DC Power

Access-T 100, 200, and 400 units powered by a dc source do not have a spare fuse included within the unit. If the fuse blows, call Larscom and ask for part number 250-110-90 (2-port) or 250-110-50 (4-port).

To remove the blown fuse and install the new fuse, follow these steps:

1. Turn off power and remove the power cord from the rear of the Access-T 200 or 400 unit.
2. Use a small, flathead screwdriver to remove the fuse assembly (labeled **F1** on the rear panel).
3. Remove the blown fuse from the casing.
4. Insert a new fuse where you removed the blown fuse in step 3.

Access-T 1500

Both the ac and dc power supplies for the Access-T 1500 chassis have fuses which can be replaced. AC power supplies employ a 5 A, 250 V fast-blo fuse; dc power supplies employ a 7 A, 125 V fast-blo fuse.

To remove the blown fuse and install the new fuse, follow these steps:

1. Remove the power supply as follows:
   a. Remove the faceplate covering the power supplies by loosening the thumbscrews at the top of the faceplate. Then, grasp the extractor handle at the bottom of the faceplate an pull.
   b. Remove the defective power supply by pulling on the handle.
2. Remove the blown fuse from the power supply board.
3. Insert a new fuse where you removed the blown fuse in step 2.
4. Re-insert the power supply by carefully aligning the power supply in the guiding card slots. Be sure the card is oriented so that the plug on the rear of the power supply mates with the connector in the chassis. Verify that the power supply is securely mated to the rear of the chassis.

Replacement Parts

Field-replaceable parts are limited to the various cables and the fuse. When ordering spare or replacement parts, use the model/part numbers given in Table 9-A. Contact Larscom Customer Service Administrators for any other information required.

Customer Service

Larscom Customer Service Engineers are available to answer questions related to Access-T and to assist in problem diagnosis. Between 6:00 AM and 6:00 PM Pacific Time (Monday-Friday), Customer Service Engineers are on duty and ready to take your call. At all other times, Customer Service Engineers are on call and will return your call within 30 minutes. The Customer Service telephone number is:

(408) 988-6627

Or, you can contact us via Internet at:

support@larscom.com

When problems cannot be rectified over the telephone, on-site service is available. For information about on-site service, as well as training classes at Larscom or the customer's location, contact Larscom Customer Service.

Table 9-A. Access-T Parts and Accessories

NUMBER	DESCRIPTION
ACST-101	Chassis with 1 DTE Port (ac)
ACST-102	Chassis with 1 DTE Ports (dc)
ACST-111	Chassis with 1 DTE Port, with drop-and-insert (ac)
ACST-112	Chassis with 1 DTE Ports, with drop-and-insert (dc)
ACST-201	Chassis with 2 DTE Ports (ac)
ACST-202	Chassis with 2 DTE Ports (dc)
ACST-211	Chassis with 2 DTE Ports, with drop-and-insert (ac)
ACST-212	Chassis with 2 DTE Ports, with drop-and-insert (dc)
ACST-401	Chassis with 4 DTE Ports (ac)
ACST-402	Chassis with 4 DTE Ports (dc)
ACST-411	Chassis with 4 DTE Ports, with drop-and-insert (ac)
ACST-412	Chassis with 4 DTE Ports, with drop-and-insert (dc)
ACST-1500B-xxxx	Access-T 1500 chassis, can house dual ac/dc power supplies and 15 modules
087-2101-001-xx	Access-T 1500 module, 2 DTE ports, with drop-and-insert
PWR-PS01	Access-T 1500 ac power supply
PWR-PS03	Access-T 1500 dc power supply
A87-AK01-001	Accessory Kit, 19-inch mounting brackets for Access-T 1500 chassis
A87-AK02-001	Accessory Kit, 23-inch mounting brackets for Access-T 1500 chassis

Table 9-A. Access-T Parts and Accessories (cont'd)

NUMBER	DESCRIPTION
080-2333-0xx	DTE Cable, EIA530 to EIA530 (DB25P to DB25S), DCE-DTE, shielded *
080-2263-0xx	DTE Cable, EIA530 to EIA V.35 (DB25P to M34P), DCE-DTE, shielded *
080-2273-0xx	DTE Cable, EIA530 to RS449 (DB25P to DC37P), DCE-DTE, shielded *
080-2443-0xx	DTE Cable, EIA530 to V.35 (DB25P to M34S), DCE-DTE, shielded *
080-2413-0xx	DTE Cable, EIA530 to V.35 (DB25P to M34S), DCE-DCE, shielded *
080-2353-0xx	DTE Cable, EIA530 to V.35 (DB25P to M34P), DCE-DCE, shielded *
080-2453-0xx	DTE Cable, EIA530 to RS449 (DB25P to DC37S), DCE-DTE, shielded *
080-2423-0xx	DTE Cable, EIA530 to RS449 (DB25P to DC37S), DCE-DCE, shielded *
080-2403-0xx	DTE Cable, EIA530 to EIA530 (DB25P to DB25S), DCE-DCE, shielded *
080-2433-0xx	DTE Cable, EIA530 to EIA530 (DB25P to DB25P), DCE-DTE, shielded *
080-2373-0xx	DTE Cable, EIA530 to EIA530 (DB25P to DB25P), DCE-DCE, shielded *
080-2363-0xx	DTE Cable, EIA530 to RS449 (DB25P to DC37P), DCE-DCE, shielded *
080-2283-0xx	Line Cable, DA15S to DA15S, shielded, straight **
080-2293-0xx	Line Cable, DA15S to DA15S, shielded, crossover**
080-2313-0xx	Supervisory Cable, DE9S to DB25P, DTE-DCE, shielded straight *
080-2383-0xx	Supervisory Cable, DE9S to DB25P, DTE-DTE, shielded crossover *
080-2393-0xx	Supervisory Cable, DE9S to DE9S, DTE-DTE, shielded crossover *
080-2463-0xx	Supervisory Cable, DE9S to DB25S, DTE-DTE, shielded crossover *
080-2503-0xx	Line/Aux Cable, DA15P-DA15S, shielded
080-2513-0xx	Line/Aux Cable, DA15P-DA15S, shielded crossover
080-2523-0xx	Line Cable, DA15S-RJ48, keyed, shielded *
080-2533-0xx	Line Cable, DA15S-RJ48, keyed, shielded crossover *
080-2543-0xx	Line Cable, DA15P-RJ48, keyed, shielded *
080-2553-0xx	Line Cable, DA15P-RJ48, keyed, shielded crossover *
080-2563-0xx	Line Cable, DA15S-RJ48, unkeyed, shielded *
080-2573-0xx	Line Cable, DA15S-RJ48, unkeyed, shielded crossover *
080-2583-0xx	Line Cable, DA15P-RJ48, unkeyed, shielded *
080-2593-0xx	Line Cable, DA15P-RJ48, unkeyed, shielded crossover *
080-2603-0xx	Supervisory Cable, DB25P-DB25P, DTE-DTE, shielded crossover *
080-2613-0xx	Supervisory Cable, DB25P-DB25S, DTE-DTE, shielded crossover *
080-2623-0xx	Supervisory Cable, DB25P-DB25S, DTE-DCE, shielded *
080-2633-0xx	Supervisory Cable, DB25P-DB25P, DTE-DCE, shielded *
650-800-20	19-inch Patch Converter Panel
650-800-22	Expander panel for **650-800-20** to fit in a 23-inch rack
087-2143-001	Line Cable, 50-pin male RJ48H to RJ48C Patch Panel
087-xxxx-xxx	50-pin AMP CHAMP line connector
087-xxxx-xxx	50-pin AMP CHAMP aux connector
ACST-PPL-01	Accessory Kit, 19-inch Patch Panel and cable (line only)
ACST-PPL-02	Accessory Kit, 23-inch Patch Panel and cable (line only)
A87-AK05-001	Accessory Kit, Line Connectors
A87-AK06-001	Accessory Kit, Aux Connectors
ACST-PPA-01	Accessory Kit, 19-inch Patch Panel and cable (aux only)
ACST-PPA-02	Accessory Kit, 23-inch Patch Panel and cable (aux only)

Notes: -0xx indicates cable length, in feet.
* Available cable lengths: 6, 15, 25, 50 feet
** Available cable lengths: 6, 15, 30, 50 feet

Factory Repair Service

Larscom provides factory repair service at reasonable rates. Equipment covered by the warranty is repaired at no charge. (See warranty for details.) Equipment not under warranty is subject to a nominal repair charge. Contact Larscom Customer Service for a return authorization number (RA#) to expedite handling and repair of returned equipment. Prepare equipment for shipping as described below and send it by insured carrier to:

Larscom Incorporated
Attn: Repair Department , RA#_____
4600 Patrick Henry Drive
Santa Clara, CA 95054

Include the following information with returned items:

- Return authorization number. (Contact Larscom Customer Service.)
- Part number and serial number.
- Detailed description of malfunction, including self-test results if applicable.
- Names and phone numbers of persons familiar with the trouble symptoms.
- Complete return address. (P.O. Box numbers should not be used.)
- Purchase order number and billing address.

Authorized Canadian Maintenance Facility

For service in Canada, prepare equipment as described above and send it by insured carrier to the Larscom Canadian Maintenance Facility:

Axel Johnson / Brians Controls
294 Watline Avenue
Mississauga, Ontario, Canada L471PA

FTP Server Customer Access

You can now retrieve general product information and SNMP MIB files electronically via the Larscom FTP server. Currently, you can find RFC 1406 (DS1/E1) and RFC 1407 (DS3/E3), and the Larscom private MIB under the **pub/mibs** directory. To retrieve files from the server, perform the following steps:

1. FTP to ftp.larscom.com
2. login>anonymous (or use login ID).
3. passwd:***email address*** (i.e., smith@larscom.com).
4. cd/pub/mibs.
5. bin (transfers a file in binary mode).
6. get ***file name***.Z (i.e., rfc1406.txt.Z).
7. uncompress ***file name***.Z (i.e., rfc1406.txt.Z).
8. move ***file name file name*** 2 (i.e., rfc1406.txt.Z rfc1406.mib. This is an optional step which renames the rfc1406.txt.Z file to rfc1406.mib.)

This directory also contains a **README** file which briefly describes the MIB files as well as Larscom's software liability position.

Packing For Shipment or Storage

Prepare the equipment for shipment or storage as follows:

1. Wrap the equipment in heavy plastic wrapping and seal the plastic with strong tape.
2. Place the wrapped equipment in a corrugated container large enough to allow space for packing material. The container should be rated at 350-psi bursting strength.
3. Use inert, pliable packing material to provide cushioning around all sides, top, and bottom of the equipment.
4. Close and seal the container using strong (fiberglass) tape and/or steel or vinyl strapping.
5. Mark "DELICATE INSTRUMENT" on the container and mark the container to designate the "UP" side.

APPENDIX

A

Cable Drawings

This appendix provides pin-to-pin illustrations for all Larscom cables supported by Access-T.

DCE-DCE, Shielded (EIA530 to EIA530)

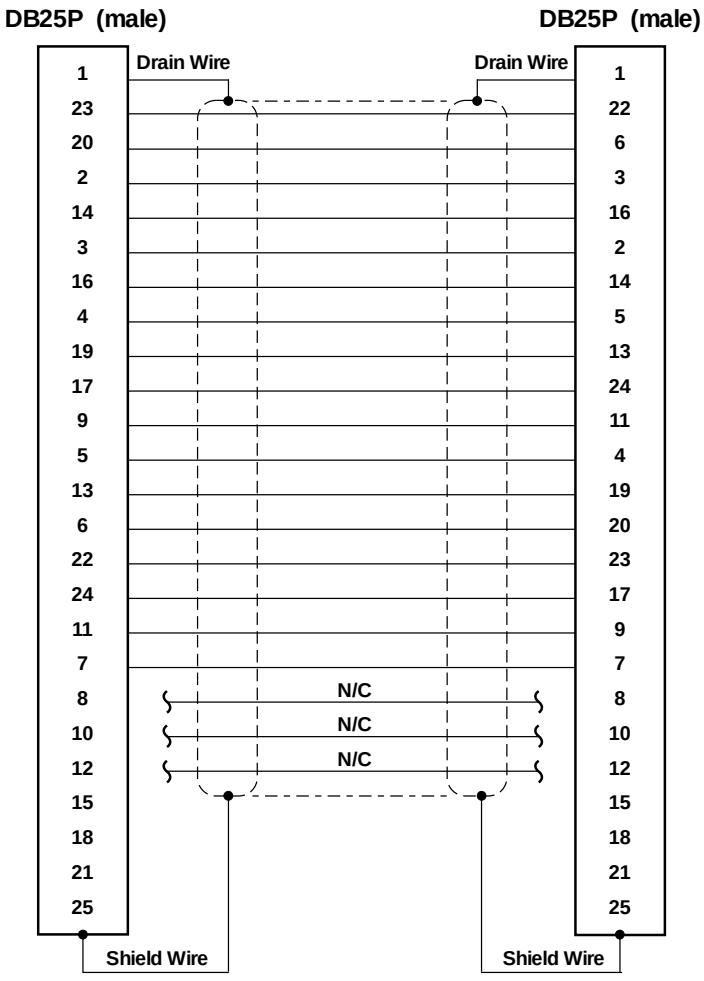


Figure A-1. DTE Cable, #080-2373-0xx

DCE-DCE, Shielded (EIA530 to EIA530)

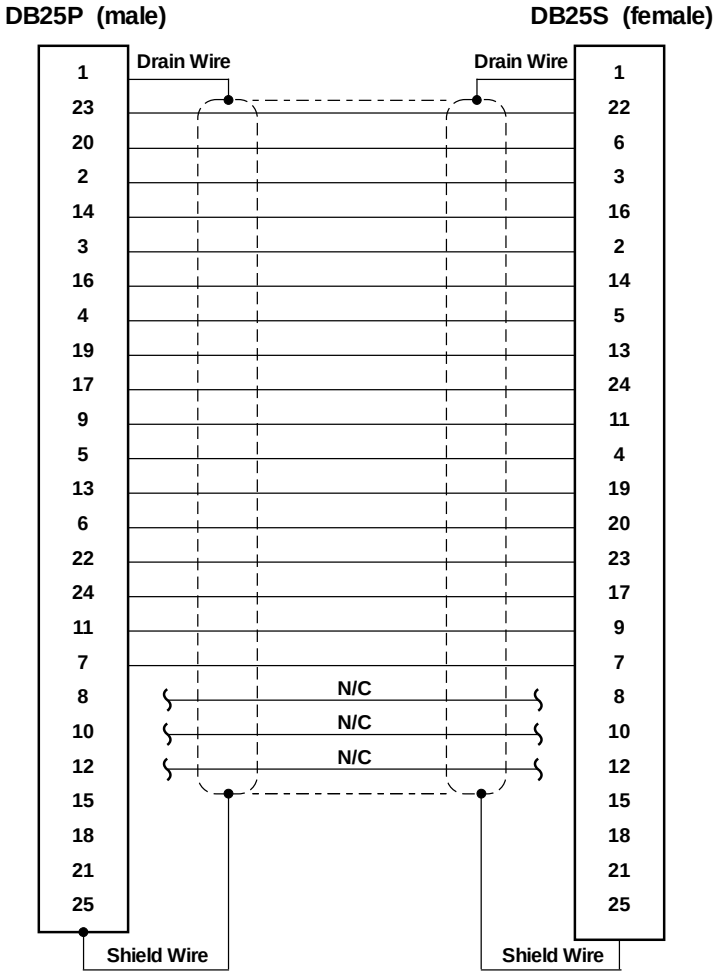


Figure A-2. DTE Cable, #080-2403-0xx

DCE-DTE, Shielded (EIA530 to EIA530)

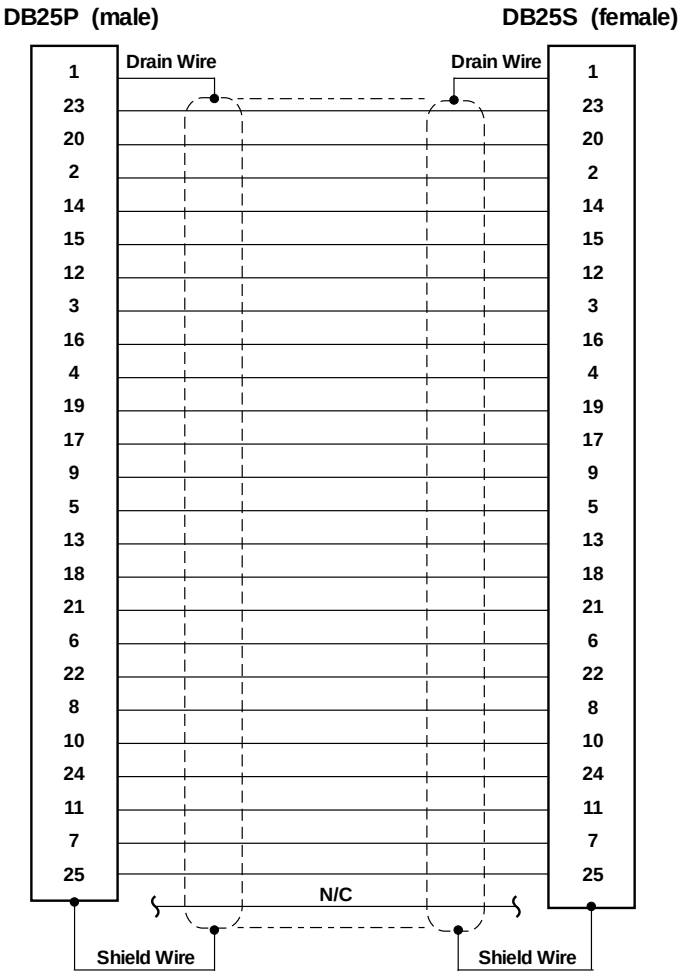


Figure A-3. DTE Cable, #080-2333-0xx

DCE-DTE, Shielded (EIA530 to EIA530)

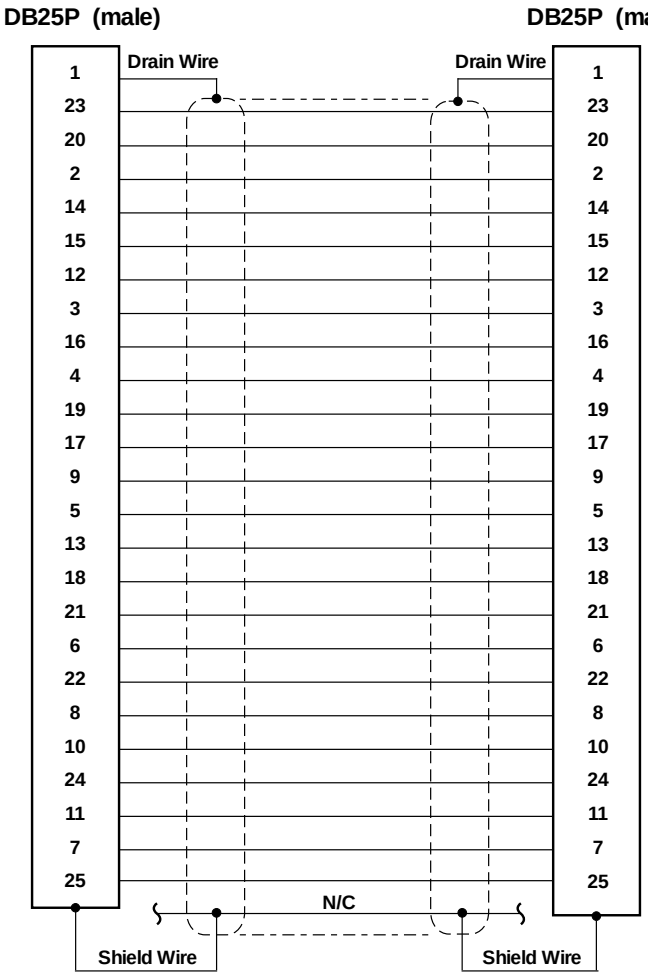


Figure A-4. DTE Cable, #080-2433-0xx

DCE-DCE, Shielded (EIA530 to V.35)

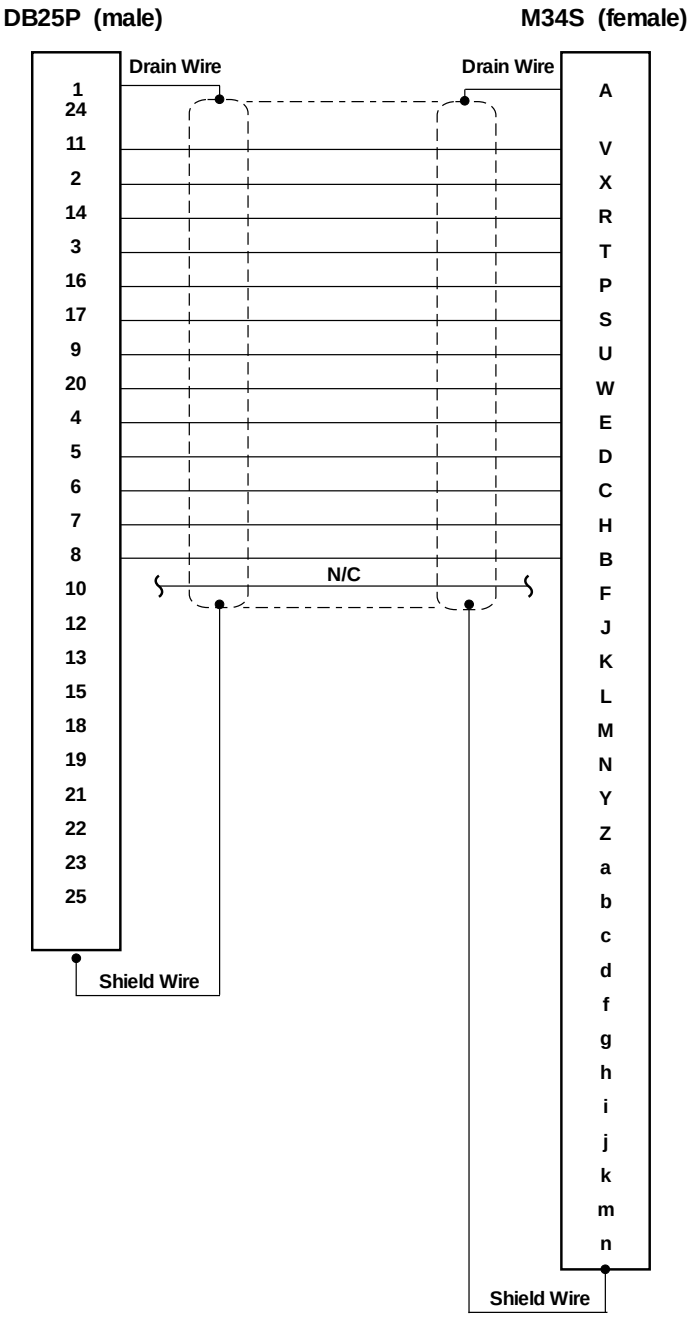


Figure A-5. DTE Cable, #080-2413-0xx

DCE-DCE, Shielded (EIA530 to V.35)

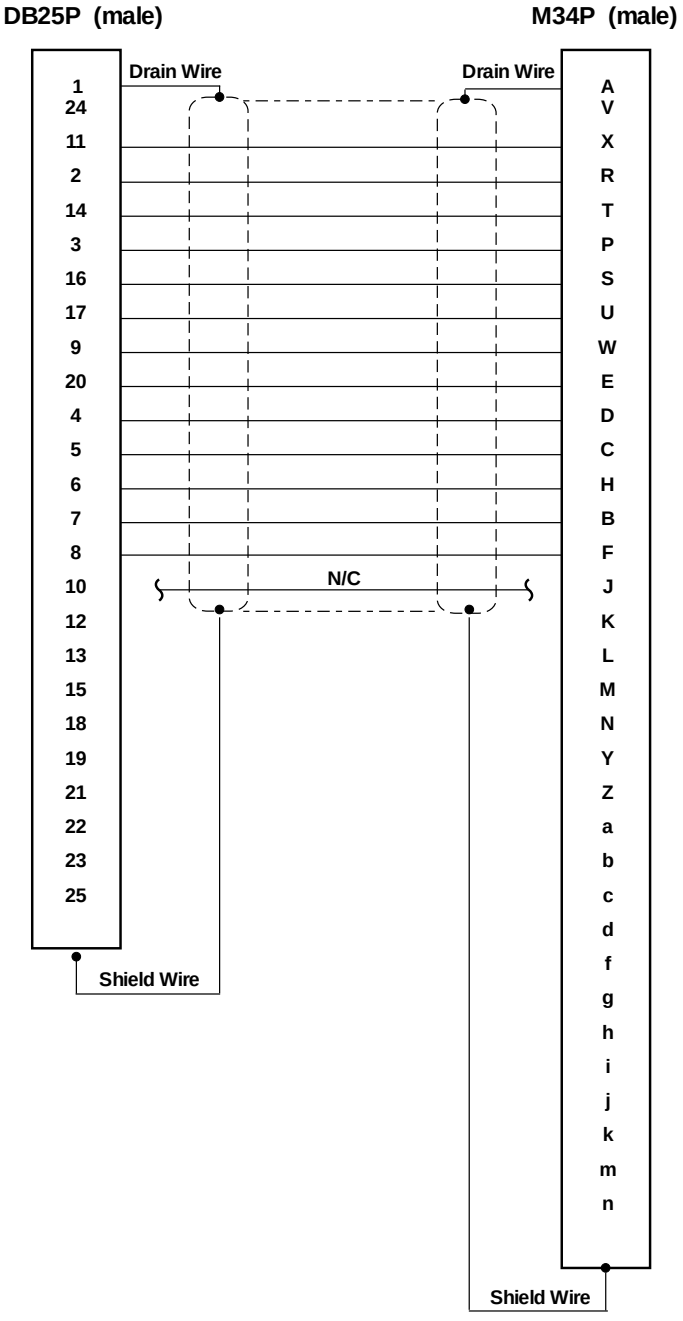


Figure A-6. DTE Cable, #080-2353-0xx

DCE-DTE, Shielded (EIA530 to V.35)

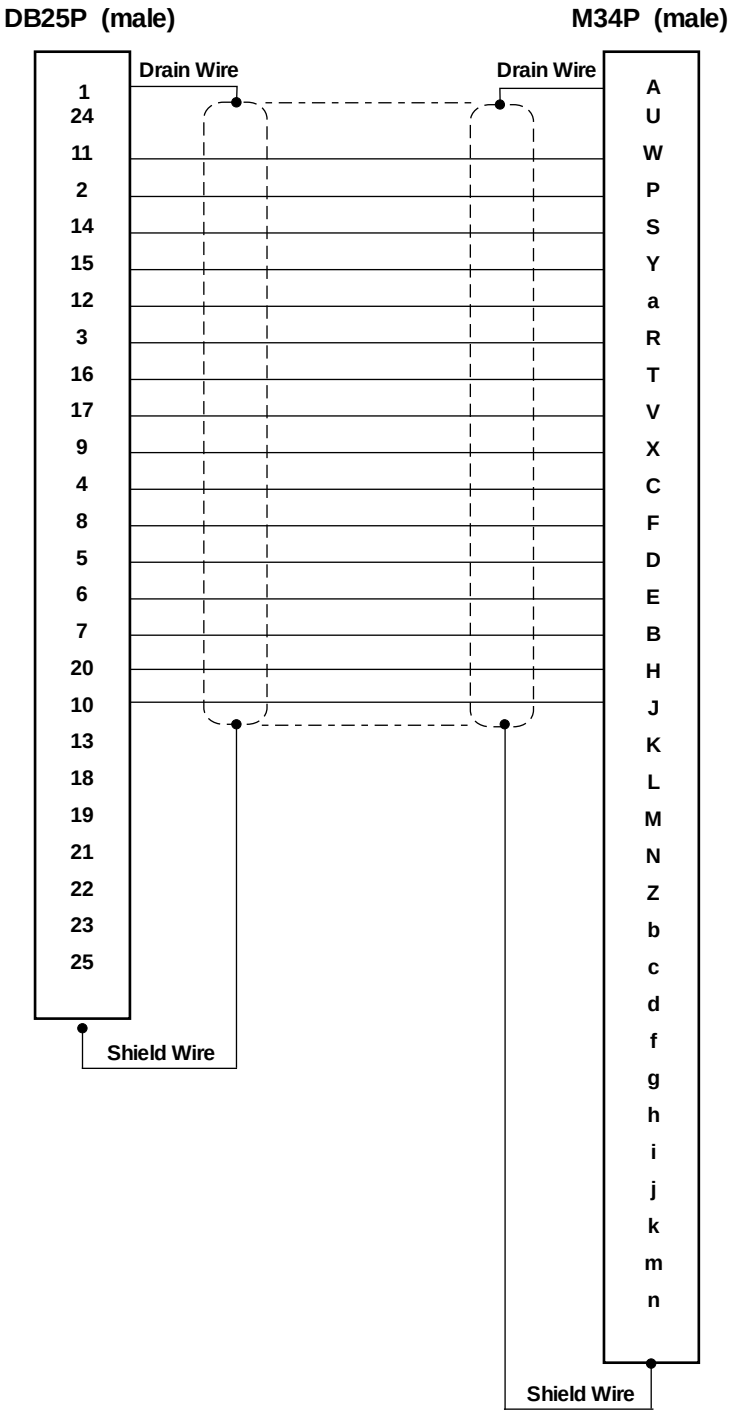


Figure A-7. DTE Cable, #080-2263-0xx

DCE-DTE, Shielded (EIA530 to V.35)

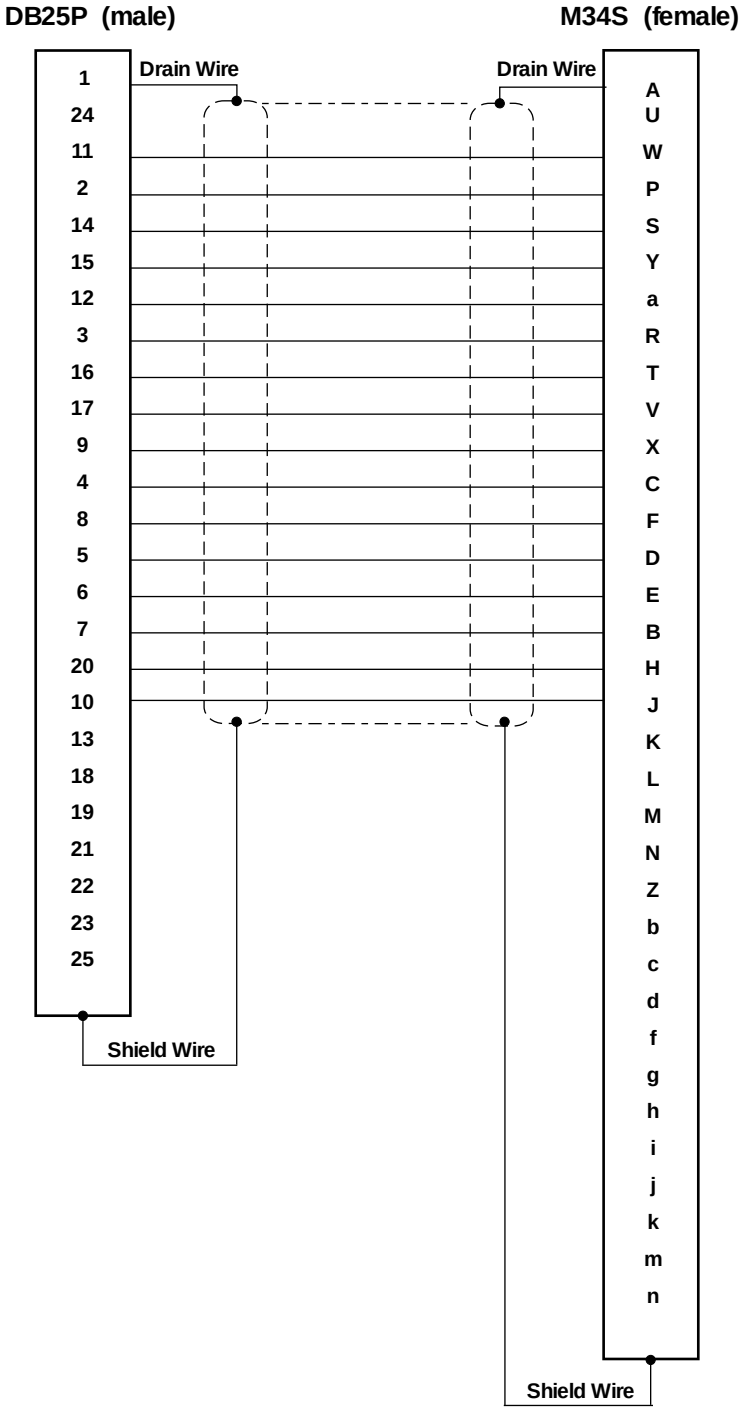


Figure A-8. DTE Cable, #080-2443-0xx

DCE-DTE, Shielded (EIA530 to RS449)

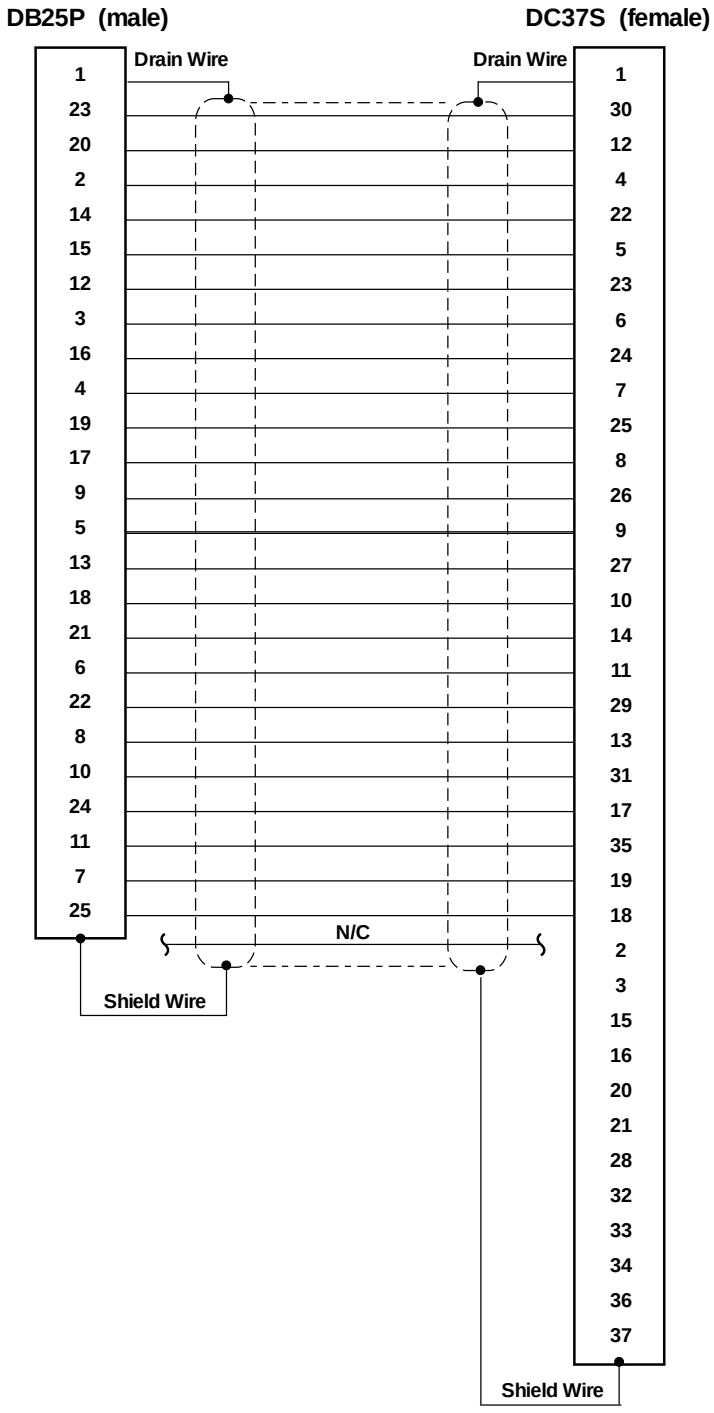


Figure A-9. DTE Cable, #080-2453-0xx

DCE-DCE, Shielded (EIA530 to RS449)

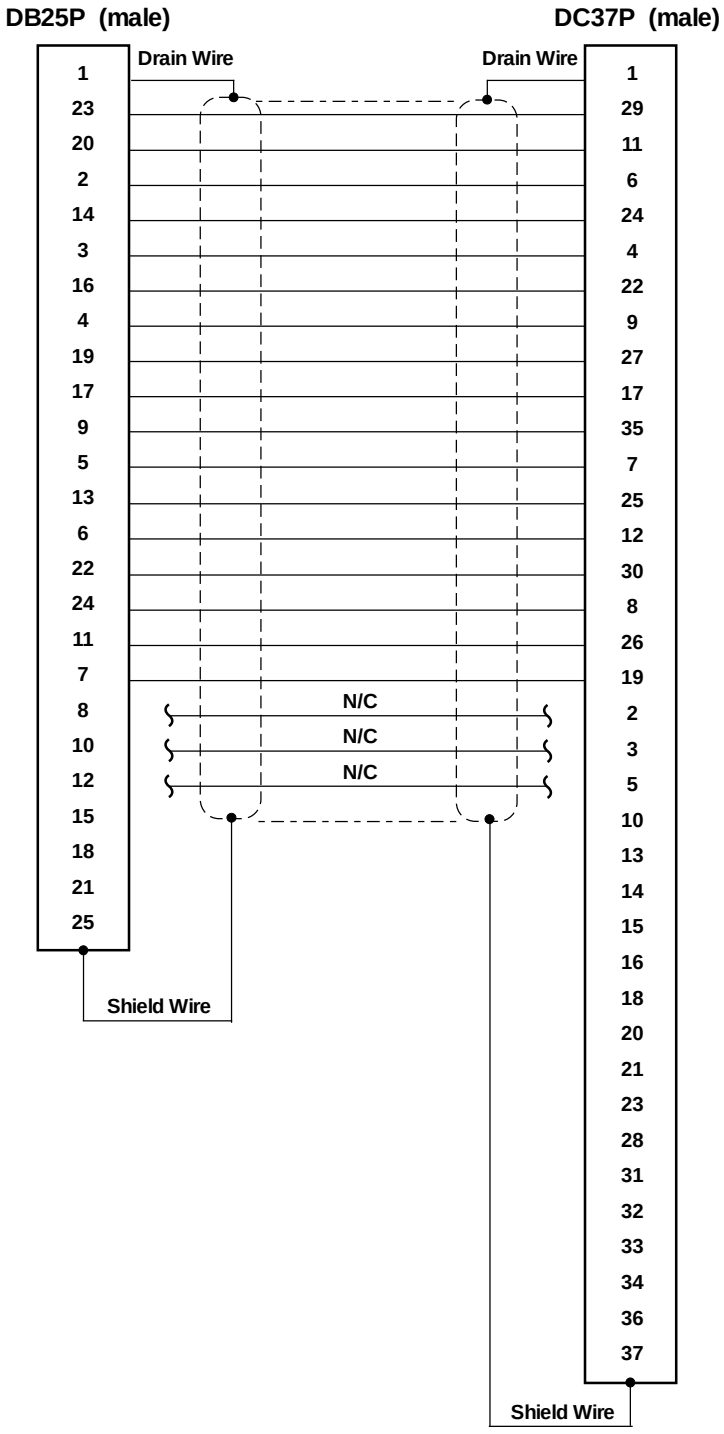


Figure A-10. DTE Cable, #080-2363-0xx

DCE-DCE, Shielded (EIA530 to RS449)

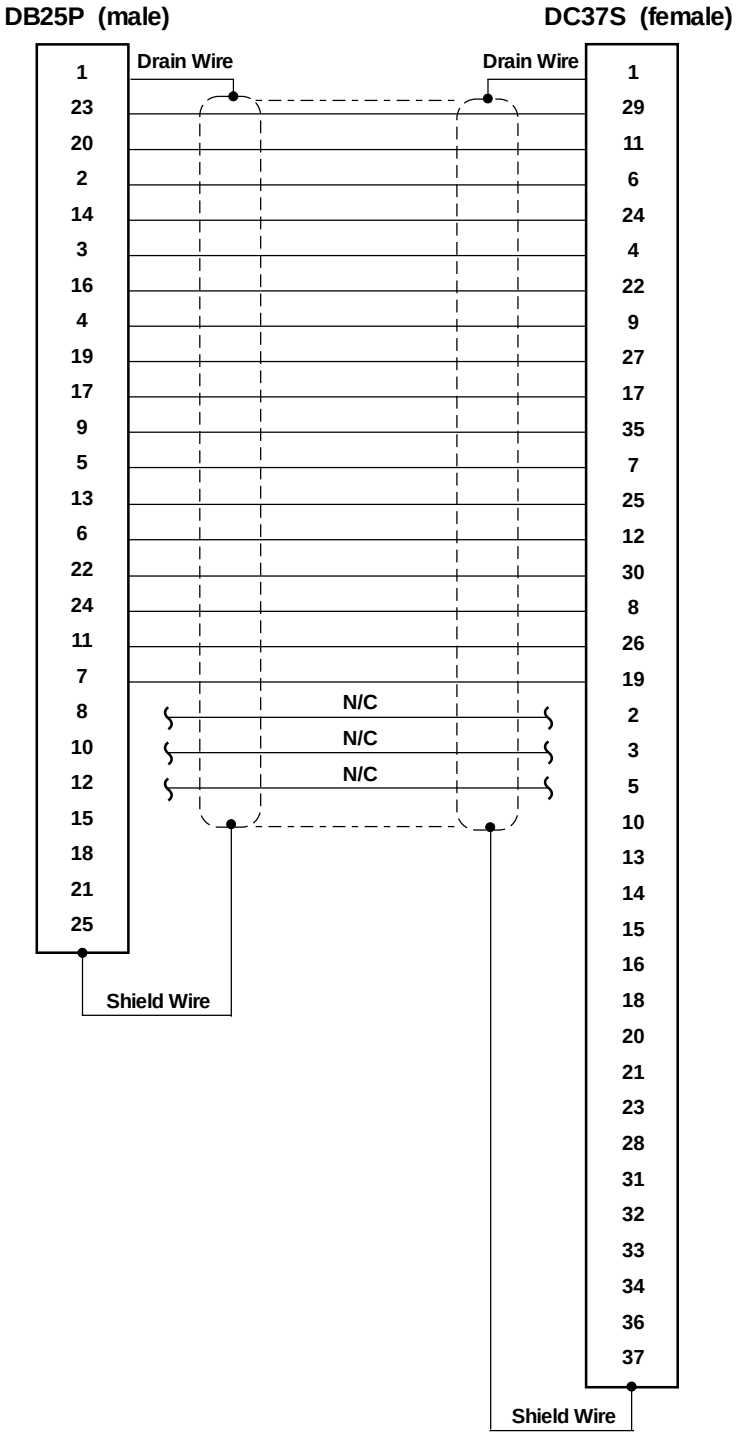


Figure A-11. DTE Cable, #080-2423-0xx

DCE-DTE, Shielded (EIA530 to RS449)

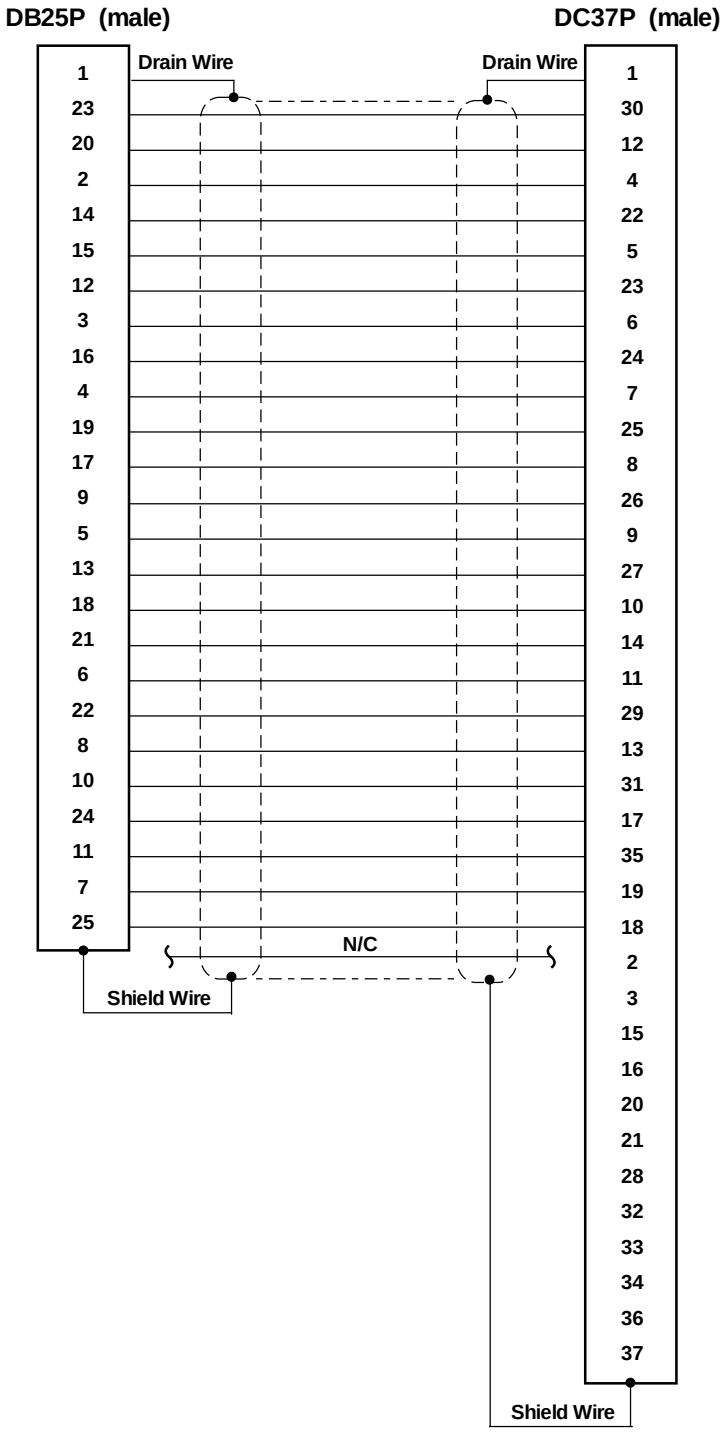


Figure A-12. DTE Cable, #080-2273-0xx

DTE-DTE Shielded Crossover

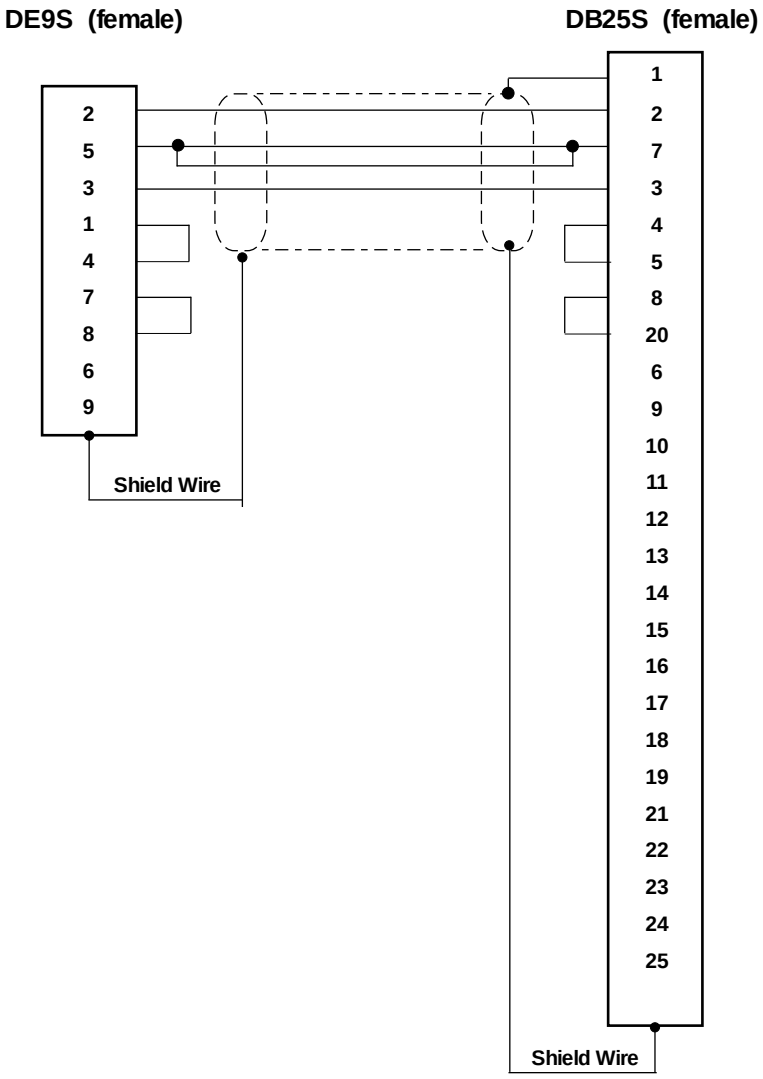


Figure A-13. Supervisory Cable, #080-2463-0xx

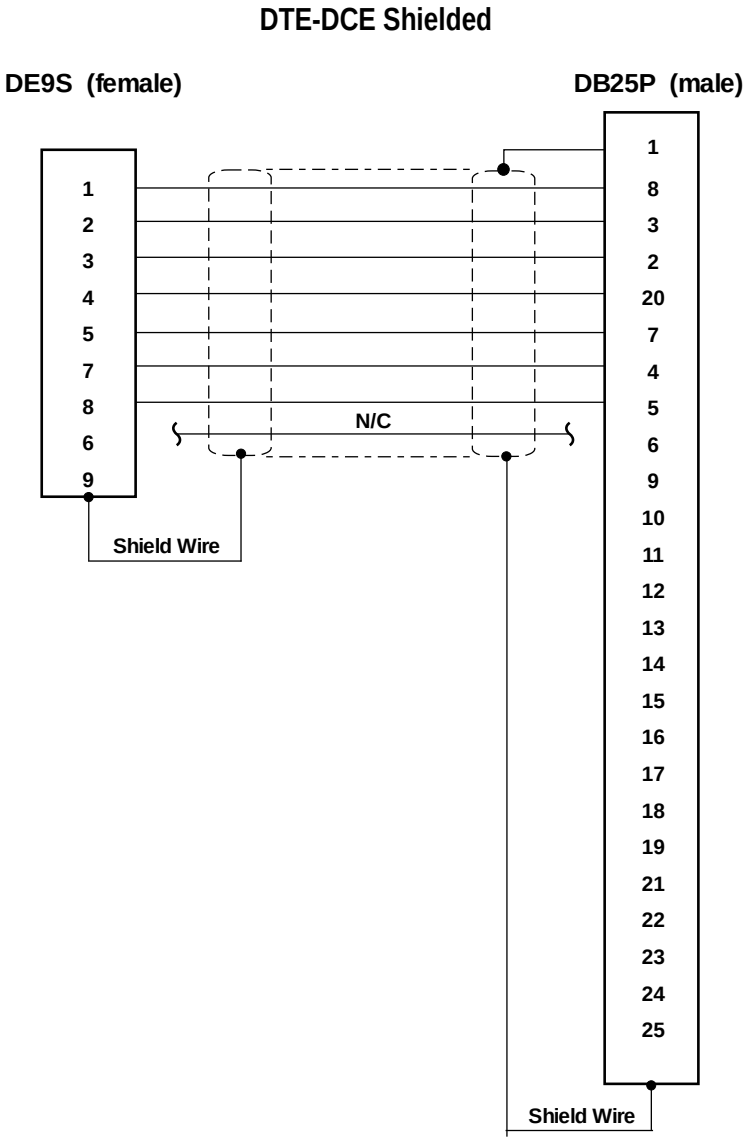


Figure A-14. Supervisory Cable, #080-2313-0xx

DTE-DTE Shielded Crossover

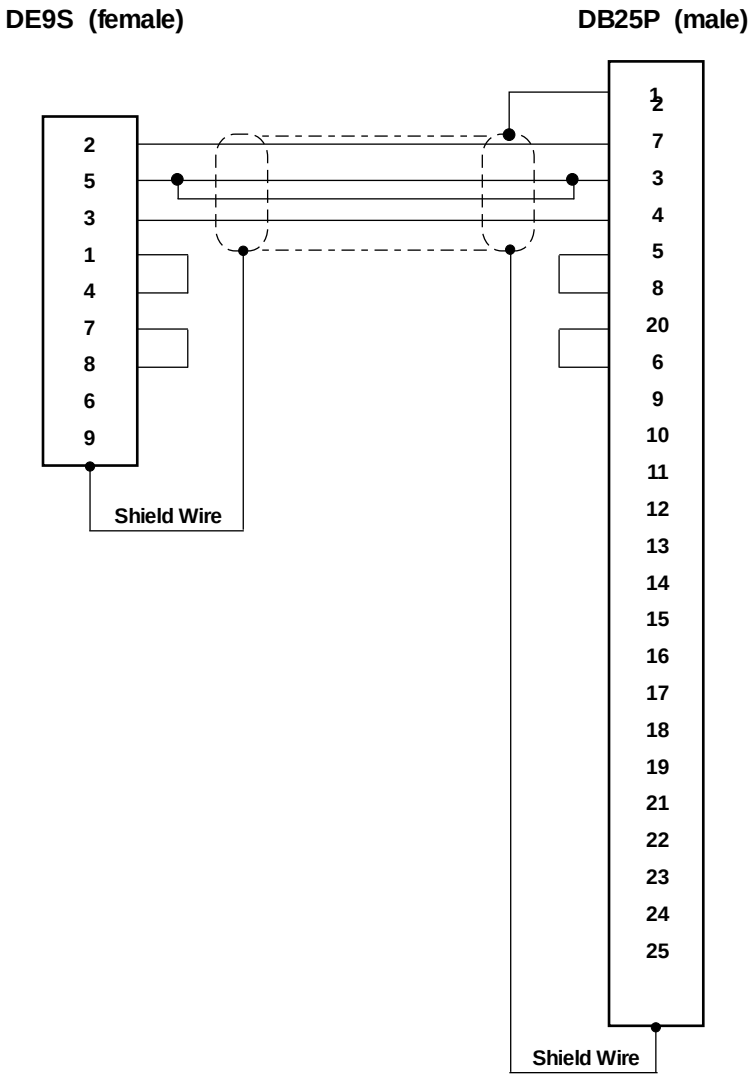


Figure A-15. Supervisory Cable, #080-2383-0xx

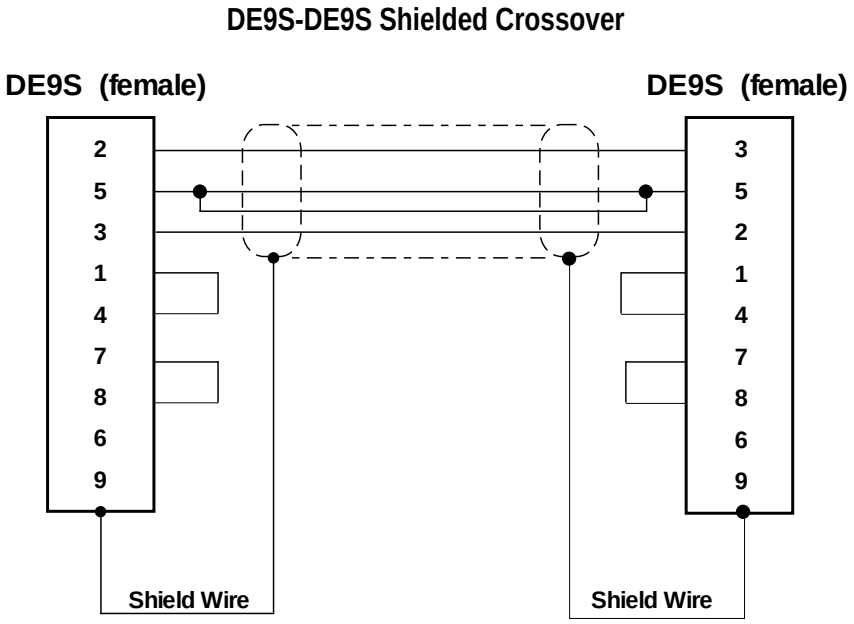


Figure A-16. Supervisory Cable, #080-2393-0xx

DA15S to DA15S, Shielded Crossover

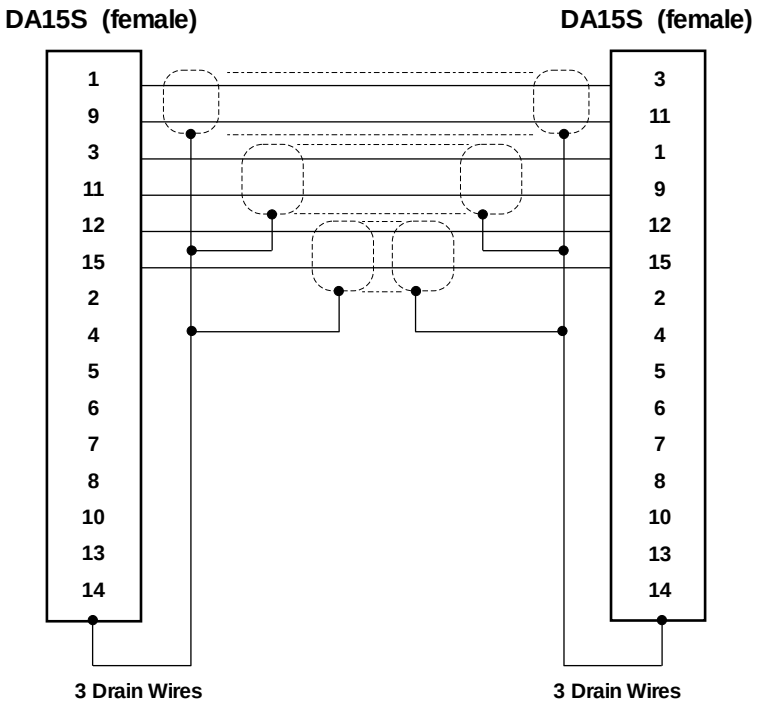


Figure A-17. Line Cable, #080-2293-0xx

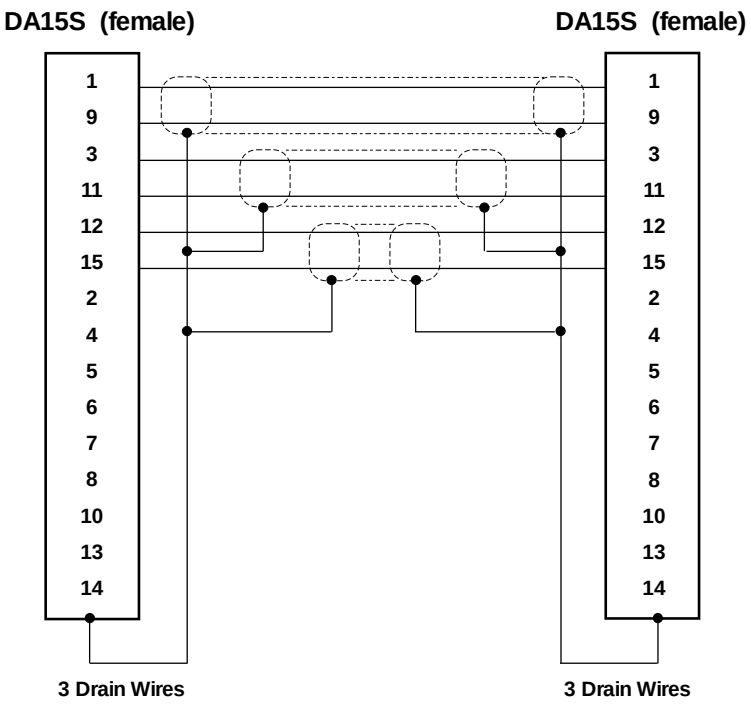


Figure A-18. Line Cable, #080-2283-0xx

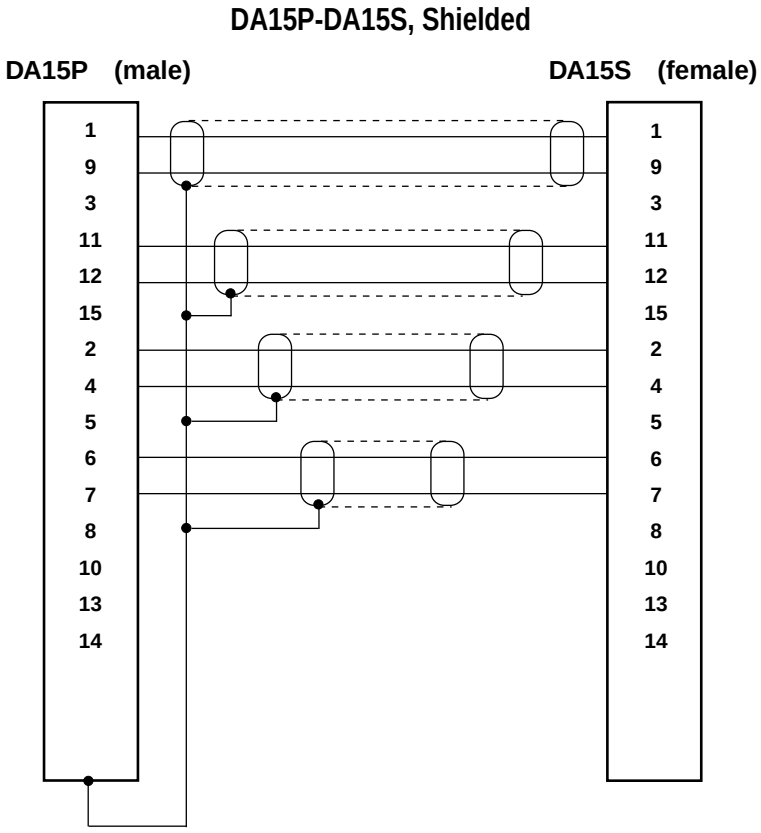


Figure A-19. Line/Aux Cable #080-2503-0xx

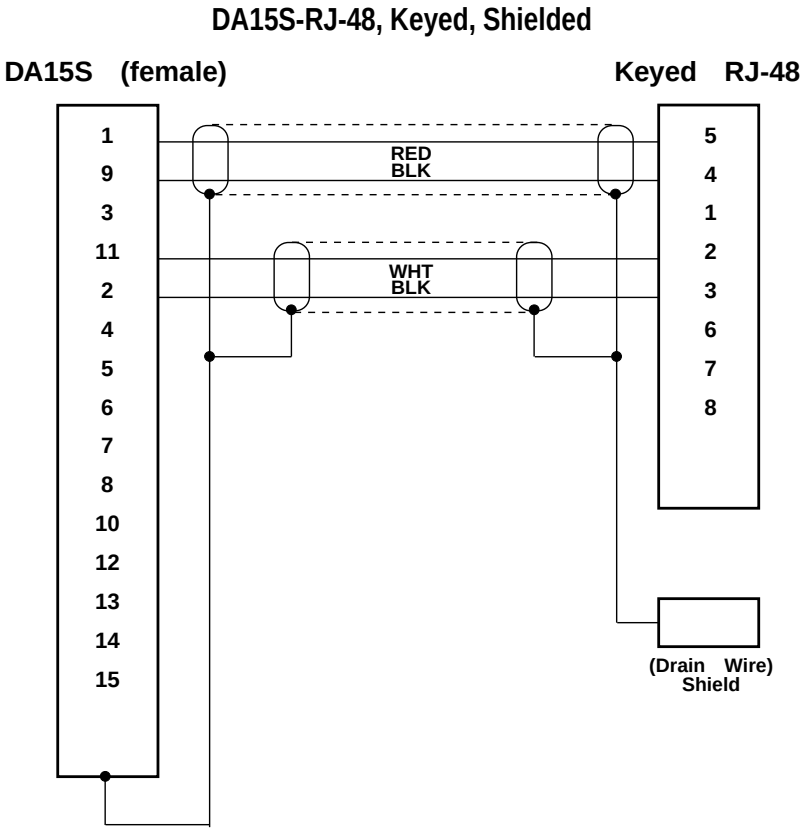


Figure A-20. Line Cable #080-2523-0xx

DA15P-RJ-48, Keyed, Shielded Crossover

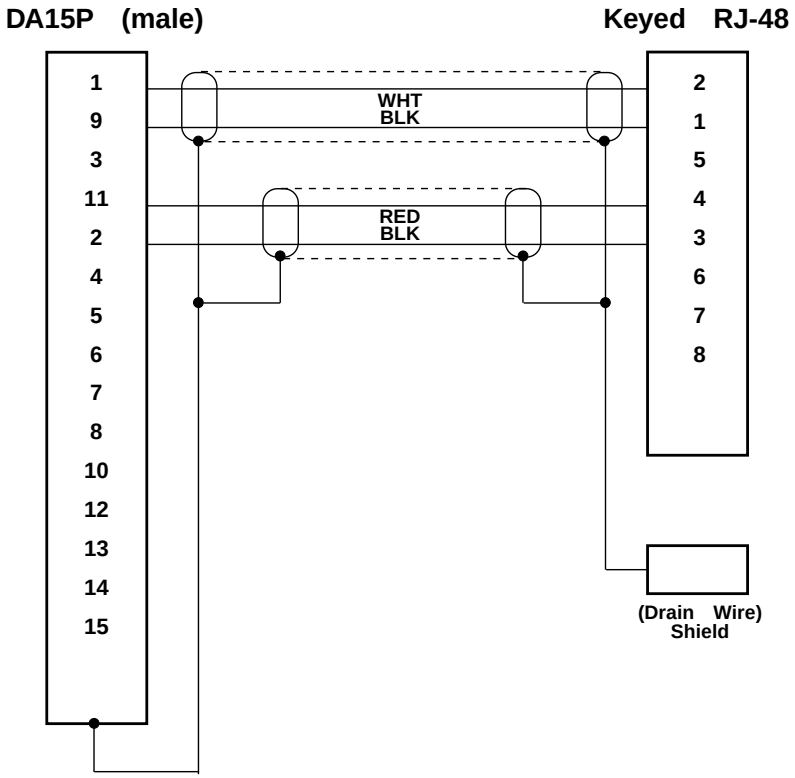


Figure A-21. Line Cable #080-2553-0xx

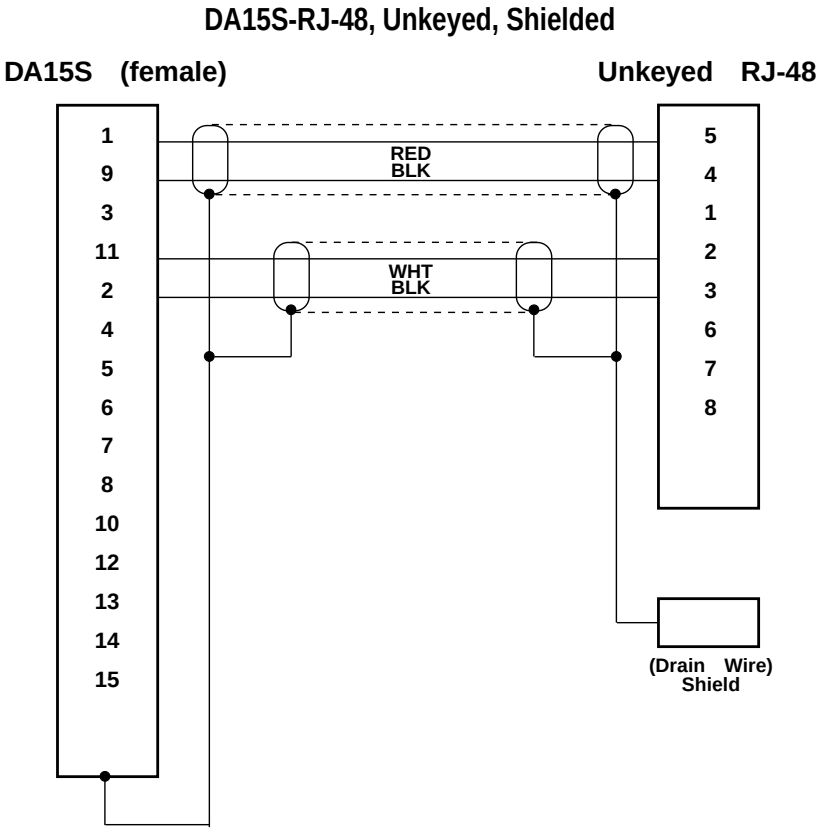


Figure A-22. Line Cable #080-2563-0xx

50-Pin RJ-48H to RJ-48C

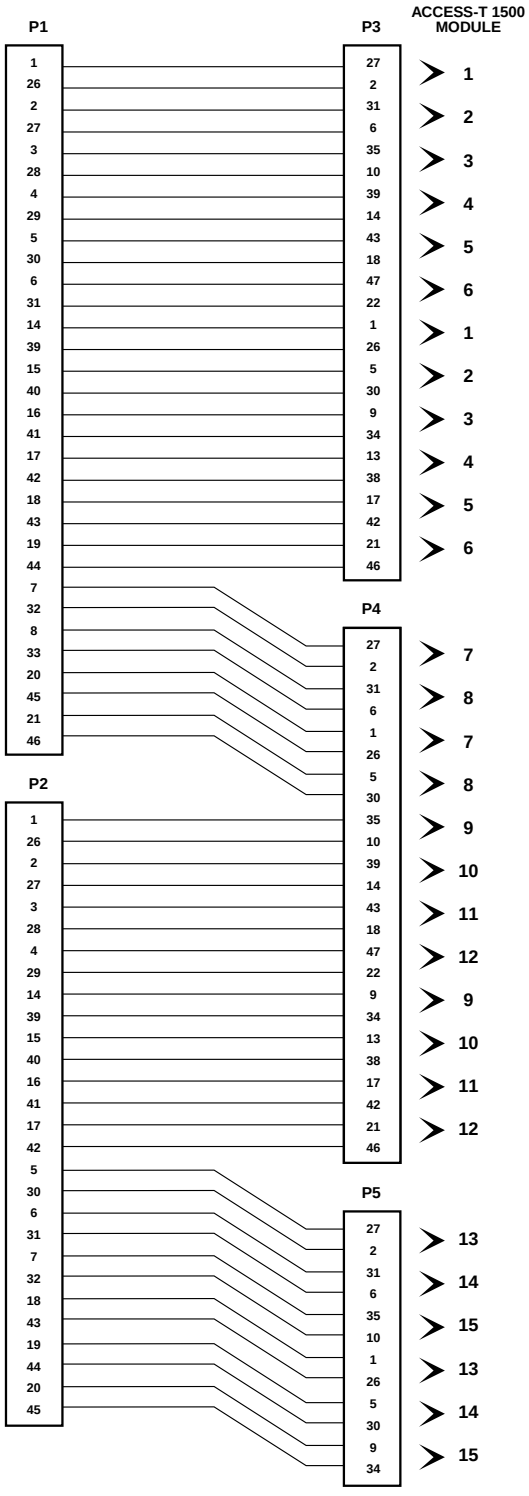


Figure A-23. Line Cable #087-2143-001

50-Pin RJ-48H to RJ-48C

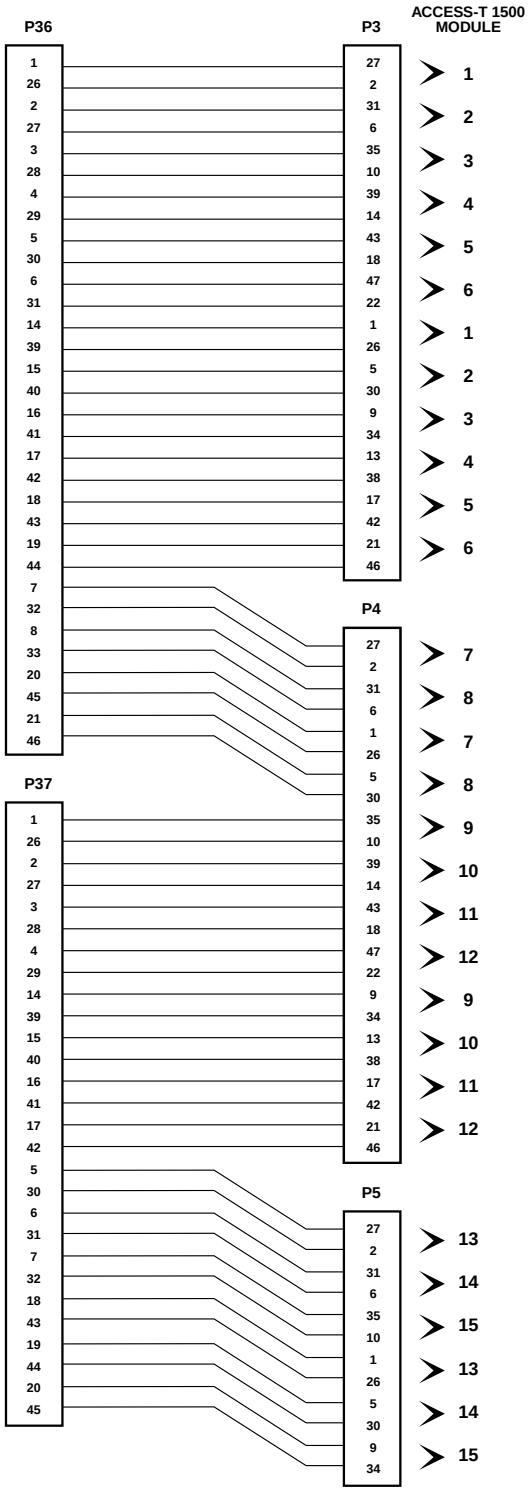


Figure A-24. Aux Cable #087-2143-002

DB25P-DB25P, DTE-DTE, Shielded Crossover

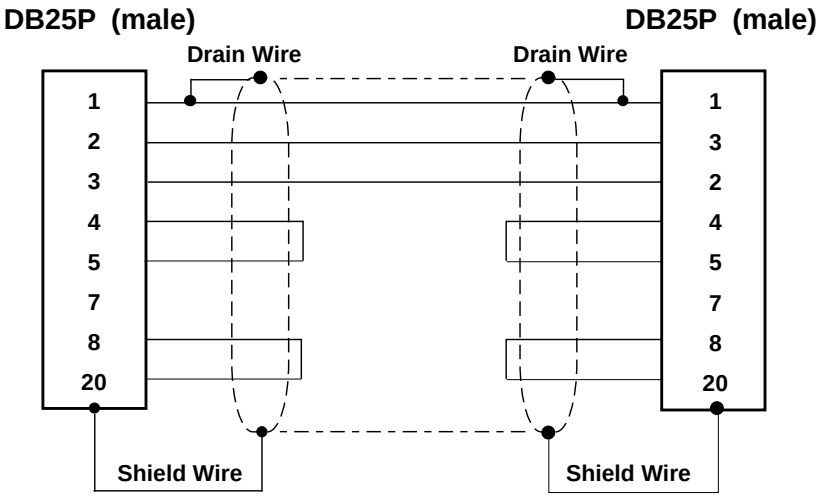


Figure A-25. Supervisory Cable #080-2603-0xx

DB25P-DB25S, DTE-DTE, Shielded Crossover

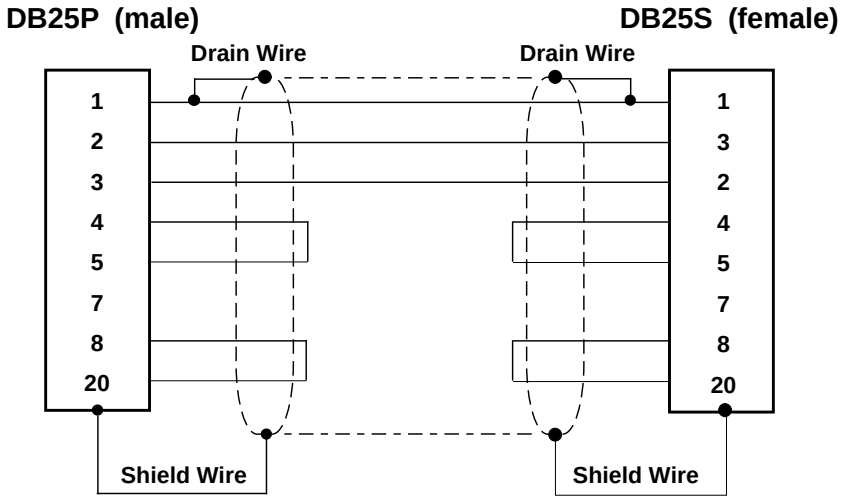


Figure A-26. Supervisory Cable #080-2613-0xx

DB25P-DB25S, DTE-DCE, Shielded

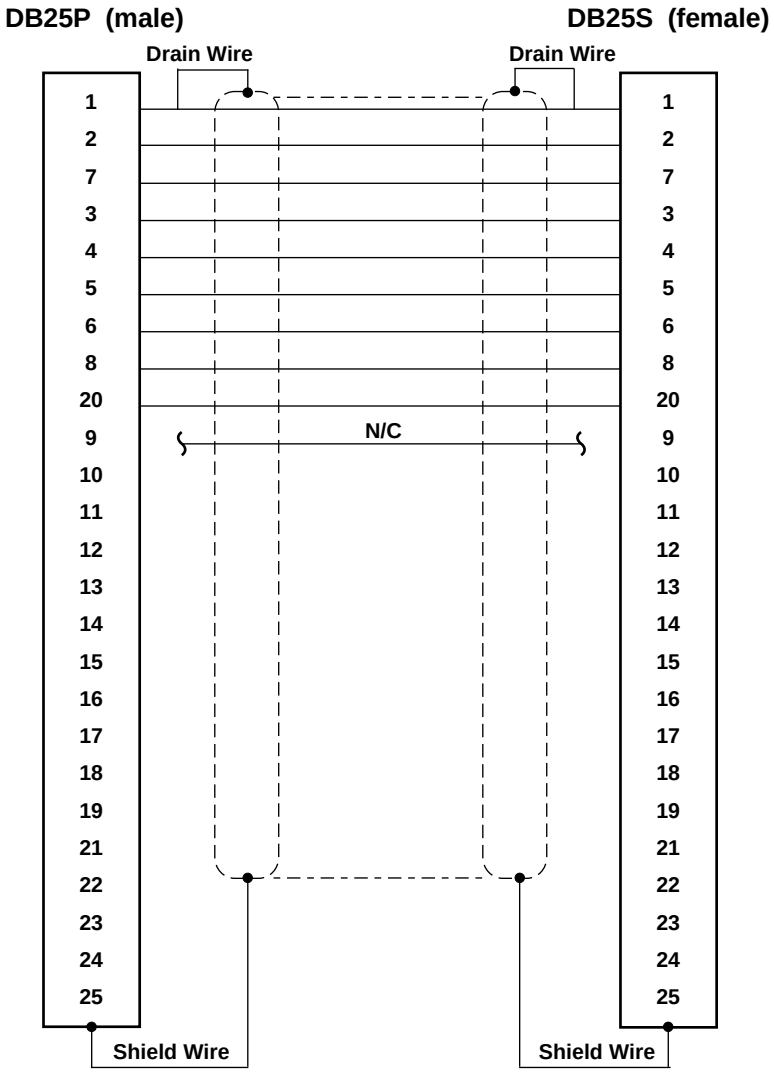


Figure A-27. Supervisory Cable #080-2623-0xx

DB25P-DB25P, DTE-DCE, Shielded

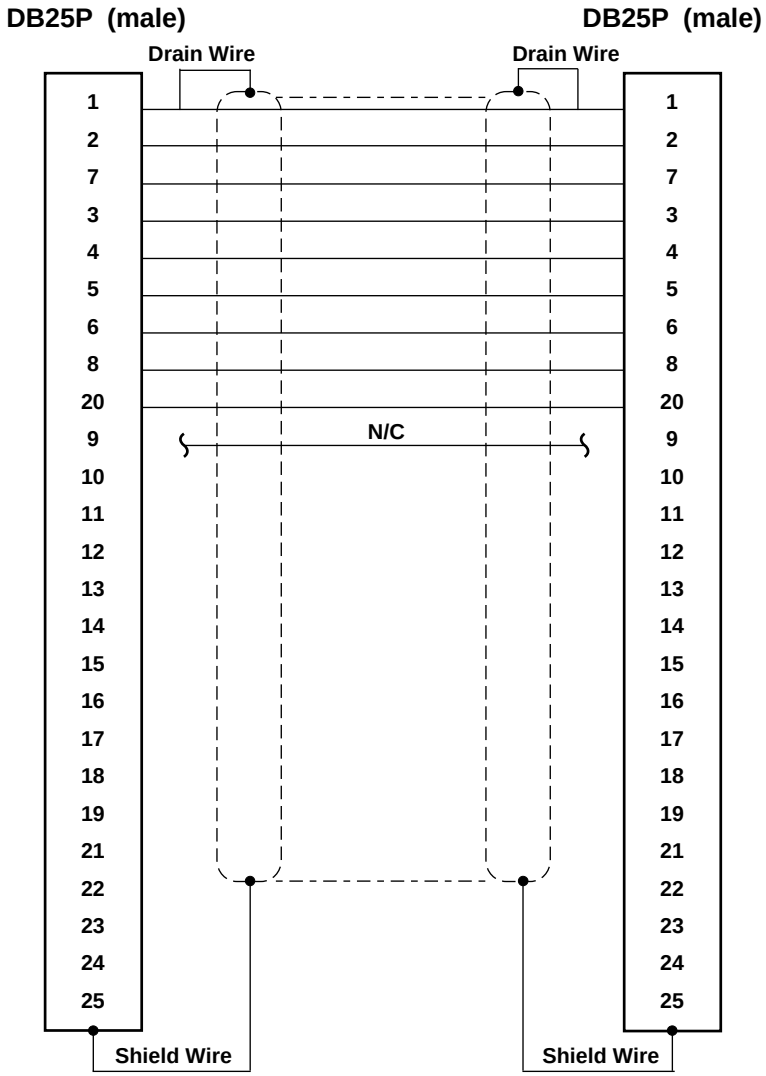


Figure A-28. Supervisory Cable #080-2633-0xx

APPENDIX

B

Glossary

Address

The node number (or TABS address) assigned to a particular Access-T.

Alarm vs. Alert

In the most precise usage, an alarm is an off-normal condition indicating a performance or equipment degradation or failure. An alert is an indication of a change from a normal to an alarm condition or vice versa. However, the term "alarm" is often used where "alert" would be more accurate. For example, "alarm dialout" actually occurs on changes from alarm to normal as well as from normal to alarm.

Alternate Mark Inversion (AMI)

AMI is a form of line coding for T1 spans that requires consecutive pulses (ONES) to alternate between positive and negative.

ANSI T1.403 (T1E1):

The performance-monitoring, data-link, and network-interface requirements for ESF CSUs as defined by the Exchange Carriers Standards Association. T1.403 specifies automatic performance reports transmitted to the network once per second via the data link.

AT&T Publication 54016

The AT&T specification of performance-monitoring, data-link, and network-interface requirements for ESF CSUs. Pub 54016 specifies a request/response method for reporting performance data via the data link.

Baud Rate

The number of possible signal changes per second; sometimes equivalent to the bit-per-second rate, but not always.

Bipolar 8-Zero Substitution (B8ZS)

B8ZS is a data-encoding scheme which replaces any eight consecutive ZEROS with a fixed code containing two bipolar violations. Equipment at each end of the T1 link must perform B8ZS encoding/decoding, and network equipment must not correct BPVs.

Bipolar Violation (BPV)

The presence of two consecutive "one" bits of the same polarity on the T1 line. A BPV indicates a transmission error on the T1 facility.

Bit 7 Stuffing

The forcing of bit 7 (the next-to-least-significant bit) to be a ONE in any DS0 channel which contains eight consecutive ZEROS. Bit 7 stuffing is implemented to guarantee a 1-in-8 pulse density.

Bursty Errored Second (BES)

In ESF mode, a Bursty Errored Second is any second with from 2 to 319 CRC-6 errors and no OOF condition. In D4 mode, Access-T declares a BES if from 2 to 319 BPVs are detected without an OOF condition. Bursty Errored Seconds are not counted when an Unavailable Signal State is in effect. For ESF mode only, BES is defined in AT&T Publication 54016. (See Figure B-1.)

Chain Port

The Chain Port is an RS485 port which enables an operator to chain up to 30 Access-Ts together. Once connected, all the units can be controlled via a single connection to a terminal or Network Management System (NMS). See ***Master and Slave***.

Channel Service Unit (CSU)

A CSU is a device that interfaces customer T1 equipment to a carrier's T1 service. At its most basic level, a CSU performs certain line-conditioning and equalization functions, and responds to loopback commands sent from the central office.

Channelization:

Division of a T1 signal into multiple data channels, which may or may not follow DS0 boundaries depending on the application.

Clear Channel Capability

Clear channel capacity means that the 192 "information" bits in a frame are all used for data; no bits are dedicated to pulse density assurance or signaling. Clear channel capability for T1 makes 1.536 Mbps available for user data.

Command Interfaces

A command interface (TABS or terminal) allows operators and installers to configure Access-T, obtain status and performance information, receive alarm information, and execute diagnostics.

Command List

A "help" list of commands available via the Terminal Interface.

Controlled Slips

A controlled slip (CS) is the addition or deletion of a frame to adjust for timing inconsistencies in a T1 link.

Craft Port

An RS232 communications port located on the front-panel of the Access-T. Designed for field personnel, it allows easy terminal configuration, including an automated baud dectection feature. It also provides access to the unit if passwords are forgotten.

Cylic Redundancy Check (CRC)

A logical check performed on data to see if an error has occurred in the transmitted data. The receiving device calculates the CRC and compares its value to the CRC already calculated by the transmitting device (and transmitted in the data link). If the two CRC values do not match, at least one transmission error has occurred.

Data Service Unit or Digital Service Unit (DSU)

A device that interfaces RS232 or other terminal interface protocols to DS1 (i.e., converts subrate signals to the T1 transmission rate of 1.544 Mbps).

Data Communicating Equipment (DCE)

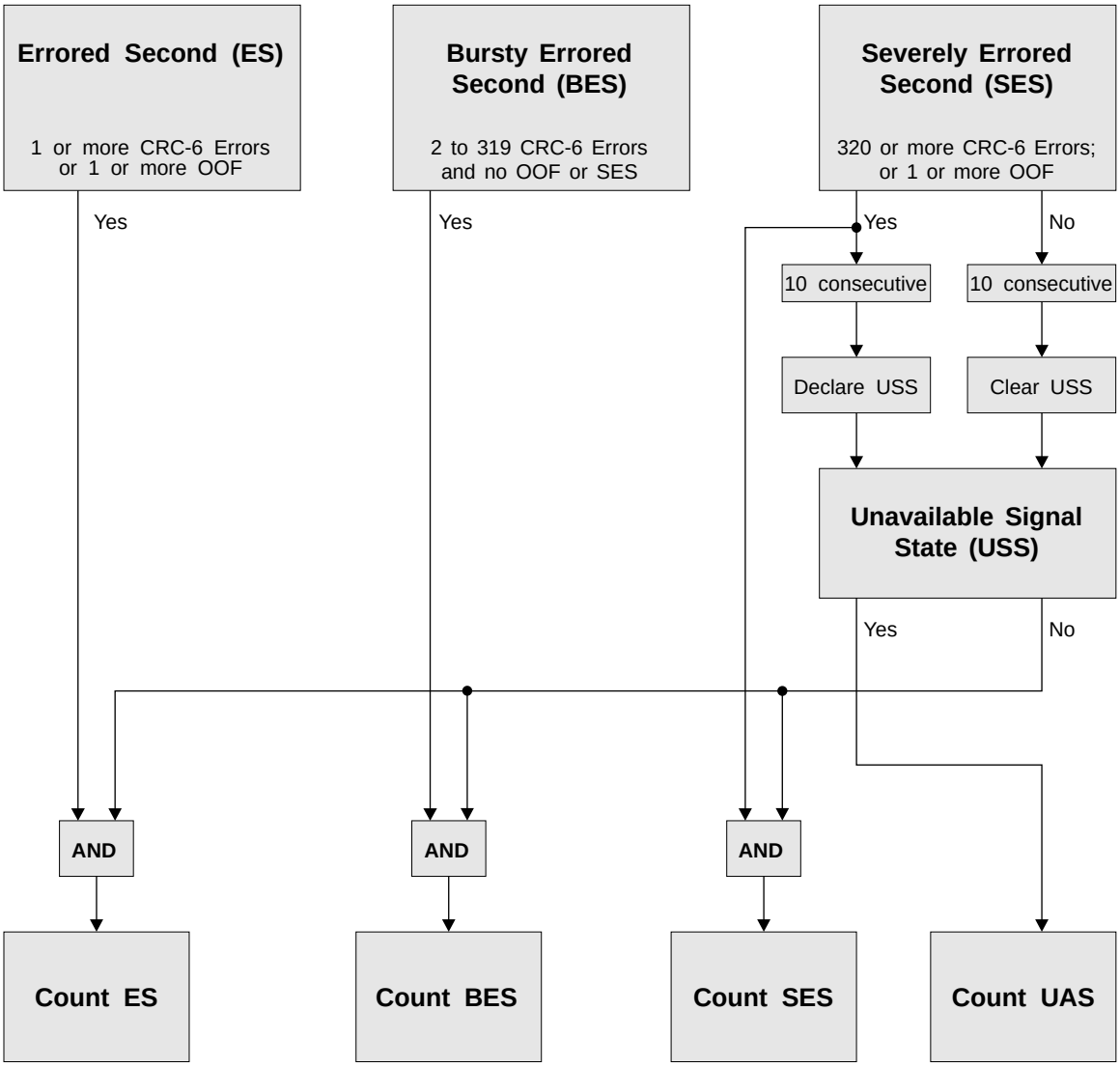
In RS232 communications, a device implementing the interface and handshaking of a data communications device (such as a modem).

Data Link ID

An "address" which directs data-link messages to DTEs or CSUs. Access-T can be configured to respond as a DTE or CSU, as appropriate.

Data Rate

Data rate is the speed at which data is transmitted.



NOTES

USS begins with the first of 10 consecutive SES and ends with the first of 10 consecutive non-SES. Thus, counts must be adjusted accordingly when USS is declared or cleared.

In D4 mode, BPVs are used instead of CRC-6 Errors to derive BES and SES.

Figure B-1. Derivation of ES, BES, SES, and UAS Parameters

Digital Access Cross-Connect Switch (DACS)

A digital switching device for routing DS0s among multiple T1 ports.

Digital Terminating (or Terminal) Equipment (DTE)

DTEs provide the source of the transmitted digital signal and the destination for the received digital signal. DTEs includes multiplexers, PBXs, T1 channel banks, front-end processors, computers, terminals, and LAN routers.

DS0

Digital signal level 0 is the worldwide standard transmission rate (64 kbps) for PCM digitized voice channels. 24 DS0s exist in each DS1 (T1) signal.

DS0 Bundling

The process of assigning data to specific DS0s for transmission through a T1 network.

DS0 Map

A DS0 map is a representation of a bundling configuration.

DS1

See ***T1***

DTE Port

A subrate interface between a DTE and an Access-T.

Errored Second (ES)

In ESF mode, a second containing one or more CRC-6 errors or an Out-of-Frame (OOF) condition. This parameter is defined for the ESF mode in AT&T Publication 54016. In D4 mode, Access-T registers an ES as a second containing one or more BPVs or an Out-of-Frame (OOF) condition. In either framing mode, ES are not counted while Unavailable Signal State is in effect. (See Figure B-1.)

ESF Error

An ESF Error is registered when an Extended Superframe contains an OOF event or CRC-6 error.

Extended Superframe (ESF)

An Extended Superframe consists of 24 frames of 193 bits each (4632 bits total). In each frame, one "F bit" is followed by 24 8-bit bytes. The 8 kbps of F-bit overhead is divided into 2 kbps for framing, 2 kbps of CRC-6 code for logic error checking, and a 4 kbps Data Link for maintenance communications. As in the Superframe (D4) format, 1.536 Mbps is the available bandwidth for user information.

Facility Data Link (FDL)

The ESF Facility Data Link is a 4 kbps channel carrying maintenance requests and responses, plus other maintenance messages.

FDL Register

The term FDL register refers to telco register contents obtained from a far-end Access-T (or other interface device) via the FDL.

Fractional T1

Fractional T1 refers to the leasing of portions of T1 bandwidth (a specific number of DS0s) by carriers. FT1 allows for more economical networking in some applications.

In-Band Codes

Specific bit patterns which are transmitted in the information bandwidth to control loopbacks or other functions.

Line Availability

The percentage of monitored seconds which are not Unavailable Seconds (UAS).

Line Build-Out

Line build-out is an impedance compensator used to compensate for various cable lengths and conditions between CSUs and the first telco line repeater.

Line Coding

The method of encoding data for transmission over a particular facility. Line coding schemes for T1 include AMI and B8ZS. It is critical that all equipment on the line be configured for the same line coding, or transmission will not be reliable.

Loopback

Loopback is the returning of received data toward the sender.

Loss of Frame

Access-T declares Loss of Frame (also called Loss of Sync) from the line when an Out of Frame condition continues for 2.5 seconds. Access-T responds to Loss of Frame by declaring Red Alarm. While Access-T is in Red Alarm, it transmits Yellow Signal (if enabled) to the line as an indication of the alarm condition. Loss of Frame is cleared within one second after the receipt of a correctly-framed signal.

Loss of Frame Count (LOFC)

A tally of the number of times Loss of Frame has been declared.

Loss of Signal (LOS)

An error that occurs when a device is not receiving a T1 signal. Specifically, Access-T declares Loss of Signal when it receives 175 ± 75 consecutive ZEROS. LOS ends when Access-T receives at least one ONE.

Loss of Sync

See ***Loss of Frame***.

Master

The operation mode for an Access-T which is to act as a poller and manager for a chain of up to 29 slave Access-Ts.

Master Clock

The clock providing the timing reference for the Access-T, including all DTE and T1 interfaces.

Minimum Pulse Density

The minimum frequency of ONES pulses that is necessary to ensure reliable timing in a T1 signal. The minimum pulse density, as defined by AT&T, equals N pulses in every 8(N+1) bits, where N ranges from 1 to 23. This formula allows the maximum number of ZEROS to be 15 and a minimum pulse density of about 12.5% (1 in 8).

Multiplexer

A device that combines two or more signals for transmission over a single facility.

Multipoint Connections

In a multipoint connection, an FT1 network routes communication channels to three or more locations through DACS nodes. Framing, CRC, and data link channels are not propagated through the DACS nodes.

Network Interface Module (NIM)

The portion of the Access-T that provides the interface to the T1 line.

Network Management System (NMS)

A centralized computer-based system from which network equipment such as Access-T can be configured, monitored, and controlled.

Node

A particular Access-T in a chain of up to 30 units. See ***Chain Port***.

Out-of-Frame (OOF)

An Out of Frame condition occurs when Access-T detects 2 out of 5 consecutive framing bits in error.

Point-to-Point Connections

In a point-to-point connection, a single T1 or FT1 link connects equipment at two locations. In such a connection, the signal is not reframed and the data link is not lost.

Polling

The task performed by a master Access-T when it requests data from each of its enabled slave nodes.

Pulse stuffing

Pulse stuffing is the process of inserting pulses into the data stream so that pulse density violations do not occur.

Quasi-Random Signal Source (QRSS)

A pseudo-random test pattern used to test looped or end-to-end T1 circuits. QRSS is a repeating pattern of 2^{20}-1 bits which simulates random "live" data and does not contain excessive zeros.

Robbed Bit Signaling

In voice applications, the use of the least significant bit in each DS0 in every 6th frame for signalling purposes. "Robbing" of these bits has no significant affect on the quality of voice transmission.

Severely Errored Second (SES):

A second with 320 or more CRC errors or one or more Out-of-Frame (OOF) conditions determines a Severely Errored Second. SES are not counted while Unavailable Signal State is in effect. (See Figure B-1.)

Slave

The operation mode for an Access-T which is to be polled by a master Access-T.

Station Clock

A centralized clock source available at the central office or other location that provides a common clock source for equipment at that office.

Superframe (D4)

D4 format employs a "Superframe" consisting of 12 frames of 193 bits each (2316 bits total). In each frame, one framing bit is followed by 24 8-bit bytes. The pattern of framing bits is repeated every Superframe. Framing requires 8 kbps, leaving 1.536 Mbps for user information.

Supervisory Port

An RS232 communications port located on the Access-T rear panel. The Supervisory Port is intended for use with a far-end device and is the only Access-T port equipped for modem connection.

T1

T1 refers to a digital bipolar link with a data capacity of 1.544 Mbps, also known as Digital Signal Level 1 (DS1). The T1 digital transmission system is the primary digital communication system in North America.

TABS (Telemetry Asynchronous Block Serial)

An AT&T-defined request-and-response protocol used for communication between monitoring/terminating equipment and a computer-based Network Management System (NMS).

Telco Register

The telco registers record performance of the input from the T1 line. Telco registers can be accessed from the network as well as from the supervisory interfaces, but can be cleared only from the network or by restarting the NIM.

Terminal Interface

The Terminal Interface provides drop-down menus, plus commands to display performance reports and perform other functions, using a standard ASCII terminal.

Unavailable Second (UAS)

A second during which Unavailable Signal State is in effect. The initial ten SES are counted as UAS, requiring an adjustment of the SES count. The ten non-SES resulting in the clearing of Unavailable Signal State are not counted as UAS. (See Figure B-1.)

Unavailable Signal State

USS is declared at the first of 10 consecutive seconds of SES; it is cleared at the first of 10 consecutive seconds which are not SES.

Unsolicited Alarm Reports

Alarm information sent automatically to an NMS (in modified TABS format) when user-selected alarm conditions occur.

User Register

The user registers record performance of the input from the T1 line. User registers are analogous to telco registers, but cannot be accessed or cleared from the network. Thus, user registers allow the user to monitor and document network performance independent of the telco.

Yellow Signal

A Yellow Signal is transmitted to the T1 line by equipment which has declared a Red Alarm (i.e., Loss of Frame from the T1 line).

APPENDIX

C

CP01 Chain Port Expander

Access-T allows supervisory control of "daisy-chained" units via RS485 ports. With the Larscom CP01 Chain Port Expander, RS485 facilities connecting multiple Access-Ts can be linked to the supervisory master via RS232 ports.

This appendix includes the following sections:

- Indicators and Switches.
- Mounting.
- Wiring Connections.
- Specifications.

The CP01 includes two RS232 ports and one RS485 port. All ports operate in half-duplex mode—i.e., data may be transmitted in only one direction at a time. Data received by any port is transmitted by the other two ports.

Figure C-1 shows a basic application in which one or more Access-Ts are linked to a Network Management System (NMS). The CP01 converts signals between an RS232 port on the NMS and the Access-T Chain Port(s).

Figure C-2 shows how the CP01 can be employed to link multiple RS485 facilities in an extended chain.

> **Note:** In these applications, the NMS communicates with one master Access-T, which in turn, communicates with all its slave nodes.

Indicators and Switches

Figure C-3 shows the front panel of the CP01, which includes five indicators and two switches. The switches allow each of the RS232-C ports (PRIMARY and SECONDARY) to be separately selected for DCE or DTE configuration.

The front-panel indicators function as follows:

- **POWER ON:** Glows red when the CP01 is receiving power.
- **PRI:** Glows red when the primary RS232-C port is receiving data.
- **SEC:** Glows red when the secondary RS232-C port is receiving data.
- **RS485:** Glows red when the RS485 port is receiving data.
- **COLL:** Glows red when a transmission collision occurs—i.e., when two ports are receiving data at the same time. Data usually will be corrupted when COLL glows red.

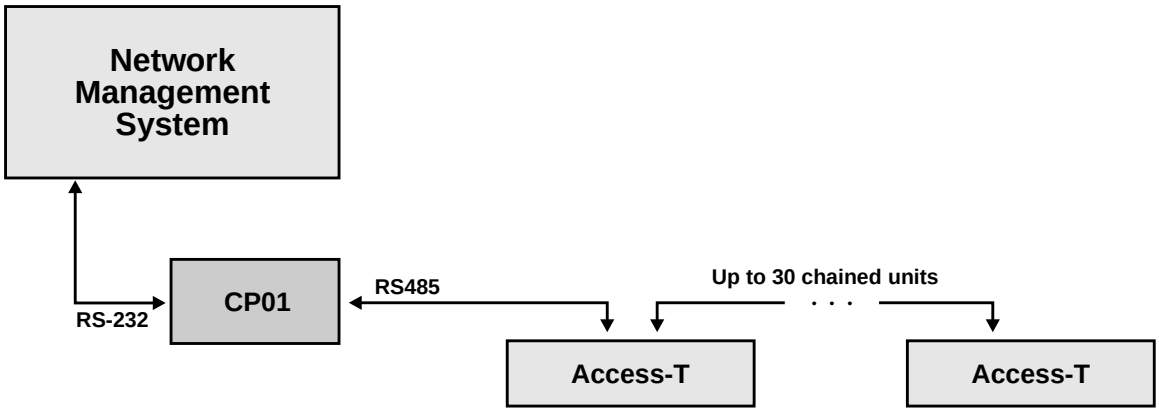


Figure C-1. CP01 Application with Single RS485 Chain

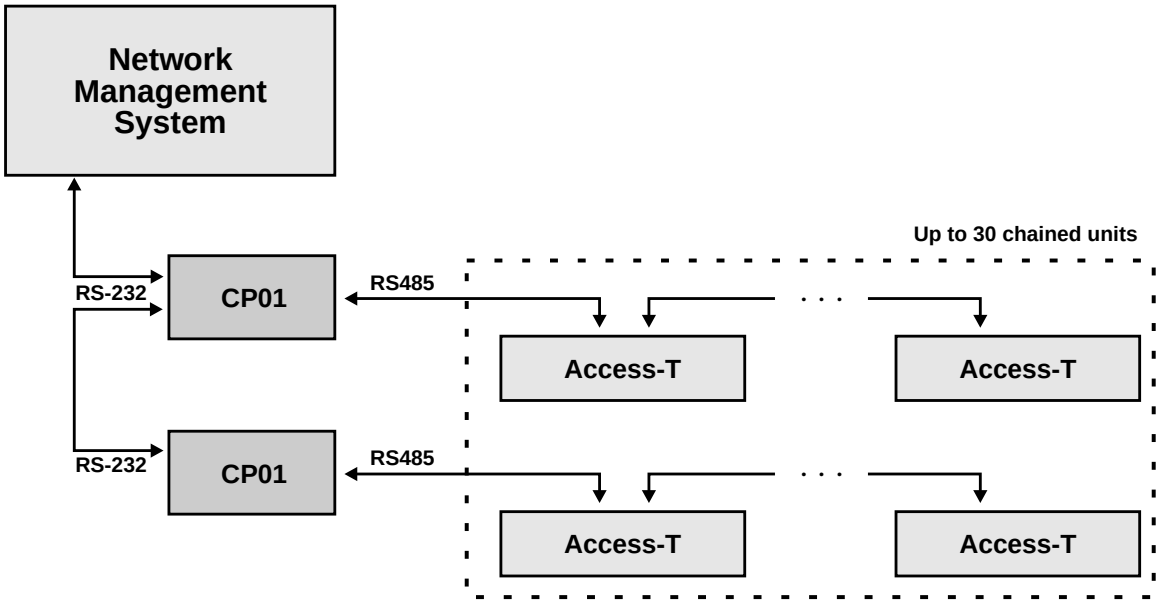


Figure C-2. CP01 Application with Multiple RS485 Chains

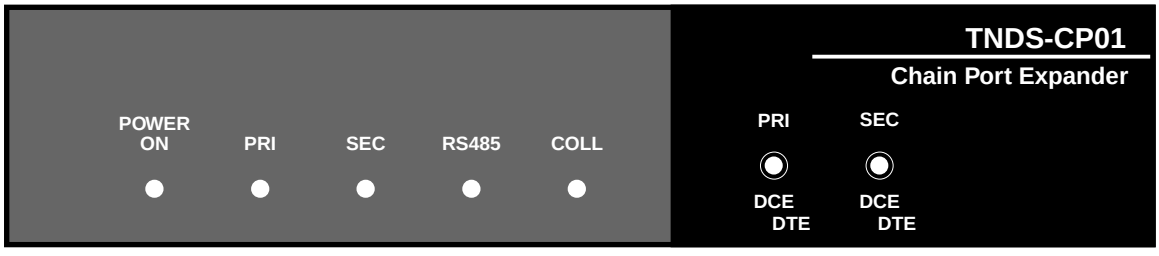


Figure C-3. CP01 Front Panel

Mounting

The CP01 is equipped with adhesive-backed hook-and-loop fastener strips for mounting to any smooth, flat surface. To mount the CP01:

1. Determine the desired location for the hook-and-loop fastener strips before peeling off the protective backing.
2. Surfaces should be clean and dry, with no oil or wax residue. If surfaces need cleaning, use isopropanol (rubbing alcohol) .
3. Remove the protective backing from the hook-and-loop fastener strips. Carefully press the strips into place as desired.
4. Mount the CP01 by placing it so the hook-and-loop fastener strips make contact, then pressing gently.

Wiring Connections

Make RS232-C, RS485, and power connections to the CP01 Chain Port Expander as follows:

1. Connect the RS485 cable to the PDATA and NDATA molex pins. Make sure that the #2 data wire from the Access-T Chain Port is connected to PDATA, and that the negative data wire from the Access-T Chain Port is connected to NDATA.
2. Make the first RS232-C connection to the female DB-25 PRIMARY connector. Only pins 2 and 3 of the connector are used for signal tranmission. Set the PRI switch on the front panel for DCE configuration or DTE configuration as required.

If a second RS232-C connection is required, make the connection to the female DB25 SECONDARY connector. Only pins 2 and 3 of the connector are used for signal tranmission. Set the SEC switch on the front panel for DCE configuration or DTE configuration as required.

Note: In addition to the signal pins 2 and 3, three other pins of each RS232-C connector are wired as follows:

Pin 1: Chassis ground
Pin 7: Signal ground
Pin 9: RS232-C output, positive voltage

The voltage on pin 9 can be employed with a null modem cable to assert control signals.

3. Connect 9 Volts dc power to the POWER INPUT mini phone jack.

Specifications

Specifications for the CP01 Chain Port Expander are given in Table C-1.

Table C-1. CP01 Specifications

Ports	
RS232-C	Two female DB-25 connectors, individually selected DCE or DTE
RS485	2-pin Molex connector
Power	
Input	9 Vdc 10%; 150 mA maximum
Connector	Subminiature phone plug (3/32 inch)
Mechanical	
Dimensions (H x W x D)	1.5 x 6.4 x 9.8 inches (3.8 x 16.2 x 24.9 cm)
Mounting	Hook-and-loop fastener strips; mountable on any smooth flat surface
Environment	
Ambient Temperature	0 to 50 °C
Relative Humidity	Up to 95%, noncondensing

APPENDIX

D

Access-T Operator Messages

This chapter provides a detailed listing and explanation of all the operator messages that can be genereated by Access-T.

AVAILABILITY NOT CALCULABLE — EXCESSIVE ERRORS. Notification that the number of UAS errors has exceeded 65,535.

CANNOT START TEST. The requested loopback could not be established because a test is already in progress or the test was requested for a non-existing port.

COMMAND NOT VALID WHILE TEST IN PROGRESS. A QRSS test is currently running. An attempt was made to restart the mux, change the map, or change the system defaults. Stop the QRSS test before using such a command.

FAILED FDL COMMAND. Communication cannot be established across data link.

FAR LOOP SENT WAITING FOR VERIFICATION. A command to engage a loopback has been attempted.

FAR UNLOOP SENT WAITING FOR VERIFICATION. A command to disengage a loopback has been attempted.

INVALID ADDRESS ENTERED. An invald address value was entered while defining the Access-T node address or selecting a slave node with which to communicate.

INVALID COUNT ENTERED. An invalid value was entered while defining one of the following parameters: wait-for-connect, inactivity timeout, dialport backoff, PPP restart timer, PPP max terminate, PPP max configure, PPP max failure, interbyte timeout, or time-to-live.

INVALID DAY ENTERED. An invalid entry was made while setting the system date.

INVALID FREQUENCY ENTERED. An invalid entry was made while defining the system frequency value.

INVALID HOUR ENTERED. An invalid entry was made while setting the system time.

INVALID INTERVAL ENTERED. An invalid entry was made while defining the system line threshold ES Interval value.

INVALID MONTH ENTERED. An invalid entry was made while setting the system date.

INVALID MINUTE ENTERED. An invalid entry was made while setting the system time.

INVALID NUMBER OF CHARACTERS FOR THE PASSWORD ENTERED: Too many characters were entered when attempting to define the system password.

INVALID OPERATION FOR HARDWARE OPTIONS REQUESTED OPERATION IGNORED. This message is displayed when the user requests an operation or attempts to set options that cannot be completed due to hardware limitations (i.e., missing drop and insert port, or missing DTE ports 3 and 4 which are only available on the 4-port unit).

INVALID PARAMETER ENTERED. The software parameters have been configured in such a way that the current settings conflict each other.

INVALID PARAMETER PASSED. REQUESTED OPERATION IGNORED. The software parameters have been configured in such a way that the current settings conflict each other—usually with regard to loopback status.

INVALID PASSWORD ENTERED. An invalid confirmation entry was made when setting the system password.

INVALID REQUEST OPERATION IGNORED. The operation attempted could not be performed due to software or hardware limitations or some external factor.

INVALID SECOND ENTERED. An invalid entry was made while setting the system time.

INVALID TABS COMMAND SENT. REQUESTED OPERATION IGNORED. A generic message displayed when the last operation could not be executed.

LOOP VERIFIED. The return message displayed when a loopback is established.

NO LOOP VERIFIED. The return message displayed when a loopback could not be established.

NO UNLOOP VERIFIED. The return message when a loopback could not be disabled.

UNLOOP VERIFIED. The return message displayed when a loopback is disabled.

UNSOL AND PASSWORD SETTINGS IN CONFLICT. Unsol and passwords cannot be enabled at the same time.

WAITING FOR VERIFICATION. Access-T is attempting to establish the requested loopback.fo

APPENDIX

E

Access-T 1500 Accessory Kits

Larscom provides six different accessory kits for use with the Access-T 1500. These accessory kits are:

- **19-inch Patch Panel (A87-AK03-001):** Panel/cable combination used to convert the two male 50-pin *line connectors* on the rear panel of the Access-T 1500 to 15 RJ-48C connectors. Includes mounting ears for 19-inch rack.
- **23-inch Patch Panel (A87-AK04-001):** Identical to the 19-inch model (A87-AK03-001), except for the mounting ears, which fit a 23-inch rack.
- **19-inch Patch Panel (A87-AK07-001):** Panel/cable combination used to convert the two female 50-pin *aux connectors* on the rear panel of the Access-T 1500 to 15 RJ-48C connectors. Includes mounting ears for 19-inch rack.
- **23-inch Patch Panel (A87-AK08-001):** Identical to the 19-inch model (A87-AK07-001), except for the mounting ears, which fit a 23-inch rack.
- **2 Line Connectors (A87-AK05-001):** 2 male 50-pin AMP CHAMP connectors.
- **2 Aux Connectors (A87-AK06-001):** 2 female 50-pin AMP CHAMP connectors.

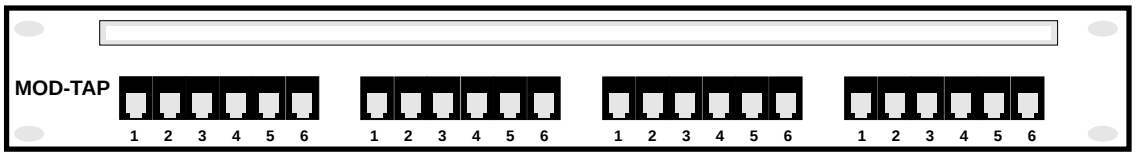
This appendix provides a description and installation procedure for the accessory kits. Refer to the section which pertains to the kit(s) you have.

Patch Converter Panels

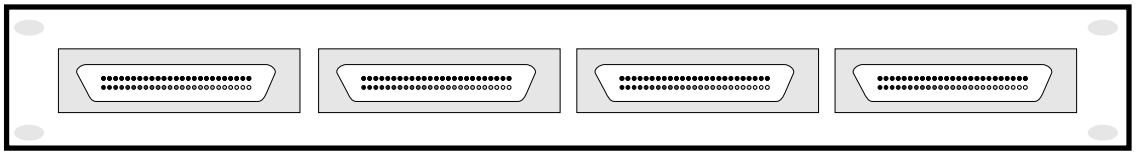
Larscom provides several Patch Converter Panel accessory kits for Access-T 1500. These kits are used to convert the two 50-pin RJ-48H line or aux connectors on the rear panel of the Access-T 1500 to 15 RJ-48C connectors, one for each Access-T 1500 module. *There are four Patch Converter Panel accessory kits, two for the line interface (19-inch rack and 23-inch rack models) and two for the aux interface (19-inch rack and 23-inch rack models).*

Larscom uses a standard cross-connect patch panel, which comes equipped with 8 wires per channel; however, the Access-T 1500 connectors require only 4 of these wires. Figure E-1 shows the front and rear panel of the patch panel.

Provided with the patch panel is a custom "converter cable" (087-2143-001 for the line panel, or 087-2143-002 for the aux panel) that connects the patch converter panel to the Access-T 1500. Figure E-2 illustrates this cable; the only difference between the two cables is the gender of the connectors. *Refer to Appendix A for cable drawings showing which pins from each 50-pin connector are routed to each RJ-48C jack on the patch panel.*



A. Front Panel



B. Rear Panel

Figure E-1. Larscom Patch Converter Panel

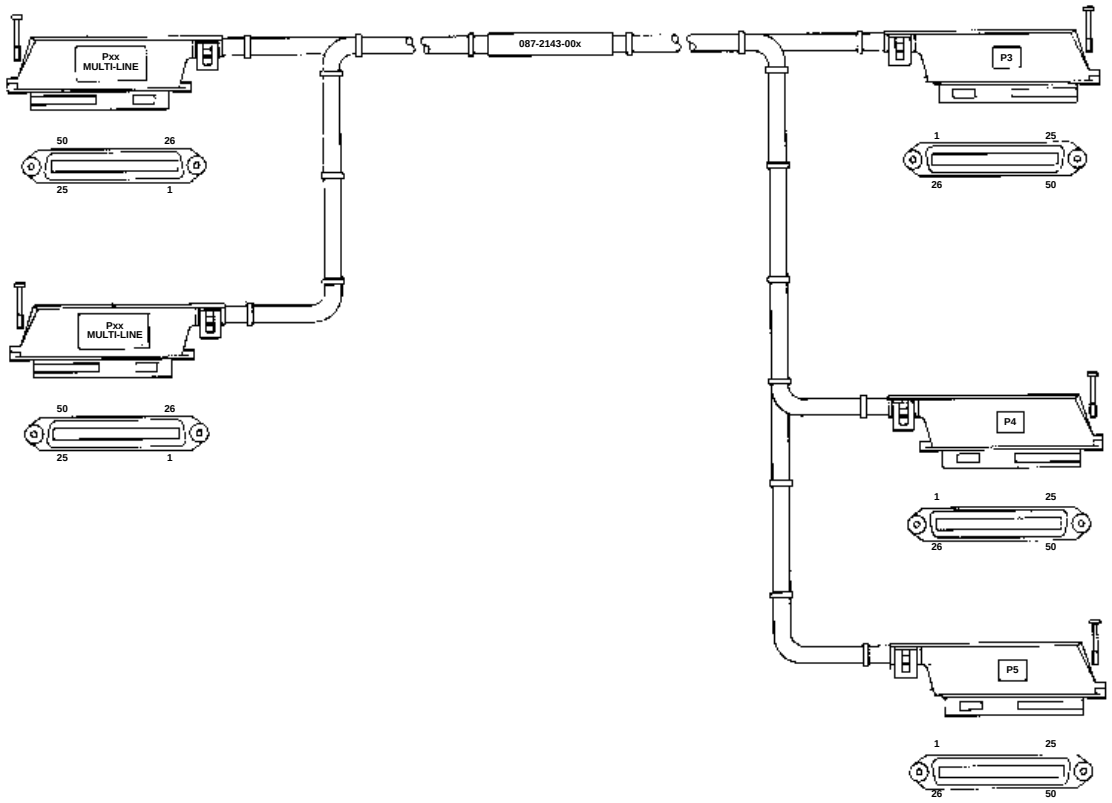


Figure E-2. Patch Converter Panel Cable, 087-2143-00x

Installation

To install the Patch Converter Panel and converter cable, follow these steps:

1. Determine the desired location. The patch panel should be positioned close enough to Access-T 1500 to allow the converter cable to reach. The patch panel requires only 1.75 vertical inches of rack space (one rack position).
2. The patch panel includes a pair of mounting ears which support either 19-inch or 23-inch equipment racks. Using the hardware provided, install the mounting ears on the sides of the patch panel in the appropriate orientation for the rack width and desired projection.
3. Mount the patch panel securely in the rack.

4. Using a Phillips screwdriver, secure a retaining clip to one side of the **P1** and **P2** connectors. (Retaining clips can be found in the plastic bag that came attached to the Access-T 1500 chassis.)

5. Install the converter cable. Connect the **P1** and **P2** connectors to line connectors **J1** and **J2** (or aux connectors **J36** and **J37**) on the Access-T 1500 rear panel. Connect the remaining three cable connectors (**P3**, **P4**, and **P5**) to the three connectors on the left-hand side of the patch panel. Be sure all connections are securely mated.

6. Using a Phillips screwdriver, secure the cable connectors on the Access-T 1500 with the retaining clips provided with your unit.

7. Secure the "hook and loop" cable retainers on the patch panel around each of the cable connectors.

8. Connect the T1 line or aux connectors to the RJ-48 jacks.

   Note: Jack numbers on the front of the Patch Converter Panel do not reflect actual Access-T 1500 slot positions. The Access-T 1500 uses only the first 15 jacks on the left side of the patch panel. Counting from left to right, the first 15 jacks on the panel correspond to slot positions 1 through 15 on the Access-T 1500, in numerical order.

9. If desired, attach the plastic labeling strip to the front of the patch panel. To attach the strip, follow these steps:

   a. Peel off the adhesive protector on the back of the strip.

   b. Firmly press the strip onto the front of the patch panel.

   c. Label the paper insert to identify each RJ-48 connector with its respective Access-T 1500 module and slide the paper into the plastic strip.

Line and Aux Port Connector Kits

Larscom offers AMP CHAMP connectors for the **LINE** and **AUX** connectors on the rear panel of Access-T 1500. With these crimp connectors, you can make all wiring connections necessary to support your specific application. Larscom recommends that you use 14 AWG wire for your connections.

To make wiring connections, follow these steps:

1. Insert wires by hand into the desired pin position on the connector, refering to Figures 3-8 and 3-9 for pinout descriptions.
2. Using an AMP CHAMP Insertion Tool (T-handle, palm grip, or butterfly), crimp the wires into place.

APPENDIX

F

Standard MIB-II Definitions

This Appendix describes the Access-T SNMP support for the Standard MIB II. The Standard MIB (i.e., MIB II) contains variables useful for Internet management. For a complete description of MIB II refer to RFC 1213.

This section defines the tables, groups, and variables in the standard MIB-II supported by Access-T. MIB-II is implemented per RFC 1213, with the following restrictions:

- No component of an object ID can have a value larger than 127 except for the Larscom enterprise number (555).
- Row insertion in tables is not supported.

MIB-II variables are divided into the following 10 functional groups:

- System Group.
- Interfaces Group.
- Address Translation Group.
- IP Group.
- ICMP Group.
- TCP Group.
- UDP Group.
- EGP Group.
- Transmission Group.
- SNMP Group.

Note: Orion supports SNMP requests only units configured as a master. The master acts a a proxy agent for the slaves on the chain.

System Group

The system group provides general information about the managed Access-T. The system group contains the following elements:

sysDescr
sysObjectID
sysUpTime
sysContact *
sysName
sysLocation *
sysServices

Objects marked with an asterisk (*) are not applicable to Access-T and always return a value of 0.

For a detailed description of these objects, refer to RFC 1213. The objects identified below include information unique to Access-T.

sysDescr

This read-only object provides the SNMP manager with a textual description of the unit it's managing. Depending on the Access-T hardware configuration, this field returns the following:

"Larscom Access-T 1 Port, <MUX S/W part number>."

"Larscom Access-T 1 Port, aux, <MUX S/W part number>."

"Larscom Access-T 2 Port, <MUX S/W part number>."

"Larscom Access-T 2 Port, aux, <MUX S/W part number>."

"Larscom Access-T 4 Port, <MUX S/W part number>."

"Larscom Access-T 4 Port, aux, <MUX S/W part number>."

sysObjectID

This read-only object acts as Access-T's network management identification. This value is allocated within the SMI enterprises subtree (1.3.6.1.4.1) and provides an easy way for an SNMP manager to determine what kind of unit is being managed.

The object identification for Access-T is *1.3.6.1.4.1.555.1.2*. (When using the Larscom private MIB, this identification becomes "Larscom Access-T".)

sysUpTime

This read-only object returns the time elapsed since Access-T was restarted.

> **Note:** System up time is based on the timestamp when the unit was powered-up. Since Access-T allows for its date and time to be user-defined, the system up time may not be accurate if the date and time values are changed after power-up.

sysName

This read-write object is an administratively assigned name for Access-T. The field is limited to 8 characters. SETs exceeding this length limitation result in a "badValue" response. Trailing spaces are ignored.

sysServices

This read-only object provides an integer value which indicates the set of services that the Access-T provides. The value returned is fixed at *72* to represent an IP host.

Interfaces Group

The interfaces group contains generic information about Access-T's physical interfaces, including configuration information and statistics on the events occurring at each interface.

The interface group contains the following elements:

- **ifNumber**
- **ifTable**
  - **ifIndex**
  - **ifDescr**
  - **ifType**
  - **ifMtu**
  - **ifSpeed**
  - **ifPhysAddress***
  - **ifAdminStatus**
  - **ifOperStatus**
  - **ifLastChange**
  - **ifInOctets ***
  - **ifInUcastPkts ***
  - **ifInNucastPkts ***
  - **ifInDiscards ***
  - **ifInErrors ***
  - **ifInUnknownProbs ***
  - **ifOutOctets ***
  - **ifOutUcastPkts ***
  - **ifOutNucastPkts ***
  - **ifOutDiscards ***
  - **ifOutErrors ***
  - **ifOutQLen ***
  - **ifSpecific**

Objects marked with an asterisk (*) are not supported and return a value of 0.

For a detailed description of these objects, refer to RFC 1213. The objects identified below include information unique to Access-T.

ifNumber

This read-only object provides the number of network interfaces supported by Access-T. This field always returns a value of "**8**"**.** ***This object applies only to Access-Ts configured as a master.***

ifTable

This read-only object provides a list of interface entries. Each “ifEntry” is indexed by “ifIndex”.

ifIndex

This read-only object provides a unique integer value for each Access-T interface. The value for each interface remains constant. In the case of Access-T, there are 8 possible values, as follows:

ifIndex value	Interface
1	reserved
2	PPP/SLIP
3	Line
4	Aux
5	DTE Port 1
6	DTE Port 2
7	DTE Port 3
8	DTE Port 4

Note: Index value “1" is allocated for a non-existent ethernet interface to make implementation consistent with the Larscom Proxy Agent and future products that may provide such an interface.

ifDescr

This read-only object provides a text description of the interface, as follows:

ifIndex value	Description
1	“reserved”
2	“PPP” or “SLIP” (depending on current protocol)
3	“Line”
4	“Aux”
5	“DTE Port 1"
6	”DTE Port 2"
7	“DTE Port 3"
8	”DTE Port 4"

ifType

This read-only object describes what type of interface is available:

ifIndex value	MIB Value
1	other (1)
2	ppp (23) or slip (28)
3	ds1 (18)
4	ds1 (18)
5	other (1)
6	other (1)
7	other (1)
8	other (1)

IfMtu

This read-only object provides the size of the largest datagram which can be sent/received on this interface. For the Access-T PPP interface, the returned value is always 1500. For the Access-T SLIP interface, the value is 1006. For all other interfaces, the returned value is always 0.

ifSpeed

This read-only object identifies the interface's current data-flow capacity. For SLIP/PPP, the returned value equals the communication port's baud rate. For the line/aux, the returned value is 1544000. For the DTE ports, the returned value is 1536000.

ifPhysAddress

This read-only object provides the interface's address at the protocol layer below the network layer. Access-T always returns the Null string for all interfaces.

ifAdminStatus

This read-write object controls or describes the interface state of a particular interface. It is equivalent to Access-T's "Current Map", and allows DS1s to be dropped/restored to the logical channel. Writes (SETs) specifying invalid values will result in a "badValue" response. Legal values for each interface are:

ifIndex value	MIB Value
1	down (2)
2	up (1)
3	up (1)
4	up (1) if unit has an aux /down (2)
5	up (1)
6	up (1)
7	up (1) if a 4-port unit / down (2)
8	up (1) if a 4-port unit / down (2)

ifOperStatus

This read-only object provides the current state of the interface. The only possible values are:

ifIndex value	MIB Value
1	down (2)
2	up (1)
3	up (1)
4	up (1) if unit has an aux /down (2)
5	up (1)
6	up (1)
7	up (1) if a 4-port unit / down (2)
8	up (1) if a 4-port unit / down (2)

ifLastChange

This read-only object provides the time that the interface entered its current operational status. Since the state cannot be changed on Access-T, the value is always 0.

ifSpecific

For the line interface, this value shall be (1.3.6.1.2.1.10.18), specifying the position of the ds1 (1406 MIB) under MIB-II.

Address Translation Group

This group contains one table which contains the network to physical address equivalences. For Access-T, this table is empty.

IP Group

The IP group contains information relevant to the implementation and operation of the IP layer. The IP group objects that are not relevant for Access-T SNMP have null values (i.e., 0). The IP group contains the following elements:

ipForwarding
ipDefaultTTL
ipInReceives
ipInHdrErrors
ipinAddrErrors
ipForwDatagrams *
ipInUnknownProtos
ipInDiscards*
ipInDelivers
ipOutRequests *
ipOutDiscards *
ipOutNoRoutes *
ipReasmTimeout *
ipReasmReqds *
ipReasmOKs *
ipReasmFails *
ipFragOKs *
ipFragFails *
ipFragCreates *

Objects marked with an asterisk (*) are not supported and always return a value of 0.

ipForwarding

This read-write object indicates whether the unit forwards datagrams (via a gateway) or not. Since Access-T does not act as a gateway, this value is always not-forwarding (2). Attempts to change this value will result in a "badValue" response.

ipDefaultTTL

This read-write object contains the default value inserted into the time-to-live field of the IP header of datagrams originated at Access-T.

ipInReceives

This read-only object provides the total number of input datagrams received from the SLIP/PPP interface, including those received in error.

ipOutRequests

This read-only object provides the total number of datagrams outputted through the SLIP/PPP interface.

ipInHdrErrors

This read-only object provides the number of input datagrams discarded due to errors in their IP headers.

ipinAddrErrors

This read-only object provides the number of input datagrams discarded because the IP address in the IP header's destination field was not a valid address to be received by Access-T.

ipInUnknownProtos

This read-only object provides the number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.

ipInDelivers

This read-only object provides the total number of input datagrams successfully delivered to ICMP and UDP layers.

ipAddrTable

This table is a sequence of ipAddrEntry's and provides addressing information relevant to the IP addresses. For Access-T, there is only 1 entry.

ipAdEntAddr

This read-only object provides the IP address of Access-T.

ipAdEntIfIndex

This read-only object provides an index value that uniquely identifies the interface to which the addressing information pertains to. Since the ipAddrTable pertains to the SLIP/PPP interface only, the ifIndex value 2 is always returned.

ipAdEntNetMask

This read-only object provides the subnet mask value. The value varies depending on the class of the IP address. As discussed in Chapter 1, class type is determined by the first number in the IP address. Values are:

Class	Subnet Mask
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

ipAdEntBcastAddr

This read-only value is the least-significant bit in the IP broadcast address. For Access-T, this value is always 1.

ipAdEntReasMaxSize

This read-only object is the same as ifMtu for PPP/SLIP, which is 1500 for a PPP interface, 1006 for a SLIP interface, and 0 for all other interfaces.

ipRouteTable

This table is empty for Access-T.

ipNetToMediaTable

This table is empty for Access-T.

ICMP Group

The ICMP group contains information relevant to the implementation and operation of ICMP. Objects that are not relevant or, for simplicity have not been implemented in Access-T, have null values (i.e., 0), indicated by not supported. Access-T will only respond to echo request messages. All other requests are ignored. The ICMP Group contains the following elements:

icmpInMsgs
icmpInErrors
icmpInDestUnreachs
icmpInTimeExcds
icmpInParmProbs
icmpInSrcQuenchs
icmpInRedirects
icmpInEchos
icmpInEchoReps
icmpInTimestamps
icmpInTimestampsReps
icmpInAddrMasks
icmpInAddrMaskReps
icmpOutMsgs
icmpOutEchoReps
icmpOutErrors *
icmpOutDestUnreachs *
icmpOutTimeExceds *
icmpOutParmProbs *
icmpOutSrcQuenchs *
icmpOutRedirects *
icmpOutEchos *
icmpOutTimestamps *
icmpOutTimestampReps *
icmpOutAddrMasks *
icmpOutAddrMaskReps *

Objects marked with an asterisk (*) are not supported and always return a value of 0.

icmpInMsgs

This read-only object provides the total number of ICMP messages that Access-T received.

icmpInErrors

This read-only object provides the number of ICMP messages that Access-T received but determined as having ICMP-specific errors (i.e., bad ICMP checksums, bad length and so on).

icmpInDestUnreachs

This read-only object provides the number of ICMP Destination Unreachable messages received by Access-T.

icmpInTimeExcds

This read-only object provides the number of ICMP Time Exceeded messages received by Access-T.

icmpInParmProbs

This read-only object provides the number of ICMP Parameter Problem messages received by Access-T.

icmpInSrcQuenchs

This read-only object provides the number of ICMP Source Quench messages received by Access-T.

icmpInRedirects

This read-only object provides the number of ICMP Redirect messages received by Access-T.

icmpInEchos

This read-only object provides the number of ICMP Echo (request) messages received by Access-T.

icmpInTimestamps

This read-only object provides the number of ICMP Timestamp messages received by Access-T.

icmpInAddrMasks

This read-only object provides the number of ICMP Address Mask Reqeust messages received by Access-T.

icmpInEchoReps

This read-only object provides the number of ICMP Echo Reply messages received by Access-T.

icmpInTimestampReps

This read-only object provides the number of ICMP Timestamp Reply messages received by Access-T.

icmpInAddrMaskReps

This read-only object provides the number of ICMP Address Mask Reply messages received by Access-T.

icmpOutMsgs

This read-only object provides the total number of ICMP messages that Access-T attempted to send.

icmpOutEchoReps

This read-only object provides the total number of ICMP Echo Reply messages that Access-T attempted to send.

TCP Group

The TCP group is not supported for Access-T.

UDP Group

The UDP group contains information relevant to the implementation and operation of the UDP. The UDP Group contains the following elements:

udpInDatagrams
udpOutDatagrams
udpNoPorts
udpInErrors
udpTable

udpInDatagrams

This read-only object provides the total number of UDP datagrams delivered to UDP users.

udpOutDatagrams

This read-only object provides the total number of UDP datagrams sent from Access-T.

udpNoPorts

This read-only object provides the total number of received UDP datagrams for which there was no application at the destination port.

udpInErrors

This read-only object provides the total number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.

udpTable

This table, which is a sequence of "udpEntrys", contains information about Access-T end-points on which a local application is currently accepting datagrams (i.e., UDP listener information). There are only 2 entries in the table.

udpLocalAddress

This read-only object provides the Access-T local IP address. For Access-T, this value will be 0.0.0.0, indicating a UDP listener willing to accept any and all UDP datagrams for the interface in question.

udpLocalPort

This read-only object provides the Access-T's (UDP local listener) local port number. For Access-T, this is 161, the standard SNMP UDP port number. Any requests for a port other than 161 are discarded.

EGP Group

The EGP group is not supported for Access-T.

Transmission Group

The transmission group is based on the transmission media underlying each interface on a system. For Access-T, only the DS1 MIB (RFC 1406) is attached to this group.

SNMP Group

The SNMP group, which is fully supported by Access-T, is a table that contains information and statistics about the SNMP Agent. The SNMP Group contains the following elements:

snmpInpkts
snmpOutPkts
snmpInBadVersions
snmpInBadCommunityNames
snmpInBadCommunityUses
snmpInASNParseErrs
snmpInTooBigs *
snmpInNoSuchNames *
snmpInBadValues *
snmpInReadOnlys *
snmpInGenErrs *
snmpInTotalReqVars
snmpInTotalSetVars
snmpInGetRequests
snmpInGetNexts
snmpInSetRequests
snmpInGetResponses *
snmpInTraps *
snmpOutNoSuchNames
snmpOutBadValues
snmpOutTooBigs
snmpOutGe nErrs
snmpOutGetRequests *
snmpOutGetNexts *
snmpOutSetRequests *
snmpOutGetResponses
snmpOutTraps
snmpEnableAuthenTraps

Objects marked with an asterisk (*) are not supported and always return a value of 0.

snmpInpkts

This read-only object provides the total number of PDUs delivered to Access-T from the transport service.

snmpOutPkts

This read-only object provides the total number of SNMP PDUs which were passed from Access-T to the transport service.

snmpInBadVersions

This read-only object provides the total number of syntactically correct SNMP PDUs which were delivered to Access-T and were from an unsupported SNMP version.

snmpInBadCommunityNames

This read-only object provides the total number of SNMP PDUs delivered to Access-T which used an SNMP community name not known to Access-T.

snmpInBadCommunityUses

This read-only object provides the total number of SNMP PDUs delivered to Access-T which represented an SNMP operation which was not allowed by the SNMP community named in the PDU.

snmpInASNParseErrs

This read-only object provides the total number of ASN.1 parsing errors (either in the encoding or syntax) encountered by Access-T when decoding SNMP PDUs.

snmpInGetNexts

This read-only object provides the total number of SNMP GetNext PDUs which have been accepted and processed by Access-T.

snmpInGetRequests

This read-only object provides the total number of SNMP GetRequests which have been accepted and processed by Access-T.

snmpInSetRequests

This read-only object provides the total number of SNMP SetRequests which have been accepted and processed by Access-T.

snmpOutTooBigs

This read-only object provides the total number of SNMP OutTooBigs which have been accepted and processed by Access-T.

snmpOutNoSuchNames

This read-only object provides the total number of valid SNMP PDUs which were generated by Access-T and for which the ErrorStatus component is no-SuchName.

snmpOutBadValues

This read-only object provides the total number of valid SNMP PDUs which were generated by Access-T and for which the ErrorStatus component is bad-Value.

snmpOutGenErrs

This read-only object provides the total number of valid SNMP PDUs which were generated by Access-T and for which the ErrorStatus component is genErr.

snmpOutGetResponses

This read-only object provides the total number of SNMP GetResponse PDUs which have been generated by Access-T.

snmpOutTraps

This read-only object provides the total number of SNMP Trap PDUs which have been generated by Access-T.

snmpEnableAuthenTraps

This read-write object indicates whether the SNMP agent is permitted to generate authentication-failure traps.

snmpTotalReqVars

This read-only object provides the total number of SNMP ReqVars which have been generated by Access-T.

snmpTotalSetVars

This read-only object provides the total number of SNMP SetVars which have been generated by Access-T.

APPENDIX

G

Access-T DS1 MIB Support

This appendix describes Access-T support for the application-specific DS1 MIB. For a complete description of the DS1 MIB refer to RFC 1406.

The DS1 MIB is attached to the Standard MIB Transmission Group, which is described in Appendix F.

Access-T supports the following DS1 MIB objects:

- dsx1ConfigTable.
- dsx1CurrentTable.
- dsx1IntervalTable.
- dsx1TotalTable.
- dsx1FarEndCurrentTable.
- dsx1FarEndIntervalTable.
- dsx1FarEndTotalTable.
- dsx1FracTable

Access-T gathers DS1 statistics from its User Registers. DS1 MIB objects which are not applicable return null values (i.e., 0).

dsx1ConfigTable

This read-only object contains various configuration-related settings for Access-T's DS1 interface. Since Access-T only has one line interface, the table contains only one instance.

dsx1LineIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex" (3).

dsx1Ifindex

This read-only object is equal to "ifIndex" (3).

dsx1TimeElapsed

This read-only object provides the number of seconds since the beginning of Access-T's current error-measurement period.

dsx1ValidIntervals

This read-only object provides the number of previous intervals for which valid data was collected.

dsx1LineType

This read-write object selects or indicates the DS1 line framing. Changing this object changes the framing for the Access-T DS1 line interface.

MIB Values	Description
dsx1ESF (2)	ESF
dsx1D4 (3)	D4

dsx1LineCoding

This read-write object selects or indicates the DS1 line coding. Changing this object changes the coding for the Access-T DS1 line interface.

MIB Values	Description
dsx1B8ZS (2)	B8ZS
dsx1AMI (5)	AM I
other (6)	AMI, Bit 8 Stuffed

dsx1SendCode

This read-write object selects or indicates the code being sent across the DS1 interface to the far-end Access-T.

MIB Values	Description
dsx1SendNoCode (1)	Sending normal data
dsx1SendLineCode (2)	Sending LS-Line Loopback request
dsx1SendPayLoadCode(3)	Sending DS-Line Loopback request
dsx1Send ResetCode (4)	Sending loopback termination request
dsx1SendQRS (5)	Sending QRSS test pattern

dsx1CircuitIdentifier

This read-write object contains a 20 character identifier used for troubleshooting.

dsx1LoopbackConfig

This read-write object provides the loopback state of the line. Possible values are:

MIB Values	Description
dsx1NoLoop (1)	No loopback established
dsx1PayloadLoop (2)	DS Line loopback established
dsx1LineLoop (3)	LS Line loopback established
dsxOtherLoop (4)	LS or DS DTE loopback established

dsx1LineStatus

This read-only object provides the status of the local Access-T DS1 line interface:

MIB Values	Description
dsx1NoAlarm (1)	No alarm present
dsx1RcvFarEndLOF (2)	Local Access-T receiving Yellow Alarm
dsx1RcvAIS (8)	Local Access-T receiving AIS
dsx1LossOfFrame (32)	Local Access-T Loss of Frame condition
dsx1LossOfSignal (64)	Local Access-T Loss of Signal condition
dsx1LoopbackStatus(128)	Local Access-T LS or DS Line Loopback or LS or DS DTE Loopback active
other failures (4096)	

The dsx1LineStatus is a bit-mapped variable (i.e., the value returned will be the total of all current alarm conditions). For example, if there is an LOS condition, there will also be an LOF condition and Yellow Signal (TYEL) will be generated; thus, the dsx1LineStatus value will be 64 + 32 + 4 = 100.

dsx1SignalMode

This read-write object indicates the signaling method used between the local and far-end Access-Ts. This object applies only to Access-Ts configured as a master.

MIB Value	Description
none (1)	No bits reserved for signaling

dsx1TransmitClockSource

This read-write object selects or indicates Access-Ts Transmit clock source:

MIB Values	Description
loopTiming (1)	Loop timing from the DS1 line interface
localTiming (2)	Internal clock source
throughtiming (3)	External clock source

The dsx1TransmitClockSource selects the configured clock source. If automatic clock switching is enabled, this object returns the clock source that was configured, which might be different than the current clock source.

dsx1Fdl

This read-write object selects or indicates the mode of the facility data link (FDL).

MIB Values	Description
dsx1Ansi-T1-403 (2)	ANSI T1.403 ESF framing with T1.403 enabled
dsx1Att-54016 (4)	AT&T 54016 ESF framing with T1.403 disabled
dsx1Att-54016 (6)	AT&T 54016 ESF framing with T1.403 enabled
dsx1 Fdl-none (8)	D4 framing

If the DS1 line interface framing mode changes (dsx1LineType) from ESF to D4, dsx1Fdl-none becomes the default automatically. If the DS1 line interface framing mode changes (dsx1 LineType) from D4 to ESF, the choice of ESF standards will depend on the current dsx1Dfl value.

The dsx1Fdl is a bit-mapped variable (i.e., the value returned will be the total of the MIB values). For instance, when Access-T is configured for ANSI T1.403, it also supports AT&T 54016; thus, the dsx1Fdl value is 4 + 2 = 6.

dsx1CurrentTable

This read-only table contains various performance statistics being collected for the current 15-minute interval. Since Access-T only has one line interface, the table contains only one instance.

dsx1CurrentIndex

This read-only object identifies the DS1-x line interface. It is equal to “ifIndex” (3), which is equal to “dsx1LineIndex”. This object applies only to Access-Ts configured as a master.

dsx1CurrentTable Statistics

The dsx1CurrentTable provides the following statistics:

dsx1CurrentESs	**read-only**
dsx1CurrentSESs	**read-only**
dsx1CurrentSEFSs	**Not applicable**
dsx1Current UASs	**read-only**
dsx1CurrentCSSs	**read-only**
dsx1CurrentPCVs	**read-only**
dsx1CurrentLESs	**Not applicable**
dsx1CurrentBESs	**read-only**
dsx1CurrentDMs	**Not applicable**
dsx1CurrentLCVs	**read-only**

Note: dsx1...PCVs = Access-T's ESFs and dsx1...LCVs = Access-T's BPVs.

dsx1IntervalTable

This read-only object contains various performance statistics being collected for the previous 24-hour interval. The past 24 hours are divided into 96 15-minute intervals. The table has four instances, one for each DS1 line interface.

dsx1IntervalIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex", which is equal to "dsx1LineIndex". This object applies only to Access-Ts configured as a master.

dsx1IntervalNumber

This read-only object identifies a 15-minute interval. It is a number between 1 and 96, where 1 is the most recently completed 15-minute interval and 96 is the least recently completed interval (assuming that all 96 intervals are valid). This object applies only to Access-Ts configured as a master.

dsx1IntervalTable Statistics

The dsx1 IntervalTable provides the following statistics:

dsx1IntervalESs	**read-only**
dsx1IntervalSESs	**read-only**
dsx1IntervalSEFSs	**Not applicable**
dsx1IntervalUASs	**read-only**
dsx1IntervalCSSs	**read-only**
dsx1IntervalPCVs	**read-only**
dsx1IntervalLESs	**Not applicable**
dsx1IntervalBESs	**read-only**
dsx1IntervalDMs	**Not applicable**
dsx1CurrentLCVs	**read-only**

dsx1TotalTable

This read-only object contains the cumulative sum of the various statistics for the 24-hour period preceding the current interval. The table has four instances, one for each DS1 line interface.

dsx1TotalIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex" (3), which is equal to "dsx1LineIndex". This object applies only to Access-Ts configured as a master.

dsx1TotalTable Statistics

The dsxlTotalTable provides the following statistics:

dsx1TotalESs	**read-only**
dsx1TotalSESs	**read-only**
dsx1TotalSEFSs	**Not applicable**
dsx1TotalUASs	**read-only**
dsx1TotalCSSs	**read-only**
dsx1TotalPCVs	**read-only**
dsx1TotalLESs	**Not applicable**
dsx1TotalBESs	**read-only**
dsx1TotalDMs	**Not applicable**
dsx1TotalLCVs	**read-only**

dsx1FarEndCurrentTable

This read-only object contains various performance statistics being collected for the far-end Access-T's current 15-minute interval.

dsx1FarEndCurrentIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex", which is equal to "dsx1LineIndex". This object applies only to Access-Ts configured as a master.

dsx1FarEndTimeElapsed

This read-only object provides the number of seconds since the beginning of the current interval at the far-end Access-T.

dsx1FarEndValidIntervals

This read-only object provides the number of previous intervals for which valid data has been collected at the far-end Access-T. The value will be 96 unless the interface was brought online with the last 24 hours. Otherwise, the value will be the number of complete 15-minute far-end intervals collected so far.

dsxlFarEndCurrentTable Statistics

The dsx1 FarEndCurrentTable provides the following statistics:

dsx1FarEndCurrentESs	**read-only**
dsx1FarEndCurrentSESs	**read-only**
dsx1FarEndCurrentSEFSs	**Not applicable**
dsx1FarEndCurrentUASs	**read-only**
dsx1FarEndCurrentCSSs	**read-only**
dsx1FarEndCurrentPCVs	**read-only**
dsx1FarEndCurrentLESs	**Not applicable**
dsx1FarEndCurrentBESs	**read-only**
dsx1FarEndCurrentDMs	**Not applicable**

dsx1FarEndIntervalTable

This read-only object contains various performance statistics being collected for the far-end Access-T's previous 24-hour interval for the DS1 line interface. The past 24 hours are divided into 96 15-minute intervals.

dsx1FarEndIntervalIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex" (3), which is equal to "dsx1LineIndex".

dsx1FarEndIntervalNumber

This read-only object identifies a 15-minute interval. It is a number between 1 and 96, where 1 is the most recently completed 15-minute interval and 96 is the least recently completed interval (assuming that all 96 intervals are valid).

dsx1FarEndIntervalTable Statistics

The dsx1FarEndIntervalTable provides the following statistics:

dsx1FarEndIntervalESs	**read-only**
dsx1FarEndIntervalSESs	**read-only**
dsx1FarEndIntervalSEFSs	**Not applicable**
dsx1FarEndIntervalUASs	**read-only**
dsx1FarEndIntervalCSSs	**read-only**
dsx1FarEndIntervalPCVs	**read-only**
dsx1FarEndIntervalLESs	**Not applicable**
dsx1FarEndIntervalBESs	**read-only**
dsx1FarEndIntervalDMs	**Not applicable**

dsx1FarEndTotalTable

This read-only object contains the cumulative sum of the various statistics for the far-end Access-T's 24-hour period preceding the current interval. his table has four instances, one for each DS1 line interface.

dsx1FarEndTotalIndex

This read-only object identifies the DS1-x line interface. It is equal to "ifIndex" (3), which is equal to "dsx1LineIndex".

dsx1FarEndTotalTable Statistics

The dsx1FarEndTotalTable provides the following statistics:

dsx1TotalESs	**read-only**
dsx1TotalSESs	**read-only**
dsx1TotalSEFSs	**Not applicable (returns 0)**
dsx1TotalUASs	**read-only**
dsx1TotalCSSs	**Not applicable (returns 0)**
dsx1TotalPCVs	**read-only**
dsx1Total LESs	**Not applicable (returns 0)**
dsx1TotalBESs	**read-only**
dsx1TotalDMs	**Not applicable (returns 0)**

dsx1FracTable

The dsx1FracTable contains information regarding the mapping of interfaces to individual DS0s.

dsx1FracIndex

This value is identical to the "dsx1LineIndex" value (3).

dsx1FracNumber

This value represents the DS0 channel number (1 to 24).

dsx1FracIndex

The dsx1FracIndex value represents the DTE interface mapped for this particular DS0 channel. Possible values are:

MIB Values	Description
0	DS0 channel is unmapped or idlef
4	DS0 channel is mapped to the Aux
5	DS0 channel is mapped to DTE Port 1
6	DS0 channel is mapped to DTE Port 2
7	DS0 channel is mapped to DTE Port 3
8	DS0 channel is mapped to DTE Port 4

APPENDIX

H

SNMP Trap Support

Access-T supports both SNMP generic and enterprise-specific traps. Traps are "autonomous" (i.e., unsolicited) messages used to report specific conditions or events that occur at an SNMP agent, such as Access-T. A special code and textual description identify each alarm and status. The SNMP manager interprets this information and takes the appropriate action.

To communicate to slave units on the chain using SNMP, you must make sure that the master unit has polling enabled for that slave and that the proper SNMP parameters are enabled on the master as well as the slave.

> **Note 1**: SNMP trap support and automatic-dial-out alarm notification are separate features. The method used for alarm reporting is user-selectable. However, the Access-T alarm must be enabled to generate an SNMP trap.
>
> **Note 2**: Only one trap manager is supported at one time. If no IP address is assigned for a trap manager, trap messages are disabled. The destination UDP port is fixed at 162, the standard UDP port for receiving traps.

The process of dialing out to report alarms is not mandatory with Access-T. If the current connection is SLIP or PPP, traps are sent immediately if the unit has determined that it is talking with the trap manager (unit has already received an IP packet from trap manager). If the current connection is TABS/UI, traps are suppressed until a SLIP or PPP connection is established or until the next opportunity to dial out arises.

In a chain configuration, slave which fail to respond to the master's polls will cause a trap specifying the slave as the problem source, even though the alarm is generated by the master. If the slave's IP address is unknown, a trap will not be generated.

Trap Messages

SNMP trap messages contain the following fields:

- **enterprise** is the same as the sysObjectID (1.3.6.1.4.1.555.1.2) described in **Appendix F** in the section *System Group*.
- **agent-addr** is the same as the Access-T IP address (ipadEntAddr) described in **Appendix F** in the section *IP Group*.
- **generic-trap** supports the predefined trap types listed in Table H-1.
- **specific-trap** supports the Larscom Access-T alarms listed in the section *Enterprise-Specific Traps*.
- **time-stamp** provides the elapsed time between the last reinitialization of Access-T and the generation of the trap.

> **Note:** System up time is based on the timestamp when the unit was powered-up. Since Access-T allows for its date and time to be user-defined, the system up time may not be accurate if the date and time values are changed after power-up.

Enterprise-Specific Traps

When a generic-trap is enterpriseSpecific, the specific-trap field of the trap message contains a special code to identify the alarm and its status (normal/alarm). Each code is a 16-bit signed integer with the least significant bit indicating status (0 = normal, 1 = alarm). Table H-2 lists the alarm codes with their corresponding text descriptions.

Table H-1. Access-T SNMP Generic Traps

Trap Type	Enterprise	Trap ID	Description
authenticationFailure (4)	SNMP	::=4	Indicates that an erroneous community name has been received.
enterpriseSpecific (6)	Larscom	::=6	Indicates that some Access-T specific event or alarm has occurred. The specific trap field indicates the type of trap. These traps are described in the **Enterprise-Specific Traps** section.

Table H-2. Enterprise-Specific Traps Alarm Codes

Alarm Code	Description
20430	Loss-of-Signal (LOS) cleared.
20431	Loss-of-Signal (LOS) detected.
20460	Loss of sync cleared.
20461	Loss of sync detected.
20470	BPV violations no longer exceeds specified rate.
20471	BPV violations exceeded specified rate.
20480	Errored Seconds (ES) no longer exceeds specified rate
20481	Errored Seconds (ES) exceeded specified rate.
20520	A loopback established from the T1 line that overrided an existing loopback no longer exists.
20521	A loopback established from the T1 line has overridden an existing loopback.
22010	Loss of RTS on DTE port 1 is no longer detected.
22011	Loss of RTS on DTE port 1 is detected.
22020	Loss of RTS on DTE port 2 is no longer detected.
22021	Loss of RTS on DTE port 2 is detected.
22030	No Master Clock loss.
22031	Master Clock loss.
22040	Network Interface Module (NIM) responding.
22041	Network Interface Module (NIM) not responding.
22050	Yellow Signal no longer detected.
22051	Yellow Signal detected.
22060	AIS signal no longer detected.
22061	AIS signal detected.
22070	Unit not in Unavailable Signal State (USS).
22071	Unit is in Unavailable Signal State (USS).
22090	Bipolar Violations (BPVs) under threshold on aux port.
22091	Bipolar Violations (BPVs) exceeded threshold on aux port.
22100	Yellow Signal no longer detected on aux port.
22101	Yellow signal detected on aux port.
22110	AIS no longer detected on aux port.
22111	AIS detected on aux port.
22120	Unavailable Signal State no longer detected on aux port.
22121	Unavailable Signal State detected on aux port.
22130	Loss of Signal no longer detected on aux port.
22131	Loss of Signal detected on aux port.

Table H-2. Enterprise-Specific Traps Alarm Codes (cont'd)

Alarm Code	Description
22140	Loss of sync no longer detected on aux port.
22141	Loss of sync detected on aux port.
22150	Errored Seconds threshold no longer exceeds specified rate on aux port
22151	Errored Seconds threshold exceeds specified rate on aux port
22160	Loss of RTS on DTE port 3 is no longer detected.
22161	Loss of RTS on DTE port 3 is detected.
22170	Loss of RTS on DTE port 4 is no longer detected.
22171	Loss of RTS on DTE port 4 is detected.
22180	Expander is responding.
22181	Expander is not responding.
22190	NIM on expander is responding.
22191	NIM on expander is not responding.
22200	Unit is responding (slave responds to master polls).
22201	Unit is not responding (slave fails to repond to master polls).

APPENDIX

I

Point-to-Point Protocol

This appendix provides supplementary information concerning the implementation of PPP as it pertains to Access-T.

PPP Support

PPP support for Access-T is contrained to the following:

- Maximum length of data field is 1500 bytes.
- Protocol support is limited to IP (0x0021), IPCP (0x8021), and LCP (0xC021). PPP authentication protocol is not supported.
- A between character timeout is implemented such that if the timeout occurs, the packet is discarded.

LCP

Before a link can be used, the two ends must negotiate certain settings or options. The protocol used for this negotiation is called the Link Control Protocol (LCP). LCP packets are encapsulated within PPP packets (i.e., it constitutes the data portion within PPP packets).

LCP support as it pertains to Access-T is implemented as follows:

- Only version 1 of the LCP is supported.
- Configuration options supported during the Link Establishment Phase are limited to:
    - **Maximum-Receive-Unit:** Maximum size of packet peer can receive or should send. Peer must be able to receive a mini-

mum packet size of 50 bytes. Access-T's maximum size is limited to 1500.

- **Async-Control-Character-Map:** Bit map of control characters (characters whose ASCII values are less than 0x20) which should be discarded if found in the data stream. If character is not to be discarded, then the sender must either perform byte stuffing (replace character with a 2-byte escape sequence) or negotiate a compatible map.

  Access-T supports this option on both receive and transmit. However, byte stuffing shall always be performed when transmitting LCP or IPCP packets. Access-T can receive all control characters without byte stuffing.

- **Protocol-Field-Compression:** When negotiated, the protocol field can be reduced to a single byte.

  Access-T supports this option on both receive and transmit. Note that only the IP protocol can be reduced.

- **Address-and-Control-Field-Compression:** When negotiated, the address and control field can be omitted.

  Access-T supports this option on transmit only and **only** for non-LCP packets. Access-T cannot receive packets with these two fields omitted.

- Echo-Request and Discard-Request LCP commands will never be sent. These commands though useful for debugging, performance testing, and link quality determination are not a necessity.

IPCP

IPCP implementation is per RFC 1332. After link options are negotiated with LCP, the two ends must negotiate for acceptance of IP packets. The protocol used for this negotiation is called IP Control Protocol (IPCP). IPCP packets are encapsulated within PPP packets.

The IPCP implementation for Access-T does not support any options on receive or transmit.

Index

24-hour registers 7-14 to 7-16

A

Access-T
- Accessories 9-4, 9-5, E-1
- Applications 2-2, 2-3
- Equipment architecture 2-1, 2-2
- Manual overview 1-2, 1-3
- Models 1-1, 3-1
- Operation modes 6-4, 6-5
- Specifications 2-26, 2-27

Access-T 1500 modules
- Removing and inserting 3-5

Accessories 9-4, 9-5, E-1
Address, Larscom 9-6
Affidavit, T1 connection xvii, xviii
AIS 2-13, 6-16, 6-17
AIS to DTE 6-16
AIS to Line 6-17
Alarm configuration 6-21
Alarm dialout 2-17, 6-22
Alarm history 2-18, 7-5, 7-6, 8-13
- Clearing 7-5 - 7-6

Alarm identifcation procedure 8-13
Alarm reporting 2-17, 6-22, 7-2, 7-3
Alarm thresholds (BPV and ES) 6-24
Alarms 2-17 - 2-19, 6-21 to 6-23, 7-1 to 7-6, 8-13
- Enabling 6-23
- History 7-5, 7-6
- Reporting 6-22, 7-2
- Viewing 7-4

Alarms, enabling 6-23
Alert banner 7-2
Alert indicator 5-1, 6-22, 7-3, 8-3
AMI 1-4
ANSI T1.403 standard 1-13, 2-14, 6-11
Applications 2-2, 2-3
ASCII interface
- See Terminal interface

AT&T publication 54016 1-9, 1-12, 2-16, 7-14
AT&T publication 62411 1-4, 1-7
Automatic baud detection 4-6, 6-2
Automatic verification 7-32
Aux port 2-13, 3-13, 6-15

B

B8ZS 1-8, 2-11, 2-14
Bipolar violation (BPV) 1-4, 2-16, 7-15
Bipolar violations (BPV) 2-18
Bit 7 stuffing 2-14, 6-13, 6-15
Bit error test 7-34
Buffer error count 7-22
Bursty errored second (BES) 1-12, 2-16, 7-15, 7-17

C

Cable drawings A-1
Cables 9-4, 9-5, A-1
Chain port 2-8, 2-10, 3-18, 3-17, 8-9, 8-10, C-1
- Expander C-1
- Managing nodes 8-1
- Polling 8-4, 8-10

Channel service unit (CSU) 1-4
Circuit ID 6-7, 7-23
Clear channel capability 1-7
Clearing ESF errors 7-20
Clock source 6-9, 6-12
Command interfaces 2-5 to 2-7, 6-29
- PPP 2-5, 2-7, 6-6
- SLIP 2-5, 2-7, 6-7
- TABS 6-8
- TABS mode 2-5, 2-6
- Terminal mode 2-5, 2-6

Command ports 2-5, 2-8, 2-9, 4-7
- Chain port 2-8
- Craft port 2-8
- Expander port 2-9
- Supervisory port 2-8

Communication options, craft port 6-1
Communication options, SUPV port 6-2, 6-3
Community name 6-7, 7-23
Configuration 6-8
- Copying 8-7

Configuration report 7-8 to 7-10
Controlled slip seconds 1-12, 2-16, 7-15
CP01 Expander C-1
Craft port 2-8, 3-23, 4-5, 6-1
Current map 6-20
Customer premises equipment 1-4

Customer service 9-4, 9-6
Internet number 9-4
Phone number 9-4

D

D4 framing 1-8, 1-10, 6-11
Data link ID 6-11
See Facility data link (FDL)
Data service unit (DSU) 1-4
Date 6-9
Date and Time 6-9
Date and time, setting 6-9
Defaults, system 5-8 to 5-12, 6-29
Description report 7-7, 7-8
Dialog boxes 5-21
Dialout parameters 6-25, 6-27, 6-28, 7-2
Dialport backoff 6-25, 6-26
Dialstrings 6-25, 6-26
DIP switches 3-26 to 3-29
Downloading software 3-30
Drop-and-insert 2-12, 2-13
Drop-down menus 5-6
DS0 bundling 2-15, 6-18
DS0 configuration report 7-12, 7-13
DS0 maps 6-18
Bundling 6-18
Current 6-20
Send 6-20
Time-of-day switching 6-19
DS1
See T1
DS1 MIB support G-1
DTE channel loopbacks 2-22
DTE interfaces 2-11
DTE ports 3-11, 6-12
Configuration 6-12 to 6-14

E

EIA 530 3-11, 3-12, 6-12, 6-15
Equalization 6-15
Equipment architecture 2-1, 2-2
Errored seconds (ES) 1-12, 2-16, 2-18, 6-24, 7-15, 7-17
Escape key (ESC) 5-4
ESF errors 1-12, 2-16, 7-19, 7-20
ESF framing 1-8 - 1-9, 1-11 to 1-14, 6-11
ESF performance parameters 1-12, 1-13
EXIT function 5-4, 6-10
Expander port 2-9, 3-20

F

Facility data link (FDL) 1-9, 1-13, 2-14
Far-end loobacks 7-28
FCC rules, part 68 xiv, 1-4
FCC rules, part 15 xv
Fractional T1 services 1-15
Framing formats 1-8 - 1-11, 2-14, 6-11, 6-15
Front panel
View 4-2, 4-3
Front-panel
Indicators 4-1, 4-4
Fuse 9-1, 9-2

G

Glossary B-1

H

HDLC-formatted data 2-11

I

Idle code 2-15
In-band codes 2-14, 2-24, 6-11
Inactivity timeout 6-25, 6-26
Installation 3-1
DIP switches 3-26 to 3-29
Modems 3-30
Mounting 3-6
Power 3-7 to 3-9
Site Requirements 3–5
Wiring connections 3-11
Interface protocols 6-29 to 6-32
Internal communication failure 2-19
Internet number, Larscom 9-4
IP address 6-5

L

Larscom address 9-6
Larscom Internet number 9-4
Larscom phone number 9-4
Line availability 2-16, 7-21
Line availability report 7-21
Line build-out (LBO) 2-14, 6-11
Line coding 1-4, 2-14, 6-11, 6-15
See also AMI; B8ZS
Line loopbacks 2-22, 2-23
Loggin off 6-34
Logging off 6-35
Logging on 6-34
Loopback override 2-18

Loopbacks 2-20 - 2-24, 7-26 to 7-29, 7-32
  Activating 7-29
  Automatic verification 7-32
  Remote loop verify 2-20, 7-31, 7-32
  Special conditions 7-28
Loss of frame count (LOFC) 1-12, 2-16, 7-15
Loss of master clock 2-19
Loss of NIM 2-19
Loss of signal 2-18
Loss of sync 2-18

M

Main menu line 5-1
Maintenance 9-1
Manual overview 1-2, 1-3
Maps
  See DS0 maps
Master clock 6-12
Master mode 2-4, 3-27, 3-28, 6-4, 6-5, 8-1, 8-8, 8-13
  Polling 8-4
  Reports 8-8
Menu and report display area 5-1, 5-3
Menu paths 5-4 to 5-6, 5-8 to 5-12, 5-20 to 5-27
  Example 5-22 to 5-27
  Navigation 5-4 to 5-6, 5-20, 5-21
  Terminology 5-13 to 5-20
MIB counts 7-24, 7-25
MIB definitions 1-19, F-1
Model numbers 9-3

Modems 3-30
  Configuration 6-4
  Dialout 6-25 to 6-28
  Dialout report 7-13, 7-14
  Recommendations 3-30
Mounting 3-4
Mux restart 7-36

N

Near-end loopbacks 7-28
Network interface 2-14, 3-14, 3-17, 6-11
Network interface module (NIM) 6-29, 7-35, 9-3
NIM restart 7-35
Nodes 2-4, 8-3, 8-4, 8-6 to 8-8, 8-10 to 8-13
  Addresses 8-3
  Alarm history 8-13
  Alarm status 8-10 to 8-13
  Configuration 8-8
  Selecting 8-13
  Viewing configuration 8-8

O

One-hour statistics 7-17, 7-18
Operation modes 2-4, 3-27, 3-28, 6-4, 6-5, 8-1
Operator messages D-1

P

Packing 9-7
Parts 9-4, 9-5
Passwords 6-30 to 6-35
Passwords, enabling 6-33
Passwords, setting 6-33
Patch panel E-1
Performance monitoring 2-16, 8-13
Performance reports 7-7, 7-14 to 7-22, 7-24, 8-9, 8-10
Phone number, Larscom 9-4
Pinouts A-1
Polling 8-4, 8-10
  Status 2-16
  Viewing status 8-9
Port loss 2-19
Ports 2-10, 4-5
Ports, configuration 6-1
Power 3-5 to 3-8
Power supply 4-5
Power-up 4-5
PPP 2-5, 2-7, 2-17, 6-6, 7-23
Protocol search mode 6-29 to 6-32
Pulse density 1-6, 2-11

Q

QRSS 7-33
  See Test patterns
Question mark key (?) 5-7

R

Rear panel 3-2, 3-3
Register clearing 7-18
Remote loop verify 7-31, 7-32
Remote loopbacks 2-24, 7-28
Repair service 9-6
Replacement parts 9-3 to 9-5
Robbed bit signaling 1-9, 1-13
RS449 2-11, 6-12
RS485 2-10
RTS 6-12

S

Self test 4-5
Send DTE configuration 6-14
Service ordering information 2-26
Severely errored second (SES) 1-12, 2-16, 7-15, 7-17
Shipping 9-6 - 9-7
Slave mode 2-4, 3-27 to 3-29, 6-4, 6-5
SLIP 2-5, 2-7, 2-17, 6-7, 7-23
SNMP 1-16 to 1-21, 6-5, 7-3, 7-23, 7-25, F-1, H-1
  Circuit ID 6-7
  Community name 6-7
  Integral SNMP 1-17
  Management 6-5
  Management information base (MIB) 1-19
  MIB counts 7-24, 7-25
  PPP 6-6, 7-23
  SLIP 6-7, 7-23
  TCP/IP protocol suite 1-18, 1-20 - 1-21
  Traps 6-6, 6-22, 7-3, H-1
SNMP parameters report 7-23, 7-24
Software, downloading 3-27
Spare fuse
  See Fuse
Specifications 2-26, 2-27
Standard MIB-II F-1
  ICMP group F-12
  Interfaces group F-4
  IP group F-8
  SNMP group F-17
  System group F-2
  UDP group F-15
Station clock 6-9
Status 8-10
Status indicators 4-1, 4-4
Status report 7-11, 7-12
Status reports 7-7 to 7-14, 7-23, 7-24, 8-8, 8-9, 8-12
Status, report 7-11
Storage 9-6 - 9-7
Supervisory port 2-8, 3-19, 3-20, 6-3
System configuration 6-3, 6-9
System defaults 6-29
System name 6-8

T

T1
  Overview 1-3
  Signal characteristics 1-4
TAB key 5-4
TABS address 6-8
TABS interface 2-5, 2-6, 2-17, 6-8, 7-3
TCP/IP 1-20 to 1-25
  Internet routing 1-25
  IP addessing 1-23
  IP address 6-5
  IP addressing 1-22
  Subnet addressing 1-23
  Subnet mask 1-23, 1-24
  Table-driven IP routing 1-25, 1-26
Temrinal interface 5-8
Terminal display 5-1, 5-2, 5-5
Terminal interface 2-5, 2-6, 2-17, 5-3, 5-9 to 5-20
  Glossary of terms 5-13 to 5-20
Terminal timing mode 2-11, 2-12, 6-12
Test patterns 2-25, 7-26, 7-33
  QRSS 7-33
Tests 7-26, 7-27
Time 6-9
  See Date and time
Title bar 5-1, 8-3
Traps 2-17, 6-6, 6-22, 7-3, H-1

U

Unavailable second (UAS) 1-12, 2-16, 7-15, 7-17
Unavailable signal state (USS) 2-18
Unpacking 3-1
Unsolicited alarm reports 2-17, 6-22
Unsolicited TABS messages 7-3

V

V.35 2-11, 6-12

W

Wait-for-connect time 6-25, 6-26
Wiring connections 3-11 to 3-24
  Pinouts 3-12 to 3-16, 3-18 to 3-24

Y

Yellow signal 2-14, 2-18, 6-11
Yellow signal transcoding 2-13, 6-15, 6-16

Addendum 1
Access-T Series 100, 200, 400 & 1500

Please make notes on the appropriate manual pages referenced by this addendum and insert this addendum inside the front cover of the *Access-T Multi-Port DSU/CSU System Series 100, 200, 400, & 1500 Installation and Operation* manual, ACST-0351-005.

Page xiv

In the ***Notice to U.S. Users,*** *item 2, third bullet, the facility code numbers have changed. Replace the facility code numbers with the following:*

- The facility code: 04DU9-BN, 04DU9-DN, 04DU9-1KN, 04DU9-1SN.

Page 2-26

Replace the second row in Table 2-A with the following row:

Facility Interface Code	**04DU9-BN** for 1.544 Mbps, D4 **04DU9-DN** for 1.544 Mbps, D4 with B8ZS **04DU9-1KN** for 1.544 Mbps, ESF **04DU9-1SN** for 1.544 Mbps, ESF with B8ZS

Page 3-10

Replace the last paragraph on the page with the following:

Access-T 1500 employs loadsharing power supplies. Thus, when two supplies are installed and both are powered, they share the load and both the front-panel LEDs illuminate green. If one power supply fails, the other power supply will assume the entire load of the unit, and the failed power supply's power LED will illuminate red.

> **Note:** If two power supplies are installed but only one is powered, the unpowered supply's power LED will illuminate red. *This is normal operation, and* ***does not*** *indicate that the unpowered supply is faulty.*

Page 9-5

Add the following items at the end of Table 9-A, Access-T Parts and Accessories:

NUMBER	DESCRIPTION
087-2073-103	Rear cover for Access-T 1500 with dual power supplies
087-3943-001	Retaining clip for 50-pin line connectors
A87-AK15-001	Accessory Kit, telco retaining clip

Supplement 3

Access-T 100-S and Access-T RDL

Release History

August 1996: ACST-0351-S51, Supplement 1, released.
October 1996: ACST-0351-S52 obsoletes and replaces Supplement 1.
December 1996: ACST-0351-S53 obsoletes and replaces Supplement 2.

Larscom now offers two new Access-T models:

- **Access-T 100-S:** Functionally identical to the single-port Access-T 100, but housed in a half-size chassis.
- **Access-T RDL**: Same as the Access-T 100-S *plus* hardware and software modification supporting the new Robbed-Bit Data Link feature.

NOTE
Access-T 100-S and Access-T RDL both use the same half-size chassis, and are identical in physical appearance. To identify the type of unit you have, look at the model number label located on the side of the Access-T chassis.

Please make notes on the appropriate manual pages referencing this supplement and insert this supplement inside the front cover of the *Access-T Multi-Port DSU/CSU System Series 100, 200, 400, & 1500 Installation and Operation* manual: ACST-0351-005.

This supplement describes these two new members of the Access-T family, and includes the following sections:

- **Rack-Mounting the Access-T 100-S or Access-T RDL.** Provides instructions on how to mount the Access-T 100-S or Access-T RDL in a standard 19-inch equipment rack.
- **Specifications.** Provides product specifications, including front- and rear-panel illustrations.

- **Compatibility with Other Versions of Access-T.** Provides important information relevant to using the Access-T 100-S and/or Access-T RDL with other versions of the Access-T family of products.
- **Disabling Span Power.** Provides a procedure on how to disable span power for Access-T 100-S and Access-T RDL.
- **Verifiying a Remote Loop.** Provides information on the preferred method for verifying a remote loopback using Access-T 100-S and Access-T RDL.
- **Access-T RDL.** Provides a detailed description of all the features unique to the Access-T RDL, as they pertain to the user interface.

Rack-Mounting the Access-T 100-S or Access-T RDL

Before attempting to rack-mount the Access-T 100-S or Access-T RDL, please verify that you have the following:

- Access-T 100-S or Access-T RDL.
- Single Rack-Mount Accessory Kit (LP#: A87-AK14-001) OR Dual Rack-Mount Tray Accessory Kit (LP#: A87-AK13-001).
- Phillips screwdriver.

If you did not receive the single- or the dual-rack-mount accessory kit, please call Larscom to obtain these parts.

To rack-mount a single Access-T 100-S or Access-T RDL:

1. Attach the mounting ears (found in the Accessory Kit) to the sides of the unit using a Phillips screwdriver and the screws and washers provided. The mounting ears can be installed in a flush or center-mount position, and can be reversed to accommodate 19- or 23-inch racks.
2. Secure the Access-T to the equipment rack.

To rack-mount the Access-T 100-S or Access-T RDL with the dual rack-mount tray:

1. Using a Phillips screwdriver, secure the Access-T mounting tray to the equipment rack. **Be sure to use only *the two lower holes* on the mounting tray.**
2. Mount the Access-T onto the tray as follows:
   a. Attach the mounting bracket to the top-left corner (if positioning the unit to the left side of the tray) or top-right corner (if positioning the unit to the right side of the tray) of the Access-T chassis.
   b. Slide the Access-T into the tray so that the unit mates with the guide pin in the rear of the tray. The mounting ear should line up with the tray's upper mounting hole.
   c. Using a Phillips screwdriver, secure the Access-T to the tray.
3. If you are installing a second Access-T, repeat Step 2 for the second unit.

> **Note:** The dual rack-mount tray can be used only with 19-inch equipment racks.

Specifications

Table A provides the electrical and environmental specifications for the Access-T 100-S and Access-T RDL units. Figures 1 and 2 illustrate the Access-T 100-S and Access-T RDL front and rear panels, respectively.

Table A. Access-T 100-S and Access-T RDL Specifications

Electrical and Environmental	
AC Power	Standard 115 V ac, 0.5 A; 50 to 60 Hz; fuse: 1 A
Dimensions, Mounting	1.75 x 8.25 x 11.55 inches (HxWxD); rack-mount shelves, which can hold two Access-T 100-S and/or Access-T RDL units, are available with brackets for 19-inch racks
Temperature, Humidity	0º to 50º C; Up to 95% relative humidity, noncondensing
Regulatory Compliance	Meets FCC requirements, Parts 15 and 68; FCC registration number: GRPUSA-73975-DE-N

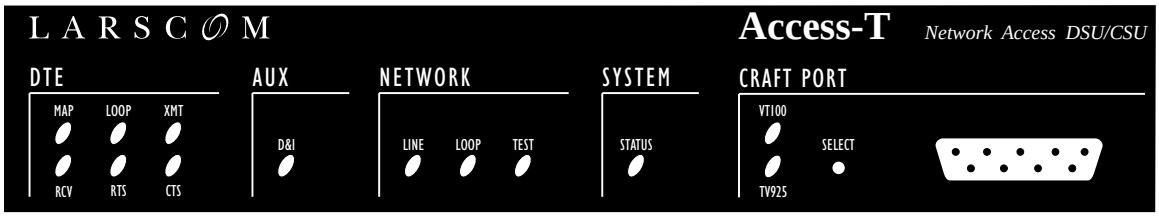


Figure 1. Access-T 100-S and Access-T RDL Front Panel

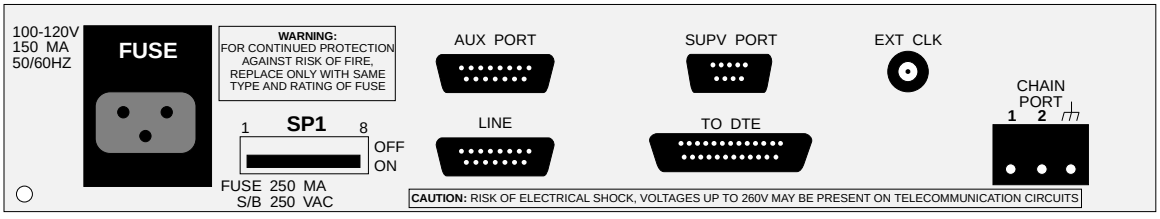


Figure 2. Access-T 100-S and Access-T RDL Rear Panel

Compatibility with Other Versions of Access-T

The Access-T 100-S and Access-T RDL are compatible with other versions of Access-T. However, if you plan to use the Access-T 100-S or Access-T RDL in combination with other Access-Ts, please be aware of the following issues:

- The Access-T 100-S or Access-T RDL cannot act as the master on a chain that has other versions of Access-T (Access-T 100, 200, 400, or 1500).
- The **SYSTEM→CHAIN PORT→CONFIG COPY** command does not copy all parameters from the master to slave units when the chain consists of mixed Access-T 100-S/Access-T RDL and other Access-Ts.
- In a master/slave configuration, the **COMMANDS→ RESET SYSTEM DEFAULTS** command does not function properly if both the master and slave units are Access-T 100-S.
- Access-T 100-S and Access-T RDL do not display an on-screen Alert if they are the master of a chain and a slave unit is removed from the chain. The Chain Poll History screen does display the correct alarm.
- Access-T can send Yellow Signal when it has lost sync on the received T1 signal. The default for this parameter for Access-T 100-S and Access-T RDL is **ON**. For other versions of Access-T (Access-T 100, 200, 400, or 1500), the default is **OFF**.
- If using SNMP to configure Access-T 100-S or Access-T RDL, the SET command does not function with the dsx1ConfigTable object. Configuration settings must be made via the Terminal Interface.
- A few screens and menu paths appear slightly different from other versions of Access-T. However, these differences do not affect performance.

Disabling Span Power

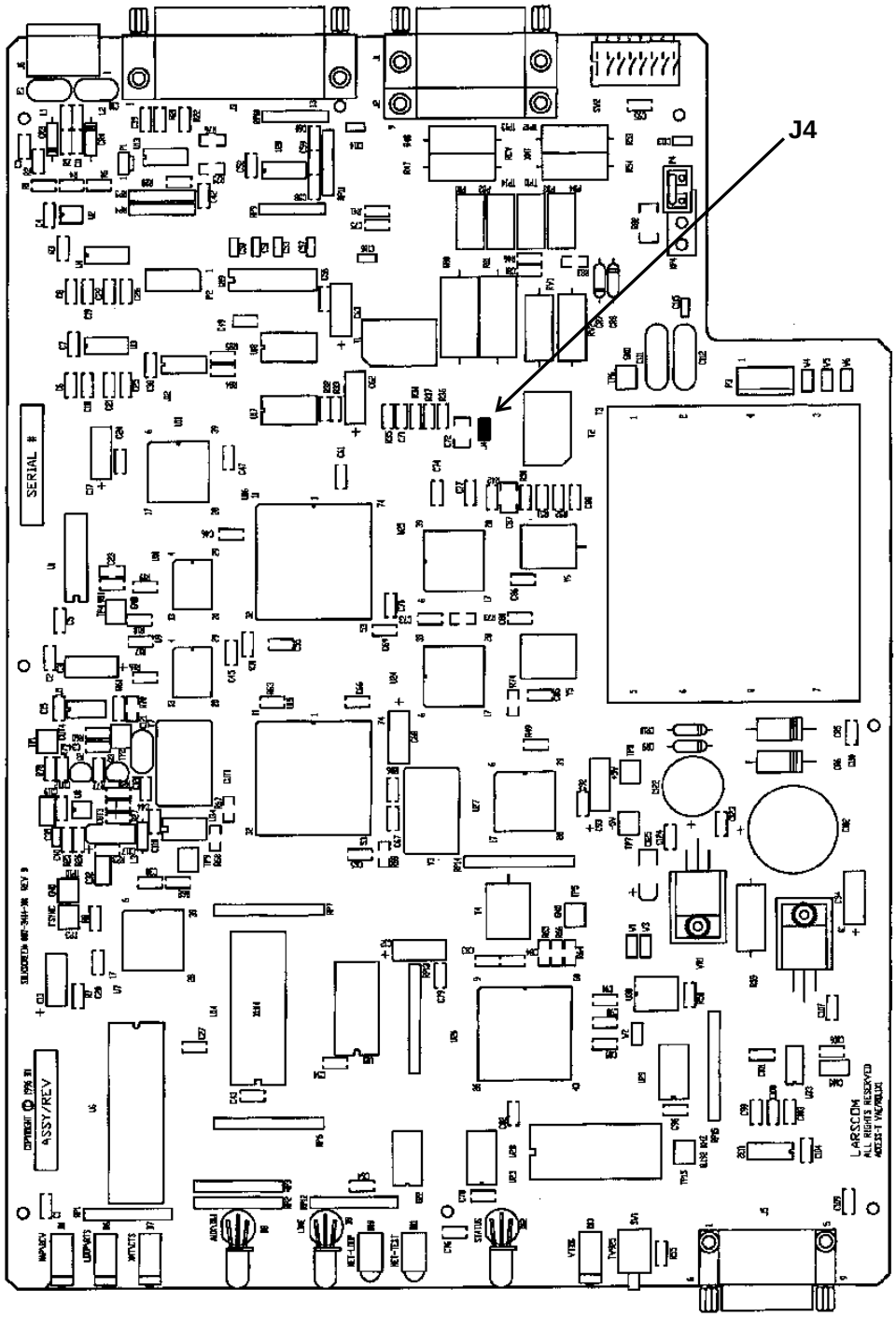
Access-T 100-S and Access-T RDL are internally configured to support span power. However, there may be certain instances where span power continuity is not desired. To disable span power, perform the following steps:

1. Using a Phillips-head screwdriver, remove the screws securing the top cover of the Access-T 100-S or Access-T RDL, then remove the top cover.
2. Locate jumper **J4** on the Access-T circuit board (refer to Figure 1).
3. Using wire snips, carefully clip the wire jumper and bend it back slightly to ensure there is no contact.
4. Replace the top cover, and secure it in place with the screws.

Verifiying a Remote Loop

The remote loopback **AUTO-VERIFY** command, described on page 7-32 of the *Access-T Multi-port DSU/CSU System Series 100, 200, 400, & 1500 Installation and Operation* manual, is not fully implemented for the Access-T 100-S and Access-T RDL. Using this command may not provide accurate loopback verification. To ensure accurate verification of loopbacks, use the **REMOTE-VERIFY** command, described on page 7-31 of the manual.

Back



Front

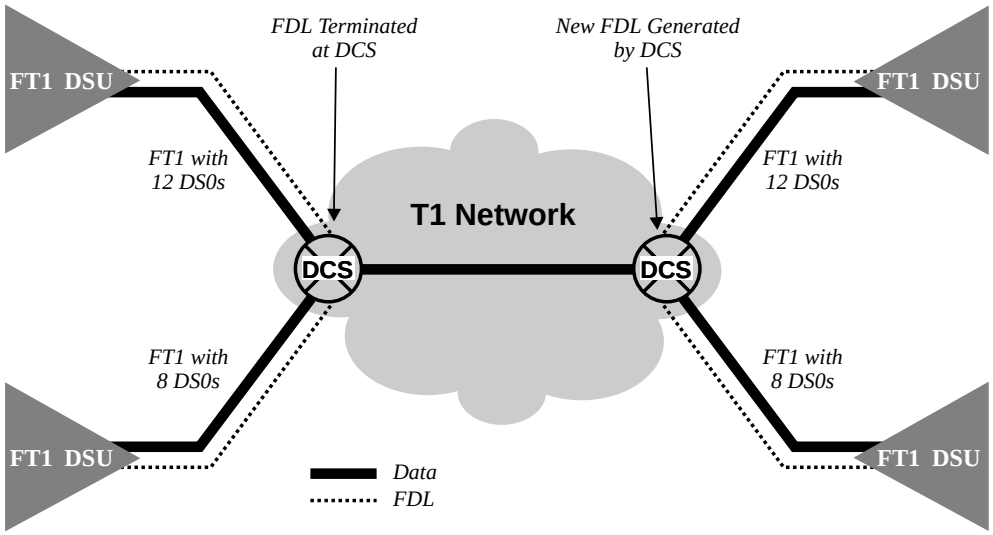
Figure 1. Location of Jumper J4

NOTE
The remainder of this supplement applies only to Access-T RDL.

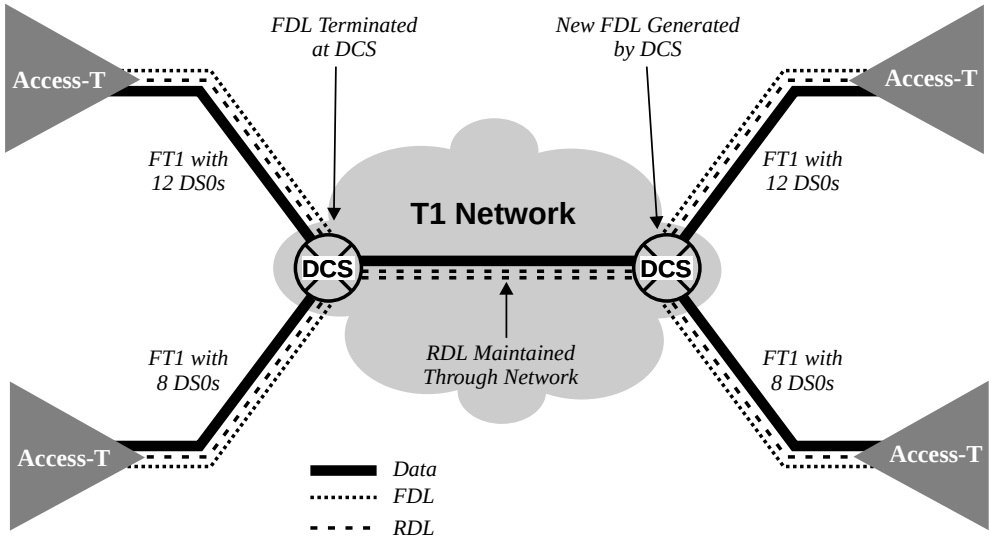
Access-T Robbed Bit Data Link (RDL)

With the growth of Internet and LAN/WAN access, the use of Fractional T1 has expanded. However, when an FT1 is merged with other FT1s by a DCS (Digital Cross-Connect Switch) in the central office, the management and performance information available from the T1 is truncated, as shown in Figure 3a. In this scenario, each FT1 that enters the DCS has its own T1 management and performance information. As the FT1s are cross-connected into a single T1, each of these individual management paths is terminated, and a new management information path is generated for the single T1. Thus, the end-to-end performance data for the individual FT1s is lost.

Larscom's Access-T RDL solves this problem by providing end-to-end performance monitoring of the FT1 data path via an in-band RDL (robbed-bit data link), as illustrated in Figure 3b. The following sections describe how the RDL works and how to control and use it via the Access-T command interface.



A. Typical FT1 DCS Solution



B. Access-T 100 RDL FT1 DCS Solution

Figure 3. Using Access-T RDL for Performance Monitoring Over a Fractional Network

Table B. RDL Framing Format

FRAME #	F-BITS	DATALINK	CRC/ALARM	DATALINK
1-4	1	D/L	CRC-4	D/L
5-8	1	D/L	CRC-4	D/L
9-12	1	D/L	CRC-4	D/L
13-16	1	D/L	CRC-4	D/L
17-20	0	D/L	R-ALARM	D/L

RDL Framing Format

The RDL bit stream, shown in Table B, uses one bit per T1 frame, resulting in an 8 KHz channel. (Note that the RDL frame numbers have no correspondence to T1 frame numbers.) The RDL multiframe is 20 frames in length; each frame has 10 data link bits, 5 alignment bits, 4 CRC-4 bits, and 1 remote alarm indication bit.

When RDL framing is lost (or regained), Access-T RDL sets (or clears) the alarm bit in the RDL register byte, which in turn toggles the **R-ALARM** bit shown in Table B. Access-T RDL declares LOF when the RDL frame remains out of sync for 2.5 seconds.

RDL Data Rates

The RDL takes a portion of the bandwidth from the FT1 payload. The RDL data stream is sent and received over the line, but does not appear at the DTE port. This means that the FT1 data rate on the line is different from the rate seen at the DTE port. The difference depends on which of the two RDL modes—Extra DS0 Mode or Robbed-Bit Mode—is selected. The actual rate at the DTE port will always be shown on the **SYSTEM—DS0 CONFIGURATION—CHANGE MAP x** screen, as **DATA=**[*rate*], whereas the FT1 data rate to and from the line is always in terms of the number of DS0s set in the current map (either Nx56 or Nx64).

The two RDL modes are explained below.

Extra DS0 Mode

In this mode, an entire DS0 is used for the RDL function, although only 8 kbps is used to create the data link. Thus, the data rate seen at the DTE port will be

either 64 kbps or 56 kbps below the rate as set in the current map (depending on how the **DTE—DTE PORT—RATE** parameter is set). Both transmit and receive clock signals sent to the DTE port will be smooth clocks.

In Extra DS0 Mode, Access-T automatically uses the highest-numbered DS0 as the data link. (For example, if you map DS0s 1-5 to DTE Port 1, DS0 5 will be used to create the data link.) If the mapping is changed later, Access-T will automatically reconfigure the RDL based on the new configuration.

> **Note:** To use the **XTRA DS0** RDL option, you must map *at least 2 DS0s* to DTE Port 1.

Robbed-Bit Mode

In Robbed-Bit Mode, one bit of one DS0 (i.e., 8 kbps of the fractional payload) is taken for the RDL function. This results in a DTE port data rate which is 8 KHz below the rate as set in the current map. The clock signals (both transmit and receive) sent to the DTE port by the Access-T will be gapped, with the gap occurring at the RDL bit position. In other words, there will be one missing clock cycle every 125 microseconds, regardless of DTE rate. *Because of this gapping, the* **DTE PORT** *option of the* **SYSTEM —MASTER CLOCK — SOURCE** *cannot be used when running in Robbed-Bit Mode.*

Enabling the RDL

To enable or disable the RDL, perform the following steps:

1. Select the **DTE—DTE PORT—RDL** menu path.
2. Select the desired RDL operation mode (**OFF**, **XTRA DS0**, or **ROBBED BIT**).
3. Press the **Esc** key.

RDL DTE Alarms

In order to monitor the performance of the RDL, Access-T has two new DTE alarms, as follows:

- **Port 1 LOF:** Access-T declares Port 1 LOF (Loss of Frame) when the RDL register byte declares an OOF (Out Of Frame) condition for at least 2.5 consecutive seconds.

- **Port 1 Remote:** Access-T declares a Port 1 Remote alarm when it receives a Port 1 LOF indication from the far-end device (similar to Yellow Signal).

For instructions on how to set up and view alarms, refer to Chapter 6 of the *Access-T Installation and Operation* manual: ACST-0351-005.

RDL 24-Hour Registers and One-Hour Statistics

All Access-T models—including Access-T RDL—provide a standard set of 24-hour register groups: **Telco, User, Aux, FDL Telco,** and **FDL User**. Access-T RDL provides additional end-to-end performance monitoring of the fractional data path with a CRC-4 and four more register groups: **RDL Telco, RDL User, RDL Local,** and **RDL Remote**. These extra register groups are described in the following sections.

RDL Telco and RDL User Registers

The RDL Telco and RDL User registers use the same performance parameters and return the same information as the FDL Telco and FDL User registers—the only difference is that the information is requested and received via the RDL rather than the FDL.

RDL Local and RDL Remote Registers

The RDL Local and RDL Remote registers are the DTE registers for the local and remote Access-T RDL units, respectively. These registers are patterned after those described in AT&T Publication 54016 (T1 ESF); ***however, they are not the same—there are several significant differences in the way they are calculated,*** as described below.

- **Errored Seconds (ES):** For the RDL, this is a second that has one or more channel framing or CRC-4 errors, but is not counted in the Unavailable Second (UAS) register.
- **Bursty Errored Seconds (BES):** For the RDL, this is a second that has two or more CRC-4 errors and no channel framing errors.
- **Severely Errored Seconds (SES):** For the RDL, this is a second that either has a channel framing error or a CRC-4 error count corresponding to a 7 x 10-4 bit error rate, but is not counted in the UAS register.

- **Unavailable Second (UAS):** For the RDL, this is a second that starts counting after 10 consecutive SES have occurred, and stops counting after 10 seconds in which no SES has occurred.
- **Loss of Frame Count (LOFC):** For the RDL, this is a count of the number of times LOF has been declared for the RDL. LOF for the RDL is declared if 2.5 seconds of continuous Out of Frame condition has occurred, or if the RDL is in a degraded condition over an integrated interval (as specified in AT&T Publication 54016). LOF Clear is a continuous second the OOF condition has not occurred.

Table C summarizes the functions of all registers available via the Access-T RDL.

Table C. RDL Registers

Register Group	Function
Telco	Records performance of input from the T1 line at the **local** Access-T RDL. Can only be cleared by the telco.
User	Records performance of input from the T1 line at the **local** Access-T RDL. Can be cleared by the user.
Aux	Records performance of input to the Aux port from a T1 DTE at the **local** Access-T RDL. Can be cleared by the user.
FDL Telco	Records performance of input from the T1 line at the **remote** Access-T RDL. Can be accessed via the FDL; can only be cleared by the telco.
FDL User	Records performance of input from the T1 line at the **remote** Access-T RDL. Can be accessed via the FDL; can be cleared by the user.
RDL Local	Retrieves DTE registers for the **local** Access-T RDL.
RDL Remote	Retrieves DTE registers for the **remote** Access-T RDL.
RDL Telco	Records performance of input from the T1 line at the **remote** Access-T RDL. Can be accessed via the RDL; can only be cleared by the telco.
RDL User	Records performance of input from the T1 line at the **remote** Access-T RDL. Can be accessed via the RDL; can be cleared by the user.

For definitions and additional explanation of the standard 24-hour registers, register parameters, and one-hour statistics provided by Access-T, refer to Chapter 2, Chapter 7, and Appendix B of the *Access-T Installation and Operation* manual: ACST-0351-005. For instructions on how to view and clear registers, refer to Chapter 7 of the manual.

RDL Loopback

Access-T RDL provides an additional loopback function to aid in testing end-to-end communication over the RDL. Similar to the FDL loopback, the RDL loopback is a Payload (DS Line) Loopback, and conforms to the characteristics defined in AT&T Publication 54016. However, because of the functionality of the RDL, this loopback provides true end-to-end testing of the entire FT1 link.

To enable or disable the RDL loopback, do the following:

1. Select the **TEST—LINE LOOP—REMOTE-UP** (to enable) or **TEST—LINE LOOP—REMOTE-DOWN** (to disable) menu path.
2. Select **RDL.**
3. Press **Enter**. The loopback will be put up or taken down.

For complete instructions on putting up and taking down loopbacks, refer to Chapter 7 of the *Access-T Installation and Operation* manual: ACST-0351-005.

RDL Menu Options

Table D lists all of the new menu paths supported by the Access-T RDL.

Table D. New Access-T RDL Menu Paths

Menu Path	Options/Results
ALARMS—SETUP—DTE—PORT 1 LOF—ENABLE ALARMS—SETUP—DTE—PORT 1 LOF—DIAL ALARMS—SETUP—DTE—PORT 1 REMOTE—ENABLE ALARMS—SETUP—DTE—PORT 1 REMOTE—DIAL	**NO**, YES **NO**, YES **NO**, YES **NO**, YES
DTE—DTE PORT—RDL	**OFF**, XTRA DS0, ROBBED BIT
TEST—LINE LOOP—REMOTE-UP TEST—LINE LOOP—REMOTE-DOWN	T1E1P, T1E1L, FDL, LINE, RDL T1E1P, T1E1L, FDL, LINE, RDL
REPORTS—CONFIGURATION—RDL REPORTS—DESCRIPTION—RDL	Far-end configuration display via RDL Far-end description display via RDL
REP ORTS—24-HOUR REGISTERS—RDL LOCAL REPORTS—24-HOUR REGISTERS—RDL REMOTE REPORTS—24-HOUR REGISTERS—RDL TELCO REPORTS—24-HOUR REGISTERS—RDL USER	Display showing the 24-hour count of the specified register type$^{\Delta}$ in 96 15-minute time intervals.
REPORTS—ONE-HOUR STATISTICS—RDL LOCAL REPORTS—ONE-HOUR STATISTICS—RDL REMOTE REPORTS—ONE-HOUR STATISTICS—RDL TELCO REPORTS—ONE-HOUR STATISTICS—RDL USER	Display showing the one-hour count of the specified register type$^{\Delta}$ in 4 latest 15-minute intervals.
REPORTS—ESF ERROR COUNT—RDL TELCO REPORTS—ESF ERROR COUNT—RDL USER	Displays the number of recorded ESF errors received at the specified register
COMMANDS—CLEAR REGISTERS—RDL LOCAL COMMANDS—CLEAR REGISTERS—RDL REMOTE COMMANDS—CLEAR REGISTERS—RDL USER	Clears the specified register group
COMMANDS—CLEAR ESF ERRORS—RDL USER	Clears the specified ESF error count

$^{\Delta}$ One of the following register types: Errored Seconds, Bursty Errored Seconds, Severely Errored Seconds, Unavailable Seconds, Loss of Frame Count

RDL DS0 Configuration Update

When the configuration of DS0 bundling maps is changed and the RDL feature is turned off, the changes must be sent to the far-end Access-T. This is still done using the **SYSTEM—DS0 CONFIGURATION—SEND** menu path. However, when the RDL feature is turned on and a change is made to the near-end DS0 configuration using the **SYSTEM—DS0 CONFIGURATION—CHANGE MAP x** menu path, you will see the following message displayed after entering the new DS0 configuration:

For RDL to work, this new DS0 configuration must be sent to the remote end.
Send now? (Y/N)

Entering **Y** immediately sends the new DS0 configuration to the far-end Access-T.

For complete instructions on DS0 configuration procedures, see the *Access-T Installation and Operation* manual: ACST-0351-005.

RDL Screen Updates

Several existing configuration and status screens have been updated to support the new Access-T RDL feature set. These screens include:

- Configuration.
- Description.
- Status.
- Alarms View.
- Alarm History.

For instructions on how to view these displays, refer to the *Access-T Installation and Operation* manual: ACST-0351-005.

Limited Warranty & License Agreement

1. Definitions

In this document, the following terms have specified meanings:

"Products" means all equipment manufactured by Larscom, including hardware components, firmware, software, and documentation, plus any enhancements, revisions, updates, or additions to said hardware, firmware, software, or documentation.

"Hardware" means any mechanical and/or electrical equipment or device manufactured by Larscom.

"Firmware" means the programmable read-only memory (PROM) embedded in Larscom-manufactured hardware.

"Software" means the object code representation of certain computer programs contained on magnetic media for use in conjunction with Larscom Products.

"OEM Products" means all equipment manufactured by original equipment manufacturers other than Larscom, and may include hardware components, firmware, software, and documentation, sold or distributed in conjunction with Larscom Products.

2. Grant of Software/Firmware License

Larscom Incorporated grants to you a non-assignable, non-exclusive license to use any enclosed Firmware and/or Software (hereinafter referred to as "Licensed Materials") as follows:

(a) Licensed Materials may be used only in conjunction with the Products.
(b) Licensed Materials may be copied into any machine-readable or printed form for backup or archival purposes to support your use of the Products.
(c) Licensed Materials and license may be transferred to another party, but only when transferred with Products in which the Licensed Materials are used, and only if the other party agrees to accept the terms and conditions of this Agreement.

You may not use, copy, or modify Licensed Materials, in whole or in part, except as expressly provided in this Agreement.

3. Term of License

This Agreement is in effect from the date on which you remove the Products from the package(s) and/or in any way use the Products and/or Licensed Materials. You may terminate this Agreement at any time by destroying the Licensed Materials, together with all copies, modifications, and merged portions in any form. Failure to comply with any term or condition of this Agreement will also terminate the Agreement.

4. Applicable Law

This Agreement is to be governed by and construed in accordance with the laws of the State of California. If any provision or portion of a provision of this Agreement is determined to be invalid under any applicable law, it shall be deemed omitted and the remaining provisions and partial provisions of this Agreement shall continue in full force and effect.

5. Ownership of Licensed Materials

Licensed Materials remain the sole and exclusive property of Larscom Incorporated. By removing the Products from the package(s) and/or in any way using the Products and/or Licensed Materials, you do not become the owner of the Licensed Materials, but are only entitled to use them according to the terms of this Agreement. You agree to use your best efforts and take all reasonable steps to safeguard the Licensed Materials to ensure that no unauthorized person shall have access to them and that no unauthorized copy, publication, disclosure, or distribution, in whole or in part, in any form shall be made. You acknowledge that the Licensed Materials contain valuable confidential information and trade secrets and that unauthorized use and/or copying could result in harm to Larscom.

6. Limited Warranty

Larscom warrants that its products, at the time of shipment, are free from defects in materials and workmanship and perform in accordance with the applicable data sheet or agreed-upon specifications when operated within the temperature and all other operating conditions limitations set forth therein under normal use for a period of three years from date of shipment from Larscom. Any OEM Products will be warranted in accordance with the terms and for the periods specified in the manufacturers' warranties which accompany the OEM Products. Buyer acknowledges that it will instruct users and installers in the proper methods and procedures as disclosed in the accompanying documentation, including safety procedures and warning notices, and in accordance with accepted industry standards and practice. The Limited Warranty is void if failure of the Licensed Materials or hardware has resulted from accident, abuse, misapplication, or act of God, or if the Product has been repaired or altered by someone other than Larscom.

The liability of Larscom hereunder is solely and exclusively limited to replacement, repair, or credit at the purchase price at Larscom's option for any product which is returned by Buyer during the applicable warranty period. Any replaced Hardware manufactured by Larscom will be warranted for the remainder of the original warranty period or 90 days, whichever is longer. For OEM Products, Larscom assumes no responsibility for product warranties, and will have no liability for any remedies.

EXCEPT FOR THE WARRANTY OF TITLE, LARSCOM MAKES NO OTHER WARRANTIES EXPRESS, IMPLIED, OR STATUTORY, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Copyright 1996

Larscom Access-T 100, 200, 400, & 1500 Network Access DSU/CSU

Software Downloading Instructions

This document provides instructions for downloading Access-T software from a personal computer (PC), directly or via modems. Access-T software consists of two parts: Network Interface Module (NIM) software and Multiplexer Module (Mux) software. The download procedure allows you to download software to Access-T Series 100, 200, 400, and 1500 units and Access-T 01 /02 units, as follows:

- Download NIM and Mux software to one Access-T Series 100, 200,400, or 1500 unit (either directly or via the chain).

  Note: Downloads to the Access-T 100-S or the Access-T 100-RDL are done through the craft port only.

  Caution: Downloading through the chain port supports an all-in-one flash download. If all your Access-Ts along the chain are not identical, downloads to the individual modules should be made via the individual craft ports.

- Download NIM and Mux software to the master Access-T Series 100, 200, 400, or 1500 unit as well as to all slaves on a chain.
- Download software in an Access-T Series 200,400, or 1500 unit's flash memory to its own or a slave's internal board(s).
- Download NIM and Mux software from diskettes to Access-T 01 /02 (older model).
- Download NIM or Mux software from diskettes to Access-T 01/02 (older model).

  Note: Access-T 1500s can contain up to 15 modules (cards). When this document refers to downloading to an Access-T 1500 unit, it refers to one or more modules.

Required Equipment

Downloading Access-T software requires the following equipment:

- IBM PC/ AT, Tandy 1400, or compatible personal computer. Must be equipped with async card and 3.5-inch floppy disk drive.
- 2 software distribution diskettes (Larscom part number 087-158D-xxx).
- Appropriate RS232 cable(s) as identified in step 3 under Setup.

Setup

1. Boot the DOS operating system on the PC.
2. Use the "diskcopy" function to create backup diskettes.
3. Connect the desired PC serial (COM) port to the **SUPV PORT** connector on the Access-T, either directly or via modems, using the appropriate Larscom RS232 cables as follows:

   Note: The Access-T 100-S and Access-T 100-RDL support modem connection only.

   - PC with male DB25 connector to Access-T Series 200/400 or 01 /02: cable 080-2463@.
   - PC with female DB25 connector to Access-T Series 200/400 or 01 /02. cable 080-2383-0xx.
   - PC with male DB connector to Access-T Series 200/400 or 01/02:cable 080-2393-Oxx.
   - PC with male DE9 connector to Access-T Series 1500: cable 080-2383-0xx.
   - PC with male DB25 connector to Access-T 1500: cable 0802603-xxx.
   - Modem with female DB25 connector to Access-T Series 200/400 or 01/02 or PC with male DB25 connector: cable 080-2633-0xx.
   - Modem with female DB25 connector to Access-T Series 1500 or PC with male DE9 connector: cable 080-2313-0xx.

4. Verify that each Access-T to be downloaded is configured for the appropriate hardware status and operation mode and has been given a unique node address. To verify and/or change an Access-T's hardware status, operation mode, or node address, do the following:

   a. **Access-T Series 1500 Units:** check the DIP switch settings on each module to be downloaded as described under **DIP Switches** in Chapter 3 of the *Access-T Network Access DSU/CSU System Installation and Operation* manual, ACST-0351-xxx.

   b. **Access-T Series 100, 200 and 400 Units:** check the DIP switch settings on the rear panel of the unit as described under **DIP Switches** in Chapter 3 of the *Access-T Network Access DSU/CSU System Installation and Operation* manual, ACST-0351-xxx.

   c. **Access-T 01/02 Units:** check the operation mode and node address software configuration as described under **System Configuration** in Chapter 6 of the *Access-T Installation and Operation* manual, ACST-0311-xxx.

5. Using the drop-down menus as described in the Access-T manual, set the Access-T **SUPV PORT** (Supervisor Port) for the following parameters:

   - Appropriate baud rate-Larscom recommends 9600 baud for direct connections or 2400 baud for modem connections.
   - 1 stop bit.
   - No parity.
   - Either terminal type (TV 925 or VT100).

6. If modems are used, verify that the modem at the Access-T site is configured as follows

100/200/400/1500	**100-S/100-RDL**
Auto answer (S0 = 1).	**Auto answer (S0 = 1).**
DTR detect on (&D2).	**DTR detect on (&D2).**
Echo off (E0).	**Echo off (E1).**
Quiet mode (Q1).	**Quiet mode (Q0).**
DCD enabled (&C1).	**DCD enabled (&C1).**

   Larscom recommends using one of the following modems: Ven-Tel 2400, Hayes 2400 Smartmodem, or Maxwell 2400 VP.

7. If you plan to download over the Chain Port, verify that all Chain Port connectors are installed as described in the Access-T operation manual.

8. Using the drop-down menus as described in the Access-T manual, verify that passwords are disabled on the Access-T unit.

General Downloading Procedure

1. *Determine which Software Distribution Diskette is to be used.* Use **Diskette #1** when downloading to an Access-T Series 200, 400, or 1500 unit (part # 087-0861-xxx-xx). Use **Diskette #2** when downloading to an Access-T 01/02 unit (part # 087-0511-xxx-xx). Use **Diskette #3** when downloading to an Access-T 100-S unit (part # 087-347D-101-xx). Use **Diskette #4** when downloading to an Access-T 100-RDL unit (part # 087-402D-101-xx).
2. To begin a download session, place the appropriate Software Distribution Diskette in the appropriate drive and select that drive. For example, enter **B**: if the diskette is inserted in drive B.
3. Type **DLEX** followed by the **Enter** key to start the download program.
4. Wait for the following display of command options:

```
ACCESS-T 2/4 PORT PC Download Program—D87-158D-201
(SINGLE-CARD DOWNLOAD SETUP)

port = 1  baud rate = 2400  chain port add. = 0  Device = 087-0861-xxx-xx

Command:--Baud--moDem commands--Escape--loGin--Hang up--dIal--load Mux
--load Nim--logOut--Port--Rtrv secu--tabs Status--card_resTart--ed secU
--Whole download--Larscom setup--chAin port address--all-in-one-Flash
--deviCe type--eXit
```

Commands are invoked by entering the letter which is capitalized in the display. (Commands can be entered in upper or lower case. Pressing the **Enter** key is not required.) Commands are defined in Table A.

5. Enter **C** and select the appropriate device type from the prompt:

```
Setup Device Configuration Type
Enter 1 for 087-0861 -xxx-xx, 2 for 087-0511-xxx-xx
3 for 087-347D-101-xx, 4 for 087-402D-101-xx
```

Enter **1** when downloading to an Access-T Series 100, 200, 400, or 1500 unit. Enter **2** when downloading to an Access-T 01 /02 unit. Enter

3 when downloading to an Access-T 100-S unit. Enter **4** when downloading to an Access-T 100-RDL unit.

6. If the port indicated in the display is not the PC COM port being used for downloading, enter **P** and select the desired COM port as prompted.

7. If the baud rate indicated in the display is not the baud rate defined for the Access-T **SUPV PORT**, enter **B** and select the desired baud rate as prompted.

8. *If the connection does not include modems*, skip to the section entitled **Specific Downloading Procedures**.

   If the connection includes modems, you must establish a connection as follows:

   a. Enter **E**. Respond as prompted with the appropriate escape string (usually **+++**) used to get the attention of the modem. Terminate the entry by pressing the Enter key.

   b. Enter **I**. Respond as prompted with the appropriate dial string (usually **ATD** followed by the telephone number of the receiving end) to dial the modem. Terminate the entry by pressing the **Enter** key.

      Note: Verify that the modem at the Access-T site is configured properly. See step 4 under **Setup**.

9. Skip to **Specific Downloading Procedures**.

Table A. Download Program Commands

Command	Description
Baud	Specifies the baud rate for downloading. Options are 300, 1200, 2400, 4800, and 9600. Default is 2400.
mo**D**em commands	Sends any command string to modem. Program prompts for string. Should be preceded by Escape command.
Escape	Gets attention of modem. Command prompts for modem escape string. In most cases the proper string is: **+++**.
lo**G**in	This command is not currently supported.
Hang up	Sends on-hook (disconnect) command to modem. Command prompts for modem hang-up string. In most cases proper string is **ATH**. Should be preceded by Escape command.

Table A. Download Program Commands (cont.)

Command	Description
d**I**al	Sends dial command to modem. Command prompts for dial string. In most cases the proper string is **ATD** followed by the number to be dialed.
load **M**ux	Loads Mux code to the Access-T. Prompt for descriptor file name requires response: **main2.des**.
load **N**im	Loads NIM code to the Access-T. Prompt for descriptor file name requires response: **nim2.des**.
log**O**ut	This command is not currently supported.
Port	Selects PC port (1 or 2) for communication with Access-T. Default is 1.
Rtrv secu	This command is not currently supported.
tabs **S**tatus	Displays TABS statistics for debugging purposes.
card_res**T**art	This command is not currently supported.
ed sec**U**	This command is not currently supported.
Whole download	Downloads both NIM and Mux software. Prompt for descriptor file name requires response: **all.des**.
Larscom setup	Selects single or multiple software downloads. (Multiple downloads for factory use only.)
ch**A**in port address	Tells master Access-T which node to download software to. Entries require a 2-digit number.
all-in-one-**F**lash	Downloads both NIM and Mux software to all units on the chain.
devi**C**e type	Selects the type of Access-T (2/4 Port or 01/02) you plan to download software to.
e**X**it	Exits from the download program.

Specific Downloading Procedures

Larscom provides five different download options. Follow the procedure for the type of download you wish to perform.

> **Note:** Do not attempt to download Access-T Series 100, 200, 400, or 1500 software to an Access-T 01/02 unit, or vice versa. Performing such a download will cause the download program to fail.

Downloading One Access-T Series 100, 200, 400, or 1500 Unit

Use this procedure to download the NIM and Mux code to a single Access-T Series 100, 200,400, or 1500 unit. This download can be achieved directly or over the chain.

1. Verify that Software Distribution Diskette #1 is loaded.
2. Verify that the appropriate cable is attached to the Access-T's Craft or Supervisory port and that the correct port baud rate is defined. If the cable is attached to the Craft port, the automatic baud rate detection feature will be executed to determine the correct baud rate when enabled.
3. **Select the Chain Port address.**
   If you are downloading through the Chain Port, enter **A** and type in the desired address (1-30) at the prompt, followed by the **Enter** key.

   > **Note:** This Download Procedure is not available for the Access-T 100-S or the Access-T 100-RDL.

   If you are NOT downloading through the Chain Port, set the Chain Port address to 0. Enter **A** and type **00** at the prompt, followed by the **Enter** key.
4. **Start the software download.** Enter **W** (Whole download) and wait for the following prompt:

   Enter (xxx.des) descriptor file name (or Ctrl-C to abort):
   Where xxx is **all** *for the Access-T 100, 200, 400, 1500;* **main3** *for Access-T 100-S; or* **main4** *for Access-T 100-RDL.*

   Enter

   ALL.DES, or
   MAIN3.DES, or
   MAIN4.DES

The download will take approximately 15 minutes at 9600 baud for a Series 200 unit and 30 n-dnutes at 9600 for the Series 100 and 400 units. If a download failure is indicated, repeat this step.

Go to **Completing the Download** *(step 5) on page 10.*

Downloading All Access-TSeries 100, 200, 400, or 1500 Units in a Chain

Use this procedure to download NIM and Mux code to all Access-T Series 100, 200, 400, or 1500 units in a chain. This procedure will first download code to the master, then to all the slaves in the chain.

1. Verify that Software Distribution Diskette #1 is loaded.
2. Verify that the appropriate cable is attached to the Access-T's Craft or Supervisory port and that the correct port baud rate is defined. If the cable is attached to the Craft port, the automatic baud rate detection feature will be executed to determine the correct baud rate.
3. **Set the Chain Port address.**
   Set the Chain Port address to **0**. Enter **A** and type **00** at the prompt, followed by the **Enter** key.
4. **Start the software download.** Enter **F** (all-in-one-Flash) and wait for the following prompt:

   Enter (xxx.des) descriptor file name (or Ctrl-C to abort):
   Where xxx is **all** *for the Access-T 100, 200, 400, 1500;* **main3** *for Access-T 100-S; or* **main4** *for Access-T 100-RDL.*

   CAUTION: Do not use "all-in-one-Flash" if you have at least one Access-T 01/02 unit on the chain. Use internal download from flash memory for a single unit (Larscom setup 4) instead.

   Enter

   ALL.DES, or
   MAIN3.DES, or
   MAIN4.DES

   The download will take approximately 45 minutes at 9600 baud.

Go to **Completing the Download** *(step 5) on page 10.*

Internal Download from Flash Memory

Use this procedure to download a copy of the software in flash memory to its own or another unit's internal board(s). This download is useful if the running copy of software gets corrupted.

1. Verify that Software Distribution Diskette #1 is loaded.
2. Select the Chain Port address. If you are downloading through the Chain Port, enter **A** and type in the desired address (1-30) at the prompt, followed by the **Enter** key.

   If you are NOT downloading through the Chain Port, set the Chain Port address to 0. Enter **A** and type **00** at the prompt, followed by the **Enter** key.
3. Start the software download. Enter **L** (Larscom setup). The following prompt will appear:

   Setup Larscom Manufacture Download

   Enter 1 for single card, 2 for multi-card,
   3 for all internal download, 4 for single unit internal download

   To download from the Access-T master to all Access-T slaves on the chain, enter **3** (All Internal Download). The download will take approximately 13 minutes for a 2-port unit and 30 minutes for a 4-port unit.

   CAUTION: Do not use "all-in-one-Flash" if you have at least one Access-T 01/02 and Access-T 100, 200, 400, and 1500 units on the same chain.

   To initiate an internal download (from flash memory to the Mux and NIM) on a specific Access-T 200 or 400 unit, enter **4** (Single unit internal download). The download will take approximately 3 minutes for a 2-port unit and 20 minutes for a 4-port unit.

Go to **Completing the Download** *(step 5) on page 10.*

Downloading NIM and Mux Software to Access-T 01/02 Unit

Use this procedure to download the NIM and Mux code to a Access-T 01 /02 unit.

1. Verify that Software Distribution Diskette #2 is loaded.
2. Verify that the appropriate cable is attached to the Access-T's Craft or Supervisory port and that the correct port baud rate is defined. If the cable is attached to the Craft port, the automatic baud rate detection feature will be executed to determine the correct baud rate ff enabled.
3. **Select the Chain Port address.**
   If you are downloading through the Chain Port, enter **A** and type in the desired address (1-30) at the prompt, followed by the **Enter** key.

   > **Note:** This Download Procedure is not available for the Access-T 100-S or the Access-T 100-RDL.

   If you are NOT downloading through the Chain Port, set the Chain Port address to 0. Enter **A** and type **00** at the prompt, followed by the **Enter** key.
4. Start the software download. Enter **W** (Whole download). The download will take approximately 15 minutes at 9600 baud.

   ***Go to* Completing the Download *(step 5) on page 10*.**

Downloading NIM or Mux Software to Access-T 01/02 Unit

Use this procedure to download either the NIM or Mux code to an Access-T 01 /02 unit.

1. Verify that Software Distribution Diskette #2 is loaded.
2. Verify that the appropriate cable is attached to the Access-T's Craft or Supervisory port and that the correct port baud rate is defined. If the cable is attached to the Craft port, the automatic baud rate detection feature will be executed to determine the correct baud rate ff enabled.
3. **Select the Chain Port address.**
   If you are downloading through the Chain Port, enter **A** and type in the desired address (1-30) at the prompt, followed by the **Enter** key.

If you are NOT downloading through the Chain Port, set the Chain Port address to 0. Enter **A** and type **00** at the prompt, followed by the **Enter** key.

4. Start the software download.

   a. To download the NIM software, Enter **N** (load-NIM) and wait for the following prompt:

      Enter (nim2.des) descriptor file name (or Ctrl-C to abort):

      Enter

      NIM2.DES

      The download will take approximately 7 minutes at 9600 baud.

   b. To download the Mux software, Enter **M** (load-Mux) and wait for the following prompt:

      Enter (main2.des) descriptor file name (or Ctrl-C to abort):

      Enter

      MAIN2.DES

      The download will take approximately 10 minutes at 9600 baud.

Completing the Download

5. For the first two or three minutes the display will show no activity, then several messages will be displayed. (Disregard the message, **Failed to get proper response.**) For the rest of the download, a block counter will increment as software is downloaded. During software download, certain status LEDs on the front panel of the Access-T receiving the new software will illuminate and flash. When downloading to a Series 200 or 400 or an Access-T 01/02 unit, LEDs illuminate and flash as follows:

   - **STATUS** LED turns red, then toggles between red and green during downloading.
   - **TV 925** and **VT100** blink green and return to off.

   When downloading to an Access-T 1500, LEDs illuminate and flash as follows:

   - The master module's **STATUS** LED turns red, and the D&I and **LINE** LEDs turn green. Then, the **STATUS** LED blinks green once per second.

- The slaves modules' **STATUS** LED blinks twice per second.

When downloading to an Access-T 100-S or 100-RDL, LEDs illuminate and flash as follows:

- The VT100 and TV 925 LEDs will both flash green. Then, the **STATUS** LED blinks red.

When a message indicates that the download has been successfully completed, the following display will occur:

The download is xx:xx min.

All Code Download Completed.
Press return key to continue

Note: If a download failure is indicated, repeat your specific download procedure. If the failure recurs, a hardware or configuration problem is the likely cause.

6. Press the **Enter** key as prompted to continue.

Disconnecting

7. If the connection includes modems, enter **E** and respond as prompted with the appropriate escape string (usually **+++**) used to get the attention of the modem. Terminate the entry by pressing the **Enter** key.

   Then enter **H** and respond as prompted with the appropriate hang-up string (usually ATH) to cause the modem to go on-hook. Terminate the entry by pressing the **Enter** key.

8. Enter **X** to exit from the download program.

9. Disconnect the PC from the Access-T. Reconfigure the Terminal Interface as required for normal operation.

Note to Access-T 100-S Users

When two Access-T 100-Ss with ESF Framing are connected back-to-back, the Far End will loop (Line Side line) after restarting the Near End. To ensure proper unit operation, always issue a loop-down after performing a download.

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP