XEL
Communications, Inc.

XEL

ARCADACS 100

Digital Access Cross-connect System

Reference Guide

Publication Order Number
9ZX-ACDX-USRS-2.5.10R.01
Issue 1
July 2003

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REGULATORY INFORMATION

Federal Communications Commission Part 15 - Regulation for telephone equipment

The product described herein has been tested and found to comply with the limits for a Class "A" Digital Device, pursuant to Part 15 of the Federal Communications Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used according to instructions in this Operations 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 their expense.

The authority to operate this equipment is conditioned on the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by the manufacturer.

This equipment was tested with shielded input/output and interface cables. It is recommended that shielded cables be used with the equipment to reduce interference whenever the possibility of interference is suspected.

FCC requirements and information on Part 68

This equipment complies with Part 68 of the FCC Rules.

Part 68 of the Federal Communications Commission (FCC) Rules permits this equipment to be directly connected to the telephone network. Standardized jacks are used for these connections. This equipment should not be used on party lines or coin phones.

If this equipment malfunctions, it may cause harm to the telephone network. This equipment should be disconnected until the source of the problem can be determined and until repair has been made. If this is not done, the telephone company may temporarily disconnect service.

The telephone company may make changes in its technical operations and procedures; if such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes. You will be advised of your right to file a complaint with the FCC.

If the telephone company requests information on what equipment is connected to its lines, give the following information:

- The telephone number to which this equipment is connected
- The USOC jack required: **RJ21X**

- The FCC registration number: **1H5USA-27100-DE-E**

Country-specific regulatory compliance information

CANADA

Industrie Canada requirements

NOTICE TO USERS OF THE CANADIAN TELEPHONE NETWORK

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

Before installing this equipment, ensure that it is permissible to connect to the facilities of the local telecommunications company. The equipment must 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 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: Do not attempt to make such connections yourself; contact the appropriate electrical inspection authority, or electrician, as applicable.

The Ringer Equivalence Number (REN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop that is used by the device to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total REN of all the devices does not exceed five (5).

Refer to Card and Assembly Descriptions on page 19 for REN information on FXO and FXS cards.

Contents

About This Guide

This Reference Guide is intended as a complete guide for system operators. This guide is organized as follows.

Regulatory information—includes agency compliance data.

Table of contents—includes lists of contents, figures, and tables.

About this guide—includes conventions used in this guide, customer service and ordering information, safety information, electrostatic discharge (ESD) prevention information, power supply information, and power source information.

General Information—provides a high-level description of the ARCADACS 100 hardware and system features.

Card and Assembly Descriptions—describes the system cards; front connector, alarm, and power feed assembly; and the backplane of the ARCADACS 100.

System Operation—describes the cross-connect capabilities of the system.

TL1 Command Interface—describes the structure and detailed Transaction Language-1 (TL1) commands used to program and operate the ARCADACS 100.

System Diagnostics and Testing—describes system alarms and performance monitoring data that you can evaluate while monitoring and testing the facilities.

Frequently-asked Questions—answers questions about software downloading, central processing unit (CPU) flash-load switching, Internet Protocol (IP) routing, performance monitoring, and voice lines.

Appendix A—provides technical specifications and requirements, and a list of the institutional standards supported by the ARCADACS 100.

Appendix B—provides a management information base (MIB) file for simple network management protocol (SNMP) stations that use an application other than HP Openview.

Appendix C—provides naming and numbering conventions used in Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) structures.

Appendix D—provides FXS and FXO signalling information.

Appendix E—provides a summary of TL1 commands and examples.

Conventions used in this guide

The following conventions are used throughout this Reference Guide to alert you to information that is useful and instructional, to information concerning potential damage to equipment, and to information concerning potential bodily injury. All individuals using ARCADACS 100 equipment should carefully read and follow the instructions included in this guide .

Note: A note gives information about a topic of importance, gives supplemental information, or amplifies information previously referenced.

Caution: A caution alerts you to a situation or potential for minor damage to system equipment or to system data.

WARNING! A warning alerts you to a situation or potential for significant damage to system equipment or to system data, or to the potential for bodily injury or death.

Typographic conventions

The following general typographic conventions are used in this guide.

Bold	Used in body text for names of buttons, dialog boxes, icons, menus, profiles, commands, options, parameters, and user input. Also used in property pages and sheets.
`Fixed`	Used in code examples for computer output, file names, path names, and the contents of online files or directories.
`Fixed Bold`	Used in code examples for text typed by the user.
`Fixed bold italic`	Used in code examples for variable user input.
Italic	Used in body text for book titles, chapter titles, file path names, notes requiring special attention, section titles, emphasized terms, and variables.
PLAIN UPPER CASE	Used in body text for environment variables and shortcut keys.

Customer service and ordering information

XEL Technical support

If you require technical assistance with installation, operation, or maintenance of the ARCADACS 100 System, or if you want to return a product for repair under warranty, please contact XEL Technical Support at phone number 800-544-6831.

If you want to return a product for repair under warranty, or to return a product out of warranty for repair, contact XEL Customer Service at phone number 303-696-2382.

If you purchased the ARCADACS 100 System from an authorized dealer, distributor, Value Added Reseller (VAR), or third party, please contact that supplier for technical assistance and warranty support.

Ordering information

Please contact your distributor to order equipment, cables, or additional copies of this guide.

Service requirements

In the event of equipment malfunction, all repairs must be performed by the manufacturer or its authorized agent. It is the responsibility of users requiring service to report the need for service to XEL Technical Support service.

General safety precautions

The equipment is designed and manufactured in compliance with Safety Standard EN60950. However, the following additional precautions should be observed to ensure personal safety during installation or service, and to prevent damage to the equipment or equipment to which it is connected.

Safety information

Read and follow all warning notices and instructions marked on the product or included in this guide.

1. This product must be grounded through the terminal marked with ⏚.

2. Slots and openings in the equipment are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, do not block or cover these slots and openings.

    Caution: Do not place anything directly on top of the equipment that can block ventilation.

3. DO NOT attempt to service this product yourself. Refer all servicing to qualified service personnel. Failure to observe these instructions will void the warranty.

4. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.

5. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the geographic locations in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.

6. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings **interconnected** through installed products. Consult a qualified electrical consultant to determine whether this phenomenon exists and, if necessary, implement corrective action before interconnecting the products.

7. Always use adequate Electrostatic Discharge (ESD) protection when handling circuit card assemblies and other electronic parts described in this manual.

Always observe the following special precautions. Only qualified technicians should perform these tasks.

8. Never install telephone wiring during a lightning storm.

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

10. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

11. Use caution when installing or modifying telephone lines.

WARNING! This product contains a Class 1 laser.

Electrostatic discharge prevention

The plug-in cards contain components that could be damaged by electrostatic discharge. When handling any cards, wear a properly grounded wrist strap to prevent possible card damage, or follow other suitable precautions to prevent equipment damage.

Power supply safety

An equipment grounding conductor not smaller in size than the ungrounded branch-circuit supply conductors must be installed as part of the circuit that supplies the product or system. Bare, covered or insulated grounding conductors are acceptable. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes. The equipment-grounding conductor must be connected to ground at the service equipment.

Power source

DC: -36.5V to -56.5V with 8 Amps Maximum

Overcurrent Protection: DC source 20 Amps

Additionally, the DC source must provide a means of disconnecting power from the supply, and the supply voltage must be provided from an isolated source complying with SELV requirements of EN60950, UL 1950, CSA 22.2 No. 950-M95.

Chapter 1 General Information

This guide provides reference information for the ARCADACS 100 scalable Digital Access and Cross Connect System. It addresses the system function, physical detail, capabilities and features, specifications, software commands and responses, operating scenarios, circuit card configuration, alarm management, displays, and associated diagnostics.

Specifications and standards for the system are contained in *Appendix A on page 365*.

For information on installing and provisioning the ARCADACS 100, refer to the *ARCADACS 100 Quick Start Guide*.

System overview

The ARCADACS 100 is an integrated, broadband network-access device specifically designed to facilitate both central office (CO) and outside plant (OSP) sites for copper systems. For purposes of clarity, the terms *structured* and *unstructured* (as used throughout this reference guide) shall be the equivalent of channelized and non-channelized, respectively.

Features

The ARCADACS 100 system supports the following features:

- TL1 command line programming, with downloaded software
- Optional Configuration Management Tool (CMT) graphical user interface
- Up to ten simultaneous TL1 command sessions (nine through Ethernet and one through the Craft port)
- Controlled access to system functions using application keys
- Structured (channelized) T1/E1 mapping capability with 1:N redundancy
- T3 mapping capability with 1:1 redundancy
- Synchronous transport signal level 1 (STS1) mapping capability with 1:1 redundancy
- DS3 to STS1 conversion using a dual-mode STS1 card
- Optical carrier level 3 (OC3) mapping capability with 1+1 line redundancy and 1:1 redundant mapper (S155) cards
- Synchronous transport module 1 (STM-1) and optical carrier level 3 (OC3) mapping capability with 1+1 line redundancy and 1:1 redundant mapper (S155) cards
- Time division multiplexing (TDM) cross-connect capability with 1:1 redundancy

- 2400 by 2400 DS0 static cross-connect capacity
- Alternate mark inversion (AMI) and bipolar 8-zero substitution (B8ZS) T1 coding
- Bipolar 3-zero substitution (B3ZS) T3 coding
- Superframe (D4), extended superframe (ESF), and subscriber loop carrier 96 (SLC-96) framing formats
- Performance monitoring on all ports, with capability of viewing alarms in TL1 sessions or from SNMP management stations

Note: If you have a network of ARCA-DACS 100 nodes, you can monitor the alarms from all of the nodes at the SNMP monitoring station.

- Retrieval of fault data for certain types of heartbeat failures on selected mapper cards (see Retrieve card exception data command on page 287)
- Automatic protection switching (APS) on S155 mapper cards
- Equipment and line loopback capability
- Metallic service unit (MSU) card with DS0 and DS1 monitor and split test capability (for T1 or E1 lines)
- Separate A and B power feeds for input dc voltage
- Front-panel connector and alarm access points
- Multiple clocking sources from selected mapper cards and from external equipment through connectors on the front panel
- MC68360-based CPU with 1:1 system redundancy
- Ethernet support, including IP address assignment, trivial file transfer protocol (TFTP) client process, TCP Telnet access for multiple (up to nine) simultaneous TL1 command sessions, and IP routing over facility data link (FDL) channels or DS0 channels
- Plain old telephone service (POTS) lines: up to 24 foreign exchange station (FXS) signals per card, with dial pulse originating (DPO) capability to support incoming direct inward dialing (DID)
- Central office (CO) to private branch exchange (PBX) support on foreign exchange office (FXO) cards, including two modes: FXO which provides loopstart and groundstart trunking, and dial pulse terminating (DPT) which provides one-way DID
- Network time protocol (NTP) for date and time synchronization
- Confirmation of network connectivity, by pinging a device through a TL1 command
- Secure access to SNMP data using community strings that can be provisioned through TL1 commands
- Choice of SNMP trap version to send to monitoring stations: proprietary traps with encapsulated TL1 text or standard traps based on XEL MIBs

- Read and write access to system name, system location, and system contact data through SNMP and TL1
- TL1 command logging to volatile memory buffer
- Telnet sessions in batch mode for OSS system
- Performance monitoring (PM) thresholds for T1 and T3
- GR834 test access support of third-party systems

Capabilities

The ARCADACS 100 system operates in the following system configuration:

- **Cross-connect configuration**—Cross-connection of mapped DS0 signals of various T1, T3, OC3, and STS1 network elements using time division multiplexing. Supported cross connections are T1 to T1, T1 to T3, T1 to STS1, T1 to OC3, T3 to T3, T3 to STS1, T3 to OC3, STS1 to STS1, STS1 to OC3, and OC3 to OC3.
- **POTS configuration**—Multiplexed voice traffic over the Pulse Code Modulation (PCM) interface of the backplane, providing 24 FXS ports per Voice card.
- **Central office, private branch exchange configuration—**Voice traffic in two modes: FXO and DPT, providing 24 FXO ports per card.
- **Combination configuration**—Combination operation of the above configurations with the capacity of any configuration determined by the number and type of functional cards installed in the system.

System redundancy

The ARCADACS 100 system may be configured to be fully redundant with the following components.

- 1:1 spared DC input (-48V, nominal) power
- 1:1 spared CPU card and clock I/O card
- 1:N spared ST1 mapper card (CT1-CSU, CT1-DSX) and SE1 mapper card using one T1/E1 I/O protection card per mapper card type
- 1:1 spared DS3 (CT3) or DS3R (CT3R) mapper card using one T3 I/O protection assembly per T3 network interface
- 1:1 spared STS1 mapper cards (in STS1 mode) using one STS1 I/O protection assembly per pair
- 1:1 spared STS1 mapper cards (in DUAL mode) using one STS1DS3 I/O protection assembly per pair
- 1+1 spared S155 mapper cards using one S155 I/O protection assembly per pair

- 1:1 spared TDM cross-connect card (XCON) card

Caution: XCON cards cannot be installed in the same system with IXCON, DS3, DS3R, S155, or STS1 cards. To support cross connections in a system with T1 interfaces, use XCON or IXCON cards. (IXCON cards support FDL muxing over DS0 channels.) To support cross connections in a system with T3 interfaces, use DS3 or DS3R cards. To support cross connections in a system with STS1 interfaces, use STS1 cards. To support cross connections in a system with STM-1 or OC3 interfaces, use S155 cards.

General system description

Introduction

The ARCADACS 100 system consists of a chassis, backplane, and a combination of I/O and logic plug-in cards. The chassis can either be rack-mounted with associated equipment or operated as a stand-alone unit. The cards can be either intelligent or unintelligent. The intelligent cards are equipped with microprocessors and can function independently of the system CPU. The unintelligent cards do not have microprocessors and are, therefore, under total system CPU control. The system may be fully redundant and input lines protected under most circumstances. Due to the flexibility in configuring the system with the various types of cards, a very wide range of detailed applications are possible within the configurations described in Capabilities on page 3.

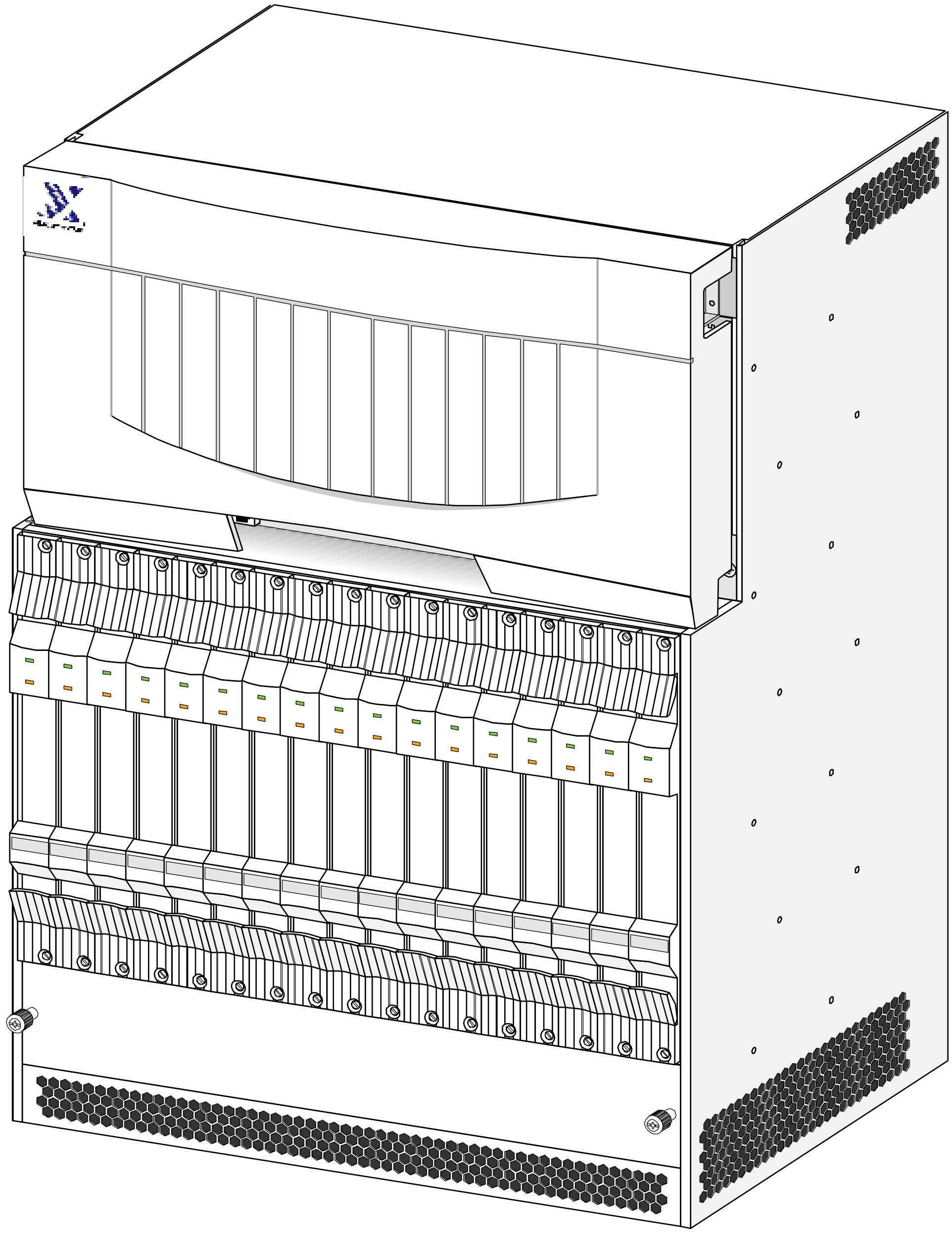
Protection can be provided for all E1 and T1 network I/O channels through use of protection cards. The system is operated using software commands from a craft terminal (VT-100 terminal-compatible) through an RS232 interface to the chassis using the TL1 transaction language protocol. After initial setup of an Ethernet interface, the system can also be operated remotely by way of a Telnet session.

Physical description

The ARCADACS 100 system consists of a 17-slot chassis and up to 15 plug-in I/O cards and 15 plug-in logic cards (see Figure 1). The I/O cards are located in the upper bank of card slots while the logic cards occupy the lower card slots. The front connector, alarm, and power feed (FCAPF) assembly panel is mounted in the chassis, between the upper and lower card slots.

Note: The last two lower card slots of the chassis are reserved for future use, and cannot be used by the logic cards at this time.

Figure 1. The ARCADACS 100 system



The listing of all system components is contained in Table 1 on page 6. The plug-in cards of the ARCADACS 100 system are divided into two types, I/O and logic. The functional assemblies are listed in Assemblies on page 10.

Equipment complement

The breakdown of system components by part name and description is provided in Table 1.

Table 1. ARCADACS 100 system components and parts

Part name	Description	XEL Part Number
ACDX-CHASSIS SYSC SYS BP BRAC BEZ C-TRAY FCAPF	 17-slot system chassis, including System backplane Mounting brackets, 19-inch, and Mounting brackets, 23-inch Chassis bezel Cable tray Front connector, alarm, & power feed assembly	**9ZX-ACDX-CHASSIS**
ACDX-FPB-IO	Blank I/O faceplates (upper)	9ZX-ACDX-FPB-IO
ACDX-FPB-DM	Blank mapper card faceplates (lower)	9ZX-ACDX-FPB-DM
ACDX-FP-DMIO	Blank mapper card faceplate and blank I/O card faceplate	9ZX-ACDX-FP-DMIO
ACDX-CLOCK-IO	Clock I/O card	9ZX-ACDX-CLOCK-IO
ACDX-BS-100	ACDX-CHASSIS W/Primary Clock IO and CPU	9ZX-ACDX-BS-100
ACDX--BS-100-R	ACDX-CHASSIS W/Primary and Redundent Clock IO and CPU	9ZX-ACDX-BS-100-R
ACDX-CPU-G1-DM	Central processing unit card (4 MB enhanced)	N/A
ACDX-CPU-G2-DM	Central processing unit card (8 MB)	9ZX-ACDX-CPU-G2-DM
ACDX-CE1-DM	E1 Mapper card, 8 port	9ZX-ACDX-CE1-DM
ACDX-CE1-DSX-DM	Structured E1 mapper card	
ACDX-CE1-DMIO	E1 Mapper card, 8 port, with I/O card	9ZX-ACDX-CE1-DMIO
ACDX-CE1-DMIO-P	E1 Mapper card, 8 port, with I/O protection card for N:1 redundancy	9ZX-ACDX-CE1-DMIO-P
ACDX-CET1-IO	T1/E1 I/O card	9ZX-ACDX-CET1-IO
ACDX-CET1-PIO	T1/E1 I/O protection card	9ZX-ACDX-CET1-PIO
ACDX-CT1-CSU-DM	Structured T1 mapper card, 8 port – CSU	9ZX-ACDX-CT1-CSU-DM
ACDX-CT1-DSX-DM	Structured T1 mapper card, 8 port – DSX	9ZX-ACDX-CT1-DSX-DM
ACDX-CT1-CSU-DMIO	Structured T1 mapper card, 8 port, and I/O card - CSU	9ZX-ACDX-CT1-CSU-DMIO
ACDX-CT1-CSU-DMIO-P	Structured T1 mapper card, 8 port, and I/O protection card -CSU	9ZX-ACDX-CT1-CSU-DMIO-P
ACDX-CT1-DSX-DMIO	Structured T1 mapper card, 8 port, and I/O card - DSX	9ZX-ACDX-CT1-DSX-DMIO
ACDX-CT1-DSX-DMIO-P	Structured T1 mapper card, 8 port, and I/O protection card - DSX	9ZX-ACDX-CT1-DSX-DMIO-P

Table 1. ARCADACS 100 system components and parts (continued)

Part name	Description	XEL Part Number
ACDX-CT3-DM	DS3 (T3) mapper card M3/1/0 crossconnect	9ZX-ACDX-CT3-DM
ACDX-CT3R-DM	DS3R (T3) mapper card	
ACDX-CT3-DMIO-R	DS3 (T3) mapper card and I/O protection card	9ZX-ACDX-CT3-DMIO-R
ACDX-CT3-PIO	Double slot T3 I/O protection assembly[1] for 1:1 switching	9ZX-ACDX-CT3-PIO
ACDX-FXO-DM	Foreign exchange office card, 24 ports	9ZX-ACDX-FXO-DM
ACDX-FXO-DMIO	Foreign exchange office mapper card, 24 ports, with FXO I/O card	9ZX-ACDX-FXO-DMIO
ACDX-FXO-IO	Ringer I/O card for use with foreign exchange office card	9ZX-ACDX-FXO-IO
ACDX-FXS-DM	Foreign exchange station (Voice) card, 24 ports	9ZX-ACDX-FXS-DM
ACDX-FXS-DMRNGIO	Foreign exchange station (Voice) card, 24 ports, with Ringer I/O card	9ZX-ACDX-FXS-DMRNGIO
ACDX-FXS-RNG-IO	Ringer I/O card for use with foreign exchange station card	9ZX-ACDX-FXS-RNG-IO
ACDX-IXCON-DM	Intelligent cross-connect card	9ZX-ACDX-IXCON-DM
ACDX-OC3-DM	S155 mapper card for OC3	
ACDX-OC3-DMIO-R	S155 mapper cards (2) with S155 I/O protection assembly[4] for OC3	
ACDX-OC3-PIO	S155 I/O protection assembly for OC3	
ACDX-STS1CT3-DMIO-R	STS1mapper cards (2) with STS1DS3 I/O protection assembly[3]	
ACDX-STM1-DM	S155 mapper card with 2400x2400 crossconnect	9ZX-ACDX-STM1-DM
ACDX-STM1-DMIO-R	S155 mapper cards (2) with dual S155 I/O protection assembly[2] for 1:1 switching for 1/0 2400x2400 crossconnect	9ZX-ACDX-STM1-DMIO-R
ACDX-STM1-PIO	Dual slot S155 I/O for 1+1 protection with Single Mode Fiber and two SC optical connectors	9ZX-ACDX-STM1-PIO
ACDX-STS1-DM	STS1 mapper card, 2 port	9ZX-ACDX-STS1-DM
ACDX-STS1-DMIO-R	STS1 mapper cards (2) with STS1 I/O protection assembly[3] sith 1:1 switching for 3/1/0 2400x2400 crossconnect	9ZX-ACDX-STS1-DMIO-R
ACDX-STS1-PIO	Double slot STS-1 I/O card for 1:1 protection	9ZX-ACDX-STS1-PIO
ACDX-XCON-DM	2400x2400 1/0 TDM cross-connect card	9ZX-ACDX-XCON-DM
ACDX-XCON-DMIO	2400x2400 1/0 TDM cross-connect card with I/O card	9ZX-ACDX-XCON-DMIO
ACDX-XCON-DMIO-R	2400x2400 1/0 TDM cross-connect cards (2) with both Upper Faceplates included	9ZX-ACDX-XCON-DMIO-R
ACDX-MSU-IO	Metallic service unit card with 2 RJ-48 interfaces and lower face plate	9ZX-ACDX-MSU-IO

Table 1. ARCADACS 100 system components and parts (continued)

Part name	Description	XEL Part Number
ACDX-DOC-SC	Documentation on CD	9ZX-ACDX-DOC-SC
ACDX-AIR-FILTER	Air Filter	
ACDX-AIR-FILTER-COVER	Cover for Air Filter slot	
ACDX-CHASSIS-FAN-TRAY	Fan tray assembly for cooling	

1. The T3 I/O protection assembly consists of a T3 I/O card and a T3 I/O protection card mounted together behind a double-width faceplate.
2. The S155 I/O protection assembly consists of a S155 I/O card and a S155 I/O protection card mounted together behind a double-width faceplate.
3. The STS1 I/O protection assembly consists of a STS1 I/O card and a STS1 I/O protection card mounted together behind a double-width faceplate.
4. The S155 I/O protection assembly consists of a S155 I/O card and a S155 I/O protection card mounted together behind a double-width faceplate.

I/O cards

The following cards form the series of I/O cards available for Release 2.5.10 of the system:

- Clock I/O (CLK IO) card (maximum of two per system)
- T1/E1 I/O (TE IO) card (maximum of nine per system)
- T1/E1 I/O protection (TE IOP) card (maximum of three per system)
- T3 I/O protection (CT3 IOP) assembly (maximum of six per system in a redundant configuration)

Note: The T3 I/O protection (CT3 IOP) assembly consists of a T3 I/O card and a T3 I/O protection card mounted together behind a double-width faceplate.

- STS1 I/O protection (STS1 IOP) assembly (maximum of six per system in a redundant configuration)

Note: The STS1 I/O protection (STS1 IOP) assembly consists of an STS1 I/O card and an STS1 I/O protection card mounted together behind a double-width faceplate.

- STS1DS3 I/O protection (STS1CT3 IOP) assembly (maximum of six per system in a redundant configuration)

> **Note:** The STS1DS3 I/O protection (STS1CT3 IOP) assembly consists of an STS1DS3 I/O card and an STS1DS3 I/O protection card mounted together behind a double-width faceplate.

- S155 I/O protection (S155 IOP) assembly (maximum of one per system in a redundant configuration)

> **Note:** The S155 I/O protection (S155 IOP) assembly consists of an S155 I/O card and an S155 I/O protection card mounted together behind a double-width faceplate.

- Ringer I/O (RNG IO) card (maximum of 11 per system)
- Metallic service unit (MSU) card (maximum of one per system)

> **Note:** The MSU card must be mounted in slot 17. The MSU card must be provisioned with the **ENT-EQPT** command.

Logic cards

The following cards form the series of logic cards:

- 8-MB CPU card (maximum of two per system)
- Structured T1 mapper – CSU (ST1-CSU) card (maximum of 10 per system, nine working and one protection)
- Structured T1 mapper – DSX (ST1-DSX) card (maximum of 10 per system, nine working and one protection)
- Structured E1 mapper (SE1) card (maximum of 10 per system, nine working and one protection)
- DS3 (CT3) or DS3R (CT3R) mapper card (maximum of six redundant pair per system)
- STS1 mapper (CTS1) card (maximum of six redundant pair per system)
- S155 mapper card (maximum of one redundant pair of cards per system)
- Foreign exchange station (FXS) card (maximum of 11 per system)
- Foreign exchange office (FXO) card (maximum of 11 per system)

- TDM cross-connect (XCON) card (maximum of two per system, one working and one redundant)

> **Caution:** XCON cards are not compatible with IXCON, DS3, DS3R, STS1, or S155 cards. XCON and IXCON cards support T1 interfaces only (IXCON cards have FDL muxing over DS0 channels), DS3 cards support T3 interfaces, STS1 cards support STS1 interfaces, and S155 cards support STM-1 and OC3 interfaces

- Intelligent cross-connect (IXCON) card (maximum of two per system, one working and one redundant)

> **Caution:** IXCON cards are not compatible with XCON, DS3, DS3R, or STS1 cards. XCON and IXCON cards support T1 interfaces only (IXCON cards have FDL muxing over DS0 channels), DS3 cards support T3 interfaces, STS1 cards support STS1 interfaces, and S155 cards support OC3 interfaces.

Assemblies

There is one functional assembly installed in the system: the front connector, alarm, and power feed (FCAPF) assembly.

Common equipment

A category of hardware called common equipment is required for every possible configuration of the system. The following listing is the equipment common to all configurations of the system.

- 17-slot system chassis (SYSC) including
  - System backplane (SYS BP) (installed in chassis)
  - Front connector, alarm, and power feed (FCAPF) assembly (installed in chassis)
  - DC wiring harness and FCAPF to backplane cables
- Clock I/O (CLK IO) card (maximum of two per system)
- 8-MB CPU card (maximum of two per system)

Card classification by intelligence

The I/O and logic cards of the system may also be classified as intelligent or unintelligent. Intelligent cards contain a microprocessor and can function independently of the CPU except when they are reset or replaced. Unintelligent cards do not have microprocessors and, therefore, are under CPU control at all times. Listing of the cards by intelligence classification is as follows:

Intelligent cards

The following cards form the series of intelligent cards available for the system:

- 8-MB CPU card
- Clock I/O (CLK IO) card
- Structured T1 mapper – CSU (ST1-CSU) card
- Structured T1 mapper – DSX (ST1-DSX) card
- Structured E1 mapper (SE1) card
- DS3 (CT3) or DS3R (CT3R) mapper card
- STS1 mapper card
- S155 mapper card
- Foreign exchange station (FXS) card
- Foreign exchange office (FXO) card
- Intelligent cross-connect (IXCON) card

Unintelligent cards

The following cards form the series of unintelligent cards:

- TDM cross-connect (XCON) card
- T1/E1 I/O (TE IO) card
- T1/E1 I/O protection (TE IOP) card
- T3 I/O protection (CT3 IOP) assembly
- STS1 I/O protection (STS1 IOP) assembly
- STS1DS3 I/O protection (STS1CT3 IOP) assembly
- S155 I/O protection (S155 IOP) assembly
- Ringer I/O (RNG IO) card
- Metallic service unit (MSU) card

Detailed descriptions of the system cards are provided in Card and Assembly Descriptions on page 19.

Card naming

To assist in the identification of the cards, Table 2 shows the common name, part name, and faceplate label for each card. The common name is used for all general references to the cards, the part name is used only when ordering new cards, and the faceplate label is what is printed on the faceplate of the card.

Table 2. Naming structure for ARCADACS 100 system cards

Common name	Part name	Faceplate label	XEL Part Number
Clock I/O	Digital Access Cross-connect System-CLOCK-IO	CLK IO	9ZX-ACDX-CLOCK-IO
T1 I/O	Digital Access Cross-connect System-CET1-IO	TE IO	9ZX-ACDX-CET1-IO
T1 I/O protection	Digital Access Cross-connect System-CET1-PIO	TE IOP	9ZX-ACDX-CET1-PIO
T3 I/O protection	Digital Access Cross-connect System-CT3-PIO	CT3 IOP	9ZX-ACDX-CT3-PIO
STS1 I/O protection	Digital Access Cross-connect System-STS1-DMIO-R[1]	STS1 IOP	9ZX-ACDX-STS1-DMIO-R
STS1DS3 I/O protection	Digital Access Cross-connect System-STS1CT3-DMIO-R[1]	STS1CT3 IOP	
S155 I/O protection (STM1)	Digital Access Cross-connect System-STM1-DMIO-R[2]	S155 IOP	9ZX-ACDX-STM1-PIO
S155 I/O protection (OC3)	Digital Access Cross-connect System-OC3-DMIO-R[2]	S155 IOP	
Ringer I/O (for FXS)	Digital Access Cross-connect System-FXS-RNG-IO	RNG IO	9ZX-ACDX-FXS-DMRNGIO
Ringer I/O (for FXO)	Digital Access Cross-connect System-FXO-IO	RNG IO	9ZX-ACDX-FXO-IO
MSU	Digital Access Cross-connect System-MSU-IO	MSU	9ZX-ACDX-MSU-IO
CPU (4 MB enhanced)	Digital Access Cross-connect System-CPU-G1-DM	CPU4	N/A
CPU (8 MB)	Digital Access Cross-connect System-CPU-G2-DM	CPU8	9ZX-ACDX-CPU-G2-DM

Table 2. Naming structure for ARCADACS 100 system cards (continued)

XCON	Digital Access Cross-connect System-XCON-DM	XCON	9ZX-ACDX-XCON-DM
IXCON	Digital Access Cross-connect System-IXCON-DM	IXCON	9ZX-ACDX-IXCON-DM
ST1 (CSU)	Digital Access Cross-connect System-CT1-CSU-DM	CT1-CSU or CTMC	9ZX-ACDX-CT1-CSU-DM
ST1 (DSX)	Digital Access Cross-connect System-CT1-dsx-DM	CT1-DSX or CTMD	9ZX-ACDX-CT1-DSX-DM
SE1	Digital Access Cross-connect System-CE1-DSX-DM	CE1-DSX	9ZX-ACDX-CE1-DSX-DM
DS3	Digital Access Cross-connect System-CT3-DM	CT3	9ZX-ACDX-CT3-DM
DS3R	Digital Access Cross-connect System-CT3R-DM	CT3R	
STS1	Digital Access Cross-connect System-STS1-DM	STS1	9ZX-ACDX-STS1-DM
S155 (STM1)	ACDX- STM1-DM	S155	9ZX-ACDX-STM1-DM
S155 (OC3)	ACDX-OC3-DM	S155	
FXS	ACDX-FXS-DM	FXS	9ZX-ACDX-FXS-DM
FXO	ACDX-FXO-DM	FXO	9ZX-ACDX-FXO-DM

1. This assembly is ordered as part of a set that also includes two STS1 mapper cards.
2. This assembly is ordered as part of a set that also includes two S155 mapper cards.

System interfaces

The ARCADACS 100 provides several interfaces for communicating with other equipment.

Subscriber or switch access

The mapper cards in the ARCADACS 100 system can be connected to the subscriber equipment or to the Class 5 local exchange switch, depending on the configuration. See Capabilities on page 3 for more information on possible configurations. The interfaces to the mapper cards are as follows:

- **ST1 mapper card**—50-pin Amphenol connector, located on the T1/E1 I/O cards in the upper slots of the chassis. Each connector supports eight pairs of T1 lines with 1:N redundancy.
- **SE1 mapper card**—50-pin Amphenol connector, located on the T1/E1 I/O cards in the upper slots. Each connector supports eight pairs of E1 lines with 1:N redundancy.
- **DS3, DS3R, and STS1 mapper card**—four 75-Ohm coaxial cables with BNC connectors, located on the associated I/O protection assembly in the upper slot of the chassis. Each pair of cables represents one port, which supports one DS3, or STS1 signal.
- **S155 mapper card**—two single-mode fiber cables with a pair of SC connectors at each end, located on the S155 I/O protection assembly in the upper slot of the chassis. Each pair of cables represents one port, which supports two redundant optical signals. Each optical signal is physically connected to a separate S155 mapper card (to provide one working line and one protection line).
- **FXS and FXO mapper card**—50-pin Amphenol connector, located on the front of the FXS or FXO cards in the lower slots of the chassis. Each connector supports 24 Tip and Ring signals for the 24 voice ports.

User access

The ARCADACS 100 system offers user or client access to the system through two interfaces:

- **Craft interface**—serial RS232 port, located at the left end of the front connector, alarm, and power feed (FCAPF) assembly mounted in the chassis. The port is VT-100 compatible and supports a TL1 command line interface. To connect to the port, a device must be configured at 9600 baud, 8 data bits, no parity, one stop bit, and flow control set to `none`. The craft interface provides an access point for testing, diagnostic, and initial provisioning activities.
- **Ethernet interface**—There are two 10Base-T ports, located on the clock IO cards. It supports the following capabilities:
  - Internet protocol (IP) address assignment
  - Telnet TL1 transmission control protocol (TCP)
  - IP routing over facility data link (FDL) and over up to 16 DS0 channels
  - Trivial file transfer protocol (TFTP) client capability
  - SNMP trap (alarms) transmission to SNMP management stations

You must perform the initial TL1 provisioning from the craft port before you can use the Ethernet port.

IP address assignment

IP address assignment allows a packet to travel across multiple networks to its destination. Data configuration for the Ethernet interface permits the following actions:

- Set up Ethernet or access port for IP routing through the system, including
  - Enable and disable access IP routing port through GATEWAY switching
  - Change the default IP address of the system
  - Set the IP address mask
  - Set the IP broadcast address
  - Set the MTU (maximum packet size) for IP data routing
- Retrieve Ethernet port settings for IP routing (including all parameters above plus MAC address)
- Add and delete entries from IP routing table
- Retrieve current IP routing table settings
- Add and delete IP addresses from the SNMP management table

Telnet TL1 TCP/IP

The Telnet TL1 TCP/IP protocol permits up to five users to issue TL1 commands to the system over the Ethernet at the same time. Other than the **login** TL1 command, no user names or passwords are required. Only one TL1 session should be used for provisioning the system at any time. The other TL1 sessions should be reserved for monitoring system performance.

After the initial craft terminal configuration of the system, any Telnet TL1 session can perform all the TL1 system control functions that the craft terminal provides.

IP port numbers and characteristics

Port numbers	characteristics
30000 to 30004	These ports are for normal telnet connections via applications like HyperTerminal. These ports have a configurable TL1 timeout. The port default is set at 30 minutes. Upon timeout, the user is logged out and the socket is disconnected.
30005 to 30007	These ports are designed to the Telcordia GR-1665 and GR-834 specifications. These ports have a configurable TL1 timeout. Ports 30005, 30006, and 30007 have no TL1 timeout defaults
30008	This port is designed for test access equipment. It has a 30-minute TL1 timeout that restores all test access connections and disconnects the port.

IP routing

The ARCADACS 100 system provides IP routing to other equipment with IP capabilities. You can configure the packet size, from 100 to 480 bytes. The system default is 240 bytes. This size limitation reduces fragmentation and packet reassembly within the network; it also eliminates the need for fragmentation and reassembly software on the CPU.

You can provision IP access routes using two types of resources:

- Facility data link (FDL) channels
- DS0 channels

Facility data link channels

You can provision an FDL channel on each of the eight ports of the structured T1 (ST1) or E1 (SE1) mapper cards, and on the DS1 facilities of the DS3R cards. An FDL channel has a 4-KB bit rate. To provision FDL channels, use the **ADD-IPRT** command (see page 107).

Note: Before you can add an IP route using an FDL channel on a DS3R card, you must provision the DS3R card with an FDL setting of NMS or ANSINMS using the **ED-FAC** command (see page 167).

DS0 channels

You can provision an IP access route on up to 16 DS0 channels of the ST1, SE1, DS3, and STS1 cards. A DS0 IP access route has a 64KB bit rate. To provision an IP access route on a DS0 channel, use the **ENT-TP** command (see page 247) to assign the DS0 channel to a termination pointer and then use the **ADD-IPRT** command (see page 107) to assign the termination pointer to an IP route.

TFTP client capability

The Ethernet interface provides trivial file transfer protocol (TFTP) client capability for downloading and uploading software to the system from an external server. The external server must have an IP address to allow access to it using TL1 software download and upload commands. See Download software command on page 135 and Upload nonvolatile memory command on page 138.

Note: You must have the TFTP server launched before uploading or downloading software.

SNMP management stations

There is a set of SNMP management information base (MIB) files (for the system, shelf, T1, T3, STS-1, STM-1, FXS, FXO, and so on) to assist in managing the system. The MIBs are provided on the CD that contains the system software.

The SNMP management stations must have an application that supports SNMPv2, such as HP Openview™. From these stations, you can do the following:

- **Monitor alarms in the** —Alarm messages are sent to the SNMP management stations as appropriate SNMP traps based on a MIB.

  For more information about alarm messages, see System Diagnostics and Testing on page 299.

- **Change the system name, system location, and system contact through SNMP**—You can assign a maximum of 255 characters for each of these parameters.
- **Monitor invalid log-in attempts**—An authentication trap is sent to the SNMP monitoring stations each time an invalid community string or IP address is used to access the .

Note: If you have a network of ARCADACS 100 nodes, you can monitor all of the nodes at an SNMP monitoring station.

Note: If you have an SNMP-compatible application other than HP OpenView, you may have to configure your application with the appropriate MIB definition. Contact technical support for applicable MIB files.

To provision the IP addresses of the SNMP management stations for the , see Edit management IP list command on page 273.

To provision the community strings for accessing the SNMP data in the , see Create community string command on page 275.

System software description

You can program the system using the following software:

- **Transaction Language 1 (TL1) command line interface**—includes command line text and error messaging. See TL1 Command Interface on page 85 for descriptions of TL1 commands used to commission and provision the system.
- **Configuration Management Tool (CMT)**—graphical user interface that translates your selections into commissioning and provisioning TL1 commands and passes the commands to the system. The CMT application is separately orderable under part number CMT-NTSWDC. Instructions for using the application are provided on the program CD, in the *Configuration Management Tool User's Guide*.

2

Chapter 2 Card and Assembly Descriptions

This chapter provides descriptions of each card and assembly of the system plus a description of the system backplane and its various buses.

The cards are divided into two types, I/O and logic. The I/O cards plug into the upper slots of the system chassis, and the logic cards plug into the lower slots. The front connector, alarm, and power feed (FCAPF) assembly is mounted in the chassis between the upper and lower card slots.

The I/O and logic cards are also classified as intelligent or unintelligent. Intelligent cards contain an on-board microprocessor and can function independently of the CPU. Unintelligent cards do not have on-board microprocessors and, therefore, are under CPU control at all times. The cards, assembly, and backplane are covered in the following order:

- Intelligent cards
  - CPU card
  - Clock I/O (CLK IO) card
  - Intelligent cross-connect (IXCON) card
  - Structured T1 mapper – CSU (CT1-CSU) or DSX (CT1-DSX) card
  - Structured E1 mapper (SE1) card
  - DS3 mapper (CT3) card
  - DS3R mapper (CT3R) card
  - STS1 mapper card
  - S155 mapper card
  - Foreign exchange station (FXS) card
  - Foreign exchange office (FXO) card
- Unintelligent cards
  - TDM cross-connect (XCON) card
  - T1/E1 I/O (TE IO) card
  - T1/E1 I/O protection (TE IOP) card
  - T3 I/O protection (CT3 IOP) assembly
  - STS1 I/O protection (STS1 IOP) assembly
  - STS1DS3 I/O protection (STS1CT3 IOP) assembly

  - S155 I/O protection assembly
  - Ringer I/O (RNG IO) card
  - Metallic service unit (MSU) card
- Assemblies
  - Front connector, alarm, and power feed (FCAPF) assembly
- System backplane

CPU card

CPU cards perform the following functions:

- System initialization
- Communication with all other cards
- Providing the user interface
- Operations, administration, maintenance and provisioning (OAM&P)
- Management of the intelligent cards
- Management of the unintelligent cards
- Control of all alarm relays and fuse functions
- Verification of system power-on and protection status
- Storage of system data
- Storage of card provisioning data for all cards
- Storage of termination pointers and cross-connection data
- Download of card provisioning data to new cards
- Full redundancy of all data between the active and standby CPU card
- Detection of fan failure

The 8-MB CPU card also has a real-time clock.

The CPU cards are based on the MC68360 microprocessor and have the following storage capacity:

8-MB CPU card

16 MB of DRAM

16 MB of flash ROM (8 MB per bank)

1 MB of NVRAM

Configuration requirements for CPU cards

You **must** use 8-MB CPU cards for configurations that cross connect signals with any of the following types of cards:

- DS3
- STS1

Note: As of the 2.5.8 release, only the 8-MB CPU is supported.

CPU card interfaces

The CPU card is designed for insertion only in logic (lower) card slots 1 and 2 of the system chassis. The CPU card communicates with other intelligent cards using DPRAM and accesses NVRAM through system memory. System function during power-on requires at least one working CPU card. Once the system is running, it can sustain normal operations even under a temporary CPU card outage. NVRAM stores nonvolatile system information on both CPU cards for redundancy. It includes input and output interface circuits used for activities such as serial communications, Ethernet LAN network management, and alarm generation.

CPU card features and functions

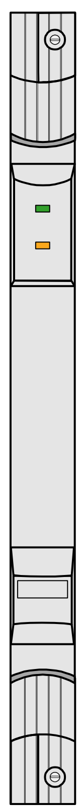
Along with the MC68360 microprocessor, the CPU cards include a large number of specialized features as follows.

- **Backplane buffers**—Ensure that bus sharing between several cards is not corrupted if one card is inserted or removed from the system while it is active
- **I/O ports**—The CPU parallel port pins are configured as input or output bits
- **Real-time clock**—Once the time has been set, switching activity between CPU cards does not reset the time.
- **Network Management System (NMS) and craft (RS423 drivers)**—Circuits used to interface the serial channel circuits, TL1/craft port on the FCAPF assembly; also permitting TL1/craft interfaces on both CPU cards to use one common physical port
- **TBOS (RS422 drivers)**—Circuits supplying an interface between the microprocessor serial channel circuits and the MSU exterior TBOS port (when so equipped)
- **10BaseT Ethernet port**—Interfaces with CPU MC68360
- **DRAM banks**—Support run-time data on a 32-bit data bus with parity supported
- **Flash ROM bank**—One CPU card supports two banks of Flash ROM, each re-programmable onboard. Flash memory maintains application software. The software executes from the flash memory.

- **NVRAM**—Stores all configuration and card-provisioning data
- **RAM**—Stores complete cross-connection and termination pointer data
- **Boot EEPROM**—Used for system power-up boot from the CPU card; stores all boot code and fixed system configuration parameters; maximum size is 256k by 8 bits
- **TBOS serial port**—Telemetry byte-oriented serial (TBOS) asynchronous RS422 port, with TX+, TX-, RX+ and RX- assigned to the CPU MC68360
- **Craft/TL1 serial port**—Asynchronous port with TX, RX, RTS, CTS, CD and DTR; interfaces with CPU through an external UART controller
- **NMS serial port**—Synchronous port with TX, RX, RTS, CTS, CD, DTR, DSR, RI, TXCLKOUT, TXCLKIN and RXCLKIN; assigned to CPU MC68360
- **LED**—Two failure or status LEDs change color depending upon CPU condition. The top LED switches between green and red, and the bottom LED switches between green and amber. See Card failure and status LEDs on page 307, for further details.

The CPU card front panel is shown in Figure 2.

Figure 2. CPU card front panel



CPU card software download capability

The CPU facilitates the download of software using the Ethernet connection to an active or inactive CPU card, or to an intelligent card. A software download is a two-step process that requires activation of the new load after load transfer is complete. The CPU also permits upload and download of an NVM image to the active CPU card. The CPU card communicates the success or failure of the download by way of alarm manager functions (see Alarm and event manager on page 25).

Downloading to an active or inactive CPU card

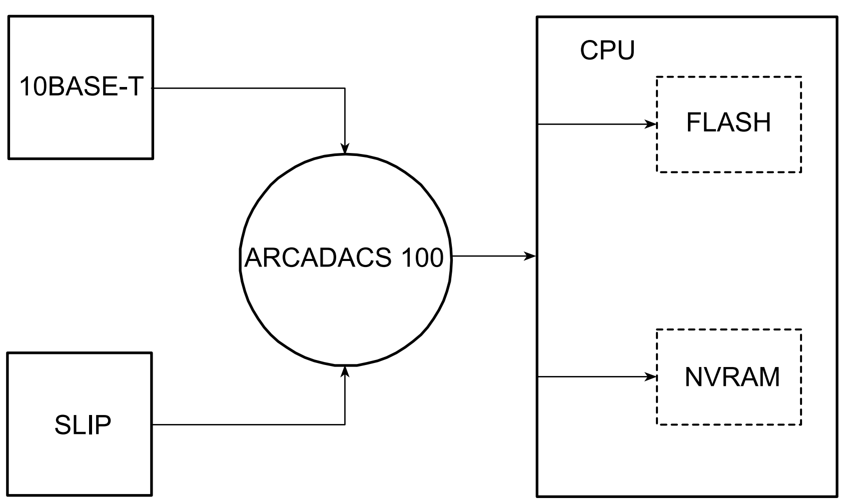
Using appropriate TL1 commands, you can download software from an Ethernet connection to the inactive Flash bank of the active CPU card. The received load is directed to either the flash (for application software download) or NVRAM (for provisioned data download) memory on the active CPU card, and its cyclic redundancy check (CRC) is verified following download completion.

Note: If the value of the CHECKSUM = FFFFFFFFFFFF, the software did not download successfully. Repeat the download procedure.

During the download process, the CPU blocks acceptance of other TL1 commands. See TL1 Command Interface on page 85, for applicable commands. Following successful download, the card exits the blocking mode.

Figure 3 illustrates a download to an active CPU card.

Figure 3. Downloading to the active CPU card



Downloading to an intelligent card

During the download process, the intelligent card receives the download into flash memory. The download is always made to the inactive flash memory of an intelligent card.

Note: IXCON, DS3, S155, and STS1 cards must be put out of service in order to accept a download. In a redundant system, download the software to one card at a time. In a nonredundant system, you will lose traffic while downloading to an IXCON, DS3, S155, or STS1 card.

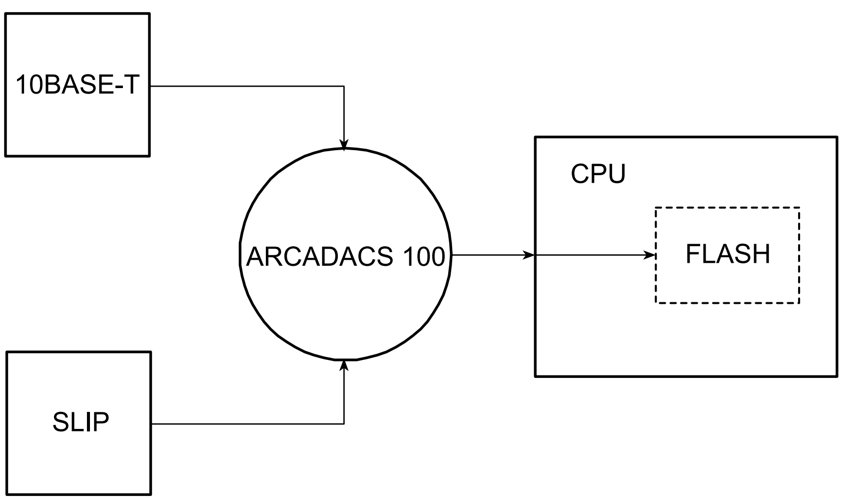
Following download completion, the alarm manager verifies and reports the results. If the appropriate TL1 command is not issued to activate the load, the card resets when it is put back into service. Figure 4 illustrates an intelligent card download sequence.

Download events and alarms

If the CHECKSUM value is FFFFFFFF, the download has failed. A failed download to an intelligent card requires the download be re-transmitted. A failed activation after a new download requires user intervention to activate the previous load (if applicable).

See Download software command on page 135, and System Diagnostics and Testing on page 299, for details on download commands and alarm reporting messages.

Figure 4. Downloading to an intelligent card



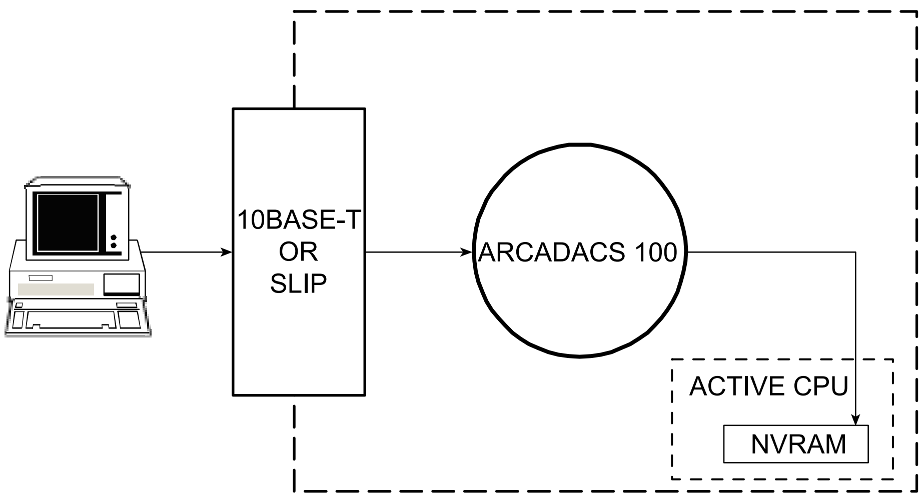
Uploading and downloading NVRAM to and from an active CPU card

To create a backup of the configuration data, you can upload the NVRAM file to a local server connected through Ethernet. To restore the configuration data, you can download from the backup file to NVRAM on the active CPU card.

When uploading or downloading NVRAM, the TL1 download command specifies the NVRAM as its target, and makes NVRAM the only available option. The load writes directly to or from the NVRAM on the active CPU card. If the CRC is acceptable following the download, the NVRAM activates immediately causing a CPU reset, and the alarm manager reports the results. It is not necessary to activate an NVRAM download. If the download fails, the previous card configuration is restored. Figure 5 illustrates the NVRAM upload and download process.

Note: On NVRAM upload the CPU does not reset. The practice of NVRAM upload for backup purposes should be a regularly scheduled maintenance activity.

Figure 5. NVRAM upload/download to and from an active CPU card



Alarm and event manager

The alarm and event manager (ALM) software feature is a system network element process residing in the CPU card. The ALM maintains a database of all alarms and events detected throughout the system on all installed cards, both common and optional. The ALM keeps a log of all events and reported abnormal conditions, updates card status for each reported condition (SET or CLEAR), determines the severity and actual effect on service, and prepares the data for generation of autonomous messages.

Autonomous messages are sent, as the alarms occur, to all users who are logged into a TL1 command session as well as to as many as four SNMP monitoring stations. You can request an alarm history for a specified time period or view the entire alarm log, using TL1 commands.

An alarm hierarchy system masks out all low-level alarms and events when triggered by high-level alarms and events to prevent unnecessary alarms being displayed. This allows only root causes to be reported. The ALM changes severity for certain types of alarms and responds to various TL1 user requests, permitting flexible alarm management.

Other functions of alarm manager include activating shelf LEDs located on the FCAPF assembly and optional card LEDs. See System Diagnostics and Testing on page 299, for further details on the alarm and event manager.

CPU redundancy

The system features CPU 1:1 redundancy when so equipped. Only the active CPU card communicates with the other cards in the system.

The following conditions invoke CPU activity transfer:

- Loss of power or removal of the active CPU card
- Software fault detection on the active CPU card
- Operator command

The redundancy transfer activity between CPU cards is transparent to user traffic on all facility interfaces.

Note: If a system contains two functioning CPU cards and two functioning Clock I/O cards, removing the Clock I/O card above the active CPU card causes the CPU activity to transfer to the remaining CPU card. If there is an active Ethernet connection at the time, it is also moved to the remaining CPU card.

Standby operation

When configured for full protection, the CPU cards are *hot* synchronized to each other, which means that the redundant CPU card has an exact, current copy of the data on the active CPU card.

Both CPU cards contain a complete picture of the system configuration and card-provisioning data. The system configuration data includes Time Division Multiplexing (TDM) termination pointer (TP) data used in cross connections. When you reset or replace any provisioned card in the system, the active CPU card downloads the provisioning data to the card.

Caution: If you remove the CPU card in a nonredundant system, or you replace both CPU cards at the same time in a redundant system, you lose all system provisioning. To preserve the configuration in a redundant system, replace the first CPU card and wait until it synchronizes to the data in the second CPU card. Then replace the second CPU card and wait for it to synchronize to the first card. To preserve the configuration in a nonredundant system, insert the new CPU card and wait for it to synchronize with the old CPU card. Then remove the old CPU card.

Clock I/O card

The Clock I/O (CLK IO) card provides the primary and secondary reference clocks for the system, as well as an Ethernet 10BaseT Media Access Unit (MAU) interface for the Telnet and TFTP connectivity. The Clock I/O card supports up to five clock input sources. You can configure the first four sources, and the fifth source is always set to the local system clock. The sources that are available are as follows:

- **LOCAL**—internal timing
- **ST1, SE1,DS3, DS3R, S155, or STS1 cards**—up to two sources
- **External BITSA and BITSB interfaces**—(located on the front control, alarm, and power feed assembly) up to two sources

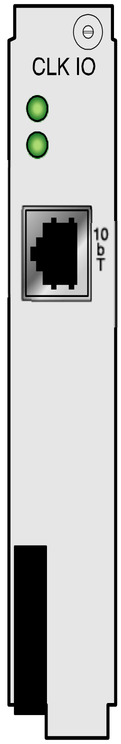
The Clock I/O card is designed for insertion only in I/O (upper) slots 1 and 2 of the chassis (above the CPU slots). The Clock I/O card meets Bellcore GR-436-CORE requirements for a Stratum 3 clock.

The Clock I/O card supports the following system cards and functions:

- **Clock I/O card hardware**—Performs clocking functions
- **TL1 process**—Provisions clock and current clock source data
- **Alarm manager—**Sends various alarm messages to the CPU alarm manager.
- **ST1 process**—Confirms T1 primary and secondary clock sourcing and reconfigures as necessary (when applicable)
- **SE1 process**—Confirms E1 primary and secondary clock sourcing and reconfigures as necessary (when applicable)
- **DS3 process—**Confirms T3 primary and secondary clock sourcing and reconfigures as necessary (when applicable)
- **STS1 process**—Confirms STS1 primary and secondary clock sourcing and reconfigures as necessary (when applicable)
- **S155 process—**Confirms S155 primary and secondary clock sourcing and reconfigures as necessary (when applicable)
- **FCAPF external clock(s)—**Confirms BitsA-T1/E1 and BitsB-T1/E1 sourcing and reconfigures as necessary
- **Ethernet access**—Supports Ethernet access on Clock I/O card

The Clock I/O card front panel is shown in Figure 6.

Figure 6. Clock I/O card front panel



Clock control

The Clock I/O card meets Bellcore GR-436-CORE requirements for Stratum 3 accuracy, with holdover at ± 4.6 PPM. The Clock I/O card meets the Stratum 3 holdover requirements on loss of signal (LOS) from ST1, SE1, DS3, S155, or STS1 interface cards. Regardless of the input clock source, the Clock I/O card is set to the Stratum 3 standard. Even if you have an external clock source with a Stratum 1 rating, the Clock I/O card is only required to meet Stratum 3 accuracy.

Card clock outputs

Table 3 lists the Clock I/O card outputs and destinations.

Table 3. Clock I/O card outputs

Clock output	Destination
8 KHz	To all system cards
1.544 MHz	To all system cards
8.192 MHz	To all system cards
16.384 MHz	To ST1, SE1, DS3, S155, or STS1 mapper and TDM cross-connect cards

Table 3. Clock I/O card outputs (continued)

Clock output	Destination
19.20 MHz	To TDM backplane bus
25.0 MHz	To CPU cards and CPU backplane bus

Clock I/O physical connections

The Clock I/O card provides the physical connection to the Ethernet 10Base-T interface through a front-panel RJ-45 connector.

Clock priority and CPU communication

The Clock I/O card searches for an acceptable source from the clock priority list stored in NVRAM, locking onto the selected in nonreverting mode (does not revert to previous clock source). The Clock I/O card provides the CPU card with all required provisioning data, including clock priorities and the current clock source. In response, the CPU card can send commands to the Clock I/O card(s), initiating a search for a new clock beginning from the highest-priority clock source.

The CPU card tracks current and other clock sources, monitoring availability of a higher-priority clock. When a higher-priority clock becomes available, the CPU commands the Clock I/O to search for the new clock. Following insertion of a new Clock I/O card, the CPU performs comparison testing whenever a clock shift occurs.

Clock I/O redundancy

The Clock I/O card can be fully redundant, with each card synchronizing to the other, matching clock phases (known as *phase copy*) although only the active card drives the backplane. If a fault occurs on the active card, the standby card begins driving the backplane.

The CPU of the Clock I/O cards controls the transfer from active to standby Clock I/O card. The Clock I/O cards provide status information, which is retrieved by the CPU and used to determine clock performance. When the CPU detects a fault in the active Clock I/O card, the CPU places the active card on standby. This automatically places the standby Clock I/O card in holdover mode while the CPU searches for a good clock source. The CPU ensures that the standby card has a good clock source to holdover before disabling the active card.

Although one Clock I/O card is active and one is standby, both cards function all of the time. The active card operates in master mode, while the standby card operates in *phase-copy* mode. In this mode, all frequencies and phases of the active Clock I/O card are copied as close to the same time as possible on the standby Clock I/O card.

The system assigns one Clock I/O card to be active and the other card (if installed) to be standby. Activity of Clock I/O cards can only change if the active card is determined to be faulty, is removed from the system, or if the system restarts.

Caution: The active Clock I/O card should never be removed from the system. If removal becomes necessary, force it out of service using the maintenance command (**ED-EQPT**) and then remove it using the procedure on page 332.

Caution: When replacing Clock I/O cards, replace one card at a time. Do not remove both Clock I/O cards at the same time unless you turn the power off first. See Replacing a failed card on page 332 for procedures.

Intelligent cross-connect card

General information

The intelligent cross-connect (IXCON) card provides cross-connection processing for a ARCADACS 100 with T1 interfaces. It receives both subscriber and local exchange switch inputs in DS0 form from a structured Tl mapper card, performs semipermanent (manually programmed) cross connects in its 2,400 by 2,400 cross-connect matrix (1728 usable on a T1-based system with 9 ST1 cards by 8 ports by 24 channels), and returns the cross-connected DS0 channels to the structured T1 mapper card for T1/DS1 processing and return to both subscriber and switch interfaces.

The intelligent cross-connect card contains a microprocessor so that it can operate independently of direct CPU control.

Note: The DS3 or DS3R card provides cross-connection processing for a ARCADACS 100 with T3 interfaces. The STS1 card provides cross-connection processing for a system with STS1 interfaces. The S155 card provides cross-connection processing for a system with STM-1 or OC3 interfaces.

IXCON card features

The IXCON card is a standard, intelligent logic card that can mount in lower slots 3 through 15 of the system chassis. It has the following standard system features:

- Default configuration from NVM
- Inter-card communication with CPU through the backplane
- Inter-card communication with other IXCON card over the backplane

- Management by the CPU card
- Alarm reports to the CPU card
- Performance reports to the CPU card
- Configuration and management using TL1 commands
- Software-download capacity
- 1:1 card redundancy
- Event log record
- Diagnostic support using serial and Ethernet port

IXCON card operation

Incoming T1 lines from wideband access devices and DS1 lines from IDTs are applied to the T1 I/O cards of the system and then terminated in the associated structured T1 mapper (ST1) cards. The mapper cards convert the T1 and DS1 inputs to their 24 DS0 channels and apply them to the TDM transmit bus for application to the IXCON card. The IXCON card reads the DS0 channels from the TDM transmit bus and applies them to the 2,400 by 2,400 cross-connect matrix. The matrix provides cross-connections for semipermanent cross-connections. The cross-connected signals of both types are routed from the matrix to the TDM receive bus from which they are retrieved by the structured mapper card, processed back into the assigned T1 or DS1 time slots, and routed back out of the system to subscribers and IDTs.

Note: Static cross connections can be provisioned using TL1 commands. The commands allow you to define the termination pointers and then assign the termination pointers to cross connections. See TL1 Command Interface on page 85 for details.

Caution: Install and provision the IXCON, DS3, DS3R, S155, or STS1 cards before creating termination pointers

Cross-connect card connections

The IXCON card supports point-to-point and loopback cross-connect types. A loopback connection includes a primary TP and no leaves. The primary TP is bidirectional. All loopback connections return data to the TDM bus.

Cross-connect termination pointers

A termination pointer (TP) is an NxDS0 endpoint on a T1 line. The system bus manager allocates and manages each TP through TL1 commands, with a map of all available DS0s across the 75 TDM buses stored in memory administration (MA) on the CPU. NVRAM also stores all the TP information on the cross-connect card.

Create and add termination pointers to the system using TL1 commands (see TL1 Command Interface on page 85, for details).

Caution: Install and provision the IXCON, DS3, DS3R, S155, or STS1 cards before creating TPs.

A TP can have assigned attributes, including a DS0 map. TP names can consist of up to eight characters, and must be unique per port assignment. A cross-connect name can have up to 18 characters and must be unique only within a node; the name can be common across a network.

DS0 cross connection

Cross-connection of DS0s consists of the following actions (see TL1 Command Interface on page 85, for specific commands).

1. Create and name a TP on an ST1 port.
2. Map the TP DS0s.
3. Create and name a second TP.
4. Create a cross-connection between the two TPs; the connection can be either unidirectional or bidirectional.
5. Activate the cross-connection (an active cross-connection maps the TPs to the TDM and to each other; a standby cross-connection is unmapped and associated TPs can be edited).

Note: For voice and signaling (VSIG) cross connections, you may want to also do the following: use the CNV=TXRX parameter in the ENT-TP command and provision the signaling conversion tables on each ST1 card. See Signaling conversion function on page 156.

IXCON card redundancy

There are two IXCON cards per system, each capable of providing the full range of supported features. This provides 1:1 redundancy for the cross connect function.

All cards are managed by the CPU card. All of the cross-connection provisioning data for the system is stored on the CPU card. When an IXCON card is replaced, its provisioning data is downloaded to it from the CPU card. If both IXCON cards fail, the provisioning data can be downloaded through the system NMS.

Another advantage to the redundancy feature is that you can provision both IXCON cards at once by addressing the provisioning commands to the left-most card in the pair.

The IXCON card faceplate is identical to that of the CPU card. See Figure 2.

Structured T1 mapper card

The structured T1 (ST1) mapper card receives eight structured DS1 frames from its associated T1 I/O card and dismantles each DS1 frame into its individual structured 24 DS0 channels. It then maps the DS0 channels to the cross-connect (XCON, IXCON, DS3, DS3R, STS1, or S155) card for standard DS0-to-DS0 cross-connection. In the opposite direction, the structured T1 mapper card receives cross-connected DS0 channels from the cross-connect card for standard DS0-to-DS0 cross-connect applications. In all cases, the input structured DS0 channels are placed in their proper slots on their assigned DS1 lines for application to their T1 interfaces through the associated T1 I/O card. The ST1 cards are designed for insertion into any of the logic (lower) chassis card slots 3 through 15.

The ST1 mapper cards are available in channel service unit (CSU) or digital signal cross-connect (DSX) versions. The CT1-CSU mapper card performs the functions of a CSU in that it terminates a digital channel, performs line coding, line equalization, and line conditioning. The CT1-DSX mapper card provides a cross-connect frame. Both versions are referred to as the ST1 mapper card throughout the manual. See Table 1 on page 6 for part numbers of both versions.

Equipped with a 68302 microprocessor, the ST1 mapper card provides high-level data link control (HDLC) to support inband NMS channels and also eight facility data link (FDL) channels, with one channel per T1 link. The microprocessor collects the performance data and stores it onboard.

The ST1 mapper card can operate independently of the CPU. It is not affected by removal of a CPU card from the system. The ST1 mapper card communicates with the CPU through the backplane. Front-panel LEDs allow easy operation and maintenance of the ST1 mapper card. See System Diagnostics and Testing on page 299, for details.

The ST1 mapper card faceplate is identical to that of the CPU card. See Figure 2 on page 22.

ST1 mapper card features

The ST1 mapper card maps eight DS1 channels. The ST1 mapper card also supports mapping of individual DS0 and fractional DS1 signals. Each mapper card supports eight full T1 interfaces, providing a 100-ohm twisted pair T1 interface with receive sensitivity up to 36 dB and DSX1 5-pulse equalization settings.

At the ST1 mapper card interface, the T1 mapper features the following:

- 4-line buildout (LBO) for a channel service unit (CSU)
- Transmit driver fail performance monitor
- B8ZS and AMI encoding and decoding

- QRSS generation and detection
- Output short circuit limit
- Inband network loopback detection and generation capability
- Local and remote loopbacks
- Clock recovery
- SF, ESF, or SLC96 (mode 1) framing format
- Pulse density violation detection
- Loss of signal (LOS), alarm indication signal (AIS), red and yellow alarm detection and integration
- Line and path performance monitoring
- Data link handling for ESF or SLC96 framing format
- Elastic buffer to handle jitter and wander
- CAS bit signaling handling
- Trunk conditioning
- Unframed mode
- Zero code suppression
- Generates primary and secondary DS1 reference clocks
- Voice PCM coding conversion between A-law and U-law
- Conversion of bit patterns from E&M and FXS-DN to loopstart and back, to support V.90 analog modem speeds for cross connections that use voice and signaling (VSIG)

The ST1 mapper card can also accommodate live insertion and removal without impact to other modules operating in the system.

ST1 card redundancy

ST1 mapper cards can be used in a protected or unprotected configuration.

Protected configuration

Protection can be provided in a 1:N pattern, using a combination of T1/E1 I/O (TE IO) cards and one T1/E1 I/O protection (TE IO) card for each type (CSU and DSX) of ST1 mapper card. See T1/E1 I/O protection card on page 56 for details.

Unprotected configuration

You can use ST1 cards without protection, using one T1/E1 I/O (TE IO) card for each installed ST1 card. See T1/E1 I/O card on page 54 for details.

Structured E1 mapper card

The Structured E1 (SE1) mapper card supports eight channelized E1s to and from the Time Division Multiplexed (TDM) bus on the backplane of the chassis. The eight channelized E1s are the equivalent of 256 DS0 channels. The SE1 card maps the DS0 channels to any of the 75 TDM buses.

The TDM bus uses a T1 format for signaling. The SE1 card contains two signaling conversion tables, to convert incoming E1 signals to T1 and to convert outgoing T1 signals to E1. You can specify the conversion data in the two tables, once for each card. For details about provisioning the signaling conversion tables, see Signaling conversion function on page 156.

The SE1 mapper card uses high-level data link control (HDLC) to support inband network management system (NMS) channels, at a bandwidth ranging from 4 Kbps to 20 Kbps. You can activate up to eight facility data link (FDL) channels on a SE1 card. An FDL channel can also be used to collect far-end performance monitoring (PM) data or to send SE1 PM data to the far end.

The SE1 cards are designed for insertion into any of the logic (lower) chassis card slots 3 through 15. The SE1 card has 1:N equipment protection through the addition of a single redundant SE1 card and a T1/E1 I/O protection (TE IOP) card.

The SE1 mapper card can operate independently of the CPU. It is not affected by removal of a CPU card from the system, except when replacing an SE1 card. The SE1 mapper card communicates with the CPU through the backplane. Front-panel LEDs allow easy operation and maintenance of the SE1 mapper card. The SE1 mapper card faceplate is identical to that of the CPU card. See Figure 2 on page 22.

Features of the SE1 card

The SE1 card supports the following functionality:

- Support for eight channelized E1 trunks for inbound and outbound TDM traffic, which breaks down to 32 DS0 channels per E1 port (2,304 DS0 channels for a fully-populated system)
- Support for eight facility data link (FDL) or national bit channels for management applications
- E1 providing full duplex, digital transmission facilities at 2.048 Mbps
- Support for fractional E1 (n by 64 Kbps)

- Capability to map E1 signals and place them on the 2,400 by 2,400 TDM backplane for static cross-connections
- Transparent E1 signaling transmission over the backplane using Timeslot 16 (TS16) signaling on the card for channel associated signaling (CAS)
- Framing format of double frame and CRC-4 multiple frame
- Line impedance of balanced 120 Ohm
- Line coding of high-density bipolar 3 (HDB3) and alternate mark inversion (AMI)
- Alarm detection of LOS, LOF, AIS, and AIS TS16 (timeslot 16), maintenance alarms (red, yellow), card status, equipment failure, and protection switching
- Performance monitoring (PM) data for line and path, stored in local RAM
- Loopback tests at the local and line level, initiated by the user
- Testing using the Bit Error Rate Test (BERT), and software-load level diagnostics provided with heartbeat messages initiated by the CPU card
- A-law and Mu-law conversion at the termination pointer (TP) level as **ENT-TP** commands are executed
- Signaling conversion between E1 and T1 for incoming and outgoing signals, using signaling conversion tables (two per SE1 card) that are programmed using TL1 commands
- 1:N redundancy using a T1/E1 I/O protection card

SE1 card redundancy

SE1 mapper cards can be used in a protected or unprotected configuration.

Protected configuration

Protection can be provided in a 1:N pattern, using a combination of T1/E1 I/O (TE IO) cards and one T1/E1 I/O protection (TE IO) card for the SE1 mapper cards. See T1/E1 I/O protection card on page 56 for details.

Unprotected configuration

You can use SE1 cards without protection, using one T1/E1 I/O (TE IO) card for each installed SE1 card. See T1/E1 I/O card on page 54 for details.

SE1 card support

External devices

Caution: A third-party balun device must be used between the ARCADACS 100 and the physical BNC coaxial connectors on the E1 switch.

The SE1 card supports either 75-Ohm unbalanced termination or 120-Ohm balanced termination for each E1 signal over the 50-pin Amphenol connector. A balun device is required in order to convert the impedance on the coaxial cable so that its signal can run on twisted-pair wiring.

Cross connections

The SE1 card supports static cross connections with the support of XCON, IXCON, DS3, DS3R, STS1, or S155 cards. Signaling conversion must be provisioned for each SE1 card if you are cross connecting to ST1, FXS, FXO, DS3, or STS1 cards. See Signaling conversion function on page 156.

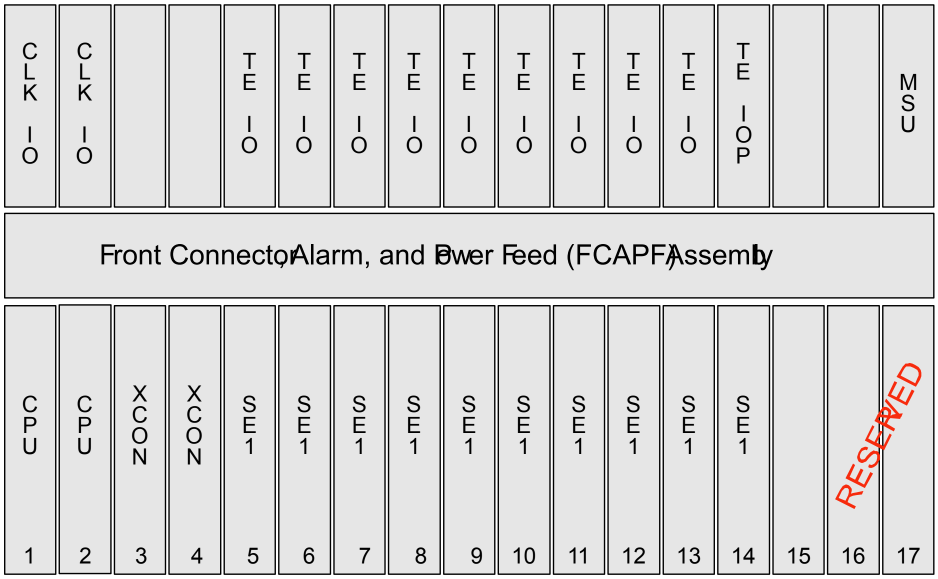
The SE1 software does not support dynamic cross connections to a Class 5 switch.

Supported configurations

The SE1 card supports static cross connections with the support of XCON, IXCON, DS3, DS3R, STS1, or S155 cards. Signaling conversion must be provisioned for each SE1 card if you are cross connecting to ST1, FXS, FXO, DS3, or STS1 cards. See Signaling conversion function on page 156.

Up to nine SE1 cards can be used for incoming and outgoing E1 traffic, with one protection SE1 card to take over if any active SE1 card fails. Figure 7 shows an E1 to E1 configuration.

Figure 7. Slot configuration for E1 to E1 cross connections



DS3 mapper card

The DS3 (CT3) mapper card provides support for two T3 or DS3 signals, having a transmission speed of 44.736 Mbps. The DS3 card performs static DS0 channel interfacing between the system TDM bus and DS3 transmission port located on the DS3 card. In addition, the DS3 card provides cross connections for a ARCADACS 100 with T3 interfaces.

In the receive direction, the signals on a DS3 mapper card are decoded as follows:

- 2 DS3 $\rightarrow$ 56 DS1 $\rightarrow$ 1,344 DS0

The DS0 channels are then cross-connected to the TDM backplane. In the transmit direction, the signals are encoded from DS0 to DS1 to DS3.

The CPU on the DS3 card can perform a signaling protocol conversion between a public-switched telephone network (PSTN) switch and the ARCADACS 100, in different configurations and with different signaling protocols. The CPU also monitors the DS3 transmission quality, detects and reports alarms, and works with the CPU card to perform housekeeping functions such as the maintenance of provisioned data.

The ARCADACS 100 supports up to six redundant pairs of DS3 cards. In a redundant configuration, each combination of an active DS3 card, a protection DS3 card, and a T3 I/O protection assembly is called a T3 network interface (T3NI).

Provisioning information is constantly updated between the two DS3 cards in each pair. For this reason, you can provision both cards at the same time by addressing the TL1 provisioning commands to the left-most DS3 card in each pair.

The DS3 card faceplate is identical to that of the CPU card. See Figure 2 on page 22.

DS3 card features

The DS3 card supports the following functionality:

- **Dual port DS3 interface**—Each T3NI has two DS3 ports able to carry a total of 1,344 DS0 channels. Each port complies with the ANSI T1.404-1994 and ANSI T1.404a-1996 standards, including B3ZS line coding and 75 Ohm unbalanced signal transmission line.
- **Fully channelized M3/1/0 function**—Each DS3 port is capable of multiplexing and de-multiplexing an arbitrary collection of DS0s to and from DS1 level and finally to and from DS3 level, respectively.
- **M13 & C-bit parity DS3 modes**—Multiplexes using both methods as per ANSI T1.404-1994. You can provision the multiplexing methods.
- **Full transmissions status indication and consequent action**—Detects all DS3 signal conditions, including alarms, their indication and other consequent action as per TR-TSY-000009.
- **Performance monitoring and reporting**—Monitors the DS3 transmission performance and generates relevant reports and logs and per TR-TSY-000009.
- **Loopback support**—In either one of the multiplexing modes (M13 or C-bit parity) the relevant loop-back capability is supported on both DS3 and DS1 levels.
- **Static DS1/DS0 mapper**—This function enables that suboptimally used DS1 and DS3 network access links are combined in a DS3 link with an optimized bandwidth utilization towards the public network. Release 2.5.10 of the ARCADACS 100 system supports six T3NI modules.
- **Cross-connect function**—The T3NI can perform the standard cross-connect functions for the ARCADACS 100 system. Ports A and B on the DS3 card can be used to set up cross connections in three ways: port A to port B, port A to TDM, and port B to TDM. With DS3 cards in the system, there is no need for XCON or IXCON cards.
- **1:1 interface redundancy**—Each T3NI can be equipped to provide a warm standby redundancy of its main functions, such as static mapping and cross-connect. When more than two DS3 cards are used in a system, the static mapping and cross-connect functions are provided by the first DS3 pair only. Redundancy also enables provisioning of two DS3 cards at a time by addressing the provisioning commands to the left-most card in each pair.
- **Software download**—The T3NI module can be software downloaded.

DS3 card redundancy

All DS3 cards are capable of providing the full range of supported features for static cross connections. However, only one pair of DS3 cards is required for cross-connect support. One card performs active cross-connection processing, while the other card operates in standby mode, ready to take over if the active card fails. This provides 1:1 redundancy for the cross-connect function.

DS3R mapper card

The DS3R mapper card is identical to the DS3 card, and has the following additional features:

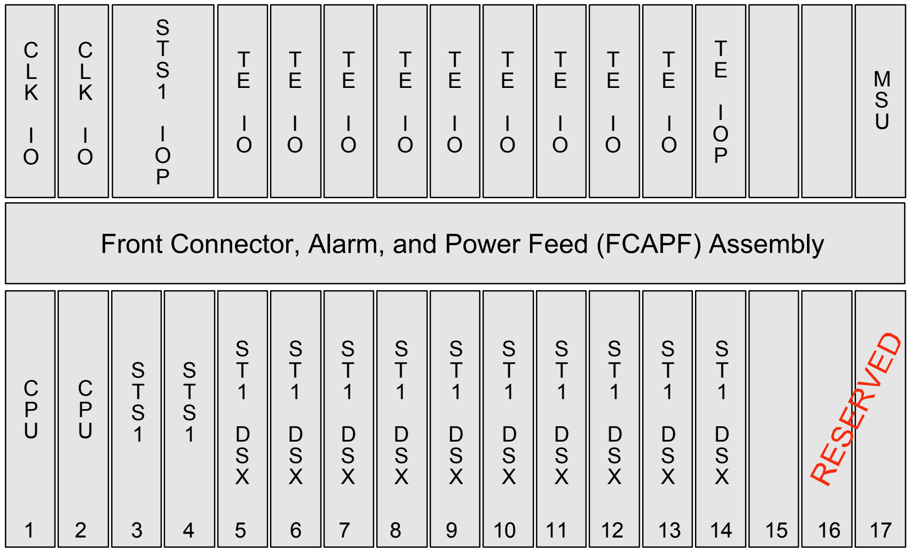
- **Signaling conversion**—The DS3R card has signaling conversion tables for the Receive (Rx) and Transmit (Tx) direction on each of the two DS3 ports. The signaling conversion tables can be used to convert the incoming and outgoing signals to meet the requirements of other equipment that may be installed in the system.

  In the case of the DS3R mapper card, signaling conversion is used to convert bit patterns from E&M and FXS-DN to loopstart and back. This is required to support V.90 analog modem speeds in cross connections that use voice and signaling (VSIG). For more information, see Signaling conversion function on page 156.

STS1 mapper card

The STS1 mapper card provides support for the STS1 high-speed interface of the Lucent 5ESS switch. Figure 8 shows a typical redundant configuration, with ten ST1 cards and two STS1 cards. This configuration provides 72 DS1 lines available for connection to analog equipment and two STS1 lines (representing 56 DS1 lines) for connection to a 5ESS switch.

Figure 8. Configuration with ST1 and STS1 cards



The STS1 (CTS1) mapper card operates in two modes:

- **STS1 mode**—The STS1 card provides support for two STS1 signals, having a transmission speed of 51.84 megabits per second. In the receive direction, the signals are decoded as follows:
  - 2 STS1 → 56 VT1.5 → 56 DS1 → 1,344 DS0

  In the transmit direction, the signals are encoded from DS0 to DS1 to VT1.5 to STS1.
- **DUAL mode**—The STS1 card provides support for one STS1 signal on port A and one T3 signal on port B. In the receive direction, the signals are decoded as follows:
  - 1 STS1 → 28 VT1.5 → 28 DS1 → 672 DS0

    1 DS3 → 28 DS1 → 672 DS0

    for a total of 1,344 DS0 channels

  In the transmit direction, the encoding is the reverse of the decoding. Half of the DS0 channels are encoded from DS0 to DS1 to T3, and half the DS0 channels are encoded from DS0 to DS1 to VT1.5 to STS1.

  When in the DUAL mode, the STS1 cards require an STS1DS3 I/O protection assembly installed in the two slots above each pair of cards.

In both modes, the STS1 card performs static DS0 channel interfacing between the system TDM bus and transmission ports located on the STS1 card. The CPU on the STS1 card can perform a signaling protocol conversion between a public-switched telephone network (PSTN) switch and the ARCADACS 100, in different configurations and with different signaling protocols. The CPU also monitors the STS1 transmission quality, detects and reports alarms, and works with the CPU card to perform housekeeping functions such as the maintenance of provisioned data.

The ARCADACS 100 supports up to six pairs of STS1 cards.

Provisioning information is constantly updated between the two STS1 cards in each pair. For this reason, you can provision both cards at the same time by addressing the TL1 provisioning commands to the left-most STS1 card in each pair.

The STS1 card faceplate is identical to that of the CPU card. See Figure 2 on page 22.

STS1 card features

The STS1 card performs the following operations at the DS1 application layer:

- Framer initialization and configuration
- Performance statistics collection
- Alarm generation
- Trunk conditioning
- Signaling supervision
- Facility data link (FDL)
- High-level data link control (HDLC) over DS0 and FDL
- Bit Error Rate test (BERT) generation and reception
- Loopbacks

The STS1 card performs the following operations at the STS1 and VT1.5 application layer:

- Device initialization and configuration
- Performance statistics collection
- Alarm generation
- Loopback configuration

STS1 card hardware

The STS1 card uses a MC860 PowerQuicc microprocessor with the following features:

- 50 MHz operation
- 16-bit wide boot flash device with up to 2 MB of flash storage
- 8-bit wide flash disk from M-Systems with up to 72 MB operating system storage space
- Two 4-MB by 16 bit SDRAMS with 16 MB of execution memory
- VxWorks operating system

STS1 card redundancy

All STS1 cards are capable of providing the full range of supported features for cross connections. However, you can use only one pair of STS1 cards for cross-connect support. One card in each pair performs active cross-connect processing, while the other card operates in standby mode, ready to take over if the active card fails. This provides 1:1 redundancy.

S155 mapper card

The S155 card has one port that connects an optical interface to the TDM backplane of the ARCADACS 100. The S155 card also uses the TDM to cross connect signals from other mapper cards in the system. The label on the card indicates the transmission speed: 155.5 Mbps.

You can install six pairs of S155 cards. The ARCADACS 100 supports a redundant configuration only. In this configuration, provisioning information is constantly updated between the two S155 cards in the pair. You can provision both cards at the same time by addressing the TL1 provisioning commands to the left-most S155 card in each pair.

The S155 card faceplate is identical to that of the CPU card. See Figure 2 on page 22.

Modes of operation

The S155 card operates in the following modes:

- Synchronous transport module 1 (STM1) for European synchronous digital hierarchy (SDH) systems
- Optical carrier level 3 (OC3) for North American synchronous optical network (SONET) systems

> **Note:** OC3C is not supported in this release.

STM1 mode

Using the European synchronous digital hierarchy (SDH) standard, the STM-1 signal is decoded as follows:

- 63 VT2 $\rightarrow$ 63 E1 $\rightarrow$ 2,016 DS0

The DS0 channels are cross connected using the TDM backplane. In the transmit direction, the DS0 channels are assembled into E1s, mapped into VT2s, and assembled into the STM-1 signal.

In STM1 mode, the interface on the card consists of one section, one line, and one path layer. Path failures in this mode affect all VT2s.

OC3 mode

Using the North American SONET standard, the OC3 signal is decoded as follows:

- 1 OC3 → 3 STS1 → 84 VT1.5 → 84 DS1 → 2,016 DS0

The DS0 channels are cross connected using the TDM backplane. In the transmit direction, the DS0 channels are assembled into T1s, mapped into VT1.5s, assembled into STS1s, and assembled into the OC3 signal.

In OC3 mode, the interface on the card consists of one section, one line, and three path layers. Each path layer corresponds to 28 VTs, for a total of 84 VTs in the system. Path failures in this mode affect the connected third of the VTs.

Note: OC3C is not supported in this release.

S155 card features

The S155 card performs the following operations at the port level:

- Configuration
- Alarm generation specific to each logical layer
- Performance monitoring within each logical layer

Note: Bit interleaved parity (BIP) and remote error indication (REI) errors use a block-based counting method.
All TL1 commands, system alarms, and performance monitoring counters use BellCore and American National Standards Institute (ANSI) naming conventions. See *Appendix C on page 373* for a translation of these names to International Telecommunication Union (ITU) and European Telecommunications Standards Institute (ETSI) names.

The S155 card performs the following operations at the VT level:

- Configuration
- Alarm generation (adjusted to the correct number of VTs for the selected mode)
- Performance monitoring (adjusted to the correct number of VTs for the selected mode)

The S155 card performs the following operations at the DS1 level (when in OC3 or OC3c mode):

- Configuration
- Alarm generation
- Performance monitoring
- Secondary state reporting
- Loopback testing
- BERT
- Trunk conditioning

Note: OC3C is not supported in this release.

The S155 card performs the following operations at the E1 level (when in STM1 mode):

- E1 configuration such as framing mode and transmit timing
- Alarm generation
- Performance monitoring
- Secondary state reporting
- Loopback testing
- BERT
- Trunk conditioning
- HDLC interface

S155 card redundancy

The S155 cards have three protection settings: SX, DX, 1+1, and 1+1W. The SX and DX modes operate the same way as for DS3 and STS1 cards. The SX setting provides no protection, and the DX mode provides 1:1 equipment protection.

Note: The SX setting is not supported in this release.

In 1+1 and 1+1W modes, the S155 cards provide linear, 1+1, nonrevertive **line** protection.

Note: 1+1 and 1+1W operate in the same fashion. The only difference is that 1+1W supports configurations with wireless (radio) equipment.

Duplicate optical signals are carried by both mapper cards in a redundant pair. The mapper card on the left carries the working **line** and the mapper card on the right carries the protection **line**. Activity switches between the two lines, depending on line failure conditions and user-provisioned settings for redundancy and automatic protection switching (APS).

Note: When the ARCADACS 100 reports performance monitoring results and alarms, the card access identifier (CARDAID) for S155 cards with 1+1 redundancy shows the slot number of the left mapper card in the pair of cards. In addition, it shows port 1 as the working line and port 2 as the protection line. In this case, the term working does not imply activity: active traffic can be carried by the working or the protection line.

For more information on provisioning redundancy, see Create equipment command on page 143. For more information on APS, see Automatic protection switching on page 220.

Foreign exchange station mapper card

The foreign exchange station (FXS) mapper card provides 24 voice ports, enabling voice traffic to be multiplexed over the pulse code modulation (PCM) interface of the ARCADACS 100 backplane. The interface between the voice ports and the CPU is a serial peripheral interface (SPI) bus. The PCM bus interface on the FXS card maps and demaps 24 DS0 channels to any of 2,400 DS0 channels through the backplane.

The FXS card operates in the following signaling modes:

- **FXS**—Foreign exchange station mode
- **FXSDN**—Foreign exchange station defined network mode
- **WINK**—Wink start mode; 150 ms. delay followed by a 200 ms. wink back to the switch
- **TR08**—Subscriber loop carrier mode
- **DPO**—Dial pulse originating mode; for detection of extension digits so they can be forwarded to a private branch exchange (PBX) for switching

  Note: The DPO mode works with the DPT mode on the FXO card.

- **PLAR**—Private line automatic ringdown; if you have two FXS ports connected across the backplane and one of them goes offhook, the other rings
- **RINGBK**—Ring back; in networks that do not provide audible ringing feedback to the calling party, you can turn on the RINGBK setting to provide this feedback to the caller

The FXS card has state machines for each of the different signaling modes. The state machine is the signaling register tool that converts between analog signals and the corresponding ABCD bits at each stage of a voice call. The state machine for each signaling mode has its own set of state transitions, triggers, and actions.

An additional R2 signaling state machine converts between analog signals and AB bits. This state machine is required in systems outside of North America and supports A-law coding.

For instructions to provision the signaling modes and types, see Edit facility data command on page 167.

The faceplate of the card features two LED indicators and a 50-pin Amphenol connector. The card occupies any slot from 3 to 15 in the lower bank of the chassis. The card is controlled by its own CPU and can operate independently of the CPU card.

The ARCADACS 100 can support a maximum of eight FXS cards, depending on the configuration:

- For an STS1 to FXS configuration, the system supports two STS1 cards and eleven FXS cards.
- For an ST1 to FXS configuration, the system supports two XCON or IXCON cards, two ST1 cards (one working and one protection), one blank slot for DACS applications, and eight FXS cards.
- For an SE1 to FXS configuration, the system supports two XCON or IXCON cards, two SE1 cards (one working and one protection), and nine FXS cards.

Figure 9 shows the faceplate of a FXS card.

FXS card features

The FXS card supports the following features:

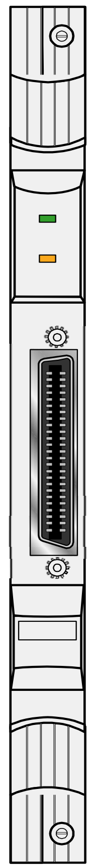
- Live insertion and removal of the card from the chassis
- Supervision mode of foreign exchange station mode (FXSMD), foreign exchange station defined network (FXSDN), WINK, subscriber loop carrier mode (TR08), and dial pulse originating mode (DPO).

> **Note:** The DPO mode works with the DPT mode on the FXO card.

- Signaling mode of loop start, ground start, loop start with forward disconnect (LPFD), ground start immediate (GSI), ground start automatic (GSA), universal voice grade (UVG), universal voice grade automatic (UVGA), single-party (SP), loop start with R2 signaling (LSR2A: for systems outside North America and supports A-LAW coding), and private line automatic ringdown (PLAR: when two FXS cards are connected to the backplane, the other rings when the first goes off-hook)
- Audible ringing feedback to the originator of a call
- TLP in increments of 0.1 dB on Transmit (-9.0 to +6.5 dB) and Receive (-23.0 to +3.0 dB)

- Loop length of up to 12,000 feet (3,690 meters) or 800 Ohms external resistance, including set
- Ringing voltage of 86 VRMS
- CLASS features, such as Distinctive Ringing and Caller ID
- Full compatibility with V.34 and V.90 modem standards

Figure 9. FXS mapper card front panel



Foreign exchange office mapper card

The foreign exchange office (FXO) mapper card provides 24 voice ports, enabling voice traffic to be multiplexed over the pulse code modulation (PCM) interface of the ARCADACS 100 backplane. The interface between the voice ports and the CPU is a serial peripheral interface (SPI) bus. The PCM bus interface on the FXO card maps and demaps 24 DS0 channels to any of 2,400 DS0 channels through the backplane.

The FXO card can operate in two modes:

- **FXO mode**—supports two trunk types: loopstart (LS) and groundstart (GS). Figure 10 shows a typical FXO application. This application allows you to route some traffic to central offices using analog trunks for services such as 411 and 911.
- **DPT mode**—dial pulse terminating; supports direct inward dialing (DID). Figure 11 shows a typical DPT application. This application allows external users to dial internal private branch exchange (PBX) extensions directly.

Note: The DPT mode works with the DPO mode on the FXS card.

Figure 10. Application with FXO mode

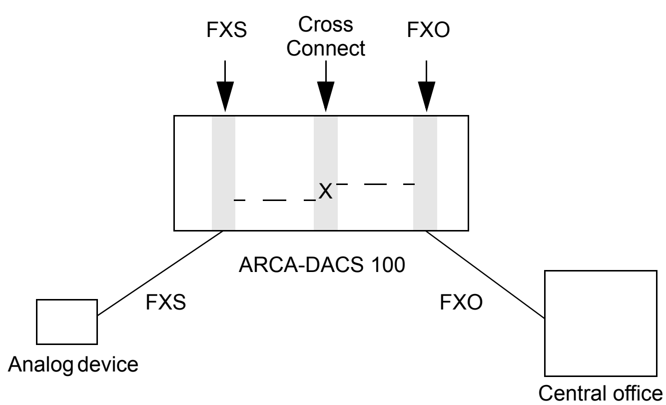
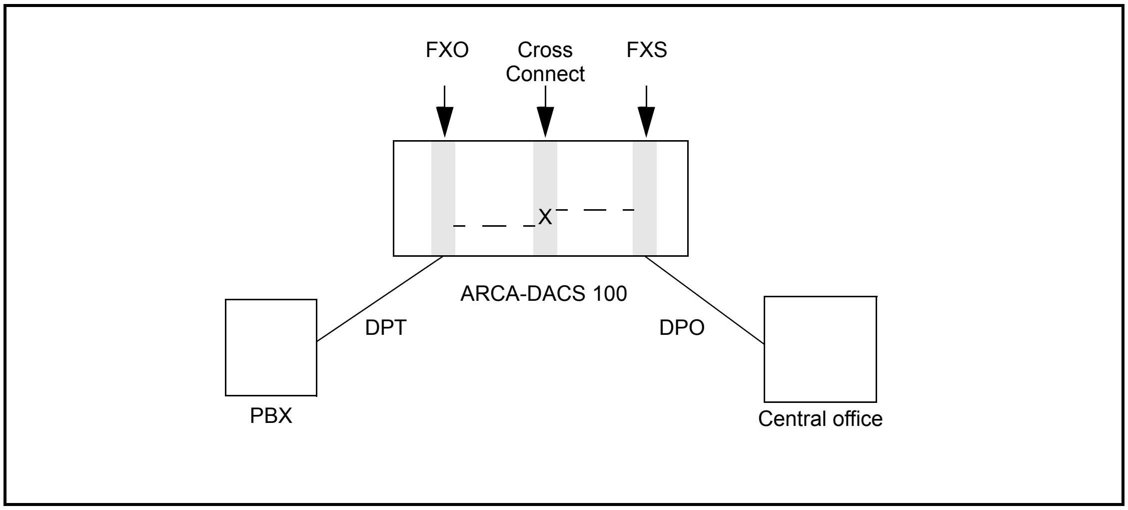


Figure 11. Application with DPT mode



The FXO card has a state machine for each of the three signaling modes: LS, GS, and DPT. The state machine is the signaling register tool that converts between analog signals and the corresponding ABCD bits at each stage of a voice call. The state machine for each signaling mode has its own set of state transitions, triggers, and actions.

A fourth R2 signaling state machine converts between analog signals and AB bits. This state machine is required in international systems (outside of North America) and supports A-law coding.

For instructions to provision the signaling modes and types, see Edit facility data command on page 167.

The faceplate of the FXO card is identical to that of the FXS card (see Figure 9 on page 48). The card occupies any slot from 3 to 15 in the lower bank of the chassis. The card is controlled by its own CPU and can operate independently of the CPU card.

The can support from eight to eleven FXO cards, depending on the configuration:

- For a DS3 to FXO configuration, the system supports two DS3 cards and eleven FXO cards.
- For an STS1 to FXO configuration, the system supports two STS1 cards and eleven FXO cards.
- For an ST1 to FXO configuration, the system supports two XCON or IXCON cards, two ST1 cards (one working and one protection), one blank slot for DACS applications, and eight FXO cards.
- For an SE1 to FXO configuration, the system supports two XCON or IXCON cards, two SE1 cards (one working and one protection), and nine FXO cards.

FXO card features

The FXO card supports the following features:

- Live insertion and removal of the card from the chassis
- Supervision mode of FXO mode (FXOMD) and dial pulse terminating (DPT)
- Signaling mode of loop start, ground start, loop start forward disconnect (LPFD) and loop start R2 signaling (LSR2A)
- TLP in increments of 0.1 dB on Transmit (-9.0 to +6.5 dB) and Receive (-23.0 to +3.0 dB)
- Loop length of up to 12,000 feet (3,690 meters) or 800 Ohms external resistance, including set
- CLASS features, such as Distinctive Ringing and Caller ID
- Full compatibility with V.34 and V.90 modem standards
- PBX addressing from CO to PBX

TDM cross-connect card

The TDM cross-connect (XCON) card permits large-capacity digital cross-connection and test access for T1 and E1 applications. The cross-connect card is a nonblocking 2,400 by 2,400 DS0 cross-connect card that can be installed in any of logic (lower) chassis slots 3 through 15. The number of DS0 channels that are available for cross connections depends on the system configuration:

- An ST1 card supports 192 DS0 channels, for a maximum of 1,728 DS0 channels with nine ST1 cards.
- An SE1 card supports 256 DS0 channels, for a maximum of 2,304 DS0 channels with nine SE1 cards.

The minimum requirements for a cross-connection configuration are as follows:

- one CPU card
- one Clock I/O card
- one ST1 or SE1 card
- T1/E1 I/O cards (one per card-type: CT1-CSU, CT1-DSX, and SE1)
- one XCON or IXCON card

Note: In a system with DS3, S155, or STS1 cards, the cross-connect function is performed by these cards. For this reason, XCON or IXCON cards are not compatible with DS3, S155, or STS1 cards.

The TDM XCON faceplate is identical to that of the CPU card. See Figure 2 on page 22.

XCON card features

Some of the features of the cross-connect card include the following:

- Non-blocking cross-connection of 2,400 by 2,400 DS0 channels across 75 DS1 lines (1728 usable channels in a T1 application, 2,304 usable channels in an E1 application)
- Bit and byte sequence integrity on each DS0
- Timeslot sequence integrity for multichannel service (Nx64kb/s)
- Transparent signaling formats
- Test access to any through-DS0 circuits
- Cross-connect pattern memory storage
- Test access configuration in NVRAM
- Performs self-diagnostics to invoke protection switching
- 1:1 redundancy
- Front panel LEDs for operational and fault indications

Cross-connect card circuit description

Communicating with the CPU card across the system backplane, the cross-connect card requires no individual processor. Installation and removal of the card does not affect other cards in the chassis. A 2K EEPROM onboard the card maintains card history information, along with some configuration parameters. The CPU controls card provisioning and operation.

The card supports nonblocking cross-connection for up to 2,400 time slots, all written sequentially into fixed positions in data memory (DM). The 2,400 time slots are arranged as 75 buses (0-74) with 32 timeslots on each bus (75x32 = 2,400). The TDM bus is divided into transmit and receive sections, operating at 19.2 MHz. Since the TDM bus is 75 buses wide, one XCON card supports all TDM connections for the system.

Each timeslot on the backplane consists of 8 bits data, 4 bits signaling, and 1 bit parity (for data). Framers on each end of the connection provide signaling conversion by using this common format internally. Two of the 75 buses are reserved for conferencing.

A dual-port RAM, providing connection memory (CM), provisions DS0 connections. Permanent virtual connection (PVC) information is stored in NVRAM on the CPU card and is also stored for reference purposes only on the cross-connect card. While the CPU can be replaced without loss of PVC information, the information stored on the cross-connect card is not sufficient to restore active connections.

At system power up, the cross-connect card loads itself from local flash memory. When the CPU recognizes the card, it enables or restores connections as appropriate. The CPU can also detect a missing card, in which case a redundant cross-connect XCON card (if present) assumes control of the TDM bus and restores all cross-connects.

While the cross-connect card does not generate trunk conditioning data, it does store the data and uses it at the DS0 level for configuring and mapping the cross-connects. The card uses a structured T1 or E1 mapper to perform cross-connection mapping (see ST1 mapper card features on page 33 and Features of the SE1 card on page 35).

Incoming T1 or E1 signals pass through the I/O cards, terminating in the structured mapper cards. The mapper cards convert the DS1 (or E1) signals to 24 DS0s (or 32 DS0s) and add them to the TDM transmit bus. The cross-connect cards cross-connect the received DS0 timeslots and place them on the TDM receive bus. From the receive bus, the cross-connected DS0s are retrieved by the mapper cards, converted back to T1 or E1 signals, and routed back to the I/O cards.

Cross-connect card connections

The cross-connect card supports point-to-point and loopback cross-connect types in either unidirectional or bidirectional operation. Point-to-point unidirectional and point-to-point bidirectional are examples of a multipoint connection. A loopback connection includes a primary TP and no leaves. The primary TP is bidirectional. All loopback connections return data to the TDM bus.

Cross-connect termination pointers

A termination pointer (TP) is an NxDS0 endpoint on a T1/E1 line. The system bus manager allocates and manages each TP through TL1 commands, with a map of all available DS0s across the 75 TDM buses stored in memory administration (MA) on the CPU. NVRAM also stores all the TP information on the cross-connect card.

Create and add termination pointers to the system using TL1 commands (see TL1 Command Interface on page 85, for details).

Caution: Install and provision the XCON, IXCON, DS3, DS3R, S155, or STS1 cards before creating TPs.

A TP can have assigned attributes, including a DS0 map. TP names can consist of up to eight characters, and must be unique per port assignment. A cross-connect name can have up to 18 characters and must be unique only within a node; the name can be common across a network.

DS0 cross connection

Cross-connection of DS0s consists of the following actions (see TL1 Command Interface on page 85, for specific commands).

1. Create and name a TP on an ST1 or SE1 port.
2. Map the TP DS0s.
3. Create and name a second TP.
4. Create a cross-connection between the two TPs; the connection can be either unidirectional or bidirectional.
5. Activate the cross-connection (an active cross-connection maps the TPs to the TDM and to each other; a standby cross-connection is unmapped and associated TPs can be edited).

Note: For voice and signaling (VSIG) cross connections, you may want to also do the following: use the CNV=TXRX parameter in the **ENT-TP** command and provision the signaling conversion tables on each ST1 card. See Signaling conversion function on page 156.

TDM XCON redundancy

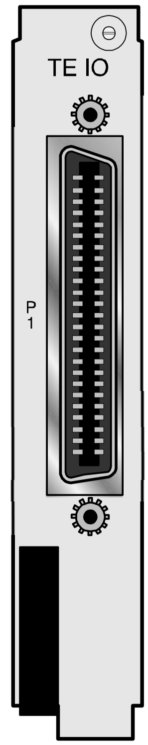
Redundancy is 1:1 for TDM-TDM connections through the cross-connect card and is controlled by the CPU. Cross-connect card switching is nonrevertive.

T1/E1 I/O card

The T1/E1 I/O (TE IO) card provides the physical connection for up to eight T1 or E1 lines. The card plugs into any one of the universal slots 3 to 15 in the I/O (upper) card slot bank of the chassis. The T1/E1 I/O card is an unintelligent card under CPU control. It controls the T1or E1 signals but does not process them and it provides surge protection to meet Bellcore GR-1089-CORE NEBS Physical Protection Requirements. The incoming T1 or E1 lines connect through a 50-pin Amphenol connector on the card front panel.

The T1/E1 I/O card front panel is shown in Figure 12.

Figure 12. T1/E1 I/O card front panel



T1 interface

T1 is a digital transmission facility operating at 1.544Mbps in full duplex, Time Division Multiplexing (TDM) mode within the North American standard T-carrier system. It is available as channelized or unchannelized service. Most often it is delivered as 24 voice-grade channels (DS0 channels), each running at between 56 and 64 Kbps.

E1 interface

E1 is a digital transmission facility operating at 2.048 Mbps within the European Conference of European Postal and Telecommunication Administrations (CEPT) carrier system. It is designed to carry 32 digital channels (DS0 channels) of 64 Kbps each. Of the 32 channels, 30 are used for voice or data calls, one is used for signaling, and one is used for framing and maintenance.

T1 and E1 relays

Transmission tip and ring signals (from the I/O bus and the I/O protection bus) terminate on the T1 and E1 relays. Tip and ring signals are under CPU control, with tip and ring pairs protected from lightning and power surge.

In normal operation, the T1 or E1 signals from the Amphenol connector are connected to the I/O bus through the relays. In protection situations, however, the T1/E1 I/O card redirects the T1 or E1 signals from the Amphenol connector to the protection bus as directed by the CPU. This supports mapper card protection.

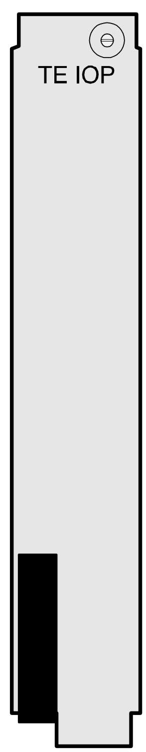
T1/E1 I/O protection card

The T1/E1 I/O protection (TE IOP) card provides 1:N protection for all of any one type of mapper card (CT1-CSU, CT1-DSX, or SE1) installed in the system. The type of mapper card protected depends upon the type of redundant mapper card installed in the logic card slot immediately below the I/O slot of the protection card. The protection card can be installed in any I/O slot from 3 to 15.

When a mapper card of the protected type fails or is removed from service, its T1 or E1 signals are routed to the protection bus. The relays on the protection card route the protection bus signals to the I/O bus of the protection card or redundant mapper card slot. From the I/O bus, the T1 signals are applied to the redundant mapper card below the protection card. The protection card remains in the protection state until the failure that caused the protection switching is lifted. If another failure occurs on a mapper card of the same type, protection is not available until the original problem clears and releases the protection bus.

Figure 13 shows the faceplate of a T1/E1 I/O protection card.

Figure 13. T1/E1 I/O protection card front panel



T3 I/O protection assembly

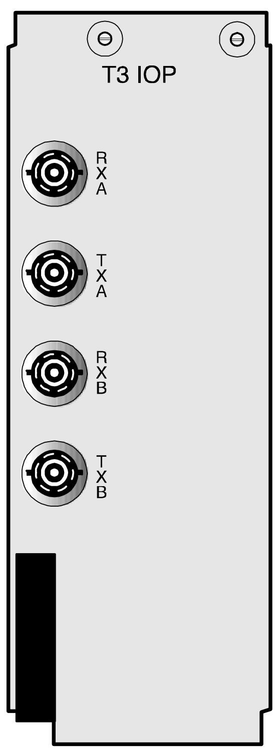
The T3 I/O protection (CT3 IOP) assembly consists of two cards (T3 I/O and T3 I/O protection) mounted together behind a single, double-width, faceplate. It provides a dual port DS3 physical interface towards the network, and it provides a TTL level DS3 signal interface towards the DS3 or DS3R card. This card mechanically conforms to other I/O cards and is plugged in an upper bank slot of ARCADACS 100 chassis. It provides protection in a 1:1 redundancy scheme when installed above two DS3 or DS3R cards (one working and one protection).

The T3 I/O protection card uses a local connection with the T3 I/O card to provide routing of the DS3 signals between the T3 I/O and the redundant DS3 cards. The T3 I/O protection card is controlled by the CPU card through the IOC Bus.

The assembly takes two slots in the upper bank. It is used in protected and unprotected DS3 configurations. In the unprotected configuration, a single DS3 card is inserted in the left-most slot below the T3 I/O protection assembly.

The T3 I/O protection card attaches to the T3 I/O card by means of four stand-offs. The faceplate has openings for two pairs of BNC connectors located on the front of the card. The ARCADACS 100 supports up to six T3 I/O protection assemblies. Figure 14 shows the faceplate of the T3 I/O protection assembly.

Figure 14. T3 I/O protection assembly front panel



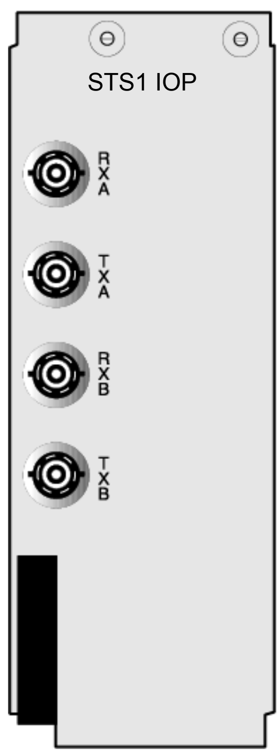
STS1 I/O protection assembly

The STS1 I/O protection assembly consists of two cards (STS1 I/O and STS1 I/O protection) mounted together behind a double-width faceplate. It provides protection in a 1:1 redundancy scheme when installed above two STS1 cards (one working and one protection). The STS1 I/O protection card uses a local connection with the STS1 I/O card to provide routing of the STS1 signals between the STS1 I/O and the redundant STS1 cards. The STS1 I/O protection card is also controlled by the CPU card through the IOC Bus.

The assembly takes two slots in the upper bank. It is used in protected and unprotected STS1 configurations. In the unprotected configuration, a single STS1 card is inserted in the left-most slot below the STS1 I/O protection assembly.

The STS1 I/O protection card attaches to the STS1 I/O card by means of four stand-offs. The ARCADACS 100 supports up to six STS1 I/O protection assemblies. Figure 14 shows the faceplate of the STS1 I/O protection assembly. The faceplate provides Rx and Tx connectors for two STS1 signals.

Figure 15. STS1 I/O protection assembly front panel



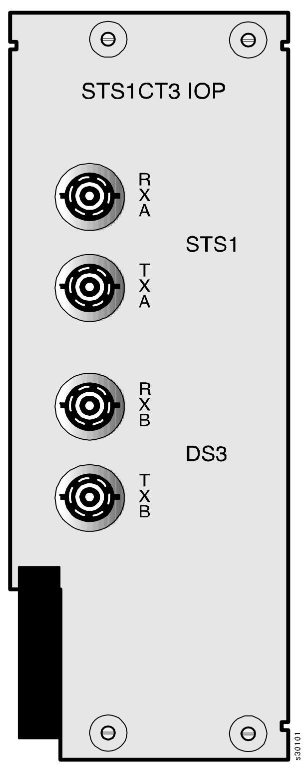
STS1DS3 I/O protection assembly

The STS1DS3 I/O protection (STS1 IOP) assembly consists of two cards (STS1DS3 I/O and STS1DS3 I/O protection) mounted together behind a double-width faceplate. It provides protection in a 1:1 redundancy scheme when installed above two STS1 cards (one working and one protection) that are in DUAL mode.

The STS1DS3 I/O protection card uses a local connection with the STS1DS3 I/O card to provide routing of an STS1 signal and a DS3 signal between the STS1DS3 I/O and the redundant STS1 cards. The STS1DS3 I/O protection card is also controlled by the CPU card through the IOC Bus. The assembly takes two slots in the upper bank. It is used in protected STS1 to DS3 configurations.

The STS1DS3 I/O protection card attaches to the STS1DS3 I/O card by means of four stand-offs. The ARCADACS 100 supports up to six STS1DS3 I/O protection assemblies. Figure 14 shows the faceplate of the STS1DS3 I/O protection assembly. The faceplate provides Rx and Tx connectors for one STS1 signal and one DS3 signal.

Figure 16. STS1DS3 I/O protection assembly front panel



S155 I/O protection assembly

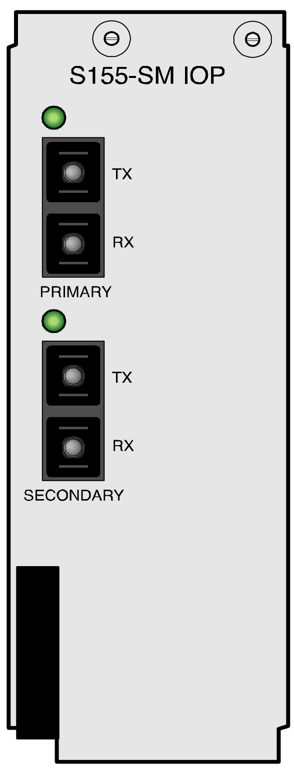
The S155 I/O protection (S155 IOP) assembly, shown in Figure 17, consists of two cards (S155 I/O and S155 I/O protection) mounted together behind a double-width faceplate. The faceplate has two SC connectors for connecting to the optical equipment. The S155 I/O protection assembly provides protection in a 1+1 redundancy scheme when installed above two S155 cards. It does this by sending duplicate optical signals to both S155 cards. An LED associated with each optical signal indicates which signal is active.

Each SC connector on the S155 I/O protection assembly uses a local connection with the S155 mapper cards to provide separate routing of the optical signals to each mapper card. There is no communication between the two SC connectors on the S155 I/O protection assembly.

The S155 I/O protection card is controlled by the CPU card through the IOC Bus.

The ARCADACS 100 supports up to six S155 I/O protection assemblies. Each assembly takes two slots in the upper bank of the chassis.

Figure 17. S155 I/O protection assembly

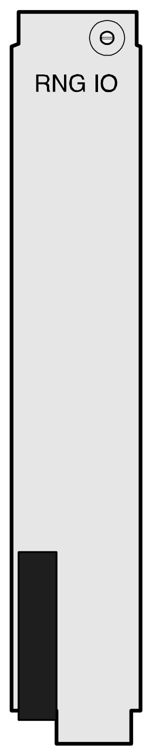


Ringer I/O card

The Ringer I/O (RNG IO) card provides filtered 48V battery power to the FXS or FXO cards. For the FXS card, itgenerates ringing signal to the loop. The ring generater module accepts the 48 V DC and generates a sine wave at one of the (jumper selectable) following frequencies: 16.7, 20, 25, or 50 Hz (default is N. A, 20 Hz)..

The output voltage is 86 Vrms at a loading of 15 REN biased by Vbat, and is fed to the FXS card through the I/O bus between the upper and lower slots on the ARCADACS 100 chassis. The Ringer I/O card occupies any slot in the upper bank of the chassis, directly above each FXS and FXO card. The ARCADACS 100 supports up to ten 11 Ringer I/O cards. Figure 18 shows the faceplate of a Ringer I/O card.

Figure 18. Ringer I/O card front panel



Metallic service unit card

The metallic service unit (MSU) card provides the physical access connections and the switching capability to test active DS1 lines and DS0 channels. (See the *Quick Start Guide* for the connector pinouts.) The MSU card uses the TE I/O protection bus to obtain its DS1 lines and DS0 channels for testing. The MSU card shares the protection bus with the equipment protection circuits and yields it whenever protection switching is required.

You can use the MSU card for the following tests:

- Non-intrusive monitoring
  - of one or two DS1 or E1 lines
  - of up to 24 DS0 channels within a DS1 line
  - of up to 32 DS0 channels within an E1 line
- Intrusive (split) testing
  - of one or two DS1 or E1 lines
  - of up to 24 DS0 channels within a DS1 line
  - of up to 32 DS0 channels within an E1 line

To monitor a DS1 or E1 line, you require initial manual or forced protection switching of the subject mapper card as described in Equipment protection switching for mapper cards on page 214. The following types of cross connections can be monitored:

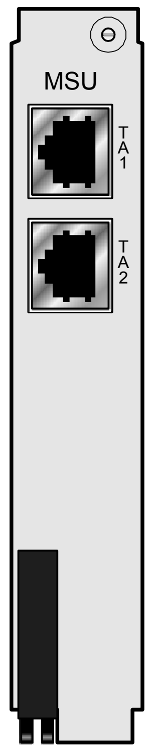
- DS3 or DS3R card to STS1 card
- DS3 or DS3R card to ST1 card
- DS3 or DS3R card to SE1 card
- DS3 or DS3R card to FXS card
- DS3 or DS3R card to FXO card
- STS1 card to ST1 card
- STS1 card to SE1 card
- STS1 card to FXS card
- STS1 card to FXO card
- ST1 card to ST1 card (the same card or different cards)
- ST1 card to FXS card
- ST1 card to FXO card
- SE1 card to SE1 card
- SE1 card to FXS card
- SE1 card to FXO card

Note: You cannot test the following types of cross connections:
DS3 or DS3R card to DS3 or DS3R card
STS1 card to STS1 card
FXS card to FXS card
FXO card to FXO card

The other MSU tests request and use the protection bus but do not use protection switching. For details about MSU test commands, see Active connection testing on page 261.

The MSU card is an unintelligent I/O card that can reside only in slot 16 or 17 of the upper (I/O) slots of the chassis. Under CPU control, any of eight T1 (DS1) lines present on the protection bus can be switched through the MSU card relay array to either of two test access connectors on the MSU card front panel for testing. The MSU card front panel is shown in Figure 19.

Figure 19. MSU card front panel



Front connector, alarm, and power feed assembly

The front connector, alarm, and power feed (FCAPF) assembly is located horizontally on the front of the system chassis, between the upper and lower banks of card slots. The FCAPF assembly provides the following:

- **System clock (input and output) interface**—includes one external clock connector per Clock I/O card. The balanced input and output clock signals pass through the backplane to the clock cards.
- **Alarm and status LEDs**— Remote, critical, major, and minor alarm signals coming from the CPU are directed to corresponding LEDs on the FCAPF assembly, permitting convenient system operation. The external alarm signals (critical audible and visual,

major audible and visual, minor audible and visual, power audible and visual) coming from the CPU drive the relays connected to the external alarm DB25 connector located on the FCAPF assembly.

Note: The minor alarm is generated as a local general alarm only. It does not drive a line on the external alarm DB25 connector.

- **Push-button switches**—for operations and testing
- **Two DB25 connectors**—one connector is for alarm relays and the other is for the network management system (NMS), which is not currently supported.
- A and B power input connectors and fuses
- An electrostatic discharge (ESD) access jack

See System Diagnostics and Testing on page 299, for further detail on the FCAPF assembly.

System backplane and buses

The system backplane supports several different traffic types and features, and includes the following buses.

- **CPU bus**—Performs configuration, control, and statistical collection for all cards of the system, as well as card-to-card communications.Contains a complete picture of traffic-related provisioning for cross-connect cards (XCON, IXCON, DS3, DS3R, S155, or STS1) and a complete picture of all card provisioning.
- **TDM bus**—Two parallel buses for data and signaling running at 19.2 MHz providing 2,400 64 Kbps timeslots. Timeslots are divided into 75 groups of 32 timeslots each. Normally, one group handles one entire T1 port. The bus is divided into transmit and receive sections. Mapper cards write to the transmit bus and read from the receive bus while cross-connect cards normally write to the receive bus and read from the transmit bus.
- **I/O bus**—Physically connects each logic card slot to an I/O card located above it for slots 3 through 17 of the chassis.
- **Clock bus**—Clock synchronization and timing signal bus, providing the following:
  - Primary reference clock generated by mapper card slots
  - Secondary reference clock generated by mapper card slots
  - Temperature-compensated 12.3648-MHz TCXO
  - 1.544-MHz clock used by ST1 mapper card
  - 16.384-MHz clock used by T1/E1 I/O cards and cross-connect cards
  - 19.2-MHz clock output for the TDM bus
  - 25-MHz clock used by CPU cards

  - 8-kHz frame reference

- **I/O connector bus**—Bus carrying all required connector card signals and redundancy from the CPU card to the I/O connector cards (also known as the Serial Peripheral Interface SPI bus).
- **Protection bus**—Supports redundancy for all mapper cards by running along all I/O and logic card slots. Use of T1 I/O protection card can make any slot a protection slot. It can also be used for individual line testing.
- **I/O control bus**—Provides serial communication between the CPU and the I/O cards, indicating when to switch to the redundant bus for protection (also known as the serial peripheral interface (SPI) bus).
- **I/O power bus**—Distributes power to all plug-in cards through 7.5 Amp contacts with the following signals provided through a dedicated connector:
  - -48V DC (x2)—Primary power input distributed to all slots with input voltage ranging between -36.5V to -56.5V (typically not used by I/O connector cards)
  - PGND (x2)—Ground input for -48V
  - DGND (x4)—Digital ground for all slots
  - 5V (x2)—Primary power input used by typical I/O connector cards
- **Clock connector card bus**—This bus takes -48V and supplies 5V to the remaining 15 I/O cards; it distributes many of the system clocks and receives clock inputs; and it has direct access to the wirewrap terminal on the front connector, alarm, and power feed (FCAPF) assembly for external clock input and output.

Backplane bus termination

The backplane actively terminates with a +2.5V DC regulated source originating from the Clock I/O cards. A resistor of appropriate value (82 ohms) on the backplane connects to the 2.5V DC source.

Backplane slot ID system and memory maps

Each backplane slot has a unique slot identifier hardwired at the card slot connector. This identifier is used by all cards to select the base address range to which the card responds.

Backplane connector numbering convention

The backplane connectors are numbered as follows for slots 1 to 15:

- **P1YX**—I/O bus 120-pin metric connector
- **P2YX**—Power bus 24-pin metric connector

- **P3YX**—CPU/ADM bus 192-pin metric connector
- **P4YX**—TDM/ATM bus 192-pin metric connector

where YX = slot number

For example, P215, P315, P415 is slot 15.

3 Chapter 3 System Operation

This chapter describes the cross-connect function of the ARCADACS 100 system.

Cross-connect operation

The ARCADACS 100 operates as a T1, E1, T3, STS1, STM-1, or OC3 cross connect to provide interconnection between mapped DS0 signals from any supported type of network lines. The following configurations are the most common:

- T1 to T1, DS3, STS1, or OC3
- FXS or FXO to T1, DS3, or STS1
- FXO to FXO to E1
- E1 to STM-1
- E1 to T1, or DS3

T1 cross connections

Input T1 signals are routed through the T1/E1 I/O cards and terminated in the structured T1 (ST1) mapper cards. The ST1 mapper cards convert each T1 signal to 24 DS0 signals and place them on the TDM transmit bus. The cross-connect card (XCON, IXCON, DS3, DS3R, S155, or STS1) takes the DS0 signals from the TDM transmit bus, performs the cross connections, and places the resultant DS0 signals on the TDM receive bus. The ST1 mapper cards then retrieve the cross-connected DS0 signals from the TDM receive bus, convert them back to T1 signals, and route them to their destinations through the T1/E1 I/O cards. Maximum cross-connect card capacity is 2,400 DS0 time slots while maximum system T1 line capacity is 72, providing a usable cross-connect space for a T1 to T1 configuration of 1,728 DS0 signals.

E1 cross connections

Input E1 signals are routed through the T1/E1 I/O cards and terminated in the structured E1 (SE1) mapper cards. The SE1 mapper cards convert each E1 signal to 32 DS0 signals and place them on the TDM transmit bus. The cross-connect (XCON, IXCON, DS3, DS3R, STS1, or S155) card takes the DS0 signals from the TDM transmit bus, performs the cross connections, and places the resultant DS0 signals on the TDM receive bus. The SE1 mapper cards then retrieve the cross-connected DS0 signals from the TDM receive bus, convert them back to E1 signals, and route them to their destinations through the T1/E1 I/O cards.

Maximum cross-connect card capacity is 2,400 DS0 time slots while maximum system E1 line capacity is 72, providing a usable cross-connect space for an E1 to E1 configuration of 2304 DS0 signals.

T3 cross connections

DS3 functionality is provided in ARCADACS 100 through a T3 network interface (T3NI) that consists of DS3 mapper cards and a T3 I/O protection assembly (a T3 I/O card and a T3 I/O protection card, mounted together behind a double-width faceplate). This T3NI set provides an electrical interface for two DS3 signals between the ARCADACS 100 and an external communication network. This is done using two DS3 interface ports on the T3 I/O card. The main function of the T3NI is performed on the DS3 card, and can be described as three sub-functions:

- DS3 to DS0 format conversion and cross connect
- General cross connect
- Call processing

DS3 to DS0 format conversion and cross connect

Towards the outside network the DS3 converts up to 1,344 DS0 Tx channels into 56 DS1 formatted Tx signals. These 56 DS1 signals are then grouped further in to two groups of 28 DS1 tributaries and finally formatted into two Tx DS3 signals.

In the opposite direction the operation is reversed. From the network two Rx DS3 signals are demultiplexed into 2 by 28 DS1 Rx signals finally amounting to 1,344 DS0 Rx channels.

Note: 1,344 DS0 full-duplex channels represent the bandwidth capacity of one T3NI. All these DS0 channels are available on the system TDM Bus. The availability of the 1,344 DS0 channels is achieved by a dedicated cross connection function which allows that any of these DS0 channels be mapped from, and to, the system TDM Bus.

General cross connect

A separate functional entity on the DS3 card is a general cross-connect. This function has the same characteristics as the XCON or IXCON card with a capacity of 1,200 full duplex circuit-switched connections established between different ST1 cards as well as the DS3 cards. This function effectively eliminates the need for a separate XCON or IXCON card.

Ports A and B on the DS3 card can be used to set up cross connections in three ways: port A to port B, port A to TDM, and port B to TDM.

Caution: XCON or IXCON cards cannot be installed in the same system with DS3 cards. To support cross connections in a system with T1 or E1 interfaces, use XCON or IXCON cards. (IXCON cards have FDL muxing over DS0 channels.) To support cross connections in a system with T1 and T3 interfaces, use DS3 or DS3R cards.

Call processing

The DS3 card can interface to a Class 5 switch in two ways: over the DS3 port A, or over T1 trunks on the ST1 cards (in the same manner as the XCON or IXCON card).

STS1 cross connections

STS1 functionality is provided through STS1 mapper cards and an STS1 I/O protection assembly. This set of cards provides an electrical interface for two STS1 signals between the ARCADACS 100 and an external communication network. This is done using two STS1 interface ports on the STS1 I/O protection assembly. The main function is performed on the STS1 card, and can be described as three sub-functions:

- STS1 to DS0 format conversion and cross connect
- General cross connect
- Call processing

STS1 to DS0 format conversion and cross connect

Towards the outside network the STS1 converts up to 1,344 DS0 Tx channels into 56 DS1 formatted Tx signals. These 56 DS1 signals are then grouped into two groups of 28 DS1 tributaries, converted to VT1.5 signals, and finally formatted into two Tx STS1 signals.

In the opposite direction the operation is reversed. From the network two Rx STS1 signals are demultiplexed into 2 by 28 VT1.5 signals, then converted to 2 by 28 DS1 Rx signals, and finally amounting to 1,344 DS0 Rx channels.

The 1,344 DS0 channels are available for cross connections using the TDM backplane.

General cross connect

A separate functional entity on the STS1 card is a general cross connect. This function has the same characteristics as the XCON or IXCON card with a capacity of 1,200 full duplex circuit-switched connections established between different ST1 cards as well as the STS1 cards. This function eliminates the need for a separate cross-connect card in the system.

Ports A and B on the STS1 card can be used to set up cross connections in three ways: port A to port B, port A to TDM, and port B to TDM.

Caution: XCON or IXCON cards cannot be installed in the same system with STS1 cards. To support cross connections in a system with T1 interfaces, use XCON or IXCON cards. (IXCON cards have FDL muxing over DS0 channels.) To support cross connections in a system with STS1 interfaces, use STS1 cards.

Call processing

The STS1 card can interface to a Class 5 switch in two ways: over the STS1 port A, or over T1 trunks on the ST1 cards (in the same manner as the XCON or IXCON card).

OC3 cross connections

Cross connections with optical signals is provided through S155 mapper cards and an S155 I/O protection assembly. This set of cards provides an optical to electrical interface for an OC3 or OC3c signal between the ARCADACS 100 and an external communication network. This is done using a Tx and Rx optical interface port on the S155 I/O protection assembly.

Note: OC3C is not supported in this release.

The main function is performed on the S155 card, and can be described as three sub-functions:

- OC3 to DS0 format conversion and cross connect
- General cross connect
- Call processing

OC3 to DS0 format conversion and cross connect

The S155 card converts DS0 channels to optical signals in the following ways:

- **OC3 mode**—Towards the outside network the S155 converts up to 2,016 DS0 Tx channels into 84 DS1 formatted Tx signals. These 84 DS1 signals are then converted to 84 VT1.5 tributaries, and formatted into 3 STS1 signals, which are finally converted to 1 OC3 signal.

- **OC3C mode**—Towards the outside network the S155 converts up to 2,016 DS0 Tx channels into 84 DS1 formatted Tx signals. These 84 DS1 signals are then converted to 84 VT1.5 tributaries, and formatted into 1 STS3 signal, which is finally converted to an OC3 or OC3c signal.

Note: OC3C is not supported in this release.

In the opposite direction the operation is reversed. From the network one Rx OC3 or OC3c signal is demultiplexed into 3 STS1 signals (OC3 mode) or 1 STS3 signal (OC3C mode), then into 84 VT1.5 tributaries, then converted to 84 DS1 Rx signals, and finally amounting to 2,016 DS0 Rx channels.

The 2,016 DS0 channels are available for cross connections using the TDM backplane.

General cross connect

A separate functional entity on the S155 card is a general cross connect. This function has the same characteristics as the IXCON card with a capacity of 1200 full duplex circuit-switched connections established between different ST1, STS1 cards, and S155 cards. This function eliminates the need for a separate cross-connect card in the system.

Caution: S155 cards and IXCON cards cannot be installed in the same system. To support cross connections in a system with T1 interfaces, use IXCON cards. To support cross connections in a system with optical interfaces, use S155 cards.

Optical cross connections

Cross connections with optical signals is provided through S155 mapper cards and an S155 I/O protection assembly. This set of cards provides an optical to electrical interface for an STM-1, OC3, or OC3c signal between the ARCADACS 100 and an external communication network. This is done using a Tx and Rx optical interface port on the S155 I/O protection assembly.

Note: OC3C is not supported in this release.

The main function is performed on the S155 card, and can be described as these sub-functions:

- Optical signal to DS0 format conversion and cross connect
- General cross connect

Optical signal to DS0 format conversion and cross connect

The S155 card converts DS0 channels to optical signals in the following ways:

- **STM1 mode**—Towards the outside network the S155 converts up to 2,016 DS0 Tx channels into 63 E1 formatted Tx signals. These 63 E1 signals are then converted to 63 VT2 tributaries, and finally formatted into 1 STM-1 signal.
- **OC3 mode**—Towards the outside network the S155 converts up to 2,016 DS0 Tx channels into 84 DS1 formatted Tx signals. These 84 DS1 signals are then converted to 84 VT1.5 tributaries, and formatted into 3 STS1 signals, which are finally converted to 1 OC3 signal.
- **OC3C mode**—Towards the outside network the S155 converts up to 2,016 DS0 Tx channels into 84 DS1 formatted Tx signals. These 84 DS1 signals are then converted to 84 VT1.5 tributaries, and formatted into 1 STS3 signal, which is finally converted to an OC3 or OC3c signal.

Note: OC3C is not supported in this release.

The 2,016 DS0 channels are available for cross connections using the TDM backplane.

General cross connect

A separate functional entity on the S155 card is a general cross connect. This function has the same characteristics as the XCON or IXCON card with a capacity of 1200 full duplex circuit-switched connections established between different SE1, ST1, STS1 cards, and S155 cards. This function eliminates the need for a separate cross-connect card in the system.

Caution: S155 cards cannot be installed in the same system with XCON or IXCON cards. To support cross connections in a system with T1 or E1 interfaces, use XCON or IXCON cards. (IXCON cards have FDL muxing over DS0 channels.) To support cross connections in a system with optical interfaces, use S155 cards.

Call processing

The S155 card can interface to a Class 5 switch in two ways: over the S155 port, or over T1 facilities on the ST1, DS3, and STS1 cards (in the same manner as the XCON or IXCON card).

Types of cross connections

There are three types of cross connections available in the ARCADACS 100 system:

- VOICE
- DATA
- VSIG (voice and signaling)

Each type of cross connection has specific applications for trunk conditioning and signaling. All three types use a 64KB clear channel for the connection.

Voice cross connections

The VOICE setting for cross connection uses hex 7F bit pattern for trunk conditioning Create single line cross connection command on page 256. This setting is recommended for voice calls that use out-of-band signaling only.

Data cross connections

The DATA setting for cross connection uses a hex 1A bit pattern for trunk conditioning. It is recommended for data connections, such as those between two computing devices.

VSIG cross connections

The VSIG setting for cross connection causes the ARCADACS 100 to extract the ABCD bits on ingress and reinsert the ABCD bits on egress of the shelf. For T1 interfaces, 1/48th of the payload is lost to the ABCD bits (robbed-bit signaling). For E1 interfaces, the ABCD bit processing is done out of band, with the ARCADACS 100 providing the translations.

VSIG cross connections use a hex 7F bit pattern for trunk conditioning. This setting is recommended for voice calls that use channel-associated signaling (CAS). VSIG cross connections are the only type supported on FXS and FXO cards.

Equipment requirements for cross connections

All cross-connect applications require the common equipment (see Common equipment on page 10). Table 4 shows the minimum additional equipment required for each type of cross connection that is supported in Release 2.5.10.

Table 4. Minimum additional equipment for cross-connections

Cross connection	Equipment required
T1 to T1	ST1 card, TE IO card, XCON or IXCON card
T1 to E1	ST1 card, SE1 card, TE IO card, XCON or IXCON card
T1 to T3	ST1 card, TE IO card, two DS3 or DS3R cards, T3 IO protection assembly *Note: This application also supports T1 to T1 and T3 to T3.*
T1 to STS1	ST1 card, TE IO card, two STS1 cards, STS1 IO protection assembly

Table 4. Minimum additional equipment for cross-connections (continued)

Cross connection	Equipment required
T1 to OC3	ST1 card, TE IO card, two S155 cards, S155 IO protection assembly
T1 to FXS	ST1 card, FXS card, TE IO card, RNG IO card, XCON or IXCON card *Note: This application also supports FXS to FXS and T1 to T1.*
T1 to FXO	ST1 card, FXO card, TE IO card, RNG IO card, XCON or IXCON card *Note: This application also supports FXO to FXO and T1 to T1.*
E1 to E1	SE1 card, TE IO card, XCON or IXCON card
E1 to T3	SE1 card, DS3 or DS3R cards, TE IO card, T3 IO protection assembly
E1 to STS1	SE1 card, two STS1 cards, TE IO card, STS1 IO protection assembly
E1 to STM-1	SE1 card, two S155 cards, TE IO card, S155 IO protection assembly
E1 to FXS	SE1 card, FXS card, TE IO card, RNG IO card, XCON or IXCON card
E1 to FXO	SE1 card, FXO card, TE IO card, RNG IO card, XCON or IXCON card
T3 to T3	Two DS3 or DS3R cards, T3 IO protection assembly
T3 to STS1	Two STS1 cards (in DUAL mode), STS1DS3 IO protection assembly
T3 to OC3	Two DS3 or DS3R cards, T3 IO protection assembly, two S155 cards, S155 IO protection assembly
T3 to FXS	Two DS3 or DS3R cards, FXS card, T3 IO protection assembly, RNG IO card
T3 to FXO	Two DS3 or DS3R cards, FXO card, T3 IO protection assembly, RNG IO card
T3 to STS1 to T1	Two STS1 cards (in DUAL mode), STS1DS3 IO protection assembly, ST1 card, TE IO card
STS1 to STS1	Two STS1 cards, STS1 IO protection assembly
STS1 to OC3	Two STS1 cards, STS1 IO protection assembly, two S155 cards, S155 IO protection assembly
STS1 to FXS	Two STS1 cards, FXS card, STS1 IO protection assembly, RNG IO card
STS1 to FXO	Two STS1 cards, FXO card, STS1 IO protection assembly, RNG IO card
FXS to FXS	FXS card, RNG IO card, XCON or IXCON card
FXS to FXO	FXS card, FXO card, two RNG IO cards, XCON or IXCON card
FXO to FXO	FXO card, RNG IO card, XCON or IXCON card
FXS to T1 to T3	FXS card, ST1 card, two DS3 or DS3R cards, RNG IO card, TE IO card, T3 IO protection assembly *Note: This application also supports T1 to T1, T3 to T3, and FXS to FXS.*
E1 to T1 to T3 to FXS	SE1 card, ST1 card, two DS3 or DS3R cards, FXS card, TE IO cards, T3 IO protection assembly, RNG IO card

Cross connection capacity

The number of cross connections that are supported by the ARCADACS 100 is affected by the size of the backplane andthe cross connection capability of the mapper cards. The TDM backplane consists of 2,400 DS0 channels. Table 5 indicates the number of TDM backplane channels that are used for the different types of connections in your system. These values are applied to the examples given in this section.

Table 5. TDM backplane channels used per connection type

Connection type	# channels used
Between two cards without xcon[1]	2
Between a card with xcon[2] and a card without xcon[1]	1
Between two cards with xcon[2]	1
Within the same xcon card[2]	0

1. Cards without xcon capability include ST1, FXS, and FXO.
2. Cards with xcon capability include: DS3, STS1.

Note: Table 5 is based on the assumption that the cross connections use termination pointers (TP) with a single DS0. For TPs with more than one DS0, multiply the value in the “# channels used” column by the number of DS0s in the TP.

Table 6. TDM backplane channels used per connection type

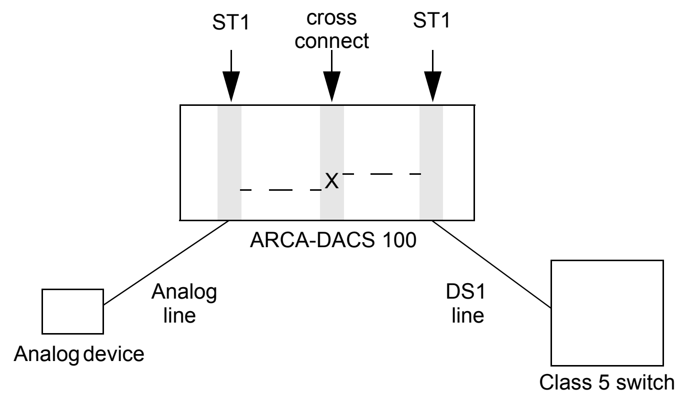
Connection type	# channels used
Between two cards without xcon[1]	2
Between a card with xcon[2] and a card without xcon	1
Between two cards with xcon[3]	1
Within the same xcon[4] card	0

1. Cards without xcon capability include ST1, SE1, FXS, and FXO.
2. DS3, DS3R, STS1, and S155.
3. DS3, DS3R, STS1, and S155.
4. DS3, DS3R, STS1, and S155.

T1 to T1 cross connection system

In a system using ST1 mapper cards, one card or group of cards connects to analog devices and another card or group of cards connects to a Class 5 switch. To set up a cross connection between an analog device and the Class 5 switch, the analog line resource (ALR) and the DS1 line resource (DS1LR) are each assigned a TP. The two TPs are then assigned to a cross connection, which is set up on the cross connection (XCON or IXCON) card. Figure 20 shows this type of cross connection. The dashed lines represent the backplane channels being used to carry the signals to the cross-connect card.

Figure 20. ST1 to ST1 cross connection



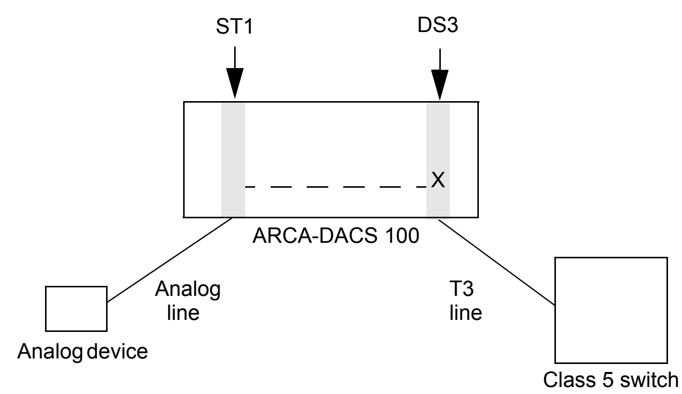
Nine ST1 cards provide 1,728 DS0 channels (9 x 8 DS1 x 24 DS0), which gives the following system capacity:

- 864 cross connections (at two backplane channels per cross connection)

T1 to T3 cross connection system

In an example using ST1 and DS3 mapper cards, a group of ST1 cards connects to analog devices and a DS3 card connects to a Class 5 switch. Figure 21 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on the DS3 card. The dashed line represents the backplane channel being used to carry the ST1 signal to the cross-connect card.

Figure 21. ST1 to DS3 cross connection



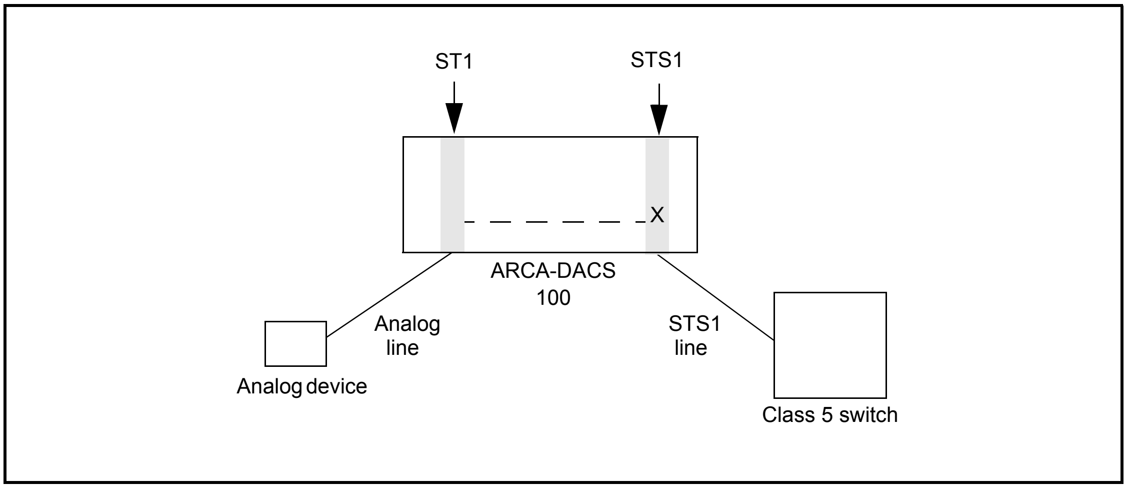
Nine ST1 cards provide 1,728 DS0 channels (9 x 8 DS1 x 24 DS0). A DS3 card provides 1,344 DS0 channels (2 T3 x 28 DS1 x 24 DS0). This represents 3,072 DS0 channels, which can be used in cross connections as shown in the following table:

# cross connections	Resources used	Resources remaining
1,344 (DS3 to ST1) *Each cross connection uses 1 backplane channel*	1,344 DS0s from DS3 cards 1,344 DS0s from ST1 cards 1,344 backplane channels	0 DS0s from DS3 cards 384 DS0s from ST1 cards 1,056 backplane channels
192 (ST1 to ST1)	384 DS0s from ST1 cards 384 backplane channels	0 DS0s from ST1 cards 672 backplane channels

T1 to STS1 cross connection system

In an example using ST1 and STS1 mapper cards, a group of ST1 cards connects to analog devices and a STS1 card connects to a Class 5 switch. Figure 22 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on the STS1 card. The dashed line represents the backplane channel being used to carry the ST1 signal to the cross-connect card.

Figure 22. ST1 to DS3 cross connection



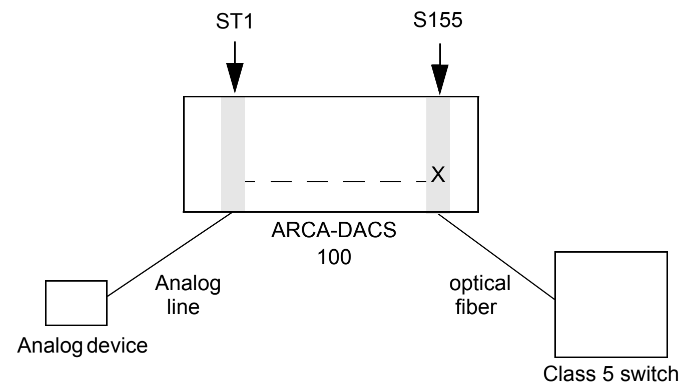
Nine ST1 cards provide 1,728 DS0 channels (9 x 8 DS1 x 24 DS0). An STS1 card provides 1,344 DS0 channels (2 STS1 x 28 VT1.5/DS1 x 24 DS0). This represents 3,072 DS0 channels, which can be used in cross connections, as shown in the following table

# cross connections	Resources used	Resources remaining
1,344 (STS1 to ST1) *Each cross connection uses 1 backplane channel*	1,344 DS0s from STS1 cards 1,344 DS0s from ST1 cards 1,344 backplane channels	0 DS0s from STS1 cards 384 DS0s from ST1 cards 1,056 backplane channels
192 (ST1 to ST1)	384 DS0s from ST1 cards 384 backplane channels	0 DS0s from ST1 cards 672 backplane channels

T1 to OC3 connection system

In an example using ST1 and S155 mapper cards, a group of ST1 cards connects to analog devices and an S155 card connects to a Class 5 switch. Figure 23 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on the S155 card. The dashed line represents the backplane channel being used to carry the ST1 signal to the cross-connect card.

Figure 23. ST1 to S155 cross connection



Nine ST1 cards provide 1,728 DS0 channels (9 x 8 T1 x 24 DS0). An S155 card in OC3 mode provides 2,016 DS0 channels (1 OC3 x 84 VT1.5/T1 x 24 DS0).

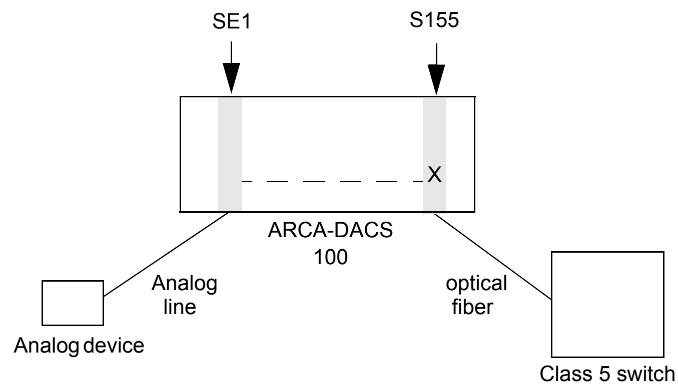
This represents 3,744 DS0 channels, which can be used in cross connections, as shown in the following table

# cross connections	Resources used	Resources remaining
1,728 (S155 to ST1) *Each cross connection uses 1 backplane channel*	1,728 DS0s from S155 cards 1,728 DS0s from ST1 cards 1,728 backplane channels	288 DS0s from S155 cards 0 DS0s from ST1 cards 672 backplane channels
144 (S155 to S155)	288 DS0s from S155 cards 0 backplane channels	0 DS0s from S155 cards 672 backplane channels

E1 to S155 connection system

In an example using SE1 and S155 mapper cards, a group of SE1 cards connects to analog devices and an S155 card connects to a Class 5 switch. Figure 24 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on the S155 card. The dashed line represents the backplane channel being used to carry the SE1 signal to the cross-connect card.

Figure 24. SE1 to S155 cross connection



Nine SE1 cards provide 2,160 DS0 channels (9 x 8 E1 x 30 DS0). An S155 card in STM1mode provides 1,890 DS0 channels (1 STM-1 x 63 VT2/E1 x 30 DS0).

Note: Although there are 32 DS0 channels on an E1 facility, the estimates allow for 30 available channels. Channels 0 and 16 are frequently reserved for other types of signaling.

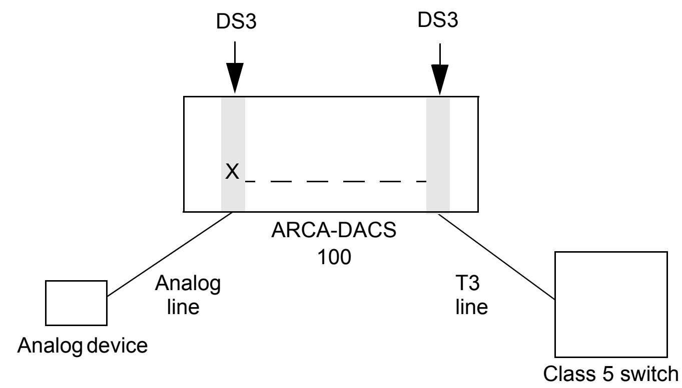
This represents 4,050 DS0 channels, which can be used in cross connections, as shown in the following table

# cross connections	Resources used	Resources remaining
1,890 (S155 to SE1) *Each cross connection uses 1 backplane channel*	1,890 DS0s from S155 cards 1,890 DS0s from SE1 cards 1,890 backplane channels	0 DS0s from S155 cards 270 DS0s from SE1 cards 510 backplane channels
135 (SE1 to SE1)	270 DS0s from SE1 cards 270 backplane channels	0 DS0s from SE1 cards 240 backplane channels

T3 to T3 cross connection system

In an example using DS3 mapper cards, one card or group of cards connects to analog devices and another card or group of cards connects to one or more Class 5 switches. Figure 25 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on one of the DS3 cards (usually the one providing the primary TP). The dashed line represents the backplane channel being used to carry the DS3 signal to the cross-connect card.

Figure 25. DS3 to DS3 cross connection



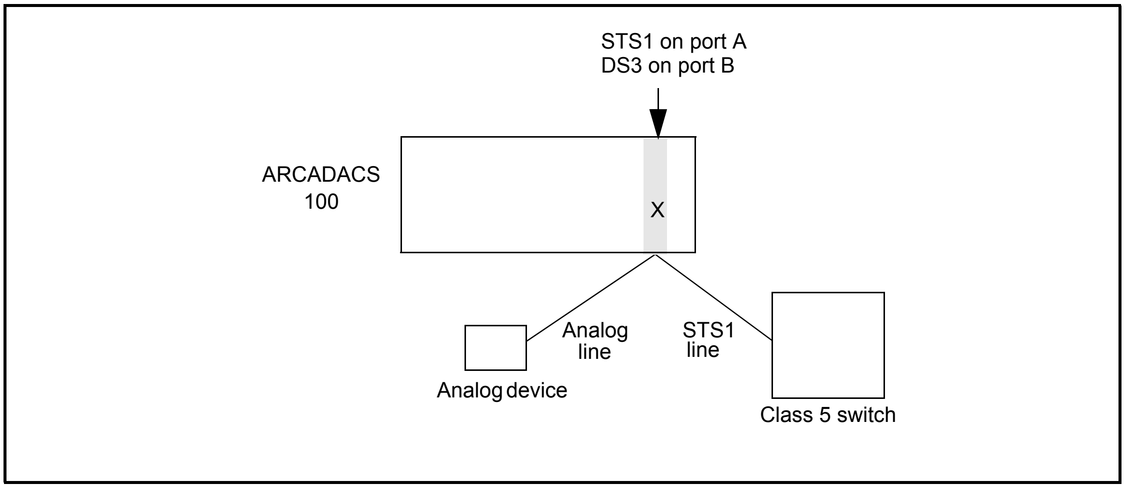
Six pairs of DS3 cards provide 8,064 DS0 channels (6 x 2 T3 x 28 DS1 x 24 DS0), which can be in cross connections as shown in the following table:

# cross connections	Resources used	Resources remaining
2,400 (DS3 to another DS3) *Each cross connection uses 1 backplane channel*	4,800 DS0s from DS3 cards 2,400 backplane channels	3,264 DS0s from DS3 cards 0 backplane channels
1,632 (DS3 to same DS3) *Each cross connection uses 0 backplane channels*	3,264 DS0s from DS3 cards	0 DS0s from DS3 cards
OR		
4,032 (DS3 to same DS3)	8,064 DS0s from DS3 cards	0 DS0s from DS3 cards 2,400 backplane channels

T3 to STS1 cross connection system

In an example using an STS1 mapper card in DUAL mode, one pair of cards connects to analog devices and to one or more Class 5 switches. Figure 26 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on a DUAL-mode STS1 card. There is no backplane channel required to connect a DS3 signal and an STS1 signal within a DUAL-mode STS1 card.

Figure 26. DS3 to STS1 cross connection



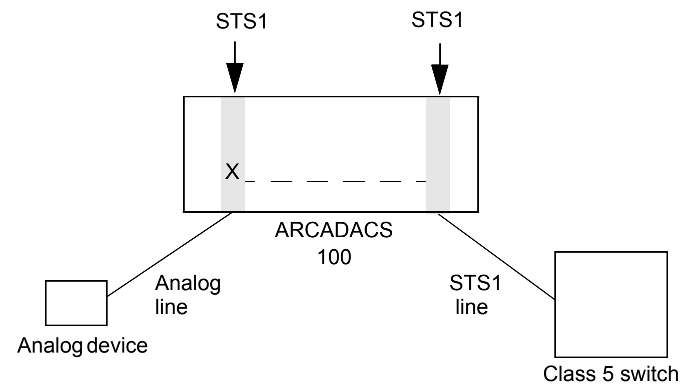
Six pairs of DUAL-mode STS1 cards provide 8,064 DS0 channels ([6 x 1 T3 + 6 x 1 STS1] x 28 DS1[/VT1.5] x 24 DS0), which can be in cross connections as shown in the following table:

# cross connections	Resources used	Resources remaining
2,400 (between any two pairs of cards) *Each cross connection uses 1 backplane channel*	4,800 DS0s from STS1 cards 2,400 backplane channels	3,264 DS0s from STS1 cards 0 backplane channels
1,632 (On same STS1 pair) *Each cross connection uses 0 backplane channels*	3,264 DS0s from STS1 cards 0 backplane channels	0 DS0s from STS1 cards 0 backplane channels
OR		
4,032 (On same STS1 pair)	8,064 DS0s from STS1 cards 0 backplane channels	0 DS0s from STS1 cards 2,400 backplane channels

STS1 to STS1 cross connection system

In an example using STS1 mapper cards, one card or group of cards connects to analog devices and another card or group of cards connects to one or more Class 5 switches. Figure 27 shows a cross connection between an analog device and the Class 5 switch. The cross connection is set up on one of the STS1 cards (usually the one providing the primary TP). The dashed line represents the backplane channel being used to carry the STS1 signal to the cross-connect card.

Figure 27. STS1 to STS1 cross connection



Six pairs of STS1 cards provide 8,064 DS0 channels (6 x 2 STS1 x 28 VT1.5/DS1 x 24 DS0), which can be in cross connections, as shown in the following table:

# cross connections	Resources used	Resources remaining
2,400 (STS1 to another STS1) *Each cross connection uses 1 backplane channel*	4,800 DS0s from STS1 cards 2,400 backplane channels	3,264 DS0s from STS1 cards 0 backplane channels
1,632 (STS1 to same STS1) *Each cross connection uses 0 backplane channels*	3,264 DS0s from STS1 cards 0 backplane channels	0 DS0s from STS1 cards 2,400 backplane channels
OR		
4,032 (STS1 to same STS1)	8,064 DS0s from STS1 cards 0 backplane channels	0 DS0s from STS1 cards 2,400 backplane channels

-

Chapter 4 TL1 Command Interface

This chapter provides detailed software command and response descriptions for the ARCADACS 100 system. All operator interaction with the ARCADACS 100 system is accomplished using transaction language 1 (TL1) software commands over a VT-100-compatible terminal.

For a quick reference list of all TL1 commands, refer to *Appendix E on page 387*.

Software description

The ARCADACS 100 uses TL1 commands over a VT-100 terminal or emulator for system configuration and operation. The TL1 commands consist of ASCII-based instruction strings exchanged between network elements (NE) and operating systems to support network surveillance, provisioning, and line and loop test functions. TL1 also allows operating systems to communicate with different types of equipment through a common language protocol.

There is no hierarchy or menu structure to the TL1 commands. Commands are syntax-sensitive and must be entered exactly as noted. If a syntax error occurs, the entire command is rejected as invalid. TL1 commands can be entered either as upper or lower case. All commands convert automatically to upper case and all responses are upper case.

Software organization

This chapter is organized as follows:

- Software Configuration
  - User log in reference
  - Listing of TL1 general functions
  - TL1 command entry mode, including the following:
    - Command cycle
    - Line edit keystroke definitions
    - Autonomous message description
    - Command termination options
    - Command acknowledgment response
    - Command character case conversion
    - Remote commands

- Typographic conventions
- TL1 command syntax and format
- TL1 normal response syntax and format
- TL1 autonomous message format
- TL1 error message format

Software configuration

This section details syntax and format of the TL1 commands and responses that apply to operating Release 2.5.10 of the ARCADACS 100 system.

Note: For all TL1 commands that pertain to DS3 cards, the same syntax applies to the DS3R cards unless otherwise noted.

User log in

The ARCADACS 100 system does not have a user interface and the only TL1 command that the system accepts is **log in**. This command is discussed in detail in Log in command on page 94. When you have successfully logged into the system, a session is initiated and all TL1 commands are accepted. Upon receipt of the **log out** command (see Log out command on page 95), the system terminates the TL1 session. Also, if a session is idle for 30 minutes (nominal), the system performs an automatic log out and the session is terminated. This TL1 timeout is configurable on a per port basis. See “Modify port settings command” on page 101.

TL1 functions

The TL1 functions include the following:

- Providing user command input
- Performing command parsing (checking syntax, semantics, and format translation)
- Checking user privileges to ensure that users are authorized to perform various operations
- Invoking commands
- Formatting execution responses to commands properly according to TL1 format as well as formatting for screen printing

Command entry mode

After successful log in, the system enters the TL1 command entry mode, and accepts start, retrieve, and edit commands. The system also issues autonomous messages, responds to command termination inputs or creates command termination conditions, provides TL1 command acknowledgment responses, supports input command character case conversion, and responds to remote commands.

Caution: General system functions are available only after a valid application key code is entered to activate them. See Application keys on page 117.

Command cycle

The command cycle is initiated by receipt of the `<cr>` carriage return response following successful log in (see Log in command on page 94). This places the system in command entry mode. The command prompt response following the carriage return indicates that the network element is ready to accept command input. Figure 28 illustrates the command cycle syntax.

Figure 28. Command cycle syntax

```
Log in<
ACT-USER:[<TID>]:<UID>:[<CTAG>]::<PID>;  (see Log in command on page 94)
<cr>
<_
```

Note: When connecting to the system over Telnet, the IP address and a port number are required. The port number must be in the range of 30000 to 30004. Ports 30005 to 30008 are exclusively used for telnet sessions in batch mode.

Line edit keystroke definitions

You can perform line edit functions using the keys on the number pad of your keyboard. These keys are defined as follows:

DEL	Delete the character positioned at cursor.
¨	Delete the character positioned before the cursor.
CTRL_A	Move the cursor to the beginning of the command string.
CTRL_Z	Move the cursor to the end of the command string.
CTRL_I	Invoke the insert and replace mode; default mode is insert.
CTRL_X	Abort current command entry.
¦	Move the cursor back to the previous command (there are six recall command buffers).

`Ø`	Move the cursor forward to the next command.
`¨`	Move the cursor left.
`Æ`	Move the cursor right.

Autonomous messages

Autonomous messages are unsolicited messages sent by network elements to report both alarmed and nonalarmed events. Autonomous messages do not interrupt a command but are saved in logs and appear after the command either times out or is terminated. Any or all autonomous messages can be retrieved through use of the **retrieve alarm log** command described in Retrieve alarm log command on page 285.

Command termination options

A command terminates when any of the following commands are given, or any of the following described conditions exist.

`;`	Denotes the normal end-of-command
`CTRL_X`	Aborts the command
`Time out`	Any period of time longer than 30 seconds after entering each character, and before entering the next character in the command string
`500+`	An input consisting of more than 500 characters
`Response`	From previous command

Command acknowledgment response

If the system does not generate a response within 2 seconds after command entry, an acknowledgment of IP appears on the screen to indicate that the command has been initiated and is in progress. If there is no further response within 8 seconds of this acknowledgment, NA appears on the screen to indicate the command has been accepted but processing control has been lost.

Command character case conversion

All characters entered as commands are converted automatically to upper case.

Remote commands

Since the ARCADACS 100 system supports both local and remote log in, TL1 commands can be sent to a remote system using the Telnet protocol over the Ethernet interface. The absence of a security check on the remote network equipment provides the same authority to both local and remote network equipment.

Typographic conventions

The following general typographic conventions are used in the descriptions and explanation of the TL1 command and response structure.

Bold	Used for commands, options, and parameters in body text, and user input in body text.
`Fixed`	Used in code examples for computer output, file names, and the contents of online files or directories.
`Fixed Bold`	Used in code examples for text typed by the user.
`Fixed bold italic`	Used for variable user input.

TL1 command, syntax, and format

The following command characters define the ARCADACS 100 system TL1 syntax.

^	Indicates a space
<>	Encloses a command or response parameter
|	Indicates choice between command parameters
[]	Encloses optional command parameters
()	Encloses command or response parameters for the following operators:
	* Indicates that preceding enclosed parameter(s) may or may not occur
	+ Indicates that preceding enclosed parameter(s) occurs at least once

Figure 29 illustrates general syntax of a typical TL1 command.

Figure 29. TL1 command example

```
<command>:[<TID>]:[<AID>]:[<CTAG>]::[<payload(s)>];
```

The command syntax items in Figure 29 are defined as follows.

<TID>	Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens. (The initial TID is FACTORY but can be changed with the **ED-NE** command on page 125.)
<AID>	**Access identifier—**card-slot-port-facility-DS0.
<CTAG>	Correlation tag is an identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.

<payloads>	Specific parameters are command-dependent and are described later in this chapter with specific commands.

If you wish to issue commands to the ARCADACS 100 programmatically, all TL1 commands must be preceded by the characters **\r** in the program software. In this case, the syntax becomes

```
\r<command>:[<TID>]:[<AID>]:[<CTAG>]::[<payload(s)>];
```

TL1 normal response syntax and format

A normal TL1 response consists of a number of characters arranged in a format, as follows:

<SID>	Source identifier is generally the same as the target identifier (TID) defined in TL1 command, syntax, and format on page 89
<yy-mm-dd>	Calendar date by year-month-day
<hh:mm:ss>	Time of day by hour:minute:second
<CTAG>	Correlation tag is an identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.
<cmplcde>	Completion code is one of the following:
	<COMPLD> Command executed
	<DELAY> Command accepted, to be executed
	<PRTL> One or more requested records cannot be retrieved
<rspblk>	Specific command-defined response data
<rsptxt>	Specific command-defined text
<terminator>	A terminator is one of the following:
	; If no more data follows
	> If more data follows under another header

Figure 30 depicts the general syntax of a TL1 normal response as it would appear on a screen.

Figure 30. TL1 normal response syntax

```
cr lf lf
^^^<SID>^<yy-mm-dd>^<hh:mm:ss>
cr lf
M^^[<CTAG>]^<cmplcde>
cr lf
[<rspblk>][<rsptxt>]*
cr lf
<terminator>
```

TL1 autonomous message format

A TL1 autonomous message indicates the presence of a system alarm or the occurrence of an event. The format is defined as follows:

`<SID>`	Source identifier is generally the same as the target identifier (TID) defined in TL1 command, syntax, and format on page 89
`<yy-mm-dd>`	Calendar date by year-month-day
`<hh:mm:ss>`	Time of day by hour:minute:second
`<rspcde>`	See Response codes for autonomous messages on page 91.
`<ATAG>`	Autonomous message tag is an identification tag of up to six integers.
`<rspname>`	See Response names for autonomous messages on page 92
`<rspblk>`	Specific command-defined response data
;	End of autonomous message

Figure 31 depicts the general syntax of a TL1 autonomous message as it would appear on the screen.

Figure 31. TL1 autonomous message syntax

```
cr lf lf
^^^<SID>^<yy-mm-dd>^<hh:mm:ss>
cr lf
<rspcde>^<ATAG>^<rspname>
cr lf
[<rspblk>]*
cr lf
;
```

Response codes for autonomous messages

The response codes for alarm messages are as follows:

*C	Critical alarm
**	Major alarm
*^	Minor alarm
A^	Non-alarm message

Response names for autonomous messages

The response names for autonomous messages are as follows:

- An event:

  `<rspname>` REPT^EVT^(T1|EQPT|SYS|SECU|NE|CPUBANK|IP|TP|SESSION|DS3BANK|DIAG)

- An alarm:

  `<rspname>` REPT^ALM^(T1|T3|EQPT|SYS|SECU|NE|CPUBANK|IP|TP|IOSLOT)

TL1 error message format

If a command fails, an error message appears. Figure 32 illustrates the format and syntax of an error message. The text block includes a description of the reason for the error message.

<TID>	Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
<yy-mm-dd>	Calendar date by year-month-day
<hh:mm:ss>	Time of day by hour:minute:second
<rspcde>	See Response codes for autonomous messages on page 91.
<CTAG>	Correlation tag is an identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.
<text block>	Specific error message data
;	End of error message

Figure 32. Error message format and syntax

```
cr lf lf
^^^<TID>^<YY-MM-DD>^<HH:MM:SS> cr lf
M^^<ctag>^DENY cr lf
^^^<errcde> cr lf
{^^^"<error description>" cr lf}  *
{^^^/*error text*/ cr lf} *;
```

TL1 command organization

The TL1 commands are classified into different operational types based on access targets and function. Some access targets are read only, others are read and write. The functional groups include the following.

- Administrative
- Equipment
- Facility
- Path
- Protection
- Performance monitoring
- Cross-connect
- Alarm and log

Each functional group of commands is described in its separate section. Detailed descriptions of the individual commands are then provided within the separate sections.

Administrative commands

The administrative commands include the following:

- User configuration commands
- Port configuration commands
- Clock source configuration commands
- Application key commands
- View system inventory commands
- View network elements commands
- Software download and upload commands

User access

User access commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Log in** command
- **Log out** command

- **Retrieve current user group** command
- **Retrieve current user group** response
- **Create user** command
- **Delete user** command
- **Retrieve specified user** command
- **Retrieve specified user** response
- **Change user access privilege(s)** command
- **Change user password** command
- **Edit human interface dialog mode** command

Log in command

The user **log in** command sets up a user session as described in User log in on page 86. To log in to the system, enter the **ACT-USER** command and the applicable parameters as shown in Figure 33.

Note: The system allows multiple TL1 sessions at a time, but only one of those sessions should be used to configure the system at any time.

Figure 33. Log in command

```
Syntax
ACT-USER:[<tid>]:<uid>:[<ctag>]::<pid>;

Example
ACT-USER:FACTORY:ROOT:TID1::;
```

The command parameters are as follows:

<TID>	**Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
<UID>	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<PID>	**Password ID**—A string of eight to ten characters, including at least one numeric, one alphabetic, and one special character.

Log out command

The user **log out** command cancels the user session as described in User log in on page 86. To log out of the session, enter the **CANC-USER** command and the applicable parameters as shown in Figure 34.

Figure 34. Log out command

```
Syntax
CANC-USER:[<tid>]:[<uid>]:[<ctag>];

Example
CANC-USER:FACTORY:ROOT:CTAG1;
```

The command parameter is as follows:

`<TID>`	**Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve current user group command

To retrieve (view) a current user group, enter the **RTRV-USER** command and the applicable parameters as shown in Figure 35.

Figure 35. Retrieve current user group command

```
Syntax
RTRV-USER:[<tid>]:[<uid>]:[<ctag>];

Example
RTRV-USER:FACTORY:ROOT:CTAG1;
```

The command parameter is as follows:

`<TID>`	**Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve current user group response

The `<rspblk>` portion of the response to the **RTRV-USER** command is shown in Figure 36.

Figure 36. Retrieve current user group response

```
Syntax
"RTRV-USER:[<tid>]:[<uid>]:[<ctag>];"

Example
"USER1:,ROOTGRP,SUPER"
```

The response parameters are as follows:

`<TID>`	**Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<GID>`	**Group ID**—ROOTGRP
`<CAG>`	**Command access group**—SUPER | RW | RD

System and user security

The ARCADACS 100 system includes a security feature permitting users to belong to one or more work groups with different authorization and access capabilities. Whenever a command is issued, the system automatically checks the user's access level to ensure that the requested command is authorized. Table 7 lists the authorized privileges and associated commands. There are three types of privileges: Read, Read and Write, and Super. When creating a new user, the system manager assigns one or more privilege types to the user. Users can access only those commands within their privilege group(s).

Note: There is a limit of 10 different user IDs per system.

Table 7. Privilege groups and associated commands

Privileges	Command type	Command description
SUPER	ENT-USER-SECU	Create new user
SUPER	DLT-USER-SECU	Delete user
SUPER	ED-PID	Change specified user password
READ/WRITE, SUPER	ENT	Create entity
READ/WRITE, SUPER	SET	Set value
READ/WRITE, SUPER	OPR | RLS | ALW | INH | INIT | SW	Operation

Table 7. Privilege groups and associated commands (continued)

Privileges	Command type	Command description
READ/WRITE, SUPER	ED	Edit value
READ/WRITE, SUPER, READ	ACT-USER	Log in user
READ/WRITE, SUPER, READ	CANC-USER	Log out current user
READ/WRITE, SUPER, READ	ED-PID	Change current user password
READ/WRITE, SUPER, READ	RTRV	Retrieving data

Create user command

To create a new user, enter the **ENT-USER-SECU** command and the applicable parameters as shown in Figure 37. The password must be entered twice to confirm correct entry, and does not appear on the screen.

Figure 37. Create user command

```
Syntax
ENT-USER-SECU:[<TID>]:<UID>:[<CTAG>]::<PID>,<PID>,,<GID>,<CAG>;

Example
ENT-USER-SECU::USER1:::PSWORD1%,PSWORD1%,,ROOTGRP,RW;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<UID>	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<PID>	**Password ID**—A string of up eight to ten characters, including one numeric, one alphabetic, and one special character *Note: PID must be entered twice, to verify the new password.*
<GID>	**Group ID**—ROOTGRP
<CAG>	**Command access group**—SUPER | RW | RD

Delete user command

To delete one or more users, enter the **DLT-USER-SECU** command and the applicable parameters as shown in Figure 38.

Figure 38. Delete user command

```
Syntax
DLT-USER-SECU:[<TID>]:<UID>[&<UID>]:[<CTAG>];

Example
DLT-USER-SECU::USER1&USER2&USER3:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<UID>	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter. Can be multiple entries per command.

Retrieve specified user command

To retrieve (view) a specified user, enter the **RTRV-USER-SECU** command and the applicable parameters as shown in Figure 39.

Figure 39. Retrieve specified user command

```
Syntax
RTRV-USER-SECU:[<TID>]:(<UID>[&<UID>]|ALL):[<CTAG>];

Example
RTRV-USER-SECU::ALL:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<UID>	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter. Can be multiple entries per command.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve specified user response

The `<rspblk>` portion of the response to the **RTRV-USER-SECU** command is shown in Figure 40.

Figure 40. Retrieve specified user response

```
Syntax
"<UID>:,<GID>,<CAG>"+

Example
"USER1:,ROOTGRP,RD"+
```

The response parameters are as follows:

`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<GID>`	**Group ID**—ROOTGRP
`<CAG>`	**Command access group**—SUPER | RW | RD

Change user access privileges command

To change user access privilege(s), enter the **ED-USER-SECU** command and the applicable parameters as shown in Figure 41.

Figure 41. Change user access privilege(s) command

```
Syntax
ED-USER-SECU:[<TID>]:<UID>:[<CTAG>]::,,<GID>,[<CAG>];

Example
ED-USER-SECU::USER1:::,,ROOTGRP,RD;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<GID>`	**Group ID**—ROOTGRP
`<CAG>`	**Command access group**—SUPER | RW | RD

Change user password command

To change user password, enter the **ED-PID** command and the applicable parameters as shown in Figure 42. For definitions of the line editing keystrokes for command editing, see Line edit keystroke definitions on page 87.

Figure 42. Change user password command

```
Syntax
ED-PID:[<TID>]:<UID>:[<CTAG>]::<old PID>,<new PID>,<new PID>;

Example
ED-PID::USER1:::PSWORD1%,PSWORD2%,PSWORD2%;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<UID>`	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<PID>`	**Password ID**—A string of eight to ten characters, including one numeric, one alphabetic, and one special character.

Edit human interface dialog mode command

The human interface dialog mode (HIDM) command controls whether the ARCADACS 100 interprets TL1 commands in an interactive or batch mode. The default mode is interactive (CMD). You must set HIDM to batch mode (BAT) in the following situations:

- if you are connected to the ARCADACS 100 using an interface other than telnet or HyperTerminal (for example, you have opened a TCP/IP socket to the shelf using C or C++ and you do not receive any responses to the TL1 commands)
- if you are sending a series of TL1 commands programmatically (using software such as C, C++, Java, Visual Basic, Tcl, Perl, and others)

If you set HIDM to BAT while you are in a telnet session, the consequences are:

- the carriage return does not give you the command prompt
- you cannot use the arrow keys to navigate through the five previous commands
- you cannot see the commands as you enter them

The batch mode remains in effect for the duration of the current session (that is, until you log out or the session times out). Ports 30005 to 30008 are exclusively used for telnet sessions in batch mode. There are no timeouts for these ports that are normally used for automated OSS systems.

To set the mode, enter the **ED-HIDM** command and the applicable parameters as shown in Figure 43. The leading characters '\r' are required when issuing the command programmatically from another software program.

Figure 43. Edit human interface dialog mode command

```
Syntax
ED-HIDM:<TID>:[<UID>]:<CTAG>::<HIDMdata>;

Example
ED-HIDM:FACTORY::1::BAT;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<UID>	**User ID**—A string of up to ten characters, both alphabetic and numeric. The user ID must begin with a letter.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<HIDMdata>	**Human interface dialog mode**—CMD | BAT CMD is interactive mode, BAT is batch mode.

TCP/IP port timeout and status commands

The following commands control TCP/IP port timeout and status:

- **Modify port settings** command
- **Clear port settings** command
- **Retrieve port settings** command

Modify port settings command

To set a port timeout, enter the **ED-PORT** command.

Figure 44. Change port settings command

```
Syntax
ED-PORT:[<tid>]:<AID>:[<ctag>]:::TMOUT=<time value>;

Example
ED-PORT:FACTORY:30007::::TMOUT=60;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<AID>	**Access identifier**—the port number from <30000 to 30008>.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<TIME VALUE>	**Timeout**— the timeout in minutes from 0 (no TL1 timeout) to 60 minutes. *Note: This value must be larger than 20 minutes for the CMT GUI to work.*

Clear port settings

To clear a port's settings, enter the **INIT-PORT** command. The **INIT-PORT** command brings any port back to the LISTEN or idle state.

Figure 45. Clear port settings command

```
Syntax
INIT-PORT:[<tid>]:<AID>:[<ctag>];

Example
INIT-PORT:FACTORY:30004:CTAG99;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<AID>	**Access identifier**—the port number from <30000 to 30008>.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve port settings

To retrieve a port's settings, enter the **RTRV-PORT** command.

Figure 46. Retrieve port settings command

```
Syntax
RTRV-PORT:[<tid>]::[<ctag>];

Example
RTRV-PORT:FACTORY:ALL:CTAG1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<CTAG>` **Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve port response

The `<rspblk>` portion of the response to the **RTRV-PORT** command is shown in Figure 47.

Figure 47. Retrieve port response

```
 RTRV-PORT::ALL:;


   FACTORY 03-04-28 14:38:30
M    COMPLD

"PORT-30000::STATE=CONNECTED,PST=IS,TMOUT=30,CLIENT=172.16.16.153,
ROOT,ROOTGR
P,SUPER"

"PORT-30001::STATE=CONNECTED,PST=IS,TMOUT=30,CLIENT=172.16.16.138,
ROOT,ROOTGR
P,SUPER"

"PORT-30002::STATE=CONNECTED,PST=IS,TMOUT=30,CLIENT=172.16.16.115,
ROOT,ROOTGR
P,SUPER"
   "PORT-30003::STATE=LISTEN,PST=IS,TMOUT=30,CLIENT=0.0.0.0,,,"
   "PORT-30004::STATE=LISTEN,PST=IS,TMOUT=30,CLIENT=0.0.0.0,,,"
   "PORT-30005::STATE=LISTEN,PST=IS,TMOUT=0,CLIENT=0.0.0.0,,,"
   "PORT-30006::STATE=LISTEN,PST=IS,TMOUT=0,CLIENT=0.0.0.0,,,"
   "PORT-30007::STATE=LISTEN,PST=IS,TMOUT=0,CLIENT=0.0.0.0,,,"
   "PORT-30008::STATE=LISTEN,PST=IS,TMOUT=30,CLIENT=0.0.0.0,,,"
```

The response parameters are as follows:

`<PORT>`	**Port number**—< 30000 to 30008>
`<STATE>`	**Current port state**—LISTEN | CONNECTED
`<TMOUT>`	**Timeout**—TL1 timeout value in minutes (0 means no TL1 timeout)
`<PST>`	**Primary State**—In service (IS) or out of service (OOS)
`<CLIENT>`	**Client**—IP address of the user connected to the port. If someone is logged into a port it gives User ID, Group ID and command access group.

Autonomous message commands

Per GR-833-CORE requirements, users can allow or inhibit autonomous messages with the **ALW-MSG-ALL** and **INH-MSG-ALL** commands. Note that the system default is to allow autonomous messages.

Allow autonomous messages command

To turn on autonomous messages, enter the **ALW-MSG-ALL** command and the applicable parameters as shown in Figure 48.

Figure 48. Allow autonomous messages command

```
Syntax
ALW-MSG-ALL:[<tid>]:[ALL]:[<ctag>][::,[,]];

Example
ALW-MSG-ALL:FACTORY:ALL:CTAG1::,,;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Inhibit autonomous messages command

To turn off autonomous messages, enter the **INH-MSG-ALL** command and the applicable parameters as shown in Figure 49.

Figure 49. Inhibit autonomous messages command

```
Syntax
INH-MSG-ALL:[<tid>]:[ALL]:[<ctag>][::,[,]];

Example
INH-MSG-ALL:FACTORY:ALL:CTAG1::,,;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Note: The **INH-MSG-ALL** command only applies to that specific user session. Other users logged in will not be affected and will still receive autonomous messages.

IP interface configuration

The ARCADACS 100 system has two interfaces that it uses to transmit IP traffic:

- **Ethernet interface**—is used to send traffic out onto the LAN. Ethernet connections are provided on the front of each Clock I/O card.
- **Access interface**—is used to send traffic out over DPRAM to the intelligent cards in the system.

IP interface configuration commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

Note: If the MAC address is all 0's (which is corrupted), contact XEL Technical Support to restore the MAC address.

- **Set IP interface** command
- **Retrieve IP interface settings** command
- **Retrieve IP interface settings** response
- **Add entry to IP routing table** command
- **Delete entry from IP routing table** command
- **Retrieve IP routing table settings** command
- **Retrieve IP routing table settings** response

Set IP interface command

To set up the Ethernet and access interfaces, enter the **ED-IP** command and the applicable parameters as shown in Figure 50.

Note: To provision SNMP monitoring agents, see SNMP monitoring commands on page 273.

Figure 50. Set IP interface

```
Syntax
ED-IP:[<TID>]:<IPAID>:[<CTAG>]:::<IP PARAM>;

Example
ED-IP::ETHER:::GATEWAY=ON,IP=199.190.212.4,MASK=255.255.255.0,
BRDCAST=199.190.212.255;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<IPAID>`	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<IP PARAM>`	See Table 8.

Table 8. IP interface options

<IP PARAM>	Description
GATEWAY = (On | Off)	Enable or disable IP routing over FDL ports (*For ETHER only*)
IP = (0–255).(0–255).(0–255).(0–255)	IP address—default value is 0.0.0.0
MASK = (0–255).(0–255).(0–255).(0–255)	IP routing mask
BRDCAST = (0–255).(0–255).(0–255).(0–255)	IP broadcast address
MTU = (100-480)	Message transfer unit packet size (*For ACCESS only*)

Retrieve IP interface settings command

To retrieve the IP interface settings, enter the **RTRV-IP** command and the applicable parameters as shown in Figure 51.

Figure 51. Retrieve IP interface settings command

```
Syntax
RTRV-IP:[<TID>]:<IPAID>:[<CTAG>];

Example
RTRV-IP::ETHER:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<IPAID>`	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve IP interface settings response

The `<rspblk>` portion of the response to the **RTRV-IP** command is shown in Figure 52.

Figure 52. Retrieve IP interface settings response

```
Syntax
"(<IPAID>::<IP PARAM>,MacAddr=<Mac Address>")

Example
"(ETHER::GATEWAY=ON,IP=199.190.212.4,MASK=255.255.255.0,
BRDCAST=199.190.212.255,MTU=480,MacAddr=56:A3:39:4D:82:58"
```

The response parameters are as follows:

`<IPAID>`	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
`<IP PARAM>`	See Table 8.
`<Mac Address>`	**Machine address**—A unique 48-bit (six-byte) identification number for the Ethernet network element making the response

Note: If the MAC address is all 0's or corrupted, contact XEL Technical Support to restore the MAC address.

Add entry to IP routing table command

To add an entry to the IP routing table, enter the **ADD-IPRT** command and the applicable parameters as shown in Figure 53. This command can add either an Ethernet interface or access interface, with command syntax differing slightly for each interface type. In Figure 53, syntax and examples of both types of entries are provided. .

Note: When adding an IP access route using a DS0 channel, you must use a TP that has been defined as TYPE=IP. Create the TP using the **ENT-TP** command (see page 247).

Note: When adding an IP access route using an FDL channel, you can use ST1, SE1, and DS3R cards.

Figure 53. Add entry to IP routing table command

```
Syntax
ADD-IPRT:[<TID>]:<IPAID>:[<CTAG>]:::IP=<IPaddr>,[MASK=<IPmask>,]
(CHANNEL=<RTdata>|GATEWAYIP=<IPgate>);

Examples
ADD-IPRT::ETHER:::IP=DEFAULT,GATEWAYIP=200.218.43.8;
ADD-IPRT::ACCESS:::IP=199.190.212.5,MASK=255.255.0.0,CHANNEL=
ST1-6-FDL1;
ADD-IPRT::ACCESS:::IP=199.190.212.8,CHANNEL=TP-18;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<IPAID>`	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<IPaddr>`	**IP address**—See Table 9 *Note: If you enter an IP address of DEFAULT, the MASK parameter is not required.*
`<IPmask>`	**IP mask**—See Table 9.
`<RTdata>`	**Route data**—ST1-(3–15)-FDL-(1–8) | SE1-(3–15)-FDL(1–8) | DS3-(3–15)-(1–2)-FDL(1–28)* | STS1-(3–15)-(1–2)-FDL(1–28) | TP-<#> where TP-<#> is a termination pointer of TYPE=IP (*for ACCESS only*) * *FDL channels are available on DS3R cards and not on DS3 cards.*
`<IPgate>`	**IP gateway**—See Table 9.

Table 9. IP address, IP mask, and RT data entry ranges

Parameter	Range
<IPaddr>	(0–255).(0–255).(0–255).(0–255) | DEFAULT (*for ETHER only*)
<IPmask>	255.255.255.255 | 255.255.255.0 | 255.255.0.0 | 255.0.0.0
<IPgate>	(0–255).(0–255).(0–255).(0–255) (*for ETHER only*)

Delete entry from IP routing table command

To delete an entry from the IP routing table, enter the **DLT-IPRT** command and the applicable parameters as shown in Figure 54. Deleting this connection operation disables all IP communications for that particular route. If there is an IP communication session in progress on the deleted channel, this command also terminates the session.

Note: If you have provisioned any DS0 channels as IP access routes, the **DLT-IPRT** command is the only way to delete them.

Figure 54. Delete entry from IP routing table command

```
Syntax
DLT-IPRT:[<TID>]:<IPaddr>:[<CTAG>];

Example
DLT-IPRT::199.190.212.4:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<IPaddr>	**IP address**—See Table 9.

Retrieve IP routing table settings command

To retrieve the IP routing table, enter the **RTRV-IPRT** command and the applicable parameters as shown in Figure 55.

Figure 55. Retrieve IP routing table settings

```
Syntax
RTRV-IPRT:[<TID>]:<IPAID>:[<CTAG>];

Example
RTRV-IPRT::ACCESS:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<IPAID>	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve IP routing table settings response

The `<rspblk>` portion of the response to the **RTRV-IP** command is shown in Figure 56.

Figure 56. Retrieve IP routing table settings response

```
Syntax
"<IPAID>::IP=<IPaddr>,Mask=<IPmask>,[CHANNEL=<RTdata>|GATEWAYIP=
<IPgate>]"+;

Examples
"ETHER::IP=199.190.212.4,MASK=255.255.0.0,
GATEWAYIP=192.168.120.102"
"ACCESS::IP=199.190.212.5,MASK=255.255.0.0,CHANNEL=ST1-6-FDL1"
"ACCESS::IP=199.190.212.8,MASK=255.255.0.0,CHANNEL=TP-18"
```

The response parameters are as follows:

`<IPAID>`	**Internet protocol access identifier**—ACCESS | ETHER (see TL1 command, syntax, and format on page 89)
`<IPaddr>`	**IP address**—See Table 9 on page 108.
`<IPmask>`	**IP mask**—See Table 9 on page 108.
`<RTdata>`	**Route data**—ST1-(3–15)-FDL-(1–8) | SE1-(3–15)-FDL(1–8) | DS3-(3–15)-(1–2)-FDL(1-28) | STS1-(3–15)-(1–2)-FDL(1-28) | TP-<#> where TP-<#> is a termination pointer of TYPE=IP
`<IPgate>`	**IP gate**—See Table 9 on page 108.

Clock source configuration

The ARCADACS 100 system clock source configuration is determined by a clock priority list. There are up to five clock sources in the list, depending upon system configuration. You can configure the first four sources and the fifth source is always set to local clock (lowest priority).

During system initialization or if the current clock fails during normal operation, the Clock I/O card enters holdover mode and searches for a good clock source from the priority list. It uses the highest priority good clock from the list as the current active clock. Clock source management options include changing (editing) the clock priority list, retrieving the list, retrieving the current active clock, and retrieving the Clock I/O card, and resetting the Clock I/O card.

Clock source configuration commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Retrieve current clock list** command
- **Retrieve current clock list** response
- **Edit clock source** command
- **Retrieve current active clock** command
- **Retrieve current active clock** response
- **Retrieve Clock I/O card settings** command
- **Retrieve Clock I/O card settings** response
- **Reset Clock I/O card** command

Retrieve current clock list command

Following an edit of clock source, poll the clock status to ensure that the desired clock was selected. To retrieve the current clock list (poll clock status), enter the **RTRV-CLKLST** command and the applicable parameters as shown in Figure 57.

Figure 57. Retrieve current clock list command

```
Syntax
RTRV-CLKLST:[<TID>]::[<CTAG>];

Example
RTRV-CLKLST:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve current clock list response

The `<rspblk>` portion of the response to the **RTRV-CLKLST** command is shown in Figure 58.

Figure 58. Retrieve current clock list response

```
Syntax
"CLKSRC1=<CLOCK SOURCE>,CLKSRC2=<CLOCK SOURCE>,
CLKSRC3=<CLOCK SOURCE>,CLKSRC4=<CLOCK SOURCE>"

Examples
"CLKSRC1=ST1-5-4,CLKSRC2=BITSA_T1,CLKSRC3=BITSB_T1,
CLKSRC4=ST1-6-4"

"CLKSRC1=SE1-7-3,CLKSRC2=BITSA_E1,CLKSRC3=BITSB_E1,
CLKSRC4=SE1-8-3"
```

The response parameters are as follows:

`<CLOCK SOURCE>`	ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-1-(1–28) | STS1-(3–15)-(1–2)* | STS1-1 | STS1-2-(1–28) | S155-(3–15)-1 | LOCAL | BITSA_T1 | BITSB_T1 | BITSA_E1 | BITSB_E1 *Note: You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.* ** For STS1 cards in STS1 mode, both ports (STS1 lines) are available. In DUAL mode, port 1 is available for an STS1 line and port 2 is available for DS1 facilities.*

where the CLOCK SOURCE parameter descriptions are as follows:

ST1-(3–15)-(1–8)	External timing from structured T1 mapper cards
SE1-(3–15)-(1–8)	External timing from structured E1 data module cards
SE1-(3–15)-(1–8)	External timing from structured E1 mapper cards
DS3-(3–15)-1-(1–28)	External timing from DS3 or DS3R mapper cards *Note: Only port A (1) is supported for both cards.*
STS1-(3–15)-(1–2)	External timing from ports on STS1 mapper cards (in STS1 mode) *Note: (1–2) refers to port.*
STS1-(3–15)-1	External timing from port 1 on STS1 mapper cards (in DUAL mode)
STS1-(3–15)-2-(1–28)	External timing from port 2 on STS1 mapper cards (in DUAL mode) *Note: In DUAL mode, port B connects to a DS3 line.*
S155-(3–15)-(1–2)	External timing from S155 mapper cards *Note: When redundancy is 1+1 or 1+1W, (3–15) is the slot number of the working line.*
LOCAL	Stratum 3 local timing from Clock I/O card
BITSA_T1 or BITSA_E1	Bits A (primary) is external timing received from user facility (T1 or E1) through "EXT-CLK1" on the chassis FCAPF assembly.

BITSB_T1 or BITSB_E1	Bits B (secondary) is external timing received from user facility (T1 or E1) through “EXT-CLK2” on the chassis FCAPF assembly.

Edit clock source command

To edit the clock source, enter the **ED-CLKLST** command and the applicable parameters as shown in Figure 59.

Do not select more than two external clocks of each type; that is, up to two clocks from ST1, SE1, DS3, DS3R, S155, or STS1 mapper cards, and up to two clocks from bits sources. To avoid unwanted loopbacks, do not duplicate clock sources except for the LOCAL entry.

Figure 59. Edit clock source command

```
Syntax
ED-CLKLST:[<TID>]::[<CTAG>]:::<CLOCK PARAM>;

Examples
ED-CLKLST:::::CLKSRC1=ST1-5-4,
CLKSRC2=BITSA_T1,CLKSRC3=BITSB_T1,CLKSRC4=ST1-6-4;

ED-CLKLST:::::CLKSRC1=SE1-7-3,
CLKSRC2=BITSA_E1,CLKSRC3=BITSB_E1,CLKSRC4=SE1-8-3;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<CLOCK PARAM>`	CLKSRC1=<CLOCK SOURCE>, CLKSRC2=<CLOCK SOURCE>, CLKSRC3=<CLOCK SOURCE>, CLKSRC4=<CLOCK SOURCE>

where CLOCK SOURCE is defined as:

`<CLOCK SOURCE>`	ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-1-(1–28) | STS1-(3–15)-(1–2)* | STS1-1 | STS1-2-(1–28) | S155-(3–15)-1 | LOCAL | BITSA_T1 | BITSB_T1 | BITSA_E1 | BITSB_E1 *Note: You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.* ** For STS1 cards in STS1 mode, both ports (STS1 lines) are available. In DUAL mode, port 1 is available for an STS1 line and port 2 is available for DS1 facilities.*

The CLOCK SOURCE parameter descriptions are as follows:

ST1-(3–15)-(1–8)	External timing from structured T1 mapper cards
SE1-(3–15)-(1–8)	External timing from structured E1 mapper cards
DS3-(3–15)-1-(1–28)	External timing from DS3 or DS3R mapper cards *Note: Only port A (1) is supported on both cards.*

STS1-(3–15)-(1–2)	External timing from ports on STS1 mapper cards (in STS1 mode) *Note: (1–2) refers to port.*
STS1-(3–15)-1	External timing from port 1 on STS1 mapper cards (in DUAL mode)
STS1-(3–15)-2-(1–28)	External timing from port 2 on STS1 mapper cards (in DUAL mode) *Note: In DUAL mode, port B connects to a DS3 line.*
S155-(3–15)-1	External timing from S155 mapper cards
LOCAL	Stratum 3 local timing from Clock I/O card
BITSA_T1 or BITSA_E1	Bits A (primary) is external timing reference received from user facility (T1 or E1) through "EXT-CLK1" on the chassis FCAPF assembly.
BITSB_T1 or BITSB_E1	Bits B (secondary) is external timing reference received from user facility (T1 or E1) through "EXT-CLK2" on the chassis FCAPF assembly.

Retrieve current active clock command

To retrieve the current active clock, enter the **RTRV-ACTCLK** command and the applicable parameters as shown in Figure 60.

Figure 60. Retrieve current active clock command

```
Syntax
RTRV-ACTCLK:[<TID>]::[<CTAG>];

Example
RTRV-ACTCLK:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve current active clock response

The <rspblk> portion of the response to the **RTRV-ACTCLK** command is shown in Figure 61.

Figure 61. Retrieve current active clock response

```
Syntax
"CLKSRC1|CLKSRC2|CLKSRC3|CLKSRC4|LOCAL::
ACT_CLK=<Clock Source>,CLK_MODE=HOLDOVER|NORMAL"

Example
"CLKSRC2::ACT_CLK=ST1-5-4,CLK_MODE=NORMAL"
```

The response parameter is as follows:

`<Clock Source>`	ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) |DS3-(3–15)-1-(1–28) | STS1-(3–15)-(1–2)* | STS1-1 | STS1-2-(1–28) | S155-(3–15)-1 | LOCAL | BITSA_T1 | BITSB_T1 | BITSA_E1 | BITSB_E1 ** For STS1 cards in STS1 mode, both ports (STS1 lines) are available. In DUAL mode, port 1 is available for an STS1 line and port 2 is available for DS1 facilities.*

Retrieve Clock I/O card settings command

To retrieve the Clock I/O card settings, enter the **RTRV-EQPT** command and the applicable parameters as shown in Figure 62.

Figure 62. Retrieve Clock I/O card settings command

```
Syntax
RTRV-EQPT:[<TID>]:CLKALL:[<CTAG>];

Example
RTRV-EQPT::CLKALL:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve Clock I/O card settings response

The `<rspblk>` portion of the response to the **RTRV-EQPT** command is shown in Figure 63.

Figure 63. Retrieve Clock I/O card settings response

```
Syntax
"CLK-1:::PST=(IS|OOS|RESET|OOSMT),SST=(BUSY|FLT|UEQ|IDLE)"
"CLK-2:::PST=(IS|OOS|RESET|OOSMT),SST=(BUSY|FLT|UEQ|IDLE)"

Example
"CLK-1::PST=IS,SST=BUSY"
"CLK-2::PST=OOS,SST=UEQ"
```

The response parameters are as follows:

`PST`	**Primary state**—of Clock I/O card, where IS is in service, OOS is out-of-service, RESET is reset, and OOSMT is out of service for maintenance.

SST	**Secondary state**—of Clock I/O card, where BUSY is busy, FLT is fault, UEQ is unequipped, and IDLE is idle.

Reset Clock I/O card command

To switch activity from the active to the standby Clock I/O card, enter the **ED-EQPT** command and the applicable parameters as shown in Figure 64. When an active Clock I/O card is reset, it is switched to standby status in the system.

Figure 64. Reset Clock I/O card command

```
Syntax
ED-EQPT:[<TID>]:<(CLK-1|CLK-2)>:[<CTAG>]:::PST=RESET;

Example
ED-EQPT::CLK-1::::PST=RESET;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
PST	**Primary state**—of Clock I/O card. Value = RESET.

Application keys

Application keys ensure that you access only the software applications that you have ordered for your ARCADACS 100 system. Application keys are similar to the licensing codes used by many software companies.

Application keys are unique to the application and the CPU that is installed with each system. To obtain the application keys for your system, contact XEL Technical Support (see page xiii).

The following application keys settings are supported:

- **General Access**—Activates all software applications that are available in Release 2.5.10 of the ARCADACS 100 system.
- **FDL Disable**—Allows the ability to control FDL usage in the system.

The Application keys commands and response are listed and described in the following sections.

- **Activate application** command
- **Activate application** response
- **Retrieve application settings** command
- **Retrieve application settings** response
- **Delete application** command
- **Delete application** response

Activate application command

The **activate application** command authorizes the use of certain functions in the ARCADACS 100 system.

Facility data link (FDL) activation and de-activation is supported with the **activate application** command. The FDL disable feature is a software key that will keep users from editing the facilities in the ARCADACS 100 in order to allow an FDL connection.

Note: The FDL application is turned OFF by default on all systems. The FDLDISABLE key does not automatically correct if FDLDISABLE has already been enabled on a facility. If FDL already exists in the system, the user must turn FDL OFF to ensure that it cannot be turned ON again. Refer to the Edit facility data command on page 167 for more information.

To enter application keys and activate an application, enter the **ACT-APP** command and the applicable parameters as shown in Figure 65.

Figure 65. Activate application command

```
Syntax
ACT-APP:[<TID>]::[<CTAG>]:::APP=<APPdata>,KEY=<APPKEY>;

Example
ACT-APP:FACTORY::CTAG1:::APP=FDLDISABLE,KEY=<fdl_key>;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<APPdata>`	**Application identifier**—GENERAL_ACCESS|FDLDISABLE|APP303 where GENERAL_ACCESS is all optional functions.
`<APPKEY>`	**Application key code**—Code that is unique to the system. *Note: Obtain this code from XEL Technical Support (see page xiii).*

Activate application settings response

The `<rspblk>` portion of the response to the **ACT-APP** command is shown in Figure 66.

Figure 66. Activate application response

```
Syntax
"(GENERAL ACCESS)"+

Example
"GENERAL ACCESS"
"FDLDISABLE"
```

Retrieve application settings command

The **retrieve application** command prompts the ARCADACS 100 system to list the applications that have been activated using application keys.

Use retrieve application command to find out FDLDISABLE application status of the system.

To query the system, enter the **RTRV-APP** command and the applicable parameters as shown in Figure 67.

Figure 67. Retrieve application command

```
Syntax
RTRV-APP:[<TID>]::[<CTAG>]:::(ALL | APP=<APPdata>);

Example
RTRV-APP:FACTORY::CTAG2:::ALL;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<APPdata>`	**Application identifier**—GENERAL_ACCESS|FDLDISABLE|APP303 where GENERAL_ACCESS is all optional functions.

Retrieve application settings response

The `<rspblk>` portion of the response to the **RTRV-APP** command is shown in Figure 68.

Figure 68. Retrieve application response

```
Syntax
"(GENERAL ACCESS)"+

Example
"GENERAL ACCESS"
"FDLDISABLE"
```

Delete application settings command

The **delete application** command prompts the ARCADACS 100 system to delete the application settings that have been activated using application keys.

To delete applications, enter the **DLT-APP** command and the applicable parameters as shown in Figure 69.

Figure 69. Delete application command

```
Syntax
DLT-APP:[<TID>]::[<CTAG>]:::APP=<APPdata>,KEY=<APPKEY>;

Example
DLT-APP:FACTORY::CTAG3:::APP=<APPKEY>,KEY=<fdl_key>;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<APPdata>`	**Application identifier**—GENERAL_ACCESS|FDLDISABLE|APP303 where GENERAL_ACCESS is all optional functions.
`<APPKEY>`	**Application key code**—Code that is unique to the system. *Note: Obtain this code from XEL Technical Support (see page xiii).*

Delete application settings response

The `<rspblk>` portion of the response to the **DLT-APP** command is shown in Figure 70.

Figure 70. Delete application response

```
Syntax
"(GENERAL ACCESS)"+

Example
"FDLDISABLE IS DISABLED"
```

Network connectivity

After the ARCADACS 100 has been placed in your IP network, you can use a TL1 command to *ping* a device and confirm connectivity in the network. This capability is useful in situations such as the following:

- to check if there is a valid path to the TFTP server (for software downloads)
- to confirm connectivity and a route to the gateway router

Confirm connectivity command

To check a device, enter the **OPR-PING** command and the applicable parameters as shown in Figure 71.

Figure 71. Confirm connectivity command

```
Syntax
OPR-PING:[<TID>]::[<CTAG>]:::IP=<IPaddr>;

Example
OPR-PING:::::IP=172.16.191.20;
```

The command parameter is as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<IPaddr>`	**IP address**—Address of the device to be checked.

Confirm connectivity response

The `<rspblk>` portion of the response to the **OPR-PING** command is shown in Figure 72.

Figure 72. Confirm connectivity response

```
Syntax
"IPADDR=(<IPaddr> is alive)|(<IPaddr> is not found)"

Example
"IPADDR=172.16.191.20 is alive"
```

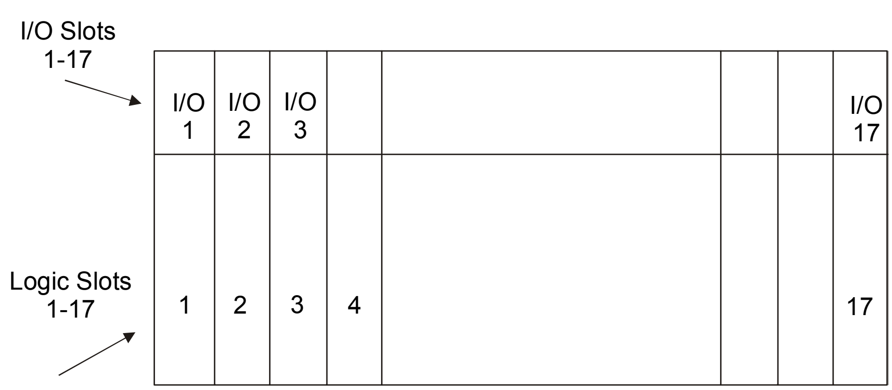
The parameters for the response are as follows:

`<IPaddr>`	**IP address**—Address of the device being checked

System inventory display

The ARCADACS 100 system can provide a display of its own inventory of installed cards. As described in Physical description on page 4, the ARCADACS 100 system is a chassis with I/O cards located in the upper bank, and logic cards located in the lower bank. Figure 73 shows positioning and numbering of the upper and lower slots.

Figure 73. Chassis and card slots



The system inventory command and response are listed and described in the following sections.

- **Retrieve system inventory** command
- **Retrieve system inventory** response

Retrieve system inventory command

The inventory retrieval feature provides a detailed list of equipment installed in the system. To obtain system inventory retrieval, enter the **RTRV-INVENTORY** command and the applicable parameters as shown in Figure 74.

Figure 74. Retrieve system inventory command

```
Syntax
RTRV-INVENTORY:[<TID>]::[<CTAG>];

Example
RTRV-INVENTORY:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve system inventory response

The <rspblk> portion of the response to the **RTRV-INVENTORY** command is shown in Figure 75. The optional entries in the syntax portion of Figure 75 are not applicable to the T1/E1 I/O (IO_WK) and T1/E1 I/O protection (IO_PRT) cards.

Figure 75. Retrieve system inventory response

```
Syntax
"<slot number>::CRDTYPE=<CARDTYPE>,CRDSN=<SN>,MFDAT=<DAT>,
PRODNO=<PROD>,CRDREV=<REV>"

Example
"SLT-1::CRDTYPE=CPU,CRDSN=24,MFDAT=10/10/2000,PRODNO=712700,
CRDREV=C"
"IOSLT-1::CRDTYPE=CLK,CRDSN=1551,MFDAT=09/09/2000,PRODNO=712600,
CRDREV=C0"
```

The response parameters are as follows:

<slot number>	SLT-(1–17) for lower bank, IOSLT-(1–17) for upper bank

`<CARDTYPE>`	**Type of card**—CPU | DS3 | STS1 | S155 | ST1_CSU | ST1_DSX | SE1 | XCON | IXCON | FXS | FXO | RINGER | MSU | CLK | DS3_IO_WK | DS3_IO_PRT | STS1_IO_WK | STS1_IO_PRT | STS1DS3_IO_WK | STS1DS3_IO_PRT | S155_IO_PRT | S155_IO_WK | T1/E1_IO_WK | T1/E1_IO_PRT
`<SN>`	**Card serial number**—up to 20 characters
`<DAT>`	**Manufacture date**—up to 15 characters
`<PROD>`	**Product number**—up to 20 characters, usually the firmware code for the type of card
`<REV>`	**Card revision**—up to 10 characters

Network element management

Network elements (NE) are all the cards, assemblies, and associated functions present in a ARCADACS 100 system network. An NE has its own ID, system date-time, and system type. All this information can be retrieved, displayed, and edited.

Network element management commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

The network element management commands and responses are:

- **Retrieve NE information** command
- **Retrieve NE information** response
- **Retrieve NE type** command
- **Retrieve NE type** response
- **Change NE type** command
- **Change NE type** response
- **Change local NE node identifier** command
- **Retrieve system date and time** command
- **Retrieve system date and time** response
- **Change local system date and time** command
- **Edit network time protocol server address** command
- **Retrieve network time protocol server address** command
- **Retrieve network time protocol server address** response
- **Retrieve target identifier map** command

- **Provision target identifier map** command
- **Retrieve header** command
- **Retrieve header** response

Retrieve NE information command

To retrieve the NE local node or target node identification information (also known as the target identifier), enter the **RTRV-NE** command and the applicable parameters as shown in Figure 76.

Figure 76. Retrieve NE information command

```
Syntax
RTRV-NE:[<TID>]::[<CTAG>];

Example
RTRV-NE:::;
FACTORY 02-09-20 17:48:02
M   COMPLD
   "-1:FACTORY"
;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve NE information response

The `<rspblk>` portion of the response to the **RTRV-NE** command is shown in Figure 77.

Figure 77. Retrieve NE information response

```
Syntax
"<NODEID>:<TID>"

Example
"1:TARGET1"
```

The response parameters are as follows:

`<NODEID>`	**Node identifier**—contains one or more digits
`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.

Change local node identifier command

You must change the local node identifier in order to clear the NODEID MISMATCH alarm. To change the local node identifier, enter the **ED-NE** command and the applicable parameters as shown in Figure 78)

Caution: The node identifier must be changed from the factory default to ensure proper system operation.

Figure 78. Change local node identifier command

```
Syntax
ED-NE:[<TID>]::[<CTAG>]::<NODEID>-<TID2>;

Example
ED-NE::::2-TARGET;
```

Note: This command changes the TID value used in all TL1 commands.

command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<NODEID>	**New node identifier**—contains one or more digits.
<TID2>	**New target identifier**—See TL1 command, syntax, and format on page 89.

Retrieve NE type command

To retrieve equipment-related information (for example, VENDOR, MODEL, NETYPE, and SW_ISSUE), enter the **RTRV-NETYPE** command and the applicable parameters as shown in Figure 79.

Figure 79. Retrieve NE type command

```
Syntax
RTRV-NETYPE:[<TID>]::[<CTAG>];

Examples
RTRV-NETYPE:FACTORY::CTAG1;
RTRV-NETYPE:FACTORY::CTAG1:GENERALBLOCK;
```

The **RTRV-NETYPE** command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve NE type response

The `<rspblk>` portion of the response to the **RTRV-NETYPE** command is shown in Figure 80.

Figure 80. Retrieve NE type response

```
Syntax
"<NODEID>:<TID>"

Example
"cr lf lf
^^^<SID>^<YY-MM-DD>^<HH:MM:SS> Cr lf
M^^<CTAG>^COMPLD cr lf
^^^"e,f,g,h" cr lf; "
```

The response parameters are as follows:

e=VENDOR	**Vendor**—the NE equipment vendor name. The syntax of the value of this keyword is an alphanumeric string of up to 40 characters.
f=MODEL	**Model**—the NE equipment model name. The syntax of the value of this keyword is an alphanumeric string of up to 40 characters.
g=NETYPE	**NETYPE**—the NE equipment type. The syntax of the value of this keyword is an alphanumeric string of up to 40 characters. An abbreviation of NE type may be used (examples of abbreviated types include DLC for digital loop carrier and DCS for digital cross-connect system). Compound values are allowed (e.g., **ISDN-PS**). The grouping sign “&” can be used to indicate malfunction NE type (e.g., **PM&TEST** signifies a performance monitoring and test system).
h=SW_ISSUE	**SW_ISSUE**—the software release issue of the NE.

Change NE type command

To change the NE type, enter the **ED-NETYPE** command and the applicable parameters as shown in Figure 81)

Figure 81. Change NE type command

```
Syntax
ED-NETYPE:[<TID>]::[<CTAG>]::[VENDOR="<vendor>",NETYPE="<netype>",
MODEL="<model>";]

Example
ED-NETYPE:[<TID>]::[<CTAG>]::[VENDOR="<vendor>"]|
[,NETYPE="<netype>"]|[,MODEL="<model>"];
```

The **ED-NETYPE** command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve system date and time command

To retrieve the current system date and time settings, enter the **RTRV-DAT** command and the applicable parameters as shown in Figure 82.

Figure 82. Retrieve system date and time command

```
Syntax
RTRV-DAT:[<TID>]::[<CTAG>];

Example
RTRV-DAT:::;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve system date and time response

The <rspblk> portion of the response to the **RTRV-DAT** command is shown in Figure 83.

Figure 83. Retrieve system date and time response

```
Syntax
"::yy-mm-dd,hh-mm-ss"

Example
"::98-08-07,03-45-00"
```

The response parameters are as follows:

yy-mm-dd	Calendar date by year-month-day
hh-mm-ss	Time of day by hour-minute-second

Change local system date and time command

To change the local system date and time, enter the **ED-DAT** command and the applicable parameters as shown in Figure 84.

Note: It is recommended that the logs and PM data be cleared before setting the date. Use the following commands:
DLT-LOG:::;
INIT-PM::ALL:;

Figure 84. Change system date and time command

```
Syntax
ED-DAT:[<TID>]::[<CTAG>]::<SYSTIME>;

Example
ED-DAT::::1998-10-27,11-15-00;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<SYSTIME>	yyyy-mm-dd,hh-mm-ss

Edit network time protocol server address command

You can identify up to two network time protocol (NTP) servers, which are used by the NE to synchronize the system date and time. The NE checks with a server at the specified interval and synchronizes its date and time with that of the server.

The NTP server always reports the time using Greenwich Meridian Time (GMT), also referred to as Coordinated Universal Time (UTC). The GMTOFFSET parameter indicates the number of hours and minutes that the shelf should add to or subtract from the NTP server time.

To provision the NTP servers, enter the **ED-NTP** command and the applicable parameters as shown in Figure 85. Each time you change the GMTOFFSET or FREQ parameter, the system immediately sends a synchronization request to one of the NTP servers. Then it waits for the duration of the frequency before sending the next request.

Note: At least one parameter must be present in the **ED-NTP** command.

Figure 85. Edit NTP server address command

```
Syntax
ED-NTP:[<TID>]::[<CTAG>]:::IPADDR1=<IPaddr1>[,IPADDR2=<IPaddr2>],
GMTOFFSET=<offset>,FREQ=<interval>;

Example
ED-NTP:::::IPADDR1=172.16.191.20,IPADDR2=172.16.191.24,GMTOFFSET=
-5.00,FREQ=12;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<IPaddr1>`	**IP address**—Address of the first NTP server.
`<IPaddr2>`	**IP address**—Address of the backup NTP server. *Note: The NE synchronizes with the date and time on the backup server when it is unable to connect to the first NTP server.*
`<offset>`	**Offset time**—Number of hours and minutes that the shelf should add to or subtract from the NTP server time. The range is –12 to +12. Use a decimal point to separate the hours and minutes. For example, +5.30 means to add 5 hours and 30 minutes.
`<interval>`	**Frequency**—Number of hours between synchronization checks. *Note: If this value remains at zero, the NE does not synchronize.*

Retrieve network time protocol server address command

To retrieve the settings for the NTP server, enter the **RTRV-NTP** command and the applicable parameters as shown in Figure 86.

Figure 86. Retrieve NTP server address command

```
Syntax
RTRV-NTP:[<TID>]::[<CTAG>];

Example
RTRV-NTP:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve network time protocol server address response

The `<rspblk>` portion of the response to the **RTRV-NTP** command is shown in Figure 87.

Figure 87. Retrieve NTP server address response

```
Syntax
"NTP::IPADDR1=<IPaddr1>,IPADDR2=<IPaddr2>,GMTOFFSET=<offset>,
FREQ=<interval>"

Example
"NTP::IPADDR1=172.16.191.20,IPADDR2=172.16.191.24,GMTOFFSET=
-5.00,FREQ=12"
```

The response parameters are as follows:

<IPaddr1>	**IP address**—Address of the first NTP server.
<IPaddr2>	**IP address**—Address of the backup NTP server.
<offset>	**Offset time**—Number of hours and minutes that the shelf adds to or subtracts from the NTP server time. The range is –12 to +12. A decimal point separates the hours and minutes. For example, +5.30 means to add 5 hours and 30 minutes.
<interval>	**Frequency**—Number of hours between synchronization checks.

Retrieve target identifier map command

To retrieve the target identifier map, enter the **RTRV-TIDMAP** command and the applicable parameters as shown in Figure 88.

Figure 88. Retrieve target identifier map command

```
Syntax
RTRV-TIDMAP:[<TID>]::[<CTAG>];

Example
RTRV-TIDMAP:::;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<CTAG>` **Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve target identifier map response

The `<rspblk>` portion of the response to the **RTRV-TIDMAP** command is shown in Figure 89.

Figure 89. Retrieve target identifier map response

```
Syntax
"<NODEID>:<TID>"
"[&<NODEID>:<TID>]"

Example
"2:TARGET1"
   "3:TARGET2"
   "-1:"
```

The parameters for the response are as follows:

`<NODEID>` **New node identifier**—contains only one or more digits.

`<TID>` **New target identifier**—See TL1 command, syntax, and format on page 89.

Provision target identifier map command

To provision the target identifier map, enter the **ENT-TIDMAP** command and the applicable parameters as shown in Figure 90.

Figure 90. Provision target identifier map command

```
Syntax
ENT-TIDMAP:[<TID>]::[<CTAG>]::<NODEID>-<TID2>[&<NODEID>-<TID2>];

Example
ENT-TIDMAP::::2-TARGETX&3-TARGETY;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<NODEID>	**New node identifier**—contains only one or more digits
<TID2>	**New target identifier**—See TL1 command, syntax, and format on page 89.

Retrieve header command

You can verify the target identifier and date and time data. This information is included at the start of every response to a TL1 command. To view the header, enter the **RTRV-HDR** command and the applicable parameters as shown in Figure 91.

Figure 91. Retrieve header command

```
Syntax
RTRV-HDR:[<TID>]::[<CTAG>];

Example
RTRV-HDR:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve header response

The response to the **RTRV-HDR** command gives the header line that is used as the first line in all responses to TL1 commands, shown in Figure 92.

Figure 92. Retrieve header response

```
Syntax
RTRV-HDR:<TID> <yy-mm-dd hh:mm:ss>
M   COMPLD
;

Example
RTRV-HDR:AC3::CTAG1;

   AC3 02-11-02 15:19:38
M  CTAG1 COMPLD
;
```

The response parameter is as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

Software management

The ARCADACS 100 system software is identified by its location within the system through the software access identifier command and response parameter (SWAID). Included in the software information that can be retrieved is the following:

- Location of the software image block; a card can have more than one image (termed a block); the CPU card has two blocks
- Software version and checksum
- File name of the software before its downloading
- Server from which the software is downloaded

Note: You must have the TFTP server launched before uploading or downloading software with TFTP.

Note: Software can be downloaded through Ethernet only. You cannot use the craft port for downloading software.

- Current image state; an image can be **active, inactive, download** or **upload**
- Checksum of the software image

The software on the CPU, ST1, SE1, DS3, DS3R, STS1, S155, FXS, FXO, XCON, and IXCON cards (as applicable) is downloadable and retrievable, and its state can be changed between **active** and **inactive** status.

System-specific software can also be downloaded and uploaded as required for management of the configuration data. The data is stored in nonvolatile memory (NVM) and resides on the CPU cards. NVM contains configuration data for the entire ARCADACS 100 system, including card provisioning data, cross-connection configuration data, and facilities data.

Software management commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Retrieve software image** command
- **Retrieve software image** response
- **Download software** command
- **Upload nonvolatile memory (NVM)** command
- **Download and upload software** response messages
- **Change software access identifier (SWAID) Status** command
- **Clear nonvolatile memory (NVR)** command
- **Retrieve configuration index** command

Retrieve software image command

To retrieve current software information, enter the **RTRV-IMG** command and the applicable parameters as shown in Figure 93.

Figure 93. Retrieve software image command

```
Syntax
RTRV-IMG:[<TID>]:<SWAID>:[<CTAG>];

Example
RTRV-IMG::CPU-1-2:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<SWAID>	**Software access identifier**—CPU-(1–2)-(1–2) | | IXCON-(3–15)-(1–2) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2) | S155-(3–15)-(1–2) | FXS-(3–15) | FXO-(3–15) *Note: For CPU, IXCON, DS3, DS3R, S155, and STS1 cards, the second range (1–2) identifies the memory location.*

`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve software image response

The `<rspblk>` portion of the response to the **RTRV-IMG** command is shown in Figure 94.

Figure 94. Retrieve software image response

```
Syntax
"<SWAID>::STATE=(ACTIVE|DEACTIVE|LDIP|CRCERR|LDERR),
[VER=<string> (up to 40 char),BOOT_VER=<string> (up to 40 char),
CHECKSUM=hexadecimal characters]"

Example
"CPU-1-2:STATE=ACTIVE,VER=2.0.0(0),
BOOT_VER=1.0.0 (0),CHECKSUM=1AA04D44";
```

The response parameters are as follows:

`<SWAID>`	**Software access identifier**—CPU-(1–2)-(1–2) | | IXCON-(3–15)-(1–2) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2) | S155-(3–15)-(1–2) | FXS-(3–15) | FXO-(3–15)
`STATE`	Can be one or two entries, ACTIVE | DEACTIVE | LDIP in all cases, and CRCERR | LDERR added in those cases where error(s) are detected **LDIP**—Software loading in process **CRCERR**—Cyclic redundancy check (CRC) error detected **LDERR**—Loading error detected
`VER`	**Software version**—a string of up to 40 alphanumeric characters. Only occurs when STATE=ACTIVE | DEACTIVE
`BOOT_VER`	**Software booter version**—a string of up to 40 alphanumeric characters. Only occurs when STATE=ACTIVE | DEACTIVE
`CHECKSUM`	Checksum for the software image. Appears as a set of hexadecimal characters

Download software command

To download a software file from its server to the SWAID, enter the **STA-DNLD** command and the applicable parameters as shown in Figure 95.

Note: You must have the TFTP server launched before uploading or downloading software with TFTP.

Note: The CHECKSUM parameter indicates whether the download is successful. If the value of the CHECKSUM = FFFFFFFF, download the file again.

Caution: An image download may take a significant amount of time. For example, a CPU card image download can take several minutes on a mostly idle IP network. Plan the download for an off-peak operating period.

Figure 95. Download software command

```
Syntax
STA-DNLD:[<TID>]:<SWAID>:[<CTAG>]:::SERVER=<Imageserver>,
<FILEType>=<FILEName>;

Example
STA-DNLD::CPU-1-2::::SERVER=199.190.212.188,FILE=CPUSW40;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<SWAID>`	**Software access identifier**—CPU-(1–2)-(1–2) | IXCON-(3–15)-(1–2) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2) | S155-(3–15)-(1–2) | ST1-(3–15) | SE1-(3–15) | FXS-(3–15) | FXO-(3–15) | NVM *Note: For CPU, IXCON, DS3, DS3R, S155, and STS1 cards, the second range (1–2) identifies the memory location.* *Note: Only the inactive memory location (1 or 2) should be addressed.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<Imageserver>`	**IP address**—of server that stores the software image being downloaded. *Note: The server must be running a trivial file transfer protocol (TFTP) utility that allows read and write access.*
`<FILEType>`	**Type of software being downloaded**—See Table 10.
`<FILEName>`	**Name of software image file being downloaded**—See Table 10.

Table 10. Download software command options

<SWAID>	<FILEType>	<FILEName>
CPU-(1–2)-(1–2)	FILE	CPU software load on server, may be similar to CPU_SWDLIMAGE_PRODUCT.
IXCON-(3–15)-(1–2)	FILE	IXCON software load on server. Name may be similar to IXCON_303SWDLIMAGE_PRODUCT.Z.
	FPGAFILE	Field programmable gate array software load on server.
	BSPFILE	Board support package software load on server.

Table 10. Download software command options (continued)

<SWAID>	<FILEType>	<FILEName>
DS3-(3–15)-(1–2)	FILE	DS3 software load on server. Name may be similar to MT3C_303SWDLIMAGE_PRODUCT.Z.
	BOOTFILE	Common facilities software load on server. Name may be similar to IXCON_COMFACSWDLIMAGE_ PRODUCT.Z.
	FPGAFILE	First field-programmable gate array software load on server.
	FPGAFILE2	Field programmable gate array software load on server.
	BSPFILE	Board support package software load on server.
STS1-(3–15)-(1–2)	FILE	STS1 software load on server. Name may be similar to STS1_303SWDLIMAGE_PRODUCT.Z.
	BOOTFILE	Common facilities software load on server. Name may be similar to IXCON_COMFACSWDLIMAGE_ PRODUCT.Z.
	FPGAFILE	First field-programmable gate array software load on server.
	FPGAFILE2	Second field-programmable gate array software load on server.
	BSPFILE	Board support package software load on server.
S155-(3–15)-(1–2)	FILE	S155 software load on server. Name may be similar to S155_303SWDLIMAGE_PRODUCT.Z.
	BOOTFILE	Common facilities software load on server. Name may be similar to IXCON_COMFACSWDLIMAGE_ PRODUCT.Z.
	FPGAFILE	First field-programmable gate array software load on server.
	FPGAFILE2	Second field-programmable gate array software load on server.
	BSPFILE	Board support package software load on server.
ST1-(3–15)	FILE	ST1 software load on server. Name may be similar to STE1_SWDLIMAGE_PRODUCT.
SE1-(3–15)	FILE	SE1 software load on server. Name may be similar to SE1_SWDLIMAGE_PRODUCT.
FXS-(3–15)	FILE	FXS software load on server. Name may be similar to FXS_SWDLIMAGE_PRODUCT.
FXO-(3–15)	FILE	FXO software load on server. Name may be similar to FXO_SWDLIMAGE_PRODUCT.
NVM	FILE	NVM backup file on server. Name is whatever you called it when you made the backup file. *Note: You cannot download NVM unless you first uploaded it to the server during maintenance procedures.*

Upload nonvolatile memory command

To upload nonvolatile memory (NVM) to a server file, enter the **STA-UPLD** command and the applicable parameters as shown in Figure 96.

Note: You must have the TFTP server launched before uploading or downloading software with TFTP.

Note: An NVM upload should be performed as soon as possible after upgrading the system, so that your backup copy of configuration data is compatible with the new software.

Figure 96. Upload NVM command

```
Syntax
STA-UPLD:[<TID>]:<UPAID>:[<CTAG>]:::SERVER=<Imageserver>,
FILE=<ImageFileName>;

Example
STA-UPLD::NVM::::SERVER=199.190.212.188,FILE=CPUSW40;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<UPAID>`	**Upload card access identifier**—NVM | CPU-(1–2)-(1–2) *Note: For CPU cards, the second range (1–2) identifies the memory location.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<Imageserver>`	**Name of server**—that stores the software image being uploaded. *Note: The server must be running a trivial file transfer protocol (TFTP) utility that allows read and write access.*
`<ImageFileName>`	**Name of software image file being uploaded**—You may choose any unique name. FILE is for NVM uploads.

Download and upload software response messages

Each software download and upload command generates at least two response messages. The initial message starts the download and upload process; it is a TL1 normal response message, the general syntax of which is shown in Figure 30. The final message ends the download and upload process; it is an autonomous message, the general syntax of which is shown in Figure 31. The syntax of both initial and final response messages is shown in Figure 97. When system conditions exist that prevent successful completion of the download and upload command, there can be any of several other autonomous or error response messages present between the initial and final messages. These messages have either the autonomous message syntax shown in Figure 31 or the error message syntax shown in Figure 32. Table 11 lists the typical response messages to an unsuccessful download and upload command. These responses are the `<rspblk>` field of the autonomous message or the `<text block>` field of the error message.

Table 11. Response messages to unsuccessful download and upload command

Syntax	Message	Definition
<rspblk>	NO SERVER	TFTP (trivial file transfer protocol) server cannot be located.
<rspblk>	NO FILE FOUND	TFTP file cannot be found.
<rspblk>	SERVER:ACCESS VIOLATION	Server cannot be written to.
<rspblk>	SERVER:DISK FULL	Server disk is full.
<rspblk>	SERVER:FILE EXISTS	File with same name already exists in server.
<rspblk>	SOFTWARE INTERNAL ERROR	An internal error occurs.
<rspblk>	NO CONNECTION	Connection to server cannot be established.
<rspblk>	CARD BUSY	Mapper card is busy.
<rspblk>	DOWNLOAD FAILURE TIME-OUT	A download has aborted due to a time-out.
<rspblk>	DOWNLOAD FAILURE CRC FAILED	A download has aborted due to a CRC error.
<rspblk>	UPLOAD ERROR	An upload has terminated due to an error.
<text block>	DENY, FLASH ACTIVE	Requested a download to an intelligent card that is not in OOS.

Figure 97. Download and upload software response message

```
Initial message
Syntax
<SID>^<yy-mm-dd>^<hh:mm:ss>
M  PRTL
<rspblk>
;

Example
FACTORY 1998-11-26 11:08:05
M  PRTL
^^^/+ DOWN/UP LOAD IN PROGRESS +/
;

Final message
Syntax
<SID>^<yy-mm-dd>^<hh:mm:ss>
A^^<ATAG>^<rspname>
<rspblk>
;
```

Figure 97. Download and upload software response message (continued)

```
Example
FACTORY 1998-11-26 11:11:37
A^ 2320 REPT EVT CPUBANK
"CPU-1-2:SWLOAD_FLASH_LOAD_COMPL,SC,1998-11-26,
11-11-37,,,,:\"FLASH LOADING COMPLETED\""
;
```

Change software image state command

This command activates the inactive bank or image of an intelligent mapper card. It can also be used to switch activity between the redundant and active CPU card.

Note: Before switching activity, check the spare CPU card using the **RTRV-EQPT** command. It should be synchronized with the active CPU card, as shown by the settings PST=IDLE and SST=BAC. If the spare CPU is not in the list of retrieved cards, do the following:

- Manually reset the spare CPU by pulling it and then re-seating it.
- Wait until the CPU cards have finished synchronizing before continuing.

To change software image state, enter the **ACT-IMG** command and applicable parameters as shown in Figure 98.

Figure 98. Change software image state command

```
Syntax
ACT-IMG:[<TID>]:<SWAID>:[<CTAG>];

Example
ACT-IMG::CPU-2-2:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<SWAID>	**Software access identifier**—CPU-(1–2)-(1–2) | IXCON-(3–15)-(1–2) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2) | S155-(3–15)-(1–2) | ST1-(3–15) | SE1-(3–15) | FXS-(3–15) | FXO-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Clear NVM command

The NVM (nonvolatile memory) is used to store system configuration data. Clearing NVM erases the configuration data in NVM. To perform this function, enter the **INIT-NVM** command and the applicable parameters as shown in Figure 99.

Caution: Exercise caution when using the **INIT-NVM::ALL:;** command. This command erases all system settings except Ethernet (IP and IP routes), SNMP (MGMTIPLIST and community strings), application access, and the NETYPE data settings.

Figure 99. Clear NVM command

```
Syntax
INIT-NVM:[<TID>]:ALL:[<CTAG>];

Example
INIT-NVM::ALL:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Equipment commands

Following system power-up, the CPU polls the chassis for the presence of ARCADACS 100 system cards. Card insertion is detected and the CPU determines if the detected card(s) are new or preexisting. If the card is new, it is initialized and provisioned by NVRAM. At initialization, all outstanding alarms (if any) are cleared.

The equipment commands include the provisioning, configuration, and operation of the various ARCADACS 100 system cards within a particular installation. See Physical description on page 4 for details of card installation within the system.

The equipment group command structure consists of the following functions:

- Create (provision) parameters and settings for specific logic card types in specific logic card slots of the system.
- Retrieve previously provisioned parameters and settings of logic card types in specific logic card slots of the system.
- Edit (change) provisioned parameters and settings of specific logic card types in specific logic card slots of the system.

- Initiate testing (diagnostic operation) of specific logic card types when their PST (primary setting) is set to OOSMT (out of service for maintenance).
- Delete provisioning for specific logic card types in specific logic card slots of the system.
- Provision signaling conversion function for SE1, ST1, DS3, and DS3R cards

Create equipment function

The create equipment function provides provisioning of logic card parameters and settings for a specific logic card slot within the system. This function normally sets up the individual cards and associated logic card slots for the system. There are some conditions, however, under which the create equipment function fails:

- The logic card slot is already provisioned for a different type of card.
- The logic card or slot is already provisioned but slot is empty and a card missing alarm is active. This condition occurs if the secondary state of the existing card provisioning is UEQ (unequipped).
- A card is inserted into a slot already provisioned for another card type, and a card mismatch alarm is generated.

In all cases, the existing card or slot provisioning must be deleted before the create equipment function can operate. See Delete card function on page 155. Under normal circumstances, however, the create equipment function provisions an empty slot with parameters and settings for a logic card assigned to that slot from the particular system configuration. A valid card name and slot number identifies the type of logic card and its location within the system. When a card is set to working mode but simplex redundancy, there is no protection available; conversely, when a card is set to working mode but duplex redundancy, it can have protection when a protection card is available. After any card has been provisioned as a working or protection card, it cannot be changed unless it is deleted and provisioned again. A working card, however, can switch its mode of operation between simplex (unprotected) and duplex (protected) at any time.

The create equipment function consists of a single **create equipment** command as described in Create equipment command on page 143 and a standard TL1 response as described in TL1 normal response syntax and format on page 90.

Create equipment command

To provision a logic card slot with parameters and settings for any of the logic cards of the system, enter the **ENT-EQPT** command and the applicable parameters as shown in Figure 100.

Figure 100. Create equipment command

```
Syntax
ENT-EQPT:[<TID>]:<CARDAID>:[<CTAG>]:::<EQ_DATA>[,<EQ_DATA>];

Example
ENT-EQPT::ST1-8::::PST=IS,WKMOD=WK,RN=DX,PRIORITY=6;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | FXS-(3–15) | FXO-(3–15) | XCON-(3–15) | IXCON-(3–15) | MSU-(17) *Note: For CPU, IXCON, DS3, DS3R, S155, and STS1 cards, the second range (1–2) identifies the memory location.* *Note: The MSU card must be provisioned in slot 17.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<EQ_DATA>	**Equipment data**—See Table 12.

A listing of valid card names along with their slot number ranges (<CARDAID>), parameter listings (<EQ_DATA>), and parameter descriptions is provided in Table 12.

Table 12. Create equipment command options

<CARDAID>	<EQ_DATA>	Description
XCON-(3–15)	PST=(IS | OOSMT)	PST is primary state, IS is in service, OOSMT is out of service maintenance.
IXCON-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex. *Note: the protection card must be provisioned before the DX value is allowed.*

Table 12. Create equipment command options (continued)

<CARDAID>	<EQ_DATA>	Description
ST1-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	TYPE=(DSX | CSU)	TYPE is card type.
	WKMOD=(WK | PRT)	WKMOD is working mode. WK is working card, PRT is protection card.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex.
	PRIORITY=(1–14)	PRIORITY is protection switch priority (valid only when WKMOD=WK and RN=DX). 1 is lowest and 14 is highest priority.
	TR08_G(1–2)=(1–4)	Each ST1 card has two TR_08 groups. Each group can have 1 to 4 elements or ports. Group 1 starts from port 1, group 2 starts from port 5. Default values are zero. First element in group has FRM=SLC96_MOD1, the rest FRM=SLC96_D4. Default value is zero.
SE1-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	WKMOD=(WK | PRT)	WK MOD is working mode. WK is working card, PRT is protection card.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex. *Note: the protection card must be provisioned before the DX value is allowed.*
	PRIORITY=(1–14)	PRIORITY is protection switch priority (valid only when WK MOD=WK and RN=DX). 1 is lowest and 14 is highest priority.
DS3-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex.
STS1-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex.
	MODE=(STS1 | DUAL)	MODE is operating mode. STS1 is both ports connect to STS1 signals and DUAL is port A connects to STS1 and port B connects to DS3. *Note: The default setting is STS1.*

Table 12. Create equipment command options (continued)

<CARDAID>	<EQ_DATA>	Description
S155-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
	RN=(SX | DX | 1+1 | 1+1W)	RN is redundancy. SX is simplex; DX is duplex; 1+1 is linear, 1+1, nonrevertive line protection; and 1+1W is 1+1 for systems with wireless (radio). *Note: 1+1 and 1+1W indicate that the card can use the automatic protection switching (APS) feature. APS does not work until you activate it. See Activate automatic protection switching command on page 221.*
	MODE=(STM1 | OC3 | OC3C)	MODE is operating mode. STM1 is synchronous transport module 1 (for European and Asian SDH systems), OC3 is optical carrier level 3 at 155 Mbps (for North American SONET systems), and OC3C is optical carrier level 3 concatenated. *Note: OC3C is not supported in this release.*
FXS-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
FXO-(3–15)	PST=(IS | OOSMT)	PST is primary state. IS is in service, OOSMT is out of service maintenance.
MSU-(17)	PST=IS	IS is in service. Although not required for the MSU to function, it provides for card alarms if removed or it goes faulty.

Retrieve card settings function

Parameters and settings of the various logic card types should be retrieved individually to ensure proper configuration and operation. Since the logic card cage of the system contains two CPU card slots, and 15 common card slots for all other logic cards, there are more than one of most logic card types. The settings for each card can be retrieved individually, or settings for all cards of a specific type can be retrieved at the same time.

The retrieve card settings command and response are listed and described in the following sections:

- **Retrieve card settings** command
- **Retrieve card settings** response

Retrieve card settings command

To retrieve previously-provisioned parameters and settings of a specific logic card or all logic cards of a specific type in the system, enter the **RTRV-EQPT** command and the applicable parameters as shown in Figure 101.

> **Note:** Parameters are not allowed in the trailing fields for the **RTRV-EQPT** command. The trailing fields are allowed but not required.

Figure 101. Retrieve card settings command

```
Syntax
RTRV-EQPT:[TID]:<aid>:[CTAG][::::];


Example
RTRV-EQPT::STS1-10:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—CPU-(1–2) | CLKALL | ST1-(3–15) | SE1-(3–15) | XCON-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | FXS-(3–15) | FXO-(3–15) | IXCON-(3–15) | MSU-(17) | ALL
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve card settings response

The `<rspblk>` portion of the response to the **RTRV-EQPT** (all cards) command is shown in Figure 102.

Figure 102. Retrieve card settings response

```
Syntax
CPU
"CPU-(1-2):::PST=IS|OOS,SST=BUSY|IDLE|FLT|PROT|UEQ|SYNCH|BAC"

CLK
"CLK-(1-2):::PST=IS|OOS,SST=BUSY|FLT|UEQ|IDLE"

ST1
"ST1-(3-15)::PRIORITY=(1-14),TYPE=(DSX|CSU),WKMOD=WK|PRT,
RN=SX|DX:PST=IS|OOSMT|RESET|OOS,SST=BUSY|FLT|PROT|UEQ|IDLE,
SWST=SWIDLE|MANPNDG|MANCMPL|FRCDPNDG|FRCDCMPL|LOCKCMPL|AUTOPNDG|
AUTOCMPL|AUTOWTR[,PRTSTATE=IDLE|PROTECTING,PROTECTEDCRD=NULL|
<CARDAID>]"+
```

Figure 102. Retrieve card settings response (continued)

```
SE1
“SE1-(3-15)::PRIORITY=(1-14),WKMOD=WK|PRT,RN=SX|DX:PST=IS|OOS|
OOSMT|RESET,SST=BUSY|FLT|PROT|UEQ|IDLE,SWST=SWIDLE|MANPNDG|
MANCMPL|FRCDPNDG|FRCDCMPL|LOCKCMPL|AUTOPNDG|AUTOCMPL|AUTOWTR[,
PRTSTATE=IDLE|PROTECTING,PROTECTEDCRD=NULL|<CARDAID>]”+

DS3
“DS3-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|IDLE|BAC|SYNCH|PROT|
UEQ|FLT,RN=SX|DX”

STS1
“STS1-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|IDLE|BAC|SYNCH|PROT
|UEQ,RN=SX|DX,MODE=(STS1|DUAL)”

S155
“S155-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|IDLE|BAC|SYNCH|PROT
|UEQ,RN=SX|DX|1+1|1+1W,MODE=STM1|OC3|OC3C”

XCON
“XCON-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|IDLE|SYNCH|FLT|BAC|
PROT|UEQ”+

IXCON
”IXCON-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|IDLE|SYNCH|FLT|
BAC|PROT|UEQ,RN=SX|DX”

FXS
“FXS-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|FLT|UEQ|IDLE”

FXO
“FX0-(3-15):::PST=IS|OOS|OOSMT|RESET,SST=BUSY|FLT|UEQ|IDLE”

MSU
"MSU-17:::PST=IS|OOS,SST=BUSY|UEQ|IDLE"

Example
“ST1-6::TYPE=DSX,WKMOD=PRT,RN=DX:PST=IS,SST=PROT,
SWST=SWIDLE,PRTSTATE=PROTECTING,PROTECTEDCRD=ST1-10”+
"ST1-7::PRIORITY=1,TYPE=CSU,WKMOD=WK,RN=DX:PST=IS,SST=BUSY,
SWST=SWIDLE"
"ST1-8::PRIORITY=1,TYPE=CSU,WKMOD=WK,RN=DX:PST=IS,SST=BUSY,
SWST=SWIDLE"
"ST1-9::PRIORITY=1,TYPE=CSU,WKMOD=WK,RN=DX:PST=IS,SST=IDLE,
SWST=SWIDLE"
"ST1-10::PRIORITY=1,TYPE=CSU,WKMOD=WK,RN=DX:PST=IS,SST=IDLE,
SWST=SWIDLE"
"ST1-15::TYPE=CSU,WKMOD=PRT:PST=IS,SST=IDLE,SWST=SWIDLE"
"FXS-5:::PST=IS,SST=IDLE"
```

Note: OC3C is not supported in this release.

The response parameters are defined in Table 13. For all card types listed in Table 13, the relationship between primary state setting (PST) and secondary state (SST) shown in Table 14 exists for each individual card.

Table 13. Retrieve card settings response definitions

Card	Response	Definition
CLK-(1–2)	PST=IS | OOS	PST is primary state. IS is in service, OOS is out of service.
	SST=BUSY | FLT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, UEQ is unavailable equipment, IDLE is idle.
ST1-(3–15)	TYPE=(DSX | CSU)	Type of ST1 card: DSX is digital signal cross connect, CSU is channel service unit.
	PRIORITY=(1–14)	Sets protection switching priority (valid only when WK MOD=WK and RN=DX) 14 is the highest priority.
	WKMOD=WK | PRT	WK MOD is working mode. WK is working card, PRT is protection card.
	RN=SX | DX	RN is redundancy. SX is simplex, DX is duplex.
	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOSMT is out of service maintenance, RESET is reset card, OOS is out of service.
	SST=BUSY | FLT | PROT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle.
	SWST=SWIDLE | MANPNDG | MANCMPL | FRCDPND | FRCDCMPL | LOCKCMPL | AUTOPNDG | AUTOCMPL | AUTOWTR	SWST is switch state. SWIDLE is switch idle, MANPNDG is manual switch to protection or working card pending, MANCMPL is manual switch to protection or working card complete, FRCDPNDG is forced switch to protection or working card pending, FRCDCMPL is forced switch to protection or working card complete, LOCKCMPL is lockout of protection complete, AUTOPNDG is auto switch to protection or working card pending, AUTOCMPL is auto switch to protection or working card complete, AUTOWTR is wait-to-restore countdown occurring.
	PRTSTATE=IDLE | PROTECTING	PRTSTATE is protection state. IDLE is idle, PROTECTING is protecting state. Appears when WKMOD=PRT.
	PROTECTEDCRD=NULL | <CARDAID>	PROTECTEDCRD is protected card. NULL is none, <CARDAID> is access identifier of protected card. Appears when WKMOD=PRT.

Table 13. Retrieve card settings response definitions (continued)

Card	Response	Definition
SE1-(3–15)	PRIORITY=(1–14)	Sets protection switching priority (valid only when WK MOD=WK and RN=DX). 14 is the highest priority.
	WKMOD=WK | PRT	WK MOD is working mode, WK is working card, PRT is protection card.
	RN=SX | DX	RN is redundancy. SX is simplex, DX is duplex.
	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOSMT is out of service maintenance, RESET is reset card, OOS is out of service.
	SST=BUSY | FLT | PROT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle.
	SWST=SWIDLE | MANPNDG | MANCMPL | FRCDPND | FRCDCMPL | LOCKCMPL | AUTOPNDG | AUTOCMPL | AUTOWTR	SWST is switch state. SWIDLE is switch idle, MANPNDG is manual switch to protection or working card pending, MANCMPL is manual switch to protection or working card complete, FRCDPNDG is forced switch to protection or working card pending, FRCDCMPL is forced switch to protection or working card complete, LOCKCMPL is lockout of protection complete, AUTOPNDG is auto switch to protection or working card pending, AUTOCMPL is auto switch to protection or working card complete, AUTOWTR is wait-to-restore countdown occurring.
	PRTSTATE=IDLE | PROTECTING	PRTSTATE is protection state. IDLE is idle, PROTECTING is protecting state. Appears when WKMOD=PRT.
	PROTECTEDCRD=NULL | <CARDAID>	PROTECTEDCRD is protected card. NULL is none, <CARDAID> is access identifier of protected card. Appears when WKMOD=PRT.
DS3-(3–15)	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance. RESET is reset card.
	SST=BUSY | FLT | PROT | UEQ | IDLE | BAC | SYNCH	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle, BAC is backup card, SYNCH is synchronizing with other DS3 card.
	RN=SX | DX	RN is redundancy. SX is simplex, DX is duplex.

Table 13. Retrieve card settings response definitions (continued)

Card	Response	Definition
STS1-(3–15)	PST=IS | OOS | OOSMT | Reset	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance. RESET is reset card.
	SST=BUSY | FLT | PROT | UEQ | IDLE | BAC | SYNCH	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle, BAC is backup card, SYNCH is synchronizing with other STS1 card.
	RN=SX | DX	RN is redundancy. SX is simplex, DX is duplex.
	MODE=(STS1 | DUAL)	MODE is operating mode. STS1 is both ports connect to STS1 signals and DUAL is port A connects to STS1 and port B connects to DS3. *Note: The default setting is STS1.*
S155-(3–15)	PST=IS | OOS | OOSMT | Reset	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance. Reset is reset card.
	SST=BUSY | IDLE | BAC | SYNCH | PROT | UEQ	SST is secondary state. BUSY is busy, IDLE is idle, BAC is backup card, SYNCH is synchronizing with other S155 card, PROT is protection, UEQ is unavailable equipment.
	RN=SX | DX | 1+1 | 1+1W	RN is redundancy. SX is simplex; DX is duplex; 1+1 is linear, 1+1, nonrevertive line protection; and 1+1W is 1+1 for systems with wireless (radio).
	MODE=STM1 | OC3 | OC3C	MODE is operating mode. STM1 is synchronous transport module 1 (for European and Asian SDH networks), OC3 is optical carrier level 3 (for North American SONET networks), and OC3C is optical carrier level 3 concatenated. *Note: OC3C is not supported in this release.*
CPU-(1–2)	PST=IS | OOS	PST is primary state. IS is in service, OOS is out of service.
	SST=BUSY | FLT | PROT | UEQ | IDLE | SYNCH	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle, and SYNCH is synchronizing with other CPU card.
XCON-(3–15)	PST=(IS | OOS | OOSMT | RESET)	PST is primary state. IS is in service, OOSMT is out of service maintenance, RESET is reset card, OOS is out of service.
	SST=BUSY | FLT | PROT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle.

Table 13. Retrieve card settings response definitions (continued)

Card	Response	Definition
IXCON	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance, RESET is reset card.
	SST=BUSY | FLT | PROT | UEQ | IDLE | BAC | SYNCH	SST is secondary state. BUSY is busy, FLT is fault, PROT is protection, UEQ is unavailable equipment, IDLE is idle, BAC is backup card, SYNCH is synchronizing with other IXCON card.
	RN=SX | DX	RN is redundancy. SX is simplex, DX is duplex.
FXS-(3–15)	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance, RESET is reset card.
	SST=BUSY | FLT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, UEQ is unavailable equipment, IDLE is idle.
FXO-(3–15)	PST=IS | OOS | OOSMT | RESET	PST is primary state. IS is in service, OOS is out of service, OOSMT is out of service maintenance, RESET is reset card.
	SST=BUSY | FLT | UEQ | IDLE	SST is secondary state. BUSY is busy, FLT is fault, UEQ is unavailable equipment, IDLE is idle.
MSU-(17)	PST=IS | OOS	PST is primary state. IS is in service, OOS is out of service.
	SST=BUSY | UEQ | IDLE	SST is secondary state. BUSY is busy, UEQ is unavailable equipment, IDLE is idle.

Table 14. Card state descriptions

PST setting	SST setting	Description
IS	BUSY	Card is protecting a working card, or a T1 port has a cross-connect or is a clock source for the system.
IS	IDLE	Card has no busy condition.
OOS	UEQ	Card is missing.
OOS	PROT	Card is switched to a protection card.
OOS	FLT	Card has a fault.
OOSMT	any	Card is manually put in out of service for maintenance purposes.

Edit card settings function

The edit card settings function permits changing of parameters and settings for certain logic cards of the system. These cards include the CPU, ST1 (CSU or -DSX), SE1, XCON, IXCON,DS3, DS3R, STS1, S155, FXS, and FXO mapper cards. The edit card setting function consists of the single **edit card settings** command as described in Edit card settings command on page 152 and a standard TL1 response as described in TL1 normal response syntax and format on page 90.

Use the edit card settings command to put a mapper card out of service, using the PST=OOSMT parameter.

Edit card settings command

To edit previously-provisioned parameters and settings of a specific logic card in the system, enter the **ED-EQPT** command and the applicable parameters as shown in Figure 103.

Figure 103. Edit card command

```
Syntax
ED-EQPT:[<TID>]:<CARDAID>:[<CTAG>]:::<EQ_DATA>[,<EQ_DATA>];

Example
ED-EQPT::ST1-6::::RN=SX;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—CPU-(1–2) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | FXS-(3–15) | FXO-(3–15) | XCON-(3–15) | IXCON-(3–15) *Note: You must provision only the left-most CPU, IXCON, DS3, DS3R, S155, or STS1 card in each pair of cards. The provisioning is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<EQ_DATA>	**Equipment data**—See Table 15.

A listing of valid card names along with their slot number ranges (<CARDAID>), parameter listings (<EQ_DATA>), and parameter descriptions is provided in Table 15.

Table 15. Edit card command options

<CARDAID>	<EQ_DATA>	Description
CPU-(1–2)	PST=RESET	PST is set primary state. RESET is reset card.

Table 15. Edit card command options (continued)

<CARDAID>	<EQ_DATA>	Description
ST1-(3–15)	PST=(IS | OOSMT | RESET)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex. *Note: the protection card must be provisioned before the DX value is allowed.*
	PRIORITY=(1–14)	PRIORITY is protection switch priority (valid only when WK MOD=WK and RN=DX). 14=highest.
SE1-(3–15)	PST=(IS | OOSMT | RESET)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex. *Note: the protection card must be provisioned before the DX value is allowed.*
	PRIORITY=(1–14)	PRIORITY is protection switch priority (valid only when WK MOD=WK and RN=DX). 14=highest.
DS3-(3–15)	PST=(IS | OOSMT | RESET)	PST is set primary state. IS is in service, OOSMT is out of service maintenance, RESET is reset card (can only be performed when PST = OOSMT).
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex.
STS1-(3–15)	PST=(IS | RESET | OOSMT)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.
	RN=(SX | DX)	RN is redundancy. SX is simplex, DX is duplex.
S155-(3–15)	PST=(IS | RESET | OOSMT)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.
	RN=(SX | DX | 1+1 | 1+1W)	RN is redundancy. SX is simplex, DX is duplex, and 1+1 or 1+1W means the card can use the automatic protection switching (APS) feature (see Activate automatic protection switching command on page 221).
	MODE=(STM1 | OC3 | OC3C)	MODE is operating mode. STM1 is synchronous transport module 1 (for European and Asian SDH networks), OC3 is optical carrier level 3 (for North American SONET networks), and OC3C is optical carrier level 3 concatenated. *Note: OC3C is not supported in this release.*
FXS-(3–15)	PST=(IS | RESET | OOSMT)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST=OOSMT), OOSMT is out of service maintenance.
FXO-(3–15)	PST=(IS | RESET | OOSMT)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.

Table 15. Edit card command options (continued)

<CARDAID>	<EQ_DATA>	Description
XCON-(3–15)	PST=(IS | RESET)	PST is set primary state. IS is in service, RESET is reset card.
IXCON-(3–15)	PST=(IS | RESET | OOSMT)	PST is set primary state. IS is in service, RESET is reset card (can only be performed when PST = OOSMT), OOSMT is out of service maintenance.

Initiate testing function

Testing of the logic cards of the system can be initiated when they are set to PST=OOSMT (primary setting is out of service for maintenance). The initiate testing function consists of an initiate diagnostic testing command and its associated response.

The initiate diagnostic testing command and associated response are listed and described in the following sections:

- **Initiate diagnostic testing** command
- **Initiate diagnostic testing** response

Initiate diagnostic testing command

To initiate diagnostic testing of a specific logic card of the system, enter the **ACT-DIAG** command and the applicable parameters as shown in Figure 104.

Note: You must put a card out of service (OOSMT) before you can run diagnostic tests. See Edit card settings command on page 152.

Figure 104. Initiate diagnostic testing command

```
Syntax
ACT-DIAG:[<TID>]:<CARDAID>:[<CTAG>];

Example
ACT-DIAG::ST1-9:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—CPU-(1–2) | IXCON-(3–15) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Initiate diagnostic testing response

The `<rspblk>` portion of the response to the **ACT-DIAG** command is shown in Figure 105.

Figure 105. Initiate diagnostic testing response

```
Syntax
(<TEST> <RESULT> <DETAILS>)+;

Example  (for an ST1 card)
DPRAM  PASS DPRAM READ OK
RAM   PASS OS9 RAM CHECK OK
FPGA  PASS FPGA READ OK
NVM   PASS EEPROM READ OK
;
```

The response command parameters are as follows:

`<CARDAID>`	**Card access identifier**—CPU-(1–2) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | ST1-(3–15) | SE1-(3–15) | IXCON-(3–15)
`<TEST>`	**Name of test** **CPU**—NVM, RAM, BKPLN, FPGA, DPRAM, IOCARD, ETHER **IXCON, DS3, STS1, S155**—NVM/DOC, BKPLN, HDLC Bus **ST1**, **SE1**—FPGA, DPRAM, RAM, NVM (EEPROM)
`<RESULT>`	PASS | FAIL
`<DETAILS>`	Details about the action performed (for example, data read or communication checked) and its success

Delete card function

A card may be deleted (deprovisioned) when it is no longer in service.

Delete card command

To delete previously-provisioned parameters and settings of a specific logic card in the system, enter the **DLT-EQPT** command and the applicable parameters as shown in Figure 106.

Figure 106. Delete card command

```
Syntax
DLT-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
DLT-EQPT::ST1-9:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | FXS-(3–15) | FXO-(3–15) | XCON-(3–15) | IXCON-(3–15) *Note: You must specify only the left-most IXCON, DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Signaling conversion function

The ST1, SE1, and DS3R cards have signaling conversion tables for received (RX) signals and for transmitted (TX) signals. Each table has sixteen values, from **0000** to **1111**. The default settings show no conversion (for example, 0000 -> 0000).

The ST1 and SE1 cards have one RX table and one TX table. Once the values have been entered and applied, they affect the traffic on all eight ports of the card.

The DS3R card has two RX tables (RX1 and RX2) and two TX tables (TX1 and TX2). The RX1 and TX1 tables affect port A, and the RX2 and TX2 tables affect port B.

Signaling conversion is required in the following situations:

- **SE1 cards**—If the system has SE1 cards and other mapper card types (such as ST1, DS3, or STS1), cross connections between the SE1 cards and other types of cards require conversion from E1 to T1 and back again. You provision this type of conversion on the SE1 cards only.
- **ST1 and DS3R cards**—A Class 5 switch is typically connected to a T1 digital modem, which supports loopstart signaling. At the customer end, devices are typically connected to V.90 analog modems, which support E&M or FXS-DN signaling. Figure 107 shows a sample configuration.

  Occasionally, a network condition known as the robbed-bit signaling effect will cause degradation in some V.90 modem speeds. If your V.90 modems are not achieving high data rates, you can use the signaling conversion feature to alleviate the effect.

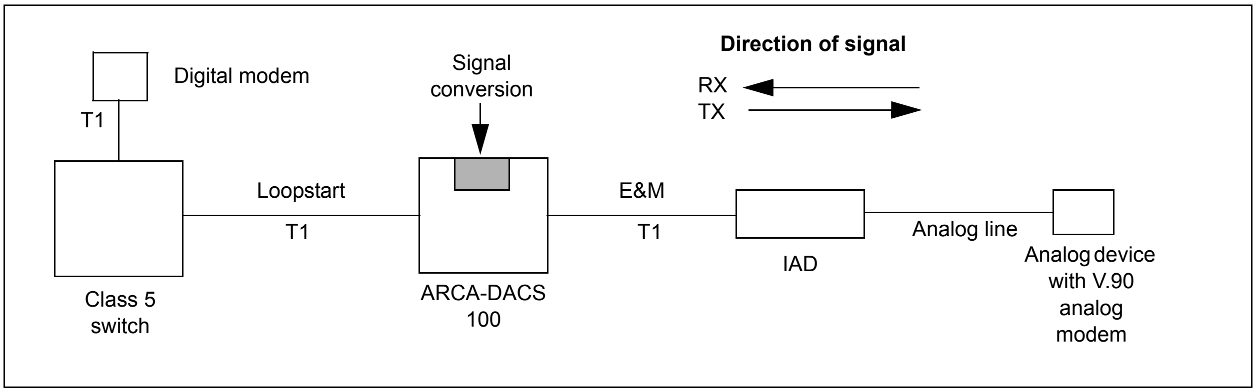
  To overcome the robbed-bit signaling effect, the shelf must convert the E&M and FXS-DN bit patterns to loopstart bit patterns and back again. The conversion is required for any cross connection using voice and signaling (VSIG). You must provision certain values on the ST1 and DS3R cards to support the V.90 modems:

  - In each RX table, convert **0000** to **0101**.

– In each TX table, convert **0000** to **1111**, **1111** to **0000**, and **0101** to **0000**.

Note: You must also do the following:
- Provision the IAD with E&M or FXS-DN signaling.
- Use the **CNV=TXRX** parameter when configuring termination pointers (**ENT-TP**).

Figure 107. Sample configuration for signaling conversion



Edit signaling conversion table command

To change the signaling conversion settings in an RX or TX table, enter the **ED-SIGTBL** command and the applicable parameters as shown in Figure 108.

Figure 108. Edit signaling conversion table command

```
Syntax
ED-SIGTBL:[<TID>]:<CARDAID>:[<CTAG>]:::SIG=<EQ_DATALIST>
[,<EQ_DATALIST>];

Example
ED-SIGTBL::ST1-5-RX::::SIG=0000->0101;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CARDAID>`	**Card access identifier**—SE1-(3–15)-(RX | TX) | ST1-(3–15)-(RX | TX) | DS3-(3–15)-(RX1 | RX2 | TX1 | TX2)* * *DS3R (CT3R) cards only*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<EQ_DATALIST>`	**Conversion value**—`nnnn->nnnn`, where `nnnn` is the signal value from 0000 to 1111.

Retrieve signaling conversion table command

To view the settings in the RX or TX tables for an SE1, ST1, or DS3R card, enter the **RTRV-SIGTBL** command and the applicable parameters as shown in Figure 109.

Figure 109. Retrieve signaling conversion table command

```
Syntax
RTRV-SIGTBL:[<TID>]:<CARDAID>:[<CTAG>];

Example
RTRV-SIGTBL::STE1-5-RX:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CARDAID>`	**Card access identifier**—SE1-(3–15)-(RX | TX) | ST1-(3–15)-(RX | TX) | DS3-(3–15)-(RX1 | RX2 | TX1 | TX2)* * *DS3R (CT3R) cards only*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve signaling conversion table response

The `<rspblk>` portion of the response to the **RTRV-SIGTBL** command is shown in Figure 110.

Figure 110. Retrieve card settings response

```
Syntax
"<CARDAID>
0000->0000 0100->0100 1000->1000 1100->1100
0001->0001 0101->0101 1001->1001 1101->1101
0010->0010 0110->0110 1010->1010 1110->1110
0011->0011 0111->0111 1011->1011 1111->1111";

Example
"ST1-5-RX
0000->0101 0100->0100 1000->1000 1100->1100
0001->0001 0101->0101 1001->1001 1101->1101
0010->0010 0110->0110 1010->1010 1110->1110
0011->0011 0111->0111 1011->1011 1111->1111";
```

The response parameter is as follows:

`<CARDAID>`	**Card access identifier**—SE1-(3–15)-(RX | TX) | ST1-(3–15)-(RX | TX) | DS3-(3–15)-(RX1 | RX2 | TX1 | TX2)* * *DS3R (CT3R) cards only*

Facility commands

The facility commands permit configuration and port testing of the T1 or E1 facility. Included in the facility port testing commands are the loopback and BERT test commands. The cards that can perform facility tests are the ST1, SE1, DS3, DS3R, and STS1 mapper cards. Primary and secondary facility states are listed in Table 16. See Testing a facility on page 331 for procedures detailing facility operations.

Table 16. Primary and secondary facility states

Primary state	Secondary state	Description
IS	BUSY	T1 port has a cross-connect, or it is a clock source.
IS	IDLE	T1 port is not a clock source, and has no cross connection.
OOS	UEQ	Card is missing.
OOS	FLT	The card is faulty; or the channel has a Status Point Failure (SPF) or Control Point Failure (CPF).
OOS	PPS	The card is protected.
OOS	LPBKLOCAL	T1 port has a local loopback.
OOS	LPBKLINE	T1 port has a line loopback.
OOS	LPBKMETALLIC	T1 port has a metallic loopback.

Facility configuration

The facility configuration commands and responses are described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Enter facility data** command
- **Edit facility data** command
- **Retrieve facility data** command
- **Retrieve facility data** response
- **Delete facility data** command
- **Retrieve T1 condition** command
- **Retrieve T1 condition** response
- **Retrieve T3 condition** command
- **Retrieve T3 condition** response

Enter facility data command

To enter facility data, use the **ENT-FAC** command. This command will be denied if the facility is not in the idle state, which indicates that the facility has cross connects. Use this command if you want to bring a facility into service that has no cross connects.

Note: The applicable parameters for the **ENT-FAC** command are listed in Table 17 and as shown in Figure 111.

Note: This command is not required for most users. The ENT-EQPT command will automatically provision facilities on that card. This command is required for the Telcordia OSS systems.

Figure 111. Enter facility data command

```
Syntax
ENT-FAC:[<TID>]:[<FACAID>]):[<CTAG>];

Examples
successful:
ENT-FAC::ST1-5-1::::FRM=ESF,PST=IS;


   FACTORY 02-11-03 10:34:01
M   COMPLD
;
failure:
ENT-FAC:AC3:ST1-7-3:CTAG1:::PST=IS,FRM=ESF;


   AC3 02-11-01 12:47:11
M  CTAG1 DENY
   FAIL
   "ST1-7-3:ERRCDE = FAIL"
   /* STATUS, COMMAND FAIL */
   /* PORT is not IDLE */
;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<FACAID>`	**Facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1 *Note: You can specify a list (using &) or a range (using &&) of facility access identifiers for ST1 and for the DS1 level of DS3, DS3R, S155, or STS1 (that is, <card>-(3–15)-(1–2)-(1–n)) For SE1 cards, you can specify a list of facility access identifiers.* *You must provision only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The provisioning is applied to both cards.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<FAC_DATA>`	**Facility data**—See Table 17.

Table 17. Enter Facility command options

<FACAID>	<FAC_DATA>	Description
ST1-(3–15)-(1–8)	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(**D4** | ESF)	FRM is framing format. D4 is standard, ESF is extended super frame.
	LINELEN=(133 | 266 | 399 | 533 | 655)	LINELEN is T1 line length, in feet.This only applies to the DSX card.
	LBO=(0 | 7.5 | 15 | 22.5)	LBO is line build-out range, in dB. This only applies to the CSU card.
	LINECDE=(**B8ZS** | AMI)	LINECDE is T1 line code format.
	FDL=(**OFF** | NMS | SLC96_WP1 | SLC_96WP1B | SLC96_NOTE)	FDL is the facility data link state. If FRM=D4, use OFF. If FRM=ESF, you may use NMS. OFF means that only ANSI PRMS will be supported. If FRM=ESF and ENT-EQPT specifies TR08 (see Create equipment command on page 143), you may use one of the SLC options.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
SE1-(3–15)-(1–8)	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(UNFRM | MFM | **CRCMFM**)	FRM is framing format. MFM is multiframing format. CRCMFM is CRC-4 multiple frame.
	LINECDE=(**HDB3** | AMI)	LINECDE is T1 line code format. AMI is alternate mark inversion. HDB3 is high-density bipolar 3 and is the default.
	FDL=(**OFF** | NMS_4K | NMS_8K | NMS_12K | NMS_16K | NMS_20K)	FDL is the facility data link state. NMS_4K to NMS_20K represent different bandwidths of the national bit channel.
	LINETYPE=(75 | **120**)	LINETYPE is the type of cable, 75-Ohm (coaxial cable) or 120-Ohm (. **CAUTION**: If using 75-Ohm (coaxial cable), ensure the jumper switches on the SE1 card are in the 75-Ohm position. (Refer to the *ARCADACS 100 Quick Start Guide*, for procedures.)
	A4STATE=(**NONE** | CSA4)	A4STATE should be left as NONE. CSA4 refers to Bit S_{a4}, part of the CRC-4 multiframe structure which can be used as a message-based data link for operations, maintenance, and performance monitoring. *Note: CSA4 is currently not supported.*
SE1-(3–15)-(1–8)	SIGMOD=(NONE | CCS | **CAS**)	SIGMOD is signaling mode. CCS is common channel signaling,. CAS is channel (or call path) associated signaling and is the default.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
DS3-(3–15)-(1–2)-(1–28)	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame. The default is ESF. *Note: If the T1 facility is linked to an IP route, you cannot change FRM to D4.*
	FDL= (OFF | NMS | **ANSI** | ANSINMS)	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	LBDET=(**OFF** | ON |TMOUT)	LBDET is loopback detection.
	TXTIMING=(LOOP | **INTERNAL**)	TXTIMING is transmit timing.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).
	PST=IS	PST is primary state. IS is in service.
DS3-(3–15)-(1–2) ***CAUTION***: *Only the left-most card in each pair of DS3 or DS3R cards can be provisioned. The provisioning is applied to both cards.*	FRM=(M13 | **C-BIT**)	FRM is framing format. M13 is multiplexed DS1 to DS3 framing and C-BIT is modified control bit framing.
	LINELEN=(100 | **450**)	LINELEN is T1 line length, in feet.
	AIS_TX_FMT=**NORMAL**	AIS_TX_FMT is alarm indication signal transmission mode format. *Note: This release supports NORMAL only.*
	AIS_DET_FMT=(**FRAMED_1010 PAT** | FRAMED_1111PAT | UNFRAMED_ALL_ ONES)	AIS_DET_FMT is alarm indication signal detection mode format.
	RM_LPBK_DET=**OFF**	RM_LPBK_DET is remote loopback detection mode. *Note: This release supports OFF only.*
STS1-(3–15)-(1–2)-(VT1–VT28)	PST=(IS)	PST is primary state. IS is in service.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	TX_PLABEL is transmitted path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	EXP_RX_PLABEL is expected received path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
STS1-(3–15)-(1–2)-(1–28) ***CAUTION***: *Only the left-most STS1 card in each pair of cards can be provisioned. The provisioning is applied to both cards.*	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame.
	FDL= (OFF | NMS | **ANSI** | ANSINMS)	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	LBDET=(**OFF** | ON |TMOUT)	LBDET is loopback detection.
	TXTIMING=(LOOP | **INTERNAL**)	TXTIMING is transmit timing.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).
STS1-(3–15)-(1–2)	PST=(IS)	PST is primary state. IS is in service.
	LBO=(100 | **450**)	LBO is line build-out range, in feet.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL is transmitted path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	PTRACE=<“string”>	PTRACE is path trace. It can be up to 64 characters and identifies what is being sent.
	SDVALUE=(10E3 | 10E4 | 10E5 | 10E6 | 10E7 | 10E8 | 10E9)	SDVALUE is signal degrade threshold: the bit error rate that will trigger the APSSD alarm. 10E3 is 10 to the 3rd, and so on.
S155-(3–15)-1-(VT1–VTxx) *where xx is 63 in STM1 mode and 84 in OC3 or OC3c mode OC3C is not supported in this release.*	PST=(IS)	PST is primary state. IS is in service.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	TX_PLABEL is transmitted path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	EXP_RX_PLABEL is expected received path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1-(1–63) *Note: In STM1 mode, there are 63 E1 facilities.*	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	LBDET=**OFF** | ON | TMOUT	LBDET is loopback detection. *Note: LBDET does not apply to S155 cards in STM1 mode.*
	FRM=(PCM30 | PCM30CRC | PCM31 | PCM31CRC)	FRM is framing format. PCM30 is TS16 using channel associated signaling (CAS), PCM30CRC is CAS and CRC4 multiframing active, PCM31 is TS16 is not using CAS, and PCM31CRC is no CAS and CRC4 multiframing active.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
S155-(3–15)-1-(1–84) *Note: In OC3 or OC3C mode, there are 84 DS1 facilities. OC3C is not supported in this release.*	PST= (IS | OFFLINE)	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame.
	LBDET= (**OFF** | ON | TMOUT)	LBDET is loopback detection.
	FDL= OFF | NMS | **ANSI** | BOTH	FDL is facility data link. NMS is network management system (to send ARCADACS 100 provisioning data), and ANSI is American National Standards Institute (to send ISDN primary rate interface signaling). *Note: FRM must be ESF to use NMS, ANSI, or BOTH. These settings are required if using the T1 facility for IP routing.* *If the T1 facility is linked to an IP route, you cannot change FDL to OFF.*
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	FDL= (OFF | NMS | **ANSI** | ANSINMS)	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1 **CAUTION:** *Only the left-most S155 card in each pair of cards can be provisioned. The provisioning is applied to both cards.*	PST=(IS)	PST is primary state. IS is in service.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL is transmitted path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	TX_PLABEL2=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL2 is transmitted path signal label for the second path layer. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	TX_PLABEL3=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL3 is transmitted path signal label for the third path layer. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	EXP_RX_PLABEL2=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label for the second path. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	EXP_RX_PLABEL3=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label for the third path. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	PTRACE=<“string”>	PTRACE is path trace. It can be up to 15 characters (STM1 mode) or 62 characters (OC3 and OC3C mode) and identifies what is being sent. *Note: OC3C is not supported in this release.*

Table 17. Enter Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1 (continued)	PTRACE2=<"string">	PTRACE is path trace for the second path layer. The limit is 62 characters in OC3 mode . It identifies what it being sent. *Note: This applies in OC3 mode only.*
	PTRACE3=<"string">	PTRACE is path trace for the third path layer. The limit is 62 characters in OC3 mode. It identifies what it being sent. *Note: This applies in OC3 mode only.*
	SDVALUE=(10E3 | 10E4 | 10E5 | 10E6 | 10E7 | 10E8 | 10E9)	SDVALUE is signal degrade threshold: the bit error rate that will trigger the APSSD alarm. 10E3 is 10 to the 3rd, and so on.

Edit facility data command

To edit facility data, enter the **ED-FAC** command. The applicable parameters listed in Table 18 and as shown in Figure 112.

Figure 112. Edit facility data command

```
Syntax
ED-FAC:[<TID>]:(<FACAID>[&<FACAID>]|<FACAID>[&&<FACAID>]):
[<CTAG>]:::<FAC_DATA>[,<FAC_DATA>];

Examples
ED-FAC::ST1-5-8::::FRM=ESF,LINECDE=B8ZS,LBO=15,FDL=NMS;
ED-FAC::DS3-3-2-1&&DS3-3-2-4::::FRM=ESF;
ED-FAC::ST1-5-1&ST1-5-4&ST1-5-5::::FRM=D4;
ED-FAC::FXS-7-1::::DS0=1,MODE=TR08,SIGTYPE=SP;
ED-FAC::STS1-5-1-2::::PST=OFFLINE;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<FACAID>` **Facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1 | FXS-(3–15)-1 | FXO-(3–15)-1
Note: You can specify a list (using &) or a range (using &&) of facility access identifiers for ST1 and for the DS1 level of DS3, DS3R, S155, or STS1 (that is, <card>-(3–15)-(1–2)-(1–n)) For SE1 cards, you can specify a list of facility access identifiers.
You must provision only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The provisioning is applied to both cards.

`<CTAG>` **Correlation tag**—See TL1 command, syntax, and format on page 89.

`<FAC_DATA>` **Facility data**—See Table 18.

Table 18. Edit Facility command options

<FACAID>	<FAC_DATA>	Description
ST1-(3–15)-(1–8)	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(**D4** | ESF)	FRM is framing format. D4 is standard, ESF is extended super frame.
	LINELEN=(133 | 266 | 399 | 533 | 655)	LINELEN is T1 line length, in feet. This only applies to the DSX card.
	LBO=(0 | 7.5 | 15 | 22.5)	LBO is line build-out range, in dB. This only applies to the CSU card.
	LINECDE=(**B8ZS** | AMI)	LINECDE is T1 line code format.
	FDL=(**OFF** | NMS | SLC96_WP1 | SLC_96WP1B | SLC96_NOTE)	FDL is the facility data link state. If FRM=D4, use OFF. If FRM=ESF, you may use NMS. OFF means that only ANSI PRMS will be supported. If FRM=ESF and ENT-EQPT specifies TR08 (see Create equipment command on page 143), you may use one of the SLC options.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
SE1-(3–15)-(1–8)	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(UNFRM | MFM | **CRCMFM**)	FRM is framing format. MFM is multiframing format. CRCMFM is CRC-4 multiple frame.
	LINECDE=(**HDB3** | AMI)	LINECDE is T1 line code format. AMI is alternate mark inversion. HDB3 is high-density bipolar 3 and is the default.
	FDL=(**OFF** | NMS_4K | NMS_8K | NMS_12K | NMS_16K | NMS_20K)	FDL is the facility data link state. NMS_4K to NMS_20K represent different bandwidths of the national bit channel. OFF indicates no IP over FDL.
	LINETYPE=(75 | **120**)	LINETYPE is the type of cable, 75-Ohm (coaxial cable) or 120-Ohm (. **CAUTION**: If using 75-Ohm (coaxial cable), ensure the jumper switches on the SE1 card are in the 75-Ohm position. (Refer to the *ARCADACS 100 Quick Start Guide*, for procedures.)
SE1-(3–15)-(1–8) (continued)	A4STATE=(**NONE** | CSA4)	A4STATE should be left as NONE. CSA4 refers to Bit S_{a4}, part of the CRC-4 multiframe structure which can be used as a message-based data link for operations, maintenance, and performance monitoring. *Note: CSA4 is currently not supported.*
	SIGMOD=(NONE | CCS | **CAS**)	SIGMOD is signaling mode. CCS is common channel signaling,. CAS is channel (or call path) associated signaling and is the default.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).

Table 18. Edit Facility command options (continued)

<FACAID>	**<FAC_DATA>**	**Description**
DS3-(3–15)-(1–2)-(1–28)	PST= (IS | OFFLINE)	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame. The default is ESF. *Note: If the T1 facility is linked to an IP route, you cannot change FRM to D4.*
	FDL= (OFF | NMS | **ANSI** | ANSINMS)	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	LBDET=(**OFF** | ON |TMOUT)	LBDET is loopback detection.
	TXTIMING=(LOOP | **INTERNAL**)	TXTIMING is transmit timing.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).
DS3-(3–15)-(1–2) ***CAUTION***: *Only the left-most card in each pair of DS3 or DS3R cards can be provisioned. The provisioning is applied to both cards.*	PST=(IS)	PST is primary state. IS is in service.
	FRM=(M13 | **C-BIT**)	FRM is framing format. M13 is multiplexed DS1 to DS3 framing and C-BIT is modified control bit framing.
	LINELEN=(100 | **450**)	LINELEN is T1 line length, in feet.
	AIS_TX_FMT=**NORMAL**	AIS_TX_FMT is alarm indication signal transmission mode format. *Note: This release supports NORMAL only.*
	AIS_DET_FMT=(**FRAMED_1010 PAT** | FRAMED_1111PAT | UNFRAMED_ALL_ ONES)	AIS_DET_FMT is alarm indication signal detection mode format.
	RM_LPBK_DET=**OFF**	RM_LPBK_DET is remote loopback detection mode. *Note: This release supports OFF only.*
STS1-(3–15)-(1–2)-(VT1–VT28)	PST=(IS)	PST is primary state. IS is in service.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	TX_PLABEL is transmitted path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	EXP_RX_PLABEL is expected received path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
STS1-(3–15)-(1–2)-(1–28) ***CAUTION**:* *Only the left-most STS1 card in each pair of cards can be provisioned. The provisioning is applied to both cards.*	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame.
	FDL= (OFF | NMS | **ANSI** | ANSINMS)	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	LBDET=(**OFF** | ON |TMOUT)	LBDET is loopback detection.
	TXTIMING=(LOOP | **INTERNAL**)	TXTIMING is transmit timing.
	CNV=(**NONE** | TX | RX | TXRX)	CNV is signaling conversion (required for VSIG cross-connections over V90 modems).
STS1-(3–15)-(1–2)	PST=(IS)	PST is primary state. IS is in service.
	LBO=(100 | **450**)	LBO is line build-out range, in feet.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL is transmitted path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	PTRACE=<“string”>	PTRACE is path trace. It can be up to 64 characters and identifies what is being sent.
	SDVALUE=(10E3 | 10E4 | 10E5 | 10E6 | 10E7 | 10E8 | 10E9)	SDVALUE is signal degrade threshold: the bit error rate that will trigger the APSSD alarm. 10E3 is 10 to the 3rd, and so on.
S155-(3–15)-1-(VT1–VTxx) *where xx is 63 in STM1 mode and 84 in OC3 or OC3c mode OC3C is not supported in this release.*	PST=(IS)	PST is primary state. IS is in service.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	TX_PLABEL is transmitted path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED | ASYNC_DS1E1)	EXP_RX_PLABEL is expected received path signal label. ASYNC_DS1E1 is asynchronous mapping for DS1 and E1.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1-(1–63) *Note: In STM1 mode, there are 63 E1 facilities.*	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	LBDET=**OFF** | ON | TMOUT	LBDET is loopback detection. *Note: LBDET does not apply to S155 cards in STM1 mode.*
	FRM=(PCM30 | PCM30CRC | PCM31 | PCM31CRC)	FRM is framing format. PCM30 is TS16 using channel associated signaling (CAS), PCM30CRC is CAS and CRC4 multiframing active, PCM31 is TS16 is not using CAS, and PCM31CRC is no CAS and CRC4 multiframing active.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
S155-(3–15)-1-(1–84) *Note: In OC3 or OC3C mode, there are 84 DS1 facilities. OC3C is not supported in this release.*	PST= IS | OFFLINE	PST is primary state. IS is in service and OFFLINE is in service but signaling is blocked and facility alarms are not reported.
	FRM=(D4 | **ESF**)	FRM is framing format. D4 is standard, ESF is extended super frame.
	LBDET=**OFF** | ON | TMOUT	LBDET is loopback detection.
S155-(3–15)-1-(1–84) (continued) *Note: In OC3 or OC3C mode, there are 84 DS1 facilities. OC3C is not supported in this release.*	FDL= OFF | NMS | **ANSI** | BOTH	FDL is facility data link. NMS is network management system (to send ARCADACS 100 provisioning data), and ANSI is American National Standards Institute (to send ISDN primary rate interface signaling). *Note: FRM must be ESF to use NMS, ANSI, or BOTH. These settings are required if using the T1 facility for IP routing.* *If the T1 facility is linked to an IP route, you cannot change FDL to OFF.*
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	FDL= OFF | NMS | **ANSI** | ANSINMS	FDL is facility data link. NMS is network management system (used for IP over FDL), and ANSI is used for ANSI PRMs. OFF indicates no IP or PRMs over FDL. ANSINMS indicates both IP and PRMs over FDL.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1 **CAUTION:** *Only the left-most S155 card in each pair of cards can be provisioned. The provisioning is applied to both cards.*	PST=(IS)	PST is primary state. IS is in service.
	TXTIMING=(LOOP | INTERNAL)	TXTIMING is transmit timing.
	TX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL is transmitted path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.
	TX_PLABEL2=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL2 is transmitted path signal label for the second path layer. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	TX_PLABEL3=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	TX_PLABEL3 is transmitted path signal label for the third path layer. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	EXP_RX_PLABEL=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
S155-(3–15)-1 (continued)	EXP_RX_PLABEL2=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label for the second path. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	EXP_RX_PLABEL3=(UNEQUIPPED | EQUIPPED_NS | VT_STS1SPE)	EXP_RX_PLABEL is expected received path signal label for the third path. EQUIPPED_NS is equipped, nonspecific; and VT_STS1SPE is VT-structured STS1 synchronous payload envelope. *Note: This applies in OC3 mode only.*
	PTRACE=<“string”>	PTRACE is path trace. It can be up to 15 characters (STM1 mode) or 62 characters (OC3 and OC3C mode) and identifies what is being sent. *Note: OC3C is not supported in this release.*
	PTRACE2=<“string”>	PTRACE is path trace for the second path layer. The limit is 62 characters in OC3 mode. It identifies what it being sent. *Note: This applies in OC3 mode only.*
	PTRACE3=<“string”>	PTRACE is path trace for the third path layer. The limit is 62 characters in OC3 mode. It identifies what it being sent. *Note: This applies in OC3 mode only.*
	SDVALUE=(10E3 | 10E4 | 10E5 | 10E6 | 10E7 | 10E8 | 10E9)	SDVALUE is signal degrade threshold: the bit error rate that will trigger the APSSD alarm. 10E3 is 10 to the 3rd, and so on.
FXS-(3–15)-1 ***CAUTION****: MODE and SIGTYPE are interdependent. If you change the MODE setting, you must select a compatible SIGTYPE setting at the same time.*	DS0=(1–24)	DS0 is the DS0 time slot; it is required in order to change FXS facilities.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
FXS-(3–15)-1 (continued)	MODE=(**FXSMD** | FXSDN | WINK | TR08 | DPO)	MODE indicates the type of equipment connected to the port. FXSMD is foreign exchange station mode, FXSDN is foreign exchange station defined network, WINK is 150 ms. delay followed by a 200 ms. wink back to the switch, TR08 is subscriber loop carrier mode, and DPO is dial pulse originating mode. *Note: The DPO mode works with the DPT mode on the FXO card to support direct inward dialing (DID).*
	SIGTYPE=(**LOOPSTART** | LPFD | GSI | GSA | GNDSTART | SP | UVG | UVGA | LSR2A | PLAR)	SIGTYPE is signaling type. LPFD is loopstart forward disconnect, GSI is ground start immediate, GSA is ground start automatic, SP is single party, UVG is universal voice grade, UVGA is universal voice grade automatic, LSR2A is loopstart R2 signaling (for systems outside North America), and PLAR is private line automatic ringdown. *SP, UVG, and UVGA apply when MODE is TR08. All other SIGTYPE settings apply when MODE is FXSMD, FXSDN, or WINK. LOOPSTART is the only SIGTYPE that applies when MODE is DPO. PLAR must be used with a MODE of FXSMD.*
	CODING=(**ULAW** | ALAW)	Coding sets the PCM companding method used for a port. ULAW is used in North America; ALAW is used internationally. *Note: Set the CODING once for every four ports. Coding is applied at the CODEC level, and there is one CODEC for every four ports:* *CODEC 1: ports 01-04* *CODEC 2: ports 05-08* *CODEC 3: ports 09-12* *CODEC 4: ports 13-16* *CODEC 5: ports 17-20* *CODEC 6: ports 21-24* *Therefore you only need to use the ED-FAC command on ports 1, 5, 9, 13, 17, 21.*
	RXTLP=(3.0 to –23.0)	RXTLP is receive transmission level point, which controls the gain or loss added to the incoming signal after it is decoded to analog. Increase the signal by setting to a higher positive value; decrease the signal by setting to a higher negative value. The default is **0**.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
FXS-(3–15)-1 (continued)	TXTLP=(6.5 to –9.0)	TXTLP is transmit transmission level point, which controls the gain or loss added to a voice signal from the CPE before it is encoded to digital PCM. Increase the signal by setting to a higher negative value; decrease the signal by setting to a higher positive value. The default is **0**.
	TEST=(TON | **TOFF**)	TEST is test mode of port. TON is test mode on and TOFF is test mode off.
	LPBACK=(**LBOFF** | DGTL | ANLG)	Applies when TEST is TON. LPBACK is FXS loopback type. LBOFF is disable loopback, DGTL is sending the incoming digital DS0 signal to the far end without decoding it, and ANLG is sending the analog signal back to the far end after decoding and recoding it.
	TXABCD=(0–**1111**)	Applies when TEST is TON. TXABCD is transmit ABCD bits, and sets the value of the ABCD bits that are transmitted to the network.
	TRCNTL=(TBRG | **RBTG** | RINGON | RBTO)	Applies when TEST is TON. TRCNTL is Tip and Ring control. TBRG is –48V applied to Tip and Ring grounded, RBTG is –48V applied to Ring and Tip grounded, RINGON is ringing voltage applied across Tip and Ring, and RBTO is –48V applied to Ring and Tip is open.
	RINGBK=(ON | **OFF**)	RINGBK is ringback, which provides audible ringing feedback to the caller.
FXO-(3–15)-1	DS0=(1–24)	DS0 is the DS0 time slot; it is required in order to change FXO facilities.
	MODE=(**FXOMD** | DPT)	MODE indicates the type of equipment connected to the port. FXOMD is foreign exchange office mode and DPT is dial pulse terminating mode. *Note: The DPT mode works with the DPO mode on the FXS card to support direct inward dialing (DID).*
	SIGTYPE=(**LOOPSTART** | LPFD | GNDSTART | LSR2A)	SIGTYPE is signaling type. LPFD is loopstart forward disconnect and LSR2A is loopstart R2 signaling.

Table 18. Edit Facility command options (continued)

<FACAID>	<FAC_DATA>	Description
FXO-(3–15)-1 (continued)	CODING=(**ULAW** | ALAW	Coding sets the PCM companding method used for a port. ULAW is used in North America; ALAW is used internationally. *Note: Set the CODING once for every four ports. Coding is applied at the CODEC level, and there is one CODEC for every four ports:* *CODEC 1: ports 01-04* *CODEC 2: ports 05-08* *CODEC 3: ports 09-12* *CODEC 4: ports 13-16* *CODEC 5: ports 17-20* *CODEC 6: ports 21-24* *Therefore you only need to use the ED-FAC command on ports 1, 5, 9, 13, 17, 21.*
	RXTLP=(2.8 to –23.2)	RXTLP is receive transmission level point, which controls the gain or loss added to the incoming signal after it is decoded to analog. Increase the signal by setting to a higher positive value; decrease the signal by setting to a higher negative value. The default is **0**.
	TXTLP=(6.5 to –9.0)	TXTLP is transmit transmission level point, which controls the gain or loss added to a voice signal from the CPE before it is encoded to digital PCM. Increase the signal by setting to a higher negative value; decrease the signal by setting to a higher positive value. The default is **0**.
	TEST=(TON | **TOFF**)	TEST is test mode of port. TON is test mode on and TOFF is test mode off.
	LPBACK=(**LBOFF** | DGTL | ANLG)	Applies when TEST is TON. LPBACK is loopback type. LBOFF is disable loopback, DGTL is sending the incoming digital DS0 signal to the far end without decoding it, and ANLG is sending the analog signal back to the far end after decoding and recoding it.
	TXABCD=(0– **1111**)	Applies when TEST is TON. TXABCD is transmit ABCD bits, and sets the value of the ABCD bits that are transmitted to the network.
	TRCNTL=(**OPEN** | CLOSE | RINGGND)	Applies when TEST is TON. TRCNTL is Tip and Ring control. OPEN is Tip and Ring are not connected, CLOSE is Tip and Ring are connected, and RINGGND is –48V applied to Ring and Tip is open.

Retrieve facility data command

To retrieve facility data, enter the **RTRV-FAC** command. The applicable parameters are listed in Table 18 and as shown in Figure 113.

Figure 113. Retrieve facility data command

```
Syntax
ST1, DS1 level for DS3, S155, level for S155, and STS1, and E1,
RTRV-FAC:[<TID>]:(<FACAID>[&<FACAID>]|<FACAID>[&&<FACAID>]):
[<CTAG>]::::;

SE1
RTRV-FAC:[<TID>]:<FACAID>:[<CTAG>]::::;

DS3, S155, and STS1 port level
RTRV-FAC:[<TID>]:<FACAID>:[<CTAG>]::::;

FXS, FXO
RTRV-FAC:[<TID>]:<FACAID>:[<CTAG>]::::(DS0=(1-24)[&DS0=
(1-24)]|DS0=(1-24)[&&DS0=(1-24)]);

Examples
RTRV-FAC::ST1-10-1:;
RTRV-FAC::DS3-5-1-1:;
RTRV-FAC::DS3-5-1:;
RTRV-FAC::ST1-5-1&ST1-5-4&ST1-5-5:;
RTRV-FAC::FXS-7-1::::DS0=1&&DS0=24;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<FACAID>	**Facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1 | FXS-(3–15)-1 | FXO-(3–15)-1 *Note: You can specify a list (using &) or a range (using &&) of facility access identifiers for ST1 and for the DS1 level of DS3, DS3R, S155, or STS1 (that is, <card>-(3–15)-(1–2)-(1–xx), where xx is 28 for DS3, DS3R, and STS1; and is 63 or 84 for S155).*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve facility data response

The `<rspblk>` portion of the response to the **RTRV-FAC** command is shown in Figure 114.

Figure 114. Retrieve facility data response

```
SE1
"<FACAID>::LINECDE=(HDB3|AMI),LINETYPE=(75|120),A4STATE=(NONE|
CSA4),FRM=(UNFRM|MFM|CRCMFM),FDL=(OFF|NMS_4K|NMS_8K|NMS_12K|
NMS_16K|NMS_20K),SIGMOD=(NONE|CCS|CAS):PST=(IS|OOSMT),SST=(BUSY[&]
|FLT|PROT|UEQ|IDLE),
IPSTATE=(ON|OFF)"+

ST1
"<FACAID>::LINECDE=(B8ZS|AMI),LINELEN=(133|266|399|533|655),FRM=(D
4|ESF|SLC96-MOD1|UNFRM),FDL=(OFF|NMS|SLC96_WP1|SLC_96WP1B|SLC96_NO
TE),
[SIGMOD=RBIT,]LBO=(0DB|7.5DB|15DB|22.5DB):PST=(IS|OOS|OFFLINE|
OOSMT),SST=(BUSY[&]|FLT|PROT|UEQ|IDLE),IPSTATE=(ON|OFF)"+;

SE1
"<FACAID>::LINECDE=(HDB3|AMI),LINETYPE=(75|120),A4STATE=(NONE|
CSA4),FRM=(UNFRM|MFM|CRCMFM),FDL=(OFF|NMS_4K|NMS_8K|NMS_12K|
NMS_16K|NMS_20K),SIGMOD=(NONE|CCS|CAS):PST=(IS|OOS|OFFLINE|OOSMT),
SST=(BUSY[&]|FLT|PROT|UEQ|IDLE),IPSTATE=(ON|OFF)"+;

DS3 (DS1 level)
"<FACAID>::LBDET=(OFF|ON|TMOUT),FRM=(ESF|D4),FDL=(ANSI|NMS|
ANSINMS|OFF),TXTIMING=(INTERNAL|LOOP)[,CNV=(NONE|TXRX)]:PST=(IS|
OOS|OFFLINE),SST=(OK|BUSY|IDLE|FLT|PROT|UEQ)"

DS3 (DS3 level)
"<FACAID>::FRM=(M13|C-BIT),AIS_TX_FMT=(NORMAL|
FRAMED_1010PAT|UNFRAMED_ALL_ONES),AIS_DET_FMT=(FRAMED_1010PAT|
FRAMED_1111PAT),RM-LPBK_DET=(OFF|DS3|DS1|BOTH),LINELEN=(100|
450):PST=(IS|OOS),SST=(OK|BUSY|IDLE|FLT|PROT|UEQ)"

STS1 (STS1 level)
"<FACAID>::LBO=(100|450),TXTIMING=(LOOP|INTERNAL),TX_PLABEL=
(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|NOT_SET),EXP_RX_PLABEL=
(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|NOT_SET),ACT_RX_PLABEL=
(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|LOCKED_VT|ASYNC_DS3|
ASYNC_DS4NA|ATM|DQDB|FDDI|UNDEF|NOT_SET),PTRACE="<string>",
RX_PLABEL="<string>":PST=(IS|OOS),
SST=(OK|BUSY|IDLE|FLT|PROT|UEQ)"+

STS1 (VT level)
"<FACAID>::TX_PLABEL=(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1|NOT_SET),
EXP_RX_PLABEL=(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1|NOT_SET),
ACT_RX_PLABEL=(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1|BIT_SYNC_DS1E1|
BYTE_SYNC_DS1E1|UNDEF|NOT_SET):PST=(IS|OOS),SST=(OK|BUSY|IDLE|
FLT|PROT|UEQ)"+
```

Figure 114. Retrieve facility data response (continued)

```
S155, STS1 (DS1 level)
“<FACAID>::LBDET=(OFF|ON|TMOUT),FRM=(ESF|D4),FDL=(ANSI|NMS|
ANSINMS|OFF),TXTIMING=(INTERNAL|LOOP):PST=(IS|OOS|OFFLINE),SST=(OK
|BUSY|IDLE|FLT|PROT|UEQ)”

S155 (port level, OC3 mode)
“<FACAID>::SDVALUE=(10E3|10E4|10E5|10E6|10E7|10E8|10E9|NOT_SET),
TXTIMING=(LOOP|INTERNAL),TX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|
VT_STS1SPE),EXP_RX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE),
ACT_RX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|LOCKED_VT|
ASYNC_DS3|ASYNC_DS4NA|ATM|DQDB|FDDI|UNDEF|NOT_SET),PTRACE=
“<string>”,RX_PTRACE=“<string>”,TX_PLABEL2=(UNEQUIPPED|
EQUIPPED_NS|VT_STS1SPE),EXP_RX_PLABEL2=(UNEQUIPPED|EQUIPPED_NS|
VT_STS1SPE),ACT_RX_PLABEL2=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|
LOCKED_VT|ASYNC_DS3|ASYNC_DS4NA|ATM|DQDB|FDDI|UNDEF|NOT_SET),
PTRACE2=“<string>”,RX_PTRACE2=“<string>”,TX_PLABEL3=(UNEQUIPPED|
EQUIPPED_NS|VT_STS1SPE),EXP_RX_PLABEL3=(UNEQUIPPED|EQUIPPED_NS|
VT_STS1SPE),ACT_RX_PLABEL3=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|
LOCKED_VT|ASYNC_DS3|ASYNC_DS4NA|ATM|DQDB|FDDI|UNDEF|NOT_SET),
PTRACE3=“<string>”,RX_PTRACE3=“<string>”:PST=(IS|OOS),SST=(OK|BUSY
|IDLE|FLT|PROT|UEQ|LPBKLOCAL)”+

S155 (port level, STM1 and OC3C mode)
“<FACAID>::SDVALUE=(10E3|10E4|10E5|10E6|10E7|10E8|10E9),
TXTIMING=(LOOP|INTERNAL),TX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|
VT_STS1SPE),EXP_RX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE),
ACT_RX_PLABEL=(UNEQUIPPED|EQUIPPED_NS|VT_STS1SPE|LOCKED_VT|
ASYNC_DS3|ASYNC_DS4NA|ATM|DQDB|FDDI|UNDEF|NOT_SET),PTRACE=
“<string>”,RX_PLABEL=“<string>”
:PST=(IS|OOS),SST=(OK|BUSY|IDLE|FLT|PROT|UEQ|LPBKLOCAL)”+

S155 (E1 level)
“<FACAID>::LBDET=(OFF|ON|TMOUT),FRM=(PCM30|PCM30CRC|PCM31|
PCM31CRC),TXTIMING=(LOOP|INTERNAL):PST=(IS|OOS|OFFLINE),SST=(OK|BU
SY|IDLE|FLT|PROT|UEQ)”+

S155 (VT level)
“<FACAID>::TX_PLABEL=(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1),EXP_RX_
PLABEL=(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1),ACT_RX_PLABEL=
(UNEQUIPPED|EQUIPPED|ASYNC_DS1E1|BIT_SYNC_DS1E1|BYTE_SYNC_DS1E1|
UNDEF|NOT_SET):PST=(IS|OOS),SST=(OK|BUSY|IDLE|FLT|PROT|UEQ)”+

FXS
“<FACAID>::DS0=(1-24),MODE=(FXSMD|FXSDN|WINK|TR08|DPO),SIGTYPE=
(LOOPSTART|LPFD|GSI|GSA|GNDSTART|SP|UVG|UVGA|LSR2A),CODING=(ULAW|
ALAW),RXTLP=(3.0 to -23.0),TXTLP=(6.5 to -9.0),LPBACK=(LBOFF|DGTL|
ANLG),TEST=(TON|TOFF),RINGBK=(OFF|ON),TXABCD=(0–1111),RXABCD=(0–
1111),TRSTATUS=(OPEN|TRLOOP|RINGGND),TRCNTL=(TBRG|RBTG|RINGON|
RBTO)”
```

Figure 114. Retrieve facility data response (continued)

```
FXO
“<FACAID>::DS0=(1–24),MODE=(FXOMD|DPT),SIGTYPE=(LOOPSTART|LPFD|
GNDSTART|LSR2A),CODING=(ULAW|ALAW),RXTLP=(2.8 to -23.2),TXTLP=
(6.5 to -9.0),LPBACK=(LBOFF|DGTL|ANLG),TEST=(TON|TOFF),TXABCD=
(0–1111),RXABCD=(0–1111),TRSTATUS=(RINGON|LCF|LCO|TIPGND|RLCF),
TRCNTL=(OPEN|CLOSE|RINGGND)”

Examples
"ST1-10-1::LINECDE=B8ZS,LINELEN=133,FRM=ESF,FDL=NMS:PST=IS,SST=IDL
E,IPSTATE=OFF";
"DS3-5-1-1::LBDET=OFF,FRM=ESF,FDL=ANSINMS,TXTIMING=INTERNAL:PST=I,
SST=IDLE,IPSTATE=ON_FDL";
"DS3-5-1::FRM=M13,AIS_TX_FMT=NORMAL,AIS_DET_FMT=FRAMED_1010PAT,RM_
LPBK_DET=OFF,LINELEN=100:PST=IS,SST=IDLE";
“FXS-6-1::DS0=1,MODE=FXSDN,SIGTYPE=LOOPSTART,CODING=(ULAW|ALAW),
RXTLP=O,TXTLP=0,LPBACK=LBOFF,TEST=TOFF,TXABCD=0,RXABCD=0,TRSTATUS=
OPEN,TRCNTL=RBTG”
```

Note: For FXS and FXO facilities, LPBACK, TXABCD, TRCNTL,TRSTATUS, and RXABCD appear regardless of the TEST status.

Note: OC3C is not supported in this release.

See Table 18 for definitions of most of the response parameters. Certain parameters are not covered in Table 18, and are as follows:

`RX_PTRACE`

Received path trace—
STS1, STS1 level—Up to 64 characters, recovered from the received SONET overhead.
S155, STM1—Up to 15 characters, recovered from the received SONET overhead.
S155, OC3 or OC3C level—Up to 62 characters, recovered from the received SONET overhead.
Note: This value cannot be changed. OC3C is not supported in this release.

`RX_PTRACE2`

Received path trace for second path—
S155, OC3 level—Up to 62 characters, recovered from the received SONET overhead.
Note: This value cannot be changed.

`RX_PTRACE3`

Received path trace for third path—
S155, OC3 level—Up to 62 characters, recovered from the received SONET overhead.
Note: This value cannot be changed.

ACT_RX_PLABEL	**Actual received path signal label—** **STS1 and S155, port level**—UNEQUIPPED; EQUIPPED_NS is equipped, nonspecific; VT_STS1SPE is virtual tributary structured STS1 synchronous payload envelope; LOCKED_VT is locked VT mode; ASYNC_DS3 is asynchronous mapping for DS3; ASYNC_DS4NA is asynchronous mapping for DS4NA; ATM is asynchronous transfer mode; DQDB is distributed queue dual bus; FDDI is fiber distributed data interface; and UNDEF is unknown label. **STS1 and S155, VT level**—UNEQUIPPED; EQUIPPED; ASYNC_DS1E1 is asynchronous mapping for DS1 and E1; BIT_SYNC_DS1E1 is bit-synchronous mapping for DS1 and E1; BYTE_SYNC_DS1E1 is byte-synchronous mapping for DS1 and E1; and UNDEF is unknown label.
ACT_RX_PLABEL2	**Actual received path signal label for second path—** **S155, OC3 level**—UNEQUIPPED; EQUIPPED_NS is equipped, nonspecific; VT_STS1SPE is virtual tributary structured STS1 synchronous payload envelope; LOCKED_VT is locked VT mode; ASYNC_DS3 is asynchronous mapping for DS3; ASYNC_DS4NA is asynchronous mapping for DS4NA; ATM is asynchronous transfer mode; DQDB is distributed queue dual bus; FDDI is fiber distributed data interface; and UNDEF is unknown label.
ACT_RX_PLABEL3	**Actual received path signal label for third path**— **S155, OC3 level**—UNEQUIPPED; EQUIPPED_NS is equipped, nonspecific; VT_STS1SPE is virtual tributary structured STS1 synchronous payload envelope; LOCKED_VT is locked VT mode; ASYNC_DS3 is asynchronous mapping for DS3; ASYNC_DS4NA is asynchronous mapping for DS4NA; ATM is asynchronous transfer mode; DQDB is distributed queue dual bus; FDDI is fiber distributed data interface; and UNDEF is unknown label.
RXABCD	**Received ABCD bits**—Indicates the value of the ABCD bits that are received from the network. *Note: This value cannot be changed.*
TRSTATUS	**Tip and Ring Status**— **FXS**—OPEN | CLOSE | RINGGND OPEN is Ring lead not connected to Tip or to ground; CLOSE is Tip and Ring connected together, and RINGGND is Ring lead grounded. **FXO**—RINGON | LCF | LCO | TIPGND | RLCF RINGON is loop open, LCF is loop current feed, LCO is loop current open, TIPGND is Tip ground, and RLCF is reverse loop current feed. *Note: This value shows what the attached device is doing with the Tip and Ring leads of the port, and cannot be changed.*
SDVALUE	**Signal degrade value**—The value at which the APSSD alarm is triggered. 10E3 is 10 to the 3rd, and so on.

Delete facility data command

S155,To delete facility data, use the **DLT-FAC** command as shown in Figure 115. This command will be denied if the facility is in the BUSY state, which indicates that the facility still has cross connects. Use this command if you want to ensure a facility has no cross connects before removing service.

Figure 115. Delete facility data command

```
Syntax
DLT-FAC:[<TID>]:[<FACAID>]):[<CTAG>];

Examples
DLT-FAC:AC3:ST1-7-3:CTAG2;

   AC3 02-11-01 12:45:09
M CTAG2 COMPLD
;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<FACAID>	**Facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1 *Note: You can specify a list (using &) or a range (using &&) of facility access identifiers for ST1 and for the DS1 level of DS3, DS3R, S155, or STS1 (that is, <card>-(3–15)-(1–2)-(1–n)) For SE1 cards, you can specify a list of facility access identifiers.* *You must provision only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The provisioning is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve T1 condition command

The **RTRV-COND-T1** command instructs an NE to return the current standing condition and/or state associated with one or more facilities on specified equipment or in specified states. The **RTRV-COND-T1** command and applicable parameters are listed in Table 18 and as shown in Figure 116.

Figure 116. Retrieve T1 condition command

```
Syntax
RTRV-COND-T1:[tid]:[t1_cond_aid]:[ctag]::[typereq][,,,];
```

Figure 116. Retrieve T1 condition command (continued)

```
Examples
RTRV-COND-T1::::LOF;
RTRV-COND-T1::ST1-7:::LOS;
RTRV-COND-T1::DS3-4:::CGA-RED
RTRV-COND-T1::::CGA-RED;
RTRV-COND-T1::ST1-7:::ALL;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<T1_COND_AID>`	**T1 condition access identifier**—See Table 19.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<TYPEREQ>`	**Type Requested**—Supported condition type: LOS, LOF, YEL, AIS, CGA-RED, CGA-YEL, FACLPBK, TERMLPBK, or ALL *Note: Other than supported typeReqs, there would be no condition returned. When <typeReq>=ALL, <{t1|t3}_cond_aid> should be specified. In this case, all conditions on the specific facility will be returned. Otherwise, there would be no condition returned.*

Table 19. Retrieve T1 condition command options

<T1_COND_AID>	Description
ST1-([3-15])	will retrieve required conditions on all ST1 T1 ports on this ST1
DS3-([3-15])	will retrieve required conditions on all DS3 T1 ports on this DS3
empty	will retrieve conditions on all T1 ports (all ST1 and DS3 cards) with a specific condition type

Retrieve T1 condition command data response

The `<rspblk>` portion of the response to the **RTRV-COND-T1** command is shown in Figure 117.

Figure 117. Retrieve T1 condition response

```
Syntax
RTRV-COND-T1::ST1-5:::LOF;

Example
FACTORY 02-12-10 16:14:25
M   COMPLD
   "ST1-5-1,T1:MJ,LOF,SA,02-12-10,16-12-54,,,"
;
```

The **retrieve T1 condition** response parameters are as follows:

<TID>	**Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
<FACAID>	**Facility access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | DS3-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<TYPEREQ>	**Type Requested**—Supported condition type: LOS, LOF, YEL, AIS, CGA-RED, CGA-YEL, FACLPBK, TERMLPBK, or ALL *Note: Other than supported typeReqs, there would be no condition returned. When <typeReq>=ALL, <{t1|t3}_cond_aid> should be specified. In this case, all conditions on the specific facility will be returned. Otherwise, there would be no condition returned.*
<LOCN>	**Location**—Location of performance monitoring, where NEND indicates near end and FEND indicates far end.
<DIRN>	**Direction of monitored signal**—RX is receive and TX is transmit.
<TMPER>	**Time period of monitoring**—1-DAY | 15-MIN

Retrieve T3 condition command

The **RTRV-COND-T3** command instructs an NE to return the current standing condition and/or state associated with one or more specified equipment units, facilities, interfaces, subscriber lines, trunks, links, or test access in the NE. The **RTRV-COND-T3** command and applicable parameters are listed in Table 18 and as shown in Figure 118.

Figure 118. Retrieve T3 condition command

```
Syntax
RTRV-COND-T3:[tid]:[t3_cond_aid]:[ctag]::[typereq][,,,];

Examples
RTRV-COND-T3::DS3-4:::LOF;
RTRV-COND-T3:::::LOF;
RTRV-COND-T3::DS3-4:::ALL;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<T3_COND_AID>	**T1 condition access identifier**—See Table 20.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

<TYPEREQ> **Type Requested**—supported condition type: LOS, LOF, AIS, PERR, RAI, FEBE, FACLPBK, TERMLPBK, or ALL
Note: Other than supported typeReqs, there would be no condition returned. When <typeReq>=ALL, <{t1|t3}_cond_aid> should be specified. In this case, all conditions on the specific facility will be returned. Otherwise, there would be no condition returned.

Table 20. Retrieve T3 condition command options

<T3_COND_AID>	Description
DS3-([3-15])	will retrieve required conditions on all DS3 T1 ports on this DS3
empty	will retrieve conditions on all T1 ports (all ST1 and DS3 cards) with a specific condition type

Retrieve T3 command data response

The `<rspblk>` portion of the response to the **RTRV-COND** command is shown in Figure 119.

Figure 119. Retrieve condition response

```
Syntax
RTRV-COND-T3:FACTORY:DS3-3:CTAG1::ALL;

Example
FACTORY 02-12-15 13:21:31
M  CTAG1 COMPLD
   "DS3-3-2,T3:CR,LOF,SA,02-12-15,13-20-58,,,"
   "DS3-3-2,T3:CR,PARITY_ERR,SA,02-12-15,13-20-58,,,"
;
```

The **retrieve T3 condition** response parameters are as follows:

<TID> **Target ID**—Target identifier is an identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.

<FACAID> **Facility access identifier**— DS3-(3–15)-(1–2)

<CTAG> **Correlation tag**—See TL1 command, syntax, and format on page 89.

<TYPEREQ> **Type Requested**—supported condition type: LOS, LOF, AIS, PERR, RAI, FEBE, FACLPBK, TERMLPBK, or ALL
Note: Other than supported typeReqs, there would be no condition returned. When <typeReq>=ALL, <{t1|t3}_cond_aid> should be specified. In this case, all conditions on the specific facility will be returned. Otherwise, there would be no condition returned.

<LOCN> **Location**—Location of performance monitoring, where NEND indicates near end and FEND indicates far end.

`<DIRN>`	**Direction of monitored signal**—RX is receive and TX is transmit.
`<TMPER>`	**Time period of monitoring**—1-DAY | 15-MIN

Facility port loopback testing

As part of ARCADACS 100 facility port testing, various types of local and remote loopback configurations are supported. The loopback testing can be set up in any of a variety of configurations, both initiated and externally-activated control, local and remote modes, and line and payload types. The configuration of loopback testing depends upon the framing mode (D4 or ESF) used in the DS1 (T1) signal interface and operator choice using TL1 commands.

The level at which you can perform loopback tests depends on the type of mapper card. Table 21 shows the ports, lines, and/or facilities that can be tested for each type of card.

Table 21. Loopback tests supported by type of mapper card

Card	Loopback supported on
ST1	DS1, DS0
SE1	E1, DS0
DS3	DS3, DS1
STS1	STS1, DS1
S155	STM1, E1

Near-end loopback tests

This section describes the route of the signal for the near-end loopback tests on the different mapper cards. In all TXLOCAL loopbacks, framing is added and then removed at the layer (T1, DS3, SONET) at which the loopback occurs. Lower layer framing is also added and removed as the signal travels through the different framers on the route.

Figure 120 shows the loopback tests for the ST1 and SE1 card, which consist of the following:

- TXLINE—The signal travels from the wire side (line interface unit or LIU) to the T1 or E1 framer and back out to the wires, with no decoding.
- PAYLOAD—The signal travels from the wire side through the T1 or E1 framer and back out to the wires. The framer extracts the framing bits, then rebuilds them and adds them back in to the signal before sending it out again.
- TXLOCAL—The signal travels from the backplane to the T1 or E1 framer and back out to the backplane, with framing generated on the TX side and removed on the RX side.

Figure 120. Near-end loopback tests on ST1 and SE1 cards

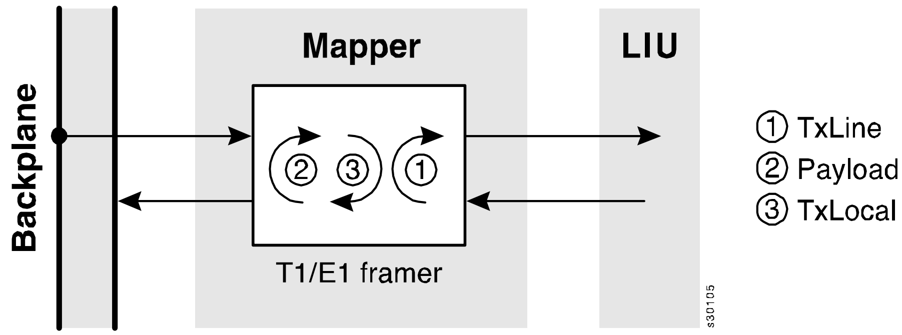


Figure 121 shows the loopback tests for the DS3, DS3R, and STS1 card, which consist of the following:

- TXLINE (T1)—The signal travels from the wire side to the T1 framer and back out to the wires, with no decoding.
- PAYLOAD (T1)—The signal travels from the wire side through the T1 framer and back out to the wires. The T1 framer extracts the framing bits, then rebuilds them and adds them back in to the signal before sending it out again.
- TXLOCAL (T1)—The signal travels from the backplane to the T1 framer and back out to the backplane, with framing generated on the TX side and removed on the RX side.
- TXLINE (DS3/SONET)—The signal travels from the wire side to the DS3/STS1 framer and back out to the wires, with no decoding.
- TXLOCAL (DS3/SONET)—The signal travels from the backplane to the DS3/STS1 framer and back out to the backplane, with framing generated on the TX side and removed on the RX side.
- LIULINE—The signal travels from the wire side to the LIU framer and back out to the wires, with no decoding.
- LIULOCAL—The signal travels from the backplane to the LIU framer and back out to the backplane, with no decoding.

Figure 121. Near-end loopback tests on DS3, DS3R, and STS1 cards

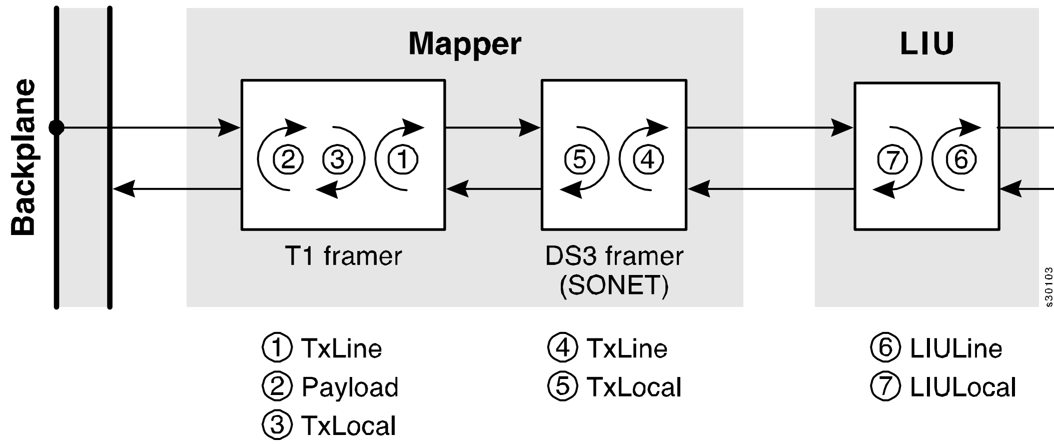
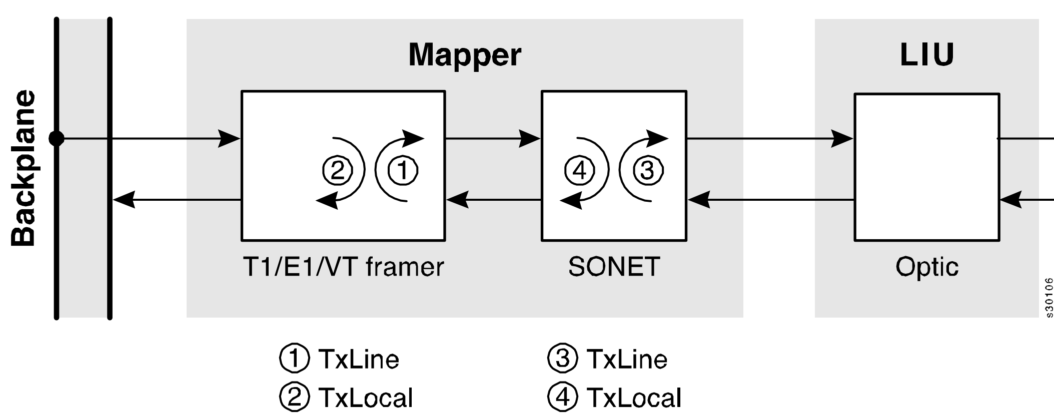


Figure 122 shows the loopback tests for the S155 card, which consist of the following:

- TXLINE (T1/E1/VT)—The signal travels from the wire side to the T1 or E1 framer and back out to the wires, with no decoding.
- TXLOCAL (T1/E1/VT)—The signal travels from the backplane to the T1 or E1 framer and back out to the backplane, with framing generated on the TX side and removed on the RX side.
- TXLINE (SONET)—The signal travels from the wire side to the SONET framer and back out to the wires, with no decoding.
- TXLOCAL (SONET)—The signal travels from the backplane to the SONET framer and back out to the backplane, with framing generated on the TX side and removed on the RX side.

Figure 122. Near-end loopback tests on S155 cards



Loopback description for D4 framing

When the framing mode of the DS1 signal to be tested is D4, only line loopbacks are supported by the ARCADACS 100 system. Line loopbacks are activated and deactivated by in-band signaling. The in-band signaling consists of specific bit patterns repeated continuously in the payload of the DS1 signal for at least five seconds. The bit patterns are 00001 for activate line loopback and 001 for deactivate line loopback. The ARCADACS 100 system must be able to either receive and respond to these codes sent from external switching equipment or generate and transmit these codes to the external equipment. There are four requirements that the ARCADACS 100 system must fulfill to successfully support ST1 mapper card maintenance with D4 framing format. These requirements are as follows:

- Activate or deactivate loopback mode in response to commands from external equipment over DS1 signal payload and report action taken using an autonomous message. See Autonomous messages on page 88.
- Report loopback status of a specific ST1 card port using the **retrieve facility data** TL1 response (see Retrieve facility data response on page 179) in response to the **retrieve facility data** command (see Retrieve facility data command on page 178).
- Transmit applicable trunk conditioning messages to affected external equipment. See Create DS0 termination pointer command on page 247, Retrieve DS0 termination pointer command on page 250, and Retrieve DS0 termination pointer response on page 251.
- Automatically deactivate any externally-activated loopback after 15 minutes.

Loopback description for ESF framing

When the framing mode of the DS1 signal to be tested is ESF, both line and payload loopbacks are supported by the ARCADACS 100 system. In ESF framing mode, both types of loopback activation and deactivation signals consists of 16-bit binary words; these words are inserted in the facility data link (FDL) channel of the DS1 line under test. The FDL channel has capacity of 4k bits and it consists of half the 8k overhead bits of the DS1 line. The loopback control commands and their structure are listed in Table 22.

Table 22. ESF framing mode loopback commands

Loopback command name	Loopback command bit structure			
Activate line loopback	0000	1110	1111	1111
Deactivate line loopback	0011	1000	1111	1111
Activate payload loopback	0001	0100	1111	1111
Deactivate payload loopback	0011	1110	1111	1111
Universal loopback deactivate	0000	1110	1111	1111

To be valid, any of the loopback commands must be repeated at least ten consecutive times within the DS1 frame. The ARCADACS 100 system must be able to either receive and respond to these codes sent from external switching equipment or generate and transmit these codes to the external equipment. There are six requirements that the ARCADACS 100 system must fulfill to successfully support ST1 mapper card maintenance with ESF framing format. These requirements are listed as follows:

- Activate or deactivate loopback mode in response to commands from external equipment over DS1 signal payload and report action taken using an autonomous message. See Autonomous messages on page 88.
- Activate line loopback mode only after detection of the end of the activate line loopback code transmission (see the first entry of Table 22). The detection of the end of the code transmission constitutes a request for activation of line loopback.
- Deactivate all loopbacks under any of the following conditions:
  - Receipt of the universal loopback deactivate code over the FDL channel. See the last entry of Table 22.
  - Receipt of AIS (all ones) on the DS1 line under test
  - Receipt of two successive performance report messages with only data link idle code (01111110) separating them. See Performance report messages on page 191.
- Report loopback status of a specific ST1 card port using the **retrieve facility data** TL1 response (see Retrieve facility data response on page 179) in response to the **retrieve facility data** command (see Retrieve facility data command on page 178).
- Transmit applicable trunk conditioning messages to affected external equipment. See Create DS0 termination pointer command on page 247, Retrieve DS0 termination pointer command on page 250, and Retrieve DS0 termination pointer response on page 251.
- Automatically deactivate any externally-activated loopback after 15 minutes.

Performance report messages

When the framing mode of the DS1 signal to be tested is ESF, performance report messages (PRM) can be either received from external switching equipment or generated and transmitted to the external equipment over the 4k facility data link (FDL) channel. The performance report messages occur once per second. Each message consists of four sets of fifteen 8-bit words and contains T1 performance data from the previous four seconds of activity. In the ARCADACS 100 system, received performance report messages are used only for detection to deactivate loopbacks. (Two consecutive performance report messages separated only by idle code (01111110) over the FDL channel causes loopback deactivation). Performance report messages sent from the system to external equipment contain T1 performance information for the downstream equipment.

Loopback test commands

The loopback command group consists of two commands and a single response. There is an operate loopback test command which creates the loopback test and a release loopback test command which terminates the loopback test.

Note: In accordance with GR-833-CORE requirements, the T1 and T3 second command modifiers (SCCM) are supported by the **OPR-LPBK-T1, RLS-LPBK-T1, OPR-LPBK-T3,** and **RLS-LPBK-T3** commands.

Note: The **OPR-LPBK-T0, RLS-LPBK-T0**, and **RTRV-LPBK-T0** commands comply with GR-839-CORE requirements for IXCON systems.

The loopback commands are listed and described in the following sections. Since no responses to the commands are listed and described, those responses are assumed to be TL1 normal responses as described in TL1 normal response syntax and format on page 90.

- **Operate loopback test** command
- **Release loopback test** command
- **Operate DS0 loopback test** command
- **Retrieve DS0 loopback test** command
- **Retrieve DS0 loopback test** response
- **Release DS0 loopback test** command
- **Operate DS0 loopback test for IXCON systems** command
- **Retrieve DS0 loopback test for IXCON systems** command
- **Retrieve DS0 loopback test for IXCON systems** response
- **Release DS0 loopback test for IXCON systems** command
- **Operate DS0 loopback test on DS3 cards** command
- **Retrieve DS0 loopback test on DS3 cards** command
- **Retrieve DS0 loopback test on DS3 cards** response
- **Release DS0 loopback test on DS3 cards** response
- **Operate T1 loopback test** command
- **Release T1 loopback test** command
- **Operate T3 loopback test** command
- **Release T3 loopback test** command

Operate loopback test command

To perform loopback testing, enter the **OPR-LPBK** command and the applicable parameters as shown in Figure 123.

Figure 123. Operate port or T1 loopback test command

```
Syntax
OPR-LPBK:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>]::<LBCFG>;

Examples
OPR-LPBK::ST1-5-6:::TXLINE;
OPR-LPBK::DS3-10-1-3&DS3-10-1-5&DS3-10-1-6:::PAYLOAD;
OPR-LPBK::DS3-10-1-24&&DS3-10-1-28:::FEPAYLOAD;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<PORTAID>` **Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1
Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, DS3R, S155, and STS1 cards. You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.

`<CTAG>` **Correlation tag**—See TL1 command, syntax, and format on page 89.

`<LBCFG>` **Loopback configuration**—See Table 23.

Table 23. Operate loopback test command options

<PORTAID>	<LBCFG>	Description
ST1-(3–15)-(1–8)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback
	PAYLOAD	Activates a near-end payload loopback
	FECSU	Initiates transmission of the in-band line loop-up command which requests a far-end line loopback
	FELINE	Initiates transmission of the ESF FDL line loop-up command which requests a far-end line loopback
	FEPAYLOAD	Initiates transmission of the ESF FDL payload loop-up command which requests a far-end payload loopback
SE1-(3–15)-(1–8)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.

Table 23. Operate loopback test command options (continued)

<PORTAID>	<LBCFG>	Description
DS3-(3–15)-(1–2)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.
	LIULINE	Activates a near-end line interface unit loopback.
	LIULOCAL	Activates a local line interface unit loopback.
	REMOTEUP	Sends a loop-up command which requests a far-end line loopback.
	REMOTEDOWN	Sends a loop-down command which requests that a far-end loopback be deactivated.
DS3-(3–15)-(1–2)-(1–28)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.
	PAYLOAD	Activates a near-end payload loopback.
	FECSU	Sends an in-band line loop-up command which requests a far-end line loopback.
	FELINE	Sends an ESF FDL line loop-up command which requests a far-end line loopback.
	FEPAYLOAD	Sends an ESF FDL payload loop-up command which requests a far-end payload loopback.
	FECBIT	Sends a C-Bit line loop-up command which requests a far-end line loopback.
	FENIU	Sends an in-band line loop-up command which requests a far-end network interface unit loopback.
STS1-(3–15)-(1–2)-(1–28)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.
	PAYLOAD	Activates a near-end line interface unit loopback.
	FELINE	Sends an ESF FDL line loop-up command which requests a far-end line loopback.
	FEPAYLOAD	Sends an ESF FDL payload loop-up command which requests a far-end payload loopback.
STS1-(3–15)-(1–2)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.
	LIULINE	Activates a near-end line interface unit loopback.
	LIULOCAL	Activates a local line interface unit loopback.
S155-(3–15)-1-(1–63)[1] (*E1*)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.

Table 23. Operate loopback test command options (continued)

<PORTAID>	<LBCFG>	Description
S155-(3–15)-1-(1–84) (*DS1*)	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.
	PAYLOAD	Activates a near-end line interface unit loopback.
	FELINE	Sends an ESF FDL line loop-up command which requests a far-end line loopback.
	FEPAYLOAD	Sends an ESF FDL payload loop-up command which requests a far-end payload loopback.
S155-(3–15)-1[1]	TXLINE	Activates a near-end line loopback.
	TXLOCAL	Activates a local loopback.

1. When performing loopback tests on S155 facilities that are in 1+1 or 1+1W redundancy mode, lock out automatic protection switching (APS) before you begin testing. To do this, use the **OPR-APS** command, with the LP parameter. See Activate automatic protection switching command on page 221. The loopback test momentarily affects traffic on the transmit side of the optics. If APS is enabled, it could cause a protection switch at the far end, which would then result in a protection switch at the near end.

Release loopback test command

Following completion loopback testing, release the loopback by entering the **RLS-LPBK** command and the applicable parameters as shown in Figure 124.

Note: When you do not specify a loopback parameter, all loopbacks at the local facility are dropped.

Figure 124. Release loopback test command

```
Syntax
With loopback parameter
RLS-LPBK:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>]::<LBCFG>;

Without loopback parameter
RLS-LPBK:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>];

Examples
RLS-LPBK::ST1-4-5:::FECSU;
RLS-LPBK::DS3-10-1-3&DS3-10-1-5&DS3-10-1-6:;
RLS-LPBK::DS3-10-1-24&&DS3-10-1-28:::FEPAYLOAD;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.

<PORTAID> **Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1 | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84)
Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, DS3R, S155, and STS1 cards.
You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.

<CTAG> **Correlation tag**—See TL1 command, syntax, and format on page 89.

<LBCFG> **Loopback configuration**—See Table 24.

Table 24. Release port or T1 loopback test command options

<PORTAID>	**<LBCFG>**
ST1-(3–15)-(1–8)	FECSU | FELINE | FEPAYLOAD
DS3-(3–15)-(1–2)-(1–28)	FELINE | FEPAYLOAD | FECBIT | FECSU | FENIU
DS3-(3–15)-(1–2)	LIULINE | LIULOCAL
STS1-(3–15)-(1–2)-(1–28)	FELINE | FEPAYLOAD
STS1-(3–15)-(1–2)	N/A (Always leave blank)
S155-(3–15)-1-(1–63)[1] (*E1*)	N/A (Always leave blank)
S155-(3–15)-1-(1–84)[1] (*DS1*)	FELINE | FEPAYLOAD | FECSU | FENIU
S155-(3–15)-1[1]	N/A (Always leave blank)

1. If you were testing S155 facilities that are in 1+1 or 1+1W redundancy mode, be sure to set the APS setting back to its former value.

Operate DS0 loopback test command

You can perform loopback tests using the DS0 channels within any DS1 or E1 port on an ST1 or SE1 card. The loopback can use from 2 to 24 (ST1) or 30 (E1) DS0 channels in the test. The DS0 loopback test has the following restrictions:

- If there are no DS0 channels currently in use by a cross connection, you may use any or all DS0 channels.
- If you wish to run a loopback test on a DS0 channel that is being used in a cross connection, you must select all of the same DS0 channels that are used in the cross connection. For example, if you want to use channel 2 in a DS0 loopback test but it is in use by a cross connection between channels 2 and 6, then you must also select channel 6 for the loopback test.
- When you deactivate a DS0 loopback test, the DS0 channels are restored to their original state. If any DS0 channels were in use by cross connections, these cross connections are restored.
- If any card is reseated or the CPU is reset, all DS0 loopback tests are deactivated.

- When a channel is in use for a DS0 loopback test, it cannot be used in a cross connection.
- There is no limit to the number of DS0 loopback tests you can run at one time.
- Loopback types supported are: FACILITY (line), TERMINAL (local), and PAYLOAD.

While the loopback test is active, the ARCADACS 100 generates a DS0 facility loopback alarm, which clears when the test is deactivated. To perform a DS0 loopback test, enter the command and the applicable parameters as shown in Figure 125.

Figure 125. Operate DS0 loopback test command

```
Syntax
OPR-DS0LPBK:[<TID>]:<PORTAID>-DS0:[<CTAG>]::DS0LINE,DS0=<DS0num>
(<&DS0num>|<&&DS0num>)[<&DS0num>+];

Example
OPR-DS0LPBK::ST1-5-1-DS0:::DS0LINE,DS0=1;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<DS0num>`	**DS0 channel**—1–24 (ST1) | 1–30 (SE1) *Note: You must specify at least two DS0 channels. You can specify a list (using &) or a range (using &&) of card and port access identifiers.*

Retrieve DS0 loopback test command

To confirm that a DS0 loopback test is running, enter the **RTRV-DS0LPBK** command and the applicable parameters as shown in Figure 126.

Figure 126. Retrieve DS0 loopback test command

```
Syntax
RTRV-DS0LPBK:[<TID>]:<PORTAID>-DS0:[<CTAG>];

Example
RTRV-DS0LPBK::ST1-13-1-DS0:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve DS0 loopback test response

The `<rspblk>` portion of the response to the **RTRV-DS0LPBK** command is shown in Figure 127.

Figure 127. Retrieve DS0 loopback test response

```
Syntax
"<PORTAID>-DS0::LPBK-<integer>=<DS0num>(<&DS0num>|<&&DS0num>)
[<&DS0num>+]"

Example
"ST1-13-1-DS0::LPBK-1=1&&4&6"
```

The command parameters are as follows:

`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<DS0num>`	**DS0 channel**—1–24 (ST1) | 1–30 (SE1)

Release DS0 loopback test command

To stop a DS0 loopback test, enter the **RLS-LPBK** command and the applicable parameters as shown in Figure 128.

Figure 128. Release DS0 loopback test command

```
Syntax
RLS-DS0LPBK:[<TID>]:<PORTAID>-DS0:[<CTAG>]::DS0LINE,DS0=<DS0num>
(<&DS0num>|<&&DS0num>)[<&DS0num>+];

Example
RLS-DS0LPBK::ST1-13-1-DS0:::DS0LINE,DS0=1&&4&6;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

`<DS0num>`	**DS0 channel**—1–24 (ST1) | 1–30 (SE1) *Note: Specify the same list of DS0 channels that you used to activate the loopback test.*

Operate DS0 loopback command

To perform DS0 loopbacks which comply with GR-839-CORE requirements for IXCON systems, enter the **OPR-LPBK-T0** command and the applicable parameters as shown in Figure 129.

Figure 129. Operate DS0 loopback command

```
Syntax
OPR-LPBK-T0:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
: [<CTAG>]::<LBCFG>;

Examples
OPR-LPBK-T0::ST1-10-1-1:::,,,LINE;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<LBCFG>`	**Loopback configuration**—Near-end LINE loopbacks. Only LINE loopbacks are supported.

Retrieve DS0 loopback command

To confirm that a DS0 loopback test is running on IXCON systems which comply with GR-839-CORE requirements, enter the **RTRV-LPBK-T0** command and the applicable parameters as shown in Figure 130.

Figure 130. Retrieve DS0 loopback command

```
Syntax
RTRV-LPBK-T0:[<TID>]:<PORTAID>:[<CTAG>];

Examples
RTRV-LPBK-T0::ST1-10-1-1:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.

<PORTAID>	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve DS0 loopback response

The <rspblk> portion of the response to the **RTRV-LPBK-T0** command is shown in Figure 131.

Figure 131. Retrieve DS0 loopback response

```
Syntax
"<PORTAID>-DS0::LPBK-<integer>=<DS0num>(<&DS0num>|<&&DS0num>)
[<&DS0num>+]"

Example
"ST1-13-1-DS0::LPBK-1=1&&4&6"
```

Note: No matter what DS0 you specify with **RTRV-LPBK-T0** command, all (groups) of DS0 under loopback will show up in the response. The DSO specified as the <PORTAID> will be displayed as *x*-*x*-DS0.

The command parameters are as follows:

<PORTAID>	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
<DS0num>	**DS0 channel**—1–24 (ST1) | 1–30 (SE1) | 1-28 (DS3)

Release DS0 loopback command

Following completion DS0 loopback testing on IXCON systems which comply with GR-839-CORE requirements, release the loopback by entering the **RLS-LPBK-T0** command and the applicable parameters as shown in Figure 132.

Note: When you do not specify a loopback parameter, all loopbacks at the local facility are dropped.

Figure 132. Release DS0 loopback command

```
Syntax
RLS-LPBK-T0:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>
[&&<PORTAID>]):[<CTAG>]::<LBCFG>;

Examples
RLS-LPBK-T0::ST1-10-1-2:::,,,LINE;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PORTAID>	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<LBCFG>	**Loopback configuration**—Near-end LINE loopbacks. Only LINE loopbacks are supported.

Operate DS0 loopback test on DS3 cards command

To perform DS0 loopbacks on low-speed ports of the DS3 family of cards, enter the **OPR-LPBK-T0** command and the applicable parameters as shown in Figure 133.

Figure 133. Operate DS0 loopback test on DS3 cards command

```
Syntax
OPR-LPBK-T0:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
: [<CTAG>]::<LBCFG>;

Examples
OPR-LPBK-T0::DS3-5-1-2-1:::,,,LINE;
```

The command parameters are as follows:

<TID>	**Target identifier**—An identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
<PORTAID>	**Port and facility card access identifier**— DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2)
<CTAG>	**Correlation tag**—An identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.
<LBCFG>	**Loopback configuration**—Near-end LINE loopbacks. Only LINE loopbacks are supported.

Retrieve DS0 loopback test on DS3 cards command

To confirm that a DS0 loopback test is running on low-speed ports of the DS3 cards, enter the **RTRV-LPBK-T0** command and the applicable parameters as shown in Figure 134.

Figure 134. Retrieve DS0 loopback test on DS3 cards command

```
Syntax
RTRV-LPBK-T0:[<TID>]:<PORTAID>:[<CTAG>];

Examples
RTRV-LPBK-T0::DS3-5-1-2-1:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—An identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.
`<PORTAID>`	**Port and facility card access identifier**— DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2)
`<CTAG>`	**Correlation tag**—An identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.

Retrieve DS0 loopback test on DS3 cards response

The `<rspblk>` portion of the response to the **RTRV-LPBK-T0** command is shown in Figure 135.

Figure 135. Retrieve DS0 loopback test on DS3 cards response

```
Syntax
"<PORTAID>-DS0::LPBK-<integer>=<DS0num>(<&DS0num>|<&&DS0num>)
[<&DS0num>+]"

Example
"DS3-5-1-2-DS0::LPBK-1=1"
```

Note: No matter what DS0 you specify with **RTRV-LPBK-T0** command, all (groups) of DS0 under loopback will show up in the response. The DSO specified as the <PORTAID> will be displayed as *x*-*x*-DS0.

The command parameters are as follows:

`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2)

<DS0num> **DS0 channel**—1–24 (ST1) | 1–30 (SE1) | 1-28 (DS3)

Release DS0 loopback test on DS3 cards command

Following completion DS0 loopback testing on low-speed ports of the DS3 family of cards, release the loopback by entering the **RLS-LPBK-T0** command and the applicable parameters as shown in Figure 136.

Note: When you do not specify a loopback parameter, all loopbacks at the local facility are dropped.

Figure 136. Release DS0 loopback test on DS3 cards command

Syntax
RLS-LPBK-T0:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>
[&&<PORTAID>]):[<CTAG>]::<LBCFG>;

Examples
RLS-LPBK-T0::DS3-5-1-2-1:::,,,LINE;

The command parameters are as follows:

<TID> **Target identifier**—An identifier specifying TL1 command routing. The TID can be up to 20 characters long and can contain letters, digits and hyphens.

<PORTAID> **Port and facility card access identifier**— DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2)

<CTAG> **Correlation tag**—An identifier of up to six characters that correlates a particular response to a particular command. The CTAG can be an integer or a TL1 identifier.

<LBCFG> **Loopback configuration**—Near-end LINE loopbacks. Only LINE loopbacks are supported.

Operate T1 loopback test command

To perform T1 loopback testing, enter the **OPR-LPBK-T1** command and the applicable parameters as shown in Figure 137.

Figure 137. OperateT1 loopback test command

```
Syntax
OPR-LPBK-T1:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>]::<LBCFG>;

Examples
OPR-LPBK-T1:AC3:ST1-8-1:CTAG1::,,,TERMINAL;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Port and facility card access identifier**—ST1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–84) *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, S155, and STS1 cards.* *You must specify only the left-most DS3, S155, or STS1 card in each pair of cards. The command is applied to both cards.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<LBCFG>`	**Loopback configuration**—FACILITY for line loopbacks; TERMINAL for local loopbacks; PAYLOAD for payload loopbacks.

Release T1 loopback test command

Following completion T1 loopback testing, release the loopback by entering the **RLS-LPBK-T1** command and the applicable parameters as shown in Figure 138.

Note: When you do not specify a loopback parameter, all loopbacks at the local facility are dropped.

Figure 138. Release T1 loopback test command

```
Syntax
With loopback parameter
RLS-LPBK-T1:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>]::<LBCFG>;

Without loopback parameter
RLS-LPBK-T1:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>];

Examples
RLS-LPBK-T1:AC3:ST1-8-1:CTAG2::,,,TERMINAL;
```

The command parameters are as follows:

<TID> **Target identifier**—See TL1 command, syntax, and format on page 89.

<PORTAID> **Port and facility card access identifier**—ST1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–84)
Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, S155, and STS1 cards.
You must specify only the left-most DS3, S155, or STS1 card in each pair of cards. The command is applied to both cards.

<CTAG> **Correlation tag**—See TL1 command, syntax, and format on page 89.

<LBCFG> **Loopback configuration**—FACILITY for line loopbacks; TERMINAL for local loopbacks; PAYLOAD for payload loopbacks.

Operate T3 loopback test command

To perform T3 loopback testing, enter the **OPR-LPBK-T3** command and the applicable parameters as shown in Figure 139.

Figure 139. Operate T3 loopback test command

```
Syntax
OPR-LPBK-T3:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>]::<LBCFG>;

Examples
OPR-LPBK-T3::DS3-6-2:::,,,TERMINAL;
```

The command parameters are as follows:

<TID> **Target identifier**—See TL1 command, syntax, and format on page 89.

<PORTAID>	**Port and facility card access identifier— DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)** *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3 and STS1 cards.* *You must specify only the left-most DS3 or STS1 card in each pair of cards. The command is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<LBCFG>	**Loopback configuration**—FACILITY for line loopbacks; TERMINAL for local loopbacks; PAYLOAD for payload loopbacks.

Release T3 loopback test command

Following completion of T3 loopback testing, release the loopback by entering the **RLS-LPBK-T3** command and the applicable parameters as shown in Figure 140.

Note: When you do not specify a loopback parameter, all loopbacks at the local facility are dropped.

Figure 140. Release T3 loopback test command

```
Syntax
With loopback parameter
RLS-LPBK-T3:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>]::<LBCFG>;

Without loopback parameter
RLS-LPBK-T3:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>])
:[<CTAG>];

Examples
RLS-LPBK-T3:AC3:DS3-3-1:CTAG2::,,,TERMINAL;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PORTAID>	**Port and facility card access identifier— DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)** *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3 and STS1 cards.* *You must specify only the left-most DS3 or STS1 card in each pair of cards. The command is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<LBCFG>	**Loopback configuration**—FACILITY for line loopbacks; TERMINAL for local loopbacks; PAYLOAD for payload loopbacks.

Bit error rate test commands

Introduction

As part of the ARCADACS 100 facility port testing, a bit error rate test (BERT) can be performed on ST1, SE1, DS3, DS3R, S155, or STS1 cards, using the remote loopback system capability or remote test equipment. The BERT test consists of sending one of three selected patterns through the mapper card out to the remote system or equipment and then monitoring the bit error rate (BER) of the returned pattern on the card. You control the BERT test using TL1 commands and responses.

BERT description

The bit patterns available for BERT testing are as follows:

- Quasi-random signal source (that produces a quasi random bit pattern)
- All ones (marks)
- All zeroes (spaces)

Once BERT testing begins, the test runs continuously until you turn it off. With the testing operational, the channel sending the BERT pattern (and receiving the returned pattern) attempts to synchronize itself with the remote system equipment or remote test equipment receiving the pattern (and then sending the pattern back to the source). If synchronization is not successful, a series of error counts is compiled for display upon retrieval. The following bit error rate (BER) information is available to you upon BERT retrieval:

- Synchronization (SYNC) indicates whether or not synchronization between the ST1, SE1, DS3, DS3R, S155, or STS1 card and the remote equipment has been achieved at the time of the retrieve command.
- Out-of-synchronization seconds (OSS) indicates the total number of seconds that the BERT was out of synchronization.
- Errored seconds (ES) indicates the total number of seconds in which any errors were detected.
- Severely errored seconds (SES) indicates the total number seconds in which the BER exceeded one bit per thousand.
- Consecutive severely errored seconds (CSES) indicates that ten consecutive SES have occurred. After it has begun, the CSES field increases by one each second until ten consecutive non SES have occurred.
- Bit error (BE) indicates the number of bit errors detected in the last second.
- Bit error rate (BER) indicates the rate at which bit errors are being detected and logged. The BER is determined by dividing the number of bit errors (BE) detected by the total number of bits transmitted during the test, expressed as an exponential. See Retrieve BERT results response on page 210.

- Elapsed time (ELAP) indicates the total number of seconds during the tests.
- Total errors (TOT_ERR) indicates the number of bit errors detected since the test began.

A bit error can be generated and inserted into the BERT test pattern. If this is done, all BERT counts are affected.

The BERT results can be retrieved only while the test is running. At any time when the test is running, the various errors can be initialized (set to zero). When BERT is turned off, the error counts are automatically cleared.

BERT testing conditions and limitations

There are a number of operating conditions and limitations on BERT testing that you must be aware of:

- Each ST1 or SE1 mapper card can have up to two BERT tests running at the same time. Any TL1 BERT configuration command that exceeds this number is rejected.
- BERT should be run in the following sequence:
  a. Use the **ENT-EQPT** command to provision the ST1, SE1, DS3, DS3R, S155, or STS1 card for BERT.
  b. Use the **ENT_BERT** command to turn BERT on.
  c. Use the **RTRV-BERT** command and its response to monitor BERT operations.
  d. Use the **INIT-BERT** command to reset the test counters.
  e. Use the **ENT-BE** command to generate a one-bit error in the test.
  f. Use the **DLT-BERT** command to stop the test (ST1 and SE1 cards only).
  g. Use the **ENT-BERT** command (with the parameter OFF) to stop the test (DS3, DS3R, S155, and STS1 cards only).
- Once initiated, BERT runs continuously through CPU protection switching or removal.
- BERT is set to off if the applicable ST1, DS3, DS3R, S155, or STS1 mapper card fails or is reset.
- BERT is set to off if the CPU card fails.

BERT commands

The BERT commands and responses are listed and described in the following sections. In the case where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Configure BERT** command
- **Edit BERT** command

- **Retrieve BERT** command
- **Retrieve BERT** response
- **Clear BERT error counts** command
- **Generate one bit error** command
- **Delete BERT** command

Configure BERT command

To start BERT testing on a port of an ST1, SE1, DS3, DS3R, S155, or STS1 mapper card; or to stop a BERT on an DS3, DS3R, S155, or STS1 mapper card; enter the **ENT-BERT** command and the applicable parameters as shown in Figure 141.

Figure 141. Configure BERT command

```
Syntax
ENT-BERT:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>]::<BERTCONFIG>;

Examples
ENT-BERT::ST1-8-7:::QRSS;
ENT-BERT::DS3-10-1-1&DS3-10-1-4&DS3-10-1-5:::MARK;
ENT-BERT::STS1-11-1-1&&STS1-11-1-8:::QRSS;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, DS3R, S155, and STS1 cards.* *You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<BERTCONFIG>`	**BERT configuration data—** **ST1 and SE1** SPACE | MARK | QRSS where SPACE is a pattern of all zeroes, MARK is a pattern of all ones, and QRSS is a quasi random bit pattern. **DS3, S155, and STS1 in OC3 and OC3C mode** OFF | QRSS *Note: OC3C is not supported in this release.*

Retrieve BERT results command

To retrieve BERT results on a specific port of an ST1, SE1, DS3, DS3R, S155, or STS1 mapper card, enter the **RTRV-BERT** command and the applicable parameters as shown in Figure 142.

Figure 142. Retrieve BERT results command

```
Syntax
RTRV-BERT:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>];

Examples
RTRV-BERT::ST1-8-4:;
RTRV-BERT::DS3-10-1-1&DS3-10-1-4&DS3-10-1-5:;
RTRV-BERT::STS1-11-1-1&&STS1-11-1-8:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PORTAID>	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, DS3R, S155, and STS1 cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve BERT results response

The `<rspblk>` portion of the response to the **RTRV-BERT** command is shown in Figure 143.

Figure 143. Retrieve BERT results response

```
Syntax
"<PORTAID>:ELAP=integer,SYNC=YES|NO,MODE=OFF|SPACE|MARK|QRSS,
BE=integer,ES=integer,SES=integer,CSES=integer,OSS=integer,
BER=exponential[,TOT_ERR=integer]"

Example
"ST1-8-4:ELAP=16432,SYNC=YES,MODE=QRSS,BE=45,ES=33,
SES=12,CSES=10,OSS=11,BER=10E-8"
```

The response parameters are as follows (refer also to BERT description on page 207):

<PORTAID>	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84)
ELAP	**Elapsed time**—Integer, 1–65,536 (2^{0}–2^{16})
SYNC	**Synchronization**—YES | NO
MODE	**Test mode**—OFF | QRSS | 2E15 For DS3, S155, and STS1 (OC3 and OC3C mode), the parameters are OFF | QRSS. *Note: OC3C is not supported in this release.*
BE	**Bit error**—Integer, 1–65,536 (2^{0}–2^{16})
ES	**Errored seconds**—Integer, 1–65,536 (2^{0}–2^{16})
SES	**Severely errored seconds**—Integer, 1–65,536 (2^{0}–2^{16})
CSES	**Consecutive severely errored seconds**—Integer, 1–65,536 (2^{0}–2^{16})
OSS	**Out of synchronization seconds**—Integer, 1–65,536 (2^{0}–2^{16})
BER	**Bit error rate**—Exponential indication [NONE | $10e^{-4}$ | $10e^{-5}$| $10e^{-6}$| $10e^{-7}$| $10e^{-8}$ | $10e^{-9}$]
TOT_ERR	**Total errors**—Integer, 1-65,536 (2^{0}–2^{16}) since the test began

Clear BERT error counts command

To clear error counts during BERT testing on an ST1, SE1,DS3, DS3R, S155, or STS1 mapper card, enter the **INIT-BERT** command and the applicable parameters as shown in Figure 144.

Figure 144. Clear BERT error counts command

```
Syntax
INIT-BERT:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>];

Examples
INIT-BERT::ST1-8-2:;
INIT-BERT::DS3-10-1-11&DS3-10-1-14&DS3-10-1-20:;
INIT-BERT::STS1-11-1-3&&STS1-11-1-6:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<PORTAID>`	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, DS3R, S155, and STS1 cards.* *You must specify only the left-most DS3, DS3R, S155, or STS1 card in each pair of cards. The command is applied to both cards.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Generate one bit error command

To generate a 1-bit error in the test pattern during BERT testing of an ST1, SE1, DS3, or DS3R mapper card, enter the **ENT-BE** command and the applicable parameters as shown in Figure 145. Additional error bits can be added into the pattern as desired by repetition of the command.

Figure 145. Generate one-bit error command

```
Syntax
ENT-BE:[<TID>]:(<PORTAID>[&<PORTAID>]|<PORTAID>[&&<PORTAID>]):
[<CTAG>];

Examples
ENT-BE::ST1-8-1:;
ENT-BE::DS3-10-1-11&DS3-10-1-14&DS3-10-1-20:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) *Note: You can specify a list (using &) or a range (using &&) of card and port access identifiers for DS3, and DS3R cards only.* *You must specify only the left-most DS3, or DS3R card in each pair of cards. The command is applied to both cards.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Delete BERT command

To stop BERT testing on a port of an ST1 or SE1 mapper card, enter the **DLT-BERT** command and the applicable parameters as shown in Figure 146.

Note: This command does not apply to DS3, DS3R, S155, or STS1cards.

Figure 146. Delete BERT command

```
Syntax
DLT-BERT:[<TID>]:<PORTAID>:[<CTAG>];

Example
DLT-BERT::ST1-8-7:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<PORTAID>`	**Card and port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Protection commands

There are different types of protection available for different types of cards.

- For intelligent cross-connection cards (IXCON, DS3, DS3R, S155, and STS1 in DX mode), you can apply card protection switching.
- For S155 cards, you can use automatic protection switching.
- For ST1 and SE1 cards, you can use equipment protection switching.

Card protection switching

The card protection switching command applies to the two IXCON, DS3, DS3R, S155, or STS1cards (XCON cards are not intelligent).

Note: This command applies to redundant systems only. Note that the presence of more than two DS3, DS3R, or STS1 cards does not mean the system is redundant: the cards must be provisioned as duplex (RN=DX) and each pair must be installed with the appropriate I/O protection assembly.

The command switches the states of the two cross-connection cards between protection and working states.The DS3, DS3R, and STS1 cards in a redundant system are always in a 1:1 protection state. The S155 cards may be in a 1:1 protection state if redundancy is set to DX, or in a 1+1 protection state if redundancy is set to 1+1 or 1+1W.

Switch between working and protection card command

To swap the working and protection DS3, DS3R, S155, or STS1cards within the ARCADACS 100 system, enter the **SW-EQPT** command and the applicable parameters as shown in Figure 147 .

Note: This command applies to S155 cards when redundancy is DX.

Note: Specify the card and slot number of the left-most cross-connection card of the pair.

Figure 147. Card protection switching command

```
Syntax
SW-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
SW-EQPT::DS3-3:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—IXCON-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Equipment protection switching for mapper cards

Equipment protection (1:N type) is available for ST1 and SE1 mapper cards installed in logic card (lower) slots 3 through 15 of the chassis by installing a T1/E1 I/O protection card in the I/O slot immediately above one of the ST1 or SE1 cards. When this is done, the mapper card in the slot with the T1/E1 I/O protection card above it becomes the protection card for all mapper cards of that type in the system.

There are four modes of equipment protection switching (EPS) for ST1 and SE1 cards in the ARCADACS 100 system. These modes are described in descending order of EPS priority:

- **LOCKOUT**—Card is inhibited from participating in protection switching. If the card is a working card, lockout means the card cannot be protected; if the card is a protection card, lockout means the card cannot be used to protect its associated working card(s). Since protection cards can be provisioned for two different card types (CT1-CSU, CT1-DSX), however, protection may still be active on the card types not set into lockout mode. Lockout has the highest priority of the EPS modes and cannot be overridden by any lower-priority EPS command.

- **FORCED**—Working card traffic is forced to the protection card, provided that protection is provisioned, neither working nor protection card is in lockout mode, and the protection card is not already busy with forced traffic from a higher-priority card.

> **Note:** You assign priority when you first provision the equipment (see Create equipment command on page 143). Priority 1 is the lowest and priority 14 is the highest.

  The forced mode is initiated by operator command, can be replaced by another forced command with a higher priority card, and can only be eliminated by operator command. Forced mode has the second-highest priority of the protection switching modes.

- **AUTO**—Working card traffic is switched to the protection card when the system detects a failure on the working card, provided that there are no lockout or forced commands acting upon either of the subject cards and no auto protection with a higher card priority is already occurring. The auto mode is initiated by the system and cannot be manually controlled. Auto mode ranks above manual mode but below lockout and forced modes in the protection switching mode hierarchy.
- **MANUAL/NORMAL**—You can manually switch the working card traffic to the protection card, provided that there are no lockout or forced commands acting upon either of the subject cards. If the manual mode is overwritten by the auto mode with a higher-priority card, you must re-enter it if you still require it after the higher-priority protection has been cleared. Manual mode is the lowest priority of the protection switching modes. Note that the MANUAL and NORMAL modes of protection are functionally equivalent.

The protection switching can be either automatic (the auto mode) or manually invoked with TL1 commands (the lockout, forced, and manual modes). The auto mode is the default mode requiring no operator action. The lockout mode uses the inhibit switch-to-protection and inhibit switch-to-working commands while the unlock mode removes the lockout mode by using the allow switch-to-protection and allow switch-to-working commands. For force and manual modes, the switch-to-protection and switch-to-working commands are used.

Each time protection switching is invoked, regardless of mode, an autonomous message reporting either a request alarm (of minor severity) or event is returned by the system. All messages returned in response to protection switching commands are in the autonomous message format of TL1 autonomous message format on page 91.

Auto mode

Auto mode protection switching requires no operator command entry other than proper card provisioning for 1:N protection setup for the mapper cards. With automatic 1:N protection controlling the protection bus and no protection switching already occurring, the CPU automatically switches traffic to the protection card when it detects a working ST1 or SE1 card that requires switching. If another working card of higher priority fails, the auto mode overrides the original protection switching with the new higher-priority protection switching. In this case, the traffic from the original protection switching goes into a waiting state termed pending. This type of switching is auto reverting: when the highest priority failure is cleared, the protection automatically switches to the next highest card priority in line. This continues until all failures on all supported card types are cleared. If there is only a single failure to be cleared, a 5-minute WTR (wait-to-restore) period ensues before the traffic is restored to the working card.

The characteristics for each mapper card to be protected or to perform the redundant protection card function are provisioned by the **ENT-EQPT** (see page 143) or **ED-EQPT** (see page 152) commands. These characteristics include working mode, redundancy, and priority. If the cards are provisioned but their protection status is unknown, the provisioned information can be obtained with the **RTRV-EQPT** command and its response (see page 146).

Lockout and unlock modes

To set up the lockout mode of equipment protection switching for both working cards and their protection card, see Inhibit switch-to-protection command on page 217 and Inhibit switch-to-working command on page 217. To remove the lockout mode (unlock) and enable equipment protection switching for both working cards and their protection card, see Allow switch-to-protection command on page 218 and Allow switch-to-working command on page 218.

Protection commands

The protection commands control equipment protection on structured T1 and E1 mapper cards. The protection commands are listed and described in the following sections.

- **Inhibit switch-to-protection** command
- **Inhibit switch-to-working** command
- **Allow switch-to-protection** command
- **Allow switch-to-working** command
- **Switch-to-protection setup** command
- **Switch-to-working setup** command
- **Operate path protection switch** command
- **Release path protection switch** command

Inhibit switch-to-protection command

To inhibit traffic of the specified working card from being switched to the protection card or to remove protection if the switching has already occurred, enter the **INH-SWTOPROTN-EQPT** command and the applicable parameters as shown in Figure 148.

Figure 148. Inhibit switch-to-protection command

```
Syntax
INH-SWTOPROTN-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
INH-SWTOPROTN-EQPT::ST1-8:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Inhibit switch-to-working command

To inhibit the specified protection card from protecting any of its associated working cards or to remove any protection currently occurring, enter the **INH-SWTOWKG-EQPT** command and the applicable parameters as shown in Figure 149.

Figure 149. Inhibit switch-to-working command

```
Syntax
INH-SWTOWKG-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
INH-SWTOWKG-EQPT::ST1-8:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Allow switch-to-protection command

To enable traffic of the specified working card to be switched to the protection card, enter the **ALW-SWTOPROTN-EQPT** command and the applicable parameters as shown in Figure 150.

Figure 150. Allow switch-to-protection command

```
Syntax
ALW-SWTOPROTN-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
ALW-SWTOPROTN-EQPT::ST1-8:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Allow switch-to-working command

To enable the specified protection card to switch traffic from any of its associated working cards, enter the **ALW-SWTOWKG-EQPT** command and the applicable parameters as shown in Figure 151.

Figure 151. Allow switch-to-working command

```
Syntax
ALW-SWTOWKG-EQPT:[<TID>]:<CARDAID>:[<CTAG>];

Example
ALW-SWTOWKG-EQPT::ST1-8:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Forced and manual modes

The next two commands set up the forced or manual mode of equipment protection switching for both working cards and their protection card.

Switch-to-protection command

To switch traffic from the specified working card to the protection card, enter the **SW-TOPROTN-EQPT** command and the applicable parameters as shown in Figure 152. Before this command can be executed, the subject working card and protection card must be in unlock mode. See Equipment protection switching for mapper cards on page 214 and Lockout and unlock modes on page 216. In addition, if this command is issued as manual (SWMODE=MAN), the auto mode can override it with a protection requirement of any card type with any card priority. If the command is issued as forced (SWMODE=FRCD), there is no auto mode override of the command.

Figure 152. Switch-to-protection command

```
Syntax
SW-TOPROTN-{EQPT}:[<tid>]:<aid>:[<ctag>]::<mode>[,<protid>]
[,<dirn>];

Example
SW-TOPROTN-EQPT:AC3:ST1-7:CTAG9::NORM,,;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<SWMODE>	**Switching mode**—MAN | FRCD | NORM

Switch-to-working command

To switch traffic back from the protection card to the specified working card (removing a forced or manual protection switch), enter the **SW-TOWKG-EQPT** command and the applicable parameters as shown in Figure 153. If the working card and protection card are in lockout mode, this command is meaningless and ignored. See Equipment protection switching for mapper cards on page 214 and Lockout and unlock modes on page 216. If the command is issued as manual (SWMODE=MAN) and a failure exists on the working card, the auto mode may override the command and switch the traffic back to the protection card until the failure has been cleared.

Figure 153. Switch-to-working command

```
Syntax
SW-TOWKG-{EQPT}:[<tid>]:<aid>:[<ctag>]::<mode>[,<dirn>];

Example
SW-TOWKG-EQPT:AC3:ST1-7:CTAG10::NORM,,;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—ST1-(3–15) | SE1-(3–15)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<SWMODE>	**Switching mode**—MAN | FRCD | NORM

Automatic protection switching

Two of the redundancy options for S155 cards are the 1+1 and 1+1W settings, which provide linear, 1+1, nonrevertive line protection.

Note: 1+1W is for systems with wireless (radio).

Automatic protection switching (APS) activates the 1+1 protection in the APS state you select.

Note: Before you can use the APS commands, you must provision the S155 cards with a redundancy setting of 1+1 or 1+1W (see Create equipment command on page 143).

There are eight APS states for a redundant pair of S155 cards. Six of them are requested by user and two are raised by the S155 card. The priority is as follows:

- **Clear**—The APS state is cleared. This user-requested state overrides all other user-requested states.
- **Lockout of protection**—The working line is locked out from switching to the protection line. This user-requested state overrides all states except clear.
- **Forced switch of protection**—Traffic on the protection line is forced to the working line, provided that 1+1 redundancy is provisioned, and neither line is in lockout mode. This user-requested state overrides all states except lockout and clear.
- **Forced switch of working**—Traffic on the working line is forced to the protection line, provided that 1+1 redundancy is provisioned, and neither line is in lockout mode. This user-requested state overrides all states except lockout and clear.

  Note: Forced switch of protection and forced switch of working have the same priority level.

- **Signal fail**—This state is raised by the line when a failure is detected. It overrides the signal degrade and manual switch states.

- **Signal degrade**—This state is raised by the line when the bit error rate threshold exceeds a provisioned level. It overrides the manual switch state.

> **Note:** To provision the signal degrade threshold for STM1 or OC3 lines, see Edit facility data command on page 167.

- **Manual switch of protection**—Traffic on the protection line is switched manually to the working line, provided that 1+1 redundancy is provisioned, and neither line is in a lockout, forced-switch, signal fail, or signal degrade state. All other APS states override this user-requested state.
- **Manual switch of working**—Traffic on the working line is switched manually to the protection line, provided that 1+1 redundancy is provisioned, and neither line is in a lockout, forced-switch, signal fail, or signal degrade state. All other APS states override this user-requested state.

> **Note:** Manual switch of protection and manual switch of working have the same priority level.

The APS commands are addressed to the left-most line in a pair of S155 cards, and applied to one or both cards as appropriate.

> **Note:** If the redundant pair of STM1 lines loses synchronization (NO_LINE_PROT alarm), all APS functions are blocked until synchronization is restored.

Activate automatic protection switching command

To apply an APS mode, enter the **OPR-APS** command and the applicable parameters as shown in Figure 154.

> **Note:** Specify the slot number of the working line in each redundant pair of S155 cards.

Figure 154. Activate APS command

```
Syntax
OPR-APS:[<TID>]:<CARDAID>:[<CTAG>]:::<APSCMD>;

Example
OPR-APS::S155-3::::FS_P;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<CARDAID>`	**Card access identifier**—S155-(3–15) *Note: (3–15) must be the slot number of the working line.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<APSCMD>`	**APS command**—LP | FS_P | FS_W | MS_P | MS_W | CLR where LP is lockout of protection, FS_P is forced switch of protection, FS_W is forced switch of working, MS_P is manual switch of protection, MS_W is manual switch of working, and CLR is clear.

Retrieve automatic protection switching status command

To check the APS state, enter the **RTRV-APS** command and the applicable parameters as shown in Figure 155.

Figure 155. Retrieve APS command

```
Syntax
RTRV-APS:[<TID>]:<CARDAID>:[<CTAG>];

Example
RTRV-APS::S155-3:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CARDAID>`	**Card access identifier**—S155-(3–15) *Note: (3–15) must be the slot number of the working line.*
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve automatic protection switching status response

The `<rspblk>` portion of the response to the **RTRV-APS** command is shown in Figure 156.

Figure 156. Retrieve APS response

```
Syntax
"<CARDAID>::APSCMD=(LP|FS_P|FS_W|MS_P|MS_W|CLR|SF_P|SF_W|SD_P|
SD_W),ACTIVE_LINE=(WORK|PROT)"

Example
"S155-3::APSCMD=FS_P,ACTIVE_LINE=WORK"
```

The response parameters are as follows:

`<CARDAID>`	Card access identifier—S155-(3–15) *Note: (3–15) is the slot number of the working line.*

`APSCMD`	**Automatic protection switching state**—LP | FS_P | FS_W | MS_P | MS_W | CLR | SF_P | SF_W | SD_P | SD_W where LP is lockout of protection, FS_P is forced switch of protection, FS_W is forced switch of working, MS_P is manual switch of protection, MS_W is manual switch of working, CLR is cleared, SF_P is signal fail on protection, SF_W is signal fail on working, SD_P is signal degrade on protection, and SD_W is signal degrade on working.
`ACTIVE_LINE`	**Active line**—WORK | PROT WORK is the mapper card on the left, and PROT is the mapper card on the right.

Performance monitoring

The performance monitoring (PM) capability permits the ARCADACS 100 system to accumulate data to validate the integrity of incoming electrical data. This data is used to calculate performance parameters for each entity being monitored. These parameters can then be used to identify potential trouble, to locate a fault, for tariffs and for preventive maintenance.

For all performance monitoring parameters, data is accumulated for two time periods, 15 minutes and day (24 hours). The PM parameters for the current 15-minute, and 32 previous 15-minute periods are maintained. For the day periods, the PM data for 1 current, and 7 previous day periods is maintained.

Using TL1 commands, you can retrieve or clear the performance monitoring data. PM data is gathered for ST1 and SE1 cards and the active DS3, DS3R, S155, and STS1 cards for the following:

- near-end line and path for T1 facilities on ST1, DS3, DS3R, S155, and STS1 cards
- near-end line and path for E1 facilities on SE1, and S155 cards
- control bit for T3 lines on DS3, DS3R, and STS1 (dual mode) cards
- section, near-end line and path, and far-end line and path for STS1 lines on STS1 cards
- near-end and far-end virtual tributary (VT) for VTs on STS1 and S155 cards
- section, near-end line and path, and far-end line and path for optical facilities on S155 cards

Threshold crossing alerts

Threshold crossing alerts are stored in the system logs. Examples of threshold crossing alerts are shown in Figure 157.

Figure 157. Threshold crossing alerts

```
FACTORY 02-12-06 10:52:16
A  645 REPT EVT T1
   "ST1-6-1:T-ESL,TC,02-12-06,10-52-15,,,,,15-MIN:\"ESL 15 MINUTE
THRESHOLD CROSSING\""
;

FACTORY 02-12-06 10:52:16
A  646 REPT EVT T1
   "ST1-6-1:T-CSS-P,TC,02-12-06,10-52-15,,,,,15-MIN:\"CSS-P 15
MINUTE THRESHOLD CROSSING\""
;
```

Performance monitoring commands

There are two performance monitoring commands and one response in the performance monitoring group. The two performance monitoring commands and one response are listed and described in the following sections. Note that in the system-wide **clear PM counts** command, the clearing of performance monitoring data from the screen is also an initialization process for the next monitoring cycle.

- **Retrieve PM counts** command
- **Retrieve PM counts** response
- **Clear PM counts** command
- **Retrieve PM T1** command
- **Retrieve PM T1** response
- **Retrieve PM T3** command
- **Retrieve PM T3** response

Retrieve PM counts command

To retrieve performance monitoring data on one of the applicable cards, enter the **RTRV-PM** command and the applicable parameters as shown in Figure 158.

Figure 158. Retrieve performance monitor counts command

```
Syntax
RTRV-PM:[<TID>]:<PMAID>[&&<PMAID>]:[<CTAG>]::[<PMTYPE>],,
[<LOCN>],[<DIR>],[<TMPER>],,<INDEX>[&&<INDEX>];

Examples
RTRV-PM::ST1-13-1:::,,,,1-DAY,,1&&4;
RTRV-PM::DS3-4-1-2&&DS3-4-1-4:::UASP,,,,15-MIN,,1&&3;
RTRV-PM::STS1-11-1-VT2:::UASV,,,,15-MIN,,4;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PMAID>	**Card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-(1–2)* *Note: You can specify a range (using &&) of card access identifiers for ST1, for the DS1 level of DS3, DS3R, and STS1 (that is, <card>-(3–15)-(1–2)-(1–n)), and for the E1 level of S155.* ** (3–15) must be the slot number of the working line and (1–2) is the working line (1) or the protection line (2).*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<PMTYPE>	**Performance monitoring counter type**—See Table 25.
<LOCN>	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end.
<DIR>	**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
<TMPER>	**Time period of monitoring**—1-DAY | 15-MIN
<INDEX>	**Time period identification**—Dependent on TMPER. For 1-DAY, INDEX is 0–7 where 0=current day. For 15-MIN, INDEX is 0–32 where 0=current 15-minute period. *Note: You can specify a range (using &&) of time periods.*

Table 25. Retrieve PM command options

<PMAID>	<PMTYPE>	Description
ST1-(3–15)-(1–8)	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	SAS-P	Severely alarmed seconds for path
	AISS-P	Alarm indication signal seconds for path
	CSS-P	Controlled slip seconds for path
	UASP	Unavailable seconds for path
	FC-P	Failure condition seconds for path
	CVL	Code violation count for line
	ESL	Errored seconds for line
	SESL	Severely errored seconds for line
	LOSS-L	Loss of signal seconds for line
	CVPFE	Code violation count for far-end path
	ESP-FE	Errored seconds for far-end path
	SESP-FE	Severely errored seconds for far-end path
	CSS-PFE	Controlled slip seconds for far-end path
	UASP-FE	Unavailable seconds for far-end path
	SEFSP-FE	Severely errored frame seconds for far-end path
	ESLFE	Errored seconds for far-end line
SE1-(3–15)	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	SAS-P	Severely alarmed seconds for path
	AISS-P	Alarm indication signal seconds for path
	CSS-P	Controlled slip seconds for path
	UASP	Unavailable seconds for path
	FC-P	Failure condition seconds for path
	CVL	Code violation count for line
	ESL	Errored seconds for line
	SESL	Severely errored seconds for line
	LOSS-L	Loss of signal seconds for line

Table 25. Retrieve PM command options (continued)

<PMAID>	<PMTYPE>	Description
DS3-(3–15)-(1–2)	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CV-C	C-bit error count for path
	ESCP-P	C-bit errored seconds for path
	SESCP-P	C-bit severely errored seconds for path
	ESL	Errored seconds for line
	CVL	Line code violation count for line
	CVP	P-bit error count for path
	CVCP-P	Coding violation - C-bit
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	SEFS	Severely errored frame seconds for path
	UASP	Unavailable seconds
DS3-(3–15)-(1–2)-(1–28) *Note: This level of PM counts applies to the DS1s on the DS3 or DS3R card.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	AISS-P	Alarm indication signal seconds for path
	CSS-P	Controlled slip seconds for path
	FC-P	Failure condition seconds for path
	CVL	Code violations for line
	ESL	Errored seconds for line
	LOSS-L	Loss of signal seconds for line
	SESL	Line severely errored seconds for line
	CVP	Code violations for path
	CVCP-P	Coding violation - C-bit
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	SAS-P	Severely alarmed seconds for path
	UASP	Unavailable seconds for path

Table 25. Retrieve PM command options (continued)

<PMAID>	<PMTYPE>	Description
STS1-(3–15)-(1–2)	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVS	Code violations for section
	ESS	Errored seconds for section
	SESS	Severely errored seconds for section
	SEFS	Severely errored framing seconds for section
	CVL	Code violations for line
	ESL	Errored seconds for line
	SESL	Severely errored seconds for line
	UASL	Unavailable seconds for line
	FC-L	Failure condition seconds for line
	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	UASP	Unavailable seconds for path
	FC-P	Failure condition seconds for path
	CV-LFE	Code violations for far-end line
	ESLFE	Errored seconds for far-end line
	SES-LFE	Severely errored seconds for far-end line
	UASL-FE	Unavailable seconds for far-end line
	FC-LFE	Failure condition seconds for far-end line
	CVPFE	Code violations for far-end path
	ESP-FE	Errored seconds for far-end path
	SESP-FE	Severely errored seconds for far-end path
	UASP-FE	Unavailable seconds for far-end path
	FC-PFE	Failure condition seconds for far-end path

Table 25. Retrieve PM command options (continued)

<PMAID>	<PMTYPE>	Description
STS1-(3–15)-(1–2)-(1–28) *Note: This level of PM counts applies to the DS1s on the STS1 card.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVL	Code violations for line
	ESL	Errored seconds for line
	SESL	Severely errored seconds for line
	LOSS-L	Loss of signal seconds for line
	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	AISS-P	Alarm indication signal seconds for path
	SAS-P	Severely alarmed seconds for path
	CSS-P	Controlled slip seconds for path
	UASP	Unavailable seconds for path
	FC-P	Failure condition seconds for path
STS1-(3–15)-(1–2)-(VT1–VT28) *Note: This level of PM counts applies to the virtual tributaries (VT) on the STS1 card.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVV	Code violations for VT
	ESV	Errored seconds for VT
	SEW	Severely errored seconds for VT
	UASV	Unavailable seconds for VT
	FC-V	Failure condition seconds for VT
	CV-VFE	Code violations for far-end VT
	ES-VFE	Errored seconds for far-end VT
	SES-VFE	Severely errored seconds for far-end VT
	UASV-FE	Unavailable seconds for far-end VT
	FC-VFE	Failure condition seconds for far-end VT

Table 25. Retrieve PM command options (continued)

<PMAID>	<PMTYPE>	Description
S155-(3–15)-(1–2) *Note: When redundancy is 1+1 or 1+1W, (3–15) must be the slot number of the working line and (1–2) is the working line (1) or the protection line (2).* *Note: The PM counters use SONET naming conventions. For a list of the PM counters for SDH, see Appendix C.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVS	Code violations for section
	ESS	Errored seconds for section
	SESS	Severely errored seconds for section
	CVL	Code violations for line
	ESL	Errored seconds for line
	SESL	Severely errored seconds for line
	UASL	Unavailable seconds for line
	FC-L	Failure condition seconds for line
	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	UASP	Unavailable seconds for path
	FC-P	Failure condition seconds for path
	CV-LFE	Code violations for far-end line
	ESLFE	Errored seconds for far-end line
	SES-LFE	Severely errored seconds for far-end line
	UASL-FE	Unavailable seconds for far-end line
	FC-LFE	Failure condition seconds for far-end line
	CVPFE	Code violations for far-end path
	ESP-FE	Errored seconds for far-end path
	SESP-FE	Severely errored seconds for far-end path
	UASP-FE	Unavailable seconds for far-end path
	FC-PFE	Failure condition seconds for far-end path
S155-(3–15)-1-(1–63) *Note: In STM1 mode, there are 63 E1 facilities on the S155 card.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVP	Code violation for path (background block error)

Table 25. Retrieve PM command options (continued)

<PMAID>	<PMTYPE>	Description
S155-(3–15)-1-(1–63) (continued)	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	FC-P	Failure count for path
	CVPFE	Code violations for far-end path (Far-end background block error) *Note: Far-end PM counts for E1 are not available in this release.*
	ESP-FE	Far-end errored seconds for path
	SESP-FE	Far-end severely errored seconds for path
	FC-PFE	Far-end failure count for path
S155-(3–15)-1-(1–84) *Note: In OC3 or OC3C mode, there are 84 DS1 facilities on the S155 card. OC3C is not supported in this release.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVP	Code violations for path
	ESP	Errored seconds for path
	SESP	Severely errored seconds for path
	SAS-P	Severely alarmed seconds for path
	UASP	Unavailable seconds for path
	AISS-P	Alarm indication signal seconds for path
	CSS-P	Controlled slip seconds for path
	FC-P	Failure condition seconds for path
S155-(3–15)-1-(VT1–VT*xx*) where *xx* is 63 in STM1 mode and 84 in OC3 or OC3C mode *Note: This level of PM counts applies to the virtual tributaries (VT) on the S155 card. OC3C is not supported in this release.*	Blank or empty	All PM counters *Note: If you leave <PMTYPE> blank, all PM counters are retrieved.*
	CVV	Code violations for VT
	ESV	Errored seconds for VT
	SEW	Severely errored seconds for VT
	UASV	Unavailable seconds for VT
	FC-V	Failure condition seconds for VT
	CV-VFE	Code violations for far-end VT
	ES-VFE	Errored seconds for far-end VT
	SES-VFE	Severely errored seconds for far-end VT
	UASV-FE	Unavailable seconds for far-end VT
	FC-VFE	Failure condition seconds for far-end VT

Retrieve PM counts response

The `<rspblk>` portion of the response to the **RTRV-PM** command is shown in Figure 159.

Figure 159. Retrieve PM counts response

```
Syntax
ST1 and SE1
"<PMAID>,<PMFAC>:<PMTYPE>,<PMVAL>,<VLDTY>,<LOCN>,<DIR>,
    <TMPER>,<MONDAT>,<MONTM>"+

DS3,  S155, and STS1
"<PMAID>,<PMFAC>:<PMTYPE>,<PMVAL>,<LOCN>,<DIR>,<TMPER>,<MONTM>,
<MONDAT>"+

Examples
"ST1-5-1,T1:ESL,680,NA,NEND,RX,15-MIN,11-03,11-15"
   "ST1-5-1,T1:SESL,680,NA,NEND,RX,15-MIN,11-03,11-15"
   "ST1-5-1,T1:LOSS-L,680,NA,NEND,RX,15-MIN,11-03,11-15"
   "ST1-5-1,T1:ESP,8,NA,NEND,RX,15-MIN,11-03,11-15"
   "ST1-5-1,T1:CSS-P,8,NA,NEND,RX,15-MIN,11-03,11-15"
;
```

The response parameters are as follows:

<PMAID>	**Performance monitoring access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-(1–2)* ** (3–15) is the slot number of the working line and (1–2) is the working line (1) or the protection line (2).*
<PMFAC>	**Performance monitoring facility—** **ST1, SE1**—EQPT | DS1 or E1 **DS3**—EQPT | T3 | T1 **STS1**—T1 | VTCHAN | STS1CHAN **S155**—E1CHAN | T1 | VTCHAN | S155CHAN
<PMTYPE>	**Performance monitoring counter**—See Table 25.
<PMVAL>	**Performance monitoring value**—A single value showing the count for the PM type. *Note: If you requested all PM types, the response shows a separate line for each PM type and value (see Figure 159).*
<VLDTY>	**Validity of performance monitoring data—** **ADJ**—the data has been reset or cleared. **COMPL**—the data set has been completed within the normal 900-second period.

	LONG—the data set is longer than the normal 900-second (15-minute) period used.
	NA PRTL—the data set was not acknowledged by the TL1 process (the card did not respond).
`<LOCN>`	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end.
`<DIR>`	**Direction of monitored signal**—RX is receive and TX is transmit.
`<TMPER>`	**Time period of monitoring**—1-DAY | 15-MIN
`<MONDAT>`	**Monitoring date**—MOY-DOM, where MOY (month of year) ranges from 1 through 12 , and DOM (day of month) ranges from 1 through 31. Values are current day and the previous seven days. If the time unit of <tmper> is MIN, the combination of <mondat> and <montm> must not be more than eight hours old. A null value defaults to the current date.
`<MONTM>`	**Begin monitoring time**—Beginning time of the storage register period specified in the <tmper> parameter. The format for <montm> is HOD-MOH, where HOD (hour of day) ranges from 0 through 23, and MOH (minute of hour) is 0, 15, 30, and 45. If the <tmper> parameter is 1-DAY, both HOD and MOH must be 0. If the time unit of <tmper> is 15-MIN, the combination of <mondat> and <montm> must not be more than eight hours old. The null value default is 0-0 if <mondat> is the current day. Otherwise, the null value defaults to the current 15-minute interval.

Clear PM counts command

To clear performance monitoring counts for the entire system, enter the **INIT-PM** command and the applicable parameters as shown in Figure 160.

Figure 160. Clear all PM counts command

```
Syntax
INIT-PM:[<TID>]:ALL:[<CTAG>];

Example
INIT-PM::ALL:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

To clear performance monitoring counts for selected facilities, enter the **INIT-PM** command parameters as shown in Figure 161.

Figure 161. Clear specific PM counts command

```
Syntax
INIT-PM:[<TID>]:<PMAID>[&&<PMAID>]:[<CTAG>]::ALL,,[<LOCN>],
[<DIR>],[<TMPER>],,<INDEX>[&&<INDEX>];

Examples
INIT-PM::ST1-11-2:::ALL,,,,,,0;
INIT-PM::ST1-6-1:::ALL,,,,1-DAY,,0&&7;
INIT-PM::STS1-3-1-VT2&&STS1-3-1-VT14:::ALL,,,,15-MIN,,0;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PMAID>	**Card access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) *Note: You must specify only the left-most DS3, DS3R, S155, or STS1card in each pair of cards. The command is applied to both cards.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<LOCN>	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end.
<DIR>	**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
<TMPER>	**Time period of monitoring**—1-DAY | 15-MIN
<INDEX>	**Time period identification**—Dependent on TMPER. For 1-DAY, INDEX is 0–7 where 0=current day. For 15-MIN, INDEX is 0–32 where 0=current 15-minute period. You can specify a single value or a range. *Note: If you choose a range (using &&), it must be the full range. For 1-DAY, the range must be* 0&&7. *For 15-MIN, the range must be* 0&&32.

Retrieve PM T1 command

To retrieve performance monitoring data on the T1 cards, enter the **RTRV-PM-T1** command and the applicable parameters as shown in Figure 162. Refer to Figure 25 on page 226 for Retrieve PM command options.

Figure 162. Retrieve T1 performance monitor command

```
Syntax
RTRV-PM-T1:[<tid>]:<t1_PMAID>:[<ctag>]::[<pmtype>],[<monlev>],
[<locn>],[<dirn>],[<tmper>],[<mondat[&&<mondat>]]
[,<montm>[&&<montm>]];

Examples
RTRV-PM-T1::ST1-7-1:::,,,,,,15-20;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<T1_PMAID>	**Card access identifier**—ST1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<PMTYPE>	**Performance monitoring counter type**—See Table 25.
<MONLEV>	**Monitoring level**—The format of monlev is LEV-DIRN, where LEV is an integer and DIRN is UP or DOWN. If <monlev> is not provided, 1-UP is the default.
<LOCN>	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end.
<DIRN>	**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
<TMPER>	**Time period of monitoring**—1-DAY | 15-MIN
<MONDAT>	**Monitoring date**—MOY-DOM, where MOY (month of year) ranges from 1 through 12, and DOM (day of month) ranges from 1 through 31. Values are current day and the previous seven days. If the time unit of <tmper> is MIN, the combination of <mondat> and <montm> must not be more than eight hours old. A null value defaults to the current date.
<MONTM>	**Begin monitoring time**—Beginning time of the storage register period specified in the <tmper> parameter. The format for <montm> is HOD-MOH, where HOD (hour of day) ranges from 0 through 23, and MOH (minute of hour) is 0, 15, 30, and 45. If the <tmper> parameter is 1-DAY, both HOD and MOH must be 0. If the time unit of <tmper> is 15-MIN, the combination of <mondat> and <montm> must not be more than eight hours old. The null value default is 0-0 if <mondat> is the current day. Otherwise, the null value defaults to the current 15-minute interval.

Retrieve PM T1 response

The `<rspblk>` portion of the response to the **RTRV-PM-T1** command is shown in Figure 163.

Figure 163. Retrieve PM T1 response

```
AC3 02-11-02 16:17:33
M  CTAG1 COMPLD
   "ST1-7-1,T1:CVP,20,COMPL,NEND,RX,15-MIN,11-02,16-00"
;
```

Retrieve PM T3 command

To retrieve performance monitoring data on the T3 cards, enter the **RTRV-PM-T3** command and the applicable parameters as shown in Figure 164. Refer to Figure 25 on page 226 for Retrieve PM command options.

Figure 164. Retrieve T3 performance monitor command

```
Syntax
RTRV-PM-T3:[<tid>]:<t3_PMAID>:[<ctag>]::[<pmtype>],[<monlev>],
[<locn>],[<dirn>],[<tmper>],[<mondat>[&&<mondat>]]
[,<montm>[&&<montm>]];

Examples
RTRV-PM-T3::DS3-4-1:::,,,,15-MIN,,15-20;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<T3_PMAID>	**Card access identifier**— DS3-(3–15)-(1–2)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<PMTYPE>	**Performance monitoring counter type**—See Table 25.
<MONLEV>	**Monitoring level**—The format of monlev is LEV-DIRN, where LEV is an integer and DIRN is UP or DOWN. If <monlev> is not provided, 1-UP is the default.
<LOCN>	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end.
<DIRN>	**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
<TMPER>	**Time period of monitoring**—1-DAY | 15-MIN

`<MONDAT>`	**Monitoring date**—MOY-DOM, where MOY (month of year) ranges from 1 through 12 , and DOM (day of month) ranges from 1 through 31. Values are current day and the previous seven days. If the time unit of <tmper> is MIN, the combination of <mondat> and <montm> must not be more than eight hours old. A null value defaults to the current date.
`<MONTM>`	**Begin monitoring time**—Beginning time of the storage register period specified in the <tmper> parameter. The format for <montm> is HOD-MOH, where HOD (hour of day) ranges from 0 through 23, and MOH (minute of hour) is 0, 15, 30, and 45. If the <tmper> parameter is 1-DAY, both HOD and MOH must be 0. If the time unit of <tmper> is 15-MIN, the combination of <mondat> and <montm> must not be more than eight hours old. The null value default is 0-0 if <mondat> is the current day. Otherwise, the null value defaults to the current 15-minute interval.

Retrieve PM T3 response

The `<rspblk>` portion of the response to the **RTRV-PM-T3** command is shown in Figure 165.

Figure 165. Retrieve PM T3 response

```
RTRV-PM-T3:FACTORY:DS3-3-1:CTAG1::UASP,,NEND,,15-MIN,11-02,16-15;

FACTORY 02-11-02 16:22:56
M  CTAG1 COMPLD
   "DS3-3-1,T3:UASP,474,NEND,RX,15-MIN,11-02,16-15"
;
```

Performance monitoring threshold commands

Performance monitoring (PM) thresholds can be set to generate alerts when certain thresholds are met or exceeded. The initial setting for this feature is off (set to 0). The following commands are used to set and modify PM thresholds:

- **SET-TH-T1**
- **RTRV-TH-T1**
- **SET-TH-T3**
- **RTRV-TH-T3**

Set T1 PM threshold command

Use the **SET-TH-T1** command to set the threshold level for a PM parameter on a T1 facility. When this threshold is met or exceeded, a threshold crossing alert (TCA) is generated. Setting the threshold for multiple parameters or intervals requires entering multiple **SET-TH-T1** commands.

Enter the **SET-TH-T1** command and the applicable parameters as shown in Figure 166.

Figure 166. Set T1 PM threshold command

```
Syntax
SET-TH-T1:[<TID>]:<t1_PMAID>:[<CTAG>]::[<montype>],[<thlev>],
[<locn>],[<dirn>],[<tmper>];

Example
SET-TH-T1:FACTORY:ST1-6-1:CTAG12::CVP,1000,NEND,,15-MIN;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<T1_PMAID>`	**Card access identifier**—ST1-(3–15)-(1–8) | DS3-(3–15)-(1–2) -(1–28)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<montype>`	**Monitoring type**—ESL | CSS-P | UASP | SAS-P | CVP | ESP | SESP

`where the values for the <montype> on ST1-based T1s are defined as:`

ESL	errored seconds - line
CVP	coding violations - path
ESP	errored seconds - path
SESP	severely errored seconds - path
CSS-P	controlled slips seconds - path
UASP	unavailable seconds - path
SAS-P	severely alarmed seconds - path

`where the values for the <montype> on DS3-based T1s are defined as:`

CVP	coding violations - path
ESP	errored seconds - path
SESP	severely errored seconds - path
CSS-P	controlled slips seconds - path
UASP	unavailable seconds - path
SAS-P	severely alarmed seconds - path

`<thlev>` **Threshold level**

`where the values for the <thlev> are defined as:`

0	disable threshold (initial setting)
10 digit integer	The actual numeric value of the threshold
DEFAULT	Value which sets threshold to factory default. See Table 26 for factory settings for PM threshold levels.

`<locn>` **Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end. (Only NEND is supported.)

`<dirn>` **Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)

`<tmper>` **Time period of monitoring**—1-DAY | 15-MIN

Table 26. Factory settings for PM threshold levels

PM Parameter	Interval	Factory setting	Maximum level
CVP and CVCP-P	15 minute	13,340	4,294,967,295
CVP and CVCP-P	1 day	133,400	4,294,967,295
ESL, ESP, and ESCP-P	15 minute	65	65,535
ESL, ESP, and ESCP-P	1 day	648	65,535
SESP and SESCP-P	15 minute	10	65,535
SESP and SESCP-P	1 day	100	65,535
CSS-P	15 minute	1	65,535
CSS-P	1 day	255	65,535
UAS-P and SAS-P	15 minute	10	65,535
UAS-P and SAS-P	1 day	100	65,535

Set T1 PM threshold response

The <rspblk> portion of the response to the **SET-TH-T1** command is shown in Figure 167.

Figure 167. Set T1 PM threshold response

```
Examples:
ST1
SET-TH-T1:FACTORY:ST1-6-1:CTAG12::CVL,1000,NEND,,15-MIN;

FACTORY 02-09-17 15:57:18
M  CTAG12 COMPLD

;
DS3
SET-TH-T1::DS3-3-1-1:::,DEFAULT,,,;


   FACTORY 02-10-29 16:02:26
M   COMPLD
;
```

Retrieve T1 PM threshold command

Use the **RTRV-TH-T1** command to to send the current threshold level for the specified T1 performance monitored (PM) parameter and interval.

Enter the **RTRV-TH-T1** command and the applicable parameters as shown in Figure 168.

Figure 168. Retrieve T1 PM threshold command

```
Syntax
RTRV-TH-T1:[<t1_PMAID>]:<AID>:[<CTAG>]::[<montype>],[<locn>],
[<tmper>];

Example
RTRV-TH-T1:FACTORY:ST1-6-1:CTAG1::ESL,NEND,15-MIN;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<T1_PMAID>	**Card access identifier**—ST1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28).
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<montype>	**Monitoring type**—ESL | CVP | ESP | SESP | CSS-P | UASP | SAS-P

where the values for the <montype> on ST1-based T1s are defined as:

ESL	errored seconds - line
CVP	coding violations - path

ESP	errored seconds - path
SESP	severely errored seconds - path
CSS-P	controlled slips seconds - path
UASP	unavailable seconds - path
SAS-P	severely alarmed seconds - path

`where the values for the <montype> on DS3-based T1s are defined as:`

CVP	coding violations - path
ESP	errored seconds - path
SESP	severely errored seconds - path
CSS-P	controlled slips seconds - path
UASP	unavailable seconds - path
SAS-P	severely alarmed seconds - path

`<dirn>` **Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)

`<tmper>` **Time period of monitoring**—1-DAY | 15-MIN

Retrieve T1 PM threshold response

The `<rspblk>` portion of the response to the **RTRV-TH-T1** command is shown in Figure 169.

Figure 169. Retrieve T1 PM threshold response

```
Examples
ST1
RTRV-TH-T1::ST1-5-1:::,,;


   FACTORY 02-11-03 08:57:06
M   COMPLD
   "ST1-5-1,T1:ESL,65,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:CVP,13340,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:ESP,65,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:SESP,10,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:SAS-P,10,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:CSS-P,1,,NEND,,15-MIN,11-03,08-45"
   "ST1-5-1,T1:UASP,10,,NEND,,15-MIN,11-03,08-45"
;

DS3
RTRV-TH-T1::DS3-3-1-1:::,,;


   FACTORY 02-11-03 08:56:56
M   COMPLD
   "DS3-3-1-1,T1:CVP,13340,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1-1,T1:ESP,65,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1-1,T1:SESP,10,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1-1,T1:SAS-P,10,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1-1,T1:CSS-P,1,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1-1,T1:UASP,10,NEND,RX,15-MIN,11-03,08-45"
;
```

Set T3 PM threshold command

Use the **SET-TH-T3** command to set the threshold level for a PM parameter on a T3 facility. When this threshold is met or exceeded, a threshold crossing alert (TCA) is generated. Setting the threshold for multiple parameters or intervals requires entering multiple **SET-TH-T3** commands.

Enter the **SET-TH-T3** command and the applicable parameters as shown in Figure 170.

Figure 170. Set T3 PM threshold command

```
Syntax
SET-TH-T3:[<TID>]:<t3_PMAID>:[<CTAG>]::[<montype>],[<thlev>],
[<locn>],[<dirn>],[<tmper>];

Example
SET-TH-T3:FACTORY:DS3-4-1:CTAG12::ESCP-P,100,,,15-MIN;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<T3_PMAID>`	**Card access identifier**— DS3-(3–15)-(1–2)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<montype>`	**Monitoring type—**ESP | SESP | UASP | CVP | CVCP-P | ESCP-P | SESCP-P

`where the values for the <montype> are defined as:`

ESP	errored seconds - path
SESP	severely errored seconds - path
UASP	unavailable seconds - path
CVP	coding violations -path
CVCP-P	coding violation - C-bit
ESCP-P	errored seconds - C-bit
SESCP-P	severely errored secs - C-bit

`<thlev>` **Threshold level**

`where the values for the <thlev> are defined as:`

0	disable threshold (initial setting)
10 digit integer	actual numeric value of the threshold
DEFAULT	Value which sets the threshold to factory default. See Table 26

`<locn>`	**Location**—of performance monitoring, where NEND indicates near end and FEND indicates far end. (Only NEND is supported.)
`<dirn>`	**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
`<tmper>`	**Time period of monitoring—**1-DAY | 15-MIN

Set T3 PM threshold response

The `<rspblk>` portion of the response to the **SET-TH-T3** command is shown in Figure 171.

Figure 171. Set T3 PM threshold response

```
Examples
SET-TH-T3:FACTORY:DS3-4-1:CTAG12::ESCP-P,100,,,15-MIN;

FACTORY 02-09-17 16:08:01
M  CTAG12 COMPLD

;

SET-TH-T3::DS3-3-1:::,DEFAULT,,,


   FACTORY 02-10-29 16:03:28
M   COMPLD
;
```

Retrieve T3 PM threshold command

Use the **RTRV-TH-T3** command to to send the current threshold level for the specified T1 performance monitored (PM) parameter and interval.

Enter the **RTRV-TH-T3** command and the applicable parameters as shown in Figure 172.

Figure 172. Retrieve T3 PM threshold command

```
Syntax
RTRV-TH-T3:[<TID>]:<t3_PMAID>:[<CTAG>]::[<montype>],[<dirn>],
[<tmper>];

Example
RTRV-TH-T3:FACTORY:DS3-4-1:CTAG1::ESCP-P,NEND,15-MIN;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<T3_PMAID>` **Card access identifier**— DS3-(3–15)-(1–2)

`<CTAG>` **Correlation tag**—See TL1 command, syntax, and format on page 89.

`<montype>` **Monitoring type—**ESP | SESP | SESP | UASP | CVP | CVCP-P | SESCP-P

`where the values for the <montype> are defined as:`

ESP	errored seconds - path
SESP	severely errored seconds - path

	UASP	unavailable seconds - path
	CVP	coding violations -path
	CVCP-P	coding violation - C-bit
	ESCP-P	errored seconds - C-bit
	SESCP-P	severely errored secs - C-bit
`<dirn>`		**Direction**—of monitored signal, where RX is receive and TX is transmit. (Not used.)
`<tmper>`		**Time period of monitoring**—1-DAY | 15-MIN

Retrieve T3 PM threshold response

The `<rspblk>` portion of the response to the **RTRV-TH-T3** command is shown in Figure 173.

Figure 173. Retrieve T3 PM threshold response

```
Example
RTRV-TH-T3::DS3-3-1:::,,;


   FACTORY 02-11-03 08:56:34
M   COMPLD
   "DS3-3-1,T3:ESP,65,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:SESP,10,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:ESCP-P,65,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:SESCP-P,10,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:UASP,10,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:CVP,13340,NEND,RX,15-MIN,11-03,08-45"
   "DS3-3-1,T3:CVCP-P,13340,NEND,RX,15-MIN,11-03,08-45"
;
```

Cross-connect commands

The cross-connect commands provide configuration and operation data for the TDM cross-connect (XCON,IXCON, DS3, DS3R, S155, or STS1) cards and the mapper (ST1, SE1, FXS, and FXO) cards.

If failures of either line or equipment occur in a facility (port) of the system, the system uses trunk conditioning patterns to report these failures to affected connections and equipment both within and outside of the system. Features of trunk conditioning implementation by the system are described in Create single line cross connection command on page 256.

Testing of any system E1, DS1, or DS0 connection can be performed using the MSU card and the protection bus, provided that at least one of the termination pointers (TP) is ST1- or SE1-based. System DS0 connections can also be tested without using the MSU card and the protection bus. Testing can consist of unintrusive monitoring of E1, DS1, or DS0 active connections and intrusive split of E1, DS1, or DS0 active connections. Details of the various types of active connection testing, including test descriptions and implementation of applicable TL1 commands and responses, are provided in Active connection testing on page 261.

DS0 cross-connect commands

The DS0 category of cross-connection commands cross-connects individual DS0 slots of ports on one mapper card to other slots on the same card or another card. You can set up cross connections between or within ST1, SE1, FXS, FXO, DS3, DS3R, S155, and STS1 cards.

When you create cross connections, the ARCADACS 100 generates the corresponding bus TPs that manage the data running over the backplane. The bus TPs are identified in the **retrieve DS0 cross connection** response.

Caution: If you see the following alarm while creating or deleting cross connections:
"<*CARD*>-<*SLOT*>:MJ,CPU_CARD_COMMUNICATION_PROBLEM,SA,
<DATE>,<TIME>,,:\"CPU_CARD_COMMUNICATION_PROBLEM\" "
it means that the card (identified by <*CARD*>-<*SLOT*>) is faulty in its communication with the CPU card. During off-peak hours, remove the faulty card and its protection card. Insert a new card and reinsert the protection card. (It is necessary to remove both cards in the pair so that they realign with the data in the CPU card.)

The DS0 cross-connect commands and responses are as follows:

- **Create DS0 termination pointer** command
- **Create DS0 termination pointer** response
- **Retrieve DS0 termination pointer** command
- **Retrieve DS0 termination pointer** response
- **Delete DS0 termination pointer** command
- **Create DS0 cross connection** command
- **Create DS0 cross connection** response
- **Retrieve DS0 cross connection** command
- **Retrieve DS0 cross connection** response
- **Delete DS0 cross connection** command
- **Create single line cross connection** command
- **Create single line cross connection** response
- **Retrieve single line cross connection** command
- **Retrieve single line cross connection** response
- **Delete single cross connection** command

- **Delete single cross connection** response

Create DS0 termination pointer command

To create a termination pointer (TP), enter the **ENT-TP** command and the applicable parameters as shown in Figure 174.

Note: When you set up voice and signaling (VSIG) cross connections, use the CNV=TXRX parameter to support the V.90 analog modem speeds. Ensure also that signaling conversion has been provisioned for the ST1 and DS3R cards (see Signaling conversion function on page 156) and that the IAD has been set to E&M or FXS-DN signaling.

Note: If you are provisioning a DS0 channel as an IP access route, use the TYPE=IP parameter. Once you have provisioned the TP, assign the TP to an IP route using the **ADD-IPRT** command (see page 107).

Caution: If you remove the CPU cards from the system, all TP information is lost.

Figure 174. Create DS0 termination pointer command

```
Syntax
ENT-TP:[<TID>]::[<CTAG>]:::FAC=<FACAID>,DS0=<CHNLAID>,<TPData>
[,<TPData>];

Examples
ENT-TP:::::FAC=ST1-8-1,DS0=3,TYPE=VSIG,TCABCD1=1111,TCABCD2=
1111,CNV=TXRX;
ENT-TP:::::FAC=DS3-10-2-20,DS0=6,TYPE=IP;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<FACAID>	**Facility access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | DS3-(3–15) | STS1-(3–15)-(1–2)-(1–28) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | FXS-(3–15)-1 | FXO-(3–15)-1 *Note: You must provision only the left-most DS3, DS3R, S155, or STS1card in each pair of cards. The provisioning is applied to both cards.*

`<CHNLAID>` **Channel access identifier—**
For ST1, DS3, STS1, S155 (OC3 or OC3C mode), FXS, and FXO
(1–24) [&&(1–24)](&(1–24)[&&(1–24)])
For SE1, and S155 (STM1 mode)
(1–32) [&&(1–32)](&(1–32)[&&(1–32)])
Note: For E1 facilities, channel 0 is always reserved for signaling and channel 16 is reserved when SIGMOD is set to CAS. OC3C is not supported in this release.

`<TPData>` **Termination pointer data**—See Table 27.

Table 27. Create DS0 TP command options

<FACAID>	<TPData>	Description
ST1-(3–15)-(1–8)	TYPE=(VOICE[1] | DATA | VSIG | IP)	VSIG is voice and signaling connection type. IP is a TP to be used in an IP access route.
	TCABCD1[2] =(0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	TCABCD2[2] =(0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	DTYPE[3] =(DIAG | NONE)	DTYPE is diagnostic termination pointer.
	LBCFG = (ON | OFF)	LBCFG is loopback configuration.
	CNV=(NONE | TX | RX | TXRX)	CNV is signaling conversion (for V.90 analog modems).
SE1-(3–15)-(1–8)	TYPE = (VOICE[1] | DATA | VSIG | IP)	VSIG is voice and signaling connection type. IP is a TP to be used in an IP access route.
	CNV = **NONE** | TXRX	CNV is conversion. TXRX enables E1 to T1 signal conversion. *Note: TXRX is not supported in this release.*
	DTYPE[3] = DIAG | **NONE**	DTYPE is diagnostic type.
	TCABCD1[2] = (0000 | 4 bits binary)	For VSIG connections only. Default is 0000.
	TCABCD2[2] = (0000 | 4 bits binary)	For VSIG connections only. Default is 0000.

Table 27. Create DS0 TP command options (continued)

<FACAID>	**<TPData>**	**Description**
DS3-(3–15)[-(1–2) [-(1–28)]]	TYPE = (VOICE[1] | DATA | VSIG | IP)	VSIG is voice and signaling connection type. IP is a TP to be used in an IP access route. Default is DATA.
	TCABCD1[2] = (0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	TCABCD2[2] = (0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	LBCFG=(ON | OFF)	LBCFG is loopback configuration.
	CNV=(NONE | TXRX)	For VSIG connections only, at the DS1 level. *Note: TXRX is required to support V.90 analog modem speeds.*
STS1-(3–15)-(1–2)-(1–28)	TYPE=(VOICE[1] | DATA | VSIG | IP)	VSIG is voice and signaling connection type. IP is a TP to be used in an IP access route. Default is DATA.
	TCABCD1=(0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	TCABCD2=(0000 | <4 bits binary>)	For VSIG connections only. Default is 0000.
	LBCFG=(ON | OFF)	LBCFG is loopback configuration.
S155-(3–15)-1-(1–*xx*) where *xx* is 63 in STM1 mode and 84 in OC3 or OC3C mode *Note: OC3C is not supported in this release.*	TYPE=(VOICE[1] | DATA | VSIG | IP)	VSIG is voice and signaling connection type. IP is a TP to be used in an IP access route. Default is DATA.
	TCABCD1[2] = (0000 | 4 bits binary)	For VSIG connections only. Default is 0000.
	TCABCD2[2] = (0000 | 4 bits binary)	For VSIG connections only. Default is 0000.
	LBCFG=(OFF | ON)	LBCFG is loopback configuration.
FXS-(3–15)-1	TYPE=(VOICE[1] | VSIG)	VSIG is voice and signaling. *Note: The recommended setting for FXS cards is VSIG.*
FXO-(3–15)-1	TYPE=(VOICE[1] | VSIG)	VSIG is voice and signaling. *Note: The recommended setting for FXO cards is VSIG.*

1. Use VSIG for voice signaling. The ARCADACS 100 extracts signaling bits on ingress and inserts signaling bits on egress for VSIG connections. The ARCADACS 100 does not insert signaling bits on egress for VOICE connections.
2. TCABCD1 and TCABCD2 provide trunk conditioning ABCD signaling bits for DS0 channels requiring trunk conditioning. TCABCD1 is sent for the initial 2.5 seconds of the trunk conditioning period, followed by TCABCD2 for the remainder of the trunk conditioning period.

3. For additional information on diagnostic termination pointers, see the DS0 testing sections under Active connection testing on page 261.

Create DS0 termination pointer response

The `<rspblk>` portion of the response to the **ENT-TP** command is shown in Figure 175. The <TPAID> field (termination pointer access identifier) is displayed as an integral value of up to six digits if a termination pointer has been created successfully.

Figure 175. Create DS0 termination pointer response

```
Syntax
"TPID=<TPAID>"+

Example
"TPID=000001"+
```

Retrieve DS0 termination pointer command

To retrieve one or more termination pointer (TP) parameters, enter the **RTRV-TP** command and the applicable parameters as shown in Figure 176.

Figure 176. Retrieve DS0 termination pointer command

```
Syntax
RTRV-TP:[<TID>]:(<RTRVTPAID>|ALL):[<CTAG>]:::[<TPTYPEAID>];

Examples
RTRV-TP::ALL::::;
RTRV-TP::ST1-8-1::::;
RTRV-TP::ALL:::IP;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<RTRVTPAID>`	**Termination pointer access identifier**—ST1-(3–15)-(1–8) | ST1-(3–15) | SE1-(3–15)-(1–8) | SE1-(3–15) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | DS3-(3–15) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | STS1-(3–15) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | FXS-(3–15)-1 | FXO-(3–15)-1 | TP-TPAID | CRS-CRSAID | ALL where TPAID is a 6-digit termination pointer identification number and CRSAID is a 6-digit cross-connection identification number
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<TPTYPEAID>`	**Termination pointer type access identifier**—STATIC | ALL | IP where the default setting is STATIC *Note: Use IP to retrieve all TPs being used in IP access routes.*

Retrieve DS0 termination pointer response

The <rspblk> portion of the response to the **RTRV-TP** command is shown in Figure 177.

Figure 177. Retrieve DS0 termination pointer response

```
Syntax
ST1
"<TPAID>:FAC=<FACAID>,MAP=BUS-(0-74),DS0=<CHNLAID>,TYPE=
(DATA|VOICE|VSIG),DTYPE=DIAG,[TCABCD1=(4 bits binary),TCABCD2=
(4 bits binary,CRS=<CRSAID>,GTP=<GTPAID>,]"+

SE1
"<TPAID>::FAC=<FACAID>,MAP=BUS-(0-74),DS0=<CHNLAID>,CNV=
(NONE|TXRX),TYPE=VSIG,DTYPE=(DIAG|NONE),TCABCD1=0000,TCABCD2=
0000"

DS3
"<TPAID>::FAC=<FACAID>,MAP=BUS-(75-131),DS0=<CHNLAID>,CNV=
(NONE|TXRX),TYPE=(DATA|VOICE|VSIG),DTYPE=(DIAG|NONE)[,TCABCD1=
(4 bits binary),TCABCD2=(4 bits binary),CRS=<CRSAID>,GTP=
<GTPAID>,LBCFG=(ON|OFF)]"+

S155, or STS1
"<TPAID>::FAC=<FACAID>,MAP=BUS-(75-131),DS0=<CHNLAID>,TYPE=
(DATA|VOICE|VSIG),DTYPE=(DIAG|NONE)[,TCABCD1=(4 bits binary),
TCABCD2=(4 bits binary),CRS=<CRSAID>,GTP=<GTPAID>,LBCFG=
(ON|OFF)]"+

ST1, DS3, or STS1, if type is IP
"<TPAID>::FAC=<FACAID>,DS0=<CHNLAID>,CRS=<CRSAID>,TYPE=IP"

FXS, FXO
"<TPAID>::FAC=<FACAID>,[MAP=BUS-(0-74),]DS0=<CHNLAID>,CNV=
(NONE|TXRX),CRS=<CRSAID>,TYPE=(VSIG|VOICE),TCABCD1=(4 bits
binary),TCABCD2=(4 bits binary)"

Examples
"TP=3::FAC=ST1-9-7,MAP=BUS-3,DS0=3,DTYPE=DIAG,TYPE=DATA,"+

"TP-1::FAC=FXS-6-1,MAP=BUS-1,DS0=1&&24,CNV=NONE,CRS=1,TYPE=
VSIG,TCABCD1=0000,TCABCD2=0000"

"TP-18::FAC=ST1-6-2,DS0=8,CRS=1,TYPE=IP"
```

The response parameters are as follows:

<TPAID>	**Termination pointer access identifier**—An identification number containing up to six digits, preceded by TP-

<FACAID>	**Facility access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8) | DS3-(3–15)-(1–2)-(1–28) | DS3-(3–15)-(1–2) | DS3-(3–15) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | STS1-(3–15) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | FXS-(3–15)-1 | FXO-(3–15)-1
<CHNLAID>	**Channel access identifier** **For ST1, DS3, STS1, S155 (OC3 or OC3C mode),, FXS, and FXO—** (1–24) [&&(1–24)](&(1–24)[&&(1–24)]) **For SE1, and S155 (STM1 mode)—** (1–32) [&&(1–32)](&(1–32)[&&(1–32)]) *Note: OC3C is not supported in this release.*
<CRSAID>	**Cross-connect access identifier**—An identification number containing up to six digits
<GTPAID>	**Group termination pointer access identifier**—An identification number containing up to six digits

Note: The TCABCD1 and TCABCD2 parameters provide trunk conditioning ABCD signaling bits for DS0 channels requiring trunk conditioning. They are only valid when TYPE=VSIG.

Note: The DTYPE=DIAG field only appears if the termination pointer has been designated as diagnostic in the **ENT-TP** command. See Create DS0 termination pointer command on page 247.

Delete DS0 termination pointer command

The DLT-TP command can be used to delete any TP that is not being used in a cross connection. To delete a TP, enter the **DLT-TP** command and the applicable parameters as shown in Figure 178.

Note: To delete a TP associated with an IP access route, you must use the **DLT-IPRT** command (see page 109).

Note: To delete TPs that are being used in a cross connection, use the **DLT-CRS-DS0** command (see page 256).

Figure 178. Delete DS0 termination pointer command

```
Syntax
DLT-TP:[<TID>]:<TPAID>:[<CTAG>];

Example
DLT-TP::TP-1:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<TPAID>`	**Termination pointer access identifier**—An identification number containing up to six digits, preceded by TP-
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Create DS0 cross connection command

To create a DS0 cross connection, enter the **ENT-CRS-DS0** command and the applicable parameters as shown in Figure 179. The cross connection must contain two termination pointers, which results in a point-to-point bidirectional connection.

Figure 179. Create DS0 cross connection command

```
Syntax
ENT-CRS-DS0:[<TID>]::[<CTAG>]:::TPLST=<TPAIDlist>,
TYPE=<TYPE>,[PST=IS,NAME=(string of up to 18 characters)]>;

Example
ENT-CRS-DS0:::::TPLST=1&2,TYPE=DATA,PST=IS,NAME=CUSTOMER1;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<TPAIDlist>`	**List of termination pointer identifiers**—Two TP numbers, separated by an ampersand—TPAID&TPAID
`<TYPE>`	**Type**—VOICE | DATA | VSIG *Note: Use VSIG for voice signaling. The ARCADACS 100 extracts signaling bits on ingress and inserts signaling bits on egress for VSIG connections. The ARCADACS 100 does not insert signaling bits on egress for VOICE connections.* *For FXS cross connections, VSIG is the recommended setting.*

> **Note:** NAME must start with an alphabetic character. It may contain alphabetic and numeric characters only.

Create DS0 cross connection response

The `<rspblk>` portion of the response to the **ENT-CRS-DS0** command is shown in Figure 180. The <CRSAID> field (cross-connection access identifier) is displayed as an integral value of up to six digits if a DS0 cross connection has been created successfully.

Figure 180. Create DS0 cross connection response

```
Syntax
"CRSID=<CRSAID>"+

Example
"CRSID=000001"+
```

Retrieve DS0 cross connection command

To retrieve (view) a DS0 cross connection and its current settings, enter the **RTRV-CRS-DS0** command and the applicable parameters as shown in Figure 181.

Figure 181. Retrieve DS0 cross connection command

```
Syntax
RTRV-CRS-DS0:[<TID>]:<RTRVCRSAID>:[<CTAG>];

Example
RTRV-CRS-DS0::CRS-1:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<RTRVCRSAID>`	**Retrieve cross-connection access identifier**—CRS-<CRSAID> | ALL | ST1-(3–15)-(1–8) | ST1-(3–15) | SE1-(3–15)-(1–8) | SE1-(3–15) | DS3-(3–15)- (1–2)-(1–28) | DS3-(3–15)-(1–2) | DS3-(3–15) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2) | STS1-(3–15) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1 | S155-(3–15) | FXS-(3–15)-1 | FXO-(3–15)-1 where <CRSAID> is the identification number of the cross-connect to be retrieved
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve DS0 cross connection response

The `<rspblk>` portion of the response to the **RTRV-CRS-DS0** command is shown in Figure 182.

Figure 182. Retrieve DS0 cross connection response

```
Syntax
ST1
"CRS-<CRSAID>:NAME=(up to 18 characters),TPLST=<TPAIDlist>,
[BUSTPLST=<TPAIDlist>,][BIDIRTP=<TPAID>,]TYPE=(VOICE|DATA|
VSIG),PST=(IS|OOS)"+

S155, DS3
"CRS-<CRSAID>:NAME=(up to 18 characters),TPLST=<TPAIDlist>,
[BUSTPLST=<TPAIDlist>,][BIDIRTP=<TPAID>,]TYPE=(VOICE|DATA|VSIG),
PST=(IS|OOSMT)"+

STS1
"CRS-<CRSAID>:NAME=(up to 18 characters),TPLST=<TPAIDlist>,
[BIDIRTP=<TPAID>,]TYPE=(VOICE|DATA|VSIG|NULL),PST=(IS|OOSMT)"+

FXS, FXO
"CRS-<CRSAID>:NAME=(up to 18 characters),TPLST=<TPAIDlist>,
[BUSTPLST=<TPAIDlist>,][BIDIRTP=<TPAID>,]TYPE=(VOICE|VSIG|NULL),
PST=(IS|OOS)"+

Example
"CRS-1:CONNECTION,TPLST=1&2,BUSTPLST=1&2,BIDIRTP=2,TYPE=DATA,
PST=IS"+
```

The response parameters are as follows:

`<CRSAID>`	**Cross-connection access identifier**—A number containing up to six digits
`<TPAIDlist>`	**List of termination pointer identifiers**—Two numbers of up to six digits separated by an ampersand—TPAID(&TPAID). Bus TPs are created by the system to manage the data running over the backplane.
`<TPAID>`	**Termination pointer access identifier**—An identification number containing up to six digits, preceded by TP-

Delete DS0 cross connection command

Deleting a DS0 cross connection detaches all associated termination pointers, along with the cross-connection identifier (<CRSAID>). By detaching, the termination pointers can then be reassigned and used for other cross connections. To delete a DS0 cross connection, enter the **DLT-CRS-DS0** command and the applicable parameters as shown in Figure 183.

Figure 183. Delete DS0 cross connection command

```
Syntax
DLT-CRS-DS0:[<TID>]:<CRSAID>:[<CTAG>];

Example
DLT-CRS-DS0::CRS-1:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CRSAID>	**Cross-connection access identifier**—An identification number containing up to six digits, preceded by CRS-
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Create single line cross connection command

To create a DS0 cross connection with a single line, enter the **ENT-CRS-T0** command with the applicable parameters as shown in Figure 184.

Figure 184. Create a single line cross connection command

```
Syntax
ENT-CRS-T0::<aidFROM>,<aidTO>::::TYPE=<crs_type>[,NAME=<crs_name>]
[,TC=<tc_pattern>];

Example
ENT-CRS-T0::ST1-3-6-1,ST1-3-6-2::::TYPE=VSIG,TC=11110000-11010110;
```

The command parameters are as follows:

<rate>	T0
<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<fromaid>	**From access identifier**
<toaid>	**To access identifier**
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

`<TYPE>`	**Type**—VOICE | DATA | VSIG *Note: Use VSIG for voice signaling. The ARCADACS 100 extracts signaling bits on ingress and inserts signaling bits on egress for VSIG connections. The* ARCADACS 100 *does not insert signaling bits on egress for VOICE connections.* *For FXS cross connections, VSIG is the recommended setting.*
`<tc_pattern>`	**Trunk Conditioning pattern**—For example, when **tc_pattern** is *ghijklmn-stuvwxyz* (where all values are either 0 or 1): *ghijklmn* is the FROM facility: *ghij* is TCABCD1, *klmn* is TCABCD2 *stuvwxyz* is the TO facility: *stuv* is TCABCD1, *wxyz* is TCABCD2 *Note: TC is only allowed on a VSIG cross-connect* *Default (if nothing is entered) will be all zeroes (00000000-00000000).*
`<crsname>`	Name of the cross-connect

Note: NAME must start with an alphabetic character. It may contain alphabetic and numeric characters only.

Create single line cross connect response

The `<rspblk>` portion of the response to the **ENT-CRS-T0** command is shown in Figure 185. .

Figure 185. Create a single line cross connection response

```
Syntax
ENT-CRS-T0::<aidFROM>,<aidTO>::::TYPE=<crs_type>[,NAME=<crs_name>]
[,TC=<tc_pattern>];

Example
ENT-CRS-T0::DS3-3-1-1-1,ST1-5-6-2::::TYPE=VSIG,TC=11110000-11010110

FACTORY 02-11-03 11:41:14
M   COMPLD
;
<RTRV-CRS-T0::DS3-3-1-1-1:;


   FACTORY 02-11-03 11:41:28
M   COMPLD
   "DS3-3-1-1-1,ST1-5-6-2,TYPE=VSIG,NAME=,TC=11110000-11010110"
;
```

Retrieve single line DS0 cross connection command

To retrieve (view) a DS0 cross connection and its current settings by entering a single command line, enter the **RTRV-CRS-T0** command and the applicable parameters as shown in Figure 186.

Figure 186. Retrieve single line DS0 cross connection command

```
Syntax
RTRV-CRS-<rate>:[<tid>]:<aid>:[<ctag>]:<head>:<size>;

Example
RTRV-CRS-T0::ST1-6-2-1&&ST1-6-2-24:;
```

The command parameters are as follows:

<rate>	T0
<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<AID>	**Access identifier**—card-slot-port-facility-DS0.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
<HEAD>	**Head**—Indicates the first DS0 in a multi-DS0-bundled cross-connect. Values: YES or NO.
<SIZE>	**Size**—Size of the bundle. 1 is used for single-DS0 cross-connects. Integers from 2 to 24 indicate the number of DS0s in the bundle.

Retrieve single line DS0 cross connection response

The <rspblk> portion of the response to the **RTRV-CRS-T0** command is shown in Figure 187.

Figure 187. Retrieve single line DS0 cross connection response

```
FACTORY 02-12-06 11:07:34
M   COMPLD
   "ST1-6-2-1,ST1-7-1-1,TYPE=DATA,NAME=UNDEFINED,HEAD=YES,SIZE=1"
   "ST1-6-2-2,ST1-7-1-2,TYPE=DATA,NAME=UNDEFINED,HEAD=YES,SIZE=1"

"ST1-6-2-3,ST1-7-1-3,TYPE=VSIG,NAME=UNDEFINED,TC=00000000-00000000
,HEAD=YES,SIZE=1"
"ST1-6-2-4,ST1-7-2-4,TYPE=VSIG,NAME=TESTCRS1,TC=01010101-01010101,
HEAD=YES,SIZE=4"
"ST1-6-2-5,ST1-7-2-5,TYPE=VSIG,NAME=UNDEFINED,TC=01010101-01010101
,HEAD=NO,SIZE=4"
"ST1-6-2-6,ST1-7-2-6,TYPE=VSIG,NAME=UNDEFINED,TC=01010101-01010101
,HEAD=NO,SIZE=4"
"ST1-6-2-7,ST1-7-2-7,TYPE=VSIG,NAME=UNDEFINED,TC=01010101-01010101
,HEAD=NO,SIZE=4"
;
```

Delete single line DS0 cross connection command

To delete a DS0 cross connection and its current settings by entering a single command line, enter the command and the applicable parameters as shown in Figure 188.

Figure 188. Delete single line DS0 cross connection command

```
Syntax
DLT-CRS-<rate>:[<tid>]:<fromaid>,<toaid>:[<ctag>];

Example
DLT-CRS-T0:FACTORY:ST1-6-1-1&&ST1-6-1-2,DS3-4-1-1-1&&DS3-4-1-1-2:
CTAG1;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<from aid>`	**From access identifier**
`<toaid>`	**To access identifier**
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Note: The AID has to match the complete range of the cross-connect about to be deleted with the **DLT-CRS-T0** command.

Delete single line cross connect response

The `<rspblk>` portion of the response to the **DLT-CRS-T0** command is shown in Figure 189.

Figure 189. Delete a single line cross connection response

```
Syntax
DLT-CRS-<rate>:[<tid>]:<fromaid>,<toaid>:[<ctag>];

Example
DLT-CRS-T0:FACTORY:ST1-6-1-1&&ST1-6-1-3,DS3-4-1-1-1&&DS3-4-1-1-3:
CTAG1;

   FACTORY 02-09-18 09:57:39
M  CTAG1 COMPLD
;
```

Trunk conditioning

Trunk conditioning consists of bit patterns or codes that are substituted for DS0 payloads and (sometimes) signaling bits in connections downstream of line failures into, or equipment failures within, the ARCADACS 100 system. The bit patterns of trunk conditioning depend upon the type of connection being affected. Table 28 shows the trunk conditioning bytes used for different types of failed connections.

Table 28. Payload bytes used for failed connections

Connection type	ST1 & SE1 card
Data	00011010 (hex 1A)
Voice	01111111 (hex 7F)
Voice and signaling (VSIG)	01111111 (hex 7F)

Note: Use VSIG for voice signaling. The ARCADACS 100 extracts signaling bits on ingress and inserts signaling bits on egress for VSIG connections. The ARCADACS 100 does not insert signaling bits on egress for VOICE connections.

Each of the three connection types also has ABCD1 and ABCD2 signaling bits, which you define using the **create DS0 termination pointer** command (see Create DS0 termination pointer command on page 247). ABCD1 signaling bits are transmitted for 2.5 seconds, allowing the receiving end to determine that trunk conditioning is occurring. ABCD2 signaling bits are transmitted for the remainder of the time that the line failure is present. If you do not provision the ABCD1 and ABCD2 signaling bits, the system uses a default value of 0000 for both parameters.

Note: The ABCD signaling bits are contained in the least significant byte of the applicable DS0s in frames 6, 12, 18, and 24 of the T1 structure.

Trunk conditioning is generated by the ARCADACS 100 system during any of the three primary failure modes, as follows:

- A T1 or E1 line input to an ST1, SE1, DS3, DS3R, S155, or STS1mapper card fails. Due to the failure, the mapper card with the failed line, as well other mapper cards of the system, may be affected because they carry DS0s cross-connected to the failed line and intended for routing out of the system. The original mapper card informs the CPU of the failure and the CPU then determines which destination termination pointers (TPs) on the mapper cards of the system are affected by the failure. After determining the affected TPs, the CPU sends the appropriate trunk conditioning management and control information to the affected cards enabling them to send applicable trunk conditioning bit patterns out on the affected DS0s.
- An ST1, SE1, DS3, DS3R, S155, or STS1 mapper card fails or is removed from the system, or both. Due to the failure, other mapper cards of the system may be affected because they carry DS0s cross-connected to the lines of the failed card and intended for

routing out of the system. In this case, the CPU detects the failure and then determines those destination termination pointers (TPs) on the mapper cards of the system affected by the failure. After determining the affected TPs, the CPU sends the appropriate trunk conditioning management and control information to the affected cards enabling them to send applicable trunk conditioning bit patterns out on the affected DS0s.

Note: When a working ST1, SE1, DS3, DS3R, S155, or STS1mapper card is being protected by a protection mapper card, the termination pointer slot identification for active traffic is not accurate. However, the CPU tracks switching of ports for all active traffic and, therefore, is able to send appropriate trunk conditioning information to the correct port if trunk conditioning is required for another failure affecting one or more of the protected ports.

- The working cross-connect (IXCON, XCON, DS3, DS3R, S155, or STS1) card fails or is removed from the system. When this failure occurs, all termination pointers of the system are affected. When the CPU detects the failure, it must provide appropriate trunk conditioning management and control information to all ST1, SE1, DS3, DS3R, S155, or STS1cards of the system because every operating port of the system must send out trunk conditioning bit patterns on all DS0s.

You control the trunk conditioning capability of the ARCADACS 100 system using the TL1 termination pointer commands and responses. See Create DS0 termination pointer command on page 247, Retrieve DS0 termination pointer command on page 250, and Retrieve DS0 termination pointer response on page 251.

Active connection testing

There are four types of testing on active connections that can be performed within the ARCADACS 100 system:

- Unintrusive (monitoring) testing of one or two line(s) from the same ST1 or SE1 mapper card
- Intrusive (split) testing of one or two line(s) from the same ST1 or SE1 mapper card
- Unintrusive (monitoring) testing of one or more (up to 32) DS0 channels within a DS1 or E1 line
- Intrusive (split) testing of one or more (up to 32) DS0 channels within a DS1 or E1 line

All four types of testing can be performed using the metallic service unit (MSU) card which has two physical test access ports on its front panel. See Metallic service unit card on page 61 for a description of the MSU card and its tests. However, only the DS1 tests require use of the MSU card; the DS0 test connection endpoints can be routed to working ST1 or SE1 mapper cards. The MSU card uses the protection bus to obtain its DS1 lines (and DS0 connections, when applicable) for testing. You select and control the various types of testing through TL1 commands and responses.

In DS0 testing, you may monitor the following types of cross-connections:

- DS3 or DS3R card to STS1, ST1, SE1, FXS, and FXO card
- ST1 card to STS1, ST1 (the same card or different cards), FXS, or FXO card
- SE1 card to STS1, ST1, FXS, and FXO card
- STS1 card to FXS and FXO card

Note: You cannot test a cross connection from DS3 to DS3, DS3R to DS3R, STS1 to STS1, FXS card to FXS, or FXO to FXO card.

The following sections provide brief descriptions of the four test types along with details of the applicable TL1 commands and responses.

Note: The only limitation to the number of DS1 and DS0 tests that you can perform simultaneously without the MSU card is the system limitation of 32 tests of any type at a time.

DS1 monitor testing

In DS1 monitor testing, you can unintrusively monitor an entire line from an ST1 or SE1 mapper card using the MSU card.

To perform DS1 monitor testing, the process is as follows:

1. On the mapper card to be tested, send the traffic to the protection card using manual or forced protection switching (see Switch-to-protection command on page 219).

2. Set up the test (see Create DS1 MSU test command on page 264).

   After all eight lines from the mapper card are running on the protection bus, the MSU card switches the selected line to the TA1 or TA2 connector on the MSU card for monitoring purposes.

3. Connect the monitoring equipment to the TA1 or TA2 connector on the MSU card and perform the tests.

4. To set up a second DS1 test on the remaining MSU card connector, repeat the first three steps.

   Note: The two tests must be conducted on different ports of the same mapper card (different lines of the protection bus) and on different MSU card connectors.

5. To confirm the test status or stop the test, see the following commands:

   – Retrieve DS1 MSU test command on page 265

– Create DS1 MSU test command on page 264

6. When the testing is complete, switch the traffic from the protection card back to the working card (see Switch-to-working command on page 219).

> **Note:** If manual rather than forced protection switching was initially performed to transfer the traffic to the protection bus, an auto protection switch can occur. In this case, the monitor testing continues, regardless of which new line is switched to the designated port(s). Alarm generation for protection switching informs you of this occurrence.

DS1 split testing

In DS1 split testing, you can also monitor a single line from an ST1 or SE1 mapper card using the MSU card. Only the line to be tested is switched to the protection bus.

To perform DS1 split testing, the process is as follows:

1. Set up the test and select the line to be tested (see Create DS1 MSU test command on page 264).

   After the designated line is on the protection bus, the MSU card switches the line to the TA1 or TA2 connector on the MSU card. The line can then be used for termination, monitoring, or generation of downstream traffic back to the designated port on the protection bus. Normal traffic is interrupted on the designated line but the remaining seven lines of the selected mapper card are unaffected.

2. Connect the monitoring or testing equipment to the TA1 or TA2 (or both) connector on the MSU card and perform the tests.

3. To set up a second DS1 test on the remaining MSU card connector, repeat the first two steps.

   > **Note:** The two tests must be conducted on different ports of the same mapper card (different lines of the protection bus) and on different MSU card connectors.

   When two DS1 tests are running, normal traffic is interrupted on both designated lines but the remaining six lines of the selected mapper card are unaffected.

4. To confirm the test status or stop the test, see the following commands:
   – Retrieve DS1 MSU test command on page 265
   – Create DS1 MSU test command on page 264

If a failure occurs requiring any type of equipment protection switching during DS1 split testing, the split testing is **automatically preempted**, the applicable split testing software backed out (overridden), and the protection switching executed. See Equipment protection switching for mapper cards on page 214.

Note: If the failure is repaired and the protection switch reverts back, the MSU test recovers when it is given back the protection bus. In other words, the split testing is automatically preempted, and if the protection bus goes idle it grabs the bus and resumes testing.

DS1 testing commands and responses

The DS1 testing commands and responses are listed and described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Create DS1 MSU test** command
- **Retrieve DS1 MSU test** command
- **Retrieve DS1 MSU test** response

Create DS1 MSU test command

To create a DS1 MSU test, enter the **SET-MSU** command and the applicable parameters as shown in Figure 190. The **SET-MSU** command can select a monitor or split test type on a T1 or E1 line, along with the MSU front-panel test access connector to be used. Setting TYPE=OFF in the command deletes the subject test and, in the case of split testing, switches the subject DS1 from the protection bus back to its mapper card.

Figure 190. Create DS1 MSU test command

```
Syntax
SET-MSU:[<TID>]:<PORTAID>:[<CTAG>]:::TYPE=MONITOR|SPLIT|OFF,
MSU-PORT=1|2;

Example
SET-MSU::ST1-7-6::::TYPE=MONITOR,MSU-PORT=1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<PORTAID>	**Cross-connect port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

TYPE **Type of DS1 or E1 test selected**—MONITOR is unintrusive monitor test, SPLIT is intrusive split test, and OFF is delete test.

Retrieve DS1 MSU test command

To retrieve (view) a current DS1 or E1 test and its characteristics, enter the **RTRV-MSU** command and the applicable parameters as shown in Figure 191.

Figure 191. Retrieve DS1 MSU test command

```
Syntax
RTRV-MSU:[<TID>]:ALL:[<CTAG>];

Example
RTRV-MSU::ALL:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve DS1 MSU test response

The <rspblk> portion of the response to the **RTRV-MSU** command is shown in Figure 192.

Figure 192. Retrieve DS1 MSU test response

```
Syntax
"PORT=<PORTAID>,TYPE=MONITOR|SPLIT,MSU-PORT=1|2,
STATE=IS|IOMISSING|MSUMISSING|MSUININCORRECTSLOT"+

Example
"PORT=ST1-9-7,TYPE=SPLIT,MSU-PORT=1,STATE=IS"+
```

The response parameters are as follows:

<PORTAID>	**Cross-connect port access identifier**—ST1-(3–15)-(1–8) | SE1-(3–15)-(1–8)
TYPE	**Type of DS1 test selected**—MONITOR is unintrusive DS1 monitor test and SPLIT is intrusive DS1 split test.

DS0 monitor testing with MSU card

In DS0 monitor testing with MSU card, you can unintrusively monitor cross connections on the DS0 channels using the MSU card.

To perform DS0 monitor testing on an existing point-to-point cross connection at the MSU card, the process is as follows:

1. Create two special diagnostic termination pointers for the existing cross-connection end points to be connected to ports of other working ST1 or SE1 mapper cards (see Create DS0 termination pointer command on page 247).

   Note: The diagnostic termination pointers must have the same number of channels and be the same type as the existing cross-connection termination pointers.
   ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use two ports of an ST1 card.
   SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use two ports of an SE1 card.

2. Create the test cross connection (see Create DS0 split or monitor connection command on page 271).

   Note: ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use both connectors on the MSU card.
   SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use both connectors on the MSU card.

   The diagnostic termination pointers on the protection mapper card are connected to the end points of the existing cross connection and routed along the protection bus to the MSU card. In the MSU card, the connected termination pointers are switched through the relay array to the selected front-panel test access connector (or connectors) for unintrusive monitoring purposes.

   Note: When the DS0 monitor connection is preempted by the **create DS0 split or monitor connection** command, the original cross connection is restored.

3. Connect the monitoring equipment to the TA1 or TA2 (or both) connector on the MSU card and perform the tests.

4. If the first DS0 split test uses only one connector on the MSU, you can repeat the first three steps to set up a second DS0 test on another existing cross connection at the same time.

   If a failure occurs requiring any type of equipment protection switching during DS0 monitor testing, the monitor testing is automatically preempted, the applicable DS0 monitor testing software backed out (overridden), and the protection switching executed. See Equipment protection switching for mapper cards on page 214.

Note: If the failure is repaired and the protection switch reverts back, the MSU test recovers when it is given back the protection bus. In other words, the split testing is automatically preempted, and if the protection bus goes idle it grabs the bus and resumes testing.

5. Use the following commands to view and delete the diagnostic termination pointers as needed:
   - Retrieve DS0 termination pointer command on page 250
   - Delete DS0 termination pointer command on page 252
6. Use the following commands to view the test status and stop the test as needed:
   - Retrieve DS0 split or monitor connection command on page 272
   - Create DS0 split or monitor connection command on page 271

DS0 monitor testing without MSU card

In DS0 monitor testing without MSU card, you can unintrusively monitor cross connections on the DS0 channels using other system T1 or E1 lines.

To perform DS0 monitor testing on an existing point-to-point cross connection at system T1 or E1, the process is as follows:

1. Create two special diagnostic termination pointers for the existing cross-connection end points to be connected to ports of other working ST1 or SE1 mapper cards (see Create DS0 termination pointer command on page 247).

   Note: The diagnostic termination pointers must have the same number of channels and be the same type as the existing cross-connection termination pointers.
   ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use two ports of an ST1 card.
   SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use two ports of an SE1 card.

2. Create the test cross connection (see Create DS0 split or monitor connection command on page 271).

   The diagnostic termination pointers created on the diagnostic ST1 or SE1 mapper card(s) are connected to the end points of the existing cross connection (at working ST1 or SE1 mapper cards) and routed to their T1 or E1 destinations where they provide the unintrusive diagnostic monitoring connections.

Note: When the DS0 split connection is preempted by the **create DS0 split or monitor connection** command, the original cross connection is restored.

3. Use the following commands to view and delete the diagnostic termination pointers as needed:
   - Retrieve DS0 termination pointer command on page 250
   - Delete DS0 termination pointer command on page 252

4. Use the following commands to view the test status and stop the test as needed:
   - Retrieve DS0 split or monitor connection command on page 272
   - Create DS0 split or monitor connection command on page 271

DS0 split testing with MSU card

In DS0 split testing with MSU card, you can intrusively break an existing cross connection on the DS0 and replace it with two new connections, each using one of the original cross-connection end points and a port on the protection ST1 or SE1 mapper card. You can then use the MSU card to connect external test equipment for traffic monitoring or generation on either end of the original cross connection.

To perform DS0 split testing on an existing point-to-point cross connection at the MSU card, the process is as follows:

1. Create two special diagnostic termination pointers for the existing cross-connection end points to be connected to ports of other working ST1 or SE1 mapper cards (see Create DS0 termination pointer command on page 247).

Note: The diagnostic termination pointers must have the same number of channels and be the same type as the existing cross-connection termination pointers.
ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use two ports of an ST1 card.
SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use two ports of an SE1 card.

2. Create the DS0 split cross connection (see Create DS0 split or monitor connection command on page 271).

Note: ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use both connectors on the MSU card.
SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use both connectors on the MSU card.

The diagnostic termination pointers on the protection mapper card are connected to the end points of the original cross connection and routed along the protection bus to the MSU card. In the MSU card, the connected termination pointers are switched through the relay array to the selected front-panel test access connector (or connectors) for intrusive monitoring and testing purposes.

Note: When the DS0 split connection is preempted by the **create DS0 split or monitor connection** command, the original cross connection is restored.

3. Connect the monitoring equipment to the TA1 or TA2 (or both) connector on the MSU card and perform the tests.

4. If the first DS0 split test uses only one connector on the MSU, you can repeat the first three steps to set up a second DS0 test on another existing cross connection at the same time.

   If a failure occurs requiring any type of equipment protection switching during DS0 split testing, the split testing is automatically preempted, the applicable DS0 split testing software backed out (overridden), and the protection switching executed. See Equipment protection switching for mapper cards on page 214.

Note: If the failure is repaired and the protection switch reverts back, the MSU test recovers when it is given back the protection bus. In other words, the split testing is automatically preempted, and if the protection bus goes idle it grabs the bus and resumes testing.

5. Use the following commands to view and delete the diagnostic termination pointers as needed:
   - Retrieve DS0 termination pointer command on page 250
   - Delete DS0 termination pointer command on page 252

6. Use the following commands to view the test status and stop the test as needed:
   - Retrieve DS0 split or monitor connection command on page 272
   - Create DS0 split or monitor connection command on page 271

DS0 split testing without MSU card

In DS0 split testing without MSU card, you can intrusively break an existing cross connection on the DS0 and replace it with two new connections. Each new connection uses one of the original cross-connection end points and a port of another working ST1 or SE1 mapper card, as applicable.

To perform DS0 split testing on an existing point-to-point cross connection at system T1 or E1, the process is as follows:

1. Create two special diagnostic termination pointers for the existing cross-connection end points to be connected to ports of other working ST1 or SE1 mapper cards (see Create DS0 termination pointer command on page 247).

> **Note:** The diagnostic termination pointers must have the same number of channels and be the same type as the existing cross-connection termination pointers.
> **ST1 cards**—If the diagnostic TPs have more than 12 DS0 channels each, use two ports of an ST1 card.
> **SE1 cards**—If the diagnostic TPs have more than 15 DS0 channels each, use two ports of an SE1 card.

2. Create the test cross connection (see Create DS0 split or monitor connection command on page 271).

   The diagnostic termination pointers created on the ST1 or SE1 mapper card(s) are connected to the end points of the existing cross connection and routed to their T1 or E1 destinations where they provide the intrusive diagnostic monitoring and testing connections.

> **Note:** When the DS0 split connection is preempted by the **create DS0 split or monitor connection** command, the original cross connection is restored.

3. Use the following commands to view and delete the diagnostic termination pointers as needed:
   – Retrieve DS0 termination pointer command on page 250
   – Delete DS0 termination pointer command on page 252

4. Use the following commands to view the test status and stop the test as needed:
   – Retrieve DS0 split or monitor connection command on page 272
   – Create DS0 split or monitor connection command on page 271

DS0 testing commands and responses

The DS0 testing commands and responses appear in the following list. Some of the commands have already been described in other sections and are referenced. Other commands are described in the following sections. In cases where the response to a command is not listed and described, that response is assumed to be a TL1 normal response as described in TL1 normal response syntax and format on page 90.

- **Create DS0 termination pointer** command (see page 247)
- **Create DS0 termination pointer** response (see page 250)
- **Retrieve DS0 termination pointer** command (see page 250)
- **Retrieve DS0 termination pointer** response (see page 251)

- **Delete DS0 termination pointer** command (see page 252)
- **Create DS0 split or monitor connection** command
- **Create DS0 split or monitor connection** response
- **Retrieve DS0 split or monitor connection** command
- **Retrieve DS0 split or monitor connection** response

Create DS0 split or monitor connection command

To create a DS0 split or monitor connection, enter the **ED-CRS-DS0-DIAG** command and the applicable parameters as shown in Figure 193. You can select the existing cross connection to be tested, the test type, the diagnostic termination pointers to be used, and the MSU front-panel test access connector to be used, if any. Setting TYPE=OFF in the command deletes the subject test and restores the original cross connection.

Note: The diagnostic termination pointers must have the same number of channels and be the same type as the existing cross-connection termination pointers.
ST1 cards—If the diagnostic TPs have more than 12 DS0 channels each, use both connectors on the MSU card.
SE1 cards—If the diagnostic TPs have more than 15 DS0 channels each, use both connectors on the MSU card.

Figure 193. Create DS0 setting or monitor connection command

```
Syntax
ED-CRS-DS0-DIAG:[<TID>]:<CRSAID>:[<CTAG>]:::
TYPE=MONITOR|SPLIT|OFF,PRI-DIAG=<TPAID>,BIDIR-DIAG=<TPAID>,
MSU-PORT=1|2|1&2;

Example
ED-CRS-DS0-DIAG::CRS-1::::TYPE=MONITOR,PRI-DIAG=TP-3,BIDIR-DIAG=TP
-4,MSU-PORT=1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CRSAID>	**Cross-connection access identifier**—A number containing up to six digits, preceded by CRS-
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.
TYPE	**Type of DS0 test**—MONITOR is unintrusive DS0 monitor test, SPLIT is intrusive DS0 split test, and OFF is delete DS0 test. *Note: SPLIT is not available in this release.*
<TPAID>	**Termination pointer access identifier**—A number containing up to six digits, preceded by TP-

Note: If you are not using the MSU card for the test, leave the MSU-PORT parameter out of the command.

Retrieve DS0 split or monitor connection command

To retrieve (view) the test settings for a DS0 split or monitor connection, enter the **RTRV-CRS-DS0-DIAG** command and the applicable parameters as shown in Figure 194.

Figure 194. Retrieve DS0 setting or monitor connection command

```
Syntax
RTRV-CRS-DS0-DIAG:[<TID>]:ALL:[<CTAG>];

Example
RTRV-CRS-DS0-DIAG::ALL:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve DS0 split or monitor connection response

The `<rspblk>` portion of the response to the **RTRV-CRS-DS0-DIAG** command is shown in Figure 195.

Figure 195. Retrieve DS0 split or monitor connection response

```
Syntax
"<CRSAID>:TYPE=MONITOR|SPLIT,PRI-DIAG=<TPAID>,
BIDIR-DIAG=<TPAID>,MSU-PORT=1|2|1&2,
STATE=IS|IO MISSING|MSU MISSING|MSUININCORRECTSLOT"+

Example
"CRS-1:TYPE=SPLIT,PRI-DIAG=TP-4,BIDIR-DIAG=TP-3,MSU-PORT=1&2,
STATE=IS"+
```

The response parameters are as follows:

`<CRSAID>`	**Cross-connection access identifier**—A number containing up to six digits, preceded by CRS-
`<TPAID>`	**Termination pointer access identifier**—TP-TPID where TPID is a number containing up to six digits, preceded by TP-

Alarm and log commands

The alarm and alarm log commands permit configuration and maintenance of the ARCADACS 100 system alarms, alarm specifics, and alarm history. Alarm history is provided for all cards in the system and can be configured as desired. The alarm and alarm history structures of the system enable efficient diagnostic testing and troubleshooting of system components. See System Diagnostics and Testing on page 299. The alarm and log command structure supports SNMP monitoring, alarm retrieval, alarm log (history) retrieval, and alarm log (history) clearing.

SNMP monitoring commands

An SNMP agent in the ARCADACS 100 system software allows passive and remote management of ARCADACS 100 alarms on up to four SNMP management stations. You identify the SNMP management stations to the ARCADACS 100 system by specifying the IP address of each station. You can also provision separate SNMP and trap ports for each of the four IP addresses.

Edit management IP list command

To specify the IP address of an SNMP management station, enter the **ED-MGMTIPLIST** command and the applicable parameters as shown in Figure 196.

Figure 196. Edit management IP list command

```
Syntax
ED-MGMTIPLIST:::::(IPADDR1=<IPaddress>|IPADDR2=<IPaddress>|
IPADDR3=<IPaddress>|IPADDR4=<IPaddress>)[,(SNMPPORT1=<integer>|
SNMPPORT2=<integer>|SNMPPORT3=<integer>|SNMPPORT4=<integer>),
(TRAPPORT1=<integer>|TRAPPORT2=<integer>|TRAPPORT3=<integer>|
TRAPPORT4=<integer>)];

Examples
ED-MGMTIPLIST:::::IPADDR1=199.190.212.4,SNMPPORT1=161,
TRAPPORT1=162;
```

The command parameters are as follows:

`<IPaddress>`	IP address of the SNMP monitoring station
`<integer>`	Any number that is available for use as a port

Note: To clear the values for one or more management stations, set the IP address, SNMP port, and trap port parameters to zero.

Retrieve management IP list command

To retrieve (view) a list of the IP addresses provisioned for SNMP monitoring stations, enter the **RTRV-MGMTIPLIST** command and the applicable parameters as shown in Figure 197.

Figure 197. Retrieve management IP list command

```
Syntax
RTRV-MGMTIPLIST:[<TID>]::[<CTAG>];

Example
RTRV-MGMTIPLIST:::;
```

Retrieve management IP list response

The `<rspblk>` portion of the response to the **RTRV-MGMTIPLIST** command is shown in Figure 198..

Figure 198. Retrieve management IP list response

```
Syntax
"IPADDR1=<IPaddress>,IPADDR2=<IPaddress>,IPADDR3=<IPaddress>,
IPADDR4=<IPaddress>,SNMPPORT1=<integer>,SNMPPORT2=<integer>,
SNMPPORT3=<integer>,SNMPPORT4=<integer>,TRAPPORT1=<integer>,
TRAPPORT2=<integer>,TRAPPORT3=<integer>,TRAPPORT4=<integer>"

Example
"IPADDR1=199.73.211.5,IPADDR2=199.73.211.9,IPADDR3=199.73.211.15,
IPADDR4=199.73.211.20,SNMPPORT1=161,SNMPPORT2=167,SNMPPORT3=102,
SNMPPORT4=212,TRAPPORT1=162,TRAPPORT2=168,TRAPPORT3=103,
TRAPPORT4=213"
```

The response parameters are as follows:

`<IPaddress>`	IP address of the SNMP monitoring station
`<integer>`	Port number for the SNMP and TRAP data

SNMP data access commands

To control access to the SNMP data in the ARCADACS 100 system, you can define up to ten community strings. Each community string specifies a type of access and the IP addresses of up to five devices that can use the community string to access the system.

Create community string command

To create a community string, enter the **ENT-COMMUNITY-STR** command and the applicable parameters as shown in Figure 199.

Figure 199. Create community string command

```
Syntax
ENT-COMMUNITY-STR::COMID-<ID>::::COMNAME=<string>,ACCESS=
<COMaccess>,IP=<IPaddr>;

Example
ENT-COMMUNITY-STR::COMID-1::::COMNAME=ZHONE_1,ACCESS=READONLY,IP=
199.17.87.5;
```

Note: All three parameters—COMNAME, ACCESS, and IP—are required in the **ENT-COMMUNITY-STR** command.

The command parameters are as follows:

<ID>	**Community string identifier**—Integer from 1 to 10, maximum of ten per system
<string>	**Community string name**—Up to 32 characters
<COMaccess>	**Access level**—Values are as follows: • **READONLY**—Read access to all fields in the shelf except administration areas such as community names • **READWRITE**—Read and write access to all fields in the shelf except administration areas such as community names • **NOACCESS**—No access to the shelf • **ADMIN**—Read and write access to all fields in the shelf including administration areas such as community names
<IPaddr>	**IP address**—in the format *x.x.x.x*, where *x* is between 0 and 255

Retrieve community string command

To view one or all community strings for the system, enter the **RTRV-COMMUNITY-STR** command and the applicable parameters as shown in Figure 200.

Figure 200. Retrieve community string command

```
Syntax
RTRV-COMMUNITY-STR::(COMID-<ID>|ALL):;

Examples
RTRV-COMMUNITY-STR::COMID-1:;
RTRV-COMMUNITY-STR::ALL:;
```

Retrieve community string response

The `<rspblk>` portion of the response to the **RTRV-COMMUNITY-STR** command is shown in Figure 201.

Figure 201. Retrieve community string response

```
Syntax
"COMID-(1 to 10):COMNAME=<string>,ACCESS=(READONLY|READWRITE,
NOACCESS|ADMIN),IPADDR1=<IPaddr>[,IPADDR2=<IPaddr>,IPADDR3=
<IPaddr>,IPADDR4=<IPaddr>,IPADDR5=<IPaddr>]"

Example
"COMID-1:COMNAME=ZHONE_1,ACCESS=READONLY,IPADDR1=199.17.87.5"
```

The response parameters are as follows:

`<string>`	**Community string name**—Up to 32 characters
`<IPaddr>`	**IP address**—in the format *x.x.x.x*, where *x* is between 0 and 255

Edit community string command

To change a parameter or add an IP address in a community string, enter the **ED-COMMUNITY-STR** command and the applicable parameters as shown in Figure 202.

Figure 202. Edit community string command

```
Syntax
ED-COMMUNITY-STR::COMID-<ID>::::[COMNAME=<string>,][ACCESS=
<COMaccess>,][IP=<IPaddr>][,INDEX=(1 to 5)];

Examples
ED-COMMUNITY-STR::COMID-1::::COMNAME=ARCADACS100_1;
ED-COMMUNITY-STR::COMID-1::::IP=199.17.87.12;
```

Note: You must have at least one of these parameters: COMNAME, ACCESS, or IP. When you specify IP by itself, the system adds the IP address to the community string. When you specify IP and INDEX, the system replaces the IP address that is identified by INDEX (up to five IP addresses per community string).

The command parameters are as follows:

`<ID>`	**Community string identifier**—Integer from 1 to 10
`<string>`	**Community string name**—Up to 32 characters
`<COMaccess>`	**Access level**—READONLY | READWRITE | NOACCESS | ADMIN

`<IPaddr>`	**IP address**—in the format *x.x.x.x*, where *x* is between 0 and 255; maximum of five per community string

Delete community string command

To remove a community string from the system, enter the **DLT-COMMUNITY-STR** command and the applicable parameters as shown in Figure 202.

Note: You must delete one community string at a time. You cannot specify ALL in this command.

Figure 203. Delete community string command

```
Syntax
DLT-COMMUNITY-STR::COMID-<ID>::;

Example
DLT-COMMUNITY-STR::COMID-1:;
```

The command parameters are as follows:

`<ID>`	**Community string identifier**—Integer from 1 to 10
`<string>`	**Community string name**—Up to 32 characters
`<COMaccess>`	**Access level**—READONLY | READWRITE | NOACCESS | ADMIN
`<IPaddr>`	**IP address**—in the format *x.x.x.x*, where *x* is between 0 and 255; maximum of five per community string

Edit SNMP trap version command

You can select the version of SNMP trap to be sent to the SNMP monitoring stations. The ARCADACS 100 uses two versions of SNMP traps:

- **PROP**—Proprietary version generates a trap for every alarm sent to the TL1, with the alarm message encapsulated in the trap.
- **STAN**—Standard version generates a standard SNMP trap with XEL MIBs, which can be decoded by an SNMP browser.

You can request PROP, STAN, or PROPSTAN traps. To select the trap version, enter the **ED-SNMPTRAP-VER** command and the applicable parameters as shown in Figure 204.

Figure 204. Edit SNMP trap version command

```
Syntax
ED-SNMPTRAP-VER:::::VERSION=<TRAPdata>;

Example
ED-SNMPTRAP-VER:::::VERSION=PROP;
```

The command parameter is as follows:

`<TRAPdata>`	**Version of SNMP trap**—PROP | STAN | PROPSTAN *Note: PROPSTAN is the default value.*

Retrieve SNMP trap version command

To check which version of SNMP traps the ARCADACS 100 is using, enter the **RTRV-SNMPTRAP-VER** command and the applicable parameters as shown in Figure 205.

Figure 205. Retrieve SNMP trap version command

```
Syntax
RTRV-SNMPTRAP-VER:[<tid>]::[<ctag>];

Example
RTRV-SNMPTRAP-VER:FACTORY::CTAG1;
```

Retrieve SNMP trap version response

The `<rspblk>` portion of the response to the **RTRV-SNMPTRAP-VER** command is as shown in Figure 206.

Figure 206. Retrieve SNMP trap version response

```
Syntax
"SNMPTRAP_VER::VERSION=<TRAPdata>"

Example
"SNMPTRAP_VER::VERSION=PROPSTAN"
```

The command parameter is as follows:

`<TRAPdata>`	**Version of SNMP trap**—PROP | STAN | PROPSTAN

SNMP variable commands

There is one command that allows you to modify SNMP variables within the TL1 environment.

Edit SNMP variable command

You can modify the SNMP variables SysName, SysLocation, and SysContact using a TL1 command. To edit an SNMP variable, enter the **ED_SNMPDATA** command and the applicable parameters as shown in Figure 207. The maximum character length supported is 24.

Figure 207. Edit SNMP variable command

```
Syntax
ED-SNMPDATA:::::SYSNAME="<name>",SYSLOCATION="<location>",
SYSCONTACT="<name>";

Example
ED-SNMPDATA:::::SYSNAME="HSPEED",SYSLOCATION="CENTRAL",
SYSCONTACT="JHIGGINS";
```

Alarm retrieval

In the system, all system alarms are stored in an alarm log. The following commands can be used to view alarms:

- **Retrieve alarms** command
- **Retrieve all alarms** command
- **Retrieve T1 alarms** command
- **Retrieve T3 alarms** command

You can view all alarms for the system or only the alarms for a specific card, using a single command. That command is the **retrieve alarm** command followed by its associated response.

Note: If any new alarms occur while you are viewing the alarm log, they will not appear in the log until you reissue the **retrieve alarm** command. They will appear, however, as regular autonomous messages.

Retrieve alarms command

To retrieve (view) the system alarms for a specific card or for the entire system, enter the **RTRV-ALM** command and the applicable parameters as shown in Figure 208.

Figure 208. Retrieve alarms command

```
Syntax
RTRV-ALM:[<TID>]:<ALMAID>:[<CTAG>];

Examples
RTRV-ALM::ST1-9:;
RTRV-ALM::ALL:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<ALMAID>	**Alarm access identifier**—CPU-(1–2) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15) | FXS-(3–15) | FXO-(3–15) | XCON-(3–15) | IXCON-(3–15) | ALL *Note: Specify the left-most card in each pair of CPU, IXCON, DS3, DS3R, S155, or STS1 cards to get facility alarms.*
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve alarms response

The <rspblk> portion of the response to the **RTRV-ALM** command is shown in Figure 209.

Note: If you detect a mismatch between the card state and alarm state for ST1 or SE1 cards, the alarm state is always correct.

Figure 209. Retrieve alarms response

```
Syntax
CPU, ST1, SE1, XCON, IXCON
“[<ATAG>,]<ALMAID>,<AIDTYPE>:<SEVERITY>,<CONDTYPE>,<SRVEFF>,
<SYSTIME>,,[“MASK”]:”+

DS3, STS1, S155
“<ALMAID>:<SEVERITY>:<CONDTYPE>,<SRVEFF>,<SYSTIME>,,
[“MASK”]:”+

FXS, FXO
“<ALMAID>,<AIDTYPE>:<SEVERITY>,<CONDTYPE>,<SRVEFF>,<SYSTIME>,,
[“MASK”]”+
```

Figure 209. Retrieve alarms response

```
Examples
"ST1-9,SYS:MJ,PROGFLT,SA,1998-12-29,10-15-44,,"":"+
"FXS-8,EQPT:MJ,RINGER_MISSING,SA,2001-02-05,17-44-42,,:"
```

The response parameters are as follows:

<ATAG>	**Autonomous message tag**—an identification tag of up to six digits. Not used in this release.
<ALMAID>	**Alarm access identifier**—CPU-(1–2) | ST1-(3–15) | SE1-(3–15) | DS3-(3–15)-(1–2) | DS3-(3–15) | STS1-(3–15)-(1–2)-(1–28) | STS1-(3–15)-(1–2)-(VT1–VT28) | STS1-(3–15)-(1–2) | STS1-(3–15) | S155-(3–15)-1-(1–63) | S155-(3–15)-1-(1–84) | S155-(3–15)-1-(VT1–VT63) | S155-(3–15)-1-(VT1–VT84) | S155-(3–15)-(1–2)* | FXS-(3–15) | FXO-(3–15) | XCON-(3–15) | IXCON-(3–15) | ALL ** For S155 cards with 1+1 or 1+1W redundancy, (3–15) is the left-most card in the pair and (1–2) is the working line (1) or the protection line (2).*
<AIDTYPE>	**Alarm access identifier type**—T1 | E1 | VT | STS | DCC | EQPT | SYS | SECU | NE
<SEVERITY>	**Alarm severity level**—CR | MJ | MN | NA | NR | CL where CR is critical, MJ is major, MN is minor, NA is not alarmed, NR is not reported, and CL is cleared
<COND TYPE>	**Alarm message**—See the alarm tables on pages 313 through 323.
<SRVEFF>	**Service effect**—SA | NSA where SA is service affecting and NSA is not service affecting
<SYSTIME>	**Date and time of alarm occurrence**—in the form of yy-mm-dd,hh-mm-ss
MASK	**Optional mask entry**—field is empty if alarm is not masked, MASK if alarm is masked

Retrieve all alarms command

To retrieve (view) all of the system alarms for the entire system, enter the **RTRV-ALM-ALL** command and the applicable parameters as shown in Figure 210.

Note: The **RTRV-ALM-ALL** command complies to GR-833-CORE specifications for **retrieve alarm** commands.

Figure 210. Retrieve all alarms command

```
Syntax
RTRV-ALM-<mod>:[<tid>]:[<aid>]:[<ctag>]::[<ntfcncde>],[<condtype>]
,[<srveff>],[<locn>],[<dirn>],[<tmper>];

Examples
RTRV-ALM-ALL:FACTORY::CTAG1::,,,,,;
FACTORY 02-09-17 15:04:17
M CTAG1 COMPLD
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve all alarms response

The <rspblk> portion of the response to the **RTRV-ALM-ALL** command is shown in Figure 211.

Note: If you detect a mismatch between the card state and alarm state for ST1 or SE1 cards, the alarm state is always correct.

Figure 211. Retrieve all alarms response

```
Examples
"ST1-6-1,T1:MJ,LOS,SA,02-09-17,13-47-23,,:"
"ST1-6-1,T1:MJ,LOF,SA,02-09-17,13-47-23,,MASK:"
"ST1-6-1,T1:MJ,CGA-RED,SA,02-09-17,13-47-23,,:"
"ST1-6-1,T1:MJ,LES,SA,02-09-17,15-01-07,,:"
"ST1-6-1,T1:MJ,LSES,SA,02-09-17,15-00-12,,:"
;
```

Retrieve T1 alarms command

To retrieve (view) T1 alarms for the entire system, enter the **RTRV-ALM-T1** command and the applicable parameters as shown in Figure 212.

Figure 212. Retrieve T1 alarms command

```
Syntax
RTRV-ALM-T1:[TID]:<T1_ALM_AID>:[CTAG][::,,,,,];

Examples
RTRV-ALM-T1::ST1-6:CTAG1::,,,,,;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<T1_ALM_AID>`	**T1 alarm access identifier**—ALL | ST1-(3-15) | DS3-(3-15)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Note: The default (or blank) in the AID field defaults to ALL.

Retrieve T1 alarms response

The `<rspblk>` portion of the response to the **RTRV-ALM-T1** command is shown in Figure 213.

Note: If you detect a mismatch between the card state and alarm state for ST1 or SE1 cards, the alarm state is always correct.

Figure 213. Retrieve T1 alarms response

```
Example
FACTORY 02-12-06 11:16:31
M CTAG1 COMPLD
   "ST1-6-1,T1:MJ,LOS,SA,02-12-06,09-26-19,,:"
   "ST1-6-1,T1:MJ,LOF,SA,02-12-06,09-26-19,,:"
   "ST1-6-1,T1:MJ,CGA-RED,SA,02-12-06,09-26-19,,:"
   "ST1-6-1,T1:MN,T-ESL,SA,02-12-06,11-16-07,,:"
;
```

Retrieve T3 alarms command

To retrieve (view) T3 alarms for the entire system, enter the **RTRV-ALM-T3** command and the applicable parameters as shown in Figure 214.

Figure 214. Retrieve T3 alarms command

```
Syntax
RTRV-ALM-T3:[TID]:<T3_ALM_AID>:[CTAG][::,,,,,];

Examples
RTRV-ALM-T3:FACTORY:DS3-3:CTAG2::,,,,,;
```

Note: The default (or blank) in the AID field defaults to ALL.

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<T3_ALM_AID>`	**T3 alarm access identifier**— ALL | DS3-(3-15)
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Retrieve T3 alarms response

The `<rspblk>` portion of the response to the **RTRV-ALM-T3** command is shown in Figure 215.

> **Note:** If you detect a mismatch between the card state and alarm state for ST1 or SE1 cards, the alarm state is always correct.

Figure 215. Retrieve T3 alarms response

```
Examples
"DS3-3-1,T3:CR,LOF,SA,02-12-18,14-17-29,,:"
"DS3-3-1,T3:CR,PARITY_ERR,SA,02-12-18,14-17-29,,:"
"DS3-3-1,T3:CR,IOLINELPBK,SA,02-12-18,14-17-28,,MASK:"
"DS3-3-2,T3:CR,LOF,SA,02-12-18,14-16-52,,:"
"DS3-3-2,T3:CR,PARITY_ERR,SA,02-12-18,14-16-52,,:"
```

Activate audible alarm cut-off command

The audible alarm cut-off feature permits deactivation of the audible relays while alarms are still active. When you activate the audible alarm cut-off feature, it turns off audible alarms connected to external equipment, raises the ACO alarm, and turns on the ACO LED (red) on the FCAPF assembly. If a new alarm occurs after you activate the feature, the associated audible alarms are active. The ACO alarm clears and the ACO LED turns off only when the entire shelf becomes alarm-free.

To activate the audible alarm cut-off feature, enter the **OPR-ACO-ALL** command and the applicable parameters as shown in Figure 216.

Figure 216. Activate audible alarm cut-off command

```
Syntax
OPR-ACO-ALL:[<TID>]:ALL:[<CTAG>];

Example
OPR-ACO-ALL::ALL:;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.

`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Alarm log management

Alarm logs are the system alarm history. Alarm log management consists of alarm log retrieval and alarm log clearing.

Retrieve alarm log command

To retrieve (view) an alarm log, enter the **RTRV-LOG** command and the applicable parameters as shown in Figure 217.

Figure 217. Retrieve alarm log command

```
Syntax
RTRV-LOG:[<TID>]::[<CTAG>]::[[<from sys date>,<from sys
time>][,<to sys date>,<to sys time>]]:[<ATAG>[,<ATAG>]]:
[<logcat>[,<logcat>]];

Examples
RTRV-LOG::::2000-09-08,08-30-00,2000-09-20,12-00-00::;
(For retrieval with time frame)

RTRV-LOG::::::;  (For retrieval of all logs)

RTRV-LOG::::::MAP-6;  (For retrieval of a type of log)

RTRV-LOG:::::14,15:;  (For retrieval using ATAGs 14 and 15)
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<CTAG>`	**Correlation tag**—See TL1 command, syntax, and format on page 89.
`<from sys date>`	**Date**—in the form of yy-mm-dd (year-month-day)
`<from sys time>`	**Time**—in the form of hh-mm-ss (hours-minutes-seconds)
`<to sys date>`	**Date**—in the form of yy-mm-dd (year-month-day)
`<to sys time>`	**Time**—in the form of hh-mm-ss (hours-minutes-seconds)
`<ATAG>`	**Autonomous message tag**—identified by number
`<logcat>`	MAP-(1–15)

Retrieve alarm log response

The alarm log consists of a sequential listing of the system alarms for the period or type of log that you specify in the **RTRV-LOG** command. See the syntax and examples in Figure 209 on page 280.

Delete alarm logs command

Alarm logs can only be deleted all at once. To delete alarm logs, enter the **DLT-LOG** command and the parameters as shown in Figure 218.

Figure 218. Delete alarm log command

```
Syntax
DLT-LOG:[<TID>]::[<CTAG>];

Examples
DLT-LOG:::;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

TL1 command log management

The system buffer holds approximately 1100 TL1 commands in volatile memory.

Retrieve TL1 command log

To retrieve the TL1 command log, enter the **RTRV-LOG-CMD** command and the applicable parameters as shown in Figure 219.

Note: TL1 log management commands will not persist after a power cycle, a CPU card pull, or an **INIT-NVM** command.

Figure 219. Retrieve TL1 command log

```
Syntax
RTRV-LOG-CMD:[<TID>]::[<CTAG>]::::;

Examples
RTRV-LOG-CMD:FACTORY::CTAG11::::;
02-09-17 16:25:33
A^   REPT EVT TL1 CMD
"RTRV-LOG-CMD:FACTORY::CTAG11::::;"
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89.

Delete TL1 log command

To delete TL1 logs, enter the **DLT-LOG-CMD** command and the parameters as shown in Figure 220.

Figure 220. Delete TL1 log command

```
Syntax
DLT-LOG-CMD:::;

Examples
DLT-LOG-CMD:FACTORY::CTAG1;
FACTORY 02-09-17 16:25:00
M CTAG1 COMPLD
;
```

Note: TL1 log management commands will not persist after a power cycle, a CPU card pull, or an **INIT-NVM** command.

Fault data retrieval

There is one TL1 command for troubleshooting a faulty card in the system. Use the command only when instructed to do so by a representative from XEL Tech Support.

Retrieve card exception data command

To retrieve the exception data that is stored on a faulty card, enter the **RTRV-EXC** command and the parameters as shown in Figure 221.

Figure 221. Retrieve card exception data command

```
Syntax
RTRV-EXC:[<TID>]:<CARDAID>:;

Example
RTRV-EXC::DS3-5:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<CARDAID>	**Card access identifier**—IXCON-(3–15) | DS3-(3–15) | STS1-(3–15) | S155-(3–15)

Retrieve card exception data response

The `<rspblk>` portion of the response to the **RTRV-EXC** command is shown in Figure 222. The XEL Tech Support representative will explain what to do with the information.

Figure 222. Retrieve card exception data response

```
Syntax
"<CARDAID>::EXCSTATUS=OLD,EXCDATA:TASKID=<code>,EVECTOR=<code>,
GPRS:R1=<code>,R2=<code>,R3=<code>,R4=<code>,R5=<code>,R6=<code>,
R7=<code>,R8=<code>,R9=<code>,R10=<code>,R11=<code>,R12=<code>,
R13=<code>,R14=<code>,R15=<code>,R16=<code>,R17=<code>,R18=<code>,
R19=<code>,R20=<code>,R21=<code>,R22=<code>,R23=<code>,R24=<code>,
R25=<code>,R26=<code>,R27=<code>,R28=<code>,R29=<code>,R30=<code>,
R31=<code>,R32=<code>,SP=<code>,LR=<code>,PC=<code>,MSR=<code>,
CR=<code>,XER=<code>,DSI=<code>,DAR=<code>,DMISS=<code>,IMISS=
<code>,SRR0=<code>,SRR1=<code>,STRC:S1=<code>,S2=<code>,S3=<code>,
S4=<code>,S5=<code>,S6=<code>,S7=<code>,S8=<code>,S9=<code>,
S10=<code>"

Example
"DS3-5::EXCSTATUS=OLD,EXCDATA:TASKID=01fcd5b8,EVECTOR=00000200,
GPRS:R1=00000002,R2=01fcd350,R3=00000000,R4=000d0000,R5=05000000,
R6=00000000,R7=00000000,R8=00000000,R9=00000000,R10=05000000,
R11=00000000,R12=000e0000,R13=48400040,R14=00000000,R15=00000000,
R16=00000000,R17=00000000,R18=00000000,R19=00000000,R20=00000000,
R21=00000000,R22=00000000,R23=00000000,R24=00000000,R25=00000000,
R26=00000000,R27=0008aa88,R28=00114bc0,R29=00000003,R30=00000003,
R31=000e0000,R32=000e0000,SP=01fcd350,LR=000a24dc,PC=0008ab68,
MSR = 00009000,CR=42400040,XER=20000000,DSI=000010a4,DAR=05000000,
DMISS=00000000,IMISS=00000000,SRR0=0008ab68,SRR1=00009000,
STRC:S1=000a24dc,S2=000a4380,S3=00041890,S4=00041714,S5=000414f4,
S6=0009a03c,S7=00000000,S8=00000000,S9=00000000,S10=00000000"
```

Test access controller commands

In compliance with the Bellcore GR-834 specification, the ARCADACS 100 uses the following commands to support inter operability with test access controllers (TACCs).

- **Enter test access** command
- **Delete test access** command
- **Retrieve test access** command

- **Connect test access digital** command
- **Connect test access T1** command
- **Change split** command
- **Change test access T1** command
- **Connect monitor** command
- **Disconnect test access** command

When testing access control, there are two levels of diagnostics: DS1 and DS0. Facility access digroup (FAD) refers to the DS1 path(s) between the test controller with the system under test. Test access digroup (TAD) refers to the DS0 path(s) connecting the test controller with the system under test. DS1 facility test access (FAD) is separate from DS0 facility access (TAD).

Test access overview

With the distribution of traffic across different network elements and across facilities that span different medium and owners, there is a need to be able to isolate issues within a network. With that need came the requirement for standards within this testing framework so that different network elements could communicate with each other. It also allows for 3rd party automated test units that can sit in a network to facilitate problem isolation.

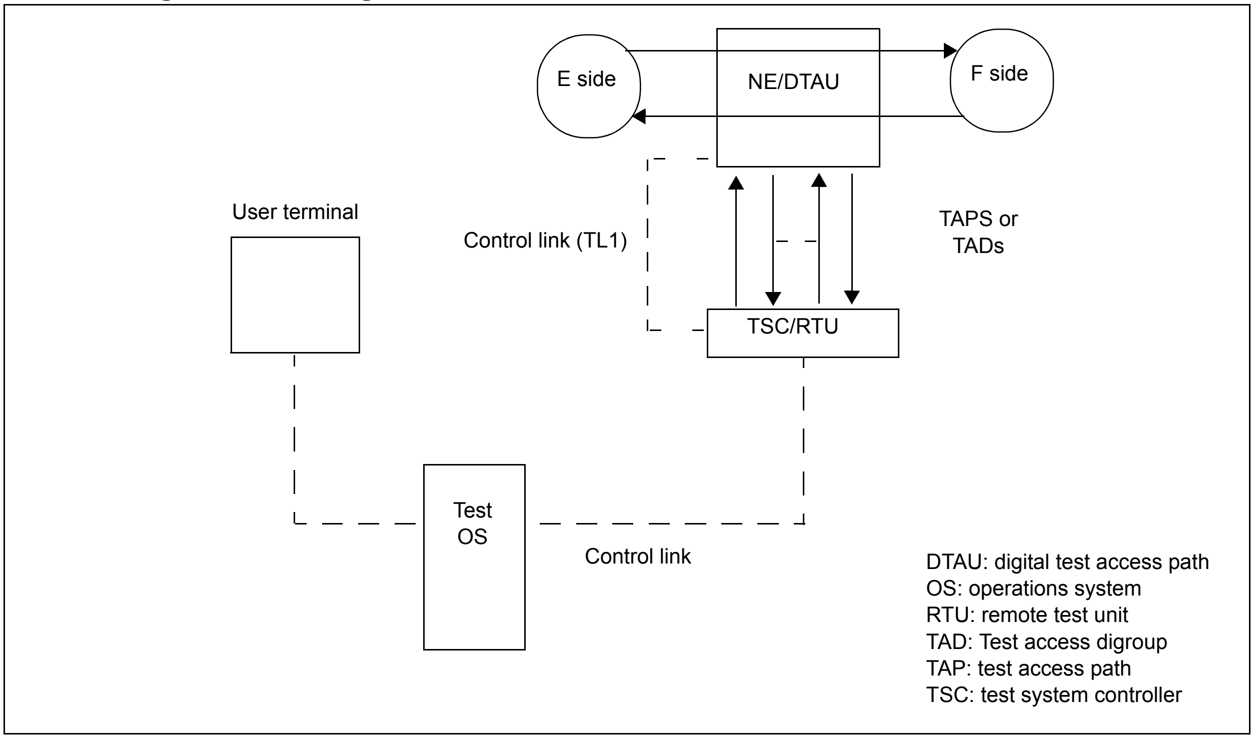
Bellcore (Bell Communication Research) was formed to develop common standards and procedures in telecommunications, from which the TL1 protocol was devised. Since then, Bellcore has changed names to Telcordia, the name it is known by today. As a network element control language, TL1 became standardized in most DCSs for the purpose of test access. It remains the dominant protocol in DCS equipment.

The following Telcordia documents pertain to test:

- TR-NWT-000818 - OTGR Section 6.1: Network Maintenance: Access and Testing -Generic Test Architecture – This document provides an overview of the Generic Test Architecture, along with detailed discussions of the Test System Controller/Remote Test Unity (TSC/RTU) and the Digital Test Access Unit (DTAU).
- GR-819
- GR-834-CORE - OTGR Section 12.4: Network Maintenance: Access and Testing Messages – This document describes the TL1 message requirements for executing access and testing functions for Network Elements suppliers that interface with TSC/RTUs.

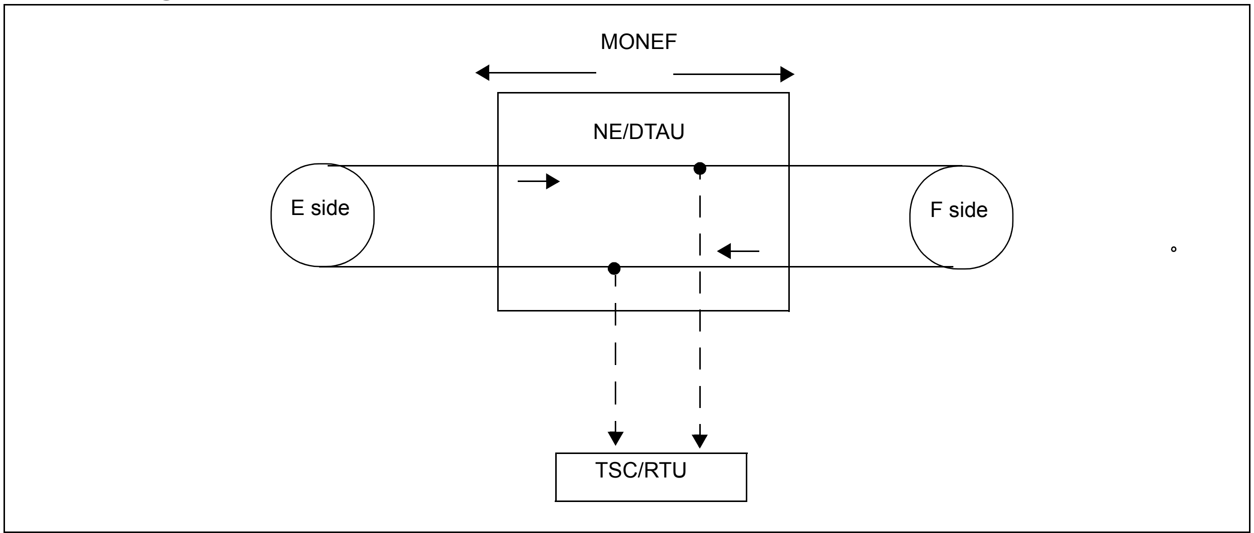
Figure 223 shows a standard NE (DTAU) that is connected to a 3rd party test controller (TSC) that usually has a GUI interface. The test controller could be a standard T1/T0 test set where an operator would type the appropriate TL1 commands to the NE to be able to access the circuit required either in a monitor mode or a split mode that allows for sending of test patterns onto the circuit.

Figure 223. Using a test controller



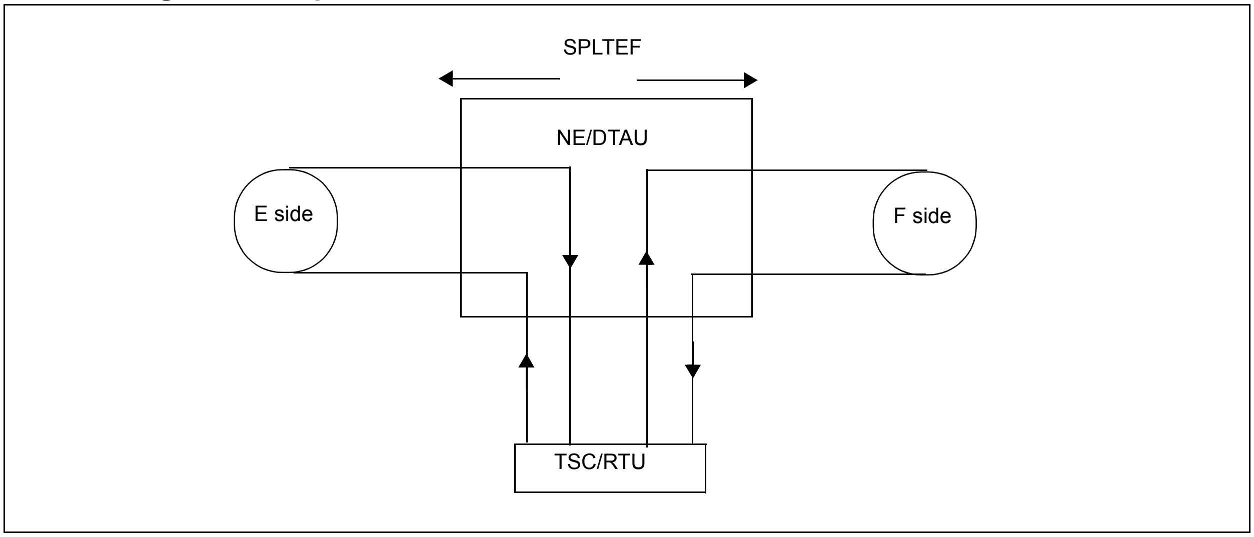
If a monitor connection is requested, a facility is required by the TL1 command. This facility is always defined as the E side of a cross-connect. Figure 224 shows the connections for a MONEF which will monitor the circuit and is non-invasive.

Figure 224. Monitor test access mode



If a split connection is required, the original connection is taken down and the circuit under test is connected to the test port to allow test set termination. At this point the test set can send a test pattern at the requested data rate (56k or 64k) and debug the network. See Figure 225.

Figure 225. Split test access mode—EF



In all cases, after the test is concluded, when the disconnect command is issued the circuit is restored to the original configuration. If for some reason, the disconnect is not issued and the TL1 session times out (configurable setting), the circuit would be restored as well.

There are 2 types of test access

- DS0 level (TAD)
- T1 level (FAD)

The standards define the requirement for each. The ARCADACS 100 NE has certain restrictions within that framework. These are described below or in the TL1 command descriptions.

Within the test access framework there are some commands that are done once to set up the facility to which the TSC or test set is connected and other commands that are done on a per test basis.

Generic commands

The ENT-TACC command assigns a T1 from an ST1 card to be the facility the test set or TSC will be connected to. It is at this time that you assign the port to be either a DS0 level port (TAD) or a T1 level port (FAD). Up to 2 ports of each type can be supported.

After the ENT-TACC command has been issued, the system automatically assigns a generic TAP or TAD number that will be used in subsequent commands.

For TADs, since there are 12 TAPs per T1 and the ARCADACS 100 support 2 T1s, this allows for 24 TAPs, numbered from 401 to 424. For FADs, there is 1 FAD per T1 and we support 2 T1s, these are numbered 1 and 2.

Enter test access command

Use the **ENT-TACC** command to enter the DS1 facility that is to be connected to the test access equipment. (This will define the TAP and/or FAD numbers that will be used in later commands.) The **ENT-TACC** command and the parameters as shown in Figure 226.

Figure 226. ENT-TACC command

```
Syntax
ENT-TACC::[<tid>]:<t1_tacc>:[<ctag>]:::TACCTYPE=<tacc_type>;

Example
ENT-TACC::ST1-7-8::::TACCTYPE=TAD-1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<T1_TACC>	**T1 Test access controller connection**—ST1-(3–15)-(1–8)
<ctag>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.
<TACC_TYPE>	**Test access controller type**—[FAD-n|TAD-n], where n=1-2.

Delete test access connection command

Use the **DLT-TACC** command to disconnect the DS1 reserved for test access and allow it to be used for normal cross-connects. This would only be used if moving or disconnecting test access to the system. The **DLT-TACC** command and the parameters as shown in Figure 227.

Figure 227. DLT-TACC command

```
Syntax
DLT-TACC:[<tid>]:<tacc_type>:[<ctag>];

Example
DLT-TACC::TAD-1:;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
<ctag>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.

`<TACC_TYPE>` **Test access controller type**—[FAD-n|TAD-n], where n=1-2.

Retrieve test access command

Use the **RTRV-TACC** command to retrieve the current status for all of the test access paths (TAPs) or TADs. The **RTRV-TACC** command and the parameters as shown in Figure 228.

Figure 228. RTRV-TACC command

```
Syntax
RTRV-TACC:[<tid>]:<tap>:[<ctag>];

Example
RTRV-TACC::401:;
```

The command parameters are as follows:

`<TID>` **Target identifier**—See TL1 command, syntax, and format on page 89.

`<TAP>` **Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
ALL is allowed on the RTRV-TACC command and will show the status of all test access paths.

`<ctag>` **Correlation tag**—See TL1 command, syntax, and format on page 89.
CTAG is optional. If it is provided by the system, the device responds with the same CTAG.

TAD Testing Commands

The first command issued for DS0 testing is the CONN-TACC-DIG command. With this command, you specify the E side of the DS0 to be tested, which TAP to use, and the type of circuit. If a TAP number is not specified, the first idle one will be used. After the command has been executed, a monitor has been set up to the test access port.

Each TAP has 2 DS0s associated with it, one for the E side and one for the F. Since the E side is always supplied with the TL1 command, this is what is seen when the retrieve command is used. The F side is implied. The DS0s on the T1 will be in the following order:

TAP	F Side	E Side
401	DS0 1	DS0 2
402	DS0 3	DS0 4
…		
…		
412	DS0 23	DS0 24

The following types of circuits supported are NON and DSE/DSG:

- 64k DS0 (DATA) is created for a NON connection
- 56K (VSIG) is created for a DSG or DSE connection

After the initial command has been issued, it can be changed to a split connection with the CHG-SPLIT command and changed back with a CONN-MON. When finished, the DISC-TACC command will restore the system back to the original state.

Connect test access digital command

Use the **CONN-TACC-DIG** command to connect the DS0 bitstream defined to the digital test access equipment in monitor mode. If the DS0 to be tested is idle, only MONE (monitor Equipment side) will be set up. Otherwise, MONEF (monitor Equipment and monitor Facility) is set up forming a full TAP with E and F present.

Note: The **CONN-TACC-DIG** command is always the first test access connect command.

The **CONN-TACC-DIG** command and the parameters as shown in Figure 229.

Figure 229. CONN-TACC-DIG command

```
Syntax
CONN-TACC-DIG: [<tid>]:<aid>:[<ctag>]::[<tap>]:<sig>;

Example
CONN-TACC-DIG: SYSTEM1:ST1-5-1-1:CTAG1::401:NON;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<AID>	**Access identifier—**card-slot-port-facility-DS0.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test. If not specified, the first idle TAP will be assigned.
<SIG>	**Signalling format**—Defines the signalling method of the circuit under test. Values: NON | DSG | DSE. Where NON has no signaling; DSG is a SF circuit with signaling; and DSE is an ESF circuit with signaling. *Note:|* *64K DS0 (DATA) is created for a NON connection* *56K (VSIG) is created for a DSG or DSE connection.*

Change TAP connect to split command

Use the **CHG-SPLIT** command to change connections to the test bus and split, at the access point, the pair or pairs specified by the access command of the circuit under test. The **CHG-SPLIT** command and the parameters as shown in Figure 233.

Figure 230. CHG-SPLIT command

```
Syntax
CHG-SPLIT:[<tid>]:<tap>:[<ctag>];

Example
CHG-SPLIT:SYSTEM1:401:CTAG1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
<ctag>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.

Change TAP to monitor command

Use the **CONN-MON** command to put the circuit under test into monitor (MON) mode. The **CONN-MON** command and the parameters as shown in Figure 231.

Figure 231. CONN-MON command

```
Syntax
CONN-MON: [<tid>]:<tap>:[<ctag>];

Example
CONN-MON: SYSTEM1:401:CTAG1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
<ctag>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.

FAD Testing Commands

The first command issued for T1 testing is the CONN-TACC-T1 command. With this command, the user specifies the E side of the T1 to be tested, which FAD to use and the type of connection requested (SPLITE or MONE). If a FAD number is not specified, the first idle one will be used. After the command has been executed, the request T1 is connected to the test access T1 exactly as the original circuit. There can be three types of connections with this facility, On a monitor, 64k circuits connect with 64k circuits and similarly with 56k circuits. On a split, idle ds0s will be connected with 64k circuits.

After the initial command the CHG-ACCMD-T1 command is used to toggle the connection to either a MONE or a SPLITE. When finished, the DISC-TACC command will restore the system back to the original state.

Note: This command can take up to a minute to establish. Each DS0 or cross-connect had to be set up individually so the time varies with the configuration.

Connect test access T1 command

Use the **CONN-TACC-T1** command to connect the DS1 bitstream defined to the digital test access equipment.

Note: The **CONN-TACC-T1** command is always the first test access connect command.

The **CONN-TACC-T1** command and the parameters as shown in Figure 229.

Figure 232. CONN-TACC-T1 command

```
Syntax
CONN-TACC-T1: [<tid>]:<aid>:[<ctag>]::[<tap>]:[mode];

Example
CONN-TACC-T1::DS3-10-2-1::::SPLTE;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<AID>	**Access identifier—**card-slot-port-facility-DS0.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test. If not specified, the first idle TAP will be assigned.

`<MODE>`	**Test mode**—Defines the type of test. Values: MONE| SPLTE. Where MONE is test access monitor Equipment side. This test is non-intrusive. SPLTE is test access split Equipment Side. This test is entered on an existing cross connect and will redirect Equipment side of the crossconnect to the test access equipment.

Change TAD connect command

Use the **CHG-ACCMD-T1** command to change connections to the test bus and split/monitor at the access point, the pair or pairs specified by the access command of the circuit under test. The **CHG-ACCMD-T1** command and the parameters as shown in Figure 233.

Figure 233. CHG-ACCMD-T1 command

```
Syntax
CHG-ACCMD-T1:[<tid>]:<tap>:[<ctag>];[<mode>];

Example
CHG-ACCMD-T1::1::::MONE;
FACTORY 03-04-22 16:21:48
M   COMPLD
;
```

The command parameters are as follows:

`<TID>`	**Target identifier**—See TL1 command, syntax, and format on page 89.
`<TAP>`	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
`<ctag>`	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.
`<MODE>`	**Test mode**—Defines the type of test. Values: MONE| SPLTE. Where MONE is test access monitor Equipment side. This test is non-intrusive. SPLTE is test access split Equipment Side. This test is entered on an existing cross connect and will redirect Equipment side of the crossconnect to the test access equipment.

Disconnect test access command

Use the **DISC-TACC** command to disconnect from test access equipment and return the connected DS0(s) to their starting condition, either connected or idle. The **DISC-TACC** command and the parameters as shown in Figure 234.

Figure 234. DISC-TACC command

```
Syntax
DISC-TACC:[<tid>]:<tap>:[<ctag>];

Example
DISC-TACC: SYSTEM1:401:CTAG1;
```

The command parameters are as follows:

<TID>	**Target identifier**—See TL1 command, syntax, and format on page 89.
<TAP>	**Test access path**—The string identifier for the physical path that connects the test controller and the circuit under test.
<CTAG>	**Correlation tag**—See TL1 command, syntax, and format on page 89. CTAG is optional. If it is provided by the system, the device responds with the same CTAG.

Chapter 5 System Diagnostics and Testing

The system offers standard performance monitoring as well as extensive alarm and diagnostic capabilities to monitor and test system components on both fiber optic and metallic facilities.

Alarm and event manager

The system alarm manager (ALM) software system monitors overall system function through current alarm and event reporting. The ALM tracks and reports abnormal equipment and facility conditions detected by individual processes, and issues autonomous TL1 **set** and **clear** alarm messages. Alarm manager features include the following.

- System-wide alarm and event tracking with storage in a database
- Alarm condition masking and unmasking according to a preset alarm hierarchy
- Alarm suppression according to a preset rate of occurrence
- Determination of alarm severity and impact to service
- Preparation of information for TL1 autonomous message generation
- Preparation of SNMP traps to send to SNMP monitoring stations
- TL1 response to alarm retrieval requests by user
- TL1 response to alarm severity change requests by user
- Shelf status message broadcasts
- Shelf alarm severity promotion
- Activation of XCON or IXCON card LEDs, CPU card LEDs, and FCAPF assembly LEDs

System alarms

The system has four alarm categories: remote, critical, major, and minor.

Failure detection

Failure on any system cards is reported to the CPU. Upon receipt of a failure report, the CPU looks for the category assigned for that particular failure, and generates one of the four alarm signals. This signal is then directed to the proper LEDs, or to the external alarm relays located on the front connector, alarm, and power feed (FCAPF) assembly. See Front connector, alarm, and power feed assembly on page 303.

Fault condition and severity level definitions

The two types of conditions reported by the alarm manager are alarm and status. Alarm conditions usually represent fault conditions in equipment or facility while status conditions typically reflect transient states resulting from user activities.

All fault conditions have associated severity levels. The system includes six severity levels, shown in Table 29. The criteria used to determine the severity of each alarm are described in the tables starting on page 313.

Table 29. Alarm manager notification code

Code	Definition
CL	Clear—no fault condition or fault condition now cleared
CR	Critical
MJ	Major
MN	Minor
NAL	Not alarmed condition
NR	Alarm not to be reported (not generated as autonomous message but stored in database, from which it can be retrieved)

The NAL code is usually associated with alarm indication signals (AIS) as well as remote defect indication (RDI) and remote failure indication (RFI) signals. You can assign the NR code to fault conditions that you want monitored and stored in the alarm log but not reported as an autonomous message.

The severity levels for each fault condition type are predefined in a reference table based on the type of card it affects. When the ALM is initialized, the associated reference table is activated. This reference table is part of the system software and cannot be edited.

Using this predefined reference table, the alarm manager checks each time an alarm condition occurs to determine the corresponding severity level for the alarm. Both the fault condition type and the severity level are included in the resulting autonomous message.

Alarm hierarchy and masking

Alarm conditions are ordered into an alarm hierarchy for the purpose of masking lower-level alarms and preventing unnecessary lower-level alarms from flooding the system. Although masked alarms are not displayed, they are stored in the database and can be retrieved.

Alarm hierarchies are formed according to the correlation between alarm conditions; therefore, only certain types of alarm conditions have hierarchy. The alarm condition types that have hierarchy are listed in Table 30 (applicable to those systems that include certain optional cards).

Table 30. Alarm hierarchy

Equipment	Facility
DS1EQPTTYPE	DS1POINTTYPE
ST1EQPTTYPE	ST1POINTTYPE
XCONEQPTTYPE	-

The masking range depends on the raised alarm condition. If the raised alarm condition comes from a mapper card, it only masks those points in that card. If the raised alarm condition comes from a channel (port) in a mapper card, only those points in that channel of that card are masked. Unmasking follows the same rules as for masking.

Alarm suppression

If alarms are occurring at a continuous high rate, it becomes impossible to track the individual alarms. When the rate of alarms reaches a preset threshold, the alarm suppression feature automatically activates. During this time, the following events occur:

- The craft terminal displays a status message in the format `"SYS:ALM,SC,2000-09-29, 01-01-05,,,,:\"ALARM SUPPRESSION\""`, where SC (Set Condition) indicates that alarm suppression is active.
- The system continues to log alarm messages, but does not send them as autonomous messages.
- The SNMP management stations continue to receive alarm messages.
- You can still retrieve the alarms using the **RTRV-ALM** command and the **ALL** parameter.

When the rate of alarms drops to a preset manageable level, the alarm suppression feature automatically deactivates. At this time, the following events occur:

- The craft terminal displays a status message in the format `"SYS:ALM,CL,2000-09-29, 01-20-15,,,,:\"ALARM SUPPRESSION\""`, where CL (Clear) indicates that alarm suppression has been deactivated.
- The system resumes sending alarm messages as autonomous messages.

TL1 autonomous message generation

Autonomous message generation is one of the alarm manager major functions. Autonomous means that the messages are generated independently of other system functions. The messages appear on any terminals at which users are logged into the system, as the alarms and events occur.

The two types of autonomous messages reporting to TL1 are alarm condition reports and event condition reports. Alarm condition reports are those with severity levels of minor (MN), or higher, and NAL. Event condition reports are those with a severity level of not alarm, reported as an event (NAL). Status conditions are always reported to TL1 upon receipt by the alarm manager. They are not stored by the alarm manager and the alarm manager is not aware of the status condition state. Status conditions are not retrievable by the retrieve alarms command because they are not stored in the database and do not have a system of hierarchy. They can be retrieved, however, with the **retrieve alarm log** command.

When it receives a new alarm condition signal, the alarm manager always evaluates the effective severity (CLR, NSA, SA), and sends the alarm to TL1 whenever necessary.

When it receives a status condition, the alarm manager evaluates the effective condition, which can be assigned a value of transient condition (TC), standing condition raised (RAI), or standing condition cleared (CLR). In this case, the ALM sends an event report to TL1 instead of an alarm condition report.

TL1 condition report generation rules

Not all alarms reported to the alarm manager result in the generation of a TL1 condition report. The ALM only initiates a TL1 autonomous message under the following conditions.

- An alarm message arrives at the alarm manager with its state changed (that is, different from what is stored in ALM), and it is not masked.
- A masked alarm is unmasked but it is still active; this can occur when the masking point is cleared allowing all the masked points blocked alarms to be sent out.
- An alarm condition must have experienced a severity level change and a notification code change to qualify as an autonomous message (assuming the state has changed).
- No alarm with a severity level of NR is generated.

These condition report-generation rules ensure that:

1. The alarm manager does not generate double reporting for the same sustained fault state, even if the individual processes report to the alarm manager.
2. No alarm autonomous message is sent out when a fault condition is reported to the alarm manager on a masked point.

Front connector, alarm, and power feed assembly

The front connector, alarm, and power feed (FCAPF) assembly is mounted horizontally in the front of the chassis, separating the upper and lower banks of card slots (see Figure 236).

The FCAPF assembly, shown in Figure 235, includes connectors, indicators, and switches to support system interconnection, operator interface, testing, and diagnostics. Table 31 describes the items on the FCAPF assembly.

Table 31. Connectors, indicators, and buttons on the FCAPF assembly

Label	Item	Description
NMS	DB25 connector	Supports RS232 NMS interface (Reserved for future use. Currently has no system effects.)
CRAFT	RJ-45 connector	Supports interface to craft terminal
TBOS	RJ-45 connector	Supports Telemetry Byte-Oriented Serial protocol (Reserved for future use. Currently has no system effects.)
EXT CLK2	RJ-45 connector	Connects external clock2 input/output for active clock I/O card*
EXT CLK1	RJ-45 connector	Connects external clock1 input/output for active clock I/O card[1]
CRIT	LED indicator	Indicates at least one critical alarm in the system
MAJ	LED indicator	Indicates at least one major alarm in the system
MN	LED indicator	Indicates at least one minor alarm in the system
RMT	LED indicator	Indicates one or more alarms from a remote system
ACO	LED indicator	Indicates at least one alarm condition assigned to Alarm Cut Off mode
BYPASS	LED indicator	Indicates that the system is in bypass mode (Reserved for future use. Currently has no system effects.)
PWR A	LED indicator	Indicates power and fuses state. Red means power feed A is below 40 volts. Off means power has failed or fuse is bad. Green means power and fuses are okay
PWR B	LED indicator	Indicates power and fuses state. Red means power feed B is below 40 volts. Off means power has failed or fuse is bad. Green means power and fuses are okay
ACO	Push-button switch	Activates the ACO LED and puts system in alarm cut-off mode. The button is a toggle: press it again to deactivate the ACO LED and exit alarm cut-off mode
BYPASS	Push-button switch	Activates the BYPASS LED and puts the system in bypass mode (Reserved for future use. Currently has no system effects.)
RESET	Push-button switch	Puts system in reset mode, which has the same effect as pulling each of the cards and reseating them individually (Reserved for future use. Currently has no system effects.)
LAMP TEST	Push-button switch	Turns LEDS on for FCAPF assembly and all logic cards

Table 31. Connectors, indicators, and buttons on the FCAPF assembly (continued)

Label	Item	Description
ALARMS	DB25 connector	Connects to external alarm relay outputs
36.5-56.5VDC	V_A and V_B power connectors	Connects to A and B power cables from power supply
ESD	ESD jack	Connects to wrist-strap worn for prevention of electrostatic discharge

1. Input clocks are routed to the active clock I/O card. Output clocks are sourced from the active clock I/O card.

Figure 235. FCAPF assembly

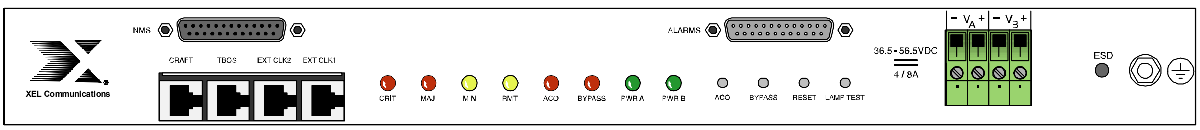
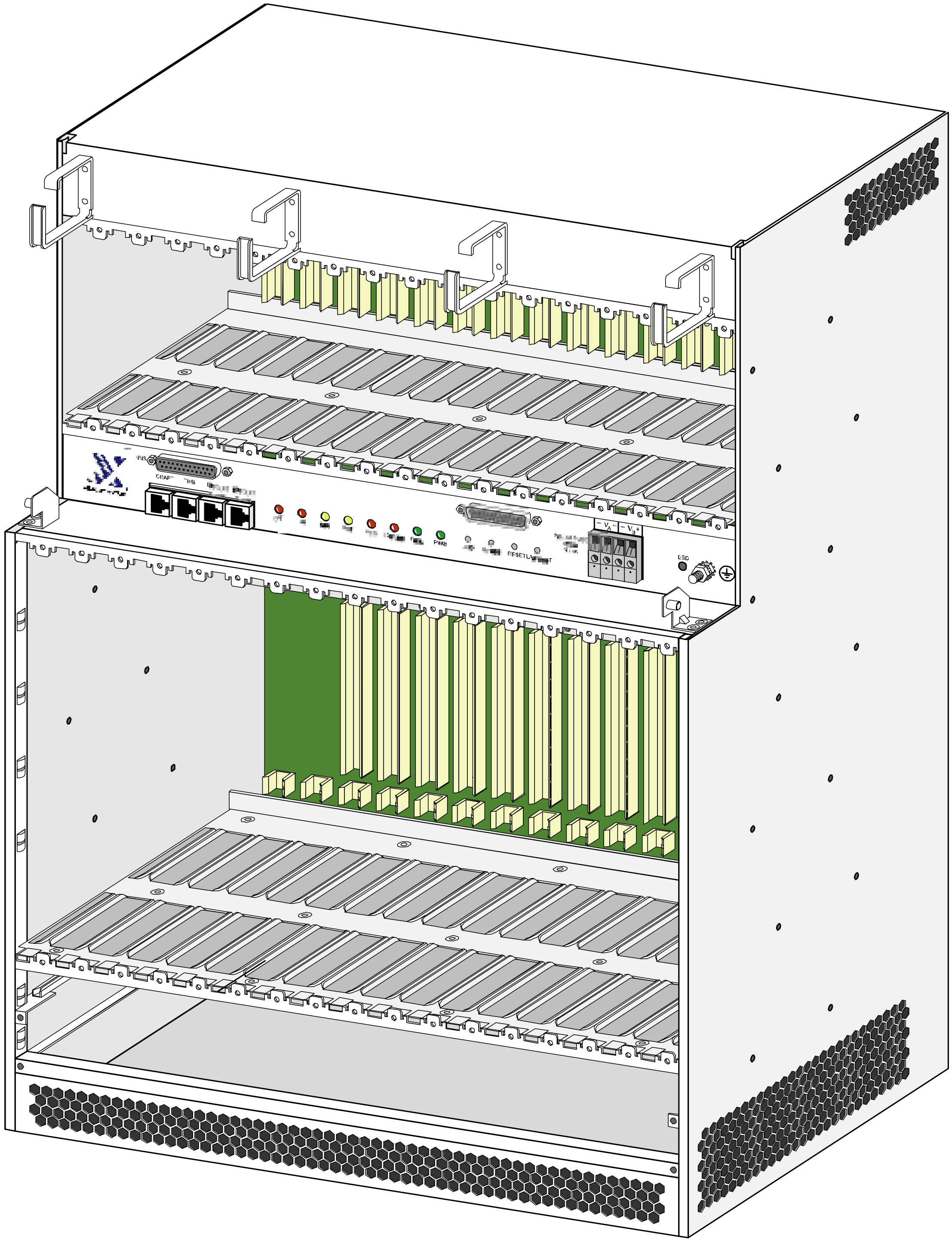


Figure 236. System chassis with FCAPF assembly



LED indicators

Eight shelf LED indicators reflect the total alarm condition for each severity level. Table 32 shows the shelf LEDs.

Table 32. Shelf LEDs

LED	No alarm condition	Alarm condition
CRIT	Off	Red
MAJ	Off	Red
MIN	Off	Amber
RMT	Off	Amber
ACO	Off	Amber
PWR A	Green	Red
PWR B	Green	Red
BYPASS	Off	Amber

Testing the LEDs

The push-button LAMP TEST test switch located on the FCAPF permits testing of all LEDs on the FCAPF assembly and all cards with LEDs in the system. Press the push-button switch to light all LEDs. Allow the push-button switch to return to its original position to extinguish all the LEDs at the conclusion of the test.

Conditions activating shelf LEDs and audible relays

The following conditions activate the shelf LEDs and audible relays:

- **Critical**—CRIT alarm LED lights whenever there is any CR alarm in the local shelf. When the CR alarm is raised, an audible alarm relay activates and remains so until all CR alarms are cleared.
- **Major**—MAJ alarm LED lights whenever there is any MJ alarm in the local shelf. When the MJ alarm is raised, an audible alarm relay activates and remains so until all MJ alarms are cleared.
- **Minor**—MIN alarm LED lights whenever there is any MN alarm in the local shelf. When the MN alarm is raised, an audible alarm relay activates and remains so until all MN alarms are cleared.
- **Remote**—RMT alarm LED lights whenever there is at least one alarm with CR, MJ, or MN severity elsewhere. When the RMT alarm is raised, an audible alarm relay activates and remains so until all RMT alarms are cleared.

Note: RMT function is not supported in this release.

- **Power A/B**—PWR A or PWR B LED lights when the input dc voltage on the associated power feed (V_A or V_B) goes below 40 volts (the alarm manager does not activate this LED), that is the CPU card is not required to provide this function. Power sense circuitry on the FCAPF provides this capability.

Alarm cutoff

An audible alarm cutoff (ACO) feature is available. The alarm cut-off (ACO) function permits deactivation of the audible relays while alarms are still active. To deactivate the CR and MJ audible alarms (together) and activate ACO, either press the ACO push button switch on the FCAPF assembly or enter `OPR-ACO-ALL::ALL:;` at the command prompt. For a more detailed description of the command, its syntax, and parameter fields, see Activate audible alarm cut-off command on page 284.

Upon ACO activation, audible alarms connected to external equipment are silenced, the ACO alarm is raised, and the ACO LED on the FCAPF assembly turns on (red). If a new alarm is raised, however, the audible alarm related to that particular alarm severity is active and audible. The ACO alarm is cleared and the ACO LED turns off only when the entire shelf becomes alarm-free.

Card failure and status LEDs

Several system cards include individual card failure or status LEDs (see Table 33).

Table 33. Cards and associated LED types

Card	LED type
CPU cards	CPU status/failure
Mapper cards (ST1, SE1, DS3, DS3R, STS1, S155, FXS, FXO)	Mapper card status/failure
XCON and IXCON cards	Cross-connect status/failure
Clock I/O cards	Ethernet and clock status
S155 I/O protection assembly	Active signal

The front panels of those cards with failure and status indicators include two LEDs controlled by the CPU. Upon detection of a failure, the card LEDs light, change color, or go out, depending upon the condition described. The LEDs are bicolored, either green/amber or green/red, and their functions for CPU, ST1, XCON, and IXCON are detailed in Table 34.

Table 34. Failure and status LED descriptions

Condition	Condition definition	LED 1 (green/red)	LED 2 (green/amber)
Normal operation	Card is fully functional and active	Green	Green

Table 34. Failure and status LED descriptions (continued)

Condition	Condition definition	LED 1 (green/red)	LED 2 (green/amber)
Stand-by/protection operation	Card is fully functional and ready to become active	Off	Green
CPU software download	NVRAM on CPU card is being written to. This state is temporary and lasts about 30 seconds per occurrence	Green	Amber
Faulty facility line	Input signal(s) to card (DSn) is not acceptable (LOS, BER)	Green	Amber
Card off-line	XCON card operating normally but is set to off-line	Green	Amber
Card failed but protected	Card has failed, but has been replaced by protection card	Red	Green
Card failure but not protected	Card has a hardware/software failure	Red	Off
Heart beat	Intelligent card awaiting application download from CPU	Green (flashing)	Off
Software download	Intelligent card receiving application download from CPU	Red (flashing)	Off
Not provisioned	Card has not been provisioned	Green (flashing)	Green
No power	Card not receiving operating power	Off	Off
Synchronization	State defined for redundancy synchronization in progress	Green	Amber (flashing)
Synchronization	CPU synchronization in progress	Off	Amber

Clock I/O card LED definitions

The clock I/O card has its own special set of LED states indicating operational state and card status as shown in Table 35.

Table 35. Clock I/O card status LED descriptions

Card state	Condition	LED 1 (green/amber)	LED 2 (green/amber)
Active	No Ethernet	Green (Flashing)	Green
Standby	No Ethernet	Green (Flashing)	Amber
Active	Ethernet present	Green	Green
Standby	Ethernet present	Green	Amber
Active	Holdover	Amber	Green

S155 I/O protection assembly LED definitions

The S155 I/O protection assembly has one LED for each pair of TX/RX signals. The status of each LED is shown in Table 36.

Table 36. S155 I/O protection assembly LED descriptions

Color	Condition	Redundancy
Green	Active signal	All
Amber	Redundant signal	1+1 or 1+1W
Off	No connection with mapper card	SX or DX

System alarms

Alarm message structure

The system provides a number of alarm messages that facilitate performance monitoring and diagnostics. All alarm messages are autonomous and are displayed in the standard TL1 autonomous message format. The autonomous message format is described in detail in TL1 autonomous message format on page 91, with syntax shown in Figure 31.

An example of a TL1 autonomous alarm message follows.

```
FACTORY 1970-01-02 00:03:01 152 REPT ALM T1 "ST1-7-6:CL,LOS,SA,1970-
01-02,00-02-59,,:\"ST1 LOSS OF SIGNAL\"
```

The alarm message can be interpreted as follows:

Message component	Description
`FACTORY 1970-01-02 00:03:01`	Date and time of the report
`152 REPT`	Report code = 152
`ALM T1`	Alarm type = T1
`ST1-7-6`	Source of alarm = ST1 card, slot 7, port 6
`CL`	Status of alarm = cleared
`LOS`	Alarm condition = loss of signal (LOS)
`SA`	Alarm severity = service-affecting
`1970-01-02,00-02-59`	Date and time of alarm = January 2, 1970 at 2 minutes and 59 seconds past midnight
`"ST1 LOSS OF SIGNAL\"`	Alarm message = ST1 card loss of signal

Alarm message management

The system features an alarm and history capability that enables efficient system diagnostics. The TL1 alarm and log command structure permits alarm parameter setting, editing, log configuration and retrieval. Alarms are reported as they occur in real time through autonomous messages which typically appear with the response code, name, and block (`<rspcde>`, `<rspname>`, and `<rspblk>` portions of the message as shown in the example of Alarm message structure on page 309. See Figure 31 for autonomous message syntax. Alarm logs form the system alarm history. Release 2.5.10 of the system includes alarm log retrieval and alarm log delete capabilities.

Alarm retrieval

To retrieve all accumulated alarms on a system card, enter the following command

```
<   RTRV-ALM::<card>-<slot#>:;
```

For a more detailed description of the command, its syntax, and parameter fields, see Retrieve alarms command on page 280. Successful retrieval results in display of all accumulated card alarms for the selected card.

An example of an alarm response follows:

```
"ST1-9,SYS:MJ,PROGFLT,SA, 1998-12-29,10-15-44,,"":"+
```

The response can be interpreted as follows:

Message component	Description
ST1-9	Source of alarm = ST1 card, slot 9
SYS	Type of alarm = system
MJ	Status of alarm = major
PROGFLT	Alarm condition = program fault
SA	Alarm severity = service-affecting
1998-12-29,10-15-44	Date and time of alarm = December 29, 1998 at 15 minutes and 44 seconds past ten

For a more detailed description of the response, its syntax, and parameter fields, see Retrieve alarms command on page 280.

Alarm log retrieval

Several types of alarm logs are retrievable by the system. Use the following commands to retrieve the desired alarm log.

- To retrieve the log with the time frame, enter the following command

```
<   RTRV-LOG:LOGID1:::1998-10-17,08-30-00;1998-12-29,16-30-00::;
```

- To retrieve of all logs, enter the following command

```
<   RTRV-LOG:LOGID1::::::;
```

- To retrieve a specific log type, enter the following command

```
<   RTRV-LOG:LOGID1:::::<card>-<slot#>;
```

- To retrieve specific autonomous message type (indicated by number), enter the following command

```
<   RTRV-LOG:LOGID1:::::<message#>;
```

For a more detailed description of the command, its syntax, and parameter fields, see Retrieve alarm log command on page 285. The response to the command is the applicable sequence of autonomous alarm or event messages described in the example of Alarm message structure on page 309.

Delete alarm logs

Alarm logs can be deleted by type or all at once. Use the following commands to delete alarm logs.

- To delete a specific log type, enter the following command

```
<   DLT-LOG:LOGID1::;
```

- To delete all logs, enter the following command

```
<   DLT-LOG:::;
```

For a more detailed description of the command, its syntax, and parameter fields, see Delete alarm logs command on page 286.

Alarm messages

Tables 37 through 52 list alarms supported by type. The alarm and event types supported include the following:

- System
- CPU

- Equipment (including CPU, XCON, IXCON, DS3, DS3R, STS1, S155, ST1, SE1, FXS, and FXO)
- ST1 card
- SE1 card
- Cards that provide cross-connect support (including XCON, IXCON, DS3, DS3R, S155, and STS1)
- DS3 T3-level (applies to DS3 and DS3R cards)
- DS3 T1-level (applies to DS3 and DS3R cards)
- STS1, STS1 level
- STS1 VT level
- STS1 T1 level
- S155, STM1 and OC3 level
- S155 VT level
- S155 E1 level
- S155 T1 level
- Protection switching (ST1 and SE1 cards)
- Software upload and download

The alarm and event types are identified as parameter fields in the autonomous message syntax of Figure 31 under `<rspname>` and in the alarm log example. See Response names for autonomous messages on page 92 and Alarm message structure on page 309. The alarm or event type is also included in the alarm retrieval example of Alarm retrieval on page 310. Each table of alarms is set up with four columns containing the following:

- **Alarm code**—A single word or code appearing in the response to the **RTRV-ALM** command. See Retrieve alarms command on page 280 and Alarm retrieval on page 310.
- **Message and definition**—The message contained in quotation marks at the end of the autonomous message reporting the alarm or event. See Alarm message structure on page 309. When the message does not fully explain the situation, a definition is also provided. All these messages can be reviewed through the response to the **RTRV-LOG** command. See Retrieve alarm log command on page 285 and Alarm log retrieval on page 311.
- **Effect**—An indication of the nature of the alarm or event. The possible indications are:
  - **SA**—Service affecting (alarm)
  - **NSA**—Not service affecting (alarm)
  - **SC**—Set condition (event)
  - **TC** —Transient condition (event)
  - **CL**—Condition cleared (event)

- **Severity**—An indication of how serious the alarm or event is. The possible indications are:
  - **CR**—Critical (alarm)
  - **MJ**—Major (alarm)
  - **MN**—Minor (alarm)
  - **CL**—Cleared (alarm)
  - **NAL**—Non alarm status (event)

Table 37 shows system alarm and event messages.

Table 37. System alarms and events of type SYS

Alarm code	Message and definition (where applicable)	Effect	Severity
POWER_A_FAIL	"POWER A FAILURE"	NSA	MN
POWER_B_FAIL	"POWER B FAILURE"	NSA	MN
NODEIDERR	"NODEID MISMATCH"—You downloaded an NVM file that does not match the CPUs in shelf. No other alarms can be reported until this alarm is cleared. If the NVM is incorrect, download the correct NVM file. If the NVM is correct, change the node ID and switch activity on the CPU cards in order to clear the NODEIDERR alarm and return all other system alarms to their normal function.	NSA	MN
CLKSRC_PRMFAIL	"T1 PRIMARY REF CLOCK FAILURE"—T1 primary reference clock failed.	NSA	MN
CLKSRC_SECFAIL	"T1 SECONDARY REF CLOCK FAILURE"—T1 secondary reference clock failed.	NSA	MN
BITSAFAIL	"PRIMARY BITS REFERENCE CLOCK FAIL"—BITSA reference clock failed.	NSA	MN
BITSBFAIL	"SECONDARY BITS REFERENCE CLOCK FAIL"—BITSB reference clock failed.	NSA	MN
CLOCK_SOURCE_ SELECTION_SWITCHED	"CLOCK SOURCE SELECTION SWITCH"	CL	NAL
CLFAN	"COOLING FAN FAILURE"—Maintenance or replacement of the fan tray is required.	NSA	MN

Table 38 shows alarm and event messages associated with the CPU.

Table 38. CPU alarms and events of type SYS

Alarm code	Message and definition (where applicable)	Effect	Severity
EQPTFAIL	"CPU FAILURE"	NSA	MN

Table 39 shows equipment alarms for the following cards: CPU, IXCON, DS3, DS3R, STS1, S155, ST1, SE1, FXS, and FXO.

Table 39. Card alarms of type EQPT

Alarm code	Message and definition (where applicable)	Effect	Severity
IO CARD MISSING	"IO CARD MISSING"—When I/O slot cards are removed.	SA	MJ
CRDRMVD	"<cardtype> CARD MISSING" where <cardtype> is IXCON, ST1, ST1 IO, SE1, SE1 IO, DS3, DS3 IO, STS1, STS1 IO, S155, S155 IO, FXS, or FXO.	SA NSA	MJ MN
CRDMISMAT	"<cardtype> CARD MISMATCH" where <cardtype> is IXCON, ST1, SE1, DS3, STS1, S155, FXS, or FXO. Card does not match its provisioned type.	SA	MN
RINGER_MISSING	"<cardtype> RINGER MISSING" where <cardtype> is FXS or FXO—Ringer I/O card is missing.	SA	MJ
RINGER_FAIL	"<cardtype> RINGER FAILURE" where <cardtype> is FXS or FXOS—The Ringer I/O card must be replaced.	SA	CR
PROT	`"ST1-6:MN,PROT,NSA,02-09-19,16-13-11,,:\"ST1 PROTECTED\""`–The alarm is generated when the ST1 and SE1 cards have switched over.	NFA	MN

Table 40 shows alarms for ST1 cards.

Table 40. ST1 alarms of type EQPT

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	"ST1 LOSS OF SIGNAL"—No input signal from the lower speed side detected in this channel.	SA	MJ
LOF	"ST1 LOSS OF FRAME"—Loss of frame in Rx.	SA	MJ
YEL	"ST1 YELLOW SIGNAL"—Receiving remote defect indication (RDI) from downstream.	NSA	NAL
AIS-L	"ST1 ALARM INDICATION SIGNAL"—Alarm indication signal detected from lower speed side input.	NSA	NAL
CGA_RED	"ST1 CGA RED SIGNAL"—Carrier group alarm sent to the operator (terminal) by a channel bank on detection of an out of frame (OOF) condition.	SA	MJ
CGA-YEL	"ST1 CGA YELLOW SIGNAL"—Carrier group alarm sent to the sending end by a channel bank upon detection of an out of frame (OOF) condition.	SA	NAL
FACLPBK	"ST1 FACILITY LOOPBACK"—Remote facility loopback alarm active.	NSA	MN
TERMLPBK	"ST1 TERMINAL LOOPBACK"—Remote terminal loopback alarm active.	NSA	MN

Table 41 shows alarms for SE1 cards.

Table 41. SE1 alarms of type EQPT

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	"SE1 LOSS OF SIGNAL"—No input signal from the lower speed side detected in this channel.	SA	MJ
LOF	"SE1 LOSS OF FRAME"—Loss of frame in Rx.	SA	MJ
YEL	"SE1 YELLOW SIGNAL"—Receiving remote defect indication (RDI) from downstream.	NSA	NAL
TS16-AIS	"SE1 ALARM INDICATION SIGNAL"—Alarm indication signal detected from lower speed side input.	NSA	NAL
CGA_RED	"SE1 CGA RED SIGNAL"—Carrier group alarm sent to the operator (terminal) by a channel bank on detection of an out of frame (OOF) condition.	SA	MJ
CGA-YEL	"SE1 CGA YELLOW SIGNAL"—Carrier group alarm sent to the sending end by a channel bank upon detection of an out of frame (OOF) condition.	SA	NAL
FACLPBK	"SE1 FACILITY LOOPBACK"—Remote facility loopback alarm active.	NSA	MN
TERMLPBK	"SE1 TERMINAL LOOPBACK"—Remote terminal loopback alarm active.	NSA	MN

Table 42 shows alarms for the T3 facilities on DS3 and DS3R cards.

Table 42. DS3 alarms of type T3

Alarm code	Message and definition (where applicable)	Effect	Severity
LOF	"DS3 LOSS OF FRAME"—3 of 16 frame bits had errors at least once every 0.5 second, for 2.5 seconds.	SA	MJ
AIS-L	"DS3 ALARM INDICATION SIGNAL"—A 1010 or 1111 pattern was detected repeatedly for 2.5 seconds.	NSA	MN
RAI	"DS3 REMOTE ALARM INDICATION"—X1 or X2 bits = 0 over 2.5 seconds.	SA	MJ
FEBE	"DS3 FAR END BLOCK ERROR"—At least one far end block error occurred in the previous second.	MJ	MJ
FACLPBK	"DS3 FACILITY LOOPBACK"—A line loopback (towards the network) is active.	MJ	MJ
TERMLPBK	"DS3 TERMINAL LOOPBACK"—A local loopback (towards the backplane) is active.	MJ	MJ
PARITY_ERR	"DS3 PARITY ERROR"—At least one DS3 parity error occurred in the last second.	SA	MJ
IOLOCLPBK	"DS3 IO LOCAL LOOPBACK"—DS3 line loopback toward the line in the I/O card is active.	NSA	MN

Table 42. DS3 alarms of type T3 (continued)

Alarm code	Message and definition (where applicable)	Effect	Severity
IOLINELPBK	“DS3 IO LINE LOOPBACK”—DS3 line loopback toward the backplane in the I/O card is active.	NSA	MN

Table 43 shows alarms for the T1 facilities on DS3 and DS3R cards.

Table 43. DS3 alarms of type T1

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	“DS1 LOSS OF SIGNAL”—More than 175 consecutive zeroes were detected at least once every 0.5 second for 2.5 seconds.	SA	MJ
LOF	“DS1 LOSS OF FRAME”—3 of 16 frame bits had errors at least once every 0.5 second, for 2.5 seconds.	SA	MJ
CGA_RED	“DS1 CGA RED SIGNAL”—This is a summary of the LOS, LOF, and AIS alarms that are active.	SA	MJ
CGA_YEL	“DS1 CGA YELLOW SIGNAL”—This is a summary of the remote alarm indications that are active.	SA	MJ
YEL	“DS1 YELLOW SIGNAL”—The far end reported a failure. It is reported immediately rather than being confirmed for 2.5 seconds.	SA	MJ
AIS-L	“DS1 ALARM INDICATION SIGNAL”—An all ones pattern was detected over 2.5 seconds.	SA	MJ
FACLPBK	“DS1 FACILITY LOOPBACK”—A line (all bits) or payload (user data bits only) loopback (towards the network) is active.	SA	MJ
TERMLPBK	“DS1 TERMINAL LOOPBACK”—A local loopback (towards the backplane) is active.	SA	MJ
PCV THRESH	“PARITY CODE VIOLATION”—More than 320 cyclic redundancy-check bit errors (ESF framing) or 8 framing bit errors (D4 framing) occurred in a second.	SA	MJ

Table 44 shows alarms for the STS1 facilities on STS1 cards.

Table 44. STS1 alarms of type STS1CHAN

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	“STS1 LOSS OF SIGNAL”—More than 175 consecutive zeroes were detected for 2.5 seconds.	SA	CR
LOF	“STS1 LOSS OF FRAME”—3 of 16 frame bits had errors for 2.5 seconds.	SA	CR
AIS-L	“STS1 AIS LINE”—An all ones pattern was detected over 2.5 seconds.	SA	CR

Table 44. STS1 alarms of type STS1CHAN (continued)

Alarm code	Message and definition (where applicable)	Effect	Severity
AIS-P	"STS1 AIS PATH"—An all ones pattern was detected over 2.5 seconds.	SA	CR
LOP	"STS1 LOSS OF POINTER"—Eight to ten invalid pointers detected.	SA	CR
UNEQ-P	"STS1 PATH UNEQUIPPED"—Five consecutive frames of unequipped payload label.	SA	CR
PLM-P	"STS1 PATH LABEL MISMATCH"— Five consecutive frames of mismatched payload label.	SA	CR
RFI-L	"STS1 LINE REMOTE FAILURE INDICATION"— K2 bit 6, 7, and 8=111 for 5 to 10 consecutive frames.	SA	CR
RFI-P	"STS1 REMOTE FAR END FAILURE INDICATION PATH"— G1 bit 5=1 for ten consecutive frames.	SA	CR
FACLPBK	"STS1 FACILITY LOOPBACK"—A line (all bits) or payload (user data bits only) loopback (towards the network) is active.	SA	CR
TERMLPBK	"STS1 TERMINAL LOOPBACK"—A local loopback (towards the backplane) is active.	SA	CR
IOLOCLPBK	"STS1 IO FACILITY LOOPBACK"—An STS1 line loopback toward the line in the I/O card is active.	SA	CR
IOLINELPBK	"STS1 IO TERMINAL LOOPBACK"—An STS1 line loopback toward the backplane in the I/O card is active.	SA	CR
APSSD	"APS SIGNAL DEGRADE"—The bit error rate has degraded past the provisioned threshold (range is from 10^{-3} to 10^{-9}).	SA	CR
APSSF	"APS SIGNAL FAILURE"—Summary alarm for loss of signal, loss of frame, alarm indication signal, and remote failure indication: bit error rate is more than 10^{-3}.	SA	CR

Table 45 shows alarms for the virtual tributary facilities on STS1 cards.

Table 45. STS1 alarms of type VTCHAN

Alarm code	Message and definition (where applicable)	Effect	Severity
AIS-V	"VT AIS"—All 1's in virtual tributary SPE including V1 to V4 bytes, detected for three frames.	SA	MJ
LOP-V	"VT LOSS OF POINTER"—Eight to ten invalid pointers detected.	SA	MJ
UNEQ-V	"VT ALRM UNEQUIPPED"—Payload label indicates unequipped VT.	SA	MJ
PLM-V	"VT PATH LABEL MISMATCH"—Five consecutive mismatched payload labels.	SA	MJ

Table 45. STS1 alarms of type VTCHAN (continued)

Alarm code	Message and definition (where applicable)	Effect	Severity
RFI-V	"VT REMOTE FAR END FAILURE INDICATION"—Attributed to various causes.	SA	MJ

Table 46 shows alarms for the T1 facilities on STS1 cards.

Table 46. STS1 alarms of type T1

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	"T1 LOSS OF SIGNAL"—More than 175 consecutive zeroes were detected at least once every 0.5 second for 2.5 seconds.	SA	MJ
LOF	"T1 LOSS OF FRAME"—3 of 16 frame bits had errors at least once every 0.5 second, for 2.5 seconds.	SA	MJ
AIS-L	"T1 ALARM INDICATION SIGNAL"—An all ones pattern was detected over 2.5 seconds.	SA	MJ
RAI	"T1 REMOTE ALARM INDICATION"—The far end reported a failure (T1 Yellow Alarm).	SA	MJ
FACLPBK	"T1 FACILITY LOOPBACK"—A line (all bits) loopback (towards the network) is active.	SA	MJ
TERMLPBK	"T1 TERMINAL LOOPBACK"—A local loopback (towards the backplane) is active.	SA	MJ
CGA-RED	"T1 CGA RED SIGNAL"—Carrier group alarm sent to the operator (terminal) by a channel bank on detection of an out of frame (OOF) condition.	SA	MJ
YEL	"T1 YELLOW SIGNAL"—Receiving remote defect indication (RDI) from downstream.	SA	MJ
CGA-YEL	"T1 CGA YELLOW SIGNAL"—Carrier group alarm sent to the sending end by a channel bank upon detection of an out of frame (OOF) condition.	SA	MJ
PCV THRESH	"PARITY CODE VIOLATION"—More than 320 cyclic redundancy-check bit errors (ESF framing) or 8 framing bit errors (D4 framing) occurred in a second.	SA	MJ

Table 47 shows alarms for the STM-1 or OC3 optical facilities on S155 cards.

Note: The S155 card alarms use SONET terminology. For equivalent SDH terminology, see *Appendix C on page 373*.

Table 47. S155 alarms of type S155CHAN

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	"*x* LOSS OF SIGNAL"—where *x* = STM-1 or OC3. More than 175 consecutive zeroes were detected for 2.5 seconds.	SA	CR
LOF	"*x* LOSS OF FRAME"—where *x* = STM-1 or OC3. 3 of 16 frame bits had errors for 2.5 seconds.	SA	CR
AIS-L	"*x* AIS LINE"—where *x* = STM-1 or OC3. An all ones pattern was detected over 2.5 seconds.	NSA	CR
RFI-L	"*x* LINE REMOTE FAILURE INDICATION"— where *x* = STM-1 or OC3. K2 bit 6, 7, and 8=111 for 5 to 10 consecutive frames.	SA	CR
AIS-P	"*x* AIS PATH"—where *x* = STM-1 or OC3. An all ones pattern was detected over 2.5 seconds.	NSA	CR
LOP	"*x* LOSS OF POINTER"—where *x* = STM-1 or OC3. Eight to ten invalid pointers detected.	SA	CR
UNEQ-P	"*x* PATH UNEQUIPPED"—where *x* = STM-1 or OC3. Five consecutive frames of unequipped payload label.	SA	CR
PLM-P	"*x* PATH LABEL MISMATCH"— where *x* = STM-1 or OC3. Five consecutive frames of mismatched payload label.	SA	CR
RFI-P	"*x* REMOTE FAR END FAILURE INDICATION PATH"— where *x* = STM-1 or OC3. G1 bit 5=1 for ten consecutive frames.	SA	CR
AIS-P2	"OC3 AIS PATH"—An all ones pattern was detected over 2.5 seconds on second path layer (OC3 mode only).	NSA	CR
LOP2	"OC3 LOSS OF POINTER"—Eight to ten invalid pointers detected on second path layer (OC3 mode only).	SA	CR
UNEQ-P2	"OC3 PATH UNEQUIPPED"—Five consecutive frames of unequipped payload label on second path layer (OC3 mode only).	SA	CR
PLM-P2	"OC3 PATH LABEL MISMATCH"—Five consecutive frames of mismatched payload label on second path layer (OC3 mode only).	SA	CR
RFI-P2	"OC3 REMOTE FAR END FAILURE INDICATION PATH"— G1 bit 5=1 for ten consecutive frames on second path layer (OC3 mode only).	SA	CR
AIS-P3	"OC3 AIS PATH"—An all ones pattern was detected over 2.5 seconds on third path layer (OC3 mode only).	NSA	CR
LOP3	"OC3 LOSS OF POINTER"—Eight to ten invalid pointers detected on third path layer (OC3 mode only).	SA	CR
UNEQ-P3	"OC3 PATH UNEQUIPPED"—Five consecutive frames of unequipped payload label on third path layer (OC3 mode only).	SA	CR

Table 47. S155 alarms of type S155CHAN (continued)

Alarm code	Message and definition (where applicable)	Effect	Severity
PLM-P3	“OC3 PATH LABEL MISMATCH”—Five consecutive frames of mismatched payload label on third path layer (OC3 mode only).	SA	CR
RFI-P3	“OC3 REMOTE FAR END FAILURE INDICATION PATH”— G1 bit 5=1 for ten consecutive frames on third path layer (OC3 mode only).	SA	CR
FACLPBK	“*x* FACILITY LOOPBACK”—where *x* = STM-1 or OC3. A line (all bits) or payload (user data bits only) loopback (towards the network) is active.	SA	CR
TERMLPBK	“*x* TERMINAL LOOPBACK”—where *x* = STM-1 or OC3. A local loopback (towards the backplane) is active.	SA	CR
IOLOCLPBK	“*x* IO FACILITY LOOPBACK”—where *x* = STM-1 or OC3. An S155 line loopback toward the line in the I/O card is active.	SA	CR
IOLINELPBK	“*x* IO TERMINAL LOOPBACK”—where *x* = STM-1 or OC3. An S155 line loopback toward the backplane in the I/O card is active.	SA	CR
APSSD	“APS SIGNAL DEGRADE”—The bit error rate has degraded past the provisioned threshold (range is from 10^{-3} to 10^{-9}). The line can be cleared or overridden by a forced automatic protection switch.	SA	CR
APSSF	“APS SIGNAL FAILURE”—Summary alarm for loss of signal, loss of frame, alarm indication signal, and remote failure indication: bit error rate is more than 10^{-3}. The line can be cleared or overridden by a forced automatic protection switch.	SA	CR
FORCE_SWITCH	“APS FORCED SWITCH”—User has forced traffic to the working or protection line.	NSA	MN
MAN_SWITCH	“APS MANUAL SWITCH”—User has manually requested traffic to switch to the working or protection line. The switch occurs if the line is not in a lockout or forced switch state.	NSA	MN
LOCK_OUT_PROT	“APS LOCK OUT OF PROTECTION”—User has locked the working line from switching to the protection line.	NSA	MN
NO_LINE_PROT	“APS NO LINE PROTECTION”—The S155 card pair has lost synchronization. Automatic protection switching functions are blocked.	NSA	MN

Table 48 shows alarms for the virtual tributary facilities on S155 cards.

Table 48. S155 alarms of type VTCHAN

Alarm code	Message and definition (where applicable)	Effect	Severity
AIS-V	"VT AIS"—All 1's in virtual tributary SPE including V1 to V4 bytes, detected for three frames.	SA	MJ
LOP-V	"VT LOSS OF POINTER"—Eight to ten invalid pointers detected.	SA	MJ
UNEQ-V	"VT ALRM UNEQUIPPED"—Payload label indicates unequipped VT.	SA	MJ
PLM-V	"VT PATH LABEL MISMATCH"—Five consecutive mismatched payload labels.	SA	MJ
RFI-V	"VT REMOTE FAR END FAILURE INDICATION"—Attributed to various causes.	SA	MJ

Table 49 shows alarms for the E1 facilities on S155 cards.

Table 49. S155 alarms of type E1CHAN

Alarm code	Message and definition (where applicable)	Effect	Severity
LOF	"E1 LOSS OF FRAME"—Loss of frame alignment	SA	MJ
LOCRC4F	"LOSS OF CRC4 MULTIFRAME"—Loss of CRC4 multi-frame alignment	SA	MJ
LOSMF	"LOSS OF MULTIFRAME SIGNAL"—Loss of signaling multiframe	SA	MJ
AIS	"E1 ALARM INDICATION SIGNAL"—Alarm indication signal	SA	MJ
RAI	"E1 REMOTE ALARM INDICATION"—The far end reported a failure (E1 Yellow Alarm).	SA	MJ

Table 50 shows alarms for the T1 facilities on S155 cards.

Table 50. S155 alarms of type T1

Alarm code	Message and definition (where applicable)	Effect	Severity
LOS	"DS1 LOSS OF SIGNAL"—More than 175 consecutive zeroes were detected at least once every 0.5 second for 2.5 seconds.	SA	MJ
LOF	"DS1 LOSS OF FRAME"—3 of 16 frame bits had errors at least once every 0.5 second, for 2.5 seconds.	SA	MJ
CGA_RED	"DS1 CGA RED SIGNAL"—This is a summary of the LOS, LOF, and AIS alarms that are active.	SA	MJ
CGA_YEL	"DS1 CGA YELLOW SIGNAL"—This is a summary of the remote alarm indications that are active.	SA	MJ

Table 50. S155 alarms of type T1 (continued)

Alarm code	Message and definition (where applicable)	Effect	Severity
YEL	"DS1 YELLOW SIGNAL"—The far end reported a failure. It is reported immediately rather than being confirmed for 2.5 seconds.	SA	MJ
AIS-L	"DS1 ALARM INDICATION SIGNAL"—An all ones pattern was detected over 2.5 seconds.		
FACLPBK	"DS1 FACILITY LOOPBACK"—A line (all bits) or payload (user data bits only) loopback (towards the network) is active.		
TERMLPBK	"DS1 TERMINAL LOOPBACK"—A local loopback (towards the backplane) is active.		

Table 51 shows alarms for protection switching on the ST1 and SE1 cards.

Table 51. Protection switching alarms of type EQPT

Alarm code	Message and definition (where applicable)	Effect	Severity
MANSWREQ	"EQPT MANUAL SWITCH REQUEST"—User has applied equipment protection manual switch.	NSA	MN
FRCDSWREQ	"EQPT FORCE SWITCH REQUEST"—User has requested a forced switch.	NSA	MN
LCKOUTREQ	"EQPT LOCKOUT WORKING REQUEST"—User has locked out working card thus preventing it from being protected.	NSA	MN
LCKOUTREQ	"EQPT LOCKOUT PROTECTION REQUEST"—User has locked out the protection card thus preventing it from protecting any mapper.	NSA	MN
SWIDLE	"EQPT SWITCH IDLE"	TC	NAL
LCKOUTCMPL	"EQPT LOCKOUT COMPLETE"	TC	NAL
FRCDSWPNDG	"EQPT FORCE SWITCH PENDING"	TC	NAL
FRCDSWCMPL	"EQPT FORCE SWITCH COMPLETE".	TC	NAL
FRCDSWFAIL	Forced switching failed.	TC	NAL
AUTOSWPNDG	"EQPT AUTO SWITCH PENDING"	TC	NAL
AUTOSWCMPL	"EQPT AUTO SWITCH COMPLETE"	TC	NAL
AUTOSWWTR	"EQPT AUTO SWITCH WAIT TO RESTORE"	TC	NAL
AUTOSWFAIL	Auto switching failed.	TC	NAL
MANSWPNDG	"EQPT MANUAL SWITCH PENDING"	TC	NAL
MANSWCMPL	"EQPT MANUAL SWITCH COMPLETE"	TC	NAL
MANSWFAIL	Manual switching failed.	TC	NAL

Table 52 shows alarms for uploading and downloading software.

Table 52. Software upload and download alarms of type CPU BANK

Alarm code	Message and definition (where applicable)	Effect	Severity
PROT	\"ST1 PROTECTED\" —The card is being protected by the system through automatic detection or manual command.	NSA	MN
SWLOAD_BADLOAD	"BAD LOAD"—Downloading failed	NSA	MN
SWLOAD_NO_FILE	"NO FILE FOUND"	SC	NAL
SWLOAD_CRC_ERR	"CRC ERROR"—Cyclic redundancy check error	SC	NAL
SW_FLASH_LOAD_ COMPL	"FLASH LOADING COMPLETED"	SC	NAL
SWLOAD_NVM_LOAD_ COMPL	"NVM LOADING COMPLETED"	SC	NAL
SWLOAD_INTERNAL_ ERR	"SOFTWARE INTERNAL ERROR"	SC	NAL
SWLOAD_DROP_ CONNECTION	"CONNECTION TIMEOUT"—Connection dropped	SC	NAL
SW_LOAD_CARD_ FAULT	"CARD FAULT"—Load aborted, card busy.	SC	NAL
SWLOAD_FLASH_ ACTIVE	"DENY, FLASH ACTIVE'—Unable to download due to flashbank being active. *Note: This alarm also applies to the IXCON, DS3, DS3R, S155, and STS1 flashbanks.*	SC	NAL

Performance monitoring

This section gives sample commands and thresholds for performance monitoring (PM) counters.

Sample commands

The examples given for initializing and retrieving performance monitoring in this section are for the ST1 card. For other cards of the system, substitute the correct card name as applicable.

To initialize performance monitoring (PM), enter **`INIT-PM::ST1-8:::ALL,,,, 15-MIN,,0&&32;`** at the command prompt. For a more detailed description of the command, its syntax, and parameter fields, see Clear PM counts command on page 233.

To retrieve ST1 card performance monitoring information, enter **`RTRV-PM::ST1-8 :::,,,,1-DAY,,0&&7;`** at the command prompt. For a more detailed description of the command, its syntax, and parameter fields, see Retrieve PM counts command on page 225.

The retrieve performance monitoring response reports up-to-date information that includes the time period selected. For a more detailed description of the response, its syntax, and parameter fields, see Retrieve PM counts response on page 232.

Performance monitoring thresholds

This section contains tables that describe the thresholds that make up each type of performance monitoring parameter. The thresholds are preset and based on technical standards.

Table 53 shows the general PM thresholds for the system.

Table 53. PM thresholds for the system

Parameter	Threshold
CV	Code violations counted in errored seconds (ES)
FC	Failure count, incrementing by 1 each time a failure (alarm) occurs
UAS	Unavailable seconds are declared after 10 consecutive severely errored seconds and are cleared after 10 consecutive non severely errored seconds
Defect	One-time occurrence of any problem (for example, loss of frame)
Alarm	Defect that persists in 5 consecutive half-second windows

Table 54 shows the PM thresholds for ST1 cards.

Table 54. PM thresholds for ST1 cards

Parameter	Threshold
CVL	Sum of BIP errors based on B8ZS line code
ESL	At least 1 of: CVL or loss of signal (LOS) event
SESL	At least 1 LOS events
LOSS-L	At least 1 LOS event (100 consecutive zeroes)
CVP	Sum of frame bit errors in errored seconds
ESP	At least 1 of: frame bit error | CRC bit error | AIS, SEF, or controlled slip event
SESP	At least: 8 frame bit errors | 320 CRC bit errors | 1 AIS or SEF event (SEF = 2 of 6 FPS or Ft bit errors, corresponds to loss of frame synchronization)
SAS-P	At least 1 of: AIS or SEF event
AISS-P	At least 1 AIS event (unframed all 1's pattern)
CSS-P	At least 1 controlled slip event
UASP	10 consecutive SESP
FC-P	Failure count on any second containing a CGA RED alarm
ESLFE	At least 1 of: remote error indication for line (REI-L) or remote defect indication for line (RDI-L)
CVPFE	Sum of REI for path in errored seconds

Table 54. PM thresholds for ST1 cards (continued)

Parameter	Threshold
ESP-FE	At least 1 of: REI-P or RDI-P defect
SESP-FE	At least 2,400 of: REI-P or RDI-P defect
CSS-PFE	At least 1 controlled slip event
UASP-FE	10 consecutive SESP-FE
SEFSP-FE	At least 1 out of frame event (four consecutive errored framing patterns)

Table 54 shows the PM thresholds for SE1 cards.

Table 55. PM thresholds for SE1 cards

Parameter	Threshold
CVP	Sum of background block errors (BBE) measured as frame errors (MFM mode) or CRC-4 errors (CRCMFM mode) in errored seconds
ESP	At least 1 of the following: BBE | loss of signal (LOS), alarm indication signal (AIS), or loss of frame (LOF) defect
SESP	At least: 320 CRC-4 errors | 1 LOS, AIS, or LOF defect
SAS-P	At least 1 of: AIS or SEF event
AISS-P	At least 1 AIS event (unframed all 1's pattern)
CSS-P	At least 1 controlled slip event
UASP	10 consecutive SESP
FC-P	Failure count on any second containing a CGA RED alarm
CVL	Sum of BIP errors in errored seconds.
ESL	At least 1 of: CVL or loss of signal (LOS) event
SESL	At least 1 LOS events
LOSS-L	At least 1 LOS event (100 consecutive zeroes)

Table 56 shows the PM thresholds for the T3 facilities on DS3 and DS3R cards.

Table 56. PM thresholds for DS3 T3 facilities

Parameter	Threshold
CV-C[1]	Sum of control bit (C-BIT) errors in errored seconds
ESCP-P	At least 1 of C-BIT error
SESCP-P	At least 45 C-BIT errors per second or 1 out of frame (OOF)
ESL	At least 1 CVL or loss-of-signal event
CVL	A count of bipolar three-zero substitution (B3ZS) line code violations
CVP	Sum of path bit (P-BIT) errors in errored seconds
ESP	At least 1 of P-BIT error
SESP	At least 45 path bit (P-BIT) errors per second or 1 OOF
SEFS	At least 1 of SEF defect (SEF = 4 consecutive invalid framing patterns)

Table 56. PM thresholds for DS3 T3 facilities (continued)

Parameter	Threshold
UASP	10 consecutive SESP

1. The **C** errors apply only when framing mode is CBIT.

Table 57 shows the PM thresholds for the DS1 facilities on DS3 and DS3R cards.

Table 57. PM thresholds for DS3 DS1 facilities

Parameter	Threshold
AISS-P	At least 1 AIS event (unframed all 1’s pattern)
CSS-P	At least 1 controlled slip event
FC-P	Failure count on any second containing a CGA RED alarm
CVL	N/A (No physical T1 line)
ESL	At least 1 of: CVL or LOS event
LOSS-L	At least 1 LOS event (100 consecutive zeroes)
SESL	At least 1 LOS events
CVP	Sum of frame bit errors in errored seconds
ESP	At least 1 of: frame bit error | CRC bit error | AIS, SEF, or controlled slip event
SESP	At least: 8 frame bit errors | 320 CRC bit errors | 1 AIS or SEF event (SEF = 2 of 6 FPS or Ft bit errors, corresponds to loss of frame synchronization)
SAS-P	At least 1 of: AIS or SEF event
UASP	10 consecutive SESP

Table 58 shows the PM thresholds for the STS1 facilities on STS1 cards.

Table 58. PM thresholds for STS1 facilities

Parameter	Threshold
CVS	Sum of B1 BIP errors in errored seconds
ESS	At least 1 of: B1 BIP error | SEF or LOS defect
SESS	At least 52 of: B1 BIP error | SEF of LOS defect
SEFS	At least 1 of SEF defect (SEF = 4 consecutive invalid framing patterns)
CVL	Sum of B2 BIP errors in errored seconds
ESL	At least 1 of: BIP error | AIS-L, LOS, or LOF defect
SESL	At least 51 of: BIP error | AIS-L, LOS, or LOF defect
UASL	10 consecutive SESL
FC-L	Failure count on AIS-l, LOS, or LOF failures
CVP	Sum of B3 BIP in errored seconds
ESP	At least 1 of: B3 BIP error | AIS-P, loss of pointer for path (LOP-P), unequipped path (UNEQ-P) defect | line defect

Table 58. PM thresholds for STS1 facilities (continued)

Parameter	Threshold
SESP	At least 2,400 of: B3 BIP error | AIS-P, LOP-P, UNEQ-P defect | line defect
UASP	10 consecutive SESP
FC-P	Failure count on AIS-P, LOP-P, or UNEQ-P failure | line failure
CV-LFE	Sum of far-end BIP errors in remote error indication for line (REI-L), (M0 byte) in errored seconds
ESLFE	At least 1 of: REI-L or remote defect indication for line (RDI-L), (K2 byte)
SES-LFE	At least 51 of: REI-L or RDI-L (K2 byte)
UASL-FE	10 consecutive SES-LFE
FC-LFE	Failure count on remote failure indication for line (RFI-L) on far-end
CVPFE	Sum of far-end BIP errors in remote error indication for path (REI-P) byte (G4 byte, bits 1 to 4) in errored seconds
ESP-FE	At least 1 of: REI-P | RDI-P defect (G4 byte, bits 5 to 8)
SESP-FE	At least 2,400 of: REI-P | RDI-P defect (G4 byte, bits 5 to 8)
UASP-FE	10 consecutive SESP-FE
FC-PFE	Failure count on RFI-P for far-end

Table 59 shows the PM thresholds for the DS1 facilities on STS1 cards.

Table 59. PM thresholds for STS1 DS1 facilities

Parameter	Threshold
CVL	N/A (No physical T1 line)
ESL	At least 1 of: CVL or LOS event
SESL	At least 1 LOS events
LOSS-L	At least 1 LOS event (100 consecutive zeroes)
CVP	Sum of frame bit errors in errored seconds
ESP	At least 1 of: frame bit error | CRC bit error | AIS, SEF, or controlled slip event
SESP	At least: 8 frame bit errors | 320 CRC bit errors | 1 AIS or SEF event (SEF = 2 of 6 FPS or Ft bit errors, corresponds to loss of frame synchronization)
AISS-P	At least 1 AIS event (unframed all 1’s pattern)
SAS-P	At least 1 of: AIS or SEF event
CSS-P	At least 1 controlled slip event
UASP	10 consecutive SESP
FC-P	Failure count on any second containing a CGA RED alarm

Table 60 shows the PM thresholds for the virtual tributaries on STS1 cards.

Table 60. PM thresholds for STS1 VTs

Parameter	Threshold
CVV	Sum of B1 BIP errors in errored seconds
ESV	At least 1 of: BIP error | AIS-V, LOP-V, UNEQ-V defect | path or line defect
SEW	At least 600 of: BIP error | AIS-V, LOP-V, UNEQ-V defect | path or line defect
UASV	10 consecutive SEW
FC-V	Failure count on AIS-V, LOP-V, or UNEQ-V | path or line defect
CV-VFE	Sum of far-end BIP errors in REI-V bit, in errored seconds
ES-VFE	At least 1 of: REI-V or RDI-V indication
SES-VFE	At least 600 of: REI-V or RDI-V indication
UASV-FE	10 consecutive SESE-VFE
FC-VFE	Failure count on RFI-V in far end

Table 61 shows the PM thresholds for the STM-1 and OC3 facilities on S155 cards.

Table 61. PM thresholds for S155 STM-1 or OC3 facilities

Parameter	Threshold
CVS	Sum of B1 channel bit interleaved parity (BIP) errors in errored seconds
ESS	At least 1 of the following: B1 BIP error | LOS or LOF defect
SESS	At least 155 of the following: B1 BIP error | LOS or LOF defect
SEFS	10 consecutive SESS
CVL	Sum of B2 channel BIP errors in errored seconds
ESL	At least 1 of the following: B2 BIP error | AIS-L defect
SESL	At least 154 of the following: B2 BIP error | AIS-L defect
UASL	10 consecutive SESL
FC-L	Failure count on LOS, LOF, or AIS-L alarms
CVP	Sum of B3 BIP in errored seconds
ESP	At least 1 of the following: B3 BIP error | AIS-P, LOP-P, UNEQ-P, or PLM-P defect
SESP	At least 2,400 of the following: B3 BIP error | AIS-P, LOP-P, UNEQ-P, or PLM-P defect
UASP	10 consecutive SESP
FC-P	Failure count on the following: LOS, LOF, or AIS-L alarms | AIS-P, LOP-P, UNEQ-P, or PLM-P alarms
CV-LFE	Sum of remote error indication for line (REI-L) in errored seconds
ESLFE	At least 1 of the following: REI-L error | remote defect indication for line (RDI-L) defect
SES-LFE	At least 154 of the following: REI-L error | remote defect indication for line (RDI-L) defect

Table 61. PM thresholds for S155 STM-1 or OC3 facilities (continued)

Parameter	Threshold
UASL-FE	10 consecutive SES-LFE
FC-LFE	Failure count on remote failure indication for line (RFI-L) alarms
CVPFE	Sum of REI for path (REI-P) in errored seconds
ESP-FE	At least 1 of the following: REI-P error | RDI-P defect
SESP-FE	At least 2,400 of the following: REI-P error | RDI-P defect
UASP-FE	10 consecutive SESP-FE
FC-PFE	Failure count on RFI-P or RFI-L alarms

Table 62 shows the PM thresholds for the E1 facilities on S155 cards.

Table 62. PM thresholds for S155 E1 facilities

Parameter	Threshold
CVP	Sum of cyclic redundancy check-4 (CRC-4) errors in errored seconds
ESP	At least 1 of: CRC-4 error | LOS, LOF, AIS, LOMF, LOSMF defect
SESP	At least 300 of: CRC-4 error | LOS, LOF, AIS, LOMF, LOSMF defect
FC-P	At least 1 of: Failure count on section | AIS-V, LOP-V, UNEQ-V | LOS, LOF, AIS, LOMF, LOSMF defect
CVPFE[1]	Sum of far end block errors (FEBE) in errored seconds
ESP-FE	At least 1 of FEBE or RAI defect
SESP-FE	At least 600 of FEBE or RAI defect
FC-PFE	Failure count on RAI alarm.

1. Far-end PM counts for E1 are not available in this release.

Table 63 shows the PM thresholds for the DS1 facilities on S155 cards.

Table 63. PM thresholds for S155 DS1 facilities

Parameter	Threshold
CVP	Sum of frame bit errors in errored seconds
ESP	At least 1 of: frame bit error | CRC bit error | AIS, SEF, or controlled slip event
SESP	At least: 8 frame bit errors | 320 CRC bit errors | 1 AIS or SEF event (SEF = 2 of 6 FPS or Ft bit errors, corresponds to loss of frame synchronization)
SAS-P	At least 1 of: AIS or SEF event
UASP	10 consecutive SESP
FC-P	Failure count on any second containing a CGA RED alarm
AISS-P	At least 1 AIS event (unframed all 1’s pattern)
CSS-P	At least 1 controlled slip event

Table 64 shows the PM thresholds for the virtual tributaries on S155 cards.

Table 64. PM thresholds for S155 VTs

Parameter	Threshold
CVV	Sum of BIP errors in errored seconds
ESV	At least 1 of the following: BIP error | AIS-V, LOP-V, or UNEQ-V error | section, line, or path failure
SEW	At least 600 of the following: BIP error | AIS-V, LOP-V, or UNEQ-V error | section, line, or path failure
UASV	10 consecutive SEW
FC-V	Failure count on the following: section | AIS-V, LOP-V, or UNEQ-V | section, line, or path failure
CV-VFE	Sum of REI in errored seconds
ES-VFE	At least 1 of the following: RE1 error | RDI-V defect
SES-VFE	At least 600 of the following: RE1 error | RDI-V defect
UASV-FE	10 consecutive SES-VFE
FC-VFE	Failure count on remote failure indication for VT (RFI-V) alarms

Diagnostics for mapper cards

Mapper cards have two types of diagnostic testing capabilities:

- Power-up diagnostics
- Equipment diagnostics

Power-up diagnostics

Following installation of a new card, the system performs equipment level diagnostics automatically. The major components of the new card are validated as the card initializes.

Equipment diagnostics

Before diagnostic testing on system cards can be performed, the cards must be placed in the out of service for maintenance (OOSMT) mode. Use the procedures in the following sections to take cards out of service, perform the available diagnostic testing, and return the cards to service. The procedures assume that the system has been installed and successfully powered up in accordance with the instructions in the ARCADACS 100 *Quick Start Guide*.

Performing diagnostics on mapper cards

Putting the cards out of service

Use the following procedure to perform diagnostic testing on selected system cards.

1. Remove the card from service by entering the following command.

   <   ED-EQPT::<card>-<slot#>::::PST=OOSMT;

   Observe a response indicating that the command was executed. See Edit card settings function on page 151.

2. Begin diagnostic testing by entering the following command.

   <   ACT-DIAG::<card>-<slot#>:;

   Observe a response similar to the following:

```
DPRAM  PASS DPRAM READ OK
RAM    PASS OS9 RAM CHECK OK
FPGA   PASS FPGA READ OK
NVM    PASS EEPROM READ OK
```

   See Initiate testing function on page 154.

3. Return the card to service by entering the following command.

   <   ED-EQPT::<card>-<slot#>::::PST=IS;

   Observe a response indicating that the command was executed. See Edit card settings function on page 151.

Testing a facility

The system provides port facility loopback testing for ST1, SE1, DS3, and DS3R cards. Testing must be performed with the facility ports in out of service for maintenance (OOSMT) mode.

Loopback testing

Perform the following procedure to accomplish the facility loopback testing.

1. Remove the port to be tested from service by entering the following command.

```
<   ED-FAC::<card>-<slot#>-<port#>[-<channel#>]::::PST=OOSMT;
```

> **Note:** The <channel#> parameter is for T1 level testing on a DS3 or DS3R card.

Observe a response indicating that the command was executed. See Facility configuration on page 159 and Edit facility data command on page 167.

2. Begin the loopback test by entering the following command.

```
<   OPR-LPBK::<card>-<slot#>-<port#>[-<channel#>]:::TXLINE;
```

See Facility configuration on page 159 and Operate loopback test command on page 193.

3. Release the port from testing by entering the following command.

```
<   RLS-LPBK::<card>-<slot#>-<port#>[-<channel#>]:;
```

See Facility configuration on page 159 and Release loopback test command on page 195.

4. Return the port to service by entering the following command.

```
<   ED-FAC::<card>-<slot#>-<port#>[-<channel#>]::::PST=IS;
```

Observe a response indicating that the command was executed. See Facility configuration on page 159 and Edit facility data command on page 167.

Replacing a failed card

Use one of the following procedures to replace a card that failed during testing.

Clock I/O cards

The procedure for replacing Clock I/O cards depends on whether there are one or two cards in the system.

Single Clock I/O card

1. Insert the replacement Clock I/O card.

2. Wait for it to synchronize with the original Clock I/O card.

3. Remove the original Clock I/O card.

Redundant Clock I/O cards

1. Ensure that two matched Clock I/O cards have been received.

2. Ensure that the LEDs on the active Clock I/O card are green/green or flashing green/green.

> **Note:** If they are not, contact XEL Tech support. The active card may be faulty and you will have to turn off power to the system before replacing the Clock I/O cards.

> **Caution:** If you must remove all Clock I/O cards at the same time, turn off the power to the shelf first. Remove the Clock I/O cards, and replace them. Then turn the power back on. This procedure will affect traffic. Perform it in an off-peak time.

3. Remove the standby Clock I/O card (the LEDs on this card are flashing green/solid amber). If Ethernet is used, detach the Ethernet cable from the card.

   The standby Clock I/O card should be the faulty card unless this is an upgrade scenario, where this procedure still applies.

> **Note:** This will cause a switch of activity on the CPU cards if the active CPU is below the I/O card you removed.

4. If Ethernet is used, attach the Ethernet cable to the new Clock I/O card.

5. Insert the new Clock I/O card and wait for it to synchronize. Synchronization is complete when the lower LED is solid amber. (The upper LED will be green or flashing green.)

6. Log into the system and check the equipment using the following command:

```
<   RTRV-EQPT::ALL:;
```

   The response will be similar to the following:

```
FACTORY 2001-09-19 09:44:01

M   COMPLD

  "CLK-1:::PST=IS,SST=BUSY"
  "CLK-2:::PST=IS,SST=IDLE"
  "CPU-1:::PST=IS,SST=BUSY&PROT"
  "CPU-2:::PST=IS,SST=IDLE&BAC"
```

   Ensure that the CPUs are in sync and that both clocks are present in the system.

7. Retrieve the alarms, using the following command:

   ```
   <   RTRV-ALM::ALL:;
   ```

   Ensure that there are no clock-based alarms. These should be cleared (or understood) before proceeding.

8. Switch the activity between the Clock I/O cards, using the following command:

   ```
   <   ED-EQPT::CLK-X::::PST=RESET;
   ```
   (where X is the slot number of the Clock I/O card that appeared as BUSY in the **RTRV-EQPT** response)

   The following alarms will appear (the example is based on a scenario where CLK-1 was active and CLK-2 was redundant):

   ```
   FACTORY 2001-09-19 09:50:34
   *A 21 REPT ALM EQPT
   "CLK-1:MN,EQPTFAIL,NSA,2001-09-19,09-50-34,,:\"CLOCK IO
   FAILURE\"";

   FACTORY 2001-09-19 09:50:37
   A^ 22 REPT ALM EQPT
   "CLK-1:CL,EQPTFAIL,NSA,2001-09-19,09-50-37,,:\"CLOCK IO
   FAILURE\"";
   ```

   If the following alarm appears, ignore it. It does not affect the system.

   ```
   FACTORY 2001-09-19 09:50:37
   A^ 23 REPT EVT SYS
   "SYS:CLK_SRC_SL,CL,2001-09-19,09-50-37,,,,:\"CLOCK SOURCE
   SELECTION SWITCHED\"";
   ```

9. Confirm that the clock switch has completed and the system is functioning properly, using the following command:

   ```
   <   RTRV-EQPT::ALL:
   ```

   The response should be similar to the following:

   ```
   FACTORY 2001-09-19 09:54:15
   M   COMPLD
     "CLK-1:::PST=IS,SST=IDLE"
     "CLK-2:::PST=IS,SST=BUSY"
     "CPU-1:::PST=IS,SST=BUSY&PROT"
     "CPU-2:::PST=IS,SST=IDLE&BAC"
   ```

   Confirm that the LEDs are correct.

10. Reset the CPU to align the active Clock I/O card with the active CPU card, using the following command:

    ```
    <   ED-EQPT::CPU-X::::PST=RESET;
    ```
    (where X is the slot number of the CPU card that appeared as BUSY in the **RTRV-EQPT** response)

11. Wait for the system to recover and log back in to ensure the system is running to your satisfaction.

12. Repeat steps 3 to 7 to replace the other Clock I/O card (which is now the redundant card).

Note: From the above example, this would be CLK-1.

13. Confirm that the system is functioning properly, using the following command:

```
<   RTRV-EQPT::ALL:
```

The response should be similar to the following (assuming you started the procedure with CLK-1 as active):

```
FACTORY 2001-09-19 15:07:28
M    COMPLD
  "CLK-1:::PST=IS,SST=IDLE"
  "CLK-2:::PST=IS,SST=BUSY"
  "CPU-1:::PST=IS,SST=IDLE&BAC"
  "CPU-2:::PST=IS,SST=BUSY&PROT"
```

ST1,SE1, IXCON, DS3, DS3R, S155 , and STS1 cards

1. If the system has not already done so, transfer activity to the protection card.

2. Put the card out of service using the **ED-EQPT** command.

3. Remove the card from its slot.

   The system generates a **UEQ** alarm.

4. Insert a new card in the slot.

   The system runs diagnostics on the new card.

5. Wait until the diagnostics have finished, and put the new card in service using the **ED-EQPT** command.

   The system configures the new card with the settings from the failed card and the **UEQ** alarm clears.

Note: The CPU may reset when you remove an ST1 or SE1 card.

FXS and FXO cards

1. Put the failed card out of service using the **ED-EQPT** command.

2. Disconnect the amphenol connector from the card.

3. Remove the Ringer I/O card from the slot above the card.

4. Remove the FXS or FXO card.

   The system generates a **UEQ** alarm.

5. Insert a new FXS or FXO card.

   The system runs diagnostics on the new card.

6. Reinsert the Ringer I/O card in the slot above the new card.

7. Connect the amphenol connector to the new card.

8. When the diagnostics have finished, put the card back in service using the **ED-EQPT** command.

   The system configures the new card with the settings from the failed card and the **UEQ** alarm clears.

Running MSU tests

This section describes the basic procedures for monitoring DS1 lines and DS0 channels using the MSU card. The sample procedures use an ST1 card for the tests. In the case of the DS0 channel tests, you may also monitor channels from a DS3, DS3R, FXS, or FXO card, provided one of the termination pointers comes from an ST1 card.

Monitoring a DS1 line

1. Send the traffic on the ST1 card to be tested over to the protection card by entering the following command.

```
<  SW-TOPROTN-EQPT::ST1-<slot#>:::MAN;
```

   For example,

```
<  SW-TOPROTN-EQPT::ST1-6:::MAN;
```

2. Set up a monitored MSU test by entering the following command.

```
<  SET-MSU::ST1-<slot# of protection card>-
   <port#>::::TYPE=MONITOR,MSU-PORT=(1|2);
```

   For example,

```
<  SET-MSU::ST1-13-1::::TYPE=MONITOR,MSU-PORT=1;
```

3. Connect to the appropriate TA1 jack on the MSU card and perform the MSU test.

4. End the monitored MSU test by entering the following command.

```
< SET-MSU::ST1-<slot# of protection card>-
  <port#>::::TYPE=OFF,MSU-PORT=(1|2);
```

For example,

```
< SET-MSU::ST1-13-1::::TYPE=OFF,MSU-PORT=1;
```

5. Switch back traffic to the ST1 card under test by entering the following command.

```
< SW-TOWKG-EQPT::ST1-<slot#>:::MAN;
```

For example,

```
< SW-TOWKG-EQPT::ST1-6:::MAN;
```

Split monitoring a DS1 line

1. Set up a split MSU test by entering the following command.

```
< SET-MSU::ST1-<slot#>-<port#>::::TYPE=SPLIT,MSU-PORT=(1|2);
```

For example,

```
< SET-MSU::ST1-6-1::::TYPE=SPLIT,MSU-PORT=1;
```

2. Connect to the appropriate TA1 jack on the MSU card and perform the split MSU test.

3. End the split MSU test by entering the following command.

```
< SET-MSU::ST1-<slot#>-<port#>::::TYPE=OFF,MSU-PORT=(1|2);
```

For example,

```
< SET-MSU::ST1-6-1::::TYPE=OFF,MSU-PORT=1;
```

Monitoring a DS0 channel

1. Provision the termination pointers and cross connects that will be tested by entering the following command.

```
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA;
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA;
< ENT-CRS-DS0:::::TYPE=DATA,TPLST=<TP#>&<TP#>;
```

For example,

```
< ENT-TP:::::FAC=ST1-8-2,DS0=1&&15&17&&31,TYPE=DATA;
< ENT-TP:::::FAC=ST1-9-2,DS0=1&&15&17&&31,TYPE=DATA;
< ENT-CRS-DS0:::::TYPE=DATA,TPLST=1&2;
```

2. Set up the diagnostic termination pointers on the protection card by entering the following command.

```
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA,DTYPE=DIAG;
```

For example,

```
< ENT-TP:::::FAC=ST1-13-1,DS0=1&&15,TYPE=DATA,DTYPE=DIAG;
< ENT-TP:::::FAC=ST1-13-1,DSO=17&&31,TYPE=DATA,DTYPE=DIAG;
```

3. Setup a diagnostic cross connection by entering the following command.

```
< ED-CRS-DS0-DIAG::CRS-<#>::::TYPE=(MONITOR),PRI-DIAG=
  TP-<#>,BIDIR-DIAG=TP-<#>,MSU-PORT=(1|2);
```

For example,

```
< ED-CRS-DS0-DIAG::CRS-1::::TYPE=MONITOR,PRI-DIAG=TP-101,
  BIDIR-DIAG=TP-102,MSU-PORT=1;
```

4. Connect to the appropriate TA1 jack on the MSU card and perform the MSU test.

5. End the diagnostic cross connection by entering the following command.

```
< ED-CRS-DS0-DIAG::CRS-<#>::::TYPE=OFF;
```

For example,

```
< ED-CRS-DS0-DIAG::CRS-1::::TYPE=OFF;
```

Split monitoring a DS0 channel

1. Provision the termination pointers and cross connects that will be tested by entering the following command.

```
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA;
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA;
<  ENT-CRS-DS0:::::TYPE=DATA,TPLST=<TP#>&<TP#>;
```

For example,

```
< ENT-TP:::::FAC=ST1-8-2,DS0=1&&15&17&&31,TYPE=DATA;
< ENT-TP:::::FAC=ST1-9-2,DS0=1&&15&17&&31,TYPE=DATA;
< ENT-CRS-DS0:::::TYPE=DATA,TPLST=1&2;
```

2. Set up the diagnostic termination pointers on the protection card by entering the following command.

```
< ENT-TP:::::FAC=ST1-<slot#>-<port#>,DS0=<one or more
  channels>,TYPE=DATA,DTYPE=DIAG;
```

For example,

```
< ENT-TP:::::FAC=ST1-13-1,DS0=1&&15,TYPE=DATA,DTYPE=DIAG;
< ENT-TP:::::FAC=ST1-13-1,DSO=17&&31,TYPE=DATA,DTYPE=DIAG;
```

3. Setup a diagnostic cross connection by entering the following command.

```
< ED-CRS-DS0-DIAG::CRS-<#>::::TYPE=SPLIT,PRI-DIAG=
  TP-<#>,BIDIR-DIAG=TP-<#>,MSU-PORT=(1|2);
```

For example,

```
< ED-CRS-DS0-DIAG::CRS-1::::TYPE=SPLIT,PRI-DIAG=TP-101,
  BIDIR-DIAG=TP-102,MSU-PORT=1;
```

4. Connect to the appropriate TA1 jack on the MSU card and perform the split MSU test.

5. End the diagnostic cross connection by entering the following command.

```
< ED-CRS-DS0-DIAG::CRS-<#>::::TYPE=OFF;
```

For example,

```
< ED-CRS-DS0-DIAG::CRS-1::::TYPE=OFF;
```

Chapter 6 Frequently-asked Questions

This chapter addresses the following frequently-asked questions about operation of the system.

- How is CPU flash load switching accomplished?
- How does IP routing work on the system?
- How is IP routing over T1 set up?
- How is IP routing over DS0 set up?
- What do the VLDTY parameters signify in the RTRV-PM response?
- How do you control volume and echo on voice lines?

How is CPU flash load switching accomplished?

Activity switches from the software in the active CPU flashbank to the software in the inactive flashbank in the following situations:

- When you manually request a switch using the **ACT-IMG** command
- When the system does not complete the startup process (SWDL)
- When the system starts up the last process (SWDL) but dies immediately after

Manual request using TL1

If you enter the command
`ACT-IMG::CPU-1-2:;`
while running the software in CPU-1–1, the system resets and attempts to start up in the indicated flash bank.

Note: If you try to activate the image that is already active, no reset occurs.

System fails to complete startup

If the system fails to successfully start up the last process (SWDL), then on the next reset the system attempts to start up in the alternate flash bank of the CPU.

Note: NEPROC is a system operation that keeps track of the various processes running on the system.

System starts up but is unstable

There is a window of disaster that the system successfully starts up the last process (SWDL) but dies immediately thereafter. It was determined that less than two minutes would not be a significant amount of time for you to log in and manually request a switch. For this scenario, the following algorithm has been designed: If the system fails to stay up for two minutes six consecutive times, then on the seventh reset, the system comes up in the other flash bank.

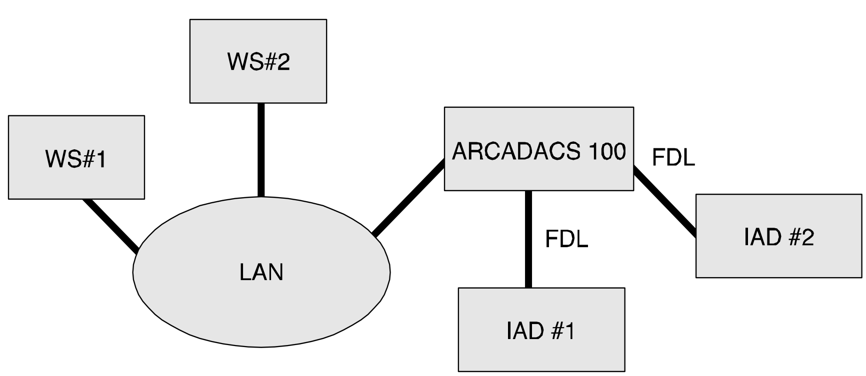
How does IP routing work on the system?

Introduction

The following sections describe the IP routing capability on the system. There are four separate configuration setups for routing of IP routing data over the system. These configuration setups provide information on the relevant TL1 commands and associated examples of equipment interconnection.

The IP stack on the system is capable of routing incoming IP traffic out various T1 lines using the FDL (facility data link) or any of up to 16 DS0 channels that you provision as IP access routes. This provides the means for remote management of Integrated Access Device (IAD) through the system. See Figure 237.

Figure 237. Generalized IP routing over ARCADACS 100 **system**



The listing below covers the four IP configuration setups:

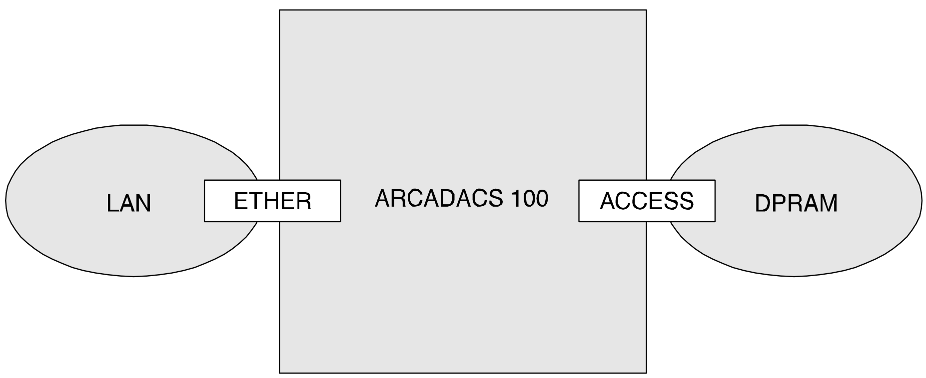
- TL1 Commands
- Sample IAD to ARCADACS 100

TL1 commands

Several TL1 commands have been provided in order to properly configure the system for management traffic. These are discussed in turn. For specifics on command and response syntax, see TL1 Command Interface on page 85.

Before describing each command, a working definition of the term *interface* must be adopted. Interface is defined as the path over which the IP stack on the system transmits its IP traffic. Each interface requires its own IP address, mask, broadcast, and so on. Currently, there are two interfaces on the as shown in Figure 238.

Figure 238. ARCADACS 100 **system interfaces**



The ETHER interface is used to send traffic out onto the LAN, while the ACCESS interface is used to send traffic out over DPRAM to the various intelligent cards, such as ST1.

1. **ED-IP::ETHER** (example: `ED-IP::ETHER::::IP=38.169.193.115,MASK=255.255.255.0;`)

   This command is used to configure the ETHER interface parameters (IP address, MASK, Broadcast, MTU, GATEWAY). For a detailed description of the command, its syntax, and parameter fields, see Set IP interface command on page 105.

   – The IP address is the address assigned to the ETHER interface.

   – The MASK is used in conjunction with IP address to determine the subnet of the connected network. For example, an IP address of 199.190.211.255 and a mask of 255.255.255.0 would combine to make a LAN with subnet 199.190.211.*.

   – The broadcast address is the address assigned to broadcast packets, such as RIP (routing information protocol).

- The MTU sets the maximum length of packets accepted through this interface. The MTU default for Ethernet is 1500 and this cannot be changed.
- The GATEWAY is a flag that can be used to toggle routing on the ARCADACS 100. If this is set to OFF, the ARCADACS 100 does not forward any packets out any interface.

2. **RTRV-IP::ETHER** (example: `RTRV-IP::ETHER:;`)

This command is used to retrieve the IP values configured above. This command also displays the read-only MAC address assigned to this CPU. For a detailed description of the command, its syntax, and parameter fields, see Retrieve IP interface settings command on page 106. For a detailed description of the response, its syntax, and parameter fields, see Retrieve IP interface settings response on page 107.

3. ED-IP::ACCESS (example: `ED-IP::ACCESS::::IP=204.200.120.5,MASK=255.255.255.0;`)

This command is used to configure the ACCESS interface parameters (IP address, Mask, Broadcast, MTU). For a detailed description of the command, its syntax, and parameter fields, see Set IP interface command on page 105.

- The IP address is the address assigned to the ACCESS interface.
- The MASK is used in conjunction with IP address to determine the subnet of the connected network. For example, an IP address of 199.190.211.255 and a mask of 255.255.255.0 would combine to make a LAN with subnet 199.190.211.*
- The broadcast address is the address assigned to broadcast packets, such as RIP.
- The MTU sets the maximum length of packets accepted through this interface. The MTU default is 240. The MTU range in ACCESS routing is 100 to 480.

Note: The ACCESS IP address should be a different subnet than the one used on the ETHER interface.

Note: The ACCESS IP address can be in the same or different network as the connected IAD. There is no limitation here.

Note: If the Ethernet IP of the near-end ARCADACS 100 and the equipment managing the NEs are on a different network, the remote IADs or remote ARCADACS 100 should use a route of the near-end NE and **not** a route of the managing equipment. This will maximize IP throughput of the system.

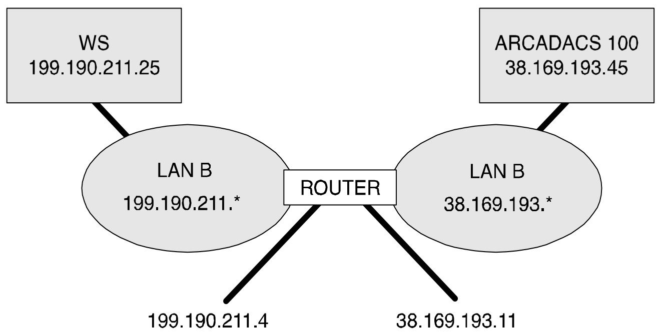
4. **RTRV-IP::ACCESS** (example: `RTRV-IP::ACCESS:;`)

This command is used to retrieve the IP values configured above. For a detailed description of the command, its syntax, and parameter fields, see Retrieve IP interface settings command on page 106. For a detailed description of the response, its syntax, and parameter fields, see Retrieve IP interface settings response on page 107.

5. **ADD-IPRT::ETHER** (example: `ADD-IPRT::ETHER::::IP=205.2.4.50,MASK=255.255.255.0, GATEWAYIP=199.5.10.3;`)

This command is used to add IP routes for the Ethernet side. The command requires an IP address, MASK, and GATEWAY IP. For a detailed description of the command, its syntax, and parameter fields, see Add entry to IP routing table command on page 107. This command is necessary for scenarios such as the following shown in Figure 239.

Figure 239. ARCADACS 100 **system and workstation on separate networks**



In this scenario, the WS is on a separate LAN from the system. A router exists with an IP address for each interface. In order to properly provide connectivity to the ARCADACS 100, a route needs to be added to teach the ARCADACS 100 of the existence of the 199.190.211.* network. The following command:

```
<   ADD-IPRT::ETHER::::IP=199.190.211.25,MASK=255.255.255.0,
    GATEWAYIP=38.169.192.11;
```

tells the that the 199.190.211.* network is accessible through the router. Note that the GATEWAYIP entry must be on the same subnet as the Ethernet address.

6. **RTRV-IPRT::ETHER** (example: `RTRV-IPRT::ETHER:;`)

This command can be used to retrieve routes added. Also, if RIP is enabled on the network, this displays any routes learned through RIP. For a detailed description of the command, its syntax, and parameter fields, see Retrieve IP routing table settings command on page 109. For a detailed description of the response, its syntax, and parameter fields, see Retrieve IP routing table settings response on page 110.

7. **ADD-IPRT::ACCESS** (example: `ADD-IPRT::ACCESS::::IP=10.1.1.1,MASK=255.0.0.0,CHANNEL=ST1-7-FDL1;`)

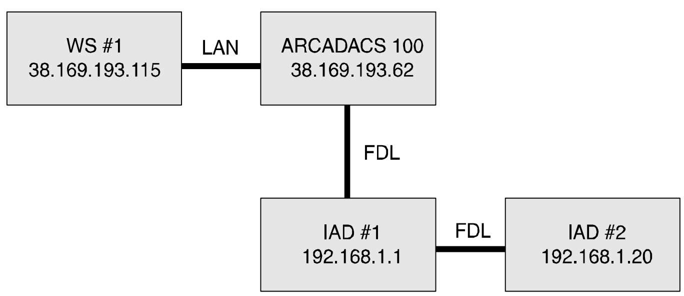
This command can be used to add IP routes for connected IAD. The command requires an IP address, MASK, and CHANNEL. For a detailed description of the command, its syntax, and parameter fields, see Add entry to IP routing table command on page 107. For example, if an IAD with address 204.50.20.10 was connected through an ST1 card in slot 5, port 3, enter the following command:

```
<    ADD-IPRT::ACCESS::::IP=204.50.20.10,MASK=255.255.255.255,
     CHANNEL=ST1-5-FDL3;
```

Note: Several parameters on the IAD and must be set up for this to work properly. See the sample setup of Sample IAD-to-ARCADACS 100 configuration on page 347.

If an entire network of IAD existed and we wished to access them using a single FDL, the ADD-IPRT command can be used to add entire networks by specifying the correct MASK value. For example, if the network setup is as shown in Figure 240:

Figure 240. Multiple IAD linked to ARCADACS 100



The following command could be used:

```
<    ADD-IPRT::ACCESS::::IP=192.168.1.1,MASK=255.255.255.0,
     CHANNEL=ST1-7-FDL1;
```

Note: Observe that subnets are not supported - only the natural mask for a given IP address is allowed.

8. **RTRV-IPRT::ACCESS** (example: `RTRV-IPRT::ACCESS:;`)

This command can be used to retrieve routes added. For a detailed description of the command, its syntax, and parameter fields, see Retrieve IP routing table settings command on page 109. For a detailed description of the response, its syntax, and parameter fields, see Retrieve IP routing table settings response on page 110.

9. **DLT-IPRT** (example `DLT-IPRT::192.168.1.4:;`)

This command can be used to delete IP routes. Only the IP address needs to be specified. For a detailed description of the command, its syntax, and parameter fields, see Delete entry from IP routing table command on page 109.

Sample IAD-to-ARCADACS 100 configuration

Equipment requirements

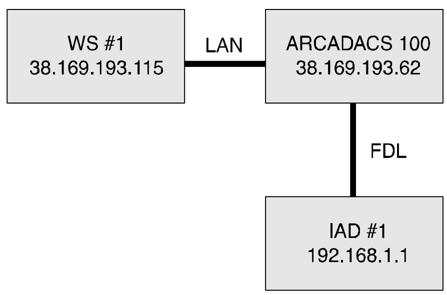
1. Workstation connected on same physical network as ARCADACS 100 CPU. This can be in a private separate network using a hub, or on a larger network. In this example, it is assumed these two systems are on the same subnet.

2. ARCADACS 100 system with ST1 card. The ARCADACS 100 CPU has a LAN connection to the workstation. The ST1 card has a T1 line connected to an IAD WAN card.

3. IAD with WAN card. This is connected to the ARCADACS 100 through a T1 WAN card. To configure the IAD, a VT-100 terminal is needed.

4. The network setup uses the addresses as shown in Figure 241.

Figure 241. IAD to ARCADACS 100 network configuration



Workstation setup

The workstation must have an IP address; in this example, the IP address is 38.169.193.115. Using the following command, you can inform the workstation of the IAD route. This should work on any workstation running NT. The command is:

```
route add 192.168.1.1 38.169.193.62
```

ARCADACS 100 system setup

The following TL1 commands assume an INIT-NVM operation has just been performed.

1. Set ETHER IP address of CPU card as follows:

```
<   ED-IP::ETHER::::IP=38.169.193.62;
```

2. Provision ST1 card as follows:

```
<   ENT-EQPT::ST1-7::::PST=IS;
```

3. Set up FDL as an NMS link (network management link) as follows:

```
<   ED-FAC::ST1-7-1::::FDL=NMS;
```

4. Set up the T1 link in ESF format as follows:

```
<   ED-FAC::ST1-7-1::::FRM=ESF;
```

5. Add in IP route as follows:

```
<   ADD-IPRT::ACCESS::::IP=192.168.1.1,MASK=255.255.255.255,
    CHANNEL=ST1-7-FDL1;
```

Note: Step 5 can fail. If the following error message occurs, continue to step 6. Otherwise, go to step 8.

```
FACTORY 1970-01-01 21:55:58
M DENY
":ERRCDE = "
/* ACCESS IP ADDRESS MUST BE SET FIRST */
;
```

6. Set ACCESS IP address (its address can be anything, provided that it differs from the ETHER IP address) as follows:

```
<   ED-IP::ACCESS::::IP=10.0.2.2;
```

7. Try adding route again as follows:

```
<   ADD-IPRT::ACCESS::::IP=192.168.1.1,MASK=255.255.255.255,
    CHANNEL=ST1-7-FDL1;
```

8. Verify that the route exists as follows:

```
<   RTRV-IPRT::ACCESS:;
```

IAD setup

It is assumed that you are familiar with configuring the IAD. The easiest way to do this is to show screen captures of the various screens that require provisioning:

1. Set up the CPU TCPIP as follows:

HOST	IP STATE	actv
HOST	IP STATE	192.168.1.1
HOST	NETMASK	255.255.255.0
DEFAULT	IP PORT	wan
DEFAULT	IP SLOT	W1
DEFAULT	IP UNIT	UNIT 1

RPT1	IP ADDR	0.0.0.0
RPT1	COMMUN	STR
RPT2	P ADDR	0.0.0.0
RPT2	COMMUN	STR
RPT3	IP ADDR	0.0.0.0
RPT3	COMMUN	STR

2. Set up the CSU screen as follows:

	CSU		CSU
STATE	actv	STATE	stdby
MODE	xcon	MODE	xcon
FORMAT	esf	FORMAT	esf
LINE CODE	b8zs	LINE CODE	b8zs
PULSE	n/a	PULSE	n/a
LINE LEN	0	LINE LEN	0
SLIP LIM	126	SLIP LIM	126
AIS/ALM	none	AIS/ALM	none
LINE LB	off	LINE LB	off
LOCAL LB	off	LOCAL LB	off
CH LB	off	CH LB	off
LB ADDR	01	LB ADDR	01
LB GEN	off	LB GEN	off
LB DET	w/to	LB DET	w/to
ESF/NMS RP	c-fdl	ESF/NMS RP	at&t
EER THRHD	10e-4	EER THRHD	10e-4
RDNT RULES	none	RDNT RULES	none
GROUP	none	GROUP	none

Troubleshooting

If the network is set up and pinging the IAD fails, try pinging the ACCESS IP address. If this does not return a response, that means that the workstation originating the PING does not know to send its IP traffic to the ARCADACS 100. The IP address can be retrieved by entering:

< RTRV-IP::ACCESS:;

Note: You may have to add a route on your workstation by the **route add** command to get a response from the ping.

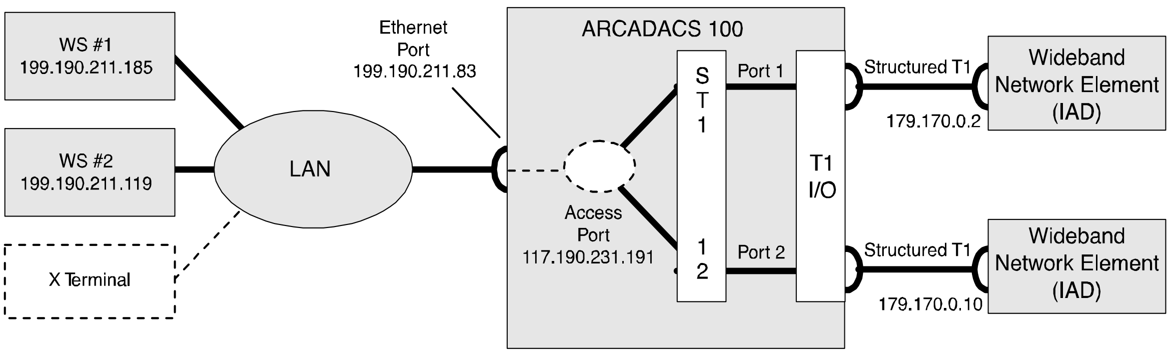
How is IP routing over T1 set up?

To do this, both ARCADACS 100 IP interfaces must be set up properly:

- The Ethernet IP interface is configured as the gateway for the access IP interface.
- The access IP interface is configured to route IP communications over the specified T1-FDL link(s).

Figure 242 shows a typical setup for IP routing over T1 lines.

Figure 242. Example of IP access routing configuration



Overview

To replicate the configuration shown in Figure 242, follow the procedure outlined in the next section. The following caveats apply:

- If an IP address is not already assigned to the ARCADACS 100, you must log in using the craft (serial) terminal port to initiate a TL1 command session. After assigning an Ethernet IP address, the setup can be completed in any of the following ways:
  - Continuing the TL1 session from the terminal connected to the craft port.
  - Use Telnet from a workstation to initiate a new TL1 command session.
  - Starting NMS and using the GUI screens (not covered in this manual).

  To assign the Ethernet IP address, enter the following TL1 command and observe the corresponding system response:

```
<   ED-IP::ETHER::::GATEWAY=ON,IP=199.190.211.83,
    MASK=255.255.255.0,BRDCAST=199.190.211.255,MTU=1500;

       FACTORY 1970-01-02 00:18:04

M    COMPLD
;
```

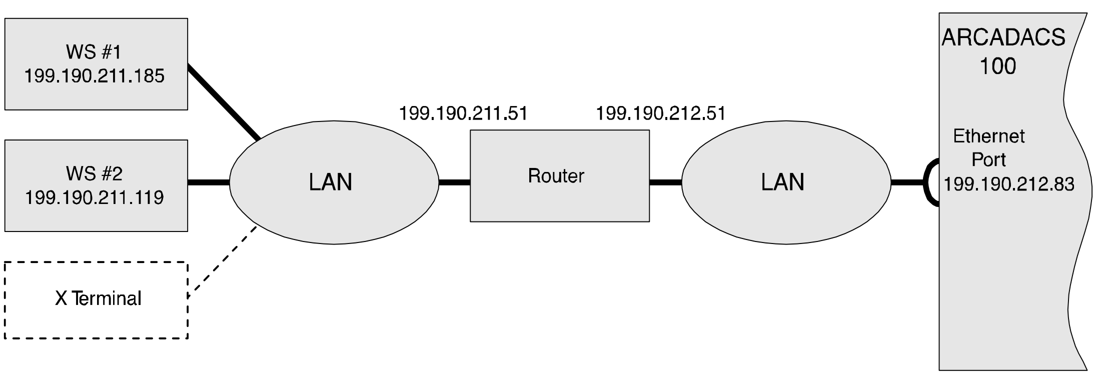
- The procedure in the next section is presented in the recommended sequence. It is very important to ensure the IAD wideband network elements and the ARCADACS 100 ST1 ports are set up properly before specifying IP access routes. Failure to do so causes the ports to report alarm conditions such as loss of frame (LOF), loss of signal (LOS), etc. While an alarm condition is pending for a port, the ARCADACS 100 disallows its use for IP routing.
- In the example shown in Figure 242, the workstations and ARCADACS 100 are on the same sub-network. If they were on different networks as shown in Figure 243, routes that define the gateway to the workstations and the ARCADACS 100 would have to be added.
  - At the workstations, use the **route add** command to define the gateway as follows:

    # route add 199.190.212.0 199.190.211.51
  - At the ARCADACS 100, create an Ethernet IP route to define the gateway by entering the following TL1 command and observing the corresponding system response:

```
<   ADD-IPRT::ETHER::::IP=199.190.211.0,MASK=255.255.255.0,
    GATEWAYIP=199.190.212.51;

    FACTORY 1970-01-02 00:18:04
    M   COMPLD
    ;
```

Figure 243. Example of LAN-to-LAN connectivity



Procedure

Proceed as follows to set up the IP routing configuration shown in Figure 242.

1. Set up the IAD wideband network element as shown in Figures 244 through 247.

Figure 244. XPP interface card home screen

```
 LocNode              |  IF  IF+modem     Rev A1-0  Ser 00933  |  03-17-99  14:56

                         1
PRIMARY CLOCK         int
EXT RATE              n/a
EXT FORMAT            n/a
EXT FRAME             n/a

SECONDARY CLOCK       int
EXT RATE              n/a
EXT FORMAT            n/a
EXT FRAME             n/a

CURRENT CLK           int

Save | Undo | Refresh | Time | ACO | proFiles | taBs | Ports| Mai
```

Figure 245. XPP WAN card home screen

```
 LocNode            | W1  DSX+DSX           Rev E2-0  Ser 02871    | 03-17-99 14:59

               DSX                              DSX
STATE          actv          STATE              stdby
MODE           xcon          MODE               xcon
FORMAT         esf           FORMAT             esf
LINE CODE      b8zs          LINE CODE          b8zs
PULSE          n/a           PULSE              n/a
LINE LEN       133           LINE LEN           133
SLIP LIM       126           SLIP LIM           126
AIS/ALM        none          AIS/ALM            none
LINE LB        off           LINE LB            off
LOCAL LB       off           LOCAL LB           off
CH LB          off           CH LB              off
LB ADDR        01            LB ADDR            01
LB GEN         off           LB GEN             off
LB DET         w/to          LB DET             w/to
ESF/NMS RP     c-fdl         ESF/NMS RP         at&t
EER THRHD      10e-4         EER THRHD          10e-4
RDNT RULES     none          RDNT RULES         none
GROUP          none          GROUP              none

Save | Undo | Refresh | Xcon | Perf | Farstat | Test | sWitch | pArs | Main
```

Figure 246. XPP CPU card home screen

```
 LocNode          | C1   CPU XCON          Rev A0-0   Ser 02175     | 03-17-99 15:10

                    1
NODE ID          LocNode
SUPERUSER        ************
MANAGER          Manager
OPERATOR         Operator
VIEWER           Viewer
SYS CONT.        sun25 operator
SYS LOC          near sun25 workstation

SYS PH#
ALRM SEQ         all
ACO              latch

C1   Active      Host 5.1.0     Voice 5.1.0


 Save | Undo | Refresh | Prt | tcp/Ip | Main
```

Figure 247. XPP CPU card TCP/IP screen

```
 LocNode          | C1   CPU XCON          Rev A0-0   Ser 02175     | 03-17-99 15:12

                    1
HOST IP STATE       actv
HOST IP ADDR        179.170.0.2
HOST NETMASK        255.255.255.0
HOST TYPE           host
DEFAULT IP PORT     wan
DEFAULT IP SLOT     W1
DEFAULT IP UNIT     1
RPT1 IP ADDR        199.190.211.185
RPT1 COMMUN STR     public
RPT2 IP ADDR        0.0.0.0
RPT2 COMMUN STR
RPT3 IP ADDR        0.0.0.0
RPT3 COMMUN STR

Ping | Netstat | rOute | Save | Undo | Refresh | Main
```

2. Set up the IAD wideband network element as shown in Figures 248 through 251.

Figure 248. XPP WAN screen

```
   unknown        | W1  CSU+DSX         Rev E2-0  Ser 00012     | 03-18-99 15:39

                   CSU                                DSX
STATE          actv          STATE          stdby
MODE           xcon          MODE           xcon
FORMAT         esf           FORMAT         esf
LINE CODE      b8zs          LINE CODE      b8zs
PULSE          n/a           PULSE          n/a
LINE LEN       0             LINE LEN       133
SLIP LIM       126           SLIP LIM       126
AIS/ALM        none          AIS/ALM        none
LINE LB        off           LINE LB        off
LOCAL LB       off           LOCAL LB       off
CH LB          off           CH LB          off
LB ADDR        01            LB ADDR        01
LB GEN         off           LB GEN         off
LB DET         w/to          LB DET         w/to
ESF/NMS RP     c-fdl         ESF/NMS RP     at&t
EER THRHD      10e-4         EER THRHD      10e-4
RDNT RULES     none          RDNT RULES     none
GROUP          n/a           GROUP          n/a

  Save | Undo | Refresh | Xcon | Perf | Farstat | Test | sWitch | pArs | Main
```

Figure 249. XPP CPU main screen

```
    unknown        | C1 CPU XCON         Rev A0-0 Ser 00188     | 03-18-99 16:17

                1
NODE ID        unknown
SUPERUSER      ************
MANAGER        Manager
OPERATOR       Operator
VIEWER         Viewer
SYS CONT.      System Contact
SYS LOC        System Location

SYS PH#
ALRM SEQ       all
ACO            latch

C1   Active    Host 5.1.0       Voice 5.1.0

   Save | Undo | Refresh | Prt | tcp/Ip | Main
```

Figure 250. XPP CPU interface screen

```
  unknown        | C1 CPU XCON       Rev A0-0 Ser 00188    | 03-18-99 16:17

PRIMARY CLOCK       int
EXT RATE            n/a
EXT FORMAT          n/a
EXT FRAME           n/a

SECONDARY CLOCK     int
EXT RATE            n/a
EXT FORMAT          n/a
EXT FRAME           n/a

CURRENT CLK         int

Save | Undo | Refresh | Time | ACO | taBs | Ports | Main
```

Figure 251. XPP CPU TCP/IP screen

```
  unknown        | C1 CPU XCON       Rev A0-0 Ser 00188    | 03-18-99 16:17

                     1
HOST IP STATE       actv
HOST IP ADDR        179.170.0.10
HOST NETMASK        255.255.255.0
HOST TYPE           host
DEFAULT IP PORT     wan
DEFAULT IP SLOT     W1
DEFAULT IP UNIT     1
RPT1 IP ADDR        199.190.211.185
RPT1 COMMUN STR     public
RPT2 IP ADDR        0.0.0.0
RPT2 COMMUN STR
RPT3 IP ADDR        0.0.0.0
RPT3 COMMUN STR

     Ping | Netstat | rOute | Save | Undo | Refresh | Main
```

3. Configure a T1 connection from the IAD WAN 1 card to port 1 of the ARCADACS 100 ST1-12 card.

4. Configure a T1 connection from the IAD WAN 1 card to port 2 of the ARCADACS 100 ST1-12 card.

5. On the ARCADACS 100, set up the clock source priority list. See Edit clock source command on page 113 for command syntax and parameter fields. For simplicity, the following example uses local timing for all settings. Enter the following TL1 command and observe the corresponding system response:

```
<   ED-CLKLST:::::CLKSRC1=LOCAL,CLKSRC2=LOCAL,CLKSRC3=LOCAL,
    CLKSRC4=LOCAL;

       FACTORY 1970-01-02 00:14:40
    M   COMPLD
    ;
```

6. On the ARCADACS 100, provision the ST1 card in slot 12. See Create equipment command on page 143 for command syntax and parameter fields. Enter the following TL1 command and observe the corresponding system response:

```
<   ENT-EQPT::ST1-12::::PST=IS;

       FACTORY 1970-01-02 00:14:40

M   COMPLD
;
```

7. On the ARCADACS 100, set up ports 1 and 2 on the ST1-12 card. See Edit facility data command on page 167 for command syntax and parameter fields. Enter the following TL1 commands and observe the system responses:

```
Port 1

<   ED-FAC::ST1-12-1::::LINECDE=B8ZS,LINELEN=133,FRM=ESF,
    FDL=NMS,PST=IS;

       FACTORY 1970-01-02 00:14:40

M   COMPLD
;

Port 2

<   ED-FAC::ST1-12-2::::LINECDE=B8ZS,LINELEN=133,FRM=ESF,
    FDL=NMS,PST=IS;

       FACTORY 1970-01-02 00:14:40

M   COMPLD
;
```

8. On the ARCADACS 100, verify that neither port 1 nor port 2 of ST1-12 has active alarms. See Retrieve alarms command on page 280 and Retrieve alarms response on page 280 for command and response syntax and parameter fields. Enter the following TL1 command and observe the system response:

```
<   RTRV-ALM::ST1-12:;

    FACTORY1 1999-04-23 09:23:28
```

```
M   COMPLD
    "ST1-12-3,T1:MJ,LOS,SA,1999-02-12,01-00-33,,:"
    "ST1-12-3,T1:MJ,LOF,SA,1999-02-12,01-00-33,,MASK:"
    "ST1-12-3,T1:MJ,CGA-RED,SA,1999-02-12,01-00-33,,:"
    "ST1-12-4,T1:MJ,LOS,SA,1999-02-12,01-00-33,,:"
    "ST1-12-4,T1:MJ,LOF,SA,1999-02-12,01-00-33,,MASK:"
    "ST1-12-4,T1:MJ,CGA-RED,SA,1999-02-12,01-00-33,,:"
    "ST1-12-5,T1:MJ,LOS,SA,1999-02-12,01-00-33,,:"
    "ST1-12-5,T1:MJ,LOF,SA,1999-02-12,01-00-33,,MASK:"
    "ST1-12-5,T1:MJ,CGA-RED,SA,1999-02-12,01-00-33,,:"
>
    FACTORY1 1999-04-23 09:23:28
M   COMPLD
    "ST1-12-6,T1:MJ,LOS,SA,1999-02-12,01-00-33,,:"
    "ST1-12-6,T1:MJ,LOF,SA,1999-02-12,01-00-34,,MASK:"
    "ST1-12-6,T1:MJ,CGA-RED,SA,1999-02-12,01-00-34,,:"
    "ST1-12-7,T1:MJ,LOS,SA,1999-02-12,01-00-34,,:"
    "ST1-12-7,T1:MJ,LOF,SA,1999-02-12,01-00-34,,MASK:"
    "ST1-12-7,T1:MJ,CGA-RED,SA,1999-02-12,01-00-34,,:"
    "ST1-12-8,T1:MJ,LOS,SA,1999-02-12,01-00-34,,:"
    "ST1-12-8,T1:MJ,LOF,SA,1999-02-12,01-00-34,,MASK:"
    "ST1-12-8,T1:MJ,CGA-RED,SA,1999-02-12,01-00-34,,:"
;
```

Note: Observe that the above response shows no alarms for ports 1 and 2. All other ports are reporting alarms since they are not connected to T1 lines.

9. On the ARCADACS 100, assign an IP address to the access port. See Figure 242. See Set IP interface command on page 105 for command syntax and parameter fields. Enter the following TL1 command and observe the corresponding system response:

```
<   ED-IP::ACCESS::::IP=117.190.231.191,MASK=255.255.255.0,
    BRDCAST=117.190.231.255,MTU=240;

       FACTORY 1970-01-02 00:18:04
M   COMPLD
;
```

10. On the ARCADACS 100, configure IP access routes to the IAD/IAD wideband network elements by assigning IP addresses to each element. See Figure 242. See Add entry to IP routing table command on page 107 for command syntax and parameter fields. Enter the following TL1 commands and observe the corresponding system responses:

```
<   ADD-IPRT::ACCESS::::IP=179.170.0.2,MASK=255.255.255.255,
    CHANNEL=ST1-12-FDL1;

       FACTORY 1970-01-02 00:18:04
M   COMPLD
```

```
;
<   ADD-IPRT::ACCESS::::IP=179.170.0.10,MASK=255.255.255.255,
    CHANNEL=ST1-12-FDL2;

       FACTORY 1970-01-02 00:18:04

M    COMPLD
;
```

11. At the workstation(s), ping the Ethernet port, access port, and IAD wideband network elements to verify IP connectivity.

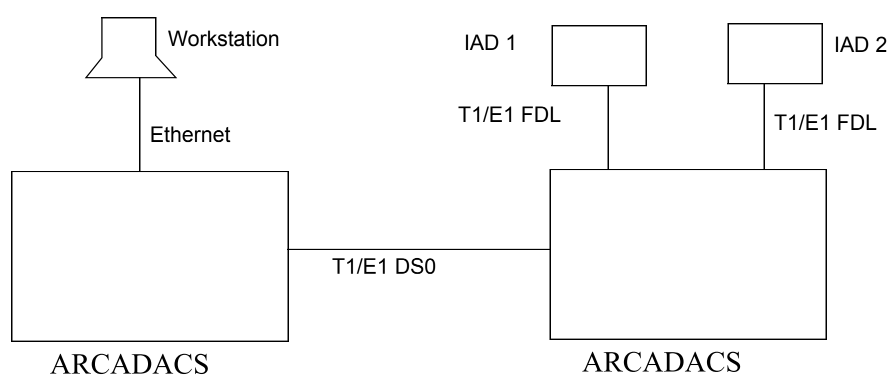
```
# ping 199.190.211.83
199.190.211.83 is alive
# ping 199.190.211.83
199.190.211.83 is alive
# ping 199.190.211.83
199.190.211.83 is alive
# ping 199.190.211.83
199.190.211.83 is alive
```

How is IP routing over DS0 set up?

This section describes a scenario in which IP traffic is routed between two ARCADACS 100 systems and two IADs using selected DS0 facilities. It contains a procedure for provisioning the routes on the workstation and the two ARCADACS 100 systems.

Figure 252 shows the configuration of the system.

Figure 252. Configuration using DS0 for IP routing



The components within the configuration have the following IP addresses:

Component	IP address
ARCADACS 100 A	Ethernet 172.16.85.100, Access 192.200.10.1
ARCADACS 100 B	Ethernet 192.200.20.1, Access 192.200.40.1
IAD1	192.100.10.1
IAD2	192.100.20.1

The ARCADACS 100 systems have the following equipment:

System	Equipment
ARCADACS 100 A	ST1 card in slot 6
ARCADACS 100 B	ST1 card in slot 6 ST1 card in slot 8

Procedure

Perform the following TL1 commands to set up the IP route between the two ARCADACS 100 systems and between ARCADACS 100 B and the two IADs. At the end of the procedure, you should be able to telnet to any of the ARCADACS 100 systems and IADs from the workstation.

1. On the workstation, add the IP addresses for the ARCADACS 100 B and the two IADs to the route list and specify that the ARCADACS 100 A is their gateway, using the following commands (for NT):

```
route add 192.200.40.1 172.16.85.100
route add 192.100.10.1 172.16.85.100
route add 192.100.20.1 172.16.85.100
```

2. On the ARCADACS 100 A, provision port 1, DS0 1 of the ST1 card in slot 6 for IP traffic between the two ARCADACS 100 systems, using the following command:

```
<   ENT-TP:::::FAC=ST1-6-1,DS0=1,TYPE=IP;
```

In this scenario, the system responds by assigning a termination pointer (TP) of 1.

3. On the ARCADACS 100 A, add the IP addresses of ARCADACS 100 B and the two IADs to the routing table, using the following commands:

```
<   ADD-IPRT::ACCESS::::IP=192.200.40.1,MASK=255.255.255.255,
    CHANNEL=TP-1;
<   ADD-IPRT::ACCESS::::IP=192.100.10.1,MASK=255.255.255.255,
    CHANNEL=TP-1;
<   ADD-IPRT::ACCESS::::IP=192.100.20.1,MASK=255.255.255.255,
    CHANNEL=TP-1;
```

4. On the ARCADACS 100 B, provision port 1, DS0 1 of the ST1 card in slot 6 for IP traffic between the two ARCADACS 100 systems, using the following command:

```
<   ENT-TP:::::FAC=ST1-6-1,DS0=1,TYPE=IP;
```

Note: The IP TP must be on the same port and DS0 as on the ARCADACS 100 A.

In this scenario, the system responds by assigning a TP of 2.

5. On the ARCADACS 100 B, add the IP addresses of the two IADs to the routing table. Specify the first two FDL channels on the ST1 card in slot 8. Use the following commands:

```
<   ADD-IPRT::ACCESS::::IP=192.100.10.1,MASK=255.255.255.255,
    CHANNEL=ST1-8-FDL1;
<   ADD-IPRT::ACCESS::::IP=192.100.20.1,MASK=255.255.255.255,
    CHANNEL=ST1-8-FDL2;
```

6. On the ARCADACS 100 B, route the traffic from the IADs to the access port and to the DS0 that has been provisioned as the IP TP:

```
<   ADD-IPRT::ACCESS::::IP=172.16.0.0,MASK=255.255.0.0,
    CHANNEL=TP-2;
```

What do the VLDTY parameters signify in the RTRV-PM response?

The PM data gathering is based on 15-minute periods and day periods. Every 15 minutes (2:00, 2:15, 2:30, 2:45, 3:00,...), the current PM data is added to the day period data and is also stored as historic 15-minute period data, the current data is reset, and accumulation of the 15-minute PM data starts again.

The VLDTY (validity) field starts off as NA (not available) which means accumulation of the current 15-minute data is not complete. If during a 15-minute period, the PM data is initialized (**INIT-PM** command), the status is changed to ADJ (adjusted). This means that the 15-minute period data may not be accurate, as data may have been lost when the data was reset. At the end of a 15-minute period, the number of seconds that PM data has been gathered for is checked. There are 900 seconds in 15 minutes. If there are less than 890 seconds of data, the status is changed to PRTL (Partial). If there are greater than 910 seconds of data, the data is changed to LONG. If there are 890 to 910 seconds of data, the status is changed to COMPL (complete). There can be too many or not enough seconds of data if the time is changed during a 15-minute period. PM intervals are based on system time: if you change the time from 2:07 to 2:12, there is 5 minutes of data missing at the end of the 15-minute period, and this results in PRTL PM data. Similarly, if the time is changed from 2:07 to 2:02, there is an extra 5 minutes worth of data and the PM data for that period is LONG.

Note that status is not changed to PRTL/LONG/CMPL until the end of the 15-minute period. This means the current data (index 0), has a VLDTY of NA or ADJ. Any historic data has a VLDTY of ADJ, PRTL, LONG or CMPL. The same can be applied to the day period data.

How are the TL1 performance monitor commands used?

The following are sample TL1 commands. For the complete description of TL1 PM commands and responses, see pages 225 through 233.

15-minute period PM data retrieval

To retrieve current 15-minute period PM data, enter the following command:

```
<    RTRV-PM::ST1-14-3:::,,,,,,;
```

This command retrieves the current PM 15-minute period data for the third DS1 of the ST1 card in slot 14.

Current day period PM data retrieval

To retrieve current day period PM data, enter the following command:

```
<    RTRV-PM::ST1-14-3:::,,,,1-DAY,,;
```

This command retrieves the current PM day period data, for the third DS1 of the ST1 card in slot 14.

Historical PM data retrieval

To retrieve historical PM data, enter the following command:

```
<    RTRV-PM::ST1-8-5:::,,,,,,2;
```

This command retrieves the second most recent historical 15-minute period PM data for the fifth DS1 of the ST1 card in slot 8. The most recent historical data would be 1, the second most recent would be 2, etc. For example, if it is currently 4:03, an index of 0 (default index) would yield the current 3 minutes of PM data, 1 would provide the PM data gathered from 3:45 to 4:00, 2 would provide the PM data gathered from 3:30 to 3:45, and so on. An index of 0&&32 would provide all of the historical 15-minute period PM data gathered. To retrieve all of the day period data, an index of 0&&7, and the 1-DAY specifier would be used.

PM data initialization – all

To initialize all PM data, enter the following command:

```
<   INIT-PM::ALL:;
```

This command initializes all current and historical PM data for all cards in the system.

PM data initialization – specific lines

To initialize PM data for a specified T1, enter the following command:

```
<   INIT-PM::ST1-8-1:::ALL,,,,,,;
```

This command initializes the current 15-minute PM data for channel 1 of the ST1 card in slot 8.

How do you control volume and echo on voice lines?

The receive transmission level point (RXTLP) and transmit transmission level point (TXTLP) parameters control the volume level and the effects of echo on FXS and FXO lines.

The range of values and default settings are shown in the following table:

Setting	Weakest											Strongest
RXTLP	–9	–8	–7	–6	–5	–4	–3	–2	–1	0	1	2	3
TXTLP	9	8	7	6	5	4	3	2	1	0	–1	–2	–3

The default value is 0 (zero) for both parameters.

To set the RXTLP and TXTLP parameters, use the **ED-FAC** command. For example, to set the RXTLP to –2 and TXTLP to 7 for an FXS card in slot 6, enter the command

```
<   ED-FAC::FXS-6-1::::RXTLP=-2,TXTLP=7;
```

Volume

There are no fixed recommendations: every network is different and some adjustments may be required to balance volume levels across the network.

Consult with Technical Support (see page xiii) at XEL Communications to arrive at the best values for your network.

Echo

Echo is caused by a number of factors in the telephone network, including end-to-end delay, line quality, and signal distortion. Signal distortion occurs at all conversion points between analog and digital signaling. In the ARCADACS 100 system, the conversion points are as follows:

- Analog signals received on FXS or FXO ports are converted to digital signals for transport through the ARCADACS 100 and digital network.
- Digital signals are converted to analog signals for transmission out of the FXS or FXO ports.

You can limit the effects of echo by adding loss or gain to the signal at each conversion point:

- Use the RXTLP setting for the analog to digital conversion on received signals.
- Use the TXTLP setting for the digital to analog conversion on transmitted signals.

Consult your network loss plan to determine the whether you should increase or decrease the signal in each direction. Then experiment with progressively larger values until you are satisfied with the results.

Note: Keep in mind that decreasing the signal too much will make it difficult to hear the caller. Increasing the signal too much may result in too much echo.

Appendix A Specifications and Standards

This appendix provides specifications for the ARCADACS 100 system and lists the standards it supports.

Chassis description

Total slots	34 (17 upper and 17 lower)
CPU slots	2 (slots 1–2, lower bank)
Clock interface slots	2 (slots 1–2, upper bank)
I/O slots	up to 13 (slots 3–15 in upper bank)
Mapper card slots	up to 13 (slots 3–15, lower bank)
Front connector and alarm panel	positioned between banks
Cable management	channel located above upper bank

Dimensions

Height	22.75 in (57.8 cm)
Width	17.50 in (44.4 cm)
Depth	10 in (25.4 cm)
Shipping weight	20 lb (9.07 kg)
Installed and loaded weight	60 to 70 lb (28 to 32 kg)

Installation

Rack mounted	19” or 23” width (48.3 or 58.4 cm)
Rack type	EIA
Maximum number per rack	3

Environmental operating requirements

Operating temperature	+23° F to +122° F (-5° C to +50° C)
Storage temperature	-40° F to +158° F (-40° C to +70° C)
Operating relative humidity	5% to 85% non-condensing
Storage relative humidity	up to 95% non-condensing
Operating altitude	up to 5,900 ft (1800 m)
Storage altitude	up to 13,000 ft (4075 m)

Power

Voltage input	dual -48 V, dc power
DC range	-36.5 to -56.5 Vdc
DC voltage amplitude slew rate	1.0V/ms, maximum
DC voltage steps change	6.0V, maximum
Input current	8 Amps typical, 13 Amps maximum
Power dissipation	384 Watts typical, 624 Watts maximum
Power feeds	separate A/B power feeds for dc protection
Modules	powered separately at varying voltages
System limit (fan tray heat dissipation)	700 Watts maximum
Transient overload voltage	To 60V DC for 0.5 s

Table 65 lists the maximum power consumption, in Watts and Amps, per card or assembly.

Table 65. Maximum power consumption per card/assembly for a typical system

Card/assembly	Watts per card	Amps per card	Max. # (incl. protection)
Clock I/O (CLK IO) card	12	0.25	2
CPU card	10	0.208	2
T1 I/O (TE IO) card	0.03	0.001	9
T1 I/O protection (TE IOP) card	0.03	0.0001	3
T3 I/O protection assembly (CT3 IOP)[1]	5.0	0.104	6
STS1 I/O protection assembly (STS1 IOP)[2]	5.0	0.104	6
STS1DS3 I/O protection assembly (STS1CT3 IOP)[3]	5.0	0.104	6
S155 I/O protection assembly (S155 IOP)[4]	29.76	0.62	6
Ringer I/O (RNG IO) card	14.4	0.3	11
Cross-connect (XCON or IXCON) card	6.24	0.13	2
Structured T1 mapper card (ST1-CSU, ST1-DSX)	8.5	0.177	10

Table 65. Maximum power consumption per card/assembly for a typical system (continued)

Card/assembly	Watts per card	Amps per card	Max. # (incl. protection)
Structured E1 mapper card	8.5	0.177	10
DS3 or DS3R mapper card (CT3, CT3R)	12.48	0.26	12
STS1 mapper card	12.96	0.27	12
S155 mapper card	13.44	0.28	12
Voice mapper card (FXS)	26.4	0.55	10
FXO mapper card	26.4	0.55	10
Front connector, alarm, and power feed (FCAPF) assembly	4.5	0.094	1
Metallic Service Unit I/O (MSU IO) card	1.8	0.038	1
Fan tray	64	1.333	1

1. The T3 I/O protection assembly consists of a T3 I/O card and a T3 I/O protection card mounted together behind a double-width faceplate.
2. The STS1 I/O protection assembly consists of an STS1 I/O card and an STS1 I/O protection card mounted together behind a double-width faceplate.
3. The STS1DS3 I/O protection assembly consists of an STS1DS3 I/O card and an STS1DS3 I/O protection card mounted together behind a double-width faceplate.
4. The STM1 I/O protection assembly consists of an STM1 I/O card and an STM1 I/O protection card mounted together behind a double-width faceplate.

A fully loaded ARCADACS 100 system, with two CPU cards, two DS3 or DS3R cards, 11 FXS cards, two clock I/O cards, one T3 I/O protection assembly, 11 Ringer I/O cards, one MSU card, and a fan tray consumes a maximum of 593 Watts at 48V DC, or 12.36 Amps.

System features

- CPU redundancy
- TL1 configurable
- Performance monitoring on all ports, equipment, and line loopback
- Front panel access to connectors and alarms
- Redundancy available (CPU, CLK IO, cross-connect modules, ST1 1:N redundancy, IXCON 1:1 redundancy, DS3 or DS3R 1:1 redundancy, STS1 1:1 redundancy, S155 1+1 redundancy)

- Front panel status LEDs on functional modules

TDM specifications

- T1 mapping (1:n circuit pack equipment redundancy)
  8 ports per module, 9 modules per system, up to 72 T1s
- I/O cross-connect (2400 DS0 non-blocking)
- AMI/B8ZS line coding (SF, ESF, SLC-96 [TR08] frame formatting)

Element management

- VT-100 local management
- Telnet support using 10bT Ethernet
- Software download capability

CPU specifications

- VT-100 terminal port interface
- 1:1 redundant
- MC68360 processor
- **8 Mb CPU card**—Two banks flash; 8 MB each
- Serial ports (one synchronous, two asynchronous)

Clock interface

- Primary and secondary system clock source
- Ethernet port interface (NMS)
- 1:1 redundancy
- Clock interface options — internal, bits

Front connector, alarm, and power feed assembly

- Connectors and alarm access points
- Alarm and status LEDs
- EIA232/RS232 serial communication interface

- VT100 craft interface for TL1 access
- External clock 1 and 2 craft interface
- BITS clock interfaces (2)
- External alarm interface
- TBOS interface

Standards supported

- ANSI T1.231 standards for T1 and DS3 failure detection and performance monitoring
- ANSI T1.231, GR-833-CORE, and GR-253-CORE standards for STS1 failure detection and performance monitoring
- ITU-T G.732, ITU-T G.775, and ITU-T G.826 for E1 failure detection, performance monitoring, and alarms on STM1 cards in STM-1 mode
- ANSI T1.231, ETS 300 417-1-1, ETS 300 147, GR-253-CORE, GR-833-CORE, and ITU-T G.826 standards for alarms and performance monitoring on STM1 cards in STM-1 mode
- ANSI T1.403-1995 standards for T1 implementation on ST1, DS3, and STS1 cards

> **Note:** Optional features not implemented include DS1-ESF ID messages, DS1 idle code, and fractional T1 loop command generation and detection.

> **Note:** The T1 framer on the STS1 card cannot detect or generate the in-band loop codes used for D4 framing. (This feature is supported on the ST1, DS3, and DS3R cards.)

- ANSI T1.403-1999 standards for T1 implementation on ST1, DS3, DS3R, and STS1 cards, as noted above.

> **Note:** Additional optional features in the 1999 standard that are not supported include error alarm generation (AIS-CI, RAI-CI) and supplementary and network performance report messages (SPRM, NPRM).

- ANSI T1.404-1994 standards for the network-to-customer and DS3 or DS3R metallic interface specifications
- ANSI T1.404a-1996 standards, including B3ZS line coding and 75 Ohm un-balanced signal transmission line
- GR-1250 File Transfer
- G.774 Management Information Model
- TR-NWT-000170 DCS Requirements

- TR-NWT-000474 Alarms
- TR-TSY-000008 SLC 96
- TR-TSY-000454 Supplier Documentation
- GR-63-CORE Physical Protection
- GR-1089-CORE EMC and Safety
- FCC Part 15 - Class A, FCC Part 68, DOC CS03 Regulatory
- UL 1950 3rd Edition, Information Technology Equipment
- CSA C22.2 No. 950-M95
- GR-834-CORE Network Maintenance: Access and Testing Message (test access)

Appendix B MIB File

The following MIB file may be required if you are using an SNMP-compatible application other than HP OpenView.

ARCADACS 100 MIB file

```
ARCADACS-SNMPv2-MIB DEFINITIONS ::= BEGIN

        IMPORTS

          enterprises, MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE

            FROM SNMPv2-SMI

          TEXTUAL-CONVENTION, DisplayString

            FROM SNMPv2-TC;

        -- Define the top of this MIB (SNMPv2 style).

        ArcaDacs MODULE-IDENTITY

          LAST-UPDATED "94042806472"

          ORGANIZATION "XEL Communications"

          CONTACT-INFO

              "XEL Communications

              17101 East Ohio Drive

              Aurora, CO 80017

              800-544-6831”

        "ARCADACS MIB using SNMPv2 SMI for Emissary 4.0 documentation."

          ::= { enterprises premisys(471) prChassis(1) prProducts(5) }

        arcadacsObjs OBJECT IDENTIFIER ::= { ArcaDacs 99 }

        arcadacsAlarms OBJECT IDENTIFIER ::= { ArcaDacs 100 0 }

        -- Make a textual convention (SNMPv2 style).

        --ExampleType ::= TEXTUAL-CONVENTION
```

```
--    STATUS      current
--    DESCRIPTION "A named two-state variable."
--    SYNTAX      INTEGER { one(1), two(2) }
arcadacsObj1 OBJECT-TYPE
  SYNTAX      DisplayString (SIZE (0..255))
   MAX-ACCESS  read-write
  STATUS      current
   DESCRIPTION "First example object."
   ::= { arcadacsObjs 1 }
-- Define a trap (SNMPv2 style).
arcadacsAlarm NOTIFICATION-TYPE
  OBJECTS     { arcadacsObj1 }
  STATUS      current
  DESCRIPTION "An example trap."
  ::= { arcadacsAlarms 1 }
END
```

Appendix C Naming and Numbering Conventions

This appendix contains tables that show the equivalent names for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) structures, alarms, and performance monitoring (PM) counters. The SONET names, used in North America, are derived from Bellcore and the American National Standards Institute (ANSI). The SDH names, used in Europe and Asia, are derived from the International Telecommunication Union (ITU) and European Telecommunications Standards Institute (ETSI).

Naming conventions

Structure

Table 66 shows the equivalent names for SONET and SDH structures.

Table 66. Naming conventions for structures

SONET name	Description	SDH name	Description
VT2	**Virtual tributary 2**—Pointer + VT2 synchronous payload envelope (SPE)	TU-12	**Tributary unit 12**—Pointer + virtual container 12 (VC-12)
VT2 payload	E1	C-12	E1
VT2 SPE	VT2 path overhead + E1, using bit asynchronous mapping	VC-12	VC-12 path overhead + C12, using bit asynchronous mapping
STS-3	Section overhead + line overhead + pointer + SPE	STM-1	Section overhead + information payload at 155.52 Mbps

Alarms

Table 67 shows the equivalent names for SONET and SDH alarms.

Table 67. Naming conventions for alarms

SONET name	Description	SDH name	Description
LOS	Loss of signal	LOS	Loss of signal
LOF	Loss of frame	LOF	Loss of frame
AIS-L	Alarm indication signal, line	MS-AIS	Multiplex section, alarm indication signal
RDI-L	Remote defect indication, line	MS-RDI	Multiplex section, remote defect indication
AIS-P	Alarm indication signal, path	HP-AIS	Higher order path, alarm indication signal

Table 67. Naming conventions for alarms (continued)

SONET name	Description	SDH name	Description
LOP-P	Loss of pointer, path	HP-LOP	Higher order path, loss of pointer
UNEQ-P	Unequipped, path	HP-UNEQ	Higher order path, unequipped
PLM-P	Payload label mismatch, path	HP-PLM	Higher order path, payload label mismatch
RFI-P	Remote failure indication, path	HP-RDI	Higher order path, remote defect indication
AIS-V	Alarm indication signal, VT	LP-AIS	Lower order path, alarm indication signal
LOP-V	Loss of pointer, VT	LP-LOP	Lower order path, loss of pointer
UNEQ-V	Unequipped, VT	LP-UNEQ	Lower order path, unequipped
PLM-V	Payload label mismatch, VT	LP-PLM	Lower order path, payload label mismatch
RFI-V	Remote failure indication, VT	LP-RDI	Lower order path, remote defect indication

Performance monitoring counters

Table 68 shows the equivalent names for SONET and SDH PM counters.

Table 68. Naming conventions for PM counters

SONET name	Description	SDH name	Description
SEFS	Severely errored framing second, section	OFS	Out of frame second
CVS	Code violation, section	RS-BBE	Regenerator section, background block error
ESS	Errored second, section	RS-ES	Regenerator section, errored second
SESS	Severely errored second, section	RS-SES	Regenerator section, severely errored second
CVL	Code violation, line	MS-BBE	Multiplex section, background block error
ESL	Errored second, line	MS-ES	Multiplex section, errored second
SESL	Severely errored second, line	MS-SES	Multiplex section, severely errored second
UASL	Unavailable second, line	MS-UAS	Multiplex section, unavailable second
FC-L	Failure condition, line	--	
CVP	Code violation, path	HP-BBE	Higher order path, background block error

Table 68. Naming conventions for PM counters (continued)

SONET name	Description	SDH name	Description
ESP	Errored second, path	HP-ES	Higher order path, errored second
SESP	Severely errored second, path	HP-SES	Higher order path, severely errored second
UASP	Unavailable second, path	HP-UAS	Higher order path, unavailable second
FC-P	Failure condition, path	--	
CV-LFE	Code violation, line far end	MS-FBBE	Multiplex section, far-end background block error
ESLFE	Errored second, line far end	MS-FES	Multiplex section, far-end errored second
SES-LFE	Severely errored second, line far end	MS-FSES	Multiplex section, far-end severely errored second
UASL-FE	Unavailable second, line far end	MS-FUAS	Multiplex section, far-end unavailable second
FC-LFE	Failure condition, line far end	--	
CVPFE	Code violation, path far end	HP-FBBE	Higher order path, far-end background block error
ESP-FE	Errored second, path far end	HP-FES	Higher order path, far-end errored second
SESP-FE	Severely errored second, path far end	HP-FSES	Higher order path, far-end severely errored second
UASP-FE	Unavailable second, path far end	HP-FUAS	Higher order path, far-end unavailable second
FC-PFE	Failure condition, path far end	--	
CVV	Code violation, VT	LP-BBE	Lower order path, background block error
ESV	Errored second, VT	LP-ES	Lower order path, errored second
SEW	Severely errored second, VT	LP-SES	Lower order path, severely errored second
UASV	Unavailable second, VT	LP-UAS	Lower order path, unavailable second
FC-V	Failure condition, VT	--	
CV-VFE	Code violation, VT far end	LP-FBBE	Lower order path, far-end background block error
ES-VFE	Errored second, VT far end	LP-FES	Lower order path, far-end errored second
SES-VFE	Severely errored second, VT far end	LP-FSES	Lower order path, far-end severely errored second
UASV-FE	Unavailable second, VT far end	LP-FUAS	Lower order path, far-end unavailable second

Table 68. Naming conventions for PM counters (continued)

SONET name	Description	SDH name	Description
FC-VFE	Failure condition, VT far end	--	

Numbering conventions

VT2 numbers

Within the STM-1 structures, the VT2s are numbered according to the following hierarchy:

- Three STS1 synchronous payload envelopes (SPE)
- Seven VT groups (VTG)
- Three VT2s

Table 69 shows the VT2 numbering.

Table 69. Numbering for VT2 facilities

VT2 #	SPE	VTG	VT2	VT2 #	SPE	VTG	VT2
1	1	1	1	33	3	4	2
2	2	1	1	34	1	5	2
3	3	1	1	35	2	5	2
4	1	2	1	36	3	5	2
5	2	2	1	37	1	6	2
6	3	2	1	38	2	6	2
7	1	3	1	39	3	6	2
8	2	3	1	40	1	7	2
9	3	3	1	41	2	7	2
10	1	4	1	42	3	7	2
11	2	4	1	43	1	1	3
12	3	4	1	44	2	1	3
13	1	5	1	45	3	1	3
14	2	5	1	46	1	2	3
15	3	5	1	47	2	2	3
16	1	6	1	48	3	2	3
17	2	6	1	49	1	3	3
18	3	6	1	50	2	3	3
19	1	7	1	51	3	3	3
20	2	7	1	52	1	4	3

Table 69. Numbering for VT2 facilities (continued)

VT2 #	SPE	VTG	VT2
21	3	7	1
22	1	1	2
23	2	1	2
24	3	1	2
25	1	2	2
26	2	2	2
27	3	2	2
28	1	3	2
29	2	3	2
30	3	3	2
31	1	4	2
32	2	4	2

VT2 #	SPE	VTG	VT2
53	2	4	3
54	3	4	3
55	1	5	3
56	2	5	3
57	3	5	3
58	1	6	3
59	2	6	3
60	3	6	3
61	1	7	3
62	2	7	3
63	3	7	3

VT1.5 numbers

Within the OC3 and OC3C structures, the VT1.5s are numbered according to the following hierarchy:

- Three STS1 synchronous payload envelopes (SPE)
- Seven VT groups (VTG)
- Four VT1.5s

Table 70 shows the VT1.5 numbering.

Table 70. Numbering for VT1.5 facilities

VT1.5 #	SPE	VTG	VT1.5
1	1	1	1
2	2	1	1
3	3	1	1
4	1	2	1
5	2	2	1
6	3	2	1
7	1	3	1
8	2	3	1
9	3	3	1
10	1	4	1
11	2	4	1

VT1.5 #	SPE	VTG	VT1.5
43	1	1	3
44	2	1	3
45	3	1	3
46	1	2	3
47	2	2	3
48	3	2	3
49	1	3	3
50	2	3	3
51	3	3	3
52	1	4	3
53	2	4	3

Table 70. Numbering for VT1.5 facilities (continued)

VT1.5 #	SPE	VTG	VT1.5	VT1.5 #	SPE	VTG	VT1.5
12	3	4	1	54	3	4	3
13	1	5	1	55	1	5	3
14	2	5	1	56	2	5	3
15	3	5	1	57	3	5	3
16	1	6	1	58	1	6	3
17	2	6	1	59	2	6	3
18	3	6	1	60	3	6	3
19	1	7	1	61	1	7	3
20	2	7	1	62	2	7	3
21	3	7	1	63	3	7	3
22	1	1	2	64	1	1	4
23	2	1	2	65	2	1	4
24	3	1	2	66	3	1	4
25	1	2	2	67	1	2	4
26	2	2	2	68	2	2	4
27	3	2	2	69	3	2	4
28	1	3	2	70	1	3	4
29	2	3	2	71	2	3	4
30	3	3	2	72	3	3	4
31	1	4	2	73	1	4	4
32	2	4	2	74	2	4	4
33	3	4	2	75	3	4	4
34	1	5	2	76	1	5	4
35	2	5	2	77	2	5	4
36	3	5	2	78	3	5	4
37	1	6	2	79	1	6	4
38	2	6	2	80	2	6	4
39	3	6	2	81	3	6	4
40	1	7	2	82	1	7	4
41	2	7	2	83	2	7	4
42	3	7	2	84	3	7	4

Appendix D FXS and FXO Signaling Details

This appendix describes the following FXS and FXO signaling details:

FXS State Machines and Signaling Bits

Table 1. FXS state machines and signalling bits

	Mode	Signal Type	Signalling Scheme Table
1	FXSMD	LOOPSTART	A
2		LPFD	A
3		GNDSTART	B
4		GSI	C
5		GSA	D
6		PLAR	E
7		LSR2A	F
8	FXSDN	LOOPSTART	G
9		LPFD	G
10		GNDSTART	H
11		GSI	H
12		GSA	H
13	WINK	LOOPSTART	G
14		LPFD	G
15		GNDSTART	H
16		GSI	H
17		GSA	H
18	TR08	SP	I
19		UVG	J
20		UVGA	K

Note:

1. Acronyms used in this table are defined as follows: FXSMD = foreign exchange station mode, FXSDN = foreign exchange station defined network, GNDSTART = ground start (signalling), GSA = ground start automatic, GSI = ground start immediate, LPFD = loopstart, forward disconnect, LSR2A = loopstart R2 signalling, PLAR = private line automatic ringdown, SP = single party signaling, UVG = universal voice grade, UVGA = universal voice grade automatic.

FXSMD Mode

Table 2. FXSMD with LOOPSTART or LPFD

Tx ABCD	Meaning	Rx ABCD	Meaning	
0101	LO (on-hook)	0101	LCF	Loop current feed
1111	LC (off-hook)	0000	LCF + ringing	Loop current feed + ringing
		1111	LCFO	Loop Current Feed Open

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: FXSMD = foreign exchange station mode, LO = loop open, LC = loop closed, LCF = loop current feed, LCFO = loop current feed open, LPFD = loopstart, forward disconnect.

Table 3. FXSMD with GNDSTART

Tx ABCD	Meaning	Rx ABCD	Meaning
0101	LO (on-hook)	0101	LCF
1111	LC (off-hook)	0000	LCF + ringing
0000	RG (service request)	1111	LCFO

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: FXSMD = foreign exchange station mode, GNDSTART = ground start (signalling), LO = loop open, LC = loop closed, LCF = loop current feed, LCFO = loop current feed open, RG = ring ground.

Table 4. FXSMD with GSA

Tx ABCD	Meaning	Rx ABCD	Meaning
0101	LO (on-hook)	0101	LCF
1111	LC (off-hook)	0000	LCF + ringing
0000	RG (service request)	1111	LCFO

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: FXSMD = Foreign exchange station mode, GSA = ground start automatic, LO = loop open, LC = loop closed, LCF = loop current feed, LCFO = loop current feed open, RG = ring ground.

Table 5. FXSMD with GSI

Tx ABCD	Meaning	Rx ABCD	Meaning
0101	LO (on-hook)	0101	LCF
1111	LC (off-hook)	0000	LCF + ringing
1010	RG (service request)	1111	LCFO

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: FXSMD = Foreign exchange station mode, GSI = ground start immediate, LO = loop open, LC = loop closed, LCF = loop current feed, LPFD = Loopstart, forward disconnect, RLCF = Reverse Loop Current Feed, LCFO = loop current feed open, RG = ring ground.

FXSMD with PLAR Mode

Table 6. FXSMD with PLAR

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	0000	LCF
1111	LC (off-hook)	1111	LCF + ringing

Notes:

1. BellCore PUB 43801 Private Line Auto Ring.
2. Acronyms used in this table are defined as follows: FXSMD = Foreign exchange station mode, LO = loop open, LC = loop closed, LCF = loop current feed, PLAR = private line auto-ring.

FXSMD with LSR2A Mode

Table 7. FXSMD with LSR2A

Tx ABCD	Meaning	Rx ABCD	Meaning
1010	LO (on-hook)	1010	LCF
0000	LC (off-hook)	0000	LCF + ringing
		1111	Disconnect

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: FXSMD = Foreign exchange station mode, LO = loop open, LC = loop closed, LCF = loop current feed, LSR2A = loopstart R2 A signalling.

FXSDN and Wink Mode

Table 8. FXSDN with LOOPSTART or LPFD

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	0000	LCF
1111	LC (off-hook)	1111	LCF + ringing

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: FXSDN = foreign exchange station defined network, LO = loop open, LC = loop closed, LCF = loop current feed, LSR2A = loopstart R2 A signalling.

Table 9. FXSDN with GNDSTART, GSA, or GSI

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	0000	LCF
1111	LC (off-hook)	1111	LCF + ringing

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: FXSDN = foreign exchange station defined network, GND-START = ground start (signalling), GSA = ground start automatic, GSI = ground start immediate, LO = loop open, LC = loop closed, LCF = loop current feed.

TR08 Mode

Table 10. TR08 with SP

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	1111	LCF
1010	LC (off-hook)	1110	LCF + ringing
		1011	LCF + ringing
		1010	LCFO

Notes:

1. For additional information, see BellCore TR-TSY-000008.
2. Acronyms used in this table are defined as follows: LO = loop open, LC = loop closed, LCF = loop current feed. SP = single party signaling.

Table 11. TR08 with UVG

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	0001	LCF
1010	LC (off-hook)	0100	LCF
0101	RG (service request)	1110	LCF + ringing
		1011	LCF + ringing
		1010	LCFO
		0000	GNDSTART

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: GNDSTART = ground start (signalling), LO = loop open, LC = loop closed, LCF = loop current feed, RG = ring ground, UVG = universal voice grade.

Table 12. T08 with UVGA

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	0001	LCF
1010	LC (off-hook)	0100	LCF
0101	RG (service request)	1110	LCF + ringing
		1011	LCF + ringing
		0000	LCFO

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: LO = loop open, LC = loop closed, LCF = loop current feed, RG = ring ground, UVGA = universal voice grade A.

DPO Mode

Table 13. DPO (Dial Pulse Originate) with LOOPSTART

Tx ABCD	Meaning	Rx ABCD	Meaning
0000	LO (on-hook)	1111	RLCF
1111	LC (off-hook)	0000	LCF

Notes:

1. For additional information, see BellCore PUB 43801 Private Line Auto Ring and ANSI T1.403 Loop-Reverse-Battery signaling.
2. Acronyms used in this table are defined as follows: DPO = dial pulse originate, LO = loop open, LC = loop closed, LCF = loop current feed, RG = ring ground, UVGA = universal voice grade A.

FXO State Machines and Signaling Bits

Table 14. FXO State Machines and Signaling Bits

	MODE	SIGTYPE	Signaling Scheme Table
1	FXOMD	LOOPSTART	A
2		LPFD	A
3		GNDSTART	B
4		LSR2A	C
5	DPT	LOOPSTART	D

Notes:

1. Acronyms used in this table are defined as follows: DPT = dial pulse termination, FXOMD = foreign exchange office mode, GNDSTART = ground start (signalling), LPFD = loopstart, forward disconnect, LSR2A = Loop-start R2 signalling.

FXO Mode

Table 15. FXOMD with LOOPSTART or LPFD

Rx ABCD	Meaning	Tx ABCD	Meaning
0101	LO (on-hook)	0101	LCF
1111	LC (off-hook)	0000	LCF + ringing
		1111	LCFO

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit (office end) and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: FXOMD = foreign exchange office mode, LO = loop open, LC = loop closed, LCF = loop current feed, LCFO = loop current feed open.

Table 16. FXSMD with GNDSTART

Rx ABCD	Meaning	Tx ABCD	Meaning
0101	LO (on-hook)	0101	LCF
1111	LC (off-hook)	0000	LCF + ringing
0000	RG (service request)	1111	LCFO

Notes:

1. For additional information, see BellCore PUB 43801 Foreign Exchange Channel Unit (office end) and ANSI T1.403 Loop Start and Ground Start signaling.
2. Acronyms used in this table are defined as follows: LO = loop open, LC = loop closed, LCF = loop current feed, LCFO = loop current feed open, RG = ring ground.

FXOMD with LSR2A mode

Table 17. FXOMD with LSR2A

Rx ABCD	Meaning	Tx ABCD	Meaning
1010	LO (on-hook)	1010	LCF
0000	LC (off-hook)	0000	LCF + ringing
		1111	Disconnect

Notes:

1. For additional information, see Malaysia Digital R2.
2. Acronyms used in this table are defined as follows: FXOMD = foreign exchange office mode, LO = loop open, LC = loop closed, LCF = loop current feed, LSR2A = Loopstart R2 A signaling.

DPT mode

Table 18. DPT with LOOPSTART

Rx ABCD	Meaning	Tx ABCD	Meaning
0000	LO (on-hook)	1111	RLCF
1111	LC (off-hook)	0000	LCF

Notes:

1. For additional information, see BellCore PUB 43801 Private Line Auto Ring and ANSI T1.403 Loop-Reverse-Battery signaling.
2. Acronyms used in this table are defined as follows: DPT = dial pulse terminate, LO = loop open, LC = loop closed, LCF = loop current feed, RLCF = reverse loop current feed.

Appendix E Summary of TL1 Commands

This section provides a quick reference of the TL1 commands. For detailed descriptions, syntax and responses, refer to TL1 Command Interface on page 85. In Table 1, TL1 commands are listed alphabetically.

Table 1. TL1 command listing by example

Command	Function and Page	Example
ACT-APP	Activate application command on page 117	ACT-APP:FACTORY::CTAG1:::APP=FDLDISABLE, KEY=<fdl_key>;
ACT-DIAG	Initiate diagnostic testing command on page 154	ACT-DIAG::ST1-9:;
ACT-IMG	Change software image state command on page 140	ACT-IMG::CPU-2-2:;
ACT-USER	Log in command on page 94	ACT-USER:FACTORY:ROOT:TID1::;
ADD-IPRT	Add entry to IP routing table command on page 107	ADD-IPRT::ETHER::::IP=DEFAULT,GATEWAYIP= *200.218.43.8*; ADD-IPRT::ACCESS::::IP=*199.190.212.5*,MASK=*255.255.0.0*,CHANNEL= ST1-6-FDL1;
ALW-MSG-ALL	Allow autonomous messages command on page 104	ALW-MSG-ALL:FACTORY:ALL:CTAG1::,,;
ALW-SWTOPROTN-EQPT	Allow switch-to-protection command on page 218	ALW-SWTOPROTN-EQPT::ST1-8:;
ALW-SWTOWKG-EQPT	Allow switch-to-protection command on page 218	ALW-SWTOWKG-EQPT::ST1-8:;
CANC-USER:FACTORY	Log out command on page 95	CANC-USER:FACTORY:ROOT:CTAG1;
CHG-ACCMD-T1	Change TAD connect command on page 297	CHG-ACCMD-T1::1::::MONE;
CHG-SPLIT	Change TAP connect to split command on page 295	CHG-SPLIT:SYSTEM1:401:CTAG1;
CONN-MON	Change TAP to monitor command on page 295	CONN-MON: SYSTEM1:401:CTAG1;
CONN-TACC-DIG	Connect test access digital command on page 294	CONN-TACC-DIG: SYSTEM1:ST1-5-1-1:CTAG1::401:NON;
CONN-TACC-T1	Connect test access T1 command on page 296	CONN-TACC-T1::DS3-10-2-1::::SPLTE;
DISC-TACC	Disconnect test access command on page 298	DISC-TACC: SYSTEM1:401:CTAG1;
DLT-APP	Delete application settings command on page 119, Delete application settings response on page 120	DLT-APP:FACTORY::CTAG3:::APP=<APPKEY>,KEY=<fdl_key>;
DLT-FAC	Delete facility data command on page 183	DLT-FAC:AC3:ST1-7-3:CTAG2;
DLT-BERT	Delete BERT command on page 212	DLT-BERT::ST1-8-7:;
DLT-CRS-DS0	Delete DS0 cross connection command on page 256	DLT-CRS-DS0::CRS-1:;
DLT-CRS-T0	Delete single line DS0 cross connection command on page 259	DLT-CRS-T0:FACTORY:ST1-6-1-1&&ST1-6-1-2, DS3-4-1-1-1&&DS3-4-1-1-2:CTAG1;
DLT-EQPT	Delete card command on page 155	DLT-EQPT::ST1-9:;
DLT-IPRT	Retrieve IP routing table settings command on page 109	DLT-IPRT::*199.190.212.4*:;
DLT-LOG	Delete alarm logs command on page 286	DLT-LOG:::;
DLT-LOG-CMD	Delete TL1 log command on page 287	DLT-LOG-CMD:FACTORY::CTAG1;
DLT-TACC	Delete test access connection command on page 292	DLT-TACC::TAD-1:;
DLT-TP	Delete DS0 termination pointer command on page 252	DLT-TP::TP-1:;
DLT-USER-SECU	Delete user command on page 98	DLT-USER-SECU::*USER1&USER2&USER3*:;
ED-CLKLST	Edit clock source command on page 113	ED-CLKLST:::::CLKSRC1=ST1-5-4, CLKSRC2=BITSA_T1,CLKSRC3=BITSB_T1,CLKSRC4=ST1-6-4; ED-CLKLST:::::CLKSRC1=SE1-7-3, CLKSRC2=BITSA_E1,CLKSRC3=BITSB_E1,CLKSRC4=SE1-8-3;

Table 1. TL1 command listing by example (continued)

Command	Function and Page	Example
ED-COMMUNITY-STR	Edit community string command on page 276	ED-COMMUNITY-STR::COMID-1::::COMNAME=ARCADACS100_1; ED-COMMUNITY-STR::COMID-1::::IP=199.17.87.12;
ED-CRS-DS0-DIAG	Create DS0 split or monitor connection command on page 271	ED-CRS-DS0-DIAG::CRS-1::::TYPE=MONITOR,PRI-DIAG=TP-3,BIDIR-DIAG=TP-4,MSU-PORT=1;
ED-DAT	Change local system date and time command on page 128	ED-DAT::::1998-10-27,11-15-00;
ED-EQPT	Reset Clock I/O card command on page 116	ED-EQPT::CLK-1::::PST=RESET;
ED-EQPT	Edit card settings command on page 152	ED-EQPT::ST1-6::::RN=SX;
ED-FAC	Edit facility data command on page 167	ED-FAC::ST1-5-8::::FRM=ESF,LINECDE=B8ZS,LBO=15,FDL=NMS; ED-FAC::DS3-3-2-1&&DS3-3-2-4::::FRM=ESF;
ED-HIDM	Edit human interface dialog mode command on page 100	ED-HIDM:FACTORY::1::BAT;
ED-IP	Set IP interface command on page 105	ED-IP::ETHER:::GATEWAY=ON,IP=*199.190.212.4*,MASK=*255.255.255.0*, BRDCAST=*199.190.212.255*;
ED-MGMTIPLIST	Edit management IP list command on page 273	ED-MGMTIPLIST:::::IPADDR1=*199.190.212.4*,SNMPPORT1=*161*,TRAPPORT1=*162*;
ED-NE	Change local node identifier command on page 125	ED-NE::::2-*TARGET*;
ED-NETYPE	Change NE type command on page 127	ED-NETYPE:[<TID>]::[<CTAG>]::[VENDOR="<vendor>"]|[,NETYPE="<netype>"]| [,MODEL="<model>"];
ED-NTP	Edit network time protocol server address command on page 129	ED-NTP:::::IPADDR1=*172.16.191.20*,IPADDR2=*172.16.191.24*,GMTOFFSET= -5.00,FREQ=12;
ED-PID	Change user password command on page 100	ED-PID::*USER1*:::*PSWORD1%*,*PSWORD2%*,*PSWORD2%*;
ED-PORT	Modify port settings command on page 101	ED-PORT:FACTORY:30007::::TMOUT=60;
ED-SIGTBL	Edit signaling conversion table command on page 157	ED-SIGTBL::ST1-5-RX::::SIG=0000->0101;
ED-SNMPDATA	Edit SNMP variable command on page 279	ED-SNMPDATA:::::SYSNAME="HSPEED",SYSLOCATION="CENTRAL", SYSCONTACT="JHIGGINS";
ED-SNMPTRAP-VER	Edit SNMP trap version command on page 277	ED-SNMPTRAP-VER:::::VERSION=PROP;
ED-USER-SECU	Change user access privileges command on page 99	ED-USER-SECU::USER1:::,,ROOTGRP,RD;
ENT-BE	Generate one bit error command on page 212	ENT-BE::ST1-8-1:; ENT-BE::DS3-10-1-11&DS3-10-1-14&DS3-10-1-20:;
ENT-BERT	Configure BERT command on page 209	ENT-BERT::ST1-8-7:::QRSS; ENT-BERT::DS3-10-1-1&DS3-10-1-4&DS3-10-1-5:::MARK; ENT-BERT::STS1-11-1-1&&STS1-11-1-8:::QRSS;
ENT-COMMUNITY-STR	Create community string command on page 275	ENT-COMMUNITY-STR::COMID-1::::COMNAME=ACDX_1,ACCESS=READONLY,IP= 199.17.87.5;
ENT-CRS-DS0	Create DS0 cross connection command on page 253	ENT-CRS-DS0:::::TPLST=1&2,TYPE=DATA,PST=IS,NAME=CUSTOMER1;
ENT-CRS-T0	Create single line cross connection command on page 256	ENT-CRS-T0::ST1-3-6-1,ST1-3-6-2::::TYPE=VSIG,TC=11110000-11010110;
ENT-EQPT	Create equipment command on page 143	ENT-EQPT::ST1-8::::PST=IS,WKMOD=WK,RN=DX,PRIORITY=6;
ENT-FAC	Enter facility data command on page 160	ENT-FAC::ST1-5-1::::FRM=ESF,PST=IS;

Table 1. TL1 command listing by example (continued)

Command	Function and Page	Example
ENT-TACC	Enter test access command on page 292	ENT-TACC::ST1-7-8::::TACCTYPE=TAD-1;
ENT-TIDMAP	Provision target identifier map command on page 132	ENT-TIDMAP::::2-TARGETX&3-TARGETY
ENT-TP	Create DS0 termination pointer command on page 247	ENT-TP:::::FAC=ST1-8-1,DS0=3,TYPE=VSIG,TCABCD1=1111,TCABCD2=1111,CNV=TXRX; ENT-TP:::::FAC=DS3-10-2-20,DS0=6,TYPE=IP;
ENT-USER-SECU	Create user command on page 97	ENT-USER-SECU::USER1:::PSWORD1%,PSWORD1%,,ROOTGRP,RW;
INH-MSG-ALL	Inhibit autonomous messages command on page 104	INH-MSG-ALL:FACTORY:ALL:CTAG1::,,;
INH-SWTOPROTN-EQPT	Inhibit switch-to-protection command on page 217	INH-SWTOPROTN-EQPT::ST1-8:;
INH-SWTOWKG-EQPT	Inhibit switch-to-working command on page 217	INH-SWTOWKG-EQPT::ST1-8:;
INIT-BERT	Clear BERT error counts command on page 211	INIT-BERT::ST1-8-2:; INIT-BERT::DS3-10-1-11&DS3-10-1-14&DS3-10-1-20:; INIT-BERT::STS1-11-1-3&&STS1-11-1-6:;
INIT-NVM	Clear NVM command on page 141	INIT-NVM::ALL:;
INIT-PORT	Clear port settings on page 102	INIT-PORT:FACTORY:30004:CTAG99;
INIT-PM	Clear PM counts command on page 233	INIT-PM::ALL:;
OPR-ACO-ALL	Activate audible alarm cut-off command on page 284	OPR-ACO-ALL::ALL:;
OPR-APS	Activate automatic protection switching command on page 221	OPR-APS::S155-3::::FS_P;
OPR-LPBK	Operate loopback test command on page 193	OPR-LPBK::ST1-5-6:::TXLINE; OPR-LPBK::DS3-10-1-3&DS3-10-1-5&DS3-10-1-6:::PAYLOAD; OPR-LPBK::DS3-10-1-24&&DS3-10-1-28:::FEPAYLOAD;
OPR-DS0LPBK	Operate DS0 loopback test command on page 196	OPR-DS0LPBK::ST1-5-1-DS0:::DS0LINE,DS0=1;
OPR-LPBK-T0	Operate DS0 loopback command on page 199	OPR-LPBK-TO::ST1-10-1-1:::,,,LINE;
OPR-LPBK-T0	Operate DS0 loopback test on DS3 cards command on page 201	OPR-LPBK-T0::DS3-5-1-2-1:::,,,LINE;
OPR-LPBK-T1	Operate T1 loopback test command on page 204	OPR-LPBK-T1:AC3:ST1-8-1:CTAG1::,,,TERMINAL;
OPR-LPBK-T3	Operate T3 loopback test command on page 205	OPR-LPBK-T3::DS3-6-2:::,,,TERMINAL;
OPR-PING	Confirm connectivity command on page 120	OPR-PING:::::IP=172.16.191.20;
RLS-LPBK	Release loopback test command on page 195	RLS-LPBK::ST1-4-5:::FECSU; RLS-LPBK::DS3-10-1-3&DS3-10-1-5&DS3-10-1-6:; RLS-LPBK::DS3-10-1-24&&DS3-10-1-28:::FEPAYLOAD;
RLS-LPBK	Release DS0 loopback test command on page 198	RLS-DS0LPBK::ST1-13-1-DS0:::DS0LINE,DS0=1&&4&6;
RLS-LPBK-T0	Release DS0 loopback command on page 200	RLS-LPBK-T0::ST1-10-1-2:::,,,LINE;
RLS-LPBK-T0	Release DS0 loopback test on DS3 cards command on page 203	RLS-LPBK-T0::DS3-15-1-2-1:::,,,LINE;
RLS-LPBK-T1	Release T1 loopback test command on page 204	RLS-LPBK-T1:AC3:ST1-8-1:CTAG2::,,,TERMINAL;
RLS-LPBK-T3	Release T3 loopback test command on page 206	RLS-LPBK-T3:AC3:DS3-3-1:CTAG2::,,,TERMINAL;
RTRV-ACTCLK	Retrieve current active clock command on page 114	RTRV-ACTCLK:::;
RTRV-ALM	Retrieve alarms command on page 280	RTRV-ALM::ST1-9:; RTRV-ALM::ALL:;
RTRV-ALM-ALL	Retrieve all alarms command on page 281	RTRV-ALM-ALL:FACTORY::CTAG1::,,,,,;

Table 1. TL1 command listing by example (continued)

Command	Function and Page	Example
RTRV-ALM-T1	Retrieve T1 alarms command on page 282	RTRV-ALM-T1::ST1-6:CTAG1::,,,,,,;
RTRV-ALM-T3	Retrieve T3 alarms command on page 283	RTRV-ALM-T3:FACTORY:DS3-3:CTAG2::,,,,,,;
RTRV-APP	Retrieve application settings command on page 118	RTRV-APP:FACTORY::CTAG2:::ALL;
RTRV-APS	Retrieve automatic protection switching status command on page 222	RTRV-APS::S155-3:;
RTRV-BERT	Retrieve BERT results command on page 210	RTRV-BERT::ST1-8-4:; RTRV-BERT::DS3-10-1-1&DS3-10-1-4&DS3-10-1-5:; RTRV-BERT::STS1-11-1-1&&STS1-11-1-8:;
RTRV-CLKLST	Retrieve current clock list command on page 111	RTRV-CLKLST:::;
RTRV-COMMUNITY-STR	Retrieve community string command on page 275	RTRV-COMMUNITY-STR::COMID-1:; RTRV-COMMUNITY-STR::ALL:;
RTRV-COND-T1	Retrieve T1 condition command on page 183	RTRV-COND-T1::::LOF; RTRV-COND-T1::ST1-7:::LOS; RTRV-COND-T1::DS3-4:::CGA-RED RTRV-COND-T1::::CGA-RED; RTRV-COND-T1::ST1-7:::ALL;
RTRV-COND-T3	Retrieve T3 condition command on page 185	RTRV-COND-T3::DS3-4:::LOF; RTRV-COND-T3::::LOF; RTRV-COND-T3::DS3-4:::ALL;
RTRV-CRS-DS0	Retrieve DS0 cross connection command on page 254	RTRV-CRS-DS0::CRS-1:;
RTRV-CRS-DS0-DIAG	Retrieve DS0 split or monitor connection command on page 272	RTRV-CRS-DS0-DIAG::ALL:;
RTRV-CRS-T0	Retrieve single line DS0 cross connection command on page 258	RTRV-CRS-T0::ST1-6-2-1&&ST1-6-2-24:;
RTRV-DAT	Retrieve system date and time command on page 127	RTRV-DAT:::;
RTRV-DS0LPBK	Retrieve DS0 loopback test command on page 197	RTRV-DS0LPBK::ST1-13-1-DS0:;
RTRV-EQPT	Retrieve Clock I/O card settings command on page 115	RTRV-EQPT::CLKALL:;
RTRV-EQPT	Retrieve card settings command on page 146	RTRV-EQPT::XCON-10:;
RTRV-EXC	Retrieve card exception data command on page 287	RTRV-EXC::DS3-5:;
RTRV-FAC	Retrieve facility data command on page 178	RTRV-FAC::ST1-10-1:; RTRV-FAC::DS3-5-1-1:; RTRV-FAC::DS3-5-1:; RTRV-FAC::ST1-5-1&ST1-5-4&ST1-5-5:; RTRV-FAC::FXS-7-1::::DS0=1&&DS0=24;
RTRV-HDR	Retrieve header command on page 132	RTRV-HDR:AC3::CTAG1;
RTRV-IMG	Retrieve software image command on page 134	RTRV-IMG::CPU-1-2:;
RTRV-INVENTORY	Retrieve system inventory command on page 122	RTRV-INVENTORY:::;
RTRV-IP	Retrieve IP interface settings command on page 106	RTRV-IP::ETHER:;
RTRV-IPRT	Retrieve IP routing table settings command on page 109	RTRV-IPRT::ACCESS:;
RTRV-LOG	Retrieve alarm log command on page 285	RTRV-LOG::::2000-09-08,08-30-00,2000-09-20,12-00-00::;
RTRV-LOG-CMD	Retrieve TL1 command log on page 286	RTRV-LOG-CMD:FACTORY::CTAG11::::;
RTRV-LPBK-T0	Retrieve DS0 loopback command on page 199	RTRV-LPBK-TO::ST1-10-1-1:;
RTRV-LPBK-T0	Retrieve DS0 loopback test on DS3 cards command on page 202	RTRV-LPBK-T0::DS3-5-1-2-1:;
RTRV-MGMTIPLIST	Retrieve management IP list command on page 274	RTRV-MGMTIPLIST:::;
RTRV-MSU	Retrieve DS1 MSU test command on page 265	RTRV-MSU::ALL:;
RTRV-NE	Retrieve NE information command on page 124	RTRV-NE:::;

Table 1. TL1 command listing by example (continued)

Command	Function and Page	Example
RTRV-NETYPE	Retrieve NE type command on page 125	RTRV-NETYPE:FACTORY::CTAG1; RTRV-NETYPE:FACTORY::CTAG1:GENERALBLOC;
RTRV-NTP	Retrieve network time protocol server address command on page 130	RTRV-NTP:::;
RTRV-PM	Retrieve PM counts command on page 225	RTRV-PM::ST1-13-1:::,,,,1-DAY,,1&&4; RTRV-PM::DS3-4-1-2&&DS3-4-1-4:::UASP,,,,15-MIN,,1&&3; RTRV-PM::STS1-11-1-VT2:::UASV,,,,15-MIN,,4;
RTRV-PM-T1	Retrieve PM T1 command on page 235	RTRV-PM-T1::ST1-7-1:::,,,,,,15-20;
RTRV-PM-T3	Retrieve PM T3 command on page 236	RTRV-PM-T3::DS3-4-1:::,,,,15-MIN,,15-2;
RTRV-PORT	Retrieve port settings on page 102	RTRV-PORT:FACTORY:ALL:CTAG1;
RTRV-SIGTBL	Retrieve signaling conversion table command on page 158	RTRV-SIGTBL::STE1-5-RX:;
RTRV-SNMPTRAP-VER	Retrieve SNMP trap version command on page 278	RTRV-SNMPTRAP-VER:FACTORY::CTAG1;
RTRV-TACC	Retrieve test access command on page 293	RTRV-TACC::401:;
RTRV-TH-T1	Retrieve T1 PM threshold command on page 240	RTRV-TH-T1:FACTORY:ST1-6-1:CTAG1::ESL,NEND,15-MIN;
RTRV-TH-T3	Retrieve T3 PM threshold command on page 244	RTRV-TH-T3:FACTORY:DS3-4-1:CTAG1::ESCP-P,NEND,15-MIN;
RTRV-TIDMAP	Retrieve target identifier map command on page 131	RTRV-TIDMAP:::;
RTRV-TP	Retrieve DS0 termination pointer command on page 250	RTRV-TP::ALL::::; RTRV-TP::ST1-8-1::::; RTRV-TP::ALL::::IP;
RTRV-USER	Retrieve current user group command on page 95	RTRV-USER:FACTORY:ROOT:CTAG1;
RTRV-USER-SECU	Retrieve specified user command on page 98	RTRV-USER-SECU::ALL:;
SET-MSU	Create DS1 MSU test command on page 264	SET-MSU::ST1-7-6::::TYPE=MONITOR,MSU-PORT=1;
SET-TH-T1	Set T1 PM threshold command on page 238	SET-TH-T1:FACTORY:ST1-6-1:CTAG12::CVP,1000,NEND,,15-MIN;
SET-TH-T3	Set T3 PM threshold command on page 242	SET-TH-T3:FACTORY:DS3-4-1:CTAG12::ESCP-P,100,,,15-MIN;
STA-DNLD	Download software command on page 135	STA-DNLD::CPU-1-2::::SERVER=*199.190.212.188*,FILE=*CPUSW40*;
STA-UPLD	Upload nonvolatile memory command on page 138	STA-UPLD::NVM::::SERVER=*199.190.212.188*,FILE=*CPUSW40*;
SW-EQPT	Switch between working and protection card command on page 214	SW-EQPT::DS3-3:;
SW-TOPROTN-EQPT	Switch-to-protection command on page 219	SW-TOPROTN-EQPT:AC3:ST1-7:CTAG9::NORM,;
SW-TOWKG-EQPT	Switch-to-working command on page 219	SW-TOWKG-EQPT:AC3:ST1-7:CTAG10::NORM,,;

Glossary

This glossary includes a list of acronyms and abbreviations applicable to the ARCADACS 100 Scalable Digital Access and Cross-Connect System.

1+1	Linear, non -revertive protection of signal from or on fiber-optic cable
10bT	10-base T - A variant of Ethernet which allows stations to be attached using twisted pair cable
2E15	Bit error rate test using 2 to the 15th power test pattern
5ESS	Class-5 switch manufactured by Lucent

A

A-law or ALAW	ITU-T standard for nonuniform quantizing logarithmic compression, used in Europe and international routes (*see also* U-law)
A4STATE	State of Bit S_{a4} of the CRC-4 multiframe format (for SE1 cards)
ABCD	Signaling bits taken from frames 6, 12, 18, and 24 of the DS1 extended super-frame format
ACDX	ARCA-DACS
ACDX-STM1-DM	ARCA-DACS STM1 data mapper card (part name)
ACDX-STM1-DM-IO-R	ARCA-DACS STM1 data mapper card (two) with STM1 protection I/O assembly (part name)
ACDX-STM1-PIO	ARCA-DACS STM1 protection I/O assembly (part name)
ACO	Alarm cut-off
ACT	Equipment is active, or activate (TL1 command)
ACT_RX_PLABEL	Actual received path signal label
ACTCLK	Active clock
ADJ	Data has been reset or cleared (performance monitoring)
AID	Access identifier or alarm identifier
AIDTYPE	Alarm access identifier type
AIS	Alarm indication signal
AIS_DET_FMT	Detection format of alarm indication signal
AIS_TX_FMT	Alarm indication signal transmission format
AIS-L	Alarm indication signal detected from lower speed side input (alarms)
AIS-P	Alarm indication signal for path (alarms)
AIS-V	Alarm indication signal for virtual tributary (alarms)
AISS-P	Alarm indication signal seconds for path (performance monitoring)

ALM	Alarm
ALMAID	Alarm access identifier
ALR	Analog line resource
ALRAID	Analog line resource access identifier
ALW	Allow (TL1 command)
AMI	Alternate mark inversion
ANLG	Analog
ANR	Abnormal condition - minor alarm present
ANSI	American National Standards Institute
APP	Application
APPKEY	Application key code
APS	Automatic protection switching
APSCMD	Automatic protection switching command
APSSD	Automatic protection switching signal degrade (alarm)
APSSF	Automatic protection switching signal fail (alarm)
ASCII	American standard code for information interchange
ASN.1	Autonomous system number protocol
ASYNC_DS1E1	Asynchronous mapping for DS1 and E1
ASYNC_DS3	Asynchronous mapping for DS3
ASYNC_ DS4NA	Asynchronous mapping for DS4NA
ATAG	Autonomous message identification number
ATM	Asynchronous transfer mode
AU3	Administrative unit 3
AUTOCMPL	Auto switch to protection or working card has completed
AUTOPNDG	Auto switch to protection or working card is pending
AUTOWTR	wait-to-restore countdown in progress
AVG	Average running call attempts per hour

B

B3ZS	Bipolar with 3-zero substitution
B8ZS	Bipolar with 8-zero substitution
BAC	Backup
BBE	Background block error (performance monitoring)
BE	Number of bit errors detected in the last second
BER	Rate at which bit errors are detected and logged
BERT	Bit Error Rate test
BEZ	Bezel (front cover)
BIDIR-DIAG	Bidirectional diagnostic termination pointer
BIP	Bit interleaved parity
BITSA	Building integrated timing supply connector A
BITSB	Building integrated timing supply connector B
BIT_SYNC_	

DS1E1	Bit-synchronous mapping for DS1 and E1
BKPLN	Backplane (diagnostic test)
BNC	Bayonet Navy connector or British Naval connector or Bayonet Nut connector or Bayonet Neill Concelman
BOOT_VER	Version of booter software
BPV	Bipolar violation (alarm monitoring)
BRAC	Mounting brackets, 19-inch or 23-inch
BRDCAST	Broadcast
BSP	Board support software
BUSTP	Data structure for managing data running over the backplane
BUSTPLST	Bus TP list
BYTE_SYNC_ DS1E1	Byte-synchronous mapping for DS1 and E1

C

C-12	E1 payload in synchronous digital hierarchy systems
C-BIT	Control bit; also, a modified framing format for DS3
C-TRAY	Cable tray
CAG	Command access group (user access level)
CANC	Cancel (TL1 command)
CARDAID	Card access identifier
CAS	Channel associated signaling
CCS	Common channel signaling
CCV	Count of code violations (performance monitoring)
CCVC	C-bit error count for path level DS3 (performance monitoring)
CD	Compact disc or carrier detect (RS232 data interface standard)
CDB	Configuration database
CE1-DM	Part order name for SE1 card
CEPT	Conference des administrations Europeenes des Postes et Telecommunications (European Conference of Postal and Telecommunications Administrations)
CES	C-bit Errored Seconds (performance monitoring)
CET1-IO	Part order name for channelized (structured) T1 input/output card
CET1-PIO	Part order name for channelize (structured) T1 protection input/output card
CGA	Carrier group alarm
CHNLAID	Channel access identifier
CL	No fault condition or fault condition cleared (alarms)
CLK	Clock or Clock I/O card
CLK IO	Clock I/O card
CLKLST	Clock list
CLKSRC	Clock source
CLR	Cleared (alarms)
CM	Connection memory to map RX-DM to TX-DM, dual port RAM
CMIS	Common management information services (network protocol)

CMT	Configuration Management Tool
CNV	Conversion (T1 to E1 signals)
CO	Central office
CODEC	Coder-decoder chip for converting voice signals from analog to digital signals acceptable to digital PBXs
COMFAC	Common facilities software
COMPL	Data set has been completed within the normal time period and digital transmission systems
COMPLD	Command has been executed
CON	Connected
CPE	Customer premises equipment
CPF	Control point failure
CPU	Central processing unit
CPU-G2	Part order name and faceplate label for central processing unit card
CR	Cross-connect or critical (alarm)
CRC	Cyclic redundancy check
CRCERR	Cyclic redundancy check error detected
CRCMFM	CRC-4 multiple frame format for SE1 cards
CRDMISMAT	ST1 card does not match its provisioned type (alarms)
CRDREV	Card revision number
CRDRMVD	Card removed
CRDSN	Card serial number
CRIT	Critical (alarm)
CRS	Cross connect
CRSAID	Cross-connect access identifier
CRV	Call reference value
CSA	Canadian Standards Association
CSA4	Bit S_{a4} of the CRC-4 multiframe format (for SE1 cards)
CSS	Controlled slip seconds (performance monitoring)
CSS-P	Controlled slip seconds for path (performance monitoring)
CSU	Channel service unit
CT1	Channelized (structured) T1 card
CT1-CSU-DM	Part order name for structured T1 card, channel service unit version
CT1-DSX-DM	Part order name for structure T1 card, digital signal cross-connect version
CT3	DS3 mapper card
CT3-DM	Part order name for DS3 card
CT3-IO	Part order name for T3 input/output card
CT3-PIO	Part order name for T3 protection assembly
CTAG	Correlation tag
CTRL_A	Control key + “A” key
CTRL_I	Control key + “I” key
CTRL_X	Control key + “A” key
CTRL_Z	Control key + “A” key
CTS	Clear to send (RS232 data interface standard)

CV-C	C-bit error count for path level DS3
CVL	Code violation for line (performance monitoring)
CV-LFE	Code violation for far-end line (performance monitoring)
CVP	Code violation for path (performance monitoring)
CVPFE	Code violation for far-end path (performance monitoring)
CVS	Code violation for section (performance monitoring)
CVV	Code violation for virtual tributary (performance monitoring)
CV-VFE	Code violation for far-end virtual tributary (performance monitoring)

D

D4	Regular superframe format (type of framing)
DACS	Digital access and cross-connect system
DAT	Date and time settings
dB	Decibels
DB-25	25-pin D-type connector
DC	Direct current
DCC	Data communication channel
DEL	Delete key
DELAY	Command accepted, to be executed (TL1 response)
DGN_NSA	Diagnostic, not service-affecting
DGN_SA	Diagnostic, service-affecting
DGND	Digital ground on the power I/O bus (for all slots)
DGTL	Digital
DIAG	Diagnostic testing (TL1 parameter)
DID	Direct inward dialing, which allows end office subscribers to dial PBX internal extensions directly
DIR	Direction of monitored signal (performance monitoring)
DLT	Delete (TL1 command)
DM	Data memory (two banks: receive and transmit), or data module
DMS	Digital multiplex signaling Also, a class-5 switch manufactured by Nortel Networks
DNLD	Download (TL1 parameter)
DPO	Dial pulse originating (signaling mode)
DPRAM	Dual-port random-access memory
DPT	Dial pulse terminating
DQDB	Distributed queue dual bus
DRAM	Dynamic random access memory
DS0	Digital service, level 0, 64 Kbps
DS1	Digital service, level 1, T1 (1.544 Mbps)
DS3	Digital service, level 3, T3 (44.76 Mbps)
DS3MIS	DS3 card does not match its provisioned type (alarms)
DSn	Digital service, level n
DSR	Data set ready (RS232 data interface standard)
DSX	Digital signal cross connect

DSX1	Digital Signal Cross-connect Level 1 – A standard that defines the voltage, pulse width, and plug and socket for connecting DS1 (T1) signals
DTR	Data terminal ready (RS232 data interface standard)
DTYPE	Diagnostic type (TL1 parameter)
DX	Duplex

E

E1	European (CEPT) framing specification that transmits 30 DS0 channels at a speed of 2.048 Mbps
ED	Edit (TL1 command)
EEPROM	Electrically-erasable programmable read-only memory
EIA232	Electronic Industries Alliance, RS-232 C physical layer interface
ELAP	Elapsed time of test (BERT)
ENT	Enter (TL1 command)
EOC	Embedded-operations channel
EOC_P	Primary embedded-operations channel
EOC_S	Secondary embedded-operations channel
EQPT	Equipment (TL1 command)
ES	Errored seconds - number of seconds in which errors occurred (performance monitoring)
ESCP-P	C-bit errored seconds for path level DS3
ESL	Errored seconds for line (performance monitoring)
ESLFE	Errored seconds for far-end line (performance monitoring)
ESP	Errored seconds for path (performance monitoring)
ESP-FE	Errored seconds for far-end path (performance monitoring)
ESS	Errored seconds for section (performance monitoring)
ESV	Errored seconds for virtual tributary (performance monitoring)
ES-VFE	Errored seconds for far-end virtual tributary (performance monitoring)
ESD	Electrostatic discharge
ESF	Extended super frame format
ETSI	European Telecommunications Standards Institute
EVT	Event (TL1 response)
EXP_RX_ PLABEL	Expected received path signal label
EXT-CLK	External clock

F

FAC	Facility
FACAID	Facility access identifier
FACLPBK	Facility loopback
FAF	Facility failure
FBBE	Far-end background block error (performance monitoring)
FC	Failure condition seconds

FC-L	Failure condition seconds for line (performance monitoring)
FC-LFE	Failure condition seconds for far-end line (performance monitoring)
FC-P	Failure condition seconds for path (performance monitoring)
FC-PFE	Failure condition seconds for far-end path (performance monitoring)
FC-V	Failure condition seconds for virtual tributary (performance monitoring)
FC-VFE	Failure condition seconds for far-end virtual tributary (performance monitoring)
FCAPF	Front connector, alarm, and power feed assembly
FCC	Federal Communications Commission
FDDI	Fiber distributed data interface
FDL	Facility data link
FEBE	Far end block error (performance monitoring)
FECBIT	Far end C-bit loopback test
FECSU	Far end in-band line loopback test
FEF	Family of equipment failure
FELINE	Far end line loopback test
FENIU	Far end network interface unit loopback test
FEPAYLOAD	Far end payload loopback test
FES	Far end errored seconds (performance monitoring)
FLT	Fault condition
FPB-DM	Part order name for blank mapper card faceplates (lower chassis)
FPB-IO	Part order name for blank I/O faceplates (upper chassis)
FPGA	Field programmable gate array
FPGA-VER	Software version of the field programmable gate array
FRCD	Forced
FRCDCMPL	Forced switch to protection or working card has completed
FRCDPNDG	Forced switch to protection or working card is pending
FRCDSWREQ	User has applied forced switch (alarms)
FRM	Framing
FS_P	Forced switch to protection line (automatic protection switching state)
FS_W	Forced switch to working line (automatic protection switching state)
FSES	Far end severely errored seconds (performance monitoring)
FUAS	Far end unavailable seconds (performance monitoring)
FXO	Foreign exchange office (central office to private branch exchange)
FXS	Foreign exchange station (plain old telephone service)
FXS-DM	Part order name for foreign exchange station card
FXSDN	Foreign exchange station defined network (port mode on FXS card)
FXSMD	Foreign exchange station mode (port mode on FXS card)

G

GID	Group Identifier (must always be ROOTGRP)
GMT	Greenwich Meridian Time
GNDSTART	Ground start (signaling)
GSA	Ground start automatic

GSI	Ground start immediate
GTP	Group termination pointer
GTPAID	Group termination pointer access identifier
GUI	Graphical user interface

H

HDB3	High-density bipolar order 3
HDLC	High level data link control
HP	Hewlett Packard
HP-AIS	Higher order path, alarm indication signal (alarms)
HP-BBE	Higher order path, background block error (performance monitoring)
HP-ES	Higher order path, errored second (performance monitoring)
HP-FBBE	Higher order path, far-end background block error (performance monitoring)
HP-FES	Higher order path, far-end errored second (performance monitoring)
HP-FSES	Higher order path, far-end severely errored second (performance monitoring)
HP-FUAS	Higher order path, far-end unavailable second (performance monitoring)
HP-LOP	Higher order path, loss of pointer (alarms)
HP-PLM	Higher order path, payload label mismatch (alarms)
HP-RDI	Higher order path, remote defect indication (alarms)
HP-SES	Higher order path, severely errored second (performance monitoring)
HP-UAS	Higher order path, unavailable second (performance monitoring)
HP-UNEQ	Higher order path, unequipped (alarms)
Hz	Hertz

I

I/O	Input/output
IAD	Integrated access device
IDT	Integrated digital terminal
IDT_PROV	Provisioned by the integrated digital terminal
IG	Interface group
IGAID	Interface group access identifier
IGSAPIAID	Interface group service access point access identifier
IMACS	Integrated multiple-access communications server
IMG	Image (software load)
INH	Inhibit (TL1 command)
INIT	Initialize (TL1 command)
IO_PRT	Protection input/output card
IO_WK	Working input/output card
IOC	Input/output control
IOSLT	Input/output slot
IP	Internet protocol
IPADDR	IP address
IPAID	IP access identifier

IPRT	IP routing table (TL1 parameter)
IS	In service
ITU	International Telecommunication Union
IXCON	Intelligent cross-connect card
IXCON-DM	Part order name for intelligent cross-connect card

K

KHz	Kilo-hertz

L

LAN	Local area network
LAP D	Link access protocol D
LBCFG	Loopback configuration
LBDET	Loopback detection
LBO	Line build-out
LBOFF	Loopback (test) off
LCKOUT COMPL	Lockout switching is complete (protection switching)
LCA	Line circuit address
LCF	Loop current feed (Tip and Ring status)
LCKOUTREQ	User has locked out working card thus preventing it from being protected (alarms)
LCO	Loop current open (Tip and Ring status)
LCVC	Line code violation count for line level DS3
LDERR	Load error (TL1 response)
LDIP	Load in progress (TL1 response)
LED	Light-emitting diode
LINECDE	T1 line code
LINELEN	T1 line length
LIULINE	Near end line interface unit loopback test
LIULOCAL	Local line interface unit loopback test
LOCKCMPL	Lockout of protection has completed
LOCKED_VT	Locked virtual tributary mode
LOCN	Location at which performance monitoring is occurring
LOF	Loss of frame
LOOP	Tip and Ring are connected by the attached device (Tip and Ring status)
LOP-P	Loss of pointer for path
LOP-V	Loss of pointer for virtual tributary
LOS	Loss of signal
LOSS	Loss of signal seconds (performance monitoring)
LOSSL	Loss of signal seconds for line (performance monitoring)
LP	Lockout of protection (automatic protection switching state)
LP-AIS	Lower order path, alarm indication signal (alarms)

LP-BBE	Lower order path, background block error (performance monitoring)
LP-ES	Lower order path, errored second (performance monitoring)
LP-FBBE	Lower order path, far-end background block error (performance monitoring)
LP-FES	Lower order path, far-end errored second (performance monitoring)
LP-FSES	Lower order path, far-end severely errored second (performance monitoring)
LP-FUAS	Lower order path, far-end unavailable second (performance monitoring)
LP-LOP	Lower order path, loss of pointer (alarms)
LP-PLM	Lower order path, payload label mismatch (alarms)
LP-RDI	Lower order path, remote defect indication (alarms)
LP-SES	Lower order path, severely errored second (performance monitoring)
LP-UAS	Lower order path, unavailable second (performance monitoring)
LP-UNEQ	Lower order path, unequipped (alarms)
LPBACK	Loopback (test) for foreign exchange station or foreign exchange office card
LPBK	Loopback
LPBK_NSA	Loopback test, not service-affecting
LPBK_SA	Loopback test, service-affecting
LPBKLINE	T1 port has a line loopback (secondary facility state)
LPBKLOCAL	T1 port has a local loopback (secondary facility state)
LPBK-METALLIC	T1 port has a metallic loopback (secondary facility state)
LPFD	Loopstart, forward disconnect
LS	Loopstart (signaling type)
LSR2A	Loopstart R2 signaling

M

M13	Multiplexer that joins 28 DS1 (T1) channels to a single, 44.736 Mb DS3 (T3) stream
MA	Memory administration
MAC address	Machine address
MAJ	Major (alarm)
MAN	Manual (protection switching mode)
MANCMPL	Manual switch to protection or working card has completed
MANPNDG	Manual switch to protection or working card is pending
MANSWREQ	User has applied equipment protection manual switch (alarms)
MARK	Pattern of all ones (BERT)
MAU	Media access unit or metallic access unit
MAX	Peak call attempts per hour
MB	Megabytes
MC68360	One of the Motorola 68000 family of microprocessors
MEA	Equipment mismatch detected
MFDAT	Manufacture date
MGMTIPLIST	Management IP list (provisioning SNMP monitoring stations)
MHz	Mega-Hertz
MIB	Management information base (a database of managed objects)

MI frames	Maximum number of outstanding I-frames
MIN	Minor (alarm)
MJ	Major (alarm)
MN	Minor (alarm)
MON	Equipment reached a monitored performance level at which it was taken out of service
MS_P	Manual switch to protection line (automatic protection switching state)
MS_W	Manual switch to working line (automatic protection switching state)
MS-AIS	Multiplex section, alarm indication signal (alarms)
MS-BBE	Multiplex section, background block error (performance monitoring)
MS-ES	Multiplex section, errored second (performance monitoring)
MS-FBBE	Multiplex section, far-end background block error (performance monitoring)
MS-FES	Multiplex section, far-end errored second (performance monitoring)
MS-FSES	Multiplex section, far-end severely errored second (performance monitoring)
MS-FUAS	Multiplex section, far-end unavailable second (performance monitoring)
MS-RDI	Multiplex section, remote defect indication (alarms)
MS-SES	Multiplex section, severely errored second (performance monitoring)
MS-UAS	Multiplex section, unavailable second (performance monitoring)
MSU	Metallic services unit
MSU-IO	Part order name for metallic services unit card
MT	Maintenance
MTCE	Equipment is out of service for maintenance
MTU	Message transfer unit

N

N200	Number of retransmissions
NA	Not alarmed
NA PRTL	Not acknowledged by the TL1 process (TL1 response)
NAL	Not alarmed condition
NE	Network element
NEBS	Network equipment building systems
NEND	Near end (performance monitoring)
NIU	Network interface unit
NMS	Network Management System
NO_LINE_ PROT	No line protection (alarms): loss of synchronization between working and protection lines for STM-1
NODEID	Node identifier
NODEID MIS- MATCH	Node identifier has not been provisioned (alarms)
NODEIDERR	Node identifier error (alarms)
NR	Not reported (alarm)
NSA	Not service-affecting (alarms)
NTP	Network time protocol

NUMWIRE	Number of wires (TL1 parameter)
NVM	Non-volatile memory
NVRAM	Non-volatile random-access memory

O

OAM&P	Operational, administrative, maintenance, and provisioning
OC3	Optical carrier level 3 (used in synchronous optical network systems), with a transmission speed of 155 Mbps
OC3C, OC3c	Optical carrier level 3 concatenated (used in synchronous optical network systems) with a transmission speed of 155 Mbps (not supported in this release)
OFS	Out of frame second (performance monitoring)
OOF	Out of frame (performance monitoring)
OOS	Out of service
OOSMT	Out of service, maintenance
OPR	Operate (TL1 command)
OS	Operating system
OSP	Outside plant
OSS	Number of seconds that BERT was out of synchronization

P

P1YX to P6YX	Backplane connectors (YX represents slot numbers)
P/N	Part number
PAYLOAD	Activates a near-end payload loopback (TL1 parameter)
PBX	Private branch exchange
PBES	Path bursty errored seconds (performance monitoring)
PBSLIP	Path buffer overflow (performance monitoring)
PCM	Port companding method
PCM30	Timeslot 16 uses channel associated signaling (framing)
PCM30CRC	Timeslot 16 uses channel associated signaling and cyclic redundancy check 4 multiframing
PCM31	Timeslot 16 does not channel associated signaling (framing)
PCM31CRC	Timeslot 16 does not use channel associated signaling and does use cyclic redundancy check 4 multiframing
PCV	Path code violation (performance monitoring)
PCVCC	P-bit error count for path level DS3 (performance monitoring)
PGND	Ground input for -48V on the power bus
PID	Password
PING	send a message to all members of a mailing list requesting an ACK (in order to verify that everybody's addresses are reachable)
PLAR	Private line automatic ringdown
PLM	Payload label mismatch
PLM-P	Payload label mismatch for path (alarms)
PLM-V	Payload label mismatch for virtual tributary (alarms)

PM	Performance monitoring
PMAID	Performance monitoring access identifier
PORTAID	Port access identifier
POTS	Plain old telephone service, regular voice communication
PPM	Parts per million (10^{-6})
PPS	The card is protected (secondary facility state)
PRDNO	Card product number, usually the firmware code for the type of card
PRI-DIAG	Primary diagnostic termination pointer
PRODNO	Card product number, usually the firmware code for the type of card
PROGFLT	Program fault
PRT	Protection
PRTCARD	Protection card
PRTL	One or more requested records cannot be retrieved (TL1 response)
PST	Primary state
PSTN	Public switched telephone network
PVC	Permanent virtual connection
PWR A	Power LED indicator for power source A
PWR B	Power LED indicator for power source B

Q

QRSS	Quasi-random bit pattern (BERT)

R

R2	ITU-T specifications for European analog and digital trunk signaling
RAI	Remote alarm indication
RAM	Random-access memory
RbTg	-48V applied to Ring, and Tip grounded
RbTo	-48V applied to Ring, and Tip is open
RD	Read-only (user access)
RDI	Remote defect indication
RDI-L	Remote defect indication for line (alarms)
RDT_PROV	Remote digital terminal provisioning in progress
REI	Remote error indication
REMOTE-DOWN	Deactivate a far end loopback test
REMOTEUP	Activate a far end loopback test
REN	Ringer equivalence number
REPT	Report (TL1 response)
RFI-L	Remote failure indication for line (alarms)
RFI-P	Remote failure indication for path (alarms)
RFI-V	Remote failure indication for virtual tributary (alarms)
RI	Ring indication (RS232 data interface standard)
RINGBK	Ringback

RINGGND	Ring is grounded by the attached device (Tip and Ring status)
RINGON	Ringing voltage applied across Tip and Ring
RIP	Routing information protocol (internet)
RJ-21X	25-pin Amphenol connector
RJ-45	8-wire serial connector
RLS	Release (TL1 command)
RM_LPBK_ DET	Remote loopback detection
RMT	Remote (alarm)
RN	Redundancy
RNG IO	Ringer I/O card
RNG-IO	Part order name for Ringer I/O card
ROM	Read-only memory
ROSE	Remote operations service element
RS-BBE	Regenerator section, background block error (performance monitoring)
RS-ES	Regenerator section, errored second (performance monitoring)
RS-SES	Regenerator section, severely errored second (performance monitoring)
RS232	Asynchronous serial line standard type of connector
RS422	An EIA serial line standard which specifies differential drivers and receivers
RS423	A common electrical specification for the signals on a serial line
rspblk	Response block (TL1 response)
RTRV	Retrieve (TL1 command)
RTRVALRAID	Retrieve analog line resource access identifier
RTRVCRSAID	Retrieve cross connection access identifier
RTRVTPAID	Retrieve termination pointer access identifier
RTS	Request to send (RS232 data interface standard)
RW	Read and write (user access)
RX	Receive
RX_PTRACE	Received path trace (recovered from SONET overhead)
RXABCD	Receive ABCD bits (from the network)
RXCLKIN	Receive clock in - Supported capability on the NMS serial port
RXTLP	Receive transmission level point (gain or loss)

S

S155	Synchronous transmission at 155 Mbps; also the faceplate label on the STM-1 card
S155 IOP	Faceplate label on the STM-1 I/O protection assembly
S155_IO_PRT	Protection line port on STM-1 I/O protection assembly (as it appears in the inventory list)
S155_IO_WK	Working line port on STM-1 I/O protection assembly (as it appears in the inventory list)
SA	Service-affecting (alarms)
SAPI	Service access point identifier
SAS	Severely alarmed seconds (performance monitoring)

SAS-P	Severely alarmed seconds for path (performance monitoring)
SD_P	Signal degrade on protection line (automatic protection switching state)
SD_W	Signal degrade on working line (automatic protection switching state)
SDH	Synchronous digital hierarchy—ITU standard fiber-optic based serial standards for SONET and ATM in Europe
SDTHRESH	Signal degrade threshold alarm; also the user-provisioned bit error rate that will trigger the SDTHRESH alarm
SE1	Structured (channelized) E1 card
SECU	Security (TL1 parameter for user access)
SEFS	Severely errored framing seconds (performance monitoring)
SELV	Safety extra low voltage
SEMIXCON	Semi-permanent cross connection
SES	Severely errored seconds (performance monitoring)
SESCP-P	Severely errored seconds for path level DS3
SESL	Severely errored seconds for line (performance monitoring)
SES-LFE	Severely errored seconds for far-end line (performance monitoring)
SESP	Severely errored seconds for path (performance monitoring)
SESP-FE	Severely errored seconds for far-end path (performance monitoring)
SESS	Severely errored seconds for section (performance monitoring)
SEW	Severely errored seconds for virtual tributary (performance monitoring)
SES-VFE	Severely errored seconds for far-end virtual tributary (performance monitoring)
SET	Set up (TL1 command)
SF	Super frame format
SP	Single party signaling
SF_P	Signal fail on protection line (automatic protection switching state)
SF_W	Signal fail on working line (automatic protection switching state)
SID	Source identifier (TL1 parameter)
SIG	Signal to be converted (TL1 parameter, for T1 to E1 conversion)
SIGGS	Ground start signaling
SIGMOD	Signaling mode
SIGTBL	Signaling conversion table (T1 to E1 conversion on SE1 cards)
SIGTYPE	Signaling type
SLC	Subscriber loop carrier
SLT	Slot
SMF	Signaling multiframe
SMODE	Switch mode
SNMP	Simple network management protocol, developed to manage nodes on an IP network
SNMP agent	A software process that responds to queries using SNMP to provide status and statistics about a network node
SONET	Synchronous optical network—North American optical interface standard across multiple vendors, defining a physical interface, optical carrier (OC) signals, frame format, and OAM&P protocol.

SP	Single party (signaling)
SPACE	Pattern of all zeroes (BERT)
SPE	Synchronous payload envelope
SPF	Status point failure
SPI	Serial peripheral interface
SST	Secondary state
ST1	Structured (channelized) T1 card
STA	Start (TL1 command)
STBY	Redundant equipment is on standby
STE1	Software load for ST1 card
STM-1, STM1	Synchronous transport module 1
STM1_AU3	Synchronous transport module 1 with three administrative unit 3 path layers
STM1 I/O	Input/output module for the STM-1 mapper card
STS	Synchronous transport signal
STS1	Synchronous transport signal level 1, operating at 51.84 Mbps
STS1 I/O	Input and output connector card for STS1 mapper card
STYPE	Switch type
SUPER	Read, write, and administration privileges (user access)
SUPSIGTYPE	Supported signaling type
SW	Switch activity to protection or working card (TL1 command)
SWAID	Software access identifier
SWDL	Software download
SWDLIMAGE	Software download image
SWIDLE	Switch is idle
SWLOAD	Software load
SWMODE	Switch mode (for Class 5 switch)
SWST	Switch state
SWTCH	Entity removed from service by local digital switch (Linestatus setting)
SWTOPROTN	Switch to protection card (TL1 command)
SWTOWKG	Switch to working card (TL1 command)
SX	Simplex
SYNC	Status of synchronization between ST1 card and remote equipment (BERT)
SYNCH	Synchronizing with other cross connection card (secondary state message)
SYS	System (filter for screening alarms)
SYS BP	System backplane
SYSC	System slot chassis

T

T1	A digital carrier facility used to transmit a DS1 formatted digital signal at 1.544 megabits per second
T1 IO	T1 I/O card
T200	Acknowledgment waiting period
T203	Inactivity period

T1FILE	Configuration data file for T1 and DS3 facilities (Release 2.1 software loads)
T3	A digital carrier facility used to transmit a DS3 formatted digital signal at 44.736 megabits per second
T3 IO	T3 I/O card
T3 IO P	T3 I/O protection assembly
T3NI	T3 network interface
TA1	Front panel connector number one on MSU card
TA2	Front panel connector number two on MSU card
TBOS	Telemetry byte-oriented serial protocol
TbRg	-48V applied to Tip, and Ring grounded
TC	Transient condition or trunk conditioning
TCABCD1	Trunk conditioning ABCD bits sent during first 2.5 seconds of a fault condition
TCABCD2	Trunk conditioning ABCD bits sent after the first 2.5 seconds of a fault condition
TCP	Transmission control protocol
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature-compensated crystal oscillator
TDM	Time division multiplexing
TE IO	T1 I/O card
TE IOP	T1 I/O protection card
TEMUX	Terminal equipment multiplexer
TERMLPBK	Remote terminal loop back alarm
TFTP	Trivial file transfer protocol
TID	Target identifier
TIDMAP	Target identifier map (TL1 command)
TIPGND	Tip ground (Tip and Ring status)
TL1	Transaction Language 1
TLP	Transmission level point
TMOUT	Time out (loopback detection setting)
TMPER	Time period (TL1 parameter)
TOFF	FXS test off
TON	FXS test on
TOPROTN	To protection (protection switching)
TOT_ERR	Total number of bit errors for a bit error rate test
TP	Termination pointer
TPAID	Termination pointer identifier
TPAIDlist	List of termination pointer access identifiers
TPTYPEAID	Termination pointer type access identifier
TR08	Subscriber loop carrier mode
TR08-G1	First subscriber loop carrier group on an ST1 card
TR08-G2	Second subscriber loop carrier group on an ST1 card
TRCNTL	Tip and Ring control
TS16	Timeslot 16

TU-12	Tributary unit 12 (used in synchronous digital hierarchy systems)
TX	Transmit
TX_PLABEL	Transmitted path signal label
TXABCD	Value of ABCD bits transmitted to the network
TXCLKIN	Transmit clock in
TXCLKOUT	Transmit clock out
TXLINE	Near end line loopback test
TXLOCAL	Local transmission loopback test
TXRX	Transmit/receive
TXTIMING	Transmit timing
TXTLP	Transmit transmission level point (gain or loss)

U

U-law or	ITU-T standard for nonuniform quantizing logarithmic compression, used in North
ULAW	America and Japan (*see also* A-law)
UART	Universal asynchronous receiver/transmitter
UAS	Unavailable seconds (performance monitoring)
UASL	Unavailable seconds for line (performance monitoring)
UASL-FE	Unavailable seconds for far-end line (performance monitoring)
UASP	Unavailable seconds for path (performance monitoring)
UASP-FE	Unavailable seconds for far-end path (performance monitoring)
UASV	Unavailable seconds for virtual tributary (performance monitoring)
UASV-FE	Unavailable seconds for far-end virtual tributary (performance monitoring)
UEQ	Unequipped
UID	User identifier
UL	Underwriters Laboratories
UNDEF	Unknown label (Received path label for STM-1 line)
UNEQ-P	Unequipped, path (alarms)
UNEQ-V	Unequipped, virtual tributary (alarms)
UNFRM	Unframed
UPLD	Upload (TL1 command)
USOC	Universal service order code
UTC	Coordinated Universal Time
UVG	Universal voice grade
UVGA	Universal voice grade automatic

V

V	Volts
V^A	Voltage input A
VAR	Value-added reseller
V^B	Voltage input B
Vbat	Battery voltage

VC-12	Virtual container 12 (used in synchronous digital hierarchy systems)
VER	Software version
VLDTY	Validity of performance monitoring data
VRMS	Volts root mean square (output is a square wave)
VSIG	Voice and data Signaling
VT	Virtual tributary
VT_STS1SPE	VT-structured STS1 synchronous payload envelope
VT-1.5	Virtual tributary at 1.544 Mbits/second
VT2	Virtual tributary carrying an E1 signal
VT-100	Standard video terminal protocol
VTG	Virtual tributary group
VT_STS1SPE	VT-structured STS1 synchronous payload envelope

W

WAN	Wide-area network
WINK	FXS card mode; 150 ms. delay followed by a 200 ms. wink back to the switch
WK	Working
WKMOD	Work mode
WS	Work station

X

XCON	Cross-connect card or cross connection
XCON-DM	Part order name for TDM cross-connect card

Index

B

C

N

O