Lucent Technologies
Bell Labs Innovations

SLC® ConnectReach™ Access System

User/Service Manual

363-208-050
Issue 4
June 2002

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of 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 in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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Follow local procedures for obtaining technical assistance. Lucent Technologies also provides in-hours or emergency out-of-hours help for the *SLC® ConnectReach™* Access System. Call the Lucent Technologies NetCare Knowledge Center (NKC) at 1-866-LUCENT8.

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Title: SLC® ConnectReach™ Access System, User/Service Manual

Identification No.: 363-208-050 Issue No.: 4 Date: June 2002

Lucent Technologies welcomes your feedback on this Customer Information Product (CIP). Your comments can be of great value in helping us improve our CIPs.

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Completeness					//////////////////
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Organization					//////////////////
Appearance					//////////////////
Examples					
Illustrations					
Overall Satisfaction					//////////////////

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❒ Add more examples
❒ Add more detail
❒ Make it more concise/brief
❒ Add more step-by-step procedures/tutorials
❒ Add more troubleshooting information
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Clarity					//////////////////
Completeness					//////////////////
Accuracy					//////////////////
Organization					//////////////////
Appearance					//////////////////
Examples					
Illustrations					
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Contents

About This Information Product (IP) vii

- **Purpose** vii
- **Scope** viii
- **Intended Audience** ix
- **Reason for Reissue** x
- **How to Use This Information Product** xi
- **Conventions Used** xiv
- **Product Safety** xvii
- **Customer Assistance and Technical Support** xx
- **Information Products** xxi

1 System Overview 1-1

- **About This Chapter** 1-2
- ***SLC® ConnectReach™* System Description** 1-3

2 Product Description 2-1

- **About This Chapter** 2-2
- **Physical and Functional Description** 2-3
- ***SLC ConnectReach* System Specifications** 2-18
- **Peripheral Hardware Equipment** 2-24

3 Preinstallation Planning 3-1

- **About This Chapter** 3-2
- **Configuration and Installation Process** 3-3

Contents

4 Configuring the *SLC® ConnectReach™* System 4-1

About This Chapter 4-3

Preparing the *SLC® ConnectReach™* System for Initial Configuration 4-4

Using the Configuration Commands 4-17

Reconfiguring the *SLC ConnectReach* System 4-165

5 Installation 5-1

About This Chapter 5-3

What Are the Requirements? 5-6

Interface Card Installation 5-10

Mount the *SLC® ConnectReach™* System 5-21

Connect Cables to the *SLC ConnectReach* System 5-33

48-Line Master/Slave Configuration 5-47

Analog Voice Interface Considerations 5-52

Alarm Relay 5-55

6 Provisioning the *SLC®*-2000 RT/HDT 6-1

About This Chapter 6-2

CIT Setup and Connection 6-3

DT Server Preparation, Installation, and Provisioning 6-6

DS0 Cross-Connections 6-12

Provision Channel Unit(s) at *SLC® ConnectReach™* System 6-14

T1 Cross-Connections 6-24

Contents

7 ***SLC ConnectReach* System Monitoring** 7-1

About This Chapter 7-3

Using the Statistics Command to Display System Elements Status 7-4

Miscellaneous Monitoring Commands 7-49

8 **Configure/Monitor and Upgrade Software for the *SLC ConnectReach* System Using a Web Browser** 8-1

About This Chapter 8-2

Preparing/Accessing the *SLC® ConnectReach™* System 8-3

Executing Commands from the Main Menu 8-6

9 **Software Upgrade, Maintenance, and Trouble Clearing** 9-1

About This Chapter 9-2

Maintenance Procedures 9-3

Trouble Clearing Procedures 9-22

A **IP Network Addresses** A-1

About This Appendix A-2

IP Network Addresses Description A-3

B **Configuration Examples** B-1

About This Appendix B-2

Examples of the Different Methods of Configuring the *SLC® ConnectReach™* System B-3

Contents

C	**Custom Firewall Configurations**	C-1
	About This Appendix	C-2
	Configuring IP Filter Groups	C-3
D	**User Interface**	D-1
	About This Appendix	D-2
	Business OfficeXchange Features	D-3
E	**EZ Config**	E-1
	About This Appendix	E-2
	Initial Setup	E-3
	Using EZConfig	E-4
F	**Configuring Enterprise NAT**	F-1
	About This Appendix	F-1
GL	**Glossary**	GL-1
IN	**Index**	IN-1

About This Information Product (IP)

Purpose

Overview

Introduction

The User/Service Manual provides the information needed by installation, operation, and maintenance personnel to configure, install, monitor, and maintain the *SLC® ConnectReach™* Access System.

Scope

SLC ConnectReach Access System

IP coverage

This IP contains the following descriptive and procedural information:

- High-level description of the system
- Product description
- Procedures for preinstallation planning
- Procedures for configuring, installing, monitoring, maintaining, and clearing troubles on the *SLC ConnectReach* system.

Supporting software

The information contained in this IP is relevant to the *SLC ConnectReach* Software Release 5.1.1; hereafter referred to as R5.1.1.

Intended Audience

Who Uses This Manual?

Customer

The User/Service Manual is intended for the following customers who participate in the engineering, installation, and maintenance of the system:

- Equipment engineers and outside plant engineers
- Transmission engineers
- Installation, operation, and maintenance personnel
- System administrators
- Technical support personnel
- Training personnel.

Knowledge required to use this manual

This IP is based on an understanding of basic digital transmission principles and familiarity with digital loop carrier systems. Background on digital loop carrier systems may be found in document 363-208-000, *SLC 2000 Carrier System, Applications, Planning, and Ordering Guide*.

Reason for Reissue

Changes Made Since Previous Issue

Introduction

This IP is reissued for the following reasons:

- To update customer support contact information from RTAC to NetCare Knowledge Center (NKC) (see copyright page for details).
- To update T1 monitoring statistics information.
- To provide updated information for the NAT feature.
- To provide new information for the PAT feature.
- To provide new information for using ARP.
- To remove outdated information about IPX, SOCKS and HDSL.
- To update firewall management information and IP filtering information.
- To provide new information for using the template archive.
- To provide new SYSLOG command information.
- To provide new Lines show-all response.
- To provide new statistics commands: WAN FR Interface (show-frinterface), Frame Relay PVCs (show-pvc), and IP Protocols (show-ipsummary).
- To make other minor revisions, clarifications, and updates throughout the material.

How to Use This Information Product

Organization

Introduction	This information product (IP) is organized in the given order.
"About This Information Product"	This section defines the purpose, scope, and intended audience for this IP; provides introductory and support information on this IP; includes the bibliography (*references*); lists training courses; and lists information on how to obtain technical support.
Chapter 1, "System Overview"	This chapter describes a high-level overview of the *SLC ConnectReach* system and its architecture.
Chapter 2, "Product Description"	This chapter provides a physical and functional description of the *SLC ConnectReach* system. This chapter also includes a description of the peripheral equipment that can be used with the *SLC ConnectReach* system.
Chapter 3, "Preinstallation Planning"	This chapter includes instructions for completing preconfiguration and preinstallation worksheets that can be used to reduce the time it takes to configure and install a *SLC ConnectReach* system.
Chapter 4, "Configuring the *SLC ConnectReach* System"	This chapter contains procedures for configuring the *SLC ConnectReach* system according to the settings selected on the preconfiguration worksheets. These procedures assume that the *SLC ConnectReach* system is to be configured at a staging area prior to installation at a customer site. Procedures are also included for reconfiguring the *SLC ConnectReach* system from a remote location after it has been installed.
Chapter 5, "Installation"	This chapter provides the procedures for mounting and connecting cables to the *SLC ConnectReach* system. The procedures for installing interface cards into the *SLC ConnectReach* system and connecting two *ConnectReach* systems together to obtain more than 24 voice channels are also included in this chapter.

(Continued on next page)

Organization (Continued)

Chapter 6, "Provisioning the *SLC*-2000 RT/HDT"	This chapter contains the procedures for provisioning the channel units at the *SLC ConnectReach* system and cross-connecting the T1 signal digital signal zero (DS0) time slots from the *SLC*-2000 remote terminal/host digital terminal (RT/HDT).
Chapter 7, "*SLC ConnectReach* System Monitoring"	This chapter contains the procedures for accessing and displaying various data that has been stored in or collected by the *SLC ConnectReach* system.
Chapter 8, "Configure/Monitor and Upgrade Software for the *SLC ConnectReach* System Using a Web Browser"	This chapter contains the procedures for configuring, monitoring, and performing software upgrades for the *SLC ConnectReach* system using a Web browser. This chapter also includes the procedure for executing other commands, rebooting the *SLC ConnectReach* system, and upgrading *SLC ConnectReach* system software.
Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing"	This chapter contains the procedures for performing software upgrades and “as required” maintenance on the *SLC ConnectReach* system. Also included in this chapter is information to assist in the isolation of a trouble condition using the indicators on the front of the *SLC ConnectReach* system unit.
Appendix A, "IP Network Addresses"	This appendix describes Internet protocol (IP) addressing including the five classes of networks and the IP addresses that are valid for each one.
Appendix B, "Configuration Examples"	This appendix contains examples of configuration sessions ranging from a simple quickstart example to a more complex arrangement requiring many parameter settings.
Appendix C, “Custom Firewall Configurations”	This appendix contains procedures for configuring IP filter groups.

(Continued on next page)

Organization (Continued)

Appendix D, "User Interface"	This appendix includes the procedures for using the Business OfficeXchange* (BOX*) features.
Appendix E, "EZConfig"	This appendix describes the procedure for configuring the *SLC ConnectReach* system with the EZConfig program.
Appendix F, "Configuring Enterprise NAT"	This appendix describes the configuration of and applications for Enterprise Network Address Translation (Enterprise NAT).
Glossary	This section lists and provides a definition of the various terms, abbreviations, and acronyms used throughout this manual.
Index	This section contains an alphabetical listing of selected subjects and key words contained in this IP along with the page number(s) where they can be found.

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Conventions Used

Special Fonts

Introduction	Special fonts are used in this IP for text that requires emphasis. The following conventions are used to highlight specific text.
Uppercase	Uppercase letters (or literal spelling) denote panel stampings located on the equipment.
Italic typeface	Italic typeface denotes the titles of IPs referenced in the text. However, italic typeface may also be used to highlight an important word or phrase.
Double quotes	Double quotes (") surround text to represent chapter titles referenced in the text.
Icons	Special symbols (icons) denote safety labels and notes.
Monospace font	**`Constant-width`** (monospace) font is used in the display of the input/output screens.

Trademarks

Introduction

The trademarks used in this IP are identified on the back of the title page. Trademarks are presented in a specific way — they stand out from the rest of the text by using a different font or capital letters, and they modify a noun. For example, the system name contains a trademark — *SLC® ConnectReach™* Access System. The trademark is never used by itself — the trademark always modifies a noun (for example, *SPOTS®* channel units).

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Lucent Technologies trademarks are identified on first use in *each chapter* (in the table of contents, text, and headings) with the registered mark (®) or trademark (™) symbol. Also, they are identified on first use in each table and figure.

Trademarks of other companies

Trademarks of other companies are identified with a footnote on the first use in each chapter of the IP.

Terms

Introduction

This section explains terms used in this IP that may have a different meaning than the general or common use of the term.

Access

In the *SLC ConnectReach* Access System, the term *access* means that the system provides the primary service interface for the customer to enter the network.

Product Safety

Safety Labels

Introduction

This IP may contain safety labels as DANGERS, WARNINGS, and CAUTIONS. These safety labels have the following definitions.

Safety alert symbol

The safety alert symbol ⚠ is used on product labels and in this IP to alert the user to important operating and maintenance instructions.

Danger

⚠ **DANGER:**
Danger indicates the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.

Warning

⚠ **WARNING:**
Warning indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.

Caution

⚠ **CAUTION:**
Caution indicates the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided. The caution is also used for property-damage-only accidents. This includes equipment damage, loss of software, or service interruption.

Electrostatic Discharge (ESD) Considerations

Considerations to avoid ESD damage

CAUTION:
Industry experience has shown that all integrated circuit packs can be damaged by static electricity that builds up on work surfaces and personnel. The static charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher potentials are measured in areas with low relative humidity, but potentials high enough to cause damage can occur anywhere.

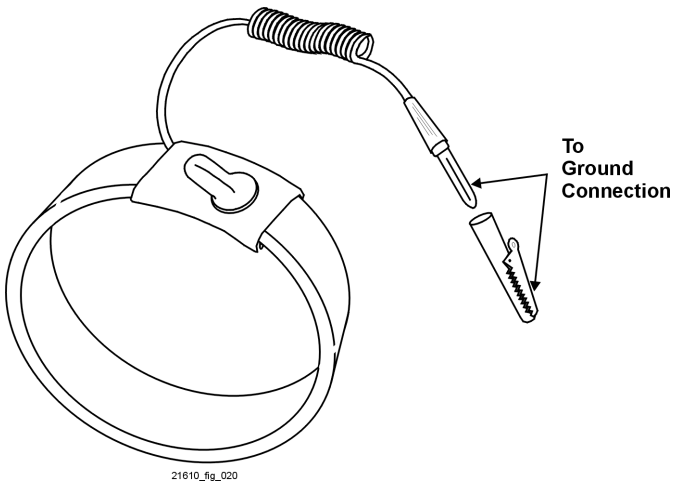
The following list of precautions should be observed when handling circuit packs to prevent damage by electrostatic discharge.

- Assume all circuit packs contain solid state electronic components that can be damaged by ESD.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat. If a static-dissipating floor mat is used, be sure that it is clean to ensure a good discharge path.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating table mat is used, be sure that it is clean to ensure a good discharge path.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and foam packaging away from all circuit packs. On removal from the bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

Electrostatic Discharge (ESD) (Continued)

Grounding using wrist strap

To reduce the possibility of ESD damage, the *SLC ConnectReach* system cabinet is equipped with a ground stud to enable personnel to ground themselves using a wrist strap (refer to the following figure) with a minimum resistance of 250 k-ohms while handling circuit packs or working on the system. The ground stud is located on the front of the cabinet between the POWER connector and the VOICE CHANNELS connector. An alligator clip adapter must be attached to the plug on the end of the wrist strap cable to enable connection to the ground stud.



Customer Assistance and Technical Support

NetCare Knowledge Center (NKC)

Introduction

Lucent Technologies provides customer assistance on the *SLC ConnectReach* Access system including, but not limited to, troubleshooting assistance, technical consultation, operational problem consultation, procedural advice, and emergency recovery assistance from a qualified system support professional at the NetCare Knowledge Center (NKC).

1-866-Lucent8

Service is provided from the Netcare Knowledge Center at **1-866-LUCENT8**. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours your call will be answered by your local regional NKC. Outside normal business hours all calls will be answered at a centralized technical assistance center where service-affecting problems will be dispatched immediately to your local NKC. All other problems will be referred to your local NKC on the next regular business day.

Warranty repair

If a *SLC ConnectReach* system unit or interface card is found to be broken or defective during the warranty period, the item should be sent to the following location for repair or replacement:

Lucent Technologies
Attn: Dock 21
1000 Twin Lakes Pkwy
Charlotte, NC 28269

Information Products

Documentation

Introduction

This section contains the system documentation plan and bibliography (list of references).

Documentation plan

The following IPs provide additional information related to the *SLC ConnectReach* Access system:

- 363-208-000, *SLC 2000 Carrier System, Applications, Planning, and Ordering Guide*

  Audience — Network planners, engineers, product evaluators, standardization groups, and ordering personnel.

  Content — Benefits and features, applications, services, product description, parts list, ordering information, system specifications and requirements, and environmental data. Refer to the customer assembly manual for ordering configurations for central office and remote terminal frame arrangements.

- 363-208-003, *SLC-2000 Access System, Commands and Messages*

  Audience — Installers, technicians, engineers, and troubleshooters.

  Content — A tutorial on system commands and messages, also detailed information about the system commands in manual-page format. The pages are organized by user interface panel (UIP) commands and craft interface terminal (CIT) commands.

Training

Introduction

The National Product Training Center in Altamonte Springs, Florida, provides management courses for planning, engineering, and ordering as well as training for telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses may be available. Consult your local Lucent Technologies Account Executive for more information or reservations.

Enroll using 1-888-LUCENT-8

For information on these and other training courses available, on schedules, fees, and registration, call the training coordinator for your company. If your company does not have an assigned training coordinator, call this toll-free number (Monday through Friday, 8:00 a.m. to 6:00 p.m. EDT) to order a product training catalog, get more information on a course, find out about new courses, or register for a class:

1-888-LUCENT8 (582-3688)

When you call 1-888-LUCENT8, select Option 2 (press ABC 2 on a touch-tone phone) for Lucent Technologies product training.

Enroll using Internet access

Internet access to training course catalogs, schedules, availability, and other course related information can be found at:

http://www.lucent-product-training.com/

Enrollment forms can be faxed to (407) 767-2677.

(Continued on next page)

Training (Continued)

TR4610, *SLC*-2000 Access System Operations and Maintenance

Audience

This course is designed for telecommunication central office, outside plant, and maintenance personnel responsible for installing and maintaining the system.

Length

5 days

Content

A comprehensive study of the *SLC*-2000 Access System and the multi-services distant terminal (MSDT) that includes a physical description, functional description, testing, basic maintenance, and system turnup.

Media

A combination of instructor lectures and class discussion. The information will be reinforced with a quiz and hands-on exercises on operational systems that are typical of those in the field.

Prerequisite

Students *must* be familiar with transmission principles (TR-0510, *Transmission Principles*) and the DDM-2000 OC-3 multiplexer (LW2603, *DDM-2000 OC-3 Multiplexer Linear Operation, Maintenance, and Administration*, or LW2608, *DDM-2000 OC-3 Multiplexer Ring Networks Operation, Maintenance, and Administration*).

Electronic and Alternative Media

Overview

Information products (IPs) for the *SLC ConnectReach* Access system are available in electronic form, on compact disk-read-only memory (CD-ROM) and floppy disk. IPs are also maintained on the Internet (behind the Lucent Technologies firewall).

CD-ROM

CD-ROM has many advantages over traditional paper documentation, including cost savings, search and retrieve capability, and the assurance of the most current documentation. CD-ROM is available by annual subscription (on standing order).

Pricing information

For pricing information, contact your Lucent Technologies Network Systems Account Executive or the Lucent Technologies Customer Information Center (1-888-LUCENT8).

How to order

To order, call your Technical Information Resource Manager, your Lucent Technologies Account Executive, or the Lucent Technologies Customer Information Center (1-888-LUCENT8).

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To order additional copies of this IP (**363-208-050**) and/or to request placement on the standing order list, send or call in an order as follows:

Customer	Mail Order	Telephone Order *(Monday Through Friday)*
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One-time orders include a binder (if applicable) and the IP contents for the current issue in effect at the time of order. Also, you may request placement on the standing order list for all later reissues of any IP. The standing order list for each IP provides automatic distribution for all reissues of the IP. The Regional Bell Operating Company (RBOC)/Bell Operating Company (BOC) customers should process IP orders or standing order requests through their Company Documentation Coordinator.

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Feedback forms

Two feedback forms are located near the front of this IP immediately after the title page.

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If the feedback forms are missing, please send your comments and suggestions to:

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Attn: Customer Documentation Coordinator
Room 14D-322
PO Box 903
67 Whippany Road
Whippany, NJ 07981-0903

Fax: 973-581-6646

System Overview

1

Contents

About This Chapter 1-2

■ Introduction 1-2

***SLC® ConnectReach™* System Description** 1-3

■ Overview 1-3

About This Chapter

Introduction

Contents

This chapter provides a high-level description of the *SLC® ConnectReach™* Access System and a description of the benefits offered by the *SLC ConnectReach* system. A description of the customer access ports and the security provided against unauthorized access is also presented in this chapter.

SLC® ConnectReach™ System Description

Overview

Description

The *SLC ConnectReach* Access System enables cost-efficient delivery of voice and data services plus Internet access to subscribers by means of a T1/DSX-1 interface at a digital signal 1 (DS1) rate of 1.544 Mb/s. The *SLC ConnectReach* system is comprised of a flexible distribution terminal that performs the functions of a data service unit/channel service unit (DSU/CSU), fractional T1 multiplexer, channel bank, T1 drop/insert, router, firewall, and much more. The *SLC ConnectReach* system is a single network device that simplifies configuration and network management by replacing more complex groups of components such as channel banks and routers.

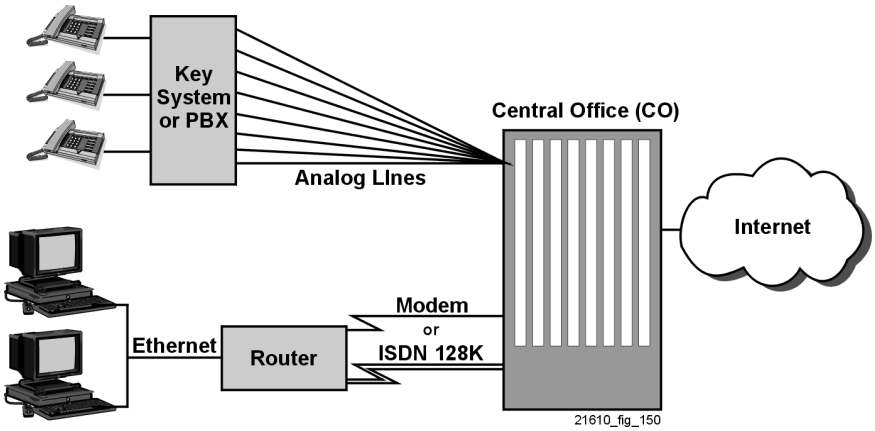
The *SLC ConnectReach* system is located at the customer's premises and interfaces to a *SLC*-2000 Access System remote terminal/host digital terminal (RT/HDT). The *SLC ConnectReach* system "extends" the backplane of the *SLC*-2000 RT/HDT closer to the customer, allowing for more efficient use of outside plant facilities.

Without the integrated access provided by the *SLC ConnectReach* system, adding outside lines for voice and data connectivity can be expensive and complex. As a company grows, analog voice lines may need to be added to its existing key system. The company's support for data and Internet access may also increase, which requires leasing or purchasing network access devices and possibly adding costly digital lines. As shown in the following illustration, the result is an excessive quantity of access lines connected to multiple hardware devices, which makes network management complex and costly.

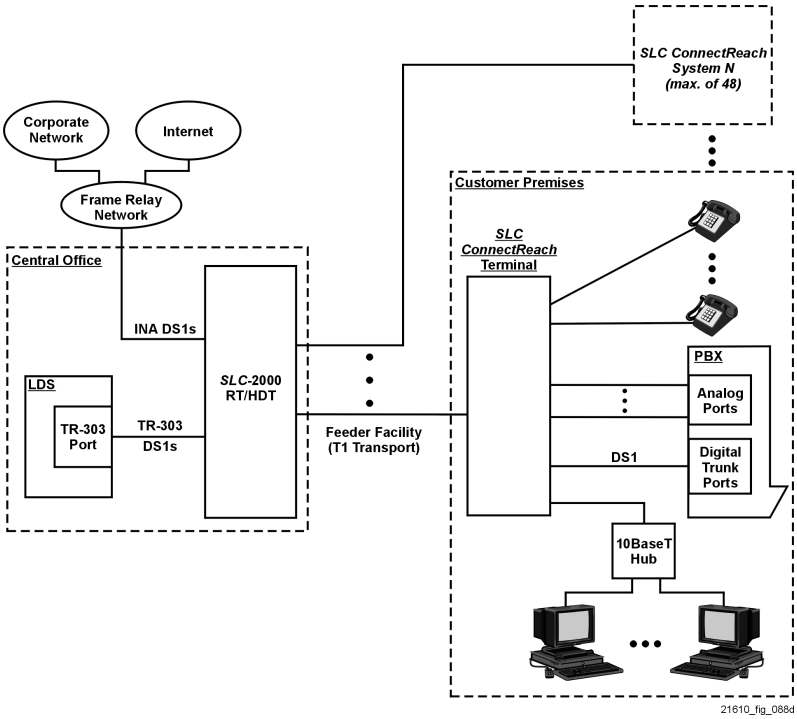
(Continued on next page)

Overview (Continued)

Description (continued)



By virtue of its integrated access, the *SLC ConnectReach* system provides a simple and comprehensive communications solution in which voice, data, and Internet access applications use a single T1 line (refer to the following figure).



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Overview (Continued)

ClearReach™ Feature

SLC-2000 Access System Software Release 4.6.1 (R4.6.1) or later along with *SLC ConnectReach* operating software R1.5.1.1 or later allows the system to support Lucent Technologies *ClearReach* feature. This feature is designed to improve the connect rate, or throughput, of analog modems served by switched single-party loop-start and ground-start lines interfacing the *SLC*-2000/*SLC ConnectReach* system through the analog voice-frequency (VF) ports. The *SLC*-2000 host digital terminal (HDT) must be connected to the TR-303/GR-303 interface of the *5ESS* switch containing *5ESS* software upgrade IBWM98-0008 of 5E12 software, secure feature 99-5E-4413 enabled. If the switch does not contain this software, then the feature is not usable with the *SLC*-2000/*SLC ConnectReach* system.

The *SLC*-2000 system and the *SLC ConnectReach* system normally use a hybrid signaling scheme, specified in TR-303/GR-303, that incorporates the use of robbed-bit signaling (RBS). The RBS signaling mode uses a small portion of the bandwidth of each DS0 (64 kb/s) within the DS1 feeder for signaling thus limiting the usable bandwidth for analog modem connections and reducing the connect rate. The *ClearReach* feature allows the system to suspend RBS and convert to a clear channel mode that makes the entire 64-kb/s bandwidth of each DS0 available for an analog modem connection. The *ClearReach* feature increases the possibility that analog modems will connect closer to their rated speed.

NOTE:
A lot of different factors combine to decrease the connect rate of a modem. These include line noise, poor physical connections, modem quality, robbed-bit signaling used in digital telecommunications systems, etc. The RBS used on the DS1s interfacing with the *SLC*-2000 system and the *SLC ConnectReach* system is only one of many factors. The *ClearReach* feature eliminates the interference of the RBS on the DS1s interfacing with *SLC*-2000/*SLC ConnectReach* equipment as one of the factors decreasing the connect rate.

Refer to document 363-208-000, SLC-*2000 Access System, Applications, Planning, and Ordering Guide*, for additional information on the *ClearReach* feature.

(Continued on next page)

Overview (Continued)

Network interfaces

The *SLC ConnectReach* system can be ordered in both AC and DC versions of systems that provide the T1/DSX-1 interface with the *SLC*-2000 HDT.

The following sections provide a brief description of this interface. Refer to document 363-208-000, SLC*-2000 Access System, Applications, Planning, and Ordering Guide*, for additional information on *SLC ConnectReach* interfaces.

T1/DSX-1 Interface

The following figure shows the basic configuration for connecting a *SLC ConnectReach* system with the *SLC*-2000 HDT using a T1 carrier system. Each T1 carrier line contains one DS1 signal. The interface with the T1 carrier is built in to the *SLC ConnectReach* system.

At the *SLC*-2000 HDT, the T1 carrier system usually interfaces the DT Server in the *SLC*-2000 MDS assembly through a DSX cross-connect. The HDT does not contain a built-in T1 interface.

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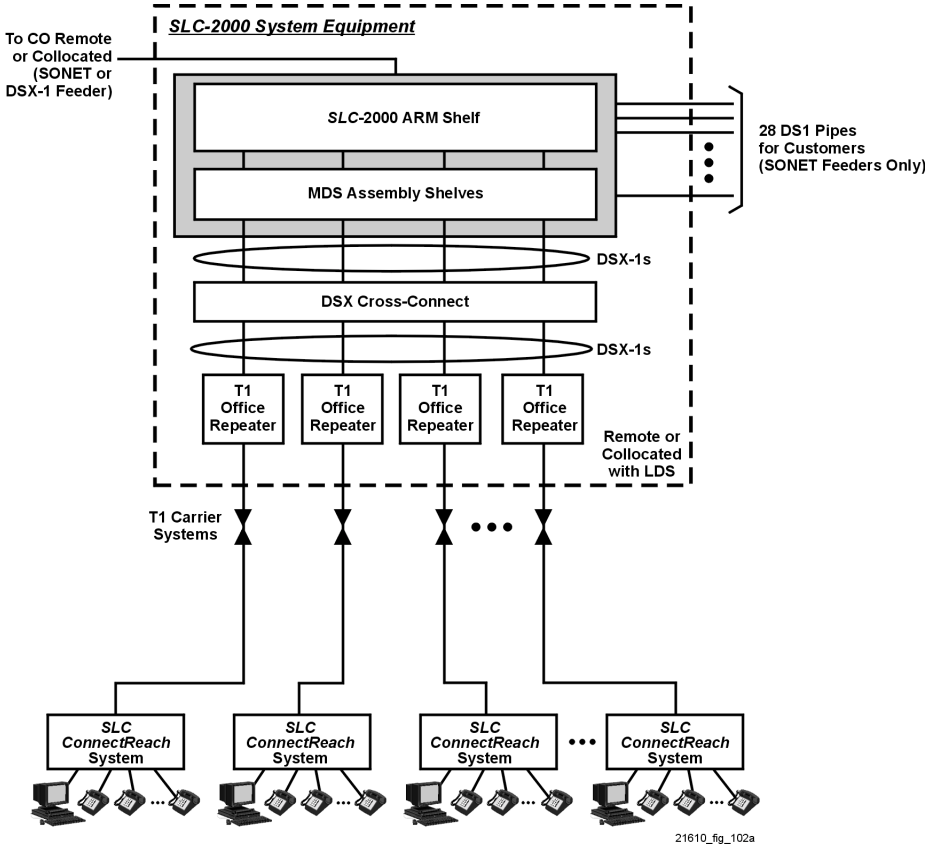
Overview (Continued)

Network interfaces (continued)



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Overview (Continued)

Benefits

The *SLC ConnectReach* system offers the following benefits:

Cost Savings

By combining voice and data services in the DS1 signal connected to the *SLC ConnectReach* system's network T1/DSX-1 interface for all communications applications, the cost of access is significantly lower than leasing individual analog or voice lines, integrated services digital network (ISDN) lines, or switched 56-kb/s or 64-kb/s lines. Costs are also reduced by eliminating costly hardware components such as channel banks, digital cross-connection system (DCS)-type equipment, multiplexers, and routers.

Flexibility

The *SLC ConnectReach* system allows bandwidth to be configured to meet the particular needs of a business as it grows. For example, for faster Internet service or more phone lines, you can remotely add a DS0 channel with a simple software configuration change instead of an on-site visit from a phone company technician.

Speed

The *SLC ConnectReach* system can allocate greater resources (DS0 channels) to bandwidth-intensive applications — up to a full DS1 speed of 1.544 Mb/s. This allows for the efficient use of the DS1 bandwidth for voice while increasing the speed of data and Internet applications. The DS1 signal interfacing the *SLC ConnectReach* system allows sufficient bandwidth for multiple simultaneous applications along with enhancing access to the Internet.

Comprehensive management capabilities

The *SLC ConnectReach* system management interface is accessible from Telnet, hypertext terminal protocol (HTTP) (using a Web browser), or an RS-232 (serial) console port. The *SLC ConnectReach* system supports simple network management protocol (SNMP).

(Continued on next page)

Overview (Continued)

Benefits (continued)

Size

The *SLC ConnectReach* system combines the functionality of several network devices into one space saving, compact chassis standing 1.75 inches high.

SLC-2000 Access System HDT Interface

Services provided by the *SLC ConnectReach* system interface the switched voice and data networks through a *SLC*-2000 host digital terminal (HDT). Interfacing through the *SLC*-2000 HDT provides the following advantages:

- **DCS-type capabilities:** Using the time slot interchange (TSI) of the *SLC*-2000 HDT, the HDT provides a DCS-type capability. You can map DS0s configured for data to a frame relay network over an INA DS1. You can map DS0s configured for switched telephony through a TR-303 or TR-08 local digital switch (LDS) interface.
- **TR-303 LDS interface:** The *SLC*-2000 HDT's TR-303 interface allows the *SLC ConnectReach* system to interface with the LDS using a high line concentration ratio, thus providing an efficient DS1 interface to the LDS. This can produce significant cost savings for your network.
- **Very high line density:** The *SLC*-2000 HDT can host up to 48 *SLC ConnectReach* systems, thus efficiently handling up to 1,152 DS0s. By grooming the DS0s from multiple *SLC ConnectReach* systems onto INA DS1s and TR-303 VRTs, you make the most efficient use of the transport DS1s.
- **TR-08 Interface:** The HDT can also serve as a TR-08 interface for the *SLC ConnectReach* system. This gives numerous *SLC ConnectReach* system customers TR-08 interfaces to a switch.

(Continued on next page)

Overview (Continued)

Benefits (continued)

Comprehensive Operation, Administration, Maintenance and Provisioning (OAM&P) Capabilities

User access to the *SLC ConnectReach* OAM&P interface can be established using any of the following methods:

- Telnet session
- A hypertext transfer protocol (HTTP) web browser through the Internet (requires a configuration using a software upgrade package SW-B or higher)
- A terminal directly connected to a local RS-232 console port
- A remote terminal through a modem connected to the RS-232 console port
- A craft interface terminal (CIT) connected to a *SLC*-2000 Access System RT/HDT.

The system supports simple network management protocol (SNMP) and provides statistics reports and logs of events and DSX-1 network interface status.

You can provision the *SLC*-2000 HDT locally or remotely from the HDT's CIT port located on the front of the user interface panel (UIP) or on the rear of the HDT, respectively.

Features

Some of the features provided by the *SLC ConnectReach* system include:

- Public switched telephone network (PSTN) telephony service. Emulates up to six quad channel units at a time (24 voice circuits). Four versions of interface cards are available: four- and eight-line current feed (CF) and four- and eight-line current sink (CS).
- Wide area network (WAN) to local area network (LAN) router (frame relay to Ethernet).

(Continued on next page)

Overview (Continued)

Features (continued)

- Business office exchange* (BOX*) private branch exchange (PBX)-like capability provides features similar to a Centrex service offered by a CO switch but without the need for dedicated lines to the CO for each extension. The BOX feature cannot be used in conjunction with the *ClearReach* feature.
- Service on any of the DS0 channels can be changed by the use of provisioning commands.
- A dynamic host configuration protocol (DHCP) server to dynamically assign Internet protocol (IP) addresses to personal computers (PCs) on the local Ethernet. This relieves system/network administrators from the requirement to assign a fixed IP address to each PC.
- A simple network management protocol (SNMP) server to allow remote monitoring, management, and event notification with standard SNMP client software.
- Routing of IP traffic.
- Multiple firewall technologies that protect local area network (LAN) users against unauthorized connections from the wide area network (WAN): network address translation (NAT), port address translation (PAT), and internet protocol (IP) filtering. The IP filtering also prevents devices that are not on a specified network from accessing the *SLC ConnectReach* system (for example, the carrier's network operations center).
- Local call routing* (LCR*) feature: Provides features such as routing incoming trunk calls to available telephone lines, routing an outgoing call to an available DS0 time slot, and alternate routing to the CO in case of a T1 failure. The LCR feature cannot be used in conjunction with the *ClearReach* feature.
- Built-in data router eliminates the need for a separate external router.

(Continued on next page)

* Trademark of VINA Technologies, Inc.

Overview (Continued)

Security

Login names and passwords protect the *SLC ConnectReach* system against unauthorized logins.

Product Description

2

Contents

About This Chapter 2-2

- Introduction 2-2

Physical and Functional Description 2-3

- *SLC® ConnectReach™* System Architecture 2-3
- Interfaces 2-4
- General Physical Characteristics 2-8
- Description of Interface Ports 2-9
- Description of Indicators 2-16

***SLC ConnectReach* System Specifications** 2-18

- Interface Ports and Functional Circuits 2-18

Peripheral Hardware Equipment 2-24

- Introduction 2-24
- Peripheral Equipment Description 2-25

About This Chapter

Introduction

Contents

This chapter provides a physical and functional description of the *SLC® ConnectReach™* Access System. A description of the *SLC ConnectReach* system specifications and the peripheral equipment that can be used with the *SLC ConnectReach* system are also presented in this chapter.

Physical and Functional Description

SLC® ConnectReach™ System Architecture

SLC ConnectReach system similarities with _SLC_-2000 MSDT

The *SLC ConnectReach* system is hosted off of a *SLC*-2000 remote terminal/host digital terminal (RT/HDT). The *SLC ConnectReach* system appears to the RT/HDT as a *SLC*-2000 multiservices distant terminal (MSDT) with its associated backplane interface unit (BIU) and channel units (CUs). The *SLC ConnectReach* system communicates with the *SLC*-2000 RT/HDT over the same T1 line 4-kb/s data link channel used by the MSDT. The *SLC ConnectReach* system will also respond to inventory request messages for the BIU and CUs just as an actual plug-in unit does. The *SLC ConnectReach* system interfaces with the *SLC*-2000 RT/HDT by means of a distant terminal (DT) Server plug-in unit that is located in the *SLC*-2000 metallic distribution shelf (MDS). Channel units must be provisioned and administered at the *SLC*-2000 RT/HDT just as they are for an MSDT.

Each *SLC*-2000 RT/HDT can serve a maximum of 1,152 customer DS0s (four MDS assemblies x two MDSs per MDS assembly x 12 DT Server cards per MDS x 12 DS0s per DT Server card = 1,152 DS0s).

SLC-2000 RT/HDT MDS DT Server/ channel unit restrictions

The *SLC*-2000 RT/HDT metallic distribution shelf (MDS) assembly is comprised of two metallic distribution shelves that contain slots that normally accept *SLC* channel unit cards. However, when the RT/HDT is serving a *SLC ConnectReach* system, a DT Server card is installed in the MDS instead of channel unit cards and the MDS is provisioned for fiber in the loop (FITL). In general, metallic channel units cannot be used with DT Servers on the same MDS.

(Continued on next page)

Interfaces

Emulated channel units

The *SLC ConnectReach* system can emulate up to a maximum of six quad channel units (24 voice circuits) with a mix or combination of any of the following types of channel units. As an example, the *SLC ConnectReach* system could be configured with all six channel units as *SPQ*® 440(C,D) channel units or there could be a mixture of two *SPQ* 440(C,D), two *SPQ* 452, and two *SPQ* 456 channel units.

All of the channel units will be specified in the *SLC ConnectReach* system configuration menu, but they must also be provisioned and administered at the *SLC*-2000 HDT.

SPQ® 440C Channel Unit (*SPOTS*®/Current Feed/Switched)

The *SPQ* 440C channel unit is a quad *SPOTS* channel unit that provides two-wire current feed (CF) voice capability and supports both loop-start and ground-start signaling. The *SPQ* 440C channel unit is emulated by software in *SLC ConnectReach* systems prior to Software Release 5.0.1 and is used for analog voice channels and secondary/fractional-T1 voice lines (TR-08 and TR-303).

NOTE:
The *SLC ConnectReach* system will not be able to implement all of the test capabilities of the *SPQ* 440C channel unit; however, the *SLC ConnectReach* system will respond to test messages with stable responses.

SPQ® 440D Channel Unit (*SPOTS*®/Current Feed/Switched)

The *SPQ* 440D channel unit is a quad *SPOTS* channel unit that provides two-wire current feed (CF) voice capability and supports both loop-start and ground-start signaling. The *SPQ* 440D channel unit is emulated by software in *SLC ConnectReach* systems with Software Release 3.6.3 and later and is used for analog voice channels and secondary/fractional-T1 voice lines (TR-08 and TR-303). The *SPQ* 440D additionally supports the voice frequency data enhancement (VFDE) feature that allows the *SLC ConnectReach* system to operate in the clear channel mode.

NOTE:
The *SLC ConnectReach* system will not be able to implement all of the test capabilities of the *SPQ* 440D channel unit; however, the *SLC ConnectReach* system will respond to test messages with stable responses.

(Continued on next page)

Interfaces (Continued)

Emulated channel units (continued)

*SPQ*443 Channel Unit (E *SPOTS*/Current Feed)

The *SPQ*443 channel unit is a quad E *SPOTS* channel unit that is used to handle DS0 signals routed to a digital PBX or digital key system attached to the secondary T1/DSX-1 line. The *SPQ*443 channel unit is used exclusively in this capacity since it communicates with the *SLC*-2000 RT/HDT using D-bank signaling and the PBX/key system also expects D-bank signaling.

NOTE:
Since the *SLC ConnectReach* system is only cross-connecting DS0 signals between the primary T1/DSX-1 line and the secondary T1/DSX-1 lines when emulating the *SPQ*443 channel unit, none of the normal provisioning parameters for the *SPQ*443 channel unit, such as transmit gain, receive gain, hybrid balance, or equalization slope, will apply to the *SLC ConnectReach* system.

*SPQ*452 Channel Unit (OCU Dataport)

The *SPQ*452 channel unit is a dual dataport channel unit that is used to provide data capability. The *SPQ*452 channel unit normally uses two DS0 signals for data and can use the other two DS0 signals for error correction. When used in the *SLC ConnectReach* system, all four DS0 signals can be used to carry data. Bandwidths greater than 64 kb/s can be constructed by mapping as many as 24 contiguous data DS0 signals. Since the *SPQ*452 channel unit is emulated by the router function embedded in the mother board of the *SLC ConnectReach* system, the use of a separate circuit card is unnecessary.

When configuring the *SLC ConnectReach* system, blocks of data DS0 signals can be assigned to go to either the router (most likely then onto the 10Base-T Ethernet port) or to the secondary T1/DSX-1 port. For data going to the router, options such as setting the data rate or SW56 have no meaning and will be ignored. For data going to the secondary T1/DSX-1 port, these commands may have meaning to hardware connected to the secondary T1/DSX-1 line, but the *SLC ConnectReach* system will not act on them.

(Continued on next page)

Interfaces (Continued)

Emulated channel units (continued)

*SPQ*456 Channel Unit (Direct Inward Dialing/Current Sink)

The *SPQ*456 channel unit is a quad direct inward dialing (DID) channel unit that is used to provide capability for applications such as DID and local call routing* (LCR*). The *SPQ*456 channel unit supports loop reverse battery signaling and D4 signaling format is used for the A/B/C/D signaling bits. The *SPQ*456 channel unit is emulated by the foreign exchange office (FXO) circuit card and is used for analog voice channels and secondary/fractional-T1 voice lines in the *SLC ConnectReach* system.

The *SPQ*456 channel unit is normally provisioned by means of software for a loss of either 0 or 2.5 dB. However, in the *SLC ConnectReach* system, provisioning messages will determine the setting and the 2.5-dB loss option will be mapped to the *SLC ConnectReach* system option of 3.0 dB of loss.

Voice interfaces

The *SLC ConnectReach* system emulates three different types of voice channel units: *SPQ*440(C,D), *SPQ*443, and *SPQ*456. The *SPQ*443 channel unit will be used to interface with the DS0 signals that the *SLC ConnectReach* system is mapping from the network T1/DSX-1 line to the secondary T1/DSX-1 line for connection to a private branch exchange (PBX) or key system.

Voice hardware that can be installed in the *SLC ConnectReach* system is comprised of four different types of circuit boards: four-line (quad) current feed, eight-line current feed, quad current sink, and eight-line current sink. Current feed boards provide service to current feed lines typically connected to analog telephones or analog ports on a PBX or key system. Both loop-start and ground-start signaling are supported on current feed lines. Current sink boards provide service to current sink lines that typically connect to a CO over an analog line for LCR applications or to a PBX analog direct inward dialing (DID)-dial pulse terminating (DPT) interface. Only loop reverse battery signaling is supported in the DID-DPT channel units.

The assignment of specific channel units must be coordinated with the installation of voice hardware so that the assigned channel units match the voice hardware. For example, if a range of analog voice channels (analog-begin and analog-end DS0 range) is configured for *SPQ*® 440, then the corresponding circuit board that must be installed to serve these channels is an FXS. Whereas, if a range of analog voice channels is configured for *SPQ*® 456, then the corresponding circuit board that must be installed to serve these channels is an FXO.

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Interfaces (Continued)

Voice interfaces (continued)

It is also possible for blocks of contiguous DS0 time slots to be routed to the secondary T1/DSX-1 port. A single block of voice time slots may be specified for mapping to the secondary T1/DSX-1 port. The *SPQ*440 or *SPQ*443 channel unit will be specified to handle these time slots so that the *SLC*-2000 HDT will transmit the standard extended superframe (ESF) signaling format. The ESF signaling format is required since the PBX connected to the secondary T1/DSX-1 line will be expecting it.

Data interfaces

The *SLC ConnectReach* system can also emulate an *SPQ*452 data channel unit. Unlike the *SPQ*452 channel unit, however, there are no digital data services (DDS) or sub-64 kb/s interfaces on the *SLC ConnectReach* system. Data may either be routed to the Ethernet port using the built-in internal router or be mapped to time slots on the secondary T1/DSX-1 line. Additionally, some combination of these two paths is also possible. If data is mapped to the secondary T1/DSX-1 line, a router must be attached to that line either directly or by means of a DS0 add/drop unit. Data transmitted on the secondary T1/DSX-1 line is in the clear channel format.

Even though the *SPQ*452 channel unit is a dual port unit, the *SLC ConnectReach* system allows up to four DS0 signal time slots to be mapped to data for every *SPQ*452 channel unit emulated.

If data speeds above 64 kb/s are required, contiguous DS0 signals can be used to provide a higher speed channel in multiples of 64 kb/s.

General Physical Characteristics

Size

The *SLC ConnectReach* system measures 1.75 inches high, 17 inches wide, and 14 inches deep.

Weight

The *SLC ConnectReach* system weighs approximately 9 lb.

Operating temperature/ humidity

The *SLC ConnectReach* system can operate within a temperature range of 0 to 50° C (32 to 122° F) at a maximum relative humidity of 95 percent, noncondensing.

Power requirements

The *SLC ConnectReach* system is designed to accept input power from either an AC or DC power source with the following requirements.

AC power

The AC input power required for the *SLC ConnectReach* system power supply transformer is 95 to 125 V AC, 60 Hz, and 1.0 amp.

DC power

The DC input power required for the *SLC ConnectReach* system is 40 to 56 V DC at 50 VA.

Mounting positions

The *SLC ConnectReach* system can be mounted at either of the following locations:

- 19- or 23-inch rack mount
- Wall mount
- Desk top mount.

Mounting clearance

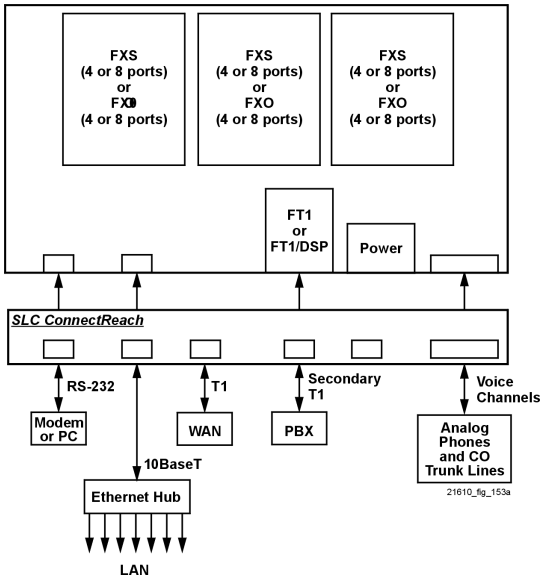
The minimum clearance around the *SLC ConnectReach* system after it is installed should be as follows:

- Above: 1.75 inches
- Below: 0.0 inch
- Front: 5.0 inches
- Rear: 0.6 inch
- Sides: 2.0 inches.

Description of Interface Ports

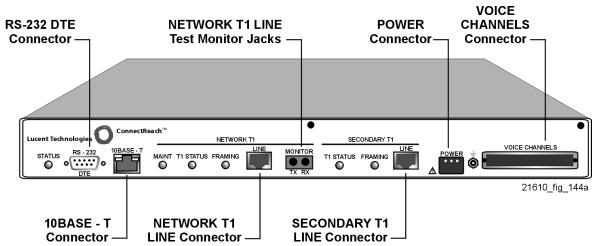
Connection information

The following figure shows a typical example of how the *SLC ConnectReach* system ports are connected at a customer site.



Location of ports

The following figure shows the positions of the interface ports on the front panel of the *SLC ConnectReach* system apparatus cases. A description of each port follows.



T1 / DSX-1

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Description of Interface Ports (Continued)

RS-232 port

The **RS-232** port contains a nine-pin D-type, data terminal equipment (DTE) connector that serves as the serial port for the *SLC ConnectReach* system. This port connects to either a local provisioning terminal serial port or to a modem accessed by a remote provisioning terminal. The provisioning terminal is used to perform initial configuration of the *SLC ConnectReach* system. A null modem cable is required for this connector when connected to a local provisioning terminal running terminal emulation software. This connection can be used for initial configuration of the system.

If you have installed an uninterruptible power supply (UPS) and want to receive SNMP traps related to it, you must connect the RS232 port on the UPS unit directly to the RS232 port on the *SLC ConnectReach* system. The cable must have a connector that is appropriate for the UPS device at one end, and a 9-pin, D-type, DTE connector at the other end for the RS-232 port on the *SLC ConnectReach* system.

The following table lists the pin assignments for the *SLC ConnectReach* system RS-232 connector.

Description	Pin	Signal Name
Data carrier detect; input	1	DCD
Receive data; input	2	RXD
Transmit data; output	3	TXD
Data terminal ready; output	4	DTR
Interface signal ground	5	GND
Data set ready; input	6	DSR
Ready to send; output	7	RTS
Clear to send; input	8	CTS
Ring indicator; input	9	RI

(Continued on next page)

Description of Interface Ports (Continued)

10BASE-T port

The **10BASE-T** port contains an eight-pin modular, RJ-45 connector that is the Ethernet LAN port for the *SLC ConnectReach* system. This port connects the customer's LAN by means of either an Ethernet hub or a direct connection to the network, depending on the topology of the customer's network.

The *SLC ConnectReach* system Ethernet port transmission mode is half-duplex.

The following table provides a list of pin assignments for the **10BASE-T** connector.

Description	Pin	Signal Name
Twisted-pair transmit data; positive output	1	ENTX+
Twisted-pair transmit data; negative output	2	ENTX-
Twisted-pair receive data; positive input	3	ENRX+
Not used	4	
Not used	5	
Twisted-pair receive data; negative input	6	ENRX-
Not used	7	
Not used	8	

NETWORK T1/ DSX-1 LINE port

The **NETWORK T1 LINE** port contains an eight-pin, modular, RJ-48C connector that accepts the primary T1/DSX-1 line for the *SLC ConnectReach* system. The network T1/DSX-1 line connects the *SLC ConnectReach* system to the *SLC*-2000 RT/HDT. The T1 line supports both voice and data/Internet traffic. The number of channels allocated to each function is configurable based on the need of the site.

The following table provides a list of the **NETWORK T1** connector pin assignments.

T1 Description	Pin	T1 Signal Name
Twisted-pair line input	1	RXRING
Twisted-pair line input	2	RXTIP
Not used	3	
Twisted-pair line output	4	TXRING
Twisted-pair line output	5	TXTIP
Not used	6	
Not used	7	
Not used	8	

Description of Interface Ports (Continued)

NETWORK T1/ DSX-1 line MONITOR port

The **NETWORK T1** line **MONITOR** port accepts standard bantam miniature telephone plugs from test equipment used to monitor the network T1/DSX-1 line.

NOTE:
In the event that it becomes necessary to connect test equipment to the **NETWORK T1** line **MONITOR** connector, be sure the test equipment is operating in the *bridge* mode. Otherwise, the test equipment can terminate the T1 line, thereby reducing T1 receive signal strength to the *SLC ConnectReach* system.

SECONDARY/ FRACTIONAL T1/ DSX-1 LINE port

The **SECONDARY/FRACTIONAL T1 LINE** port contains an eight-pin, modular, RJ-48C connector that accepts the secondary/fractional T1/DSX-1 line for the *SLC ConnectReach* system. The secondary/fractional T1/DSX-1 line connects the *SLC ConnectReach* system to a private branch exchange (PBX) or key system that has a T1 interface. Open data devices, such as video codec, can also be connected to the fractional T1 interface card by means of this port.

The connector pin assignments are the same as the pin assignments for the **NETWORK T1 LINE** connector described previously.

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Description of Interface Ports (Continued)

POWER port

The **POWER** port contains a three-pin Molex connector that provides the connection point for 48 V DC input power to the *SLC ConnectReach* system from either a 120 V AC power supply transformer or a DC power source.

The following table provides a list of the power connector pin assignments.

The *SLC ConnectReach* system includes polarity reversal protection for input power connections. Pins 1 and 3 can be connected to either polarity of DC voltage or to an AC power supply.

Description	Pin
48 V DC	1 (right)
Safety ground	2 (center)
48 V DC RET	3 (left)

VOICE CHANNELS port

The **VOICE CHANNELS** port contains a 50-pin telephony type connector which connects the *SLC ConnectReach* system to voice-frequency telephone lines by means of a telephone punch-down block at the site. If the customer's PBX or key system has an analog interface, connection is made to the analog foreign exchange station (FXS) **VOICE CHANNELS** port, and optionally to the foreign exchange office (FXO) ports for direct inward dial (DID). The CO trunk lines can also be connected to the FXO **VOICE CHANNELS** port.

(Continued on next page)

Description of Interface Ports (Continued)

VOICE CHANNELS port (continued)

The following table provides a list of pin assignments for the **VOICE CHANNELS** connector.

Description	Pin	Signal	Description	Pin	Signal
Voice Channel 1	1	Ring	Voice Channel 14	14	Ring
	26	Tip		39	Tip
Voice Channel 2	2	Ring	Voice Channel 15	15	Ring
	27	Tip		40	Tip
Voice Channel 3	3	Ring	Voice Channel 16	16	Ring
	28	Tip		41	Tip
Voice Channel 4	4	Ring	Voice Channel 17	17	Ring
	29	Tip		42	Tip
Voice Channel 5	5	Ring	Voice Channel 18	18	Ring
	30	Tip		43	Tip
Voice Channel 6	6	Ring	Voice Channel 19	19	Ring
	31	Tip		44	Tip
Voice Channel 7	7	Ring	Voice Channel 20	20	Ring
	32	Tip		45	Tip
Voice Channel 8	8	Ring	Voice Channel 21	21	Ring
	33	Tip		46	Tip
Voice Channel 9	9	Ring	Voice Channel 22	22	Ring
	34	Tip		47	Tip
Voice Channel 10	10	Ring	Voice Channel 23	23	Ring
	35	Tip		48	Tip
Voice Channel 11	11	Ring	Voice Channel 24	24	Ring
	36	Tip		49	Tip
Voice Channel 12	12	Ring	T1 Alarm	25	N.O. alarm contact
	37	Tip		50	Common
Voice Channel 13	13	Ring			
	38	Tip			

(Continued on next page)

Description of Interface Ports (Continued)

VOICE CHANNELS port (continued)

Pin pairs 1 through 24 correspond to T1 channels 1 through 24. Pair 25/50 is a normally open alarm connection (150 VRMS @ 100 mA) that connects to an alarm relay. The alarm relay provides an indication to an external alarm or trunk bypass unit that the *SLC ConnectReach* system unit is not functioning properly and one or more of the yellow or red status light emitting diodes (LEDs) are lighted.

The following four conditions will cause the alarm relay to close:

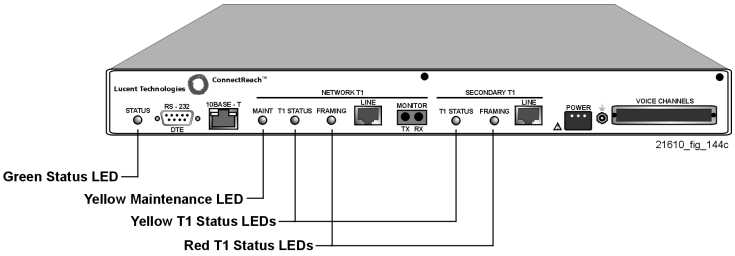
- Power fails
- *SLC ConnectReach* system fails
- Network T1 alarm is enabled and the network T1 link fails
- Secondary/fractional T1 alarm is enabled and the secondary/fractional T1 link fails.

If the *SLC ConnectReach* system has a foreign exchange office (FXO) card used with local call routing (LCR) and a trunk bypass unit is connected, the network T1 alarm should be disabled. If the T1 link fails, calls will automatically be rerouted out the FXO port, which is connected to the trunk bypass. If the network T1 alarm is enabled, calls will be rerouted out the foreign exchange station (FXS) port and within the bypass unit causing connection problems.

Description of Indicators

Indicator locations and designations

The following figure shows the positions of the LED indicators on the front panel of the *SLC ConnectReach* system apparatus cases. A description of each indicator follows.



T1 / DSX-1

STATUS LED

This green LED provides an indication of the status of the self-test and activity on the T1 line according to the state of the LED. The various states of the **STATUS** LED and their indication are as follows:

- ***On*** — Self-test was successful; no packets are being sent/received on the T1 line.
- ***Flashing*** —Self-test was successful; data packets are being sent/received on the T1 line.
- ***Off*** — Self-test failed.

MAINT LED

This yellow LED provides an indication of a network loopback or active diagnose command. The various states of the **MAINT** LED and their indication are as follows:

- ***On*** — Network loopback is present on the network T1 line.
- ***Flashing*** — A diagnose command is active.
- ***Off*** — The *SLC ConnectReach* system is operating normally.

(Continued on next page)

Description of Indicators (Continued)

T1 STATUS LEDs

These two yellow LEDs provide an indication of a yellow alert or bipolar violations on the network and/or secondary T1/DSX-1 line. The various states of the **T1 STATUS** LEDs and their indication are as follows:

- ***On*** — A yellow alert has occurred in the last second.
- ***Flashing*** — One or more bipolar violations has occurred in the last second.
- ***Off*** — The *SLC ConnectReach* system is operating normally.

NOTE:
The **T1 STATUS** LED for the secondary T1/DSX-1 line will operate only if the secondary T1/DSX-1 line is installed and enabled.

FRAMING LEDs

These two red LEDs provide an indication of a red alarm condition or a high bit error rate on the network and/or secondary T1/DSX-1 line. The various states of the **FRAMING** LEDs and their indication are as follows:

- ***On*** — A red alarm condition is present.
- ***Flashing*** — The framing bit error rate has exceeded $10E^5$ in the last second.
- ***Off*** — The *SLC ConnectReach* system is operating normally.

NOTE:
The **FRAMING** LED for the secondary T1/DSX-1 line will operate only if the secondary T1/DSX-1 line is installed and enabled.

SLC ConnectReach System Specifications

Interface Ports and Functional Circuits

Introduction

This section provides a listing of the physical and functional specifications for the various interface ports and functional circuits located within the T1/DSX-1 *SLC ConnectReach* system.

CSU functionality

The following are the specifications for the channel service unit (CSU) functionality circuit:

- DSX-1 network interface
- Connector: RJ-48C (keyed)
- Monitor jack: dual bantam
- T1/DSX-1 line rate: 1.544 Mb/s
- Loop Integrity Monitor: allows half payload functioning when one loop is down
- Clock source: line (carrier)/local
- Line coding (T1/DSX-1): bipolar 8 zero substitution (B8ZS) or alternate mark inversion (AMI) (always select B8ZS)
- Framing: D4 [superframe (SF)] or extended superframe (ESF)
- Line Build out:
  - ***T1 Carrier interface*:** 0 dB, -7.5 dB, -15 dB, or -22.5 dB
  - ***DSX-1 interface*:** 0 to 133 feet, 133 to 266 feet, 266 to 399 feet, 399 to 533 feet, and 533 to 655 feet
- Automatic receive sensitivity.

(Continued on next page)

Interface Ports and Functional Circuits (Continued)

FXS/*SPOTS*® analog line support

The following are the specifications for the foreign exchange station (FXS)/ *SPOTS* analog line support circuit:

- 4–24 ports expandable in 4- or 8-port increments
- Loop start/ground-start
- Robbed bit line signaling (prior to R3.6.3)
- Clear channel signaling (R3.6.3 and later)
- Modems supported
- 48-volt battery
- –25 V DC at 25 mA talk battery
- Supports analog PBX lines
- Ringing: 5 ringer equivalency number (REN) per port or 75 REN for each *SLC ConnectReach* system
- Transmit and receive gain adjust: 0 dB, –3 dB, –6 dB, or –12 dB
- Impedance: 600 ohms
- Range: 480 ohms (includes DC off-hook resistance of the phone plus the cable resistance)

FXO analog trunk support

The following are the specifications for the foreign exchange office (FXO) analog trunk support circuit:

- 4–24 ports expandable in 4- or 8-port increments
- Loop-start/ground-start
- Robbed bit line signaling
- REN = 1.5 per port
- Transmit and receive gain adjust: 0 dB, –3 dB, or –6 dB
- Impedance: 600 ohms.

(Continued on next page)

Interface Ports and Functional Circuits (Continued)

Network T1/ DSX-1 and secondary T1/DSX-1 support

The following are the specifications for the channel bank — digital DSX-1 support circuit:

- Fractional DSX-1 to PBX, key system, or channel bank
- Connector: RJ-48C (keyed)
- Line rate: 1.544 Mb/s
- Clock source: network/internal
- Line coding: B8ZS or AMI (always select B8ZS)
- Framing (network): ESF
- Framing (secondary): D4 (SF) or ESF
- Line Build out:
  - — ***T1 Carrier interface*:** 0 dB, -7.5 dB, -15 dB, or -22.5 dB
  - — ***DSX-1 interface*:** 0 to 133 feet, 133 to 266 feet, 266 to 399 feet, 399 to 533 feet, and 533 to 655 feet
- Automatic receive sensitivity
- Robbed bit line or trunk signaling supported
- FXS, FXO, E&M, direct inward dial (DID), automatic number identification (ANI), and dialed number identification service (DNIS) by means of a PBX or channel bank.

NOTE:
In the *SLC ConnectReach* system, references to E&M signaling refer to a signaling type supported on DID trunks. It does not refer to the E&M signaling used over metallic leads with older transmission equipment.

T1/DSX-1 provisioning

- Programmable between voice and data
- Fractionally multiplexed voice and data
- Both are programmable on a DS0 basis.

DS0 provisioning

The following is the specification for the DS0 provisioning circuit:

- Data rates: 64 kb/s to 1.536 Mb/s in 64-kb/s steps.

(Continued on next page)

Interface Ports and Functional Circuits (Continued)

IP networking

The following are the specifications for the Internet protocol (IP) networking circuit:

- IP over frame relay
- High-level data link control (HDLC) (Cisco)
- Point-to-point protocol (PPP).

Frame relay

The following are the specifications for the frame relay circuit:

- Local management interface (LMI) T1.617 (Annex D, ANSI*)
- LMI Q.933 (Annex A)
- IP over frame relay per RFC1490
- Multiple permanent virtual circuits (PVCs) supported.

IP address management

The following are the specifications for the IP address management circuit:

- Dynamic host configuration protocol (DHCP) automatically configures IP addresses for personal computers (PCs) on the Ethernet network
- IP address conservation.

(Continued on next page)

* Registered trademark of American National Standards Institute, Inc.

Interface Ports and Functional Circuits (Continued)

Ethernet port

The following are the specifications for the Ethernet port:

- 10Base-T
- Connector: RJ-45
- Cable lengths: maximum length of 100 meters or 330 feet using Category 5.

Firewall support

The following are the specifications for the firewall support circuit:

- IP filtering built in
- Compatible with Internet browsers such as those provided by Netscape and Microsoft
- Only LAN-initiated traffic is allowed through the firewall
- External firewalls supported.

Console port

The following are the specifications for the console port:

- Data terminal equipment (DTE) interface
- Baud rates: 9,600; 19,200; 38,400
- No parity, 8 bits, 1 start, 1 stop
- Hardware flow control
- Ready to connect to terminal, 28.8 modem, or switched 56 kb/s or integrated services digital network (ISDN) 64/128-kb/s modem
- Menu-based management interface.

NAT support

The following are the specifications for network address translation (NAT):

- IP address conservation through conversion and TCP/UDP port loading
- Dynamic IP addressing using one-to-one, many-to-one, and many-to-many
- Static IP addressing
- IP addressing pass through.

(Continued on next page)

Interface Ports and Functional Circuits (Continued)

PAT support

The following are the specifications for port address translation (PAT):

- Public (WAN) access to specific applications or services without compromising the NAT firewall and NAT features
- Works only for NAT Dynamic Groups.

Management

The following are the specifications for the management circuit:

- Statistics, status, and configuration of all interfaces
- Access by means of T1 line or Ethernet ports
- Simple network management protocol (SNMP) Version 1, MIB II

  MIBs supported: transport control protocol/Internet protocol (TCP/IP), frame relay, T1
- Hypertext transfer protocol (HTTP) (compatible with industry-standard Web browsers)
- Craft interface terminal (CIT) by means of RS-232 port at *SLC*-2000 HDT
- Telnet interface
- Local craft terminal by means of the RS-232 port (modem or terminal)
- Telnet and console interfaces password-protected
- HTTP interface password-protected with two privilege levels.

Compliance

The *SLC ConnectReach* system is compliant with the following standards:

- Telecom: FCC Part 68, Industry Canada CS 03
- Emissions: FCC Part 15, Class A; Canada C108.8-M1983
- Safety: UL1950, CSA 950 - Listed I.T.E.
- AT&T TR 62411, 54016
- ANSI T1.403
- EIA 464-B
- New equipment building standards (NEBS)
- Network compliance for FXO only: Federal communications commission (FCC) Part 68, Industry Canada CS-03, TA-TSY-001210, TR-TSY-000063, EIA/TIA-464-b.

Peripheral Hardware Equipment

Introduction

Overview

The *SLC ConnectReach* system supports several peripheral hardware devices that are listed below and described later in this section:

- Voice mail system
- Paging unit
- Battery backup
- Trunk bypass unit.

This section contains a brief description of these peripheral devices that can be connected to the *SLC ConnectReach* system to provide additional features. The equipment described in this section is not provided as part of the *SLC ConnectReach* system standard equipment and must be ordered separately.

Peripheral Equipment Description

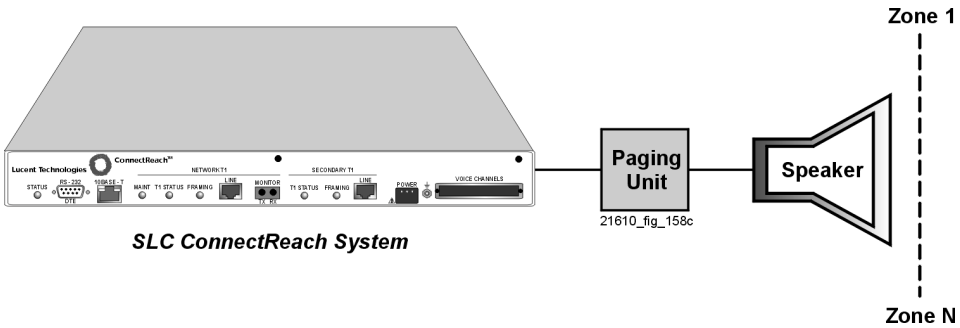
Voice mail system

The *SLC ConnectReach* system can accommodate most popular voice mail systems. For instructions on configuring the *SLC ConnectReach* system or loading a preconfigured profile, refer to Chapter 4, "Configuring the SLC® ConnectReach™ System" The voice mail system is connected to the FXS lines through the **VOICE CHANNELS** port.

Paging/amplifier unit

As shown in the following figure, any compatible paging unit may be connected to one of the *SLC ConnectReach* system's FXS lines through the **VOICE CHANNELS** port. Currently, the Valcom V-2001A paging unit is the only paging unit that has been tested and proven to be compatible with the *SLC ConnectReach* system.

NOTE:
The paging unit battery feed switch is configured "off" for connection to FXS lines.



SLC ConnectReach System

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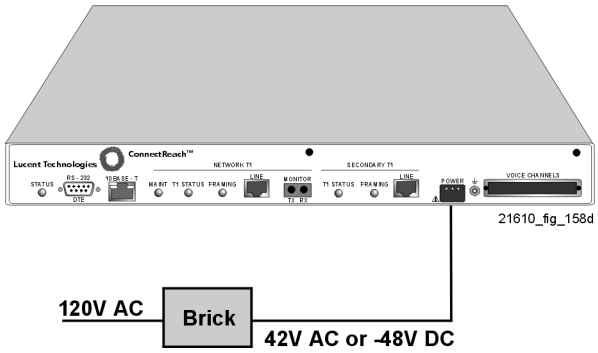
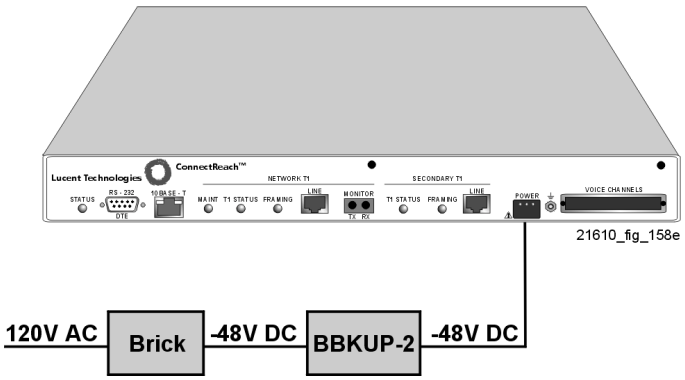
Peripheral Equipment Description (Continued)

Battery backup

The AC power supply provided with each AC powered *SLC ConnectReach* system converts the 120 V AC input voltage to a lower voltage required by the system, but it does not provide backup power when the input power is interrupted (refer to the following figure).



As an alternative, a BBKUP-2 battery backup unit (Comcode 108860248) can be used to provide up to 8-hours of non-stop power operation when input power to the *SLC ConnectReach* system is interrupted. The BBKUP-2 battery backup unit accepts a –48 V DC input, filters and regulates it, and supplies it to the SLC ConnectReach system. The –48 V DC input power to the BBKUP-2 battery backup unit can be obtained from either a –48 V DC on-site power source or from the 120 V AC power line by means of an AC-to-DC brick. The AC-to-DC brick is required to convert the 120 V AC to –48 V DC since the BBKUP-2 does not convert AC voltage to DC voltage (refer to the following figure).



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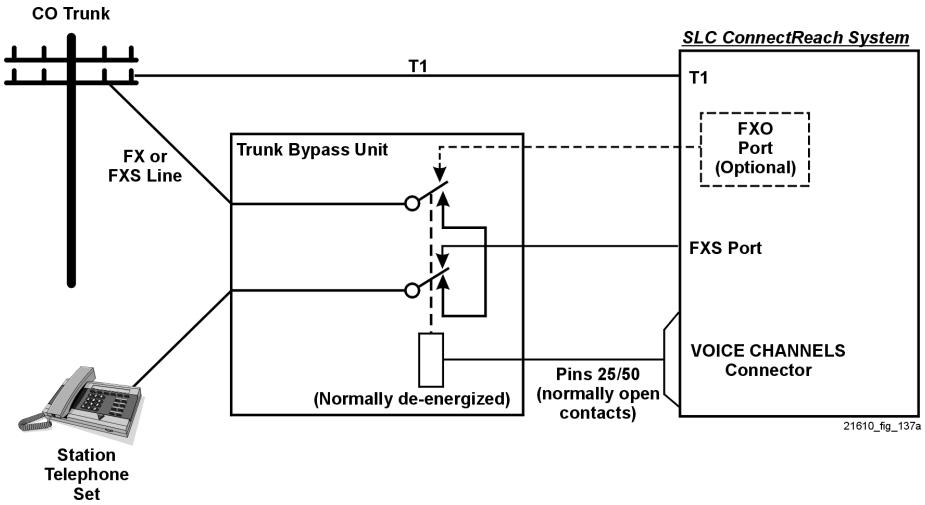
Peripheral Equipment Description (Continued)

Trunk bypass unit

In the event that the *SLC ConnectReach* system fails, the T1 link fails, or there is an electrical power failure, a trunk bypass unit allows certain phones access to outside lines for emergency 911 calls.

If a trunk bypass unit is installed, calls will be transmitted through the bypass unit to the CO. The control relay on the bypass unit is connected to pins 25/50 on the **VOICE CHANNELS** port. A description of the normally open alarm connection provided by pins 25/50 is provided earlier in this chapter. In order for the bypass unit to function properly, an FX or FXS trunk is necessary. The FXO voice card on the *SLC ConnectReach* system is optional. Currently, the DEES Communications 8 Trunk Powerfail Bypass unit, model 154A 24V is the only trunk bypass unit that has been tested and proven to be compatible with the *SLC ConnectReach* system. The following figure diagrams the routing between the *SLC ConnectReach* system and the bypass unit.



Preinstallation Planning

3

Contents

About This Chapter 3-2

- Introduction 3-2

Configuration and Installation Process 3-3

- Summary 3-3
- Quickstart Configuration 3-5
- Customized Configuration 3-7

About This Chapter

Introduction

Contents

This chapter provides information about the following topics as they relate to the *SLC® ConnectReach™* Access System:

- Summary of the configuration and installation process
- Discussion on the private and public switched networks
- Quickstart and customized configurations
- Preinstallation and preconfiguration worksheets.

Configuration and Installation Process

Summary

Introduction

This section presents the steps required to configure and install the *SLC ConnectReach* system. The more information you can gather about the customer site before beginning to configure and install the *SLC ConnectReach* system, the easier the process will be.

Customer site data

The complexity of a given *SLC ConnectReach* system installation depends mainly on one factor; namely, whether or not the site is considered a “private” data network.

In a private network, addresses are obtained from a common pool of addresses and are not guaranteed to be unique on the Internet. Therefore, to prevent confusion over packet destinations, the addresses cannot be visible to the Internet. Instead, an application proxy intercepts all incoming traffic and manages the mapping of packets to the appropriate destination on the private network.

Appendix A, "IP Network Addresses" describes private network addresses in more detail.

Configuration and installation process summary

The following steps provide a summary of the action required to configure and install the *SLC ConnectReach* system:

1. Verify that the site meets the installation and site requirements (listed in Chapter 5, "Installation").
2. Use the Preinstallation Worksheet to record the site’s installation requirements.
3. Using the Preconfiguration Worksheet, record the site’s configuration requirements.

NOTE:
The procedures in this manual are written with the assumption that the *SLC ConnectReach* system will be configured in a staging area before it is installed at the customer site. If the *SLC ConnectReach* system is to be configured after installation, then the *SLC ConnectReach* system should be installed next using the procedures in Chapter 5, “Installation”, and then configured using the procedures in Chapter 4, “Configuring the *SLC ConnectReach* System.”

(Continued on next page)

Summary (Continued)

Configuration and installation process summary (continued)

4. Apply power to the *SLC ConnectReach* system and observe the self-test light-emitting diodes (LEDs) to verify that the unit is starting up successfully. For the self-test status information, refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing"
5. In a staging area, configure the *SLC ConnectReach* system according to the Preconfiguration Worksheet. (Chapter 4, “Configuring the *SLC ConnectReach* System”, describes the utility program used to configure the *SLC ConnectReach* system.)
6. Save the new configuration in the *SLC ConnectReach* system’s nonvolatile random access memory (NVRAM). (Refer to Chapter 4, “Configuring the *SLC ConnectReach* System”.)
7. At the customer site, install the *SLC ConnectReach* system and connect all the required cables according to the Preinstallation Worksheet. (Chapter 5, “Installation”, describes the *SLC ConnectReach* system installation procedure.)
8. Apply power to the *SLC ConnectReach* system and observe the self-test LEDs to verify that the unit is starting up successfully. For the self-test status information, refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing"
9. If necessary, make any final configuration changes after physical installation is complete (refer to Chapter 4, “Configuring the *SLC ConnectReach* System”). Remember to save the revised configuration and reboot the *SLC ConnectReach* system using the procedure in Chapter 9, “Maintenance and Trouble Clearing”, so that the changes take effect.
10. Perform channel unit provisioning and DS0 cross-connection procedures from the *SLC*-2000 Access System remote terminal/host digital terminal (RT/HDT) using Chapter 6, “Provisioning the *SLC*-2000 RT/HDT”.

Changing the configuration settings

After the *SLC ConnectReach* system is configured and installed at the site, you can change its configuration by means of the craft interface terminal (CIT) at the *SLC*-2000 RT/HDT or a Telnet session or hypertext transfer protocol (HTTP) connection either from the local Ethernet or over the T1 link from the carrier central office (CO). If a modem is permanently connected to the RS-232 port, you can also change the configuration by means of a dial-up connection. If the T1 connection to the *SLC ConnectReach* system is down, you can use the Ethernet connection or the dial-up connection.

For more information about using a Telnet session, refer to Chapter 4, “Configuring the *SLC ConnectReach* System”. For more information about HTTP connections, refer to Chapter 8, "Configure/Monitor and Upgrade Software for the SLC ConnectReach System Using a Web Browser"

Quickstart Configuration

Description

The quickstart configuration is for channel bank configurations only where default settings are used for all or most of the configuration parameters. Refer to Appendix B, "Configuration Examples", for a quickstart example of the channel bank configuration. In this type of installation, there are only a few configuration parameters that you need to set.

Quickstart configuration planning process

Unless stated otherwise, the numbered steps below are in the same order as the numbered areas on the Preconfiguration Worksheet presented later in this chapter. Default values, where applicable, are shown in parentheses below and in bold on the worksheet. For detailed information about parameters and the possible values, refer to Chapter 4, “Configuring the *SLC ConnectReach* System”.

1. Determine whether the Network T1/DSX-1 default values match the carrier configuration of the T1 line. Since the *SLC ConnectReach* system will always connect to a *SLC*-2000 Access System, the Network T1/DSX-1 framing format and line coding will be extended superframe (ESF) and bipolar 8 zero substitution (B8ZS), respectively.
2. If the *SLC ConnectReach* system will have a T1 connection to the site phone system, determine whether the Secondary T1/DSX-1 default values match the configuration of the T1 connection to the phone system.
3. DS0 provisioning (voice and data channel assignments). The default channel assignments correspond to the actual hardware configuration. If these are appropriate, you do not need to set or change the channel assignments.
   - Number of analog voice channels (channels set according to actual hardware).
   - Number of secondary T1/DSX-1 voice channels (none).
   - Number of data channels (none).

(Continued on next page)

Quickstart Configuration (Continued)

Quickstart configuration planning process (continued)

4. Synchronous interface information:
   - Encapsulation scheme used on the link to the CO (frame relay).
   - *SLC ConnectReach* system IP address on the link to the CO.
   - Netmask (if any) for that address.
   - If frame relay, the data link connection identifier (DLCI) assigned to the *SLC ConnectReach* system
   - If frame relay, the local management interface (LMI) type used in signaling.
5. To configure the channel bank, you will need to know the CO digital trunk configuration and the configuration of the equipment [analog phones, private branch exchange (PBX), or key system] at the site [number 6 (Channel bank) on the worksheet]. The following is a list of provisionable channel bank parameters:
   - Trunk type (loop-ground)
   - Analog interface (FXS-loop)
   - Loop reversal from CO (enabled)
   - Transmit gain (–3 db)
   - Receive gain (–3 db)
   - On-hook threshold (1250 milliseconds)
   - Alarm state (busy)
   - State of unconfigured channels (idle).

Customized Configuration

Description

This customized configuration procedure applies if the site is not a private network, or if other default parameter values are not appropriate.

Customized configuration planning process

Because the *SLC ConnectReach* system supports many interfaces and protocols, the *SLC ConnectReach* system configuration utility offers a large number of configuration parameters. However, almost all parameters have default values; if a parameter's default is appropriate for the customer site, you do not need to set the parameter. Default values, where applicable, are shown in parentheses below and in bold in the worksheet. All parameters listed below are described in more detail in Chapter 4, "Configuring the *SLC ConnectReach* System".

NOTE:
Before starting any configuration, check and record the installed feature keys. For information about displaying the enabled features, refer to Chapter 4, "Configuring the *SLC ConnectReach* System".

SLC ConnectReach System Preinstallation Worksheet

General

1. Where will the *SLC ConnectReach* system be placed? (circle one) RACK (19” 23”) WALL DESKTOP

   (A rack mount kit for ANSI-type frames and a wall mount kit is included with all units, rubber feet are included for desktop placement.) If rack mounted, allow 1.75" above unit for cooling. Wood screws for wall mounting are not included.

2. What is the distance from the Network T1/DSX-1 Demarc? (Connector type RJ48C) _____

   (A 10 foot cable is included with each *SLC ConnectReach* system, a custom cable is required if the distance is greater than 10 feet.)

3. If AC powered, is the power receptacle within six feet of where the unit will be located? Y N

   Power requirement: 120 V AC at 1 Amp

4. If DC powered, a DC power cable is included.

Network T1 RJ48C

5. Framing ordered (required for systems prior to R3.6.3) ESF

   Coordinate with the PBX vendor to be on-site for the installation of the *SLC ConnectReach* system in case any changes need to be made to the routing parameters, etc.

Analog Voice

6. What is the distance between the *SLC ConnectReach* system and the PBX/KTS or patch panel? _____

   Analog channels are available on a standard female RJ21X 25 pair connector (order the appropriate cable length).

Secondary/Fractional T1/DSX-1 RJ48C (Optional)

7. What is the distance between the *SLC ConnectReach* system and the PBX/KTS or patch panel? _____

   Pinouts are the same as the Network T1/DSX-1, a rollover/crossover cable is required to connect to the PBX or KTS. The cable pin outs are shown in Chapter 5, "Installation".

   Line coding ordered (circle one) B8ZS AMI

   Framing ordered (circle one) ESF D4 (SF)

   Line Buildout (circle one)

DSX-1	0-133 ft.	133-266 ft.	266-399 ft.	399-533 ft.	533-655 ft.
DS1	0 db	–7.5 dB	–15 dB	–22 dB	

Ethernet 10BaseT

8. What is the distance between the *SLC ConnectReach* system and the 10BaseT hub? _____

   (Order or make appropriate cable length)

RS232 Craft Port

9. Uses standard 9 pin female/female null modem cable to connect to PC (not included).

Remote Configuration or Diagnostics

10. Will a modem be used for remote configuration or diagnostics? Y N

    If yes was circled, order a 1 MB (Measured Business) line.

    Is a modem cable required? (Connector on the *SLC ConnectReach* system requires a standard 9 pin female PC modem cable) Y N

NOTE:
In the following worksheet, the default values (if any) appear in **bold** type.

SLC ConnectReach System Preconfiguration Worksheet

1.	**Network**	T1/DSX-1	Framing Format:	❑ **ESF**	❑ D4/SF		
			Line Coding:	❑ **B8ZS**	❑ AMI		
			Buildout:	❑ **0-133 ft / 0 dB**	❑ 133-266 ft	❑ 266-399 ft	
				❑ 399-533 ft	❑ 533-655 ft	❑ –7.5 dB	
				❑ –15 dB	❑ –22.5 dB		
			Clock Source:	❑ **Network**	❑ Internal		
			Pulse Density:	❑ **Off**	❑ On		
			Alarm:	❑ Off ❑ **On**	Delay: _____	(0...**15**...3600 sec.)	
			Is-slave:	❑ **Off** ❑ On			
			IP over FDL	IP address_____	netmask_____		
2.	**Secondary/Fractional T1 DSX1**		❑ **Off**	❑ On			
			Framing Format:	❑ **ESF**	❑ D4/SF		
			Line Coding:	❑ **B8ZS**	❑ AMI		
			Buildout:	❑ **0-133 ft / 0 dB**	❑ 133-266 ft	❑ 266-399 ft	
				❑ 399-533 ft	❑ 533-655 ft	❑ –7.5 dB	
				❑ –15 dB	❑ –22.5 dB		
			Pulse Density:	❑ **Off**	❑ On		
			Alarm:	❑ **Off** ❑ On	Delay: _____	(0...**15**...3600 sec.)	
			Has-slave:	❑ **Off** ❑ On			
3.	**DS0 Provisioning** <u>Note</u>: A total of 24 channels are available. Ranges must not overlap. Channels assigned in blocks of four DS0s.	Voice Channels:	❑ Analog channel range: Begin ____ End ____				
			❑ Sec./Frac. T1/DSX-1 voice channel range: Begin ____ End ___ (**none**)				
		Data Channels:	❑ Data channel range: Begin ____ End ____				
			❑ Sec./Frac. T1/DSX-1 data channel range: Begin ____ End ____ (**none**)				
		Alignment Sec/ Frac. T1/DSX1:	❑ **Low**	❑ Same			
		ConnectReach Provisioning	Range: 1—4	CU: _____	Range: 5—8	CU: _____	
			Range: 9—12	CU: _____	Range: 13—16	CU: _____	
			Range: 17—20	CU: _____	Range: 21—24	CU: _____	
		ClearReach Feature	❑ **Off** ❑ On				

SLC ConnectReach System Preconfiguration Worksheet (Contd)

4.	**Synchronous Interface**	HDLC Inversion:	❑ **Off**	❑ On
		❑ Frame Relay	DLCI: _____ (16…991)	
			LMI type:	❑ None ❑ **T1.617 (Annex D/*ANSI*)** ❑ Q.933 (Annex A/ITU)
			N391 polling cycles: _____	(1...**6**...255)
			N392 event threshold: _____	(1...**3**...255)
			N393 event counter: _____	(1...**3**...10)
			T391 link integrity polling timer: _____	(1...**6**...10)
		PVC 1-30 (Duplicate and fill in for each PVC that is to be defined.)	DLCI:	(16...991)
			IP Address:	❑ _____IP address ❑ Enet (IP unnumbered) ❑ **Disable**
			Netmask:	_____
			RIP	❑ Enable o RxOnly o TxOnly o **Disable**
			RIP version	❑ **1** ❑ 2
			NAT:	❑ Pass ❑ In ❑ **Out**
		❑ SLA	❑ Enable ❑ **Disable**	
			SLA Thresholds:	Latency _____ Above CIR _____ Below CIR _____ PVC Down _____
		❑ PPP	IP address:	❑ _____IP address ❑ Enet (IP unnumbered) ❑ **Disable**
			IP address of peer PPP device: _____	
			Netmask: _____	
			RIP:	❑ Enable ❑ RxOnly ❑ TxOnly ❑ **Disable**
			RIP version:	❑ **1** ❑ 2
		❑ HDLC	IP address:	❑ _____IP address ❑ Enet (IP unnumbered) ❑ **Disable**
			Netmask: _____	
			RIP:	❑ Enable ❑ RxOnly ❑ TxOnly ❑ **Disable**
			RIP version:	❑ **1** ❑ 2

SLC ConnectReach System Preconfiguration Worksheet (Contd)

5.	**Ethernet Interface**	IP address: _____ (**192.168.0.1**) Netmask: _____ (**255.255.255.0**) Secondary IP address: _____(**0.0.0.0**) Secondary netmask: _____ (**255.255.255.0**) RIP: ❑ Enable ❑ Rx Only ❑ Tx Only ❑ **Disable** RIP version: ❑ **1** ❑ 2 Link integrity testing: ❑ Off ❑ **On**
6.	**Channel Bank**	Range: Begin _____ (1...24) End _____ (1...24) Beginning and ending of configuration blocks.* Signaling: ❑ **Loop-ground** ❑ E&M ❑ Unconfigured Incoming type: (E&M only) ❑ **Wink start** ❑ Immediate start ❑ Delay dial ❑ Wink delay Outgoing type: (E&M only) ❑ **Wink start** ❑ Immediate start ❑ Wink Delay Analog interface: ❑ **FXS loop start** ❑ FXS ground start ❑ FXO loop start ❑ FXO ground start ❑ FXO-DID Far end disconnect (E&M only): ❑ **Enabled** ❑ Disabled Loop reversal: ❑ Enabled ❑ **Disabled** Transmit gain: ❑ 0 dB ❑ **–3 dB** ❑ –6 dB Receive gain: ❑ 0 dB ❑ **–3 dB** ❑ –6 dB ❑ –9 dB ❑ –12 dB On-hook threshold: _____ (300...**1250**...2000 msec) Alarm state: ❑ Idle ❑ **Busy** Unconfigured state: ❑ **Idle** ❑ Busy Loop Ground Disconnect Delay:_____(20...**600**...2000 msec) Cross Connect: DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__ DS0__to line__
7.	**Digital Trunk** Note: Configuration is required only if the *LCR* feature is enabled.	Range: Begin _____ (1...24) End _____ (1...24) Beginning and ending of configuration blocks.* Group: _____ (**1**...5) Signaling: ❑ E&M ❑ Loop start ❑ Ground start ❑ **Unconfigured** E&M incoming: ❑ **Wink start** ❑ Immediate start ❑ Delay dial ❑ Wink delay E&M outgoing: ❑ **Wink start** ❑ Immediate start ❑ Wink Delay Direction: ❑ In ❑ Out ❑ **2-way** Incoming routing: ❑ **DID-DNIS** ❑ ANI-DNIS ❑ Group ❑ Line Line group: ❑ **1** ❑ Line or line group# _____ Digit type: ❑ **DTMF** ❑ MF ❑ Pulse Busy treatment: ❑ **Busy signal** ❑ Busy out ❑ Forward Busy forward line: Line # _____ (1...**24**) Transmit gain: ❑ 0 dB ❑ **–3 dB** ❑ –6 dB Receive gain: ❑ 0 dB ❑ **–3 dB** ❑ –6 dB ❑ –9 dB ❑ –12 dB

SLC ConnectReach System Preconfiguration Worksheet (Contd)

8.	**Analog Trunk**	Range:	Begin _____ (**1**...24) End _____ (1...24) Beginning and ending of configuration blocks.*			
		Group:	_____ (1…**2**…5)			
	Note: Configuration is required only if the *LCR* feature is enabled.	Signaling:	❑ Loop start	❑ Ground start	❑ **Unconfigured**	
		Direction:	❑ In	❑ Out	❑ **2-way**	
		Incoming routing:	❑ **Group**	❑ Line		
		Line group:	❑ **1**	❑ Line or line group# _____		
		Digit type:	❑ **DTMF**	❑ Pulse		
		Busy treatment:	❑ **Busy signal**	❑ Busy out	❑ Forward	
		Busy forward line:	Line # _____ (1...**24**)			
		Transmit gain:	❑ 0 dB	❑ **–3 dB**	❑ –6 dB	
		Receive gain:	❑ 0 dB	❑ **–3 dB**	❑ –6 dB	❑ –12 dB
9.	**Line**	Range:	Begin _____ (1...24) End _____ (1...24) Beginning and ending of configuration blocks.*			
		Group:	_____ (**1**...5)			
	Note: Configuration is required only if the *LCR* feature is enabled.	Signaling:	❑ Loop start	❑ Ground start	❑ **Unconfigured**	
		Direction:	❑ In	❑ **2-way**		
		Outgoing routing:	❑ ***LCR***	❑ Group		
		Trunk group:	❑ **1**	❑ Trunk group # _____		
		On-hook threshold:	_____ (300...**1250**...2000 msec)			
		Far end disconnect:	❑ Disable	❑ **Enable**		
		Polarity reversal:	❑ **Disable**	❑ Enable		
		Trunk ring default:	❑ Double	❑ **Single**		
		Paging line:	**0 (valid line)**			
		Hunting:	❑ Linear	❑ **Most idle**		
		Business OfficeXchange features	(Refer to “BOX features description” on page 4-80, for more information)			
10.	**Map Extensions**	Extension Digits: (1...**2**...10)				
		Extension Assignment:				
11.	**Dialing** (See “Configuring Dialing” on page 4-89)	Pattern of Detected Digits: Digits Range Any Digit (X) Local (L) Timeout(T)				
		Action on Detected Digits:	1...12, D, P) (see the Detect-Insert example on page “Configuring Dialing (Continued)” on page 4-90).			
		Primary and Alternate Trunk Groups:_____				
		Trunk Access Code or Local Digits:_____				
		DID Received Digits:_____(1...**2**...12)				
		Pause:_____(100...**2000**....20000 msec)				

SLC ConnectReach System Preconfiguration Worksheet (Contd)

12.	**Voice Mail** Note: Configuration is required only if the *LCR* feature is enabled.	Enable: ❑ **Off** ❑ On Line group: (1...**5**) Integration delay: (0...**500**...5000) ms Stutter tone: ❑ **Off** ❑ On Periodic ring: ❑ **Off** ❑ On DTMF settings for direct prefix, ring no answer, busy no answer, forward all, unknown forward, and message waiting indications. Preset profile: ❑ Generic ❑ BBS Telecom ❑ Panasonic TD1232 ❑ Toshiba DK280 ❑ Samsung DCS
13.	**Names and Passwords**	User privilege: Name: _____Password: _____ Additional User Access Groups: ❑ Voice ❑ Data ❑ Physical ❑ Utils Carrier privilege: Name:_____ Password: _____
14.	**DHCP Service**	Enable: ❑ On ❑ **Off** First IP address in range: _____ (**192.168.0.2**) Last IP address in range: _____ (**192.168.0.254**) Private network: ❑ **On** ❑ Off Lease time: _____ (**600**…7200 seconds) DNS server IP address: _____ (**192.168.0.1**) Domain name: _____
15.	**SNMP Service**	Enable: ❑ On ❑ **Off** IP address of SNMP host: _____ (**0.0.0.0**) Enable messages: Cold start ❑ On ❑ **Off** Warm start ❑ On ❑ **Off** Link down ❑ On ❑ **Off** Link up ❑ On ❑ **Off** Login failures ❑ On ❑ **Off** T1 traps ❑ ESs ❑ SESs ❑ SEFs ❑ UASs ❑ CSSs ❑ PCVs ❑ LESs ❑ BESs ❑ DMs ❑ LCVs
16.	**HTTP (Web Browser) Port**:	Enable: ❑ Off ❑ **On** Port Number:_____(default 80)
17.	**Telnet Port**:	Enable: ❑ Off ❑ **On** Port Number:_____(default 23)
18.	**Route** Note: One default and up to 30 static.	Default: WAN, PVCn or Gateway IP Address: _____ Static: Network IP Address:_____ Netmask: _____ WAN, PVCn or Gateway IP Address: _____

SLC ConnectReach System Preconfiguration Worksheet (Contd)

19.	**NAT and PAT**	Enable:	❑ **Off** ❑ On	
	Dynamic	Enable:	❑ **Off** ❑ On	
		Group 1	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			PAT: Protocol:_____Port #:_____	Keyword:_____Inband IP:_____
		Group 2	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			PAT: Protocol:_____Port #:_____	Keyword:_____Inband IP:_____
		Group 3	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			PAT: Protocol:_____Port #:_____	Keyword:_____Inband IP:_____
		Group 4	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			PAT: Protocol:_____Port #:_____	Keyword:_____Inband IP:_____
	Static	Enable:	❑ **Off** ❑ On	
		Group 1	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			Allow Inbound ❑ **Yes** ❑ No	
		Group 2	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			Allow Inbound ❑ **Yes** ❑ No	
		Group 3	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			Allow Inbound ❑ **Yes** ❑ No	
		Group 4	In Start IP Address _____	Last IP Address: _____
			Out Start IP Address _____	Last IP Address: _____
			Allow Inbound ❑ **Yes** ❑ No	
	Pass Thru	Enable:	❑ **Off** ❑ On	
		In Range: _____ to _____		
20.	**ARP Configuration**			
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
	IP Address_____		Ethernet Address_____	
21.	**Firewall**	Standard:	❑ IP Filter ❑ IP Filter/server	
		Custom:	(See “Custom Firewall Configurations” on page C-1 for custom IP firewall configuration.)	

SLC ConnectReach System Preconfiguration Worksheet (Contd)

22.	**NTP**	Enable:	❑ **On** ❑ Off	
		Host name or IP address: _____		
		Difference in minutes between local time and Greenwich Mean Time (GMT): _____		
23.	**DNS Proxy Service**	Enable:	❑ **On** ❑ Off	
		IP address of primary DNS server: _____		
		IP address of secondary DNS server: _____		
24 .	**QoS**	Enable:	❑ On ❑ **Off**	
		First QoS	Source IP Address _____	Source Netmask _____
		and/or	Destination IP Address _____	Destination Netmask _____
		Second QoS	Source IP Address _____	Source Netmask _____
		and/or	Destination IP Address _____	Destination Netmask _____
		Third QoS	Source IP Address _____	Source Netmask _____
		and/or	Destination IP Address _____	Destination Netmask _____
		Fourth QoS	Source IP Address _____	Source Netmask _____
		and/or	Destination IP Address _____	Destination Netmask _____
		Fifth QoS	Source IP Address _____	Source Netmask _____
		and/or	Destination IP Address _____	Destination Netmask _____
25.	**RS-232 Port**	Baud rate:	❑ **9600** (This is the default and recommended setting.) ❑ 19200 ❑ 38400	
26.	**SYSLOG**	❑ **On** ❑ Off	IP Address of Host:	IP add/name of source:
		sysconf facility ❑ (User-level msgs)	access facility ❑ (Security/Authorization msgs)	

***** Duplicate and fill in this numbered item of the worksheet for each set of channels requiring different configuration.

Configuring the *SLC*® *ConnectReach*™ System

4

Contents

About This Chapter 4-3

- Introduction 4-3

Preparing the *SLC*® *ConnectReach*™ System for Initial Configuration 4-4

- Equipment Required to Set Up the *SLC ConnectReach* System 4-4
- Making Connections to the *SLC ConnectReach* System 4-5
- Initiating a Session with the *SLC ConnectReach* System 4-11
- Using the *SLC ConnectReach* System Utility 4-13

Using the Configuration Commands 4-17

- Basic Procedure For Using the Configuration Commands 4-17
- Configuring the Network T1/DSX-1 Interface 4-22
- Configuring the Secondary/Fractional T1/DSX-1 Interface 4-27
- Configuring DS0 Provisioning 4-32
- Configuring the Synchronous Interface 4-39
- Configuring the Ethernet Interface 4-49
- Configuring the Channel Bank Mode 4-52
- Configuring Digital Trunks 4-62
- Configuring Analog Trunks 4-68
- Configuring Lines 4-74
- Configuring Extensions 4-87
- Configuring Dialing 4-89

- Configuring Voice Mail 4-97
- Configuring Passwords 4-102
- Configuring the DHCP Service 4-108
- Configuring the SNMP Service 4-110
- Configuring Routes 4-112
- Using ARP 4-116
- Configuring NAT and PAT 4-119
- Configuring the Default Firewall 4-127
- Configuring NTP 4-137
- Configuring the DNS Server 4-138
- Configuring QOS 4-140
- Configuring SYSLOG 4-146
- Configuring the RS-232 Interface 4-154
- Configuring FTP Log Dump 4-156
- Setting Features 4-158
- Displaying Current Configuration Settings 4-160
- Using Template Archive 4-161
- Setting All Configuration Settings to Default 4-161

Reconfiguring the *SLC ConnectReach* System 4-165

- Session Choices for Accomplishing Reconfiguration 4-165

About This Chapter

Introduction

Contents

This chapter provides the procedures for setting up and configuring the *SLC® ConnectReach™* system in a staging area prior to installation. This chapter also includes information that can be used to reconfigure the *SLC ConnectReach* system remotely after it has been installed.

Preparing the *SLC® ConnectReach™* System for Initial Configuration

Equipment Required to Set Up the *SLC ConnectReach* System

List of required equipment

In order to initially configure the *SLC ConnectReach* system, you will need the following components and equipment:

- A *SLC ConnectReach* system unit with a 120 V AC power supply transformer and power cord or a DC power cord.
- A computer equipped with a terminal emulation application for null modem or dial up modem connections. This can be an IBM*-compatible personal computer (PC) running an application such as *HyperTerminal*, or a UNIX† workstation running *tip*, or any computer running a similar application. The Telnet application is used for Ethernet connections.
- A connection between the *SLC ConnectReach* system and a computer terminal that can be accomplished in one of the three following ways:
  - A modem and cable for remote connection.
  - A null modem cable to connect to the serial port of a local computer terminal. For information about the pin assignments on the **RS-232** connector, refer to Chapter 5, "Installation".
  - An Ethernet cross-over cable to connect to the Ethernet port on a computer equipped with an Ethernet card (required only when a PC is being connected to the *SLC ConnectReach* system **10BASE-T** port). A PC can also be connected to the *SLC ConnectReach* system **10BASE-T** port by means of an Ethernet hub using a standard cable.
- If the *SLC ConnectReach* system is being configured from the craft interface terminal (CIT) at the *SLC*-2000 RT/HDT, the following connections must be made:
  - The T1 connection must be made at the *SLC ConnectReach* system **NETWORK T1 LINE** port
  - The CIT must be connected to the **CIT** connector on the *SLC*-2000 RT/HDT user interface panel (UIP).

* IBM is a registered trademark of the International Business Machines Corporation.

† UNIX is a registered trademark in the United States and other countries, licensed exclusively through X/Open Company Limited.

Making Connections to the *SLC ConnectReach* System

Introduction

There are four ways to obtain initial access to the *SLC ConnectReach* system in order to perform configuration procedures:

- Connect a computer directly to the **RS-232** port on the *SLC ConnectReach* system using a null modem cable.
- Connect a modem to the **RS-232** port on the *SLC ConnectReach* system using a standard serial cable and then dial up that modem from a remote computer.

  The default settings to use for the connection at the **RS-232** port are as follows:

  — 9,600 baud

  — Eight data bits

  — One stop bit

  — No parity

  — Hardware flow control.
- Connect a computer, running the *CTRM* terminal emulator software, or an American standard code for information interchange (ASCII) terminal to the **CIT** connector on the *SLC*-2000 RT/HDT UIP and access the *SLC ConnectReach* system by means of the T1 network interface. This arrangement requires Software Release 3.0.5 (R3.0.5) or later for the *SLC ConnectReach* system and R4.7 or later for the *SLC*-2000 RT/HDT.

  The default settings to use for the **CIT** are as follows:

  — Full duplex

  — Eight data bits

  — One start bit

  — One stop bit

  — No flow control

  — Baud rate set the same as the **SET-BAUD** UIP command.

(Continued on next page)

Making Connections to the *SLC ConnectReach* System (Continued)

Introduction (continued)

- Connect a computer directly to the **10Base-T** (Ethernet) port on the *SLC ConnectReach* system using an Ethernet cross-over cable or connect a computer to the *SLC ConnectReach* system **10BASE-T** port by means of an Ethernet hub using a standard cable. For this connection, the computer must have a network interface card installed. The default IP address setting for the *SLC ConnectReach* system Ethernet connection is 192.168.0.1 with a subnet mask of 255.255.255.0. The IP address and netmask for the TCP/IP protocol of the network interface card should be set at 192.168.0.2 and 255.255.255.0, respectively.

  Once the computer has been configured with the correct IP address to enable it to communicate with the *SLC ConnectReach* Ethernet interface, the *SLC ConnectReach* system supports the following sessions:

  — A Telnet session over the Ethernet using a Telnet application. Once the Telnet session is initiated, the user interface is identical to the console session.

  — A hypertext transfer protocol (HTTP) session using the Ethernet interface and a Web browser.

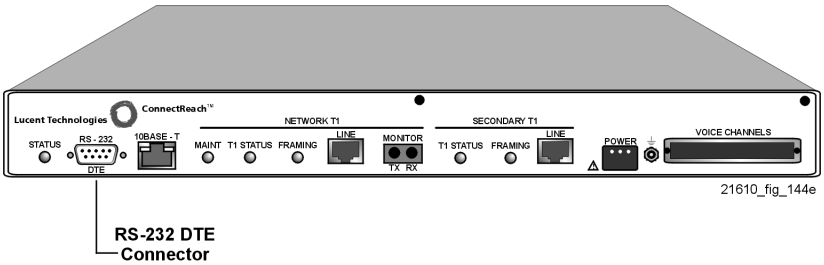
(Continued on next page)

Making Connections to the *SLC ConnectReach* System (Continued)

Connection at the RS-232 port

Connecting a Computer Directly to the RS-232 Port

Make the following connections when using a local computer to configure the *SLC ConnectReach* system:

Step	Procedure
1	Connect one end of a null modem cable to the serial port on the computer.
2	Connect the other end of the null modem cable to the **RS-232** connector on the *SLC ConnectReach* system, shown in the following figure. **NOTE:** The **RS-232** connector is a data terminal equipment (DTE) device and requires a null modem cable when connected to a computer.  ***T1 / DSX-1*** **Stop! End of Procedure.**

(Continued on next page)

Making Connections to the *SLC ConnectReach* System (Continued)

Connection at the RS-232 port (continued)

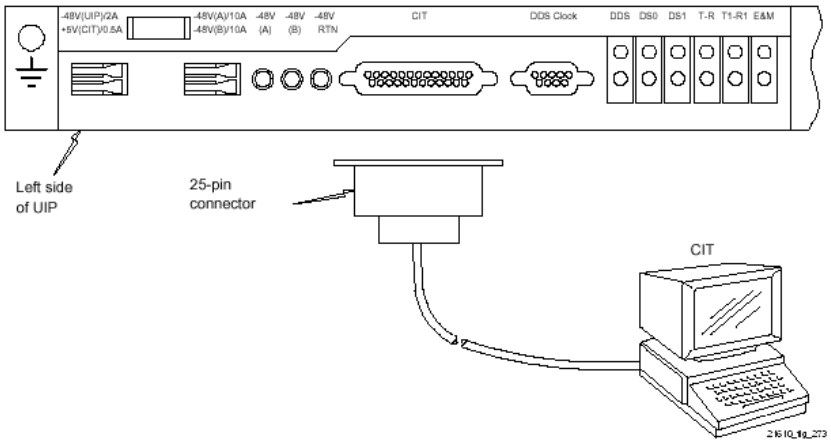
Connecting a Remote Computer to the RS-232 Port

Make the following connections when using a remote computer to configure the *SLC ConnectReach* system:

Step	Procedure
1	Connect a modem cable from the modem to the **RS-232** connector on the *SLC ConnectReach* system.
2	Connect the modem line cord to a telephone line jack. **Stop! End of Procedure.**

Connection at the *SLC*-2000 RT/HDT

Make the following connections when using a CIT at the *SLC*-2000 RT/HDT user interface panel (UIP) to configure the *SLC ConnectReach* system:

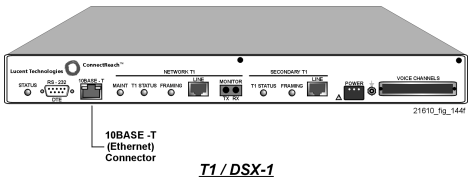
Step	Procedure
1	Connect one end of an RS-232 cable to the **COM1** port on the computer or ASCII terminal (use a 9-pin to 25-pin converter, if necessary).
2	Press the cover door of the UIP to gain access to the **CIT** port.
3	Connect the other end of the RS-232 cable to the (UIP) **CIT** port (refer to the following figure).  **Stop! End of Procedure.**

(Continued on next page)

Making Connections to the *SLC ConnectReach* System (Continued)

Connection at the 10Base-T (Ethernet) port

Make the following connections when using a local computer to configure the *SLC ConnectReach* system:

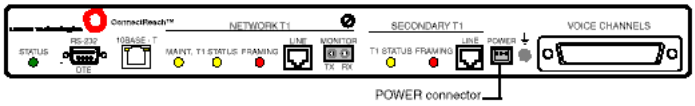
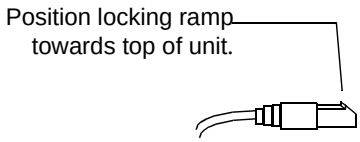
Step	Procedure
1	If connecting the computer to the **10BASE-T** (Ethernet) connector on the *ConnectReach* system by means of an Ethernet hub, continue with Step **2**. Otherwise, proceed to Step **4**.
2	Connect one end of a 10BASE-T Ethernet cable to the network interface card on the computer and the other end to the appropriate port on the Ethernet hub.
3	Connect a second 10BASE-T Ethernet cable between the Ethernet hub and the **10BASE-T** connector on the *ConnectReach* system. **Proceed to Step 6**.
4	Connect one end of a crossover cable to the **10Base-T** (Ethernet) connector on the *SLC ConnectReach* system, shown in the following figure. 
5	Connect the other end of the crossover cable to a network interface card on the computer.
6	Set the Internet protocol (IP) address and netmask for transport control protocol/Internet protocol (TCP/IP) of the network interface card using the following example: IP address: 192.168.0.2 (or another address on the same network, 192.168.0.2 — 192.168.0.255) Netmask: 255.255.255.0 **Stop! End of Procedure.**

(Continued on next page)

Making Connections to the *SLC ConnectReach* System (Continued)

Power connection

The *SLC ConnectReach* system can be powered by either a 120 V AC power supply transformer or from a 48-volt power source such as central office (CO) battery or an approved DC battery backup unit. For more information about the power requirements for the *SLC ConnectReach* system, refer to Chapter 5, "Installation". Make power connections to the *SLC ConnectReach* system as follows:

Step	Procedure
1	Plug in the power cable from the power supply source into the **POWER** connector on the *SLC ConnectReach* system. The location of the **POWER** connector is shown in the following figure.
	 T1/DSX-1
2	Position the power cable connector so that the locking ramp is toward the top of the *SLC ConnectReach* system, as shown in the following figure. 
3	Plug in the AC power supply transformer into a 120 V AC receptacle or turn on the circuit breaker switch as appropriate.
4	Observe the light emitting diodes (LEDs) on the *SLC ConnectReach* system to verify that the unit is starting up successfully. Requirement: The **STATUS**, **NETWORK T1** - **T1 STATUS**, and **NETWORK T1** - **FRAMING** LEDS are lighted. **Stop! End of Procedure.**

Initiating a Session with the *SLC ConnectReach* System

From a computer connected to RS-232 port

After you have connected a computer or modem to the *SLC ConnectReach* system, start a serial terminal emulation application to initiate a communications session. For example, you can start an application such as *tip* on a UNIX workstation, or *HyperTerminal* on Microsoft Windows.

From the CIT at *SLC*-2000 RT/HDT

Perform the following procedure to initiate a session with the *SLC ConnectReach* system:

Step	Procedure
1	Press the user interface panel **Escape** button and then the **Scroll Menu** down arrow button until ***SET-BAUD: <ent>*** is displayed. Press the user interface panel **Enter** button then the **Scroll Menu** down arrow button until the desired baud rate is displayed (9,600 is the default for the terminal emulator software and UIP). Press **Enter** to set the CIT baud rate.
2	Turn on the CIT, set the terminal parameters described previously, and start the *CTRM* terminal emulator application.
3	Enter a question mark (?) or RETURN. CIT prompts with: **`/* Enter 1 to continue */`** **`subsystem =`**
4	Enter **`1`**.
5	The CIT will respond with "**`login`** <" (enter **`LUC01`**, **`LUC02`**, or **`LUC03`**) and "**`password`**" (enter **`SLC-2000`**). Response: The CIT will display a SONET alarm summary generated by the **`rtrv-alm: all`** command. The CIT will then display a prompt.
6	Move to the DLC subsystem side by entering **`dlc`** at the CIT prompt.

(Continued on next page)

Initiating a Session with the *SLC ConnectReach* System (Continued)

From the CIT at *SLC*-2000 RT/HDT (continued)

Step	Procedure

7	At the CIT prompt, enter:
	
	`ACCESS-DT::dt-`*`mds#-cu#`*`;`
	
	Where: *mds#* = Metallic distribution shelf number (1 — 8) housing DT Server
	cu# = Channel unit slot number (1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, or 23 for 12-line DTs or 1, 5, 9, 13, 17, or 21 for 24-line DTs) of MDS slot housing DT Server.
	
	Example: `ACCESS-DT::dt-2-1;`
	
	Response: `/* Hit return to connect to DT.`
	`To exit type dlc. */`
	
	Stop! End of Procedure.

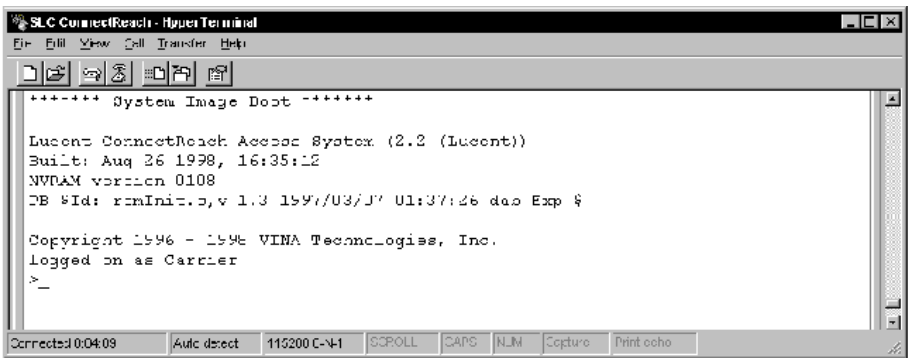
Using the *SLC ConnectReach* System Utility

Description

After the computer terminal is connected to the *SLC ConnectReach* system using a terminal emulation application, the *SLC ConnectReach* system activates the utility program which allows the computer to communicate with the *SLC ConnectReach* system to issue commands and receive messages from the *SLC ConnectReach* system. During start-up, the utility causes a series of session start-up messages and a command prompt to appear in the console window. This prompt, a greater-than symbol (**>**), is the *SLC ConnectReach* system Utility Main Menu prompt, as shown in the following figure.

NOTE:
These messages are not displayed if the power was applied before the terminal program was started. The Main Menu prompt (**>**) will be the only thing appearing on the screen. To display these messages, enter the `version` command.

NOTE:
The following screen display is only an example of what may appear on your console window. The actual display will depend on the version of software in the *SLC ConnectReach* system. Refer to the appropriate software release description for additional information.



(Continued on next page)

Using the *SLC ConnectReach* System Utility (Continued)

Entering commands

At the Main Menu prompt, you can enter a set of commands called the Main Menu commands.

These commands are not case sensitive. You can abbreviate a command to the minimum number of characters that uniquely identify the command. For example, you can enter the `configure` command by typing the first three characters:

```
> con
```

After you enter a command, the *SLC ConnectReach* system Utility either executes the command or displays a submenu command prompt. For example, if you enter the `configure` command, the Config submenu prompt appears:

```
(config) >
```

At the Config prompt, you can enter the commands to configure specific sets of commands. Each set has its own submenu, where a new prompt is displayed. For example, when you enter the command to configure the Ethernet interface, the prompt changes to:

```
(config:Ethernet)>
```

After completing the configuration for each component, you return to the Config menu by entering the `exit` command or an exclamation point (**!**) (quoted as “\ |” through the *SLC-2000* Access System CIT).

Getting online help

At any time, you can display a list of the commands in the current menu by typing a question mark (**?**). If you enter a question mark after partially typing a command, the options for that specific command are displayed. Otherwise, a list of the currently available commands is displayed. The default settings are enclosed in brackets.

In addition to the question mark, each menu has a `help` command. The `help` command displays a brief explanation of each command on the current menu.

(Continued on next page)

Using the *SLC ConnectReach* System Utility (Continued)

Exiting the Utility

When you are finished configuring the *SLC ConnectReach* system, you should exit the Utility by using the `exit` command at the Main Menu prompt.

The *SLC ConnectReach* system Utility allows only one management session at a time. Exiting the Utility allows another administrator to connect to the *SLC ConnectReach* system and configure or monitor it.

A *SLC ConnectReach* system management session can override another session in the following ways:

- If another session is already in progress, and you start a new session, you will be notified that another user is logged in and asked whether you wish to override that user.
- If you have a management session in progress, and another administrator overrides your session, you will be notified that your session has been overridden.

(Continued on next page)

Using the *SLC ConnectReach* System Utility (Continued)

Using the Main Menu commands

The following table lists the commands available at the Main Menu prompt.

To…	Enter this command…
Display Online Help for the commands currently available	? (question mark)
Configure the *SLC ConnectReach* system	`config`
Display statistics about the *SLC ConnectReach* system	`statistics`
Upgrade the *SLC ConnectReach* system with new software using the network and to switch the system into the maintenance mode for `xmodem-download` command execution	`network-upgrade`
Upgrade the *SLC ConnectReach* system with new software using a modem or direct connection to PC by means of the RS-232 port	`xmodem-download`
Save the current configuration or retrieve a configuration from a remote computer	`archive`
Display version and uptime information	`version`
Show the hardware configuration	`show-hardware-config`
View a log of events	`log`
Display a channel state or set an analog voice channel to a known state for testing	`diagnose`
Check that a device is communicating on the network	`ping`
Trace the route between two points on the network	`traceroute*`
Reboot the *SLC ConnectReach* system with minimal interruption of existing voice connections if T1 feeder is TR-08. Existing voice calls are dropped if T1 feeder is TR-303. All data connections are interrupted.	`warm-start`
Reboot the *SLC ConnectReach* system with interruptions of both voice and data connections	`cold-start`
Reboot the *SLC ConnectReach* system Slave with minimal interruption of existing voice connections	`slave-warm-start`†
Reboot the *SLC ConnectReach* system Slave with interruptions of both voice and data connections	`slave-cold-start`†
Get online assistance	`Help`
Exit the *SLC ConnectReach* system Utility and disconnect from the *SLC ConnectReach* system	`exit`

* This command available only in systems with R5.0.1 and later.

† This command available only in systems prior to R5.0.1.

Using the Configuration Commands

Basic Procedure For Using the Configuration Commands

Introduction

A list of all configuration menu commands is given in the following table. The command(s) associated with a particular feature will appear only if that feature is available (activated).

To…	Enter this command…
Configure the Network T1/DSX-1 interface to the carrier CO	`Network-t1`
Configure the Secondary T1/DSX-1 or Fractional T1/DSX-1 interface	`Secondary-t1` or `Fractional-t1`
Specify the split between voice and data T1 DS0s and to specify emulated channel units	`DS0-Provisioning`
Configure the synchronous interface	`Synchronous-interface`
Configure the Ethernet interface to the local area network (LAN)	`Ethernet`
Configure telephony functionality for channel-bank mode	`Channel-bank`
Configure digital trunks	`Digital-trunk`
Configure analog trunks	`Analog-trunk`
Configure lines	`Line`
Configure (Map) Line Extensions	`Map-Extensions`
Configure dialing	`Dialing`
Configure Attached Voice Mail System	`Voice-Mail`
Configure user names and passwords	`Password`
Configure the Internet protocol (IP) address allocation service	`DHCP`
Configure the simple network management protocol (SNMP) service	`SNMP`
Configure the default route(s)	`Route`
Configure network address translation (NAT)	`NAT`
Configure Firewall support	`FIREWALL`
Configure network time protocol (NTP)	`NTP`
Configure domain name service (DNS)	`DNS`
Configure quality of service (QOS)	`QOS`
Configure a Telnet port	`Telnet`
Configure a Web browser port	`HTTP`
Set or clear MAC/IP address mapping	`ARP`

(Continued on next page)

Basic Procedure For Using the Configuration Commands (Continued)

Introduction (continued)

To…	Enter this command…
Configure the RS-232 port	`RS232`
Configure syslog monitoring facility	`syslog`
Configure log on for file transfer protocol (FTP) download	`Ftp-log-dump`
Display features	`features-show`
Set features	`set-features`
Allows creation of configuration settings for remote *SLC ConnectReach* system	`template-archive`
Show all configuration settings	`show`
Save the configuration settings in the *SLC ConnectReach* system	`save`
Set all configuration commands to their default values	`default`
Set all configuration commands to their default values, retaining the Ethernet, password, and RS232 commands	`preserve-default`
Access online assistance	`Help`
Exit the Config prompt and return to the Main Menu prompt	`exit`

Every configuration command has default settings, including IP addresses. The default settings for each configuration command are displayed on screen in brackets after you enter a question mark (**?**) at the `Config` prompt.

(Continued on next page)

Basic Procedure For Using the Configuration Commands (Continued)

Introduction (continued)

Every configuration command has default settings, including IP addresses. The default settings for each configuration command are displayed on screen in brackets after you enter a question mark (?) at the `Config` prompt.

Basic steps in configuring and saving new settings

The following steps provide the basic procedure for entering configure commands and saving the configuration settings:

Step	Procedure
1	At the Main Menu prompt, enter the `configure` command. > **`config`** Press the **ENTER** key and the prompt changes to the Config prompt where you can enter the Configuration commands. **`(config)>`**
2	At the Config prompt, enter the appropriate Configuration commands or type a question mark (**?**) for a list of all available commands.
3	After you use the configuration commands, you must save your configuration settings in nonvolatile random access memory (NVRAM). To save the configuration settings, enter the `save` command at the Config prompt. **`(config)> save`** **NOTE:** If you do not wish to save the configuration settings that you have entered, you can discard them by using the `exit` command, explained in the next step, instead of the `save` command.
4	Enter the `exit` command: **`(config)> exit`** If you did not save the configuration settings as instructed in Step 3, you will receive the following prompt: **`Do you really want to abandon your changes? [n]y:`** Type **`y`** to display the original configuration. **Stop! End of Procedure.**

(Continued on next page)

Basic Procedure For Using the Configuration Commands (Continued)

Activating new configuration settings

Some commands are activated and take effect as soon as you enter the `save` command, but others require that you reboot the *SLC ConnectReach* system, using either the `warm-start` or `cold-start` command, before the new settings take effect. The following table indicates which commands require a reboot to take effect and which type of reboot is required.

Commands Requiring the Save Command to Take Effect:			
Analog Trunk	Channel Bank	Dialing	Digital Trunk
DS0-Provisioning* (all commands except ConnectReach and Analog-begin)		Ethernet (all commands except IP or secondary-IP)	
Firewall	Lines	Map-Extensions	NAT/PAT
NTP	Password	QOS	RS-232
Synchronous-Interface: changing IP addressing	SYSLOG	template-archive	Voice-Mail
Commands Requiring the Save and Warm-Start Commands to Take Effect:			
Default	DHCP	DNS (enable on/off)	Ethernet (IP or secondary-IP)
Network-T1 other than Clock	Preserve-Default	Route	Secondary-T1 or Fractional-T1
Set-Features	Synchronous-Interface (All commands except IP addressing)		
Commands Requiring the Save and Cold-Start Commands to Take Effect:			
ARP	ConnectReach	Cross-connect (channel-bank submenu); Network-T1 Clock	
DS0-Provisioning*	HTTP Port	SNMP (enabling/ disabling, changing host)	Telnet Port

* DS0-Provisioning command requires the Save and Cold-Start commands if the begin channel value in any of the ranges is changed. Otherwise, use only the Save command.

To reboot the *SLC ConnectReach* system, enter the appropriate command at the Main Menu prompt:

> **`warm-start`**
or
> **`cold-start`**

(Continued on next page)

Basic Procedure For Using the Configuration Commands (Continued)

Activating new configuration settings (continued)

NOTE:
Using the `warm-start` command to reboot a *SLC ConnectReach* system providing TR-08 service and feeding a *SLC*-2000 HDT interrupts all existing data connections for up to 60 seconds. Existing voice connections may have their speech path interrupted for up to one tenth of a second during the restart process. The calls will **not** be disconnected, but new connections cannot be made for up to 60 seconds. Using the `warm-start` command to rebooting a *SLC ConnectReach* system providing TR-303 service drops all existing calls.

Rebooting the *SLC ConnectReach* system with the `cold-start` command interrupts both voice and data connections. All connections are lost. New connections cannot be made for up to 60 seconds.

If you set up login names during the initial configuration, when the *SLC ConnectReach* system reboots, the Utility prompts you to enter a login name and password. Information about login names is presented later in this chapter.

CAUTION:
Do not press any keys on the keyboard during the reboot process. If a key has been pressed during a one second checking interval while the SLC ConnectReach *system is rebooting, the* SLC ConnectReach *system will boot into the Monitor mode. The Monitor mode allows the RS-232 and 10Base-T ports to be operational. To exit the Monitor mode, restart the* SLC ConnectReach *system and do not press any keys during the reboot process.*

Archiving configuration settings

In the event that the *SLC ConnectReach* system loses the configuration settings stored in nonvolatile random access memory (NVRAM), it is suggested that the configuration information be stored (archived) in a remote computer so that the information can be restored without having to enter all of it again.

The `archive` command, located in the Main Menu, is used to upload the configuration settings to a remote computer and download the saved configuration settings from the remote computer. The `archive` command also allows you to download identical or nearly identical settings to multiple *SLC ConnectReach* system units from a remote computer.

For more information concerning the use of the `archive` command to upload and download configuration settings from a remote computer, refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing".

Configuring the Network T1/DSX-1 Interface

Introduction

Before configuring the Network T1/DSX-1 interface of the *SLC ConnectReach* system, you must determine how the DS1 signal on the network carrier facility has been configured by the carrier.

Key commands

The key commands that must match the carrier's configuration are as follows:

Framing Format

The *SLC ConnectReach* systems equipped with software earlier than R3.6.3 support the three most common T1 framing formats: Extended Superframe (*ESF*), Superframe (SF or *D4*), and the Bellcore defacto standard frame adapted to a single T1 link (TR-TSY-000008 or TR08). *However, the **ESF** framing format should always be selected to assure compatibility with the* SLC*-2000 Access System remote terminal/host digital terminal (RT/HDT).*

This command is not available in *SLC ConnectReach* systems equipped with software R3.63 and later. The framing format defaults to ESF.

Line Coding

The T1 line coding formats offered by the *SLC ConnectReach* system are bipolar 8 zero substitution (B8ZS) and alternate mark inversion (AMI). *However, the **B8ZS** line coding format should always be selected to assure compatibility with the* SLC*-2000 Access System RT/HDT.*

(Continued on next page)

Configuring the Network T1/DSX-1 Interface (Continued)

Key commands (continued)

Line Buildout	T1 line buildout is configurable to 0 dB, –7.5 dB, or –15 dB, as required by Federal Communications Commission (FCC) Part 68. Buildout sets the *SLC ConnectReach* system's output T1 transmission signal level (0 dB is the highest level and –22.5 dB is the lowest level). The default, *0 dB*, is the most common signal level for connection to the carrier. If line buildout is set incorrectly, the carrier may detect errors ranging from bipolar violations (line buildout too high) to loss of signal (line buildout too low).
Clock Source	Always select network.
Pulse Density Enforcement	Always set to *off*.
Alarm Operation	This option controls whether the network T1/DSX-1 going down causes the alarm relay to close. Refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing", for more information.
Alarm Delay	This option sets the delay between when the T1 alarm is cleared and the relay returns to an unalarmed state. For example, if the delay is set for 15 seconds, the alarm relay will go from alarm to no alarm 15 seconds after the T1 alarm clears.
Is Slave	This option designates one of the two *ConnectReach* systems in a 48-line master/slave configuration as the slave unit. Refer to Chapter 5, "Installation" for details on the 48-line master/slave configuration.

(Continued on next page)

Configuring the Network T1/DSX-1 Interface (Continued)

Procedure

After you have determined the carrier's configuration, follow these steps to configure the network T1/DSX-1 interface:

Step	Procedure
1	At the Config prompt, enter the `network-t1` command: `(config)>` **`network-t1`** The prompt changes to the Config:Network T1 prompt. `(config:Network-t1)>`
2	At the Config:Network T1 prompt, enter the appropriate commands from the following table. The default setting for each command appears in brackets.

(Continued on next page)

Configuring the Network T1/DSX-1 Interface (Continued)

Procedure (continued

Step	Procedure
2 cont.	

To	Enter this command...	...and one of these options
Enable Network T1/DSX-1	`enable`	`off, [on]`
Set the framing format	`framing*`	`[ESF], D4, TR08`
Set the line coding format	`linecode`	`[B8ZS], AMI`
Set the build out in feet or decibels †	`buildout`	`[0-133ft(DSX)/ 0dB(CSU)], 133-266ft(DSX), 266-399ft(DSX), 399-533ft(DSX), 533-655ft(DSX), –7.5dB(CSU), –15dB(CSU), -22.5dB(CSU)`
Set the clock source (this option only available if internal clock exists)	`clock`	`[network], internal`
Comply with ones density specification (applies only to AMI line coding)	`pulse-density-enforce`	`[off], on`
If set to on, an alarm on Network T1/ DSX-1 will cause the alarm relay to close	`alarm-operation`	`off, [on]`
Sets the delay between a Network T1/ DSX-1 alarm and closing of the alarm relay	`alarm-delay`	`0..[15]..3600 sec`
Set the *SLC® ConnectReach™* system as a slave to another *SLC ConnectReach* system (allows for 25-48 ports for voice only)‡	`is-slave`	`[off], on`
Sets the number of bipolar violations allowed and shelf emulation	`Modify-tr08-data`§	
Access online assistance	`Help`	

* This command is not available on systems with software R5.0.1 and later.

† The line buildout command may be specified for connection to a channel service unit (CSU) or to a digital signal cross-connect (DSX). For a CSU, the value is specified in decibels (dB); for a DSX, the value is specified in feet.

‡ All of the channel units for the DS0-Provisioning:ConnectReach command must also be set to none to allow for a slave.

§ This command is not used and not available on systems with software R5.0.1 and later.

Configuring the Network T1/DSX-1 Interface (Continued)

Procedure (continued)

Step	Procedure
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **Stop! End of Procedure.**

Configuring the Secondary/Fractional T1/DSX-1 Interface

Introduction

A secondary/fractional T1/DSX-1 interface can be used to connect the *SLC ConnectReach* system to a voice or data system by means of a fractional daughter card. The secondary/fractional T1/DSX-1 interface can also be used to connect a stand alone *ConnectReach* system as a slave to support up to 24 additional foreign exchange station (FXS) lines. Examples of voice systems are key system, PBX, or channel bank. A data system is connected by means of a CSU/DSU and a router.

If the secondary/fractional T1/DSX-1 interface will be used to connect the *SLC ConnectReach* system to the telephone system, you must determine how the T1 service has been configured in the PBX or key system.

Key commands

The key commands that must match the PBX or key system's configuration are as follows:

Framing Format The *SLC ConnectReach* system offers the two most common T1 framing formats: Extended Superframe (*ESF*) and Superframe (SF or *D4*).

Line Coding The T1 line coding formats offered by the *SLC ConnectReach* system are bipolar 8 zero substitution (B8ZS) and alternate mark inversion (AMI). T1 line coding determines how the T1 requirement for ones density is handled. In every eight bits of information, at least one pulse must be present. If the T1 service uses *AMI* line coding, it is important to enable the *pulse density enforcement* option (described on next page). If the T1 service uses *B8ZS* line coding, a bipolar violation (BPV) is automatically inserted in place of a string of eight zeros during transmission. At the receiver, the original data stream is regenerated as a result of the BPV. In this configuration, the pulse density enforcement option is ignored.

(Continued on next page)

Configuring the Secondary/Fractional T1/DSX-1 Interface (Continued)

Key commands (continued)

Line Buildout

T1 line buildout is configurable to 0 dB, –7.5 dB, or –15 dB, as required by FCC Part 68. Buildout sets the *SLC ConnectReach* system's output T1 transmission signal level (0 dB is the highest level and -15 dB is the lowest level). The default, *0 dB*, is the most common signal level for connection to the carrier. If line buildout is set incorrectly, the carrier may detect errors ranging from bipolar violations (line buildout too high) to loss of signal (line buildout too low).

Pulse Density Enforcement

This option is used when *AMI* line coding is selected (see the description of line coding presented earlier). Per the AT&T TR-62411 ACCUNET specification, bit stuffing must be enabled when AMI line coding is selected. This ensures that ones density requirements are met (see ANSI standard T1.403, paragraph 5.6).

Alarm Operation

This option controls whether the secondary/fractional T1/DSX-1 going down causes the alarm relay to close. Refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing", for more information.

Alarm Delay

This option sets the delay between the secondary/fractional T1/DSX-1 alarm and the closing of the alarm relay.

Has Slave

This option allows the *SLC ConnectReach* system to serve as the master unit in a 48-line master/slave configuration. Refer to Chapter 5, "Installation" for details on the 48-line master/slave configuration.

NOTE:
The clock source for the secondary/fractional T1/DSX-1 is always internal, synchronous to the network T1/DSX-1.

(Continued on next page)

Configuring the Secondary/Fractional T1/DSX-1 Interface (Continued)

Procedure

After you have verified the required configuration, follow these steps to configure the secondary/fractional T1/DSX-1 interface for the *SLC ConnectReach* system:

Step	Procedure
1	At the Config prompt, enter the **`secondary-t1`** (T1/DSX-1 interface) command: `(config)>` **`secondary-t1`** or `(config)>` **`fractional-t1`** The prompt changes to the Config:Secondary T1 or Config:Fractional T1 prompt. `(config:Secondary-t1)>` or `(config:Fractional-t1)>`

(Continued on next page)

Configuring the Secondary/Fractional T1/DSX-1 Interface (Continued)

Procedure

Step	Procedure
2	At the Config:Secondary/Fractional T1 prompt, enter the appropriate commands from the following table. The default setting for each command appears in brackets.

To	Enter this command...	...and one of these options
Enable secondary/fractional T1/DSX-1	`enable`	`On, [Off]`
Set the framing format	`framing`	`[ESF], D4`
Set the line coding format	`linecode`	`[B8ZS], AMI`
Set the build out in feet or decibels*	`buildout`	`[0-133ft(DSX)/ 0dB(CSU)], 133-266ft(DSX), 266-399ft(DSX), 399-533ft(DSX), 533-655ft(DSX), –7.5dB(CSU), –15dB(CSU), –22.5dB(CSU)`
Comply with ones density specification (applies only to AMI line coding format)	`pulse-density-enforce`	`On, [Off]`
Enables the alarm operation	`alarm-operation`	`[off], on`
Sets the delay between a secondary/fractional T1/DSX-1 alarm and closing of the alarm relay.	`alarm-delay`	`0..[15]..3600 sec`
Set the secondary/fractional T1/DSX-1 to accept a slave from a stand alone *ConnectReach* system (allows for 25-48 ports for voice only).	`has-slave`	`[off], on`
Access online assistance	`Help`	

* The line buildout command may be specified for connection to a CSU or to a DSX. For a CSU, the value is specified in decibels (dB); for a DSX, the value is specified in feet.

(Continued on next page)

Configuring the Secondary/Fractional T1/DSX-1 Interface (Continued)

Procedure (continued)

Step	Procedure
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **Stop! End of Procedure.**

Configuring DS0 Provisioning

Introduction

A T1 consists of 24 time-division multiplexed channels, which are called DS0s. The DS0 provisioning menu maps ranges of DS0s to any of these destinations:

Analog	Voice (DS0s) to analog (FXS and FXO) ports
Data	Data (DS0s) for Ethernet hosts or for the *SLC ConnectReach* system's internal router
Secondary/Fractional T1/DSX-1 voice	Voice (DS0s) for a PBX or channel bank connected to the Secondary/Fractional T1/DSX-1 interface
Secondary/Fractional T1/DSX-1 data	Transparent data (DS0s) for a CSU/router connected to the Secondary/Fractional T1/DSX-1 interface
Alignment of Secondary/ Fractional T1/DSX-1	The DS0s on the Network T1/DSX-1 can be connected to the same DS0 numbers on the Secondary/Fractional T1/DSX-1 or the lowest numbered DS0 on the Network T1/DSX-1 that is assigned to the Secondary/Fractional T1/DSX-1 port can be connected to the first DS0 on the Secondary/Fractional T1/DSX-1. If the low option is used with the Secondary/Fractional T1/DSX-1 port and analog ports are enabled, a fractional T1/ digital signal processor (DSP) combination circuit card is required.
ConnectReach	Channel unit assignment to DS0 channels and change status of the *ClearReach* feature.

NOTE:
Secondary/Fractional T1/DSX-1 voice uses robbed bit signaling (RBS), which is the common method of transporting voice over T1. Secondary/ Fractional T1/DSX-1 data does not use RBS.

NOTE:
If the Alignment is set to the *low* option, do not begin the range of DS0s for either Secondary Voice or Secondary Data with DS0 number 3. Beginning the range with DS0-3 will cause a failure of the bit error rate (BER) test.

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Procedure

By default, the *SLC ConnectReach* system software sets the number of analog voice channels to the number of actual analog ports that are installed. It sets no channels for data. The range of the four destinations may not overlap each other.

Step	Procedure
1	At the Config prompt, enter the `DS0-provisioning` command: `(config)>` **`DS0-provisioning`** The prompt changes to the Config:DS0-provisioning prompt [`(config:DS0-provisioning)>`].

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Procedure (continued)

Step	Procedure
2	At the Config:DS0-provisioning prompt, enter the DS0 command from the following table and specify the ranges of analog and data channels.

Enter this command...	...and specify the value	Comments
analog-begin	[n] 0...24	Software automatically detects the number of voice channels. If no voice channels are found, 0 is entered.
analog-end	[n] 0...24	Sets value to the last voice channel detected.
sec-voice-begin	[0] 0...24	For network T1/DSX-1 interface use only.
sec-voice-end	[0] 0...24	For network T1/DSX-1 interface use only.
sec-data-begin	[0] 0...24	For network T1/DSX-1 interface use only.
sec-data-end	[0] 0...24	For network T1/DSX-1 interface use only.
data-begin	[0] 0...24	
data-end	[0] 0...24	
alignment-sec-t1	low*, same*	If set to the default value, *low*, the *SLC ConnectReach* system connects the lowest numbered DS0 on the Network T1/DSX-1 to the first DS0 on the Secondary/Fractional T1/DSX-1. If set to *same,* the DS0s on the Network T1/DSX-1 are connected to the same DS0 numbers on the Secondary/Fractional T1/DSX-1.
ConnectReach	DS0 range CU clearreach	Allows available channel units to be designated for DS0 channels and enables/disables the ClearReach™ feature.
Help		Access online assistance.

*The default setting is *low* for systems with software release prior to R5.0.1 and *same* for systems with R5.0.1 and later.

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Procedure (continued)

Step	Procedure
3	Assign available channel units to designated DS0 channels and, if necessary, enable/disable the *ClearReach* feature using the `ConnectReach` command. **NOTE:** Provisioning of the *SLC ConnectReach* system channel units is defaulted according to the hardware configuration of the system (FXS and FXO cards). If an *SPQ*®452 data channel unit or *SPQ*443 E *SPOTS*® channel unit is to be used, then it must be provisioned using the `ConnectReach` command. **NOTE:** The `ConnectReach` command must be executed before saving other DS0 provisioning values or a confirmation error message may be displayed.
4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change the begin channel in any of the ranges while using any of the `DS0` commands, the new command values do not take effect until you save the configuration and reboot the *SLC ConnectReach* system using the `cold-start` command. If you do not change the begin channel in any of the ranges, the new command values take effect as soon as you save the configuration. In this case you do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Examples of channel assignment schemes

Examples of channel assignment schemes are listed below:

- ***Configure full T1 bandwidth for data as follows:*** set data-begin to 1, data-end to *24*, and all other values to *0* (zero).
- ***Configure full T1 bandwidth for voice lines connected to the Secondary/Fractional T1/DSX-1 connector as follows:*** set sec/frac-t1-voice-begin to 1, sec/frac-t1-voice-end to 24, and all other values to *0* (zero).
- ***Configure half the T1 bandwidth for analog voice connections and half for data as follows:*** set analog-begin to 1, analog-end to 12, data-begin to 13, and data-end to 24.

NOTE:
There is a restriction in the same mode, that any DS0s used for analog voice must have lower channel numbers than any DS0s used for the Secondary/Fractional T1/DSX-1.

It is recommended that you always configure the voice channel range to start with the lowest numbered channel group (1—4) and increment from there. Configure the data channel range to start with the highest numbered channel group (21—24) and decrement from there. If some channels are unconfigured, it will be easier to make changes later if the unconfigured channels are between the voice range and the data range.

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Examples of channel assignment schemes (continued)

When the `ConnectReach` command is selected, the following is a sample of the display that will appear on the terminal monitor:

```
1-4              : 440      ([440] 443 452 456 400 none)
5-8              : 440      ([440] 443 452 456 400 none)
9-12             : 456      ([440] 443 452 456 400 none)
13-16            : none     ([440] 443 452 456 400 none)
17-20            : none     ([440] 443 452 456 400 none)
21-24            : 452      ([440] 443 452 456 400 none)
ClearReach-enable : on      (off [on])
Help
!
```

The left column in the display indicates a DS0 channel range. The middle column shows the currently configured channel unit. The right column shows all possible channel unit choices, including none, with the default choice in square brackets. In this specific example, for DS0 channels 1 through 4 and 5 through 8, *SPQ*®440(C,D) channel units are being emulated. An *SPQ*456 channel unit is emulated for DS0 channels 9 through 12 and an *SPQ*452 channel unit is emulated for DS0 channels 21 through 24. Since DS0 channels 13 through 16 and 17 through 20 have the “none” option, no channel unit is to be emulated in these positions.

The *SPQ*400 may only be provisioned in a *SLC ConnectReach* system operating as a secondary voice channel, and cannot provide the *ClearReach* feature.

To change channel unit assignments for a specific DS0 channel range, enter the following command:

`(config:DS0-provisioning:ConnectReach)>` *channel range channel unit*

Example:
`(config:DS0-provisioning:ConnectReach)> 1-4 443`

(Continued on next page)

Configuring DS0 Provisioning (Continued)

Example of *ClearReach* enabling/disabling

When the `ConnectReach` command is selected, the display on the terminal monitor will show a listing of the channel unit assignments, as described previously, and the status of the *ClearReach* feature. If it is necessary to change the status of the *ClearReach* feature, use the following syntax to make the appropriate change:

`(config:DS0-provisioning:ConnectReach)>` clearreach *on/off*

Example:
`(config:DS0-provisioning:ConnectReach)>` clearreach off

Configuring the Synchronous Interface

Introduction

You must specify Synchronous Interface Encapsulation for installations that use data channels. After you specify an encapsulation method, you must also configure the associated interface settings through the `Modify-encap-data` command. For example, if you set the encapsulation to point-to-point protocol (PPP), then you must also configure the PPP interface with the `Modify-encap-data` command.

Key commands

The following key commands are available using the `synchronous-interface` command:

Encapsulation Allows the selection of the encapsulation protocol to be frame relay, PPP, or high-level data link control (HDLC).

HDLC Inversion Enabling HDLC inversion helps the line comply with the ones density specification. Ones density applies only if the network T1/DSX-1 interface is configured to use AMI line coding, regardless of the encapsulation scheme being used on the synchronous interface.

Modify encap data Allows the selection of specific values appropriate to the chosen encapsulation scheme.

IP Unnumbered The *SLC ConnectReach* system allows the use of “Internet protocol (IP) unnumbered” WAN interfaces. An unnumbered interface is an interface that does not consume a unique IP address. This option is enabled by setting the `IP-address` command to *Enet*, indicating that this interface is to share the same IP address as the Ethernet interface.

RIP For each encapsulation there are four routing information protocol (RIP) options; *Enable*, *RxOnly*, *TxOnly* and *Disable*. If *RxOnly* RIP is selected, advertisements are accepted (that is, received). If *TxOnly* RIP is selected, advertisements are sent (that is, transmitted). Setting RIP to *enable* activates both transmit and receive. To turn off RIP, select *disable*.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Procedure

Step	Procedure
1	At the Config prompt, enter the synchronous-interface command: `(config)>` **`synchronous-interface`** The prompt changes to the Config:Synchronous-interface prompt. `(config:Synchronous-interface)>`

2	To set the synchronous interface encapsulation, enter the encapsulation command at the Config:Synchronous-interface prompt and the appropriate setting from the following table.
	
	Enter this command... / **...and specify this setting**
	`encapsulation` — [`Frame-relay`], `PPP`, `HDLC`
	`HDLC-inversion` — [`off`], `on`
	`modify-encap-data`
	`Help`

3	Enter the Modify-encap-data command to specify values appropriate to the chosen encapsulation scheme. The Modify-encap-data command changes the prompt to the selected encapsulation scheme.
	
	`(config:Frame-relay)>`
	or
	`(config:PPP)>`
	or
	`(config:HDLC)>`
	
	Refer to one of the following procedures that pertains to the selected encapsulation scheme to complete the configuration.

4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, except IP addressing, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. IP addressing takes effect when the save command is executed. **Stop! End of Procedure.**

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Using the frame relay modification menu

The *SLC ConnectReach* system uses the standard request for comment (RFC) 1490 to send IP packets over a frame relay connection. The local management interface (LMI)-type provides for two different signaling specifications, T1.617 (ANSI) and Q.933-annex-A [international telecommunication union/consultative committee for international telegraph and telephone (ITU/CCITT)]. The frame relay modification menu allows configuration for as many as 30 permanent virtual circuits (PVCs). At the Config:Synchronous-interface prompt, enter the Modify-encap-data command to access the frame relay commands listed in the following table:

Enter this command...	...and specify this value	Comments
PVC	(1...30)	Defines the specified PVC.
LMI-type	none,[T1.617-annex-D*], Q.933-annex-A†	Specify annex type of Local Management Interface (LMI).
N391‡	[6] 1...255	Specify the polling cycles for status of all permanent virtual circuits (PVCs).
N392‡	[3] 1...255	Specify the threshold for the monitored event counter.
N393‡	[3] 1...10	Specify the monitored event counter interval.
T391‡	[6] 1...10	Specify the time in seconds for LMI requests to be sent.
show-all-PVCs		Displays the configuration for all PVCs.
Help		Access online assistance.

* This setting is sometimes referred to as Annex D or ANSI.

† This setting is sometimes referred to as CCITT or ITU.

‡ It is recommended that you use the default values for these commands unless the carrier specifies otherwise.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands

PVC Configuration

Each PVC submenu allows the user to configure Data Link Connection Identifier (DLCI), IP commands, and Network Address Translation (NAT) options. There are three possible settings for NAT, they are *Pass*, *In*, and *Out*. Setting the NAT option to *Pass* allows all IP packets to pass through (ingress and egress) on the designated PVC. The *In* NAT option allows incoming (ingress) IP packets only for the specified PVC. The *Out* NAT option allows outgoing (egress) IP packets only for the specified PVC. In order for these NAT options to be effective, NAT must be enabled.

The *SLC ConnectReach* system's implementation of Inverse Address Resolution Protocol (InARP) is based on RFC 1293. It allows a router at the other end of the frame relay network to discover the IP address of the *SLC ConnectReach* system associated with a PVC. The *SLC ConnectReach* system passively responds to InARP requests by supplying its IP address.

Step	Procedure
1	At the Config:Frame-relay prompt, enter PVC*n* where *n* is any number from 1 to 30. `(config:Frame-relay)>` **`PVC1`** The prompt changes to the `Config:FrameRelay:PVC1` prompt. `(config:FrameRelay:PVC1)>`

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands (continued)

Step	Procedure
2	At the Config:FrameRelay:PVC1 prompt, enter the appropriate commands from the following table. The default setting for each command appears in brackets.

Enter this command...	...and specify this value	Comments
DLCI	[16]...991	Enter the assigned DLCI for the *SLC ConnectReach* system.
IP-address	*IP-address*, Enet*, [Disable]	Enter the IP address for the frame relay's interface, Enet or disable this command.
netmask	netmask	Enter a netmask value, such as 255.255.255.0.
RIP	Enable, RxOnly, TxOnly, [Disable]	Select the mode of RIP to use.
version-RIP	[1], 2	Select the version of RIP to use.
NAT	PASS, IN, [OUT]	Select the NAT option to use
SLA		Configure SLA
Help		Access online assistance.
* The Enet value assigns the primary Ethernet IP address (IP unnumbered).		

Stop! End of Procedure.

SLA Configuration

A service level agreement (SLA) is a contract between a carrier and a customer that specifies a measurable level of service the carrier will provide. SLAs offer a way to document the success or a network to meet the needs and expectations of the user.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands (continued)

Minimum and maximum levels of performance, reliability, security, and cost, defined in the SLA contract are based on customer requirements as well as service provider needs. The implementation of the SLA for the *SLC ConnectReach* system includes the measurements of end-to-end latency, below committed information rate (CIR) DDR, above CIR DDR ratios and various statistics on the PVC status. For ease of management a number of SLA SNMP traps have been made available. The SLA implemented for the *SLC ConnectReach* system is proprietary, therefore monitoring is possible between two or more *SLC ConnectReach* systems connected through a frame relay network. SLA statistics are stored in intervals of 15 minutes and kept for a period of 24 hours. All SLA statistics are based on the proprietary MIB. SLA requires the activation of the SLA feature key.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands (continued)

Step	Procedure
1	At the Config:Frame-relay:PVC*n* prompt, enter SLA. `(config:Frame-relay:PVC1)>` **SLA** The prompt changes to the `Config:FrameRelay:PVC1:SLA` prompt. `(config:FrameRelay:PVC1:SLA)>`
2	At the Config:FrameRelay:PVC1:SLA prompt, enter the appropriate commands from the following table. The default setting for each command appears in brackets.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enable SLA on this PVC.
`CIR`	`[0]...2048KB`	Specify committed information rate (CIR)
`LatencyThreshold`	`[0]...10000 ms`	This is an SNMP trap parameter. This trap is sent when the end-to-end latency exceeds the defined threshold.
`aboveCIRThreshold`	`[0]...10000`	This is an SNMP trap parameter. This trap is sent when the above CIR data delivery ratio drops below the defined threshold. The number specifies 1/100 of a percent (for example, 10000 = 100%).
`belowCIRThreshold`	`[0]...10000`	This is an SNMP trap parameter. This trap is sent when the below CIR data delivery ratio drops below the defined threshold. The number speicifes 1/100 of a percent (for example, 10000 = 100%).

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands (continued)

2 Cont.

Enter this command...	...and specify this value	Comments
PVCDownThreshold	[0]...100	This is an SNMP trap parameter. This trap is sent when the PVC down time exceeds the defined threshold. The number represents the number of times the PVC has been down within the 15 minute interval.
Help		Access online assistance.

The statistics described in the following table will be measured when SLA is enabled on a PVC.

Statistic	Sampling Interval	Description
End-to-End Latency	Once a minute	This is a running average of the current 15 minute interval. These units are in milliseconds.
Peak End-to-End latency	Once a minute	This is the peak latency so far during the current 15 minute interval. These units are in milliseconds.
Data Delivery Ratio Above CIR	Once a minute	A ratio of the number of bytes received over the number of bytes sent that are above the CIR. This is a percent value with units of measure as low as 1/100 of a percent.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Configuring using the PVC submenu commands (continued)

2 Cont.

Statistic	Sampling Interval	Description
PVC Up Time	Each time there is an SNMP request	The amount of time in milliseconds during the 15 minute interval where the PVC was reported up or active through the LMI.
PVC Down Time	Each time there is an SNMP request	The amount of time in milliseconds during the 15 minute interval where the PVC was reported down or inactive through the LMI.
PVC Down Time Totals	At the end of a 15 minute interval	The number of times during the 15 minute interval where the PVC was reported down or inactive.

Stop! End of Procedure.

(Continued on next page)

Configuring the Synchronous Interface (Continued)

Using the PPP commands

At the Config:Synchronous-interface prompt, enter the `Modify-encap-data` command to access the PPP commands listed in the following table:

Enter this command...	...and specify this value	Comments
`IP-address`	*`IP-address`*, `Enet*`, `[Disable]`	Enter the IP address for the PPP interface, Enet or disable.
`netmask`	`netmask`	Enter a netmask value, such as 255.255.255.0.
`RIP`	`Enable, RxOnly, TxOnly, [Disable]`	Select the mode of RIP to use.
`version-RIP`	`[1], 2`	Select the version of RIP to use.
`Help`		Access online assistance.

* The Enet value assigns the primary Ethernet IP address (IP unnumbered).

Using the HDLC commands

At the Config:Synchronous-interface prompt, enter the `Modify-encap-data` command to access the HDLC commands listed in the following table:

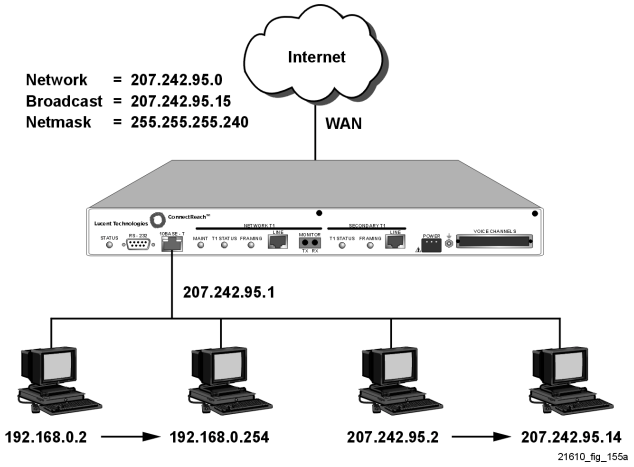
Enter this command...	...and specify this value	Comments
`IP-address`	*`IP-address`*, `Enet*`, `[Disable]`	Enter the IP address for the HDLC interface, Enet or disable.
`netmask`	`netmask`	Enter a netmask value, such as 255.255.255.0.
`RIP`	`Enable, RxOnly, TxOnly, [Disable]`	Select the mode of RIP to use.
`version-RIP`	`[1], 2`	Select the version of RIP to use.
`Help`		Access online assistance.

* The Enet value assigns the primary Ethernet IP address (IP unnumbered).

Configuring the Ethernet Interface

Introduction

If NAT is not enabled, the IP address must be that assigned to the site by the carrier. Otherwise, the IP addresses may be private. Refer to the following figure for an example of using the secondary IP address.



In the figure example, the network interface controller/Internet service provider (NIC/ISP) supplied 16 public IP addresses. One public IP address is used for the *SLC ConnectReach* system's Ethernet interface, one for the network, and one for the broadcast leaving 13 to assign to workstations. If there are more than 13 workstations as in this example, they would use private IP addressing with NAT to allow Internet access through the *SLC ConnectReach* system. Using the Ethernet menu, two logical Ethernet interfaces would be configured, one for public and one for private IP addressing.

NOTE:
The new command values, except IP address and secondary-IP, take effect as soon as you save the configuration. You only need perform a `warm-start` if the IP address and secondary-IP settings have changed.

The default IP address is 192.168.0.1, which is one of the suggested Class C private network addresses from RFC 1918 (see Appendix A, "IP Network Addresses").

(Continued on next page)

Configuring the Ethernet Interface (Continued)

Procedure

Use the following procedure to configure the Ethernet interface:

Step	Procedure
1	At the Config prompt, enter the `Ethernet` command: `(config)>` **`Ethernet`** The prompt changes to the Config:Ethernet prompt. `(config:Ethernet)>`

(Continued on next page)

Configuring the Ethernet Interface (Continued)

Procedure (continued)

Step	Procedure
2	At the `Config:Ethernet` prompt, enter the appropriate commands from the following table.

Enter this command...	...and specify this value	Comments
`IP-address`	`IP-address`	Enter the IP address of the Ethernet interface (the default is 192.168.0.1).
`netmask`	`netmask`	Enter a netmask, such as 255.255.255.0.
`secondary-ip`	`IP-address`	Enter a second IP address for a separate logical network on the same physical network. This is required for pass-Thru NAT (see Configuring NAT and PAT on page 4-119).
`sec-netmask`	`netmask`	Enter a netmask for the second IP address.
`RIP`	`Enable, RxOnly, TxOnly,[Disable]`	Enter the mode of RIP to use for the primary and secondary IP addresses.
`version-RIP`	`[1], 2`	Enter the version of RIP in use.
`link-integrity-test`	`off, [on*]`	Enable or disable automatic testing of Ethernet connectivity.
`Help`		Access online assistance.

* This setting turns on detection of conditions such as whether the *SLC ConnectReach* System is disconnected from the 10Base-T hub or the hub's power is off. If SNMP is enabled, and if SNMP messages of this type are also enabled, the *SLC ConnectReach* System reports these conditions to the SNMP host.

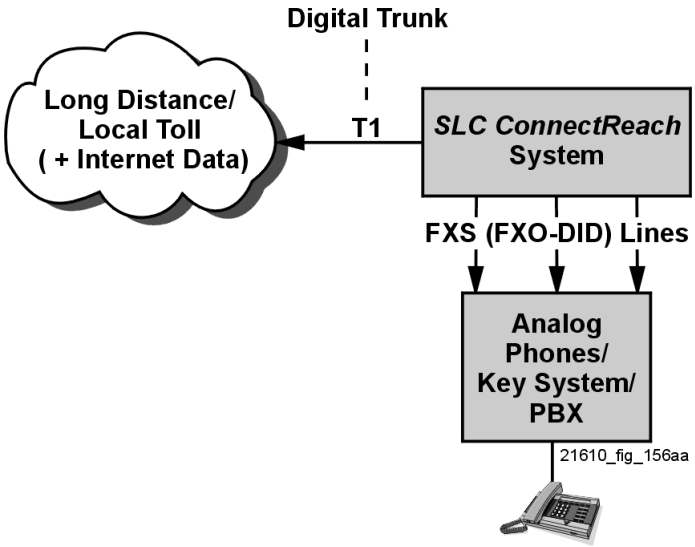
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT.) **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring the Channel Bank Mode

Introduction

The *SLC ConnectReach* system acts as a channel bank in which there is a one-to-one association between T1 voice DS0s (digital trunks) and analog (FXS) ports.

The following figure shows channel bank functionality. The telephone symbol represents users of the system. The *SLC ConnectReach* system maps digital trunks to FXS or DID lines.



Before configuring the channel bank menu, you must know how the digital trunks are configured in the central office, and how the equipment connected to the analog ports (analog phones, PBX or key system) is configured.

The user interface allows you to set up a configuration template which contains commands that are applied to a range of channels. The channel bank template contains the following commands:

- Signaling
- Incoming-type
- Outgoing-type
- Analog-interface
- Far-end-disconnect
- Loop-reversal
- Tx-gain-db

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Introduction (continued)

- Rx-gain-db
- On-hook-threshold
- Alarm-state.

There is one channel bank configuration command, `unconfigured-state`, that is not part of the template. The value set for `unconfigured-state` applies to all unconfigured analog voice channels.

Key commands

The channel bank configuration key commands are used as follows:

Begin and end

The *SLC ConnectReach* system uses a template mechanism to set groups of DS0s and associated options within a given menu. For any given menu, the template is applied to a range of channels defined by the `begin` and `end` commands.

The `begin` and `end` commands determine the range of channels to be configured. Channels may be set individually or in groups of similar configuration. The `copy-to-channel-data` command copies the configuration template commands to the channels in the range between begin and end. If you are accessing the *SLC ConnectReach* system by means of the console or Telnet, you must use the `copy-to-channel-data` command after modifying the data in the configuration template. If you do not, the configuration data for the individual channels will not be modified. If you are accessing the *SLC ConnectReach* system from a Web browser, there is no `copy-to-channel-data` command. Instead, the `Update` button performs the same function. The `Show-all` command displays the data in the individual channels.

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Key commands (continued)

Signaling

Use *loop-gnd* for loop- or ground-start trunks. If *loop-gnd* is selected, the digital trunk and analog interface must both be loop-start or both be ground- start. The *SLC ConnectReach* system does not perform loop- to ground-start conversion. Use E&M to convert digital E&M to analog loop- or ground-start signaling. *Unconfigured* is used for all unassigned channels.

NOTE: In the *SLC ConnectReach* system, references to E&M signaling refer to a signaling type supported on DID trunks. It does not refer to the E&M signaling used over metallic leads with older transmission equipment.

Incoming-type

This command is only used for E&M trunks. This command must be set to comply with the signaling mode of the digital trunk for incoming calls. The four options are wink start (*wnk-s*), immediate start (*imm-s*), delay dial (*dly-d*), and wink delay (*wnk-d*). If wink start is selected, the *SLC ConnectReach* system sends a wink as soon as the central office seizes the trunk to make an incoming call. If wink delay is selected, the wink is delayed until the device on the analog port has answered the call and is listening. Wink delay is normally used with PBXs, Voice Mail systems, etc.

Outgoing-type

This command is only used for E&M trunks. This command must be set to comply with the signaling mode of the digital trunk for outgoing calls. The three options are wink start (*wnk-s*), immediate start (*imm-s*), and delay dial (*dly-d*).

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Key commands (continued)

Analog-interface	This command must be set to comply with the signaling requirements of the device attached to the analog port. The five options are fxs-loop, fxs-ground, fxo-did, fxo-loop, and fxo-ground. The fxs-loop and fxs-ground options, which require FXS hardware, are for E&M only. The fxs-loop and fxs-ground options convert E&M signaling to FXS for connection to a loop-start or ground-start device, respectively. The fxo-did option, which requires FXO hardware, converts E&M DID signaling to FXO to allow an incoming DID connection to a PBX. The fxo-loop and the fxo-ground options, which require FXO hardware, provides a connection between loop-start or ground-start at the CO and the FXO interface. Conversion from E&M signaling to FXO loop and FXO ground is not available.
Far-end-disconnect	This command is only used for E&M trunks. If this command is enabled, and the digital central office disconnects the call, the *SLC ConnectReach* system opens the FXS tip for 1.4 seconds. This tells the analog equipment (for example, a PBX) that the call has terminated.
Loop-reversal	This command is only used for loop-ground trunks. If enabled, and a polarity reversal signal is received on the digital trunk, then the *SLC ConnectReach* system reverses the polarity of the tip and ring leads of the FXS interface. If disabled, then polarity reversal signals from the digital trunk are ignored.
Analog transmit gain	This command adjusts the transmit signal levels to the network from the FXS interface. The available settings are 0, –3, and –6 dB.
Analog receive gain	This command adjusts the received signal levels from the network to the FXS interface. The available settings are 0, –3, –6, and –12 dB.

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Key commands (continued)

On-hook-threshold

This command (expressed in milliseconds) allows the *SLC ConnectReach* system to differentiate between a flash request and an on-hook (disconnect) condition. If the telephone equipment on the far end of the digital trunk supports hook switch flash, set `on-hook-threshold` to a long enough interval (1500 milliseconds is typical) for the *SLC ConnectReach* system to differentiate between a flash and a disconnect. Note that during the `on-hook-threshold` interval, the on-hook is sent to the far end equipment. If the telephone equipment does not support flash, use the default value of 1250 milliseconds.

Alarm-state

In the event of a network T1 alarm, this command determines if the FXS is to be put into a tip closed (battery supplied) or tip open (no battery supplied) state. If this command is set to *busy*, then battery will be supplied. If set to *idle*, then no battery will be supplied.

Unconfigured-state

This command determines if the FXS ports for unconfigured channels are put into a tip closed (battery supplied) or tip open (no battery supplied) state. If this command is set to *busy*, then battery will be supplied. If set to *idle*, then no battery will be supplied. It is not part of the configuration template and has no impact on configured channels.

Load template

This command loads all of the configuration command values that are stored in a template to the channel being configured. This command allows multiple channels to be set up identically without having to enter each individual command for all channels.

Cross-connect

This command allows assignment of DS0s to specific lines. This becomes relevant when using four port boards or a combination of FXS and FXO boards with less than eight lines used on each board. If this command is enabled, then all DS0s must be assigned through the associated submenu.

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Key commands (continued)

Loop-gnd-disconnect-delay This command sets the length of time that a disconnect signal must persist on the digital side before the loop opens on the analog side. The default setting of 600 milliseconds complies with ANSI T1.403. Settings between 125 and 500 milliseconds comply with AT&T Pub. 43801. When the *ClearReach* feature is enabled and operational, the lp-gnd-disconnect-delay operates at 500 milliseconds, and is not adjustable. The setting displayed here should be disregarded.

on-hook-tx This command enables or disables transmission of signals over the T1 line when the phone is on-hook. If enabled, the message light on all on-hook phones configured will function.

Procedure

After you have verified the required configuration, follow these steps to configure the voice channels:

Step	Procedure
1	At the Config prompt, enter the `channel-bank` command: `(config)>` **`channel-bank`** The prompt changes to the Config:Channel-bank prompt. `(config:channel-bank)>`
2	Use the `begin` and `end` commands to specify the range of analog ports to which subsequent changes will apply. **NOTE:** The channel numbers specified in the begin and end commands refer to the Network T1/DSX-1 DS0s. The range of available DS0s is limited by the analog-begin and analog-end commands in the DS0 provisioning menu. If the cross-connect feature is disabled or not available, the lowest available DS0 is connected to voice channel 1 on the **VOICE CHANNELS** port (50-pin telephony type connector). For example, if analog-begin is set to eight in the DS0 provisioning menu, then channel eight refers to DS0 number eight of the Network T1/DSX-1 and to the first pair on the **VOICE CHANNELS** connector. In order to avoid confusion, it is recommended that you provision your DS0 lines with the voice channels starting at the first DS0. In that case, the analog ports and DS0 channels always have the same numbers (unless the cross-connect feature is being used).

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Procedure (continued)

Step	Procedure
3	Make the necessary configuration changes (see the following table) or use the load-template command to load an existing configuration of a channel.

To	Enter this command...	...and one of these options
Set the first channel	`begin`	Software automatically detects the number of voice channels. If no voice channels found, a value of 0 is entered.
Set the last channel	`end`	Sets value to the last voice channel detected.
Enter the type of trunk signaling (input)	`signaling`	`[loop-gnd], E&M, unconfigured`
Specify the signaling for incoming E&M trunks	`incoming-type`	`[wnk-s], imm-s, dly-d, wnk-d`
Specify the signaling for outgoing E&M trunks	`outgoing-type`	`[wnk-s], imm-s, dly-d`
Specify the equipment that is attached to the channel bank/lines	`analog-interface`	`[fxs-loop], fxs-ground, fxo-did, fxo-loop, fxo-ground`
Disable if not supported by analog equipment	`far-end-disconnect`	`disable, [enable]`
Disable if not supported by analog equipment	`loop-reversal`	`disable, [enable]`
Adjust transmit gain	`tx-gain-db`	`0, [-3], -6`
Adjust receive gain	`rx-gain-db`	`0, [-3], -6, -12`
Adjust on-hook threshold	`on-hook-threshold`	`300…[1250]...2000 msec`
Set the tip status for alarm conditions	`alarm-state`	`idle, [busy]`

(Continued on next page)

Configuring the Channel Bank Mode (Continued)

Procedure (continued)

Step	Procedure
3 cont.	

To	Enter this command...	...and one of these options
Set the tip status for all unconfigured channels	`unconfigured-state`	`[idle], busy`
Set the delay for loop-ground disconnect	`lp-gnd-disc-delay`	`20...`**`600`**`...1200 msec`
Set the line to transmit message waiting signal when on-hook	`on-hook-tx`	`on, [off]`
Load a configuration of a channel	`load-template`	`1...24`
Write your changes to the specified channels	`copy-to-channel-data`	
Display channel-bank mode	`Show-all`	
Configure cross-connect	`cross-connect`	
Access online assistance	`Help`	

4	If you are connected to the *SLC ConnectReach* system by means of a console session or a Telnet session, enter the `copy-to-channel-data` command to write your changes to the specified channel(s).
5	If you are accessing the *SLC ConnectReach* system Utility from a Web browser, select the **Update** button to write your changes to the specified channel(s).
6	Repeat Steps 3, 4, and 5 to change the configuration for other channels or ranges of voice channels, if appropriate.
7	Use the `Show-all` command to see the actual channel configuration.
8	At the `Config:Channel-bank` prompt, set the tip status for all unconfigured channels using the `unconfigured-state` command. The `unconfigured-state` command applies to all unconfigured channels.

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Configuring the Channel Bank Mode (Continued)

Procedure (continued)

Step	Procedure
9	To assign DS0s manually, enter the `Cross-connect` command from the channel-bank prompt and then enter one of the following submenu commands.

To	Enter this command...	...and one of these options
Enable cross-connect	`enable`	[off], on
Assign a DS0 to a line	`set-DS0-to-line`	DS0 (1...24) Line (0...24)
Show settings	`Show-all`	
Access online assistance	`Help`	

Example:

If the *SLC ConnectReach* system is equipped with one FXS eight port board and one FXO eight port board and the customer's site uses two FXS lines and one FXO line, the configuration steps would be as follows:

1. Enter the following commands at the config:Channel-bank:Cross-connect prompt:

   (config:Channel-bank:Cross-connect) > **`enable on`**

   (config:Channel-bank:Cross-connect) > **`set-DS0-to-line 1 1`**

   (config:Channel-bank:Cross-connect) > **`set-DS0-to-line 2 2`**

   (config:Channel-bank:Cross-connect) > **`set-DS0-to-line 3 9`**

2. To view the settings, enter the `show-all` command.
   (config:Channel-bank:Cross-connect) > **`show-all`**

DS0	Line
1	1
2	2
3	9

3. To clear a DS0 setting, enter zero for the line.
   (config:Channel-bank:Cross-connect) > **`set-DS0-to-line 3 0`**

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Configuring the Channel Bank Mode (Continued)

Procedure (continued)

Step	Procedure
10	Type **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT) to return to the Config menu. **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring Digital Trunks

Introduction

The digital-trunk table defines DID and trunk signaling commands for each digital trunk (DS0).

The `digital-trunk` command is included in the LCR/DID telephone functionality mode and the digital-trunk menu will appear only when the LCR/DID optional feature is installed in the *SLC ConnectReach* system and the *ClearReach* feature is not enabled. In the LCR/DID mode, additional configuration menus, including the digital-trunk menu, are used to specify call routing and DID operation.

NOTE:
The channel bank menu must be used in conjunction with the digital-trunk menu.

Key commands

The key commands for the *SLC ConnectReach* system's digital-trunk menu are as follows:

Begin and end

The *SLC ConnectReach* system uses a template mechanism to set groups of DS0s and associated options within a given menu. For any given menu, the template is applied to a range of channels defined by the `begin` and `end` commands.

The `begin` and `end` commands determine the range of channels to be configured. Channels may be set individually or in groups of similar configuration. The `copy-to-channel-data` command copies the configuration template commands to the channels in the range between begin and end. If you are accessing the *SLC ConnectReach* system by means of the console or Telnet, you must use the `copy-to-channel-data` command after modifying the data in the configuration template. If you do not, the configuration data for the individual channels will not be modified. If you are accessing the *SLC ConnectReach* system from a Web browser, there is no `copy-to-channel-data` command. Instead, the `Update` button performs the same function. The `Show-all` command displays the data in the individual channels.

Group

This command specifies the trunk group to which this DS0 belongs.

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Configuring Digital Trunks (Continued)

Key commands (continued)

Signaling

The *SLC ConnectReach* system supports loop-start, ground-start, or conversion from E&M trunk signaling to loop- or ground-start. The *SLC ConnectReach* system also provides an unconfigured option for signaling that is absent. If the E&M option is selected, then the following E&M signaling commands must be defined:

NOTE: In the *SLC ConnectReach* system, references to E&M signaling refer to a signaling type supported on DID trunks. It does not refer to the E&M signaling used over metallic leads with older transmission equipment.

E&M-type-incoming

Signaling for incoming E&M trunks is configured to comply with the signaling mode of the provider. There are four options: wink start (wnk-s), immediate start (imm-s), delay dial (dly-d), and wink delay (wnk-d). With the wink delay option, the off-hook signal for incoming calls is delayed until the PBX is connected and "listening."

E&M-type-outgoing

Signaling for outgoing E&M trunks is configured to comply with the signaling mode of the provider. There are three options: wink start (wnk-s), immediate start (imm-s), and delay dial (dly-d).

Direction

This command provides three options: incoming (calls from the CO), outgoing (calls to the CO), and two-way (calls from and to the CO). The incoming option specifies that analog lines can only receive incoming calls, but cannot originate calls.

Incoming-routing

This command specifies the routing options for incoming calls. If you select the DID-dialed number identification service (DNIS) or automatic number identification (ANI)-DNIS option, the incoming digits are collected by the *SLC ConnectReach* system and routed to the appropriate analog line. Selecting the `line` or `group` option allows an incoming call to be routed to a line or a group of lines, respectively.

(Continued on next page)

Configuring Digital Trunks (Continued)

Key commands (continued)

Line-group

This command is used when the `line` or `group` option is selected in the `incoming-routing` command. Use this command to specify the line or group number designated to receive incoming calls. When `line` is specified, and the line specified is busy, the call will be forwarded to the line designated in the busy-forward-line command. When `group` is specified, and the first line in the group is busy, the *SLC ConnectReach* system will forward the call to the next line in the group until an available line is found. If all lines in the group are busy, the caller will hear a busy signal. To assign lines to a group, refer to the `group` command located in the section entitled "Configuring Lines", located later in this chapter.

Digits-type

This command allows the user to select the digit-addressing option. There are three options: dual-tone multiple frequency (DTMF), multiple frequency (MF), and pulse. Incoming addressing contains DID or DNIS information.

Busy-treatment

This command specifies how a call will be handled if the line (station) is busy. If the busy-signal option is selected, the caller will hear the standard busy signal. If the busy-out option is specified, whenever all lines in a line group are in use, all trunks that route to that line group are placed in busy-out mode by taking them off-hook. The forward option sends the call to another line.

Busy-forward-line

This command is used in conjunction with the `line` option for `incoming-routing`. If the line specified for receiving incoming calls is busy, the call will be forwarded to the line specified in the `busy-forward-line` command.

Analog transmit gain

This command adjusts transmit signal levels to the network from the FXS interface. Three settings are available (0, –3, and –6 dB).

Analog receive gain

This command adjusts receive signal levels from the network to the FXS interface. Four settings are available (0, –3, –6, and –12 dB).

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Configuring Digital Trunks (Continued)

Key commands (continued)

Load template This command loads all of the configuration command values that are stored in a template to the channel being configured. This command allows multiple channels to be set up identically without having to enter each individual command for all channels.

The `copy-to-channel-data` command only modifies LCR/DID channels. If the *begin* and *end* commands include channels that are not LCR/DID, the `copy-to-channel-data` warns the user that data for those channels was not modified.

The `Show-all` command only displays all digital trunk configuration.

Procedure

After you have verified the required configuration, follow these steps to configure digital trunks:

Step	Procedure
1	Before you can set the desired channels in the digital trunk menu, you will need to unconfigure them in the channel bank menu. Refer to the previous table containing channel bank configuration commands.
2	At the Config prompt, enter the `Digital Trunk` command: `(config)>` **`Digital-trunk`** The prompt changes to the `Config:Digital Trunk` prompt. `(config:DigitalTrunk)>`
3	Use the `begin` and `end` commands to specify the digital trunk or range of digital trunks to which subsequent changes will apply. **NOTE:** The channel numbers specified in the `begin` and `end` commands refer to the Network T1/DSX-1 DS0s. The range of available DS0s is limited by the `analog-begin` and `analog-end` commands in the DS0 provisioning menu excluding the channels provisioned for the channel bank mode.

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Configuring Digital Trunks (Continued)

Procedure (continued)

Step	Procedure
4	Make the necessary configuration changes. The following table describes these commands.

To	Enter this command...	...and one of these options
Set the first channel	`begin`	`[1]...24`
Set the last channel	`end`	`1...[24]`
Specify the trunk group	`group`	`[1]...10`
Enter the trunk signaling type	`signaling`	`E&M, loop-start, ground-start, [Unconfigure]`
Enter the signaling type for incoming E&M trunks	`E&M-type-incoming`	`[wnk-start], imm-s, dly-d, wnk-d`
Enter the signaling type for outgoing E&M trunks	`E&M-type-outgoing`	`[wnk-start], imm-s, dly-d`
Specify the direction	`direction`	`in, out, [two-way]`
Select the routing option for incoming calls	`incoming-routing`	`DID-DNIS, ANI-DNIS, [Group], Line`
Select the line routing option	`line-group`	`[1], line or line group #`
Select the digit-addressing option	`digits-type`	`[DTMF], MF, Pulse`
Specify how call is handled if line is busy	`busy-treatment`	`[busy-sig], busy-out, forward`
Select the line to forward the call if line is busy	`busy-fwd-line`	`1...[24]`
Adjust transmit gain	`tx-gain-db`	`0, [-3], –6`
Adjust receive gain	`rx-gain-db`	`0, [-3], -6, -12`
Load a configuration of a channel	`load-template`	`1...24`
Write your changes to the specified channels	`copy-to-channel-data`	
Display all DS0s	`Show-all`	
Access online assistance	`Help`	

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Configuring Digital Trunks (Continued)

Procedure (continued)

Step	Procedure
5	Use the `copy-to-channel-data` command to write your changes to the specified trunks.
6	Use the `Show-all` command to see the actual channel configuration.
7	Type **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT) to return to the Config menu. **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring Analog Trunks

Introduction

The analog-trunk menu defines DID and trunk signaling commands for each analog trunk (FXO).

The `analog-trunk` command is included in the LCR/DID telephone functionality mode and the analog-trunk menu will appear only when the LCR/DID optional feature is installed in the *SLC ConnectReach* system and the *ClearReach* feature is not enabled. In the LCR/DID mode, additional configuration menus, including the analog-trunk menu, are used to specify call routing and DID operation.

NOTE:
The channel-bank menu must be used in conjunction with the analog-trunk menu.

Key commands

The key commands for the *SLC ConnectReach* system's analog-trunk menu are as follows:

Begin and end

The *SLC ConnectReach* system uses a template mechanism to set groups of commands and associated options within a given menu. For any given menu, the template is applied to a range of channels defined by the `begin` and `end` commands.

The `begin` and `end` commands determine the range of channels to be configured. Channels may be set individually or in groups of similar configuration. The `copy-to-channel-data` command copies the configuration template commands to the channels in the range between begin and end. If you are accessing the *SLC ConnectReach* system by means of the console or Telnet, you must use the `copy-to-channel-data` command after modifying the data in the configuration template. If you do not, the configuration data for the individual channels will not be modified. If you are accessing the *SLC ConnectReach* system from a Web browser, there is no `copy-to-channel-data` command. Instead, the `Update` button performs the same function. The `Show-all` command displays the data in the individual channels.

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Configuring Analog Trunks (Continued)

Key commands (continued)

NOTE:
Systems configured for Master/Slave have the following limitation; the total of combined Lines and Analog trunks are *not* to exceed 16 on the Master *SLC ConnectReach* system.

Group This command specifies the trunk group to which this analog line belongs.

Signaling The *SLC ConnectReach* system supports *loop-start* or *ground-start* and also provides an *unconfigured* option for signaling that is absent.

Direction This command provides three options: incoming (calls from the CO), outgoing (calls to the CO), and two-way (calls from and to the CO). The *incoming* option specifies that analog lines can only receive incoming calls, but cannot originate calls.

Incoming-routing This command specifies the line, group of lines, or trunk to which the analog trunk is routed.

Line-group This command is used when the *line* or *group of lines* option is selected in `incoming-routing`. Use this command to specify the line or group number designated to receive incoming calls. When *line* is specified and the line specified is busy, the call will be forwarded to the line designated in the `busy-forward-line` command. When `line group` is specified and the first line in the group is busy, the *SLC ConnectReach* system will forward the call to the next line in the group until an available line is found. If all lines in the group are busy, the caller will hear a busy signal. To assign lines to a group, refer to the `group` command under the section entitled "Configuring Lines" located later in this chapter.

Digits-type This command allows the user to select the digit-addressing option.

Busy-treatment This command specifies how a call will be handled if the line (station) is busy. If the *busy-signal* option is selected, the caller will hear the standard busy signal. If the *busy-out* option is specified, the *SLC ConnectReach* system busies out all members of the trunk when the line or line group is busy. The *forward* option sends the call to another line.

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Configuring Analog Trunks (Continued)

Key commands (continued)

Busy-forward-line This command is used in conjunction with the *line* option for `incoming-routing`. If the line specified for receiving incoming calls is busy, the call will be forwarded to the line specified in the `busy-forward-line` command.

Analog transmit gain This command adjusts transmit signal levels to the analog trunk from the FXS interface. Three settings are available (0, –3, and –6 dB).

Analog receive gain This command adjusts receive signal levels from the analog trunk to the FXS interface. Three settings are available (0, –3, –6, and –12 dB).

Load template This command loads all of the configuration command values that are stored in a template to the channel being configured. This command allows multiple channels to be set up identically without having to enter each individual command for all channels.

The `copy-to-channel-data` command only modifies LCR/DID channels. If the begin and end commands include channels that are not switched, the `copy-to-channel-data` command warns the user that data for those channels was not modified.

Procedure

After you have verified the required configuration, follow these steps to configure analog trunks:

Step	Procedure
1	At the Config prompt, enter the `Analog trunk` command: `(config)>` **`Analog trunk`** The prompt changes to the Config:Analog trunk prompt. `(config:AnalogTrunk)>`

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Configuring Analog Trunks (Continued)

Procedure (continued)

Step	Procedure
2	Use the `begin` and `end` commands to specify the analog trunk or range of analog trunks to which subsequent changes will apply. **NOTE:** The channel numbers specified in the `begin` and `end` commands refer to the voice channels (lines) on the **VOICE CHANNELS** port (50-pin telephony type connector). A foreign exchange office (FXO) type voice interface card should be used for these channels.

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Configuring Analog Trunks (Continued)

Procedure (continued)

Step	Procedure
3	Make the necessary configuration changes (see the following table) or use the `load-template` command to load an existing configuration of a channel.

To	Enter this command...	...and one of these options
Set the first channel	`begin`	`[1]...24`
Set the last channel	`end`	`1...[24]`
Specify the trunk group	`group`	`1[2]...10`
Enter the trunk signaling type	`signaling`	`loop-start, grnd-start, [Unconfigure]`
Specify the direction	`direction`	`in, out, [two-way]`
Select the routing option for incoming calls	`incoming-routing`	`[Group], Line`
Select the line routing option	`line-group`	`[1], line or line group #`
Select the digit-addressing option	`digits-type`	`[DTMF], PULSE`
Specify how call is handled if line is busy	`busy-treatment`	`[busy-sig], busy-out, forward`
Select the line to forward the call if line is busy	`busy-fwd-line`	`1...[24]`
Adjust transmit gain	`tx-gain-db`	`0, [-3], -6`
Adjust receive gain	`rx-gain-db`	`0, [-3], -6, –12`
Load a configuration of a channel	`load-template`	`1...24`
Write your changes to the specified channels	`copy-to-channel-data`	
Display switched channels	`Show-all`	
Access online assistance	`Help`	

(Continued on next page)

Configuring Analog Trunks (Continued)

Procedure (continued)

Step	Procedure
4	Use the `copy-to-channel-data` command to write the changes to the specified trunks.
5	Use the `Show-all` command to see the actual channel configuration.
6	Type **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT) to return to the Config menu. **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring Lines

Introduction

The Line menu defines line signaling commands for each LCR/DID line (FXS).

The Line command is included in the LCR/DID telephone functionality mode and the Line menu will appear only when the LCR/DID optional feature is installed in the *SLC ConnectReach* system. In the LCR/DID mode, additional configuration menus, including the Line menu, are used to specify call routing and DID operation.

NOTE:
The channel-bank menu must be used in conjunction with the Line menu.

Key commands

The key commands for the *SLC ConnectReach* system's Line menu are as follows:

Begin and end

The *SLC ConnectReach* system uses a template mechanism to set groups of commands and associated options within a given menu. For any given menu, the template is applied to a range of channels defined by the `begin` and `end` commands.

The `begin` and `end` commands determine the range of channels to be configured. Channels may be set individually or in groups of similar configuration. The `copy-to-channel-data` command copies the configuration template commands to the channels in the range between begin and end. If you are accessing the *SLC ConnectReach* system by means of the console or Telnet, you must use the `copy-to-channel-data` command after modifying the data in the configuration template. If you do not, the configuration data for the individual channels will not be modified. If you are accessing the *SLC ConnectReach* system from a Web browser, there is no `copy-to-channel-data` command. Instead, the `Update` button performs the same function. The `Show-all` command displays the data in the individual channels.

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Configuring Lines (Continued)

Key commands (continued)

NOTE:
Systems configured for Master/Slave have the following limitation; the total of combined Lines and Analog trunks are *not* to exceed 16 on the Master *SLC ConnectReach* system.

Group
This command specifies the line group to which these analog lines belong.

Signaling
The *SLC ConnectReach* system supports *loop-start* or *ground-start* and also provides an *unconfigured* option for lines that are absent.

Direction
The incoming option specifies that the analog lines can only receive incoming calls from the CO, but cannot originate calls to the CO. The *SLC ConnectReach* system also provides a *two-way* option.

Outgoing routing type
This command specifies the routing options for outgoing calls. If you select the *LCR* option, outgoing calls are routed by call processing software. If you specify the *Group* option, outgoing calls are routed to either an analog or digital trunk group.

Trunk group
This command, used only when the outgoing-routing command is set to *group*, allows the user to specify the trunk group number.

On-hook threshold
This command (expressed in milliseconds) allows the *SLC ConnectReach* system to differentiate between a flash request and an on-hook condition. If the telephone system does not support flash, set on-hook-threshold to *300* milliseconds. If the telephone system supports flash, set on-hook-threshold to an interval long enough (*1500* milliseconds is typical) for the system to differentiate between a flash and a disconnect.

Far-end-disconnect
If this command is enabled, and the digital central office disconnects the call, the *SLC ConnectReach* system opens the FXS tip for 1.4 seconds. This tells the analog equipment (for example, PBX) that the call has ended.

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Configuring Lines (Continued)

Key commands (continued)

Polarity-reversal This command is used for reversing the polarity of the DC when the central office has answered. Some PBXs use this for billing purposes.

Trunk-ring-default Trunk-ring-default applies to E&M and line-to-line calls. Ring cadence, for loop- or ground-start trunks, is controlled by the CO. This command sets the number of rings for outside trunk calls. If set to single, outside trunk calls get a single ring and inside calls get a double ring. If set to double, the opposite is true. This command is system wide and requires the optional BOX feature. The `distinctive-ring` command in the BOX submenu must be turned on for this command to function properly.

Paging-line This command is used to designate a line for paging output.

Hunting This command sets the type of line group hunting used for incoming calls. If set to most idle, the next line chosen to receive the call will be the one that was least used. If set to linear, the lowest line number that is not busy will receive the call. This command is system wide and requires the optional BOX feature. The `distinctive-ring` command in the BOX submenu must be turned on for this command to function properly.

The `copy-to-channel-data` command only modifies LCR/DID channels. If the `begin` and `end` commands include channels that are not switched, the copy-to-channel-data warns the user that data for those channels was not modified.

NOTE:
There is no option for tone versus pulse dialing. The software can always detect both dial pulses and DTMF address digits.

(Continued on next page)

Configuring Lines (Continued)

Procedure

After you have verified the required configuration, follow these steps to configure lines:

Step	Procedure
1	At the Config prompt, enter the `Line` command: `(config)>` **`Line`** The prompt changes to the Config:Line prompt. `(config:Line)>`
2	Use the `begin` and `end` commands to specify the line or range of lines to which subsequent changes will apply. **NOTE:** The channel numbers specified in the `begin` and `end` commands refer to the voice channels (lines) on the **VOICE CHANNELS** port (50-pin telephony type connector). A foreign exchange station (FXS) type voice interface card should be used for these channels.

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Configuring Lines (Continued)

Procedure (continued)

Step	Procedure
3	Make the necessary configuration changes. The following table describes these commands.

To	Enter this command...	...and one of these options
Set the first channel	`begin`	`[1]...48`
Set the last channel	`end`	`1...[48]`
Select the line group	`group`	`[1]...10`
Enter the trunk signaling type	`signaling`	`loop-start, ground-start, [Unconfigure]`
Specify the direction	`direction`	`in, [two-way]`
Select the routing option for outgoing calls	`outgoing-routing-type`	`[LCR], Group`
Select the trunk group	`trunk-group`	`[1], trunk group #`
Adjust on-hook threshold	`on-hook-threshold`	`[1250] 300...2000 msec`
Set the far end disconnect	`far-end-disconnect`	`disable, [enable]`
Set the polarity reversal	`polarity-reversal`	`disable, [enable]`
Display BOX* features menu	`BOX-features`	
Display menu for feature codes	`feature-codes`	
Set the number of rings for outside calls	`trunk-ring-default`	`[double], single`
Set a line for paging	`paging-line`	`0 <valid line>`
Set the type of line group hunting	`hunting`	`linear, [most-idle]`
Write your changes to the specified channels	`copy-to-channel-data`	
Display channel-bank lines	`Show-all`	
Access online assistance	`Help`	

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Configuring Lines (Continued)

Procedure (continued)

Step	Procedure
4	For setting BOX features enter the `BOX-features` command: `(config:Line)>` **`BOX-features`** A description of the `BOX-features` command is presented in the following section.
5	Make the necessary configuration changes. Refer to the table in the following section entitled “BOX features description”, for a description of these commands.
6	For setting feature codes, enter the `feature-codes` command: `(config:Line)>` **`feature-codes`** A description of the feature-codes command is presented in the following section.
7	Make the necessary configuration changes. Refer to the table in the section entitled “Feature codes description”, located later in this chapter, for a description of these commands.
8	Use the `copy-to-channel-data` command to update line commands from *begin* to *end*.
9	Use the `Show-all` command to see the actual channel configuration.
10	Type **exit** or an exclamation point (**!**) (quoted as “\ |” through the *SLC-2000* Access System CIT) to return to the Config menu. **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

(Continued on next page)

Configuring Lines (Continued)

BOX features description

This submenu is used to set the Business OfficeXchange (BOX) features and only appears when the BOX features and the LCR/DID features are installed and the *ClearReach* feature is not enabled. The BOX features provided are similar to a Centrex service offered by a CO switch, but without the need for dedicated lines to the CO for each extension. The BOX features also provides configurations for connections to voice mail and paging systems. The following table lists the BOX feature commands.

To	Enter this command...	...and one of these options
Set the distinctive ring option	`distinctive-ring`	`off, [on]`
Set the transfer option	`transfer`	`off, [on]`
Set the consultation hold option	`consultation-hold`	`off, [on]`
Set the three-way calling option	`three-way-calling`	`off, [on]`
Set the call waiting option	`call-waiting`	`[off], on`
Set the forward variable option	`fwd-variable`	`off, [on]`
Set the forward no answer option	`fwd-no-answer`	`off, [on]`
Set the forward busy option	`fwd-busy`	`off, [on]`
Set the number of rings before forwarding a call	`fwd-rings`	`0..[4]..10`
Set the number for call forward variable	`fwd-num-variable`	`(variable forward number)`
Set the number for call forward no answer	`fwd-num-no-answer`	`(no-answer forward number)`
Set the number for call forward busy	`fwd-num-busy`	`(busy forward number)`
Set the busy redial option	`busy-redial`	`off, [on]`
Enable direct trunk access	`direct-trunk-sel`	`[off], on`
Assign a call pickup group	`call-pickup-group`	`[0]...5`
Set the line group to the default settings	`line-group-default`	
Access online assistance	`Help`	

(Continued on next page)

Configuring Lines (Continued)

BOX features description (continued)

For information on the user interface of the BOX features, refer to Appendix D, "User Interface". The BOX features are described as follows:

NOTE:
Attendant consoles, busy lamp fields, digital phones, LCD displays are not supported.

Distinctive-Ring	This command allows incoming calls from an outside trunk to be distinguished from local intercom calls. The distinctive ring is a double ring (half second on, one second off, half second on, four seconds off). A call from an outside trunk transferred by an inside line is rung as an outside call. Each line may be individually configured to have distinctive ringing on or off.
Transfer	This command enables the call transfer feature. Lines may be configured independently of each other. It is not possible to transfer a trunk to another trunk if both trunks are loop-start. If there is a warm-start during the transfer process, all connections are lost.
Consultation-hold	This command enables the consultation hold feature and may be set individually for each line. One, but not both, of the parties may be connected from a loop-start trunk. If there is a warm-start during a consultation hold, all connections are lost.
Three-way calling	This command enables the three-way calling feature. This feature may be turned on or off for each individual line. Consultation hold and transfer must be enabled to activate three-way calling. One, but not both, of the parties may be connected from a loop-start trunk. If there is a warm-start during three-way calling, all connections are lost.

(Continued on next page)

Configuring Lines (Continued)

BOX features description (continued)

Call waiting This command enables the call waiting feature. Each line may be individually configured. An incoming call on a line in use is signaled by a call waiting tone (440 Hz for a half second). This feature is incompatible with call forward busy. If there is a warm-start during the transfer process of a call waiting, all connections are lost.

Call forward There are three types of call forwarding: variable, no answer, and busy. An incoming call may be forwarded as many as ten times. It is possible to set up a hunt group by configuring multiple phones for call forward busy and/or no answer, each forwarding to the next. Each line may be individually configured to have call forward on or off. The call forward request is preserved over a `warm-` or `cold-start`. The three types of call forwarding are described as follows:

- **Variable** This feature allows the user to forward a line to another line or outside number. An incoming call from a loop-start trunk cannot be forwarded to a loop-start trunk. The `fwd-num-variable` is preserved over a `warm-start`.
- **No answer** This feature can be used to enable voice mail coverage by forwarding the call to the voice mail extension. Each line may be individually configured with a unique forwarding number. The number of rings before forwarding is also individually configurable.
- **Busy** This feature can also be used to enable voice mail coverage by forwarding the call to the voice mail extension. Each line may be individually configured with a unique forwarding number.

Direct trunk select This feature enables a diagnostic function. If there is a connecting problem, the CO may have the user dial a feature code and a two-digit number for the trunk group to test the trunk.

(Continued on next page)

Configuring Lines (Continued)

BOX features description (continued)

Call pickup group This feature allows for a call pickup group number to be assigned to each line. A call may be answered by a different line in the same call pickup group by dialing a feature code. If multiple lines in a call pickup group are ringing, only one of them is answered on each pickup attempt. If no line is ringing when the user dials the feature code, a fast busy tone is heard.

Caller ID There are three forms of caller identification (ID): line-to-line or intercom, analog trunk call, and incoming digital trunk call. Caller ID for line-to-line displays the extension number. There is no configuration necessary to display the extension number of a line-to-line call. Caller ID with an incoming analog trunk call is passed through to the called line. For an incoming digital trunk call, the *SLC ConnectReach* system is configured to accept automatic number identification (ANI). The ANI is converted to analog caller ID information for display on a display telephone. For Caller ID to be displayed in both digital and analog trunk calls, the CO must generate caller ID information. For information concerning configuring the digital trunk to receive automatic number identification-dialed number identification service (ANI-DNIS), refer to the section entitled “Configuring Digital Trunks”, located earlier in this chapter.

To return the BOX-features back to their defaults, type **line-group-default**. To turn fwd-num-variable, fwd-num-no-answer, and fwd-num-busy off, enter the command without any numbers. To access online assistance, type **help**.

(Continued on next page)

Configuring Lines (Continued)

Feature codes description

This submenu is available when the BOX-features are installed and is used to set feature codes. Feature codes must either begin with a "*" or must be within the local dialing plan. Codes that do not start with a "*" are required for rotary dial pulse phones. This setting is system wide. The following table provides a listing of the feature codes configuration commands that can be entered at the config:Line:feature-codes prompt.

To Modify the Feature Code for	Enter this command followed by the new code	Default Setting
Canceling call waiting	`cancel-call-waiting`	`*70`
Call pickup	`call-pickup`	`*1`
Directed call pickup	`direct-call-pickup`	`*5`
Call forwarding	`call-forward-var`	`*72`
Canceling call forwarding	`cancel-forward-var`	`*73`
Initiating a page	`pager`	`*3`
Direct trunk access	`digital-direct-access`	`*40`
Analog trunk or line access	`analog-direct-access`	`*41`
Canceling the redial on busy	`cancel-busy-redial`	`*42`

The feature codes are described as follows:

Cancel call waiting This feature code disables call waiting for the next call.

Call pickup Dialing the call pickup feature code causes a ringing line in the user's pickup group to be answered.

Direct call pickup This feature allows call pickup outside the answerer's pickup group.

Call forward variable This feature forwards calls from one extension to another extension or trunk. Calls coming from a loop-start trunk cannot be forwarded to a loop-start trunk. An incoming call may be forwarded as many as forty-seven times. If there is a warm-start, call forward variable will default to the systems settings; the user's settings will be lost.

(Continued on next page)

Configuring Lines (Continued)

Feature codes description (continued)

Cancel call forward	This feature code disables call forwarding.
Pager	The pager feature allows for paging capability by dialing the pager feature code. A commercial off-the-shelf product is used for the paging amplifier (for example, Valcom V-2001A Paging Unit).
Digital direct access	This feature is used for diagnostics. The direct trunk select feature, in the BOX submenu, must be enabled for the digital direct access to function. The user may enter the digital direct access feature code followed by the trunk number to test a specific trunk.
Analog direct access	This feature is similar to digital direct access only for analog trunks and lines.
Cancel busy redial	This feature is used when a line is given a busy signal when dialing another line or when seizing an outgoing trunk.

To return the feature codes back to their default settings type **default**. To access online assistance, type **Help**.

Lines Show-all Response

The **show-all** command for channel-bank lines displays all configuration information for each channel-bank line on the *SLC ConnectReach* system. The display will appear in the format of the example shown in the following figure.

The following figure shows the Lines Show-all display.

```
Ch Gr   Signaling Dir Route  OHT Tk Sel FrEndDs BattRev fwdVarNum fwdNoAnsNum
 1  1  loop-start two   LCR 1250  1  S   enable disable
 2  1  loop-start two   LCR 1250  1  S   enable disable
 3  1  loop-start two   LCR 1250  1  S   enable disable
 4  1  loop-start two   LCR 1250  1  S   enable disable

Ch    fwdBusyNum dRng Xfer Hold 3Way Wait fwVr fwNA fwBy fwRn byRd1 tSel pkGp
 1                on   on   on   on  off   on   on   on    4    on  off    0
 2                on   on   on   on  off   on   on   on    4    on  off    0
 3                on   on   on   on  off   on   on   on    4    on  off    0
 4                on   on   on   on  off   on   on   on    4    on  off    0
```

(Continued on next page)

For the meaning of each column in the display and the range of values, see the following table.

Column Heading	Meaning	Range of Values
Ch	Channel number	1...48
Gr	Line group	1...10
Signaling	Signaling type	loop-start, ground-start, Unconfigured
Dr	Direction	in, two (two-way)
Route	Outgoing routing type	LCR, Group
OHT	On-hook Threshold	300...2000 msec
Tk	Trunk	1, *trunk group number*
Sel	Method of outgoing trunk selection	F (first-available), S (same-as-incoming)
FrEndDs	Far-end-disconnect	disable, enable
BattRev	Polarity reversal	disable, enable
fwdVarNum	Call forward variable	*variable forward number*
fwdNoAnsNum	Call forward no answer number	*no-answer forward number*
BOX Features		
Ch	Channel number	1...48
fwdBusyNum	Call forward busy number	*busy forward number*
dRng	Distinctive ring	off, on
Xfer	Transfer	off, on
Hold	Consultation hold	off, on
3Way	Three-way calling	off, on
Wait	Call waiting	off, on
fwVr	Forward variable	off, on
fwNA	Forward not available	off, on
fwBy	Forward busy	off, on
fwRn	Forward rings	0....10
byRdl	Busy redial	off, on
tSel	Direct trunk access	off, on
pkGp	Call pickup group	0...5

For details on the meanings of these configuration settings, see the corresponding command descriptions earlier in this section.

Configuring Extensions

Introduction

The extension menu associates phone extensions with analog lines. This menu is primarily used for line to line calls within the premises.

The map extensions menu may also be used to route incoming DID calls. Refer to the section entitled “Configuring Digital Trunks”, discussed previously in this chapter.

The `extension` command is included in the LCR/DID telephone functionality mode and the extension menu will appear only when the LCR/DID optional feature is installed in the *SLC ConnectReach* system. In the LCR/DID mode additional configuration menus, including the extension menu, are used to specify call routing and DID operation.

NOTE:
The channel-bank menu must be used in conjunction with the extension menu.

Key commands

The key commands for the *SLC ConnectReach* systems’s map extension menu are as follows:

Extension-digits This command specifies the number of extension digits to allow for each extension and must be the same as the number specified in the `DID-received-digits` command in the Dialing menu.

Set-line This command assigns an extension number to a line with the option of an alternate extension. All extension and alternate extension numbers must be unique.

Clear-line-extension This command allows the clearing of any line in the extension map database. The confirm option will bypass the prompt, “Do you really want to clear the extension and alt-extension of line *n*?”

The `show-extension-map` command displays the map extension database entries.

(Continued on next page)

Configuring Extensions (Continued)

Procedure

After you have verified the required configuration, follow these steps to configure the map extension:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>At the Config prompt, enter the map-extensions command:

`(config)> map-extensions`

The prompt changes to the Config:Map-Extensions prompt.

`(config:Map-Extensions)>`</td></tr>
<tr><td>2</td><td>Make the necessary configuration changes. The following table describes these commands.
<table>
<tr><th>To</th><th>Enter this command...</th><th>...and specify the value</th></tr>
<tr><td>Specify the number of extension digits allowed</td><td>`extension-digits`</td><td>`1…[2]…10`</td></tr>
<tr><td>Assign an extension and optionally an alternate extension to a line</td><td>`set-line`</td><td>`line # extension # alt-extension #`</td></tr>
<tr><td>Remove a line entry. Optional automatic confirm</td><td>`clear-line-extension`</td><td>`line # (1…48) confirm`</td></tr>
<tr><td>Display the map extension database</td><td>`show-extension-map`</td><td></td></tr>
<tr><td>Access online assistance</td><td>`Help`</td><td></td></tr>
</table></td></tr>
<tr><td>3</td><td>Use the `show-map-extension` command to see the actual configuration.</td></tr>
<tr><td>4</td><td>Type **exit** or an exclamation point (**!**) (quoted as “\ |” through the *SLC-2000* Access System CIT).

NOTE:
The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values.

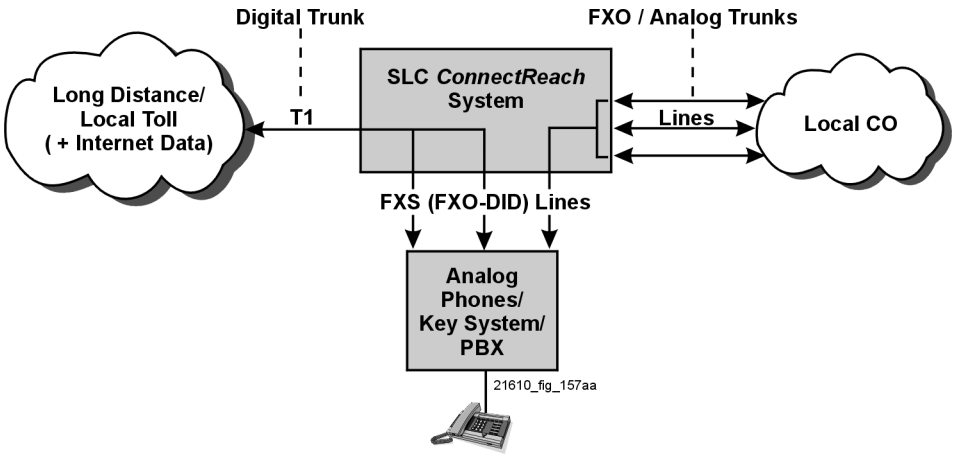
Stop! End of Procedure.</td></tr>
</table>

Configuring Dialing

Introduction

The *SLC ConnectReach* system's dialing table provides the following LCR options: translating seven- to ten-digit numbers, routing calls to either digital or analog trunks, and translating special numbers such as 411, 611, and 911 to seven- or ten-digit numbers.

The following figure shows that the *SLC ConnectReach* system intelligently routes calls to the local CO or to long distance. By configuring the dialing table, long distance calls go out by means of T1 (digital trunks) and local calls go out by means of lines (analog trunks). Incoming calls from either digital or analog trunks are routed to groups or stations.



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Configuring Dialing (Continued)

Introduction (continued)

There are two configuration tables that are used to describe this process: the detect table and the output table. The following figure shows the operation of these tables.

Detect Table

Row	Output-Row	Pattern
1	3	411
2	2	XXXXXXX
3 • • • 16	• • •	• • •

Output Table

Row	Group	Digits
1		
2	3	1415
3 • • • 16	7 • • •	DDD14155551212 • • •

21610_fig_267

In this figure, the telephone number 411 is detected by detect-table, row 1, which refers to the output-table, row 3. This entry in the output-table directs the software to seize a trunk from trunk group 7, then delete 411, and dial 1-415-555-1212. Also in this figure, any seven-digit number is detected by detect-table, row 2, which specifies that trunk group 3 be used for the call, which is to have the digits 1415 inserted.

The Dialing command is included in the LCR/DID telephone functionality mode and the Dialing menu will appear only when the LCR/DID optional feature is installed in the *SLC ConnectReach* system. In the LCR/DID mode, additional configuration menus, including the Dialing menu, are used to specify call routing and DID operation.

NOTE:
The channel-bank menu must be used in conjunction with the Dialing menu.

(Continued on next page)

Configuring Dialing (Continued)

Key commands

The key commands for the *SLC ConnectReach* system's Dialing menu are as follows:

Detect-insert

This command requires three values. The first value is the *row* number of the detect table. The second value refers to the *output-row* in the output table. The third value is where you assign a search *pattern*. When digits are dialed, the software looks at all patterns and tries to find a match. When the first match is found, the associated output table row is used to complete the call.

The *pattern* defines a range of numbers that match sequences of up to 14 digits. The syntax for the *pattern* is as follows:

Digit	One of the following: 0 1 2 3 4 5 6 7 8 9 matches that digit (for example, 3).
Range	[digit-digit] matches any digit (for example, 2-4).
X	X matches any digit (examples: XXXXXXX matches any seven-digit number, 413XXXX matches 4134361, 413436XXXX matches 4134361234).
Local	L matches any four digits (for example, 413L matches 413 followed by any four numbers).
Timeout	T accepts additional digits waiting for interdigit timeout (for example, 413T matches both 4134361234 and 4134361).

(Continued on next page)

Configuring Dialing (Continued)

Key commands (continued)

The following figure provides an example of a detect-insert table.

```
Detect table
Row out-tbl-row pattern
  1           3 1800XXXL|1888XXXL|1877XXXL|1866XXXL|1855XXXL|1900XXXL
  2           1 1[2-9]XXXXXL
  3           2 011T
  4           3 [2-9]XXL|411|611|911
  5           3 0[2-9]XXXXXL|01[2-9]T|101XXXX[0|1]XXXXXXL|10XXX[0|1]XXXXXXL
```

The following is an explanation of the detect-insert table example:

Row 1	Detects toll free and 900 number calls and refers them to output row 3.
Row 2	Detects United States long distance calls and refers them to output row 1.
Row 3	Detects international calls and refers them to ouput row 2.
Row 4	Detects local calls, including information, service repair and emergency calls, and refers them to output row 3.
Row 5	Detects credit card calls and refers them to output row 3.

Output-insert

This command requires four values. The first value is the *row* number of the output table. The second value specifies which trunk *group* to seize. The third value refers to an *alternate-output-row*. The fourth value specifies *digits* to insert or delete and includes a pausing capability. The third and fourth values are optional. For entries with digits and no alternate-output-row use a “—” (dash).

The digits define the manipulation necessary to complete the call. The syntax for this entry are as follows:

Digit	One of the following: 0 1 2 3 4 5 6 7 8 9 may be inserted at the beginning of the dialing string (for example, 3).
D	D deletes the current digit from the number dialed.
P	P provides a pause.

(Continued on next page)

Configuring Dialing (Continued)

Key commands (continued)

The following figure provides an example of an output-insert table.

```
Output table
Row       group    alt-out       digit-string
  1           1          3                  D
  2           1          3
  3           2
LocalDigits
```

The following is an explanation of the output-insert table example:

Row 1	The one is deleted, which is required by some long distance carriers, and the call is routed to trunk group 1. Trunk group 2 is an alternate (row 3).
Row 2	The call is routed to trunk 1 with trunk group 2 as an alternate (row 3).
Row 3	The call is routed to trunk 2.

Access-code

This command assigns from one to six digits, zero through nine, as the access-code for connecting to an outside trunk or an inside line.

If the access-code is to be used for connecting to an outside line, the trunk-access command needs to be enabled. The caller dials the access-code to get an outside trunk.

If the access-code is to be used for connecting to an inside line, the trunk-access is set to auto. The caller dials a seven-digit number which is made up of the access code plus the line extension being called. The number of digits necessary for the access-code is seven minus the number of extension digits. For example, if the extension digits are set to three, the access-code needs to be comprised of four digits to bring the total number of digits dialed to seven. In this example if caller dials 429-1101, the extension is 101 and the access-code is 4291.

(Continued on next page)

Configuring Dialing (Continued)

Key commands (continued)

Default-output	This command specifies the row in the output table entry that contains both the primary and alternate trunk groups.
Trunk-access	This command determines how a caller will access an outside trunk. If trunk-access is set to *access code*, the caller dials the access-code to get an outside trunk. If trunk-access is set to *auto*, the caller dials the access-code in combination with the extension to get an inside line.
DID-received-digits	This command specifies the number of direct inward dial (DID) digits to expect from the CO. The number of DID digits must be the same as the number specified in the `extension-digits` command in the configuring extensions section described earlier in this chapter.
DID-undefined-type	This parameter specifies the treatment of calls with unknown DID-strings that are received from the CO. There are two options: route the call to the specified analog line or refuse the call (reorder).
DID-undefined-line-num	If the CO sends an invalid DID string, the call will be forwarded to this line.
Pause	This command specifies the pause interval (expressed in milliseconds) inserted for a P in the digits option of the dial-string command.
Test	This command prompts the operator to enter a digit string and view the selected trunk group as well as the output digits. This command verifies that the dial-table is functioning correctly.
Extension-prefix	This command allows the dialed digits to be passed on to the class 5 switch, and should only be used when the *SLC ConnectReach* system is connected to a switch that is configured for such digit passing. This command displays the contents of both of the detect-table and the output-table.

The **`show-all`** command displays the contents of both the detect-table and the output-table.

(Continued on next page)

Configuring Dialing (Continued)

Procedure

After you have verified the required configuration, follow these steps to configure Dialing:

Step	Procedure
1	At the Config prompt, enter the `dialing` command: `(config)>` **`dialing`** The prompt changes to the Config:Dialing prompt. `(config:Dialing)>`
2	Make the necessary configuration changes. The following table describes these commands.

To	Enter this command...	...and specify the value
Assign a search pattern to detect-insert element	`detect-insert`	`row (1...16) output-row (1...16) pattern`
Remove entry from corresponding detect-row	`clear-detect`	`detect-row (1...16)`
Assign a search pattern to output-insert element	`output-insert`	`row (1...16); group; alt-out-row; digits (0...9,D,P)`
Remove entry from corresponding output-row	`clear-output`	`output-row (1...16)`
Enter digits for connecting to an outside trunk	`access-code`	`access-code (0...9)`
Specify default trunk group	`default-output`	`output-row (1...16)`
Enable the access code or set to automatic detection	`trunk-access`	`[access-code], auto`
Specify the DID digits received from the CO	`DID-received-digits`	`1...[2]...12`
	`DID-undefined-type`	`analog-line, [reorder]`
	`DID-undefined-line-num`	`[1]...48`
Specify the pause interval	`pause`	`[2000] 100...20000 msecs`
Display the detect-table and the output-table	`show-all`	
Enter a digit string to view the selected trunk group	`test`	`digits`
Access online assistance	`Help`	

Configuring Dialing (Continued)

Procedure (continued)

Step	Procedure
3	Use the `show-all` command to see the actual channel configuration.
4	Type **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring Voice Mail

Introduction

The optional BOX features, when installed, communicate with a voice mail system using dial tone multifrequency (DTMF) inband signaling. The voice mail system, typically, is located near the *SLC ConnectReach* system and is attached by means of the FXS line(s). One or more lines are dedicated to the physical voice mail ports. There are five preset voice mail profiles to choose from. Custom configuration is also possible. The *SLC ConnectReach* system can be configured to forward incoming trunk calls to a voice mail system providing auto-attendant functions.

Key commands

The key commands for the voice mail menu are as follows:

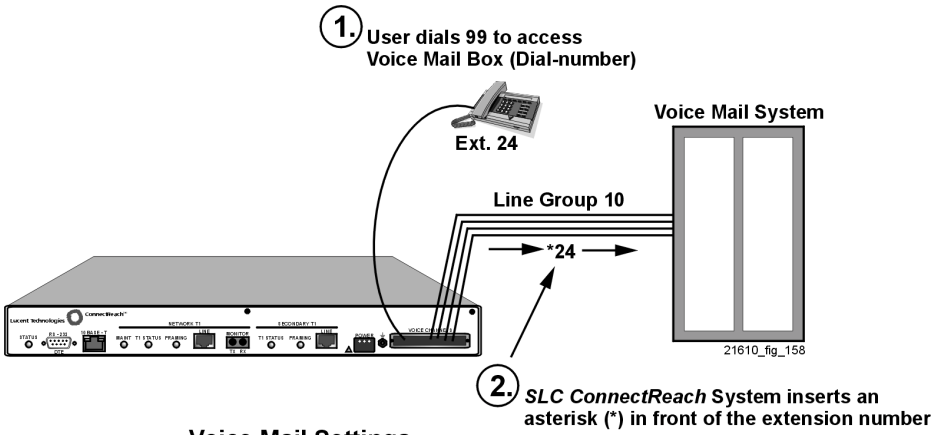
Line-group	This command specifies the line group designated for the voice mail system.
Integration-delay	This command sets the delay between the initial call to the voice mail system and the sending of the DTMF string.
Stutter-tone	If this command is enabled, the user will hear a stuttering dial tone when they pick up the receiver indicating there are messages waiting.
Periodic-ring	If this command is enabled, the phone will give two short rings every 5 minutes indicating there are messages waiting.
Dial-number	This command is used to assign a unique extension number for accessing the voice mail system.
Profile-name	A name may be assigned to the configured voice mail settings. Any alphanumeric name up to 20 characters in length is acceptable.

(Continued on next page)

Configuring Voice Mail (Continued)

Key commands (continued)

Direct-prefix This command specifies the DTMF digit required, if any, that needs to be inserted before the extension number. In most cases, this is an asterisk (refer to the following figure.



Voice Mail Settings

Line-group	=	10
Dial-number	=	99
Direct-prefix	=	*

Ring-no-answer This command specifies the DTMF string that signals to the voice mail system that the line was ringing and there was no answer. The string can include the originator's and destination extension numbers.

Busy-no-answer This command specifies the DTMF string that signals to the voice mail system that the line was busy. The string can include the originator's and destination extension numbers.

Forward-all This command specifies the DTMF string that signals to the voice mail system that the destination is an unknown location. The action by the voice mail system in this case is often to give a message (for example, "the extension you have dialed is not a valid extension, please try again or dial zero for assistance").

MWI-on-prefix This command specifies the DTMF string to attach to the user's extension indicating a message is waiting. The information is coming from the voice mail system to the *SLC ConnectReach* system.

(Continued on next page)

Configuring Voice Mail (Continued)

Key commands (continued)

MWI-off-prefix This command specifies the DTMF string to attach to the user's extension indicating no messages are waiting. The information is coming from the voice mail system to the *SLC ConnectReach* system.

Load-profile This submenu allows the option of selecting one of five preset configurations for the most common voice mail system profiles.

The profiles included are:

- Generic
- BBS Telecom
- Panasonic TD1232
- Toshiba Dk280
- Samsung DCS.

Procedure

After you have verified the required configuration, follow these steps to configure Voice Mail:

Step	Procedure
1	At the Config prompt, enter the `voice-mail` command: `(config)>` **`voice-mail`** The prompt changes to the Config:Voice-mail prompt. `(config:Voice-Mail)>`

(Continued on next page)

Configuring Voice Mail (Continued)

Procedure (continued)

Step	Procedure
2	Make the necessary configuration changes. The following table describes these commands.

To	Enter this command...	...and specify the value
Enable the voice mail system	`enable`	`[off], on`
Specify the line group for the voice mail system	`line-group`	`(1...[10])`
Specify the delay between signaling the voice mail system and sending a string	`integration-delay`	`[500] (0...5000) (ms)`
Enable the stutter dial tone as message waiting indicator	`stutter-tone`	`[off], on`
Enable the two short rings as message waiting indicator	`periodic-ring`	`[off], on`
Specify the extension for the voice mail system	`dial-number`	(*DTMF digits*)
Specify a name for the voice mail settings	`profile-name`	(*name*)
Specify the DTMF digit prefix for the extension	`direct-prefix`	[*](*DTMF digits*)
Specify the DTMF string for ringing and no answer	`ring-no-answer`	[#d] (*DTMF digits*,'s','d')
Specify the DTMF string for busy	`busy-no-answer`	[#d] (*DTMF digits*,'s','d')
Specify the DTMF string for unknown destination	`forward-all`	[#d] (*DTMF digits*,'s','d')
Specify the DTMF string for message waiting	`mwi-on-prefix`	(*DTMF digits*)
Specify the DTMF string for no message waiting	`mwi-off-prefix`	(*DTMF digits*)
Load a preset profile	`load-profile`	
Access online assistance	`Help`	

(Continued on next page)

Configuring Voice Mail (Continued)

Procedure (continued)

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>3</td><td>To select one of the preconfigured voice mail settings, enter the <code>load-profile</code> command.

<code>(config:Voice-Mail)> Load-Profile</code>

The prompt changes to the Config:Voice-mail:Load-Profile prompt.

<code>(config:Voice-Mail:Load-Profile)></code>

The following table describes the load-profile commands.
<table>
<tr><th>To</th><th>Enter this command...</th><th>...and one of these options</th></tr>
<tr><td>Select a profile number</td><td><code>profile-number</code></td><td><code>[1]...5</code></td></tr>
<tr><td>List the profiles available</td><td><code>list-profiles</code></td><td></td></tr>
<tr><td>Show the settings of the profile number selected</td><td><code>show-selected-profile</code></td><td></td></tr>
<tr><td>Copy the selected profile to the voice mail menu</td><td><code>copy-selected-profile</code></td><td></td></tr>
<tr><td>Access online assistance</td><td><code>Help</code></td><td></td></tr>
</table></td></tr>
<tr><td>4</td><td>When you have made the necessary configuration changes, you can return to the Config menu by typing exit or an exclamation point (!) (quoted as “\ |” through the SLC-2000 Access System CIT).

NOTE: The new command values take effect as soon as you save the configuration. You do not need to reboot the SLC ConnectReach system to use the new values.

Stop! End of Procedure.</td></tr>
</table>

Configuring Passwords

Introduction

When you initially access the *SLC ConnectReach* system, no login name and password are required. The *SLC ConnectReach* system immediately displays the Main Menu prompt for the *SLC ConnectReach* system Utility. For security reasons, you should configure the *SLC ConnectReach* system with login names and passwords.

When you log in to the *SLC ConnectReach* system by means of a Telnet session or the RS-232 port, there is one level of privilege for configuring and monitoring the *SLC ConnectReach* system. This privilege is called Carrier. Two privilege levels, carrier and user, are available when logging in to the *SLC ConnectReach* system using a Web browser. The two privilege levels offer different sets of available commands.

- Carrier privilege allows unlimited access to all configuration and monitoring commands. You may set one login name with Carrier privilege. Carrier privilege is designed for use by a limited number of individuals permitted to configure the *SLC ConnectReach* system. The use of this privilege should be carefully restricted.
- User privilege allows limited access to the *SLC ConnectReach* system. You may set one login name with User privilege. By default, User privilege allows access to a group of commands. To configure the User privilege with access to additional commands, use the `GroupFeature` and `CustomFeature` commands in the `Access` submenu.

The login name and password verification utility is case sensitive. When logging in, you must enter the name and password strings exactly as configured, including uppercase or lowercase characters.

After three failed attempts to log in to the *SLC ConnectReach* system, you cannot log in for 5 minutes. After 20 failed attempts, you cannot log in for 1 hour. You can bypass this problem by rebooting the *SLC ConnectReach* system.

After 5 minutes of inactivity, you are automatically logged off.

NOTE:
If the situation requires that you not reboot the *SLC ConnectReach* system, you can bypass the login counter by logging in via a different means of access. If you are using the RS-232 port or the Telnet for access, use a Web browser instead. If you are using a Web browser, log in via the RS-232 port or Telnet instead.

(Continued on next page)

Configuring Passwords (Continued)

Introduction (continued)

Passwords are stored using one-way encryption. If a customer loses or forgets the user password, you must log in with Carrier privilege and set the user password. However, if you lose or forget the carrier password, you must contact Lucent Technologies, Inc. at 1-866-LUCENT8 for assistance.

Add a login and password

Add a login name and password using the following procedure:

Step	Procedure
1	At the Config prompt, enter the `password` command: `(config)>` **`password`** The prompt changes to the Config:Password prompt. `(config:Password)>`
2	At the Config:Password prompt, enter the privilege and the corresponding login name, as shown in the following table. Login names can range from 3 to 16 characters in length. **To** / **Enter this command:** / **...and specify the value** Add a login name with USER access privilege / `user` / *name* Add a login name with CARRIER access privilege / `carrier` / *name* Configure user access / `Access` / Access online assistance / `Help`
3	The utility then prompts you to enter a password for the login name. Passwords can range from 3 to 16 characters in length. After you enter the password, the utility prompts you to confirm the password by entering it again.
4	To configure access to additional commands for User privilege, enter the `Access` command. (config:Password)> Access The prompt changes to the config:Password:Access prompt. (config:Password:Access)>
5	Make the necessary configuration changes using the commands described in the following section. **Stop! End of Procedure.**

(Continued on next page)

Configuring Passwords (Continued)

Access submenu

The `Access` submenu offers a way for the carrier to alter which commands will be available to the user. The user access may be expanded to include a group of menus, submenus, or individual commands. The following table describes the `Access` commands.

To	Enter this command:	...and specify the value
Add a group of menus to the user access list (refer to the following table for a list of menus in each group)	`GroupFeature`	*Voice, Data, Physical, Utils*
Delete a group	`ClearGroup`	`Voice, Data, Physical, Utils`
Add or delete (filter) a menu, submenu, or command in the user list	`CustomFeature`	*`[permit, deny], [menuPath]`* *
Delete a filter or group of filters	`ClearCustom`	`[permit, deny, all, filter#]`
Display list of groups and filters	`show`	
Access online assistance	`Help`	
* Example: CustomFeature permit config:NAT		

(Continued on next page)

Configuring Passwords (Continued)

Access submenu (continued)

GroupFeature Command

The `GroupFeature` command sets the user access to the associated menus of each group specified. The following table lists the menus associated with each group.

Config Voice Menus			
Channel Bank	Analog Trunk*	Digital Trunk*	Lines*
Line:BOX†	Line:feature-codes†	Map-Extension*	Dialing*
Voice-Mail†	NAT	Route	Firewall
Config Data Menus			
Synchronous-Interface	Ethernet	SNMP	Route
NTP	DHCP‡	DNS‡	Firewall‡
	QOS‡	NAT‡	
Config Physical Menus			
Network-T1	DS0-Provisioning	Secondary/Fractional-T1	
Utility Menus			
Config Menu Commands:	RS-232	FTP-log-dump	template-archive
	default	preserve-default	**Auto-config
Main Menu Commands:	xmodem-download	archive	diagnose
	network-upgrade		
Default			
Config Menu Commands:	Password	show	save
Main Menu Commands:	Statistics	version	show-hardware-config
	log	ping	traceroute

* Available if the LCD/DID feature key is enabled.
† Available if the BOX feature key is enabled.
‡ Available if the Data feature key is enabled.
**Available if the Auto-config feature key is enabled.

CustomFeature Command

The `CustomFeature` command offers a way to permit or deny user access to specific menus, submenus, or commands. It allows the carrier to further customize the group access rights if they are insufficient or are too broad. A maximum of 30 filters may be set.

(Continued on next page)

Configuring Passwords (Continued)

Access submenu (continued)

The following rules apply for the `GroupFeature` and `CustomFeature` commands.

- When a menu is permitted, then all commands and submenus below it are also permitted.
- When a command is permitted, only the command, and all menu commands required to reach the command are permitted.
- When a menu is denied, then all the commands and menus below that menu are denied.
- When a command is denied, only that command is denied. All submenus or commands at the same level of the denied command are left untouched.
- The custom filters take precedence over the group access.
- If two or more filters cover the same area, the filter entered last will take precedence of any earlier filters, For example:

  Filter One:

  ```
  (config:Password:Access)> CustomFeature permit
  config:NAT:Dynamic
  ```

  Filter Two:

  ```
  (config:Password:Access)> CustomFeature deny config:NAT
  ```

  Filter one is nullified because filter two denies the whole NAT menu.

As an example of the relation between the `GroupFeature` and `CustomFeature` commands, consider a situation where the carrier wants to permit access to the data group, but deny access to the Synchronous-Interface menu. In this example, the user may need to access the `warm-start` command in order for some changed settings to take effect. Following are the commands required to set the user access level as described above:

```
(config:Password:Access)> GroupFeature data

(config:Password:Access)> CustomFeature deny config:Synchronous-
                      Interface

(config:Password:Access)> CustomFeature permit warm-start
```

(Continued on next page)

Configuring Passwords (Continued)

Access submenu (continued)

The `features-show` command in the Access submenu would display the following:

```
User Menu Group Feature Access
------------------------------
   Default Data

User Menu Custom Feature Access
-------------------------------
   1:   DENY: config:Synchronous-interface
   2:   PERMIT: warm-start
```

Change an existing password

To change the password for an existing login name, follow the same procedure as for adding a new login name. However, in Step **3**, enter the new password.

Deleting a password

To delete a password for an existing login name, enter the `password` command without a login name. For example:

```
(config:password)> carrier
```

Logging in to the *SLC ConnectReach* system

After you configure login names and passwords, the next time you access the *SLC ConnectReach* system you must enter a name and password. After you enter the user name and password, the Main Menu prompt appears. For example:

Please enter name: `fred`

Enter password: `******`

>

(Continued on next page)

Configuring the DHCP Service

Introduction

DHCP, Dynamic Host Configuration Protocol, is used by the SLC *ConnectReach* system to dynamically assign IP addresses so PCs and other workstations can connect to the network and perform common network functions without an administrator having to assign IP addresses manually.

Procedure

Step	Procedure
1	At the Config prompt, enter the `DHCP` command: `(config)>` **`dhcp`** The prompt changes to the Config:DHCP prompt. `(config:DHCP)>`
2	At the Config:DHCP prompt, enter the appropriate commands from the following table.

Enter this command...	...and specify this value	Comments
`enable`	`off, [on]`	Enable or disable DHCP.
`start-ip*`	*`IP-address`*	Specify the start of the range of IP addresses to be used (the default is 192.168.0.2).
`end-ip`	*`IP-address`*	Specify the end of the range of IP addresses (the default is 192.168.0.254).
`private-network`	`off, [on]`	Enable this option if you do not want any IP addresses to be visible to the Internet. If the Private Network option is enabled, you must also enable NAT and PAT (see Configuring NAT and PAT on page 4-119.).
`lease-time`†	`[600]…7200 seconds`	Specify the length of lease time. DHCP attempts to link the same address to a device each time the device requests an address.
`dns-server`	*`IP-address`*	Specify the DNS server.This address should be provided by the carrier.
`domain`‡	*`domain name`*	Specify the domain name for the site.
`Help`		Access online assistance

* The IP address pool must be that assigned to the site by the carrier if SOCKS is not enabled. Otherwise, the IP address pool can be private. See the note regarding RFC 1918 in the section entitled “Configuring the Ethernet Interface”, located earlier in this chapter.

† The lease time command is set by default to industry-standard values. Only users who are familiar with the DHCP protocol should alter these values.

‡ Obtain the domain name from the carrier.

Configuring the DHCP Service (Continued)

Procedure (continued)

Step	Procedure
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **Stop! End of Procedure.**

When DHCP allocates an address to a requesting device, DHCP also notifies the device about the address of the default gateway. Because the *SLC ConnectReach* system is the default gateway, you do not need to configure this. There should be only one DHCP server on a given subnet.

Configuring the SNMP Service

Procedure

Step	Procedure
1	At the Config prompt, enter the `SNMP` command: `(config)>` **`snmp`** The prompt changes to the Config:SNMP prompt. `(config:SNMP)>`
2	At the Config:SNMP prompt, enter the appropriate commands and options to configure SNMP from the following table.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enables SNMP.
`snmp-host`	`IP-address`	IP address of the SNMP host that will receive SNMP traps.
`cold-start`	`[off], on`	This trap is sent when the unit has been powered on, has had a power failure, or has been rebooted with the `cold-start` command.
`warm-start`	`[off], on`	This trap is sent when the unit has detected a failure and has rebooted (preserving voice traffic), or has been rebooted with the `warm-start` command.
`link-down`	`[off], on`	This trap is sent when the Ethernet or T1 interface has been disconnected.
`link-up`	`[off], on`	This trap is sent when the Ethernet or T1 interface has been connected.
`login-failures`	`[off], on`	This trap is sent after each login failure has occurred.
`t1-traps`		This submenu is for changing the T1 trap settings.
`Help`		Access online assistance

(Continued on next page)

Configuring the SNMP Service (Continued)

Procedure (continued)

Step	Procedure
3	At the Config:SNMP prompt, enter the `t1-traps` command (T1/DSX-1 interface) . `(config:SNMP)>` **`t1-traps`** The prompt changes to the Config:SNMP:T1 prompt. `(config:SNMP:T1)>` The following table lists the T1traps. These traps set the T1 thresholds encountered by a DS1 interface. If the threshold is reached within the current 15-minute period, the associated trap will be sent. To disable a T1 trap, set it to 0.
4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **NOTE:** If the Network T1/DSX-1 connection is a frame relay network and you have established a secondary PVC to the carrier's management network, the `SNMP-host` command should be set to an address on that network. **Stop! End of Procedure.**

T1 Traps	Description
`ESs-threshold`	The number of Errored Seconds (ESs)
`SESs-threshold`	The number of Severely Errored Seconds (SESs)
`SEFs-threshold`	The number of Severely Errored Framing Seconds (SEFs)
`UASs-threshold`	The number of Unavailable Seconds (UASs)
`CSSs-threshold`	The number of Controlled Slip Seconds (CSSs)
`PCVs-threshold`	The number of Path Coding Violations (PCVs)
`LESs-threshold`	The number of Line Errored Seconds (LESs)
`BESs-threshold`	The number of Bursty Errored Seconds (BESs)
`DMs-threshold`	The number of Degraded Minutes (DMs)
`LCVs-threshold`	The number of Line Code Violations (LCVs)

Configuring Routes

Introduction

The Route menu of the *SLC ConnectReach* system allows the user to set a default route and up to 30 static routes. IP routes can also be obtained dynamically through routing information protocol (RIP) which is enabled in the Ethernet, Frame Relay, PPP and HDLC menus.

Key commands

The following table provides a list of the Route configuration key commands.

Enter this command...	...and specify this value	Comments
`route`	`add, delete` *`net mask`* `WAN, PVCn, FDL, GW [`*`IPaddrOfGw`*`]`	Add and delete static routes (including net mask and PVC or IP gateway).
`default`	`[WAN], PVCn,` *`IPaddrOfGw,`* `none`	Enter IP address of the primary WAN interface.
`backupDefault`	`[WAN], PVCn, FDL,` *`IPaddrOfGw`*`, none`	Specify an interface to be used as a backup to the default
`show-static-routes`		Displays the static route table.
`clear-static-routes`		Clears the static route table.
`Help`		Access online assistance.

The following is a description of the Route configuration key commands:

Default

The most common use of this command instructs the *SLC ConnectReach* system to send all nonlocal traffic to a WAN interface. For ease of use, the user can simply enter default WAN from the Route menu. This command would instruct the *SLC ConnectReach* system to send all the default IP traffic to either PVC1 (for frame relay encapsulation), PPP, or HDLC. The `default WAN` command adjusts itself to whatever synchronous encapsulation is chosen by the user. For frame relay encapsulation, the user can also select any of the five PVCs. Selecting PVC1 with frame relay encapsulation is the same as selecting WAN.

(Continued on next page)

Configuring Routes (Continued)

Configuring routes (continued)

Default (cont.)

To direct the default IP traffic to an alternate router, the user can enter:

`default` GW *IPaddrOfGw*

Where *IPaddrOfGw* is the IP address of the router.

To disable default routing on the *SLC ConnectReach* System, enter the `default none` command.

BackupDefault

This command lets you set up a backup default interface. The options are the same as those for the **default** command. To disable backup default routing on the *SLC ConnectReach* system, enter the **backupDefault** *none* command.

Route

This command allows the user to add or delete static routes through any IP gateway. For convenience, the user may specify WAN or PVC*n* instead of an IP gateway address. The WAN and PVC*n* options have the same definitions as they did in the `default` command. To specify a router on the Ethernet as the next hop, use the GW option followed by the IP address of the router.

NOTE:
The default route must be set to the Internet access location for a successful Internet connection.

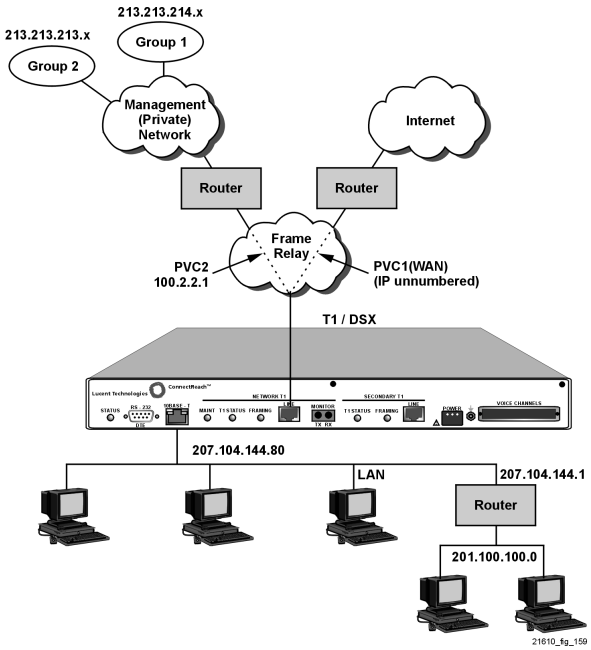
Example of default and static routes

The following figure provides an example of default and static routes.

(Continued on next page)

Configuring Routes (Continued)

Example of default and static routes (continued)



Procedure

To configure the sample route shown in the figure, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the `route` command: `(config)>` **`route`** The prompt changes to the Config:IPRoutes prompt. `(config:IPRoutes)>`

(Continued on next page)

Configuring Routes (Continued)

Procedure (continued)

Step	Procedure
2	At the Config:IPRoutes prompt, enter the `default WAN` command: `(config:IPRoutes)>` **`default WAN`**
3	At the Config:IPRoutes prompt, enter the `Route Add` command: `(config:IPRoutes)>` **`route add 213.213.213.0 255.255.255.0 PVC2`** `(config:IPRoutes)>` **`route add 213.213.214.0 255.255.255.0 PVC2`** `(config:IPRoutes)>` **`route add 201.100.100.0 255.255.255.0 GW 207.104.144.1`**
4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *ConnectReach* Terminal using the warm-start command for the new settings to take effect. **Stop! End of Procedure.**

Using ARP

Introduction

Address resolution protocol (ARP) is a TCP/IP protocol used to convert IP addresses to physical addresses, such as Ethernet (MAC) addresses. For purposes of internal testing, you can map a device's IP address or a host server's address to an Ethernet address temporarily.

NOTE:
Use this mapping with caution and make sure that when your testing is complete, you clear any mapping that may conflict with those on the network.

(Continued on next page)

Using ARP

Procedure

Use the following procedure to map an IP address to a physical address.

Step	Procedure
1	At the config prompt, enter the **ARP** command: `(config)>` **ARP** The prompt changes to the config:ARP prompt. `(config:ARP)>`

2	At the config:ARP prompt, enter the **ARP** command and parameters to carry out the tasks listed in the following table.
	
	To / **Enter this command:** / **...and specify the value**
	Convert an IP address or host server's address to a physical address / `arp` / `[`*`IP-address`*` | host] `*`Ethernet-address`* `{x:x:x:x:x:x}`
	Clear one or all ARP mappings / `clear-arp` / `[ALL |` *`IP-address`*`]`
	Display the table of all ARP mappings / `show-arp-table` /
	Access online assistance / `Help` /
	
	Enter mappings as shown in the following examples:
	
	`(config:ARP)> arp 192.168.0.1 00:60:49:00:02:87`
	`(config:ARP)> arp www.vina-tech.com 02:01:53:00:42:12`
	
	To clear a specific mapping, use the **Clear-ARP** command as in the following example:
	
	`(config:ARP)> clear-arp 192.168.0.1`

(Continued on next page)

Using ARP (Continued)

Procedure (continued)

Step	Procedure

3	To display the table of all ARP mappings, use the **Show-ARP-table** command. The results will appear as follows:
	`192.168.0.1 at 0:60:49:00:02:87`
	`192.168.0.2 at 0:b0:d0:a5:c8:19`
	
	NOTE:
	The new command values do not take effect until you save the configuration and reboot the *SLC ConnectReach* system using the `cold-start` command.
	
	Stop! End of Procedure.

Configuring NAT and PAT

Introduction

NAT

Network address translation (NAT), as laid out in RFC 1631, allows local (LAN) IP addressed workstations access to the Internet through the use of an external IP address pool. The *ConnectReach* NAT feature enables a company to increase the number of internal IP addresses pursuant to RFC 1597. There is also an Enterprise NAT option, for translating IP addresses of workstations at remote offices to WAN IP addresses (WAN-to-WAN), by means of Frame Relay PVCs. For details on Enterprise NAT, see *Configuring Enterprise NAT* on page F-1.

NAT allows the mapping of a range of LAN IP addresses to a range of WAN IP addresses. The relation of the mapping may be one-to-one, many-to-one, or many-to-many. All traffic between the LAN and the WAN must be defined if NAT is enabled. The three definitions are as follows:

- Static allocation
- Dynamic allocation
- Pass-thru.

In static allocation, the mapping between the LAN IP addresses and WAN IP addresses is a static one-to-one or many-to-many relation. Static mapping may or may not allow inbound connections from the WAN to the LAN.

In dynamic allocation, the LAN IP addresses are mapped to the available WAN IP addresses on an as-needed basis. Dynamic mapping may be defined with a many-to-one or many-to-many connection.

Pass-thru groups define LAN IP addresses that are allowed to pass through the NAT firewall. The WAN range must be a valid range.

If the firewall configuration, “IP filtering plus server” is to be used in conjunction with NAT, a static group with “allow-inbound enabled” for the server must be set up in NAT.

Examples on NAT configuration can be found in *Appendix B, Configuration Examples*.

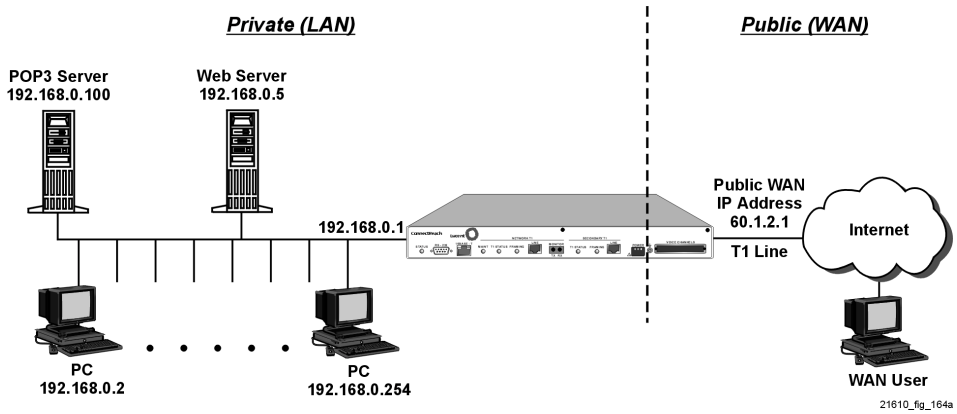
(Continued on next page)

Configuring NAT and PAT (Continued)

Introduction (continued)

PAT

Also, for any Dynamic group, Port Address Translation (PAT) may be configured. PAT allows users on the public (WAN) side of a network to access specific applications, or specific services, such as those provided by a Web server, an email server (pop3), or an FTP server on the private (LAN) side of the network. PAT allows this access without compromising the NAT firewall and network address translation features. This feature works only for NAT Dynamic translations, and it is therefore configured under the NAT Dynamic Group menu. The example in the following figure shows a user on the WAN side of the network with access to an email and Web server on the LAN side of the network.



The key commands used to create this scenario are:

```
(config:NAT:Dynamic:Group1)> IN-Start=192.168.0.2
(config:NAT:Dynamic:Group1)> IN-End=192.168.0.254
(config:NAT:Dynamic:Group1)> OUT-Start=60.1.2.1
(config:NAT:Dynamic:Group1)> PAT
(config:NAT:Dynamic:Group1:PAT)> session add http 192.168.0.5
(config:NAT:Dynamic:Group1:PAT)> session add pop3
192.168.0.100
```

In the above scenario, the WAN User can connect to the Public WAN IP address and get both Web Server access and email from the pop3 server provided from within the LAN.

(Continued on next page)

Configuring NAT and PAT (Continued)

Introduction (continued)

With static allocation, the translation between the LAN IP addresses and the WAN IP addresses is a static one-to-one relation. Static translation may or may not allow inbound connections from the WAN to the LAN. Pass-thru groups define LAN IP addresses that are allowed to pass through the NAT firewall. The WAN range must be a valid range.

NOTE:
If the firewall configuration, “IP filtering plus server” is to used in conjunction with NAT, a static group with “allow-inbound enabled” for the server must be set up in NAT. For examples on NAT configuration, see *Appendix B, NAT Examples* on page B-18.

Procedure

To configure NAT, proceed as follows:

Step	Procedure

1	At the config prompt, enter the NAT command:
	
	`(config)> NAT`
	
	The prompt changes to the Config:NAT prompt.
	
	`(config:NAT)>`

(Continued on next page)

Configuring NAT and PAT (Continued)

Procedure (continued)

Step	Procedure
2	At the Config:Nat prompt, enter the appropriate commands and options to configure NAT from the following table.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enables NAT.
`Dynamic`		The submenu for dynamic allocation of IP addressing between LAN and WAN.
`Static`		The submenu for static allocation of IP addressing between LAN and WAN.
`PassThru`		To configure pass thru LAN addresses that are valid Internet IP addresses; requires secondary IP address 9see *Configuring the Ethernet Interface* on page 4-49).
`Show-sessions`	[all], udp, tcp, icmp, config	Shows sessions associated with specified parameter.
`Clear-sessions`	[all], udp, tcp, icmp	Clear sessions associated with specified parameter.
`Help`		Access online assistance

(Continued on next page)

Configuring NAT and PAT (Continued)

Procedure (continued)

Step	Procedure
3	Each submenu command, `Dynamic`, `Static`, and `PassThru`, has four groups available for setting allocations. The following procedures explain the use of these three commands:

Dynamic

1. At the specific submenu, enter the group to be configured. For example:

   `(config:NAT:Dynamic) > 1`

   The prompt changes to the submenu-group that is to be configured. For example:

   `(config:NAT:Dynamic:Group1) >`

2. At the submenu-group prompt, enter the appropriate command from the following Dynamic configuration commands table.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enables dynamic allocation.
`IN-Start`	`0.0.0.0`	Enter the starting IP addresses for the range.
`IN-End`	`0.0.0.0`	Enter the ending IP addresses for the range.
`OUT`	`0.0.0.0`	Enter the starting IP addresses for the range.
`PAT`	`....`	Submenu for Port Address Translation
`Show`	[all], udp, tcp, icmp	Shows connections associated with specified parameter for this dynamic group.
`Clear`	[all], udp, tcp, icmp	Clear connections associated with specified parameter for this dynamic group.
`Help`		Access online assistance

(Continued on next page)

Configuring NAT and PAT (Continued)

Procedure

Step	Procedure

3 cont.	**PAT Submenu Commands**
	1. To configure PAT for a UDP port, number 312, and a default HTTP port, for example, enter the following commands:
	`(config:NAT:Dynamic:Group1)> session add udpport 312 192.168.0.3`
	`(config:NAT:Dynamic:Group1)> session add http 312 192.168.0.5`

Enter this command...	...and specify this value	Comments
`session`	`add/delete [protocol port, keyword] [InbandIPAddress]`	Adds or deletes a port address as related to a protocol - specify the protocol you are configuring, either by entering the default name and port number for that protocol (if you know it), or the keyword (e.g., pop 2, pop3, http, ftp, telnet)*. Then enter the IP address of the T1 port of the appropriate server, inside the inband range (In-start to In-end).
`Show-pat-config`		Shows protocols and connected ports.
`Clear-pat-config`		Clears PAT settings
`Help`		Access online assistance

* Examples: Default name and port number: `session add udpport 312 192.168.0.3` Keyword: `session add pop2 192.168.0.5`
The supported keywords are: Telnet, FTP, SMTP, HTTP, Icmp, Tftp, bootp, gopher, DNS, SNMP, OSPF, NFS, FTP-data, RSVP, NHRP, POP2, and POP3.

(Continued on next page)

Configuring NAT and PAT (Continued)

Procedure (continued)

Step	Procedure

4	**Static**
	1. At the specific submenu, enter the group to be configured. For example:
	`(config:NAT:Static) > 1`
	The prompt changes to the submenu-group that is to be configured. For example:
	`(config:NAT:Static:Group1) >`
	At the submenu-group prompt, enter the appropriate command from the following Static configuration commands table.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enables static allocation.
`IN-Start`	`0.0.0.0`	Enter the starting IP addresses for the range.
`IN-End`	`0.0.0.0`	Enter the ending IP addresses for the range.
`OUT-Start`	`0.0.0.0`	Enter the starting IP addresses for the range.
`OUT-End`	`0.0.0.0`	Enter the ending IP addresses for the range.
`ALLOW-INBOUND`	`off, [on]`	Allows inbound initiation from WAN.
`Show`	[all], udp, tcp, icmp	Shows connections associated with specified parameter for this static group.
`Clear`	[all], udp, tcp, icmp	Clear connections associated with specified parameter for this static group.
`Help`		Access online assistance

(Continued on next page)

Configuring NAT and PAT (Continued)

Procedure (continued)

Step	Procedure
5	**Pass-Thru** 1. At the specific submenu, enter the group to be configured. For example: `(config:NAT:PassThru) > 1` 2. The prompt changes to the submenu-group that is to be configured. For example: (config:NAT:PassThru:Group1) > At the submenu-group prompt, enter the appropriate command from the following Pass-Thru configuration commands table. **Enter this command... / ...and specify this value / Comments** `enable` / `[off], on` / Enables pass-thru definition. `IN-Start` / `0.0.0.0` / Enter the starting IP addresses for the range. `IN-End` / `0.0.0.0` / Enter the ending IP addresses for the range. `Help` / / Access online assistance .Make sure you have configured a secondary IP address for the Ethernet Interface before enabling Pass-Thru definition (see *Configuring the Ethernet Interface* on page 4-49 for details).
6	When you have made the necessary configuration changes, enter the **exit** command or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT) to return to the NAT menu. **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Configuring the Default Firewall

Introduction

The *SLC ConnectReach* system incorporates IP filtering firewall technology. For most installations, configuring the firewall is extremely simple. The *SLC ConnectReach* system allows two standard firewall configurations. However, if an installation has special requirements, the firewall configuration can be customized (see *Appendix C, Custom Firewall Configurations*).

NOTE:
For all IP filtering used in conjunction with NAT, you must use the NATed IP addresses in filters, not the original IP addresses.

IP Filtering

When IP filters are configured, the *SLC ConnectReach* system examines every LAN or WAN packet and either permits or denies the packet based on filter settings.

The *SLC ConnectReach* system's IP packet filtering consists of four groups of IP filters (sometimes called access lists): any group can be either an inbound filter group or an outbound filter group. Each IP filter group combines up to sixteen IP filters (access lists) and a default (generic) action. Group 1 contains filter 1 through filter 16, group two contains filter 17 through filter 32, group 3 contains filter 33 through filter 48, and group 4 contains filter 49 through 64.

An IP filter defines a set of conditions and the action to be taken (*permit* or *deny*) if all the filter conditions are met. The default action (*permitAll* or *denyAll*) handles the case of an IP packet that does not meet the conditions in this IP filter group. If an IP packet is for the *SLC ConnectReach* system (for example, HTTP or Telnet sessions), then the default action for this packet is always "pass." In other words, if none of the filters inside the inbound filter group match, then the *SLC ConnectReach* system will process this IP packet.

When no filters are defined for any inbound or outbound IP filter groups and the default action is *permitAll*, then the *SLC ConnectReach* system does not examine packets.

NOTE:
Changing the default action for any of the four filter groups will change the default action for the other three filter groups as well.

The order by which filters are applied is important. In any given filter group, all filters are examined in consecutive order, with filter 1 having the highest priority and filter 16 having the lowest priority.

(Continued on next page)

Configuring the Default Firewall (Continued)

Default configurations

The `default-configure` command allows the user to define one of the following four standard IP firewall configurations:

- IP filter
- IP filter plus server.

In the above default commands, the default IP filter methods only allow outgoing connections to be initiated from the PCs on the LAN. (No connections from the Internet to the PCs on the LAN can be made.)

If you want to use the NAT application with “IP filtering plus server”, you must set up a static group with “allow-inbound enabled” for the server in NAT.

NOTE:
The default server supports the following services: SMTP, POP2, POP3, HTTP, FTP, DNS, Telnet, and PING.

Firewall configuration commands

The following table lists the standard firewall configuration commands.

Enter this command...	...and specify the commands
`InIPFilterGroup`	`1...4`
`OutIPFilterGroup`	`1...4`
`Default-configure`	`IPFilter, No [server] [x.x.x.x]`
`show-config`	`1...4`
`Help`	`1...4`

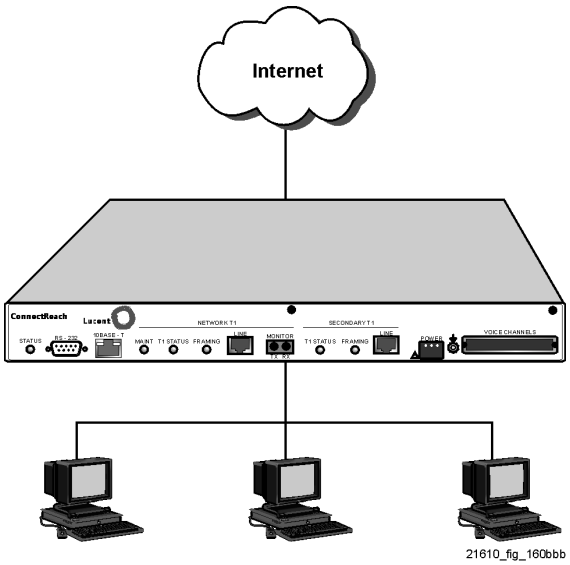
NOTE:
To totally disable the firewall, give the following command:
`(config:IPFirewall)>` **`default no`**

(Continued on next page)

Configuring the Default Firewall (Continued)

Configuring default IP filter

The following figure illustrates a sample topology for the default IP filter configuration.



Outgoing Connections Only

(Continued on next page)

Configuring the Default Firewall (Continued)

Procedure for default IP filter firewall

To configure the default IP filter firewall, proceed as follows:

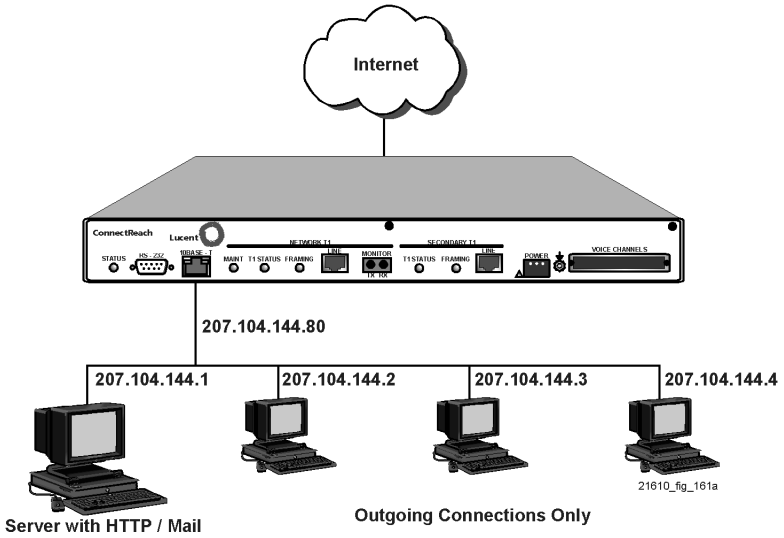
Step	Procedure
1	At the Config prompt, enter the `firewall` command: (config)> **`firewall`** The prompt changes to the Config:IPFirewall prompt. `(config:IPFirewall)>`
2	At the Config:IPFirewall prompt, enter the default IP filter command: (config:IPFirewall)> **`default ipfilter`** The prompt changes to the Change prompt. `Change Firewall config to the default 'Outgoing IPFilter only' settings?>[n]y:` **`y`** Enter '**y**' to set the default IP filter. The prompt changes to the Config:IPFirewall prompt. `(config:IPFirewall)>`
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

(Continued on next page)

Configuring the Default Firewall (Continued)

Configuring default IP filter plus server

The following figure illustrates a sample topology for the default IP filter plus server configuration.



(Continued on next page)

Configuring the Default Firewall (Continued)

Procedure for default IP filter plus server firewall

To configure the default IP filter plus server firewall, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the `firewall` command: `(config)>` **`firewall`** The prompt changes to the Config:IPFirewall prompt. `(config:IPFirewall)>`
2	At the Config:IPFirewall prompt, enter the `default ipfilter` plus `server` command: `(config:IPFirewall)>` **`default ipfilter server 207.104.144.1`** The prompt changes to the Change prompt. `Change Firewall config to the default 'only Outgoing IPFilter and a server' settings?>[n]y:` **`y`** Enter '**y**' to set the default IP filter plus server. The prompt changes to the Config:IPFirewall prompt. `(config:IPFirewall)>`
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

This completes the default firewall configurations. For the configuration settings for each of these default commands, refer to the following section entitled *Viewing default firewall configuration settings* on page 4-133.

(Continued on next page)

Configuring the Default Firewall (Continued)

Viewing default firewall configuration settings

To view the **IP inbound filter group settings,** enter:

(config:IPFirewall)> **`inipfiltergroup`**

and type a '**?**'

The IP inbound filter group settings for the default IP filter sample configuration shown in the preceding figure are as follows:

1Filter:	**permit**	**tcpport > 1023**
2Filter:	**permit**	**udpport > 1023**
3Filter:	**permit**	**ping**
4Filter:		
5Filter:		
6Filter:		
7Filter:		
8Filter:		
9Filter:		
10Filter:		
11Filter:		
12Filter:		
13Filter:		
14Filter:		
15Filter:		
16Filter:		
defaultAction	**denyAll**	

NOTE:
TCP/UDP ports: 0-1023 are reserved; 1024 and above are unreserved.

(Continued on next page)

Configuring the Default Firewall (Continued)

Viewing default firewall configuration settings (continued)

The IP outbound filter group settings for the default IP filter sample configuration shown in the preceding figure are as follows:

1Filter:

2Filter:

3Filter:

4Filter:

5Filter:

6Filter:

7Filter:

8Filter:

9Filter:

10Filter:

11Filter:

12Filter:

13Filter:

14Filter:

15Filter:

16Filter:

defaultAction **permitAll**

(Continued on next page)

Configuring the Default Firewall (Continued)

Viewing default firewall configuration settings (continued)

The IP inbound filter group settings for the default IP filter plus server sample configuration shown in the following figure are as follows:

1Filter:	**permit**	**dst 207.104.144.1 255.255.255.255 default**
2Filter:	**permit**	**tcpport > 1023**
3Filter:	**permit**	**udpport>1023**
4Filter:		**ping**
5Filter:		
6Filter:		
7Filter:		
8Filter:		
9Filter:		
10Filter:		
11Filter:		
12Filter:		
13Filter:		
14Filter:		
15Filter:		
16Filter:		
defaultAction	**denyAll**	

NOTE:
TCP/UDP ports: 0-1023 are reserved; 1024 and above are unreserved.

NOTE:
“255.255.255.255” is a netmask.

(Continued on next page)

Configuring the Default Firewall (Continued)

Viewing default firewall configuration settings (continued)

The IP outbound filter group settings for the default IP filter plus server sample configuration shown in the previous figure are as follows:

1Filter:

2Filter:

3Filter:

4Filter:

5Filter:

6Filter:

7Filter:

8Filter:

9Filter:

10Filter:

11Filter:

12Filter:

13Filter:

14Filter:

15Filter:

16Filter:

defaultAction permitAll

To see the inbound and outbound filters for a filter group, enter the show command and the number of a filter group, for example:

```
(config:IPFirewall)> show 1
```

Both the inbound and outbound filters will be displayed for that group.

Configuring custom firewall

For almost all *SLC ConnectReach* system users, the default configurations will be sufficient. For custom IP firewall configurations, see *Appendix C, Custom Firewall Configurations*

Configuring NTP

Introduction

The *SLC ConnectReach* system uses Network Time Protocol (NTP) to obtain the time of day for time-stamping messages in the event log.

Procedure

To configure NTP, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the `NTP` command: `(config)>` **`NTP`** The prompt changes to the Config:NTP prompt. `(config:NTP)>`
2	At the Config:NTP prompt, enter the appropriate commands from the following table.
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command values take effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new values. **Stop! End of Procedure.**

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enable or disable NTP. When NTP is enabled, the user can receive time- and date-stamped event log messages.
`server`	name, ip-addr	Specify the host name or the IP address. An example is host name "clock.psu.edu," which is at IP address "128.118.25.3."
`minutes-from-GMT`	number	Enter the difference in minutes between the local time and Greenwich Mean Time (GMT).*
`Help`		Access online assistance.

* The four U.S. time zones are: PST: -480, Mountain: -420, Central: -360, EST: -300. All time zones do not take into account daylight savings time.

Configuring the DNS Server

Introduction

The *SLC ConnectReach* system uses DNS servers to resolve host names for internal commands such as ping and network upgrade.

NOTE:
SOCKS Version 4 requires that the *SLC ConnectReach* system DNS server be configured. The DNS proxy server forwards IP domain name resolution requests from devices on the LAN to the primary DNS server on the WAN, or to the secondary DNS server on the WAN, if necessary.

Procedure

To configure the DNS server, proceed as follows:

Step	Procedure
1	Obtain the DNS server address(es) from the carrier.
2	At the Config prompt, enter the `DNS` command: `(config)>` **dns** The prompt changes to the Config:DNS prompt. `(config:DNS)>`
3	At the Config:DNS prompt, enter the appropriate commands from the following table. The DNS server addresses usually are the addresses of DNS servers on the WAN/Internet, not the local Ethernet, that are provided by the Internet service provider.

Enter this command...	...and specify this value	Comments
`enable`	`off, [on]`	
`primary-dns-server`	`IP-address`	Enter the address of the primary Domain Name Server.
`secondary-dns-server`	`IP-address`	Enter the address of the secondary Domain Name Server.
`Help`		Access online assistance.

(Continued on next page)

Configuring the DNS Server (Continued)

Procedure (continued)

Step	Procedure
4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **Stop! End of Procedure.**

Configuring QOS

Introduction

QOS (Quality of Service) allows prioritizing of IP packets going out the WAN link. The priority routes are defined by the source IP address, destination IP address or source and destination IP addresses. The IP address may either be a host or subnet. The QOS submenu allows up to five priority routes to be configured. Once the priority routes are defined, the *SLC ConnectReach* system identifies all IP packets as low or high priority.

The QOS may be set for guaranteed service or strict priority. Guaranteed service permanently reserves a portion of the system resources for high priority traffic. Strict priority allows system resources to be shared by low priority and high priority traffic, but at any given time high priority packets are always sent ahead of low priority packets.

NOTE:
For all QOS prioritization used in conjunction with NAT, you must use the NATed IP addresses in QOS commands, not the original IP addresses.

(Continued on next page)

Configuring QOS (Continued)

Procedure

After you have verified the required configuration, follow these steps to configure QOS:

Step	Procedure
1	At the Config prompt, enter the QOS command: `(config)>` **`QOS`** The prompt changes to the Config:QOS prompt. `(config:QOS)>`
2	At the Config:QOS prompt, enter the commands from the following table

Enter this command...	...and specify the baud rate	Comments
`enable`	`[off], on`	Enables QOS

`qos`	`add, delete`
	`src [net mask]`
	`dst [net mask]`
		Add and delete priority routes. Include IP address and netmask.

`Reserved-Bandwidth`	`[0] (kbits/sec)`	Set reserved minimum bandwidth. If set to zero, QOS is set for strict priority.
`show-qos-table`		Displays all priority routes.
`clear-qos-table`		Clears all priority routes.
`Help`		`Access online assistance`

(Continued on next page)

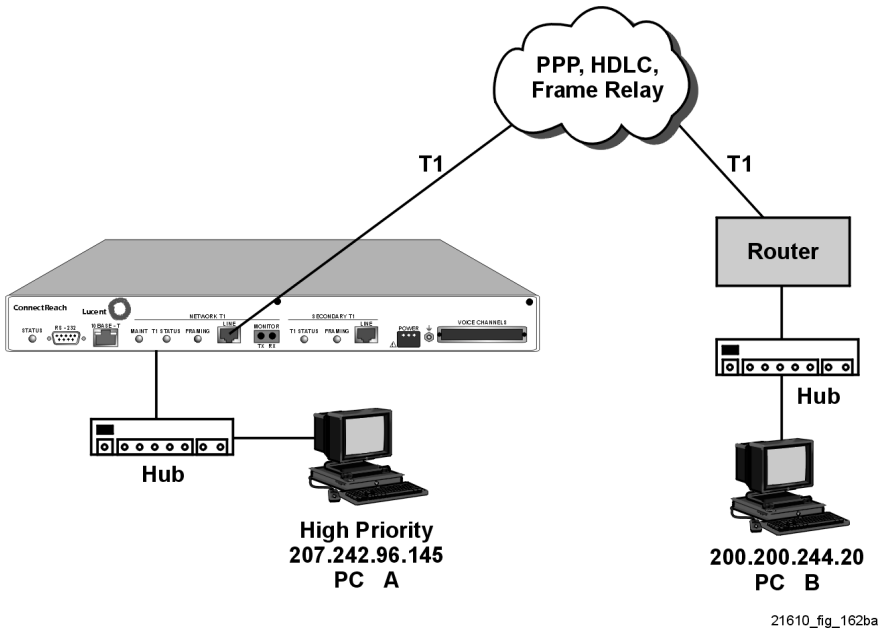
Configuring QOS (Continued)

Procedure (continued)

Step	Procedure
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command value takes effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new value. **Stop! End of Procedure.**

Example 1

The QOS example in the following figure describes a scenario where any packet originating from PC A will be treated as high priority with guaranteed service.



(Continued on next page)

Configuring QOS (Continued)

Example 1 (continued)

To configure the example shown in the figure, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the QOS command: `(config)>` **`QOS`** The prompt changes to the Config:QOS prompt. `(config:QOS)>`
2	At the config:QOS prompt, enter the following commands: (config:QOS)> **enable on** (config:QOS)> **qos add src 207.242.96.145 255.255.255.255** (config:QOS)> **reserved-bandwidth 128**

3	To view the QOS settings, enter the `show-qos-table` command.
	(config:QOS)> **show-qos-table**
	
	`IP QOS Table`
	`----------`
	`Src Addr` `Src Mask` Dst Addr Dst Mask
	`207.242.96.145` `255.255.255.0`

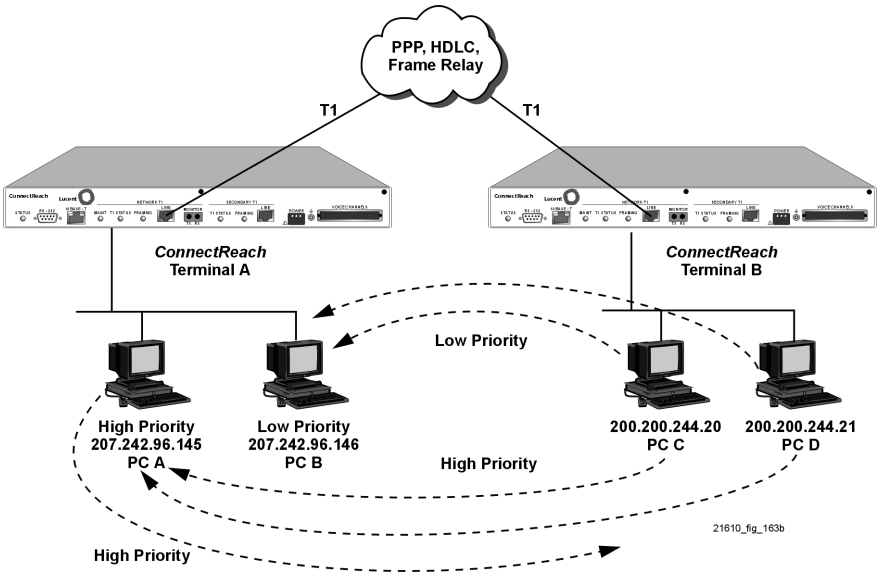
4	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command value takes effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new value. **Stop! End of Procedure.**

(Continued on next page)

Configuring QOS (Continued)

Example 2

In this example, there are two *SLC ConnectReach* systems at two different locations as shown in the following figure. Any packets originating from PC A will be sent high priority and any packets destined for PC A will be high priority.



To configure the example shown in the figure, proceed as follows:

Step	Procedure
1	For *SLC ConnectReach* system **A**: At the Config:QOS prompt, enter the following commands: `(config:QOS)>` **`enable on`** `(config:QOS)>` **`qos add src 207.242.96.145 255.255.255.255`**
2	For *SLC ConnectReach* system **B**: At the Config:QOS prompt, enter the following commands: `(config:QOS)>` **`enable on`** `(config:QOS)>` **`qos add dst 207.242.96.145 255.255.255.255`**

(Continued on next page)

Configuring QOS (Continued)

Example 2 (continued)

Step	Procedure
3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command value takes effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new value. **Stop! End of Procedure.**

Configuring SYSLOG

Introduction

The SYSLOG utility creates a log of messages reporting significant events occurring on an IAD, and makes this log available to a remote computer. SYSLOG originated in early *UNIX* systems, and is described in RFC 3164. This RFC specifies 24 different possible 'facilities' (services or software processes) from which messages can be sent, and 8 'severity' levels for each event, as shown in the following tables. The facility number and the severity level are combined into a single field, the PRI (priority) field, which is the first field in each message.

Facilities and severities

In this release of the *SLC ConnectReach* system, a subset of the facilities and severities are implemented. There are two classes of facilities, typically reported in one of two severity levels, as shown in the table that follows.

SYSLOG facilities and severities

Facilities	Abbreviation	Code	Meaning
User-level message	User	1	Indicates a change made to the system configuration of the IAD.
Security/Authorization message	Auth.	4	Indicates a login or logout via console, telnet, or HTTP.
Severities			
Warning	Warning	4	An event that could have significant security results, but that is not an error.
Informational	Info	6	An event that is a normal change.

For details on syslog facilities and severities codes, see the following two tables, and RFC 3164, Section 4.1.1.

(Continued on next page)

Configuring SYSLOG (Continued)

Facilities and severities (continued)

SYSLOG Message Facilities Codes

Code	Facility (name association)
0	Kernel messages
1	User-level messages
2	Mail system messages
3	System daemons messages
4	Security/authorization messages*
5	Messages generated internally by syslog
6	Line printer subsystem messages
7	Network news subsystem messages
8	UUCP subsystem messages
9	Clock daemon messages †
10	Security/authorization messages*
11	FTP daemon messages
12	NTP subsystem messages
13	Log audit messages*
14	Log alert messages*
15	Clock daemon messages †
16	Local use 0 (local0)
17	Local use 0 (local1)
18	Local use 0 (local2)
19	Local use 0 (local3)
20	Local use 0 (local4)
21	Local use 0 (local5)
22	Local use 0 (local6)
23	Local use 0 (local7)

*Various operating systems have been found to utilize Facilities 4, 10, 13, and 14 for security/ authorization, audit, and alert messages that seem to be similar.

†Various operating systems have been found to utilize both Facilities 9 and 15 for clock (cron/at) messages.

(Continued on next page)

Configuring SYSLOG (Continued)

Facilities and severities (continued)

SYSLOG Message Severity Codes

Code	Facility (name association)
0	Emergency: system is unusable
1	Alert: action must be taken immediately
2	Critical: critical conditions
3	Error: error conditions
4	Warning: warning conditions
5	Notice: normal but significant condition
6	Informational: informational messages
7	Debug: debug-level messages

Procedure

To configure the SYSLOG utility, take the following steps:

Step	Procedure
1	At the config prompt, enter the **syslog** command: `(config)>` **syslog** The prompt changes to the config:syslog prompt. `(config:syslog)>`

(Continued on next page)

Configuring SYSLOG (Continued)

Procedure (continued)

Step	Procedure
2	Make the necessary syslog configuration changes. The following table describes the configuration commands.

Enter this command	...and specify this value	Comments
`enable`	`[off], on`	Enables or disables the syslog utility. Syslog can only be enabled if you have specified a valid host name.
`host`	`IP address`	Specifies the IP address of the device to which you want the syslog messages sent.
`source`	`source ID string`	Specifies device from which messages are sent; enter IP address or user-defined string to identify device; appears as 'hostname' element of each syslog message.
`sysconf`	`facility`	Limits syslog reports to facility code 1 (user-level) messages generated due to configuration events.
`access`	`facility`	Limits syslog reports to facility code 4 (Security/Authorization) messages generated due to user access events.
`Help`		Access online assistance.

(Continued on next page)

Configuring SYSLOG (Continued)

Procedure (continued)

3 After making the necessary configuration changes, enter `save`.

NOTE:
The new command value takes effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new value.

To see the syslog messages from a remote workstation, log into the syslog server. The messages generated by the source IAD follow the RFC 3164 format:

```
<PRI>Mmm dd hh:mm:ss hostname TAG: Message Text
```

The fields have the meanings shown in the following table.

Field	Meaning
`PRI`	A combination of the ‘facility’ and ‘severity’ of the message
`Mmm`	The three letter abbreviation for the month
`dd`	The day of the month
`hh:mm:ss`	The time.
`hostname`	The hostname of the unit sending the message. This field may contain any user-specified string, including the IP address of the IAD.
`TAG`	The name of the program or process that generated the message.
`Message Text`	The textual content of the message.

NOTE:
The time and date fields reflect the current time/date information on the source IAD. When Network Time Protocol (NTP) is enabled on the IAD, this time/date information can be derived from an external clock source. If NTP is not enabled, the information reflects the time elapsed since the most recent reboot, added to January 1, 1970.

The messages, as described in RFC 3164, appear as shown in the following example:

```
<16>Jan 11 12:22:14 Cust-X-1 conf: Command DHCP
```

Stop! End of Procedure.

Configuring SYSLOG (Continued)

Sample

This message would appear in the implementation of a *SLC ConnectReach* system SYSLOG as shown in the following table.

Sample SYSLOG message

#	Priority/Severity	Log Message
1.	User.Info	Jan 11 12:22:14 Cust-X-1 conf: Command ‘DHCP’

The messages in the following table are a typical log. Note that the PRI value is interpreted (PRI=16 is displayed as User.Info, for example), and that the hostname value is, in the messages displayed, the IP address of the source IAD.

(Continued on next page)

Configuring SYSLOG (Continued)

Sample (continued)

#	Priority/Severity	Log Message
1.	User.Info	Jan 11 12:22:14 192.168.11.2 conf: Command ‘syslog 192.168.1.163
2.	User.Info	Jan 11 12:22:22 192.168.11.2 conf: Command ‘exit’
3.	Auth.Info	Jan 11 12:22:27 192.168.11.2 auth: Failed login for on 10
4.	Auth.Warning	Jan 11 12:22:36 192.168.11.2 auth: Telnet logged on as Carrier
5.	User.Info	Jan 11 12:23:40 192.168.11.2 conf: Command ‘config’
6.	User.Info	Jan 11 12:23:48 192.168.11.2 conf: Command ‘NTP’
7.	User.Info	Jan 11 12:24:02 192.168.11.2 conf: Set enable to on
8.	User.Info	Jan 11 12:24:29 192.168.11.2 conf: Command ‘exit’
9.	User.Info	Jan 11 12:24:39 192.168.11.2 conf: Command ‘exit’
10.	Auth.Info	Jan 11 12:24:51 192.168.11.2 auth: HTTP Connection from 192.168.1.163 refused...shell in use
11.	Auth.Info	Jan 11 12:24:58 192.168.11.2 auth: Telnet session overridden by HTML session
12.	Auth.Info	Jan 11 12:24:58 192.168.11.2 auth: Telnet session killed by console, HTTP, or FDL user
13.	Auth.Info	Jan 11 12:25:02 192.168.11.2 auth: 192.168.1.163 started HTML session
14.	User.Info	Jan 11 12:25:28 192.168.11.2 conf: HTTP Command ‘/config/NTP’
15.	User.Info	Jan 11 12:25:28 192.168.11.2 conf: Set enable to on
16.	User.Info	Jan 11 12:25:28 192.168.11.2 conf: Set server to clock.psu.edu
17.	User.Info	Jan 11 12:25:28 192.168.11.2 conf: Set minutes-from-GMT to 0
18.	Auth.Warning	Jan 11 12:36:14 192.168.11.2 auth: 192.168.1.163 logged on as Carrier

Configuring SYSLOG (Continued)

Sample (continued)

The meanings of these messages, by number, are as follows:

1. Syslog is started for IAD at 192.168.11.2, and the messages are to be sent to the device at 192.168.1.163.
2. The exit command is entered at the console. This logs off the current user, because they are at the top level menu.
3. Failed user login.
4. The user logs in by Telnet from 192.168.1.163.
5. The user enters the config command (user is now in the ‘config’ sub-menu).
6. The user enters the NTP command (user is now in the ‘NTP’ sub-menu).
7. The user sets enable to ‘on’ (turns on NTP).
8. The user enters ‘exit’ and leaves the NTP sub-menu.
9. The user enters ‘exit’ and leaves the ‘config’ sub-menu.
10. A Web browser user attempts to access the unit; access is initially refused, because the shell is in use by the Telnet user.
11. The Web browser user overrides the Telnet session.
12. The Telnet session is terminated by the Web browser user.
13. The Web browser user starts an access session from the device at 192.168.1.163.
14. The Web browser user traverses to the NTP page, and sets enable to ‘on’.
15. The NTP enable parameter is set to ‘on’.
16. The NTP server parameter is set to clock.psu.edu.
17. The NTP minutes-from-GMT parameter is set to 0.
18. The Telnet user regains control from 192.168.1.163.

NOTE:
Configuration changes executed from the command line appear differently in the log than those executed from the Web browser. When an **Update** button is pressed in the Web browser, all of the fields on the current page are updated simultaneously, as shown in messages 14-17. In contrast, when changing a single parameter from the command line, only the changed parameter is logged.

Configuring the RS-232 Interface

Procedure

To configure the RS-232 interface, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the RS232 command: `(config)>` **`rs232`** The prompt changes to the Config:RS232 prompt. `(config:RS232)>`

2	At the Config:RS232 prompt, enter the `baud-rate` command and specify the baud rate of the RS-232 port using the following table
	
	Enter this command... — **...and specify the baud rate**
	`baud-rate` — `[9600], 19200, 38400`
	`Help`

3	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **NOTE:** The new command value takes effect as soon as you save the configuration. You do not need to reboot the *SLC ConnectReach* system to use the new value. **Stop! End of Procedure.**

WARNING:
If you are using the RS-232 interface, and the settings are changed in the ***RS232*** *menu and saved, the connection to the* SLC ConnectReach *system will be disrupted. The interfacing software's baud rate must be changed to match the baud rate set in the RS-232 configuration menu. The connection will be restored when the software is restarted with the matching baud rate setting.*

(Continued on next page)

Configuring the RS-232 Interface (Continued)

Procedure (continued)

If you set the baud rate to a speed the modem or attached computer cannot match, use one of these methods to correct the problem:

- If an Ethernet or Network T1/DSX-1 address is configured and the *SLC ConnectReach* system is connected to the LAN or WAN, you can connect using Telnet or a Web browser and reset the baud rate to the correct speed for the modem or computer.
- If no Ethernet or Network T1/DSX-1 address is configured, you cannot connect to the *SLC ConnectReach* system over the network. Contact the Lucent Technologies NetCare Knowledge Center (NKC) at 1-866-LUCENT8 for assistance.

Configuring FTP Log Dump

Introduction

The FTP Log Dump menu sets the FTP commands necessary to enable the ftp-log-dump feature. If the *SLC ConnectReach* system has an abnormal termination of the software, the FTP Log Dump downloads all pertinent information as American standard code for information interchange (ASCII) text to the designated location. The location is determined by the commands host, filename, and directory. The remaining commands are for customer relevant information. This information is tied in with the FTP Log Dump information and is purely for identification purposes only.

The information that is gathered is useful in helping to debug the cause of the abnormal software termination. The information provided includes all the relevant identification type commands, as well as the configuration. The dump also shows how the software terminated.

The password is never shown for security purposes.

Procedure

Follow these steps to configure the Ftp-log-dump menu:

Step	Procedure
1	At the Config prompt, enter the `Ftp-log-dump` command: `(config)>` **`Ftp-log-dump`** The prompt changes to the Config:Ftp-log-dump prompt. `(config:Ftp-log-dump)>`

(Continued on next page)

Configuring FTP Log Dump (Continued)

Procedure (continued)

Step	Procedure
2	Make the necessary configuration changes. The following table describes these commands.

Enter this command...	...and specify this value	Comments
`enable`	`[off], on`	Enables or disables the FTP log dump.
`host`	`IP address`	
`filename`	`target file name`	
`directory`	`target directory`	
`ftp-user-password`	`user name password`	Specify the ftp user name and press enter. You will be prompted to enter a password. The password is not displayed on the screen.
`business-name`	`business-name`	`Enter the company's name of the` *`SLC ConnectReach`* `System's location.`
`zip-code`	`zip-code`	Enter the zip code of the *SLC ConnectReach* System's location.
`phone-number`	`phone-number`	Enter the phone number of the *SLC ConnectReach* System's location.
`Help`		Access online assistance.

Stop! End of Procedure.

Setting Features

Introduction

Certain features of the *SLC ConnectReach* system are enabled by entering a feature key. This allows the *SLC ConnectReach* system to support different feature sets with a single load image. The following table lists the features and describes their functionality.

Feature	Functionality
Data Module (SW-D)	Enables full data service through the 10BaseT Ethernet port.
LCR*/DID	Enables the Digital-Trunk, Analog-Trunk, Line, Map-Extensions and Dialing menus.
BOX*	Enables the Voice-Mail menu and the BOX-Features and Feature-Codes commands under the Lines menu.
Auto-config	Enables the Auto-config feature.
SLA	Enables the SLA feature.
FT-1	Enables the Fractional T1 card.
DSP	Enables the DSP card.
ConnectReach	Enables the *ConnectReach* feature.
* Trademark of VINA Technologies, Inc.	

The following table lists the Features commands.

Enter this command...	Comments
`features-show`	Displays the features that are enabled.
`set-features`	Sets feature key, which is enabled by entering a feature number that is provided by Lucent Technologies.

(Continued on next page)

Setting Features (Continued)

Display features

To display features that are enabled, proceed as follows:

Step	Procedure

1	At the Config prompt, enter the `show features` command and press enter:
	`(config)>` **`features-show`**
	
	The following default features are displayed:
	
	`Feature bits: 0x000000000000000d`
	`Features enabled: Data, DIDLCR`

2	When you have made the necessary configuration changes, you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). **Stop! End of Procedure.**

Procedure

Feature keys are normally set at the factory. To add new features to the system after it has been installed, you use the `set-features` command in conjunction with the feature key which can be obtained from Lucent Technologies.

To set a feature key, proceed as follows:

Step	Procedure
1	At the Config prompt, enter the `set-features` command followed by the feature key: `(config)>` **`set-features xxxx-yyyy-zzzz-wwww-cccc`** Example: set-features rQ5@-pQ8n-3USr-thLq-he.. **NOTE:** If you change any of these settings, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect. **Stop! End of Procedure.**

Displaying Current Configuration Settings

Procedure

To show the current configuration settings, enter the `features-show` command at the Config prompt.

`(config)>` **`features-show`**

The *SLC ConnectReach* system Utility lists all current configuration settings. The following figure shows an example of part of the configuration settings list.

```
…
SNMP
    enable on
    SNMP-host 199.199.199.3
    cold-start on
    warm-start on
    link-down on
    link-up on
    login-failures on
     !
NAT
    enable on
     !
DNS
    enable on
    primary-dns-server 199.199.199.4
    secondary-dns-server 199.199.199.5
     !
RS232
    baud-rate 9600
     !
…
```

Using Template Archive

Introduction

The template-archive mode allows a network operator to create a configuration file with complex functionality using a *SLC ConnectReach* system chassis with minimal functionality. This is accomplished by suppressing the warning messages that normally appear if the necessary hardware is not present. The configuration is then uploaded as an ASCII text file to an FTP server (configuration server) using the archive:upload command. The FTP server may have several different configuration files used as standards for the NOC. These files may be downloaded to the *SLC ConnectReach* system using the archive command or uploaded from the *SLC ConnectReach* system through auto-config. The auto-config optional feature is used in conjunction with the template-archive optional feature.

The template-archive menu is similar to the archive menu in that it will take a snapshot of the configuration displayed and represent it as an ASCII text file. The file has two parts:

- A listing similar to the config:show command, including the values of all configuration parameters
- A hexadecimal representation of the configuration.

Procedure

To configure and use the template-archive menu, perform the following steps:

Step	Procedure
1	At the config prompt, enter the **template-archive** command: `(config)> template-archive`

(Continued on next page)

Using Template Archive (Continued)

Procedure (continued)

Step	Procedure
2	At the config:template prompt, enter the commands shown in the following table.

Enter this command...	...and specify this value	Comments
`enable-template-mode`	`[off], on`	Enables the template archive function.
`server-ipaddr`	`IP address`	IP address of the FTP server
`filename`	`file name`*	The file should have a .txt suffix, unless auto-config will be used on the remote *SLC ConnectReach* system.
`user`	`name`	A valid username and password for the FTP server. The prompt for the password will appear after entering the username.
`upload`		To upload the configuration settings.
`download`		To download the specified configuration file from the FTP server to the *SLC ConnectReach* system.

** If template-archive is to be used with auto-config, the configuration file name must follow the convention of vinaconfig.serialnum, where serialnum is the serial number of the remote *SLC ConnectReach* system.

3	When you have made the necessary configuration changes you can return to the Config menu by typing **exit** or an exclamation point (**!**) (quoted as "\ |" through the *SLC-2000* Access System CIT). The prompt changes to the Enable prompt. `Enabling the Template-Archive will place this unit in to the Template-Archive mode. Are you sure you want to enable this mode?` `Spell out "enable" to continue (enter to cancel)>` **`enable`**
4	Save the template archive settings by entering the `save` command. This will put the *SLC ConnectReach* system into the template-archive mode. **NOTE:** Once the *SLC ConnectReach* system is in template-archive mode, the only menu available is the config menu. To return to the normal mode, disable the template-archive.

(Continued on next page)

Using Template Archive (Continued)

Procedure (continued)

Step	Procedure
5	Enter all the configuration parameters required for the remote *SLC ConnectReach* system. For more information on setting parameters of specific submenus, see the pertinent sections in this chapter. **WARNING:** *Do not enter the save command at this point as you may not be able to connect to the FTP server due to possible changes in the network configuration.*
6	When all the configuration parameters have been set, upload the file to the FTP server by entering the upload command from the config:template prompt. `(config:template)>` **`upload`**
7	To return to the normal operational mode, disable the template-archive by entering: `(config:template)>` **`enable off`** from the config:template prompt.
8	Save the template archive settings by entering the `save` command. This will put the *SLC ConnectReach* system in the normal functioning mode.

Setting All Configuration Settings to Default

Introduction

Every configuration command has a default setting. The default setting for each command is displayed on screen in brackets after you type the question mark key (**?**) at the Config prompt or one of the Config submenu prompts.

Procedure

NOTE:
The `default` command erases all configuration data.

To set all configuration settings to their default value, enter the `default` command at the Config prompt.

```
(config)> default
```

Preserving default settings

The `preserve-default` command erases all configuration data except Ethernet, password, and RS-232. To set the selected configuration settings to their preserve default value, enter the `preserve-default` command at the Config prompt.

```
(config)> preserve-default
```

NOTE:
If you change any of these commands, you must save the configuration and reboot the *SLC ConnectReach* system using the `warm-start` command for the new settings to take effect.

Reconfiguring the *SLC ConnectReach* System

Session Choices for Accomplishing Reconfiguration

Introduction

After you are finished with the initial configuration of the *SLC ConnectReach* system, and it is installed at the site and connected to the networks, you can reconfigure the unit in any one of the following four types of sessions:

- A local/remote console session: This session involves the connection of a computer either directly or by means of a modem to the **RS-232** port on the *SLC ConnectReach* system. This session is one of the methods that can also be used for initial configuration. The commands and examples given in this chapter show a *SLC ConnectReach* system console session. If the *SLC ConnectReach* system loses its configuration in NVRAM, you must use the RS-232 port to reconfigure the unit.
- A remote Telnet session: This session involves the use of a Telnet application in making configuration changes from a remote computer through an Ethernet connection. Once the Telnet session is connected, the user interface is identical to the console session. If the T1 connection is inoperable, you can reconfigure the *SLC ConnectReach* system and download new software by means of the Ethernet connection. For more information about downloading software, refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing".
- A remote HTTP session: This session involves a connection using a Web browser through an Ethernet or Internet/T1 connection (an IP connection over T1 using frame relay, PPP, or HDLC). Chapter 8, "Configure/Monitor and Upgrade Software for the SLC ConnectReach System Using a Web Browser", describes the user interface available through the Web browser.
- A remote CIT session: This session involves connecting a computer, running the *CTRM* terminal emulator software, or an American standard code for information interchange (ASCII) terminal to the **CIT** connector on the *SLC*-2000 RT/HDT UIP and accessing the *SLC ConnectReach* system by means of the T1 network interface.

(Continued on next page)

Session Choices for Accomplishing Reconfiguration (Continued)

Using a Telnet session to reconfigure and monitor the *SLC ConnectReach* system

Before you can use a Telnet session to configure the *SLC ConnectReach* system, the unit must be as follows:

- Connected to AC or DC power.
- Initially configured for an Ethernet or Internet/T1 connection, including an IP address, netmask, and broadcast address. For more information about initial configuration, refer to the section entitled “Connection at the RS-232 port”, located at the front of this chapter.
- Connected to the network through an Ethernet or T1 connection. For information about connecting cables, refer to Chapter 5, "Installation".

You must also have a computer that is connected to the same network as the *SLC ConnectReach* system, or to a network from which access to the *SLC ConnectReach* system is permitted.

On the computer, start a Telnet session and enter the IP address assigned to the *SLC ConnectReach* system. Once the Telnet session is connected, the user interface is identical to the console session shown in this chapter.

If a Carrier privilege login name has been configured, the *SLC ConnectReach* system Utility displays a login prompt. After you enter a login name and password, the Main Menu prompt appears, and the commands described in this chapter and in Chapter 7, "SLC ConnectReach System Monitoring", become available.

Installation

5

Contents

About This Chapter 5-3

- Introduction 5-3

What Are the Requirements? 5-6

- FCC Rules 5-6
- Power 5-7
- Physical 5-8
- Cables 5-9

Interface Card Installation 5-10

- Voice Interface Card Installation 5-10
- Optional Circuit Card Installation 5-13

Mount the *SLC*® *ConnectReach*™ System 5-21

- Introduction 5-21
- Rack Mount 5-22
- Wall Mount 5-25
- Desktop Mount 5-31
- NEBS Cover Installation (Optional) 5-32

Connect Cables to the *SLC ConnectReach* System 5-33

- Overview 5-33
- Construct Cable Assemblies 5-34
- Procedures 5-41

48-Line Master/Slave Configuration 5-47

- Overview 5-47
- Connecting Master and Slave Units 5-48

Analog Voice Interface Considerations 5-47

- FXS 5-52
- FXO 5-54

Alarm Relay 5-55

- Improper Function 5-55

About This Chapter

Introduction

Procedures to install the unit at the site

This chapter contains the required procedures to install the *SLC® ConnectReach*™ Access System at the site. This chapter describes site requirements and instructions for installing the *SLC ConnectReach* system. The following topics are included in this chapter.

- Installation and site requirements
- Safety precautions
- Electrostatic discharge
- Items included with the *SLC ConnectReach* system
- Required cables
- Installing the voice interface/optional circuit cards
- Installing the new equipment building standards (NEBS) cover (optional)
- Mounting the *SLC ConnectReach* system in a rack, on a wall, or on a desktop
- Connecting cables to the *SLC ConnectReach* system and applying power
- Connecting a *SLC ConnectReach* system to a stand alone *ConnectReach* system allowing more than 24 voice channels
- Analog voice interface considerations
- Using the alarm relay of the *SLC ConnectReach* system.

Introduction (Continued)

Safety Precautions

Before installing the *SLC ConnectReach* system, read the following basic safety precautions.

- Read and understand all instructions.
- Exercise caution when connecting the *SLC ConnectReach* system to telephone wires. Hazardous voltage may be present.
- Do not install telephone wiring during a lightning storm.
- Before installing or servicing the *SLC ConnectReach* system, disconnect all power connections from wall outlets, and disconnect all telephone lines at the network interface.
- When installing or connecting electrical wiring that is external to the *SLC ConnectReach* system, follow the provisions of the current edition of the National Electrical Code or other wiring rules that may apply.
- Do not install or use the *SLC ConnectReach* system near water.

Electrostatic discharge considerations

The following precautions should be observed when handling *SLC ConnectReach* system circuit cards:

- Assume all card assemblies contain solid state electronic components that can be damaged by electrostatic discharge (ESD).
- Observe warning labels on the bags and cartons. Whenever possible, do not remove the card assembly from antistatic packaging until the *SLC ConnectReach* system is ready for card installation.
- Open all card assembly packages at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats. If a static-dissipating table mat is used, be sure that it is clean to ensure a good discharge path.
- Always store and transport card assemblies in static-safe packaging. Shielding is not required unless specified.

(Continued on next page)

Introduction (Continued)

Standard system

The following items are included in the *SLC ConnectReach* system.

- *SLC ConnectReach* system unit
- Two mounting brackets [used for mounting the unit on the wall or in an American national standards institute (ANSI) 19- or 23-inch relay rack]
- Eight screws for attaching the mounting brackets to the unit
- Four screws for mounting the unit to a rack
- 120 V AC power supply or DC cable
- Rubber feet for desktop mounting
- 10-foot T1 modular shielded cable (RJ-48C) for network T1/DSX-1 connection.

Optional mounting hardware

The following orderable mounting hardware can be used as an alternative to the standard mounting brackets provided with the *SLC ConnectReach* system unit:

- Two mounting brackets, similar to the standard mounting brackets, for mounting the unit in a Bellcore relay rack. The eight screws for attaching the mounting brackets to the unit and the four screws for mounting the unit to the rack are also provided.
- A hinged mounting assembly that mounts to the wall and offers the ability to swing away from the wall to provide access to a maximum of four units. After the first unit is mounted on the assembly, extension brackets are used to mount the additional units.

Refer to document 363-208-000, SLC*-2000 Access System, Application, Planning, and Ordering Guide*, for information on ordering the optional mounting hardware.

What Are the Requirements?

FCC Rules

Parts 68 and 15

The *SLC ConnectReach* system complies with Part 68 of FCC rules, and with the specifications for a Class A digital device pursuant to Part 15 of FCC rules. The *SLC ConnectReach* system also complies with UL* safety standard UL1950.

* UL is a registered trademark of Underwriters Laboratories Inc.

Power

AC installations with power supply transformer

Grounded receptacle

120 V AC grounded receptacle that is easily accessible.

Input voltage supply

Input voltage supplied to an AC power supply transformer: 120 V AC, 60 Hz @1 A.

DC installations

Wire gauge

Three-conductor, 18-AWG, stranded wire with Molex connector and contacts. A 6-foot cable with pigtails may be ordered from Lucent Technologies. Refer to Chapter 2, "Product Description", for power connector pin assignments.

Input voltage supply

Input voltage to unit, 48 V DC @ 50 VA

Optional battery backup unit

Model

BBKUP-2 battery backup unit (Comcode 108860248)

Battery Pack

Nominal 48 V DC at 7 Amp hours (4 x 12 V 7 Amp hours Panasonic LCR12V7.2P batteries or equivalent.

Physical

Environmental

Operating temperature

0 to 50° C (32 to 122° F)

Power dissipation

106 BTU

Relative humidity

0 to 95 percent, noncondensing

Dimensions

Size

17 in. wide by 14 in. deep by 1.75 in. high

Weight

9 lb.

Shipping specifications

Shipping container size

18.25 in. wide by 21 in. deep by 9 in. high

Weight

20 lb.

Cables

List of cabling

You will need to provide the following cables.

- Standard 10Base-T Ethernet cable (RJ-45) for connection to the local Ethernet network.
- T1 modular shielded cable (RJ-48C) for connection to the secondary/ fractional T1/DSX-1 port (Comcode 108585654) (this cable is normally a crossover cable) and/or Telco cable (standard Telco 50-pin) for connection to the punch-down block for analog voice channels (Comcode 108585647).
- 10 AWG copper ground wire with ring lug for frame ground (recommended).
- DC power cable (optional).
- A T1 shielded crossover cable (RJ48C) is needed for the network T1/ DSX-1 port to operate in DSX mode.
- One or both of the following cables.
  a. Modem cable for connection to a modem, allowing configuration of the *SLC ConnectReach* system from a remote computer. This cable should have a 9-pin female connector at the *SLC ConnectReach* system end and a connector appropriate for the modem at the other end (usually a 25-pin male connector).
  b. Null-modem cable for connection to the serial port of a local computer. This cable should have a 9-pin female connector at the *SLC ConnectReach* system end and a connector appropriate for the computer at the other end (for an IBM*-compatible PC, usually a 9-pin female connector). See Chapter 2, "Product Description", for cable drawing. A crossover cable is needed for network T1/DSX-1 to operate in DSX mode.

NOTE:
If an uninterruptible power supply (UPS) of the APC type is to be installed with the *SLC ConnectReach* system, and you want to receive SNMP traps regarding the UPS, you must use a special connector cable to connect the RS232 port on the UPS unit directly to the RS232 port on the *SLC ConnectReach* system. The cable must have a connector that is appropriate for the UPS device at one end, and a 9-pin, D-type, DTE connector at the other end. See *Configuring the SNMP Service* on page 4-110 for configuration commands.

* IBM is a registered trademark of International Business Machines Corporation.

Interface Card Installation

Voice Interface Card Installation

Introduction

The *SLC ConnectReach* system unit has space for housing up to three voice interface cards. These cards can be either foreign exchange station (FXS) or foreign exchange office (FXO) voice interface cards. The *SLC ConnectReach* system may come from the factory with the desired number of voice interface cards already installed. However, in instances where the cards have not been installed at the factory or cards are being added to an existing system, the following procedure should be used to install the interface cards.

(Continued on next page)

Voice Interface Card Installation (Continued)

Procedure

The following procedure should be used when installing FXS and/or FXO voice interface cards in the *SLC ConnectReach* system.

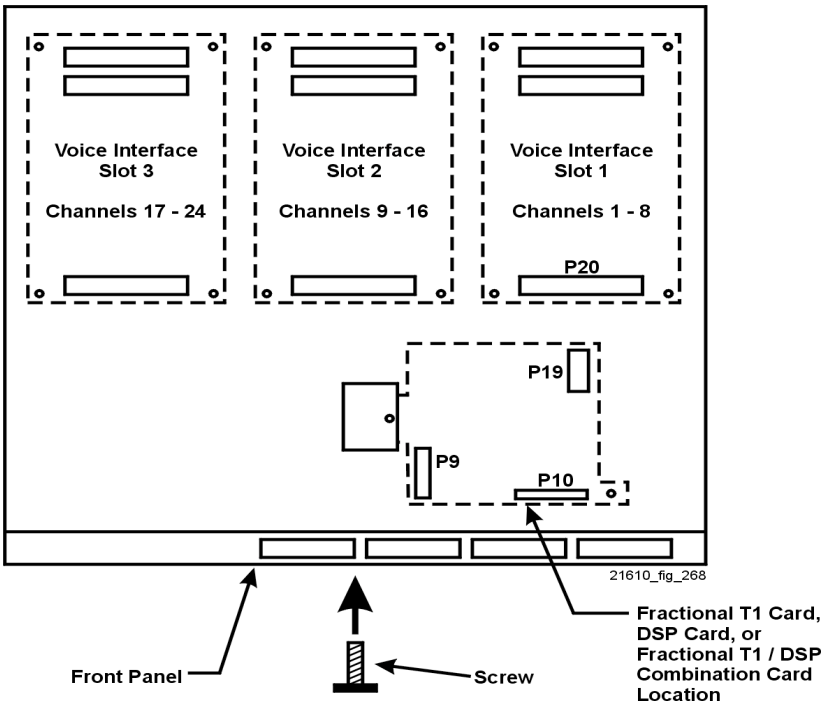
NOTE:
If Voice Interface Slots 2 and/or 3 are to be equipped with a voice interface card, then Voice Interface Slot 1 must also be equipped. If Slot 1 is not equipped, then the cards in Slot 2 and/or 3 will not be recognized.

Step	Procedure
1	Verify that power has been removed from the *SLC ConnectReach* system unit.
2	An electrostatic discharge (ESD) wrist strap with a resistance between 250 K and 1.5 M ohms should be worn when handling the *SLC ConnectReach* system interface cards or motherboard to prevent damage. Before using the wrist strap, check it for shorts, opens, and proper resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to any power source or shelf housing a power source. Use a Phillips screwdriver to remove the screw from the center of the *SLC ConnectReach* system front panel.
3	Obtain access to the inside of the *SLC ConnectReach* system by sliding the bottom tray/front panel assembly forward, separating it from the top and side cover.

(Continued on next page)

Voice Interface Card Installation (Continued)

Procedure (continued)

Step	Procedure
4	Identify the location of the interface card to be installed using the following figure showing the top view of the motherboard. 
5	Remove the interface card and the package of four plastic standoff pins from the packing carton.
6	If the motherboard is not equipped with the four plastic standoff pins needed to lock each corner of the interface board, insert the pins from the packing carton.
7	Align the connectors on the bottom of the interface card with the connector pins on the motherboard and gently press on the top of the interface card until the card locks in place.
8	After all interface cards have been installed, slide the bottom tray/front panel assembly back into the cover.
9	Install the screw in the front panel.
10	**STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Optional Circuit Card Installation

Introduction

The *SLC ConnectReach* system can contain one of the three following optional circuit cards to enable specific features and services:

- Fractional T1 circuit card
- Telco digital signal processor (DSP) circuit card
- Fractional T1/DSP combination circuit card.

The installation for these cards is divided into two procedures. One procedure covers the installation of the fractional T1 circuit card and the second procedure covers the installation of the DSP circuit card or the fractional T1/DSP combination circuit card.

(Continued on next page)

Optional Circuit Card Installation (Continued)

Fractional T1 circuit card installation procedure

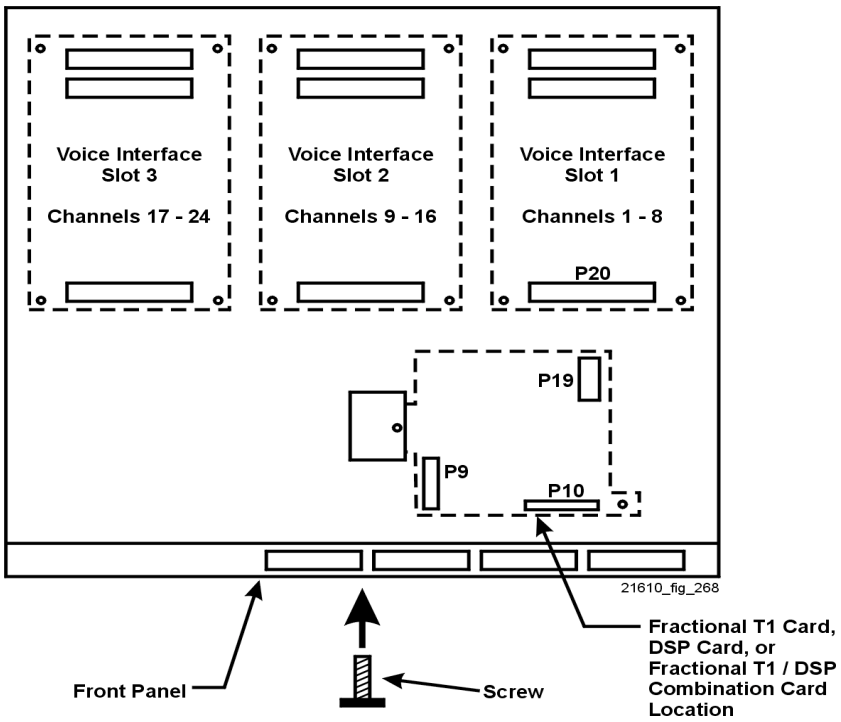
The following procedure should be used when installing a fractional T1 circuit card in the *SLC ConnectReach* system.

Step	Procedure
1	Verify that power has been removed from the *SLC ConnectReach* system unit.
2	**CAUTION:** *An electrostatic discharge (ESD) wrist strap with a resistance between 250 K and 1.5 M ohms should be worn when handling the SLC ConnectReach system interface cards or motherboard to prevent damage. Before using the wrist strap, check it for shorts, opens, and proper resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to any power source or shelf housing a power source.* Use a Phillips screwdriver to remove the screw from the center of the *SLC ConnectReach* system front panel.
3	Obtain access to the inside of the *SLC ConnectReach* system by sliding the bottom tray/front panel assembly forward, separating it from the top and side cover.
4	Remove the fractional T1 circuit card from the packing carton.

(Continued on next page)

Optional Circuit Card Installation (Continued)

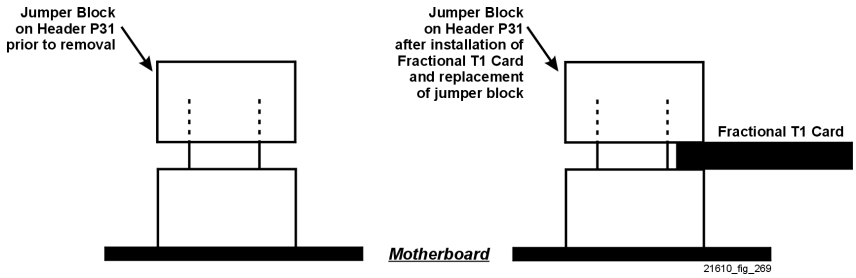
Fractional T1 circuit card installation procedure (continued)

Step	Procedure
5	Refer to the following figure showing the top view of the motherboard to locate where the card is to be installed and identify the connectors that will be involved. 
6	Remove the jumper block from header P31 located on the motherboard.
7	Align the connectors on the bottom of the fractional T1 card with the connector pins on the motherboard and gently press on the top of the card until the card locks in place over the plastic standoff pins.

(Continued on next page)

Optional Circuit Card Installation (Continued)

Fractional T1 circuit card installation procedure (continued)

Step	Procedure
8	Refer to the following figure and replace the jumper block on header P31. Note that the edge of the fractional T1 card will be located between the jumper block and header P31 when the card is properly installed. 
9	After the fractional T1 circuit card has been installed, slide the bottom tray/front panel assembly back into the cover.
10	Install the screw in the front panel.
11	**STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

(Continued on next page)

Optional Circuit Card Installation (Continued)

DSP or Fractional T1/DSP combination circuit card installation procedure

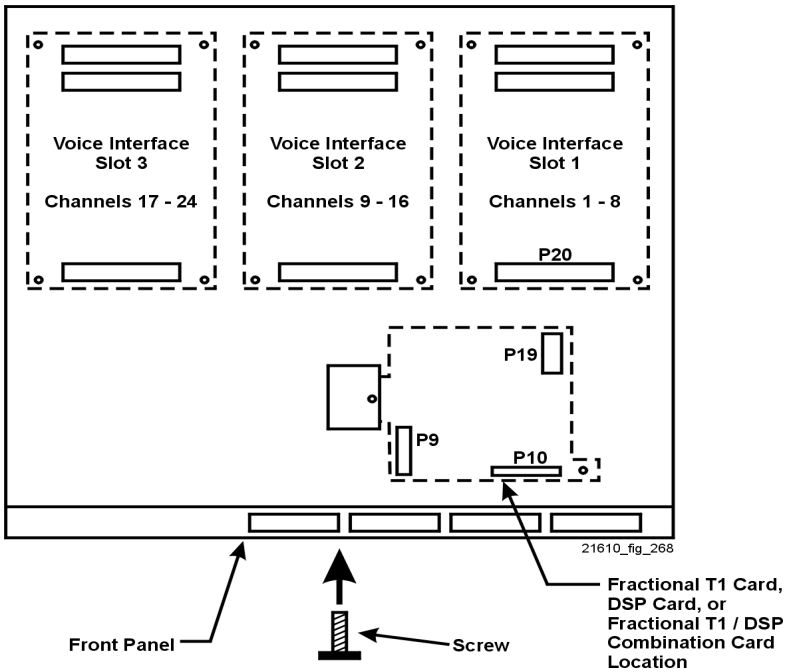
The following procedure should be used when installing a DSP circuit card or a fractional T1/DSP combination circuit card in a *SLC ConnectReach* system unit with T1/DSX-1 network interface

Step	Procedure
1	Verify that power has been removed from the *SLC ConnectReach* system unit.
2	**CAUTION:** *An electrostatic discharge (ESD) wrist strap with a resistance between 250 K and 1.5 M ohms should be worn when handling the* SLC ConnectReach *system interface cards or motherboard to prevent damage. Before using the wrist strap, check it for shorts, opens, and proper resistance value. If the strap does not pass these checks, it should not be used. To avoid possible personal injury while using the wrist strap, do not connect it to any power source or shelf housing a power source.* Use a Phillips screwdriver to remove the screw from the center of the *SLC ConnectReach* system front panel.
3	Obtain access to the inside of the *SLC ConnectReach* system by sliding the bottom tray/front panel assembly forward, separating it from the top and side cover.
4	Remove the DSP or fractional T1/DSP combination circuit card and package of hardware from the packing carton. The hardware package should contain a metal standoff and a hex nut.

(Continued on next page)

Optional Circuit Card Installation (Continued)

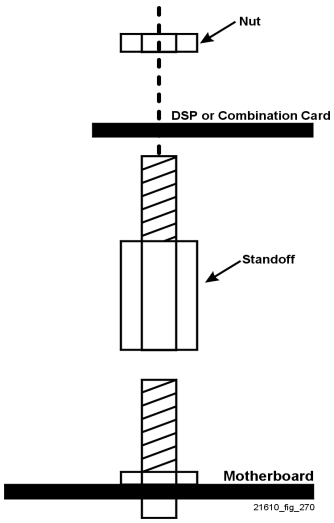
DSP or Fractional T1/DSP combination circuit card installation procedure (continued)

Step	Procedure
5	Refer to the following figure showing the top view of the motherboard to locate where the card is to be installed and identify the connectors that will be involved. 
6	Remove the jumper block from header P31 located on the motherboard.

(Continued on next page)

Optional Circuit Card Installation (Continued)

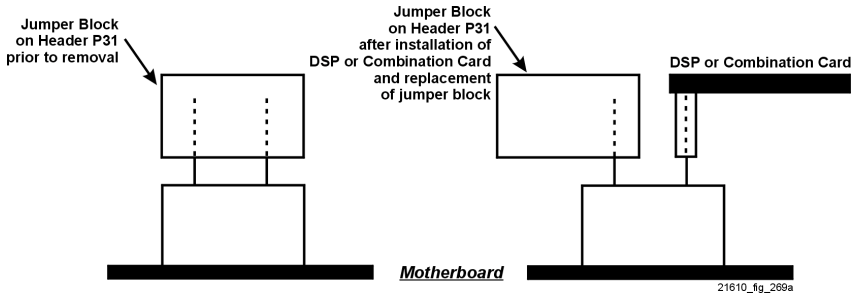
DSP or Fractional T1/DSP combination circuit card installation procedure (continued)

Step	Procedure
7	Refer to the following figure and install the metal standoff over the threaded stud on the motherboard (located near header P31). 
8	Align the connectors on the bottom of the DSP or fractional T1/DSP combination card with the connector pins on the motherboard and make sure that the hole on the edge of the circuit card is located over the standoff. Press gently on the top of the circuit card until the connector pins on the motherboard are fully seated in the circuit card connectors.
9	Secure the DSP or fractional T1/DSP combination cards to the standoff using the hex nut provided.

(Continued on next page)

Optional Circuit Card Installation (Continued)

DSP or Fractional T1/DSP combination circuit card installation procedure (continued)

Step	Procedure
10	Reposition the jumper block over the left side of block P31 (refer to the following figure). 
11	After the DSP or fractional T1/DSP combination circuit card has been installed, slide the bottom tray/front panel assembly back into the cover.
12	Install the screw in the front panel.
13	**STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Mount the *SLC® ConnectReach™* System

Introduction

Three configurations to mount the unit

The *SLC ConnectReach* system can be mounted in one of three configurations.

- Rack mount (19- or 23-inch ANSI or Bellcore rack)
- Wall mount (stationary or hinged bracket)
- Desktop mount.

Mounting brackets that fit the 23-inch Bellcore racks with 25 mm hole spacing (Comcode 108501362) may be ordered separately. A hinge mount kit (Comcode 108501354) is also available for ordering. The hinge mount, installed on a wall, can hold up to four units mounted side-by-side on end. Thus providing space saving capabilities. The hinged side allows the units to swing out for easier access in servicing.

Clearances

The following table lists the required clearances to install the *SLC ConnectReach* system.

Area	Clearance (Inches)
Above unit	1.75
Below unit	0
Front of unit (near connectors)	5
Rear of unit	0.6
Sides of unit	2

Rack Mount

Mount the *SLC ConnectReach* system in a 19-inch rack

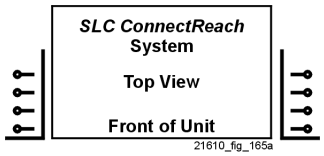
NOTE:
The mounting brackets supplied with the *SLC ConnectReach* system are for mounting the unit in an American national standards institute (ANSI) type relay rack. The mounting brackets required to mount the unit in a Bellcore relay rack must be ordered separately. Refer to document 363-208-000, SLC*-2000 Access System, Applications, Planning, and Ordering Guide*, for ordering information.

To mount the *SLC ConnectReach* system in a 19-inch rack, attach the long side of the brackets to the *SLC ConnectReach* system as shown in the following illustrations. You can arrange the brackets for a front, midway, or rear mount.

NOTE:
Attach the long side of the brackets to the *SLC ConnectReach* system.

Front mount

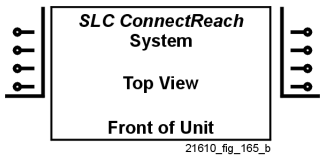
Install the brackets as shown to front mount the *SLC ConnectReach* System in a 19-inch rack.



Front Mount

Midway mount (*preferred*)

Install the brackets as shown to midway mount the *SLC ConnectReach* System in a 19-inch rack.



Midway Mount (preferred)

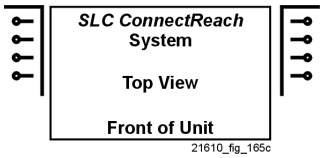
(Continued on next page)

Rack Mount (Continued)

Mount the *SLC ConnectReach* system in a 19-inch rack (continued)

Rear mount

Install the brackets as shown to rear mount the *SLC ConnectReach* System in a 19-inch rack.



Rear Mount

Mount the *SLC ConnectReach* system in a 23-inch rack

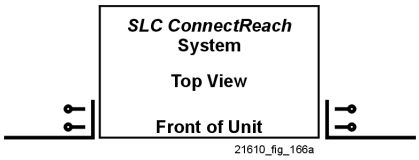
NOTE:
The mounting brackets supplied with the *SLC ConnectReach* system are for mounting the unit in an American national standards institute (ANSI) type relay rack. The mounting brackets required to mount the unit in a Bellcore relay rack must be ordered separately. Refer to document 363-208-000, SLC*-2000 Access System, Applications, Planning, and Ordering Guide*, for ordering information.

To mount the *SLC ConnectReach* system in a 23-inch rack, attach the short side of the brackets to the *SLC ConnectReach* system. You can arrange the brackets for a front, midway, or rear mount (the connectors are located on the front of the unit).

NOTE:
Attach the short side of the brackets to the *SLC ConnectReach* system.

Front mount

Install the brackets as shown to front mount the SLC ConnectReach System in a 23-inch rack.



Front Mount

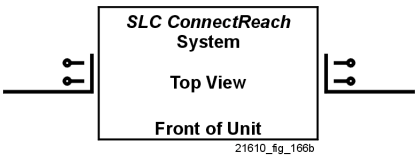
(Continued on next page)

Rack Mount (Continued)

Mount the *SLC ConnectReach* system in a 23-inch rack (continued)

Midway mount (*preferred*)

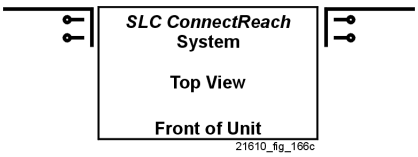
Install the brackets as shown to midway mount the SLC ConnectReach System in a 23-inch rack.



Midway Mount (preferred)

Rear mount

Install the brackets as shown to rear mount the SLC ConnectReach System in a 23-inch rack.



Rear Mount

Wall Mount

Introduction

The *SLC ConnectReach* system can be mounted on a wall using either of the following two methods described in this section:

- Stationary mounting using the mounting brackets supplied with the unit
- Attaching the unit(s) to a hinged wall mount assembly that is fastened to the wall. Up to four units can be attached to the hinged wall mount assembly. After the first unit is mounted on the assembly, extension brackets are used to mount the additional units. The hinged wall mount assembly is not supplied with the *SLC ConnectReach* system and must be ordered separately.

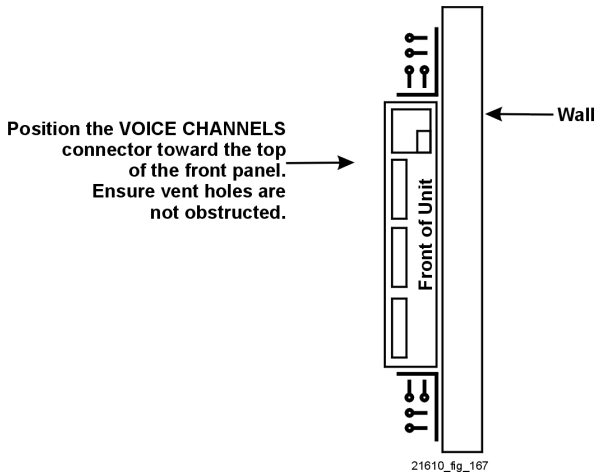
Wall mount using stationary mounting brackets

Use the following procedure to mount the *SLC ConnectReach* system on a wall using the stationary mounting brackets.

(Continued on next page)

Wall Mount (Continued)

Wall mount using stationary mounting brackets (continued)

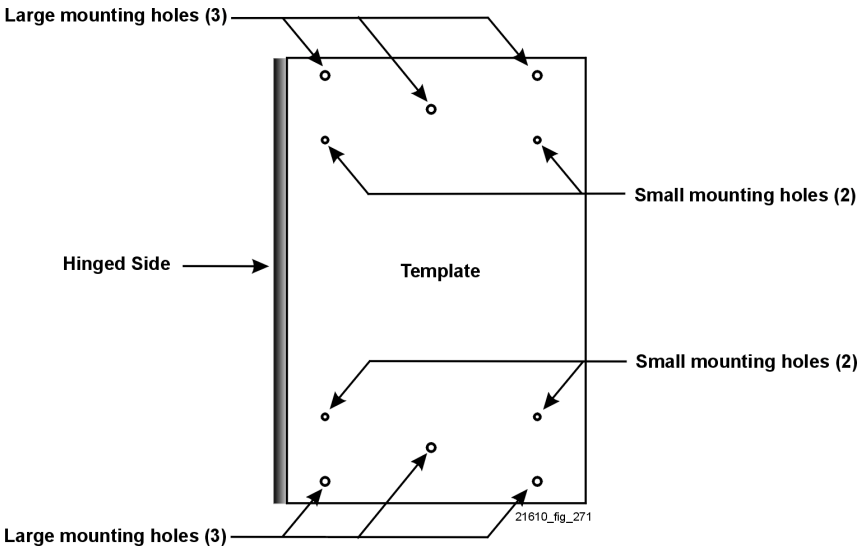
Step	Procedure
1	Attach the short side of the brackets to the *SLC ConnectReach* system.
2	Determine the location and position the unit on the wall. 
3	**NOTE:** Wall mount screws are not provided as part of the installation kit. **CAUTION:** *Moly screws or anchor bolts are required when installing the* SLC ConnectReach *system on wallboard or sheetrock walls.* Secure the unit to the wall using the required fasteners.

(Continued on next page)

Wall Mounting (Continued)

Wall mount using hinged wall mount assembly

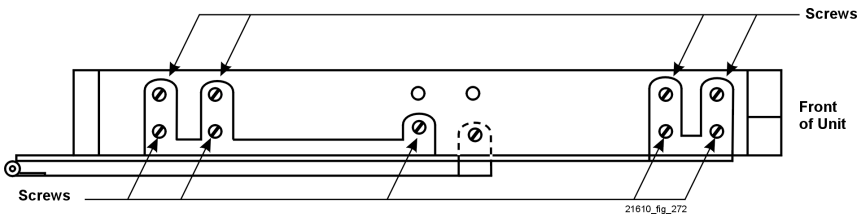
Use the following procedure to mount one or multiple (up to four) *SLC ConnectReach* systems on a wall using the hinged wall mount assembly.

Step	Procedure
1	Using the template provided with the mounting assembly, mark the location of the mounting holes on the wall. The template contains two different sets of mounting holes (refer to the following figure). The four smaller holes (0.30 inches in diameter) in the assembly are used to temporarily hang the assembly while installing the screws in the six larger holes (0.40 inches in diameter). **NOTE:** The hinged wall mount assembly must be mounted so that the hinge is on the left or right side. Failure to comply will void UL certification of the assembly. **CAUTION:** *The hinged wall mount assembly must be mounted to a minimum ¾-inch thick plywood that is securely fastened to the mounting wall.* 

(Continued on next page)

Wall Mounting (Continued)

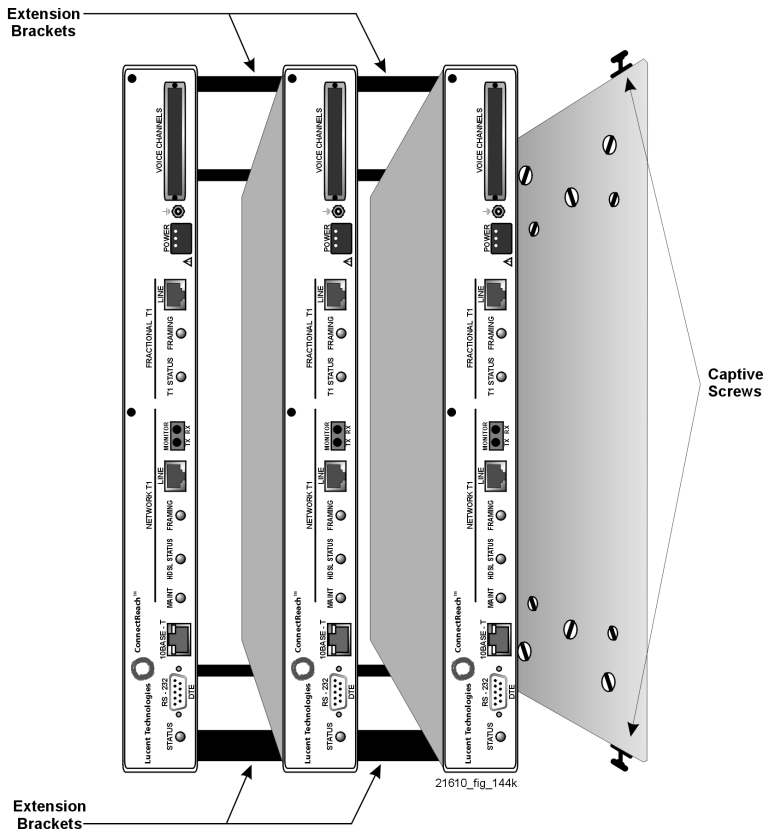
Wall mount using hinged wall mount assembly (continued)

Step	Procedure
2	Secure the hinge assembly plate to the plywood surface using #14, ¾-inch pan-head Phillips screws in each of the six large mounting holes.
3	Position a *SLC ConnectReach* system unit on its side with the **VOICE CHANNELS** connector at the top. Insert the unit between the upper and lower mounting flanges with the rear of the unit facing the hinge on the wall mount assembly. Attach the unit to the upper and lower flanges using the 18 #6-32 mounting screws and washers provided. There are nine screw locations on the top and nine on the bottom of the assembly (refer to the following figure showing a top view of the mounting assembly). 
4	If only a single *SLC ConnectReach* system unit is to be installed at this time, then secure the mounted unit against the wall using the two captive screws that screw into the existing holes on the top and bottom edges of the hinged assembly plate. Otherwise, continue with Step **5**.

(Continued on next page)

Wall Mounting (Continued)

Wall mount using hinged wall mount assembly (continued)

Step	Procedure
5	**NOTE:** In a multiple mount arrangement, extension brackets are used to attach a unit being installed in a hinged wall mount assembly to the unit that was installed last (for example, the second unit is attached to the first unit, the third unit is attached to the second unit, etc.). Using the screws and washers provided in the extension bracket kit, loosely attach two of the extension brackets to the top and two to the bottom of the last *SLC ConnectReach* system unit that was mounted in the hinged wall mount assembly (refer to the following figure). 

(Continued on next page)

Wall Mounting (Continued)

Wall mount using hinged wall mount assembly (continued)

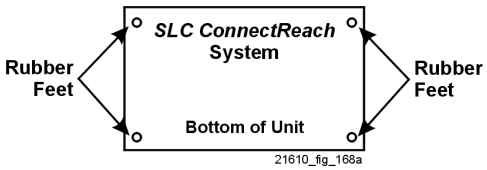
Step	Procedure
6	With the *SLC ConnectReach* system unit oriented in the same manner as the previous unit(s), insert the unit between the extension brackets and secure the unit to the brackets using the screws provided. Tighten all extension bracket screws.
7	If additional *SLC ConnectReach* system units are to be installed in the hinged wall mount assembly, repeat the procedure from Step **5** for the next unit to be installed. Otherwise, secure the mounted units against the wall using the two captive screws that screw into the existing holes on the top and bottom edges of the hinged assembly plate.

Desktop Mount

Install four rubber feet

Use the following procedure to attach the four included rubber feet to the bottom of the *SLC ConnectReach* system unit to be placed on a desktop.

NOTE:
Mounting brackets are not used for a desktop installation.

Step	Procedure
1	Remove the protective covering from the self-adhesive surface on the rubber feet.
2	Place the rubber feet in the recessed areas located on the bottom of the case. 
3	Press firmly to ensure good adhesion of the rubber feet.

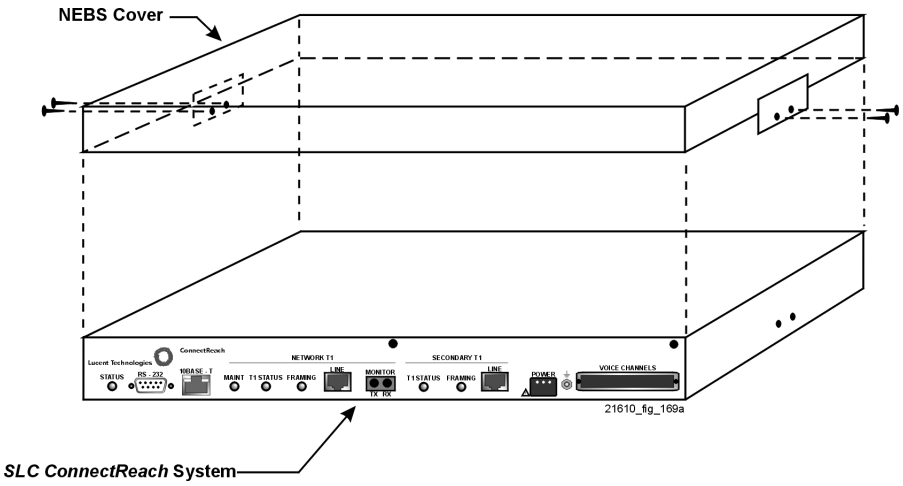
NEBS Cover Installation (Optional)

Introduction

The new equipment building standards (NEBS) installation kit (ED-7C830-30, G5) consists of a cover for the *SLC ConnectReach* system and four #6-32 mounting screws with lock washers. The NEBS cover allows the *SLC ConnectReach* system to meet Bellcore NEBS Level 3 standards (GR-63).

Procedure

The NEBS cover is placed on top of the *SLC ConnectReach* system unit and secured on each side with two screws and lock washers as shown in the following figure.

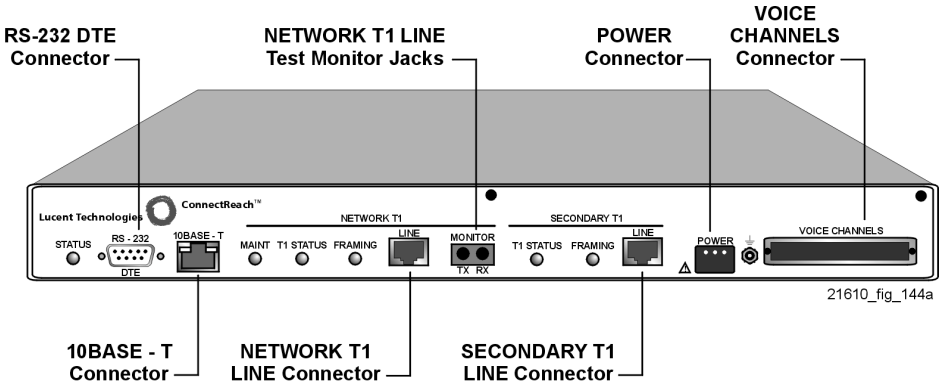


Connect Cables to the *SLC ConnectReach* System

Overview

Introduction

The following figure summarizes the cable connections to the *SLC ConnectReach* system. Refer to this figure while connecting the cables to the unit.



T1 / DSX-1

Construct Cable Assemblies

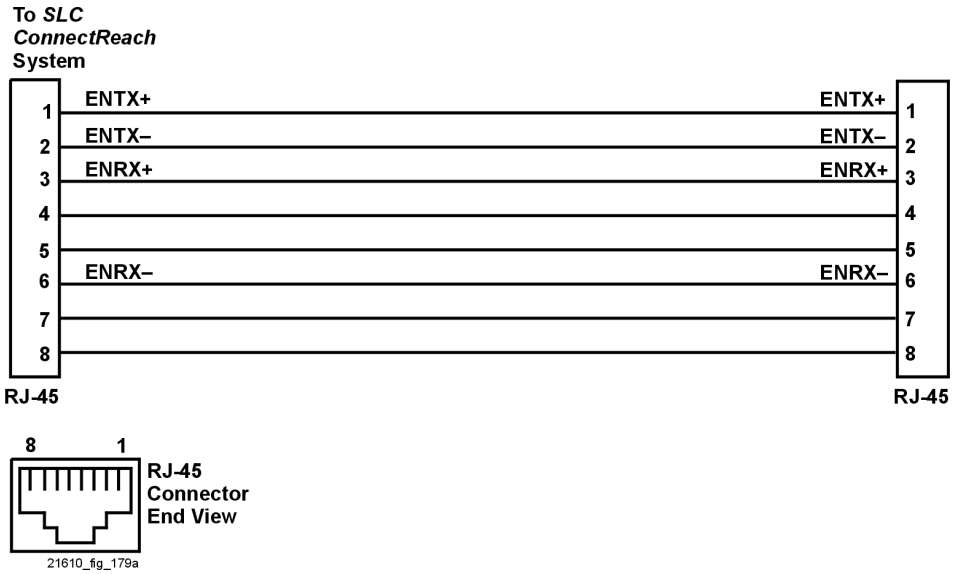
Introduction

You must provide the cable assemblies for the *SLC ConnectReach* system.

Standard cables

The following cables are standard and readily available.

- Standard 10Base-T Ethernet cable (RJ-45) for connection to the local Ethernet network (refer to the following figure for pin designations)



- Telco cable (standard Telco 50-pin) for connection to the punch-down block for analog voice channels.
- Ground wire with ring lug for frame ground (optional)
- DC power cable (optional).

(Continued on next page)

Construct Cable Assemblies (Continued)

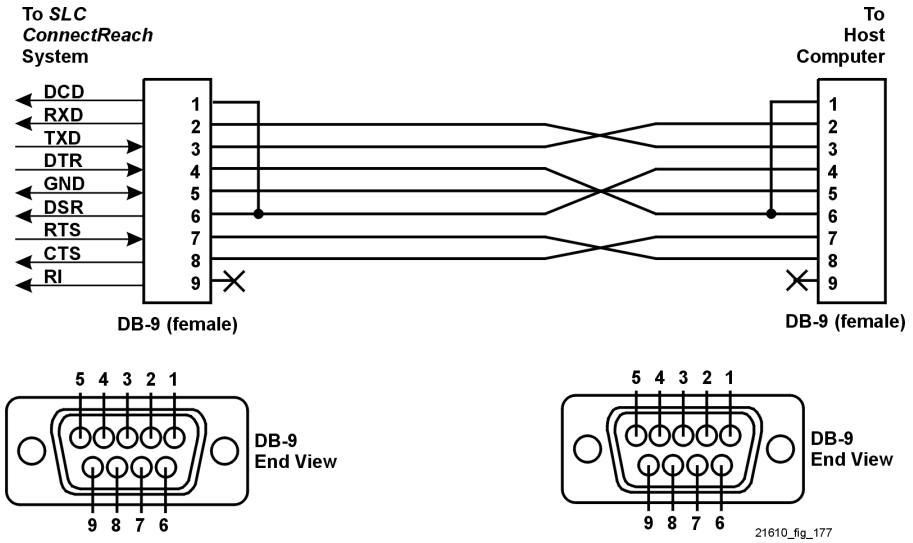
Nonstandard cables

The following cables are not standard and must be assembled for use with the *SLC ConnectReach* system.

- One or both of the following cables.
  a. Modem cable for connection to a modem, allowing configuration from a remote computer. This cable should have a 9-pin female connector at the *SLC ConnectReach* system end and a connector appropriate for the modem at the other end (usually a 25-pin male connector).
  b. Null-modem cable for connection to the serial port of a local computer.
- T1 modular shielded crossover cable (RJ-48C) for connection to the secondary/fractional T1/DSX-1 port.
- Ethernet crossover cable. Required when connecting a local provisioning terminal to the **10BASE-T** port which allows the use of a Web browser to configure and/or monitor the *SLC ConnectReach* system.

RS-232 null modem

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the RS-232 null modem connection.



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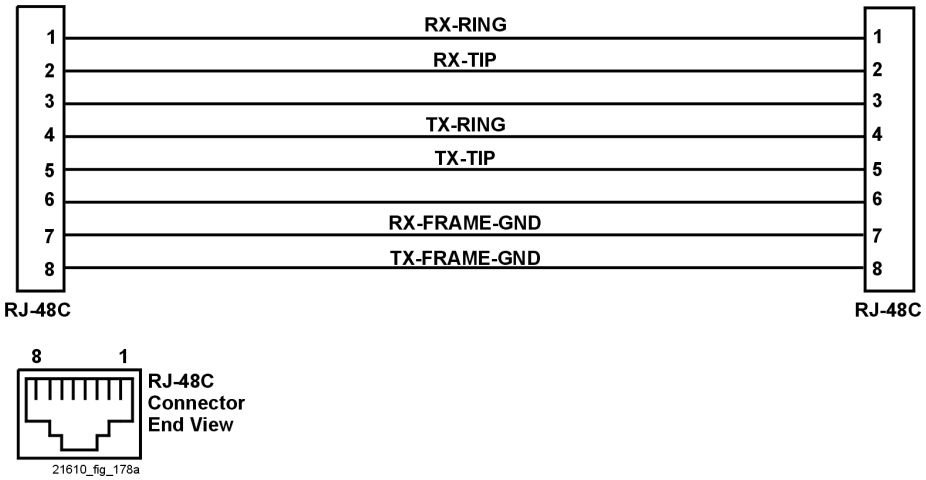
Construct Cable Assemblies (Continued)

T1, straight RJ-48 to RJ-48

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the T1 RJ-48 to RJ-48 *straight* connection. The transmit (TX) and receive (RX) designations are relative to the *SLC ConnectReach* system.

NOTE:
Note the following assembly requirements.

- TX-TIP and TX-RING must be the same twisted pair.
- RX-TIP and RX-RING must be the same twisted pair.
- Vendor PN, Siemans Co. MC5-S-8T-10-B02.
- 10-foot shielded.



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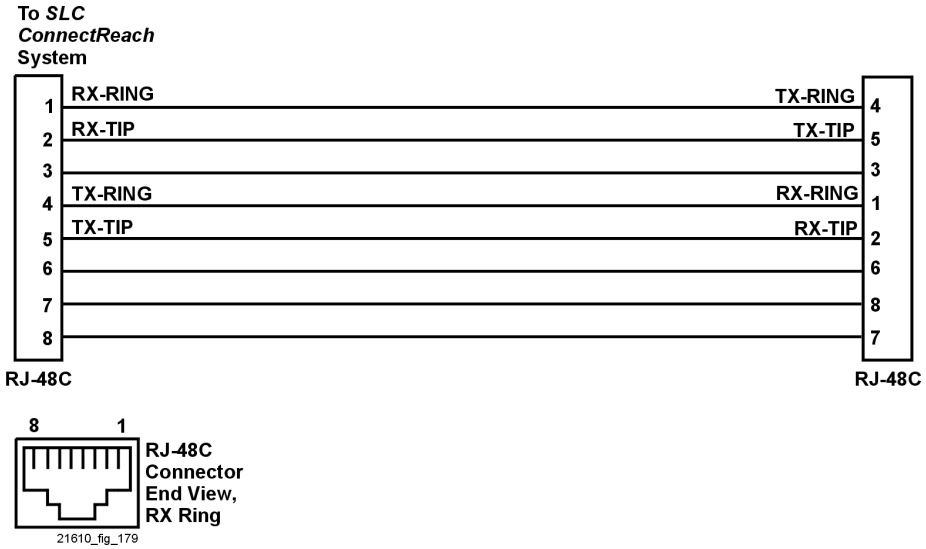
Construct Cable Assemblies (Continued)

T1, crossover RJ-48 to RJ-48

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the T1 RJ-48 to RJ-48 *crossover* connection.

NOTE:
Note the following assembly requirements.

- Use the same twisted pair for the TX-TIP and TX-RING.
- Use the same twisted pair for the RX-TIP and RX-RING.



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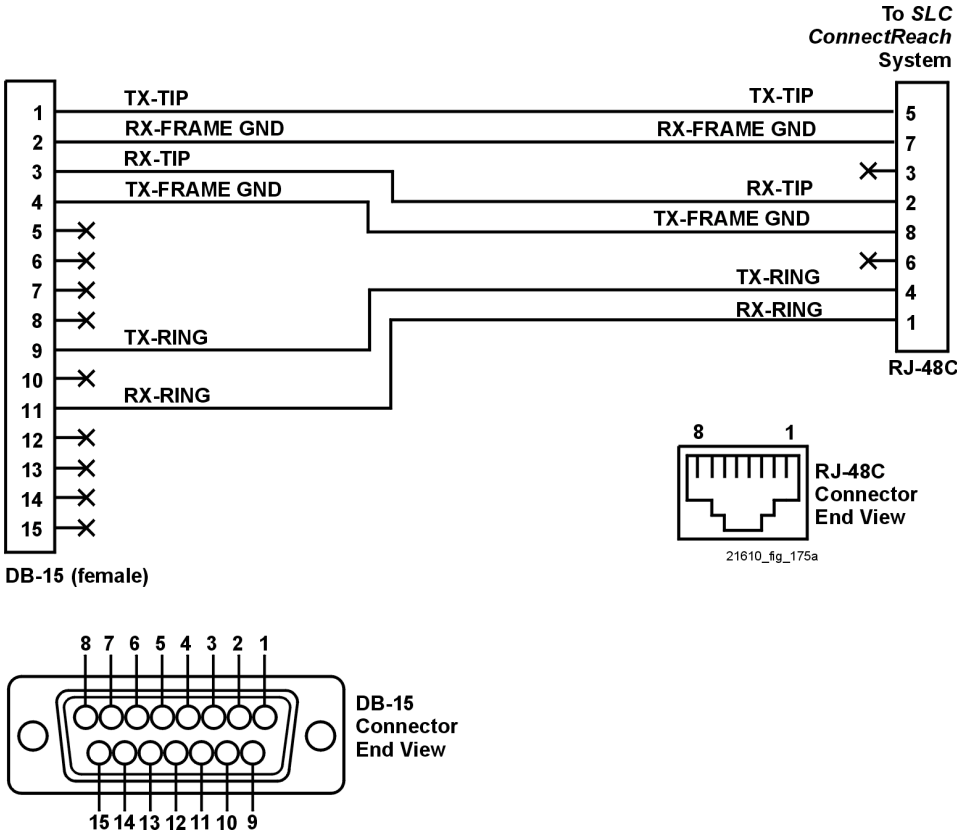
Construct Cable Assemblies (Continued)

T1, straight RJ-48 to DB-15

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the T1 RJ-48 to DB-15 *straight* connection.

NOTE:
Note the following assembly requirements.

- Use the same twisted pair for the TX-TIP and TX-RING.
- Use the same twisted pair for the RX-TIP and RX-RING.



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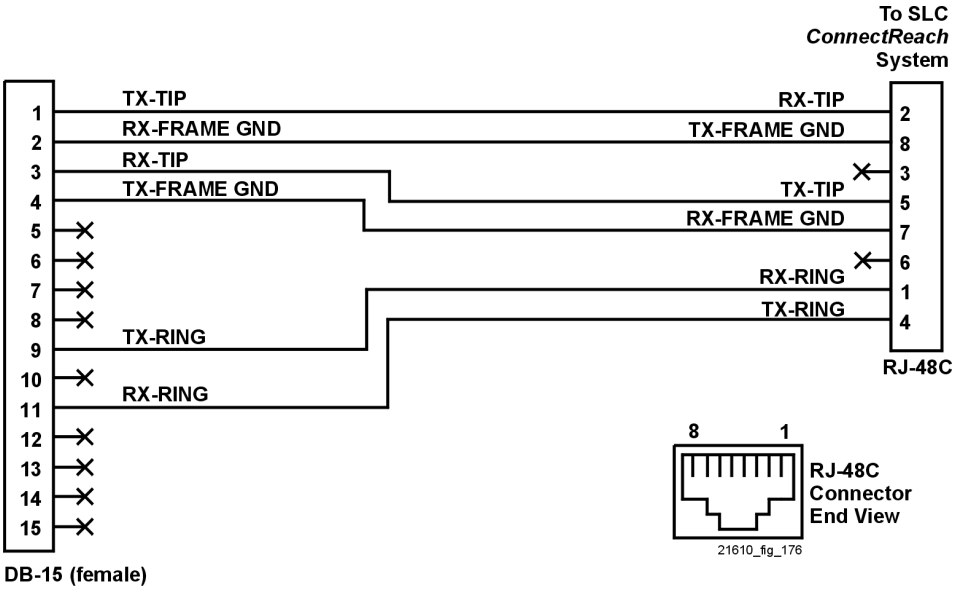
Construct Cable Assemblies (Continued)

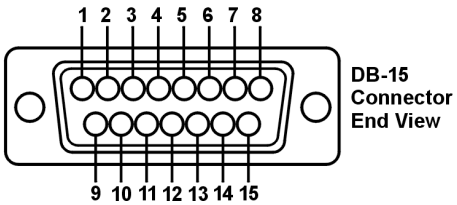
T1, crossover RJ-48 to DB-15

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the T1 RJ-48 to DB-15 *crossover* connection.

NOTE:
Note the following assembly requirements.

- Use the same twisted pair for the TX-TIP and TX-RING.
- Use the same twisted pair for the RX-TIP and RX-RING.





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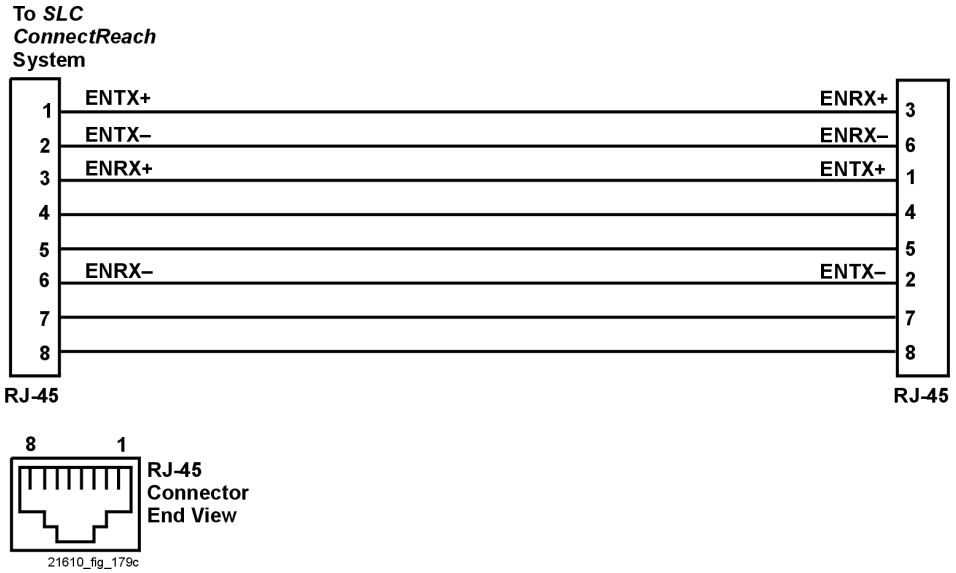
Construct Cable Assemblies (Continued)

Ethernet, crossover RJ-45 to RJ-45

The following figure illustrates the assembly of the required cable to connect the *SLC ConnectReach* system using the Ethernet RJ-45 to RJ-45 *crossover* connection.



Procedures

Introduction

After mounting the *SLC ConnectReach* system, you are ready to connect the cables to the unit.

Connect the Ethernet and T1 cables to the unit

Connect the Ethernet and network cables to the *SLC ConnectReach* system.

Step	Procedure
1	Connect the Ethernet cable from the Ethernet network hub to the **10BASE-T** connector on the *SLC ConnectReach* system. The *SLC ConnectReach* system Ethernet port operates in half-duplex transmission mode.
2	Connect a shielded T1 cable to the **NETWORK T1** — **LINE** connector on the *SLC ConnectReach* system.

NOTE:
For best performance at installation sites with ‘noisy’ grounds, a partially shielded T1 cable should be connected between the *SLC ConnectReach* system and the telephone network. Connect the shielded connector end of the cable (typically with a white boot) to the **NETWORK T1 — LINE** connector on the SLC ConnectReach system and connect the unshielded connector end (typically with a black boot) to the telephone network interface.

Connect the unit to the site phone system

Connect the unit to the phone system of the site and analog trunk lines.

NOTE:
The secondary/fractional T1/DSX-1 cable is normally a crossover cable.

PBX or key system (with T1 interface)

Connect a shielded T1 cable from the private branch exchange (PBX) or key system (with T1/DSX-1 interface) to the **SECONDARY**/**FRACTIONAL T1** — **LINE** connector located on the *SLC ConnectReach* system.

(Continued on next page)

Connect the unit to the site phone system (continued)

Phone system using the FXS or FXO interface

Connect a standard 50-pin Telco cable from the punch-down block or break-out box to the **VOICE CHANNELS** connector located on the SLC ConnectReach system.

Main ground connection

A ground stud is located on the front panel of the *SLC ConnectReach* system to allow connection to the building or office main ground bus. The crimp-type ring lug of a main ground bus conductor is to be attached to this ground stud.

NOTE:
Frame ground is provided in the power connection, however it is recommended that the connection to the main ground bus be made for all installations, especially for applications employing ground-start circuits. Unpredictable results may occur if adequate ground connections are not made. A 10 AWG copper conductor should be connected from the ground stud on the *SLC ConnectReach* system chassis to the main ground bus at the installation site using established installation practices.

Connect power cables and power the unit

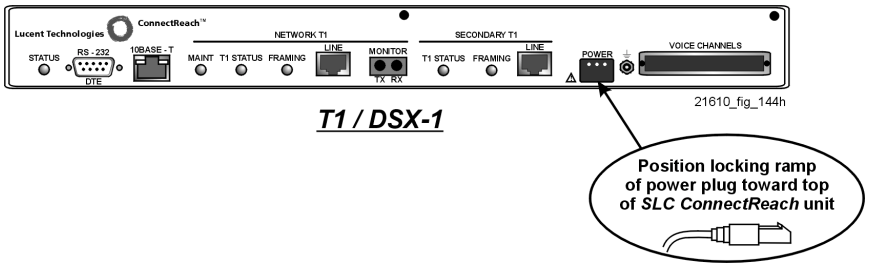
Connect AC power supply or DC power cables and power the *SLC ConnectReach* system.

Step	Procedure
1	**NOTE:** The power connector supplies frame ground. The ground stud provides an *additional* ground point. When a secondary frame ground connection to the *SLC ConnectReach* system is required, attach the ring lug of a frame ground cable to the ground stud on the *SLC ConnectReach* system.
2	Route the AC power supply or DC power cable above the **VOICE CHANNELS** connector.
3	Place a tie-wrap through the tie-wrap loop located in the upper right-hand corner of the *SLC ConnectReach* system front faceplate.
4	Secure the power cable to the *SLC ConnectReach* system using the tie-wrap.

(Continued on next page)

Procedures (Continued)

Connect power cables and power the unit (continued)

Step	Procedure
5	Position the power cable plug so that the locking ramp is facing up (toward the top of the *SLC ConnectReach* system). 
6	Insert the power cable plug into the **POWER** connector located on the *SLC ConnectReach* system.
7	Remove the 6-32 nut from the stud located next to the **POWER** connector.

(Continued on next page)

Procedures (Continued)

Connect the unit for power (continued)

Step	Procedure
8	Install the retaining bracket for the **POWER** connector.
9	Reinstall the 6-32 nut and tighten.
10	**AC** Plug the AC power supply into a grounded 120-V AC receptacle. **DC** Connect the DC power cable to the battery, the DC supply, or the battery backup unit. **NOTE:** If the Model LT733 AC-to-DC power converter with battery backup is used in powering the *SLC ConnectReach* system, refer to the Gordon Kapes, Inc. Technical Practice for the *Model 733 DC UPS Power Supply* for information concerning the installation and connection of this unit.

(Continued on next page)

Procedures (Continued)

Self test

When power is supplied, the *SLC ConnectReach* system performs a self-test. The results of the test are indicated through illuminating a combination of light-emitting diodes (LEDs) located on the front of the unit. The green **STATUS** LED indicator lights (only the **STATUS** LED indicator) when the unit passes all tests and the T1 lines are properly operating.

LED Indicator					
Green STATUS	**Yellow MAINT**	**Yellow T1 STATUS**	**Red T1 FRAMING**	**Condition**	**Recoverable/ Not Recoverable**
ON or *flashing*	OFF	OFF	OFF	The *SLC® ConnectReach™* system passed all tests and is functioning normally.	Normal operating condition
OFF	OFF	OFF	OFF	No power available to the *SLC ConnectReach* system.	Recoverable*
OFF	OFF	OFF	ON	System image check sum failed.	Recoverable†
OFF	OFF	ON	OFF	The nonvolatile random access memory (NVRAM) check sum failed.	Recoverable‡
OFF	ON	OFF	OFF	The flash *protected boot* code check sum failed.	Not recoverable§
OFF	ON	OFF	ON	An Ethernet loopback failed.	Not recoverable§
OFF	ON	ON	OFF	Codec loopbacks failed.	Not recoverable§
OFF	ON	ON	ON	Code execution from protected boot.	Not recoverable§
OFF	OFF	ON	ON	A random access memory (RAM) test failed.	Not recoverable§

* If the self-test indicates that no power is available to the *SLC ConnectReach* system, first verify that the AC power cord is plugged into a functional AC outlet or that the DC power cord is plugged into a functional DC power source. If the power source is verified to be functional, replace the power cord.

† If the system image check sum fails, you must connect a modem to the RS-232 port and download a new system image (refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing").

‡ If the NVRAM check sum fails, it is because some part of the stored configuration has become corrupted. Since it is not possible to determine which part of the data is corrupted, you should completely reconfigure the *SLC ConnectReach* system, save the new configuration, reboot, and observe the self-test LEDs again.

§ Nonrecoverable errors indicate a *SLC ConnectReach* system hardware failure. You must replace the failed *SLC ConnectReach* system with a new unit. After installing the new unit, you must configure the replacement with the same configuration settings as the original unit.

(Continued on next page)

Procedures (Continued)

Reconfigure the ConnectReach System

If necessary, you can reconfigure the *SLC ConnectReach* system. For information about using the *SLC ConnectReach* system Utility, see Chapter 4, "Configuring the SLC® ConnectReach™ System". You can also check the status of the *SLC ConnectReach* system. For more information, see Chapter 7, "SLC ConnectReach System Monitoring".

48-Line Master/Slave Configuration

Overview

Introduction

A *SLC ConnectReach* system may be connected to a stand alone *ConnectReach* system thereby doubling the maximum number of FXS lines. This configuration requires a *SLC ConnectReach* system configured with the *LCR** feature and equipped with the DSP circuit card as a *master* system and a stand alone *ConnectReach* system, configured for channel bank capability only, as a *slave* system. This feature is supported for LCR/DID lines only. The secondary/fractional T1/DSX-1 port of the master *SLC ConnectReach* system connects to the network interface of the slave *ConnectReach* system to provide up to 48-lines of service (24 lines from the master *SLC ConnectReach* system and 24 lines from the slave *ConnectReach* system). The connection between the master and slave units will always be ESF/B8ZS.

You must provision the *SLC ConnectReach* system connected to the host as "'master" by setting the `Has-Slave` command in the Secondary/Fractional T1/DSX-1 menu to ON. The *ConnectReach* system, interfacing through the master's secondary/fractional T1/DSX-1 port, must be provisioned as "slave" by setting the `Is-Slave` command in the Network T1 menu to ON. The metallic voice frequency (VF) lines connected to the "master" system are provisioned as any other *SLC ConnectReach* system configured with the *LCR* feature. The FXS channels in the "slave" *ConnectReach* system cannot be provisioned through the "master" *SLC ConnectReach* system but must be provisioned locally in the "slave" system. The analog lines (25-48) representing these channels must also be provisioned at the "master" *SLC ConnectReach* system in the Line menu. To provision the VF metallic lines connected to the "slave" *ConnectReach* system, refer to document 363-214-001, *ConnectReach Access System, User/Service and Ordering Manual*. The "slave" *ConnectReach* system should also be equipped with FXS cards with all channels provisioned as Channel-Bank with loop-ground trunk signaling.

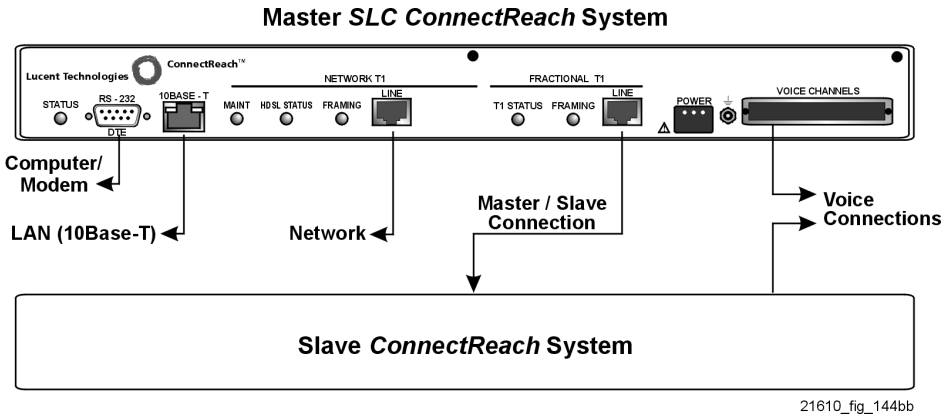
Although this configuration allows for up to 48 VF connections, a maximum of only 24 VF lines (DS0s) configured for digital trunk can be in use at a time because of the capacity of the network T1/DSX-1 interfacing between the *SLC ConnectReach* system and the *SLC*-2000 HDT.

* Trademark of VINA Technologies, Inc.

Connecting Master and Slave Units

Procedure

Connect and configure a master *SLC ConnectReach* system and a slave *ConnectReach* system for daisy chaining using the following procedure. Refer to the following figure when making connections.



Step	Procedure
1	Mount the master *SLC ConnectReach* systems using the mounting information located earlier in this chapter. Mount the *ConnectReach* system according to instructions in the document *ConnectReach Access System, User/Service and Ordering Manual* (363-214-001). **CAUTION:** *Do not mount one system on top of the other system.*

(Continued on next page)

Connecting Master and Slave Units (Continued)

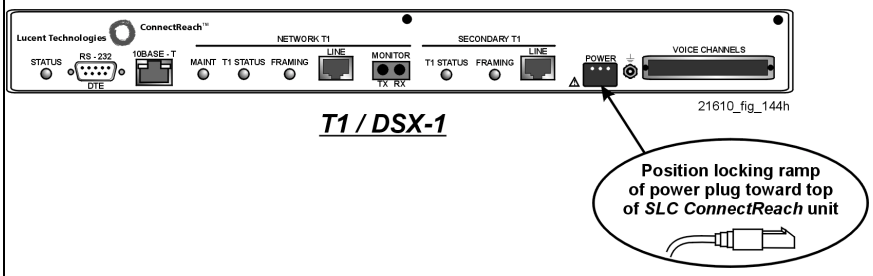
Procedure (continued)

Step	Procedure
2	Make the following cable connections according to the procedure in the section entitled “Connect Cables to the *SLC ConnectReach* system”: ■ At the *master* unit, connect the **RS-232** connector to either a local computer using a null modem cable or to a modem using a fabricated modem cable. ■ Connect the **10BASE-T** connector on the *master* unit to the Ethernet network hub using the Ethernet cable. ■ Connect the **NETWORK T1 — LINE** connector on the *master* unit to the T1 facility using a shielded T1 cable. ■ Connect the **SECONDARY/FRACTIONAL T1 — LINE** connector on the *master* unit to the **NETWORK T1 — LINE** connector on the *slave* unit using a crossover cable (refer to Chapter 2, "Product Description", for pin assignment). ■ At the *master* unit, connect the **VOICE CHANNELS** connector to a punch-down block using a standard 50-pin Telco cable.
3	**NOTE:** The power connector supplies frame ground. The ground stud provides an *additional* ground point. When a secondary frame ground connection to the *master* unit is required, attach the ring lug of a frame ground cable to the ground stud on the *master* unit.
4	Route the AC power supply or DC power cable above the **VOICE CHANNELS** connector on the *master* unit.
5	Place a tie-wrap through the tie-wrap loop located in the upper right-hand corner of the *master* unit front faceplate.

(Continued on next page)

Connecting Master and Slave Units (Continued)

Procedure (continued)

Step	Procedure
6	Secure the power cable to the *master* unit using the tie-wrap.
7	Position the power cable plug so that the locking ramp is facing up (toward the top of the unit). 
8	Insert the power cable plug into the **POWER** connector located on the *master* unit.
9	Remove the 6-32 nut from the stud located next to the **POWER** connector.
10	Install the retaining bracket for the **POWER** connector.
11	Reinstall the 6-32 nut and tighten.
12	**AC** Plug the AC power supply into a grounded 120-V AC receptacle. **DC** Connect the DC power cable to the battery, the DC supply, or the battery backup unit.
13	Make powering arrangements and apply power to the slave *ConnectReach* system according to instructions in the *ConnectReach* Access System, User/Service and Ordering Manual.

(Continued on next page)

Connecting Master and Slave Units (Continued)

Procedure (continued)

Step	Procedure
14	Refer to Chapter 4, "Configuring the SLC® ConnectReach™ System", to set up a console session on the master *SLC ConnectReach* system. The master *SLC ConnectReach* system must be configured to accept a slave. This is done in the Config:Secondary/Fractional-t1 menu. The `has-slave` command must be set on. For more information on this menu, see Chapter 4, "Configuring the SLC® ConnectReach™ System".
15	Follow the instructions in the *ConnectReach* Access System, User/Service and Ordering Manual to set up a console session on the slave *ConnectReach* system. The *slave* unit must be configured as a slave.
16	At this point the *SLC ConnectReach* system and the *ConnectReach* system are connected as master and slave. The voice channel details will be configured on the master *SLC ConnectReach* system. The slave *ConnectReach* system will reflect any changes made on the master *SLC ConnectReach* system. For more information, refer to Chapter 4, "Configuring the SLC® ConnectReach™ System". **NOTE:** Systems configured for Master/Slave have the following limitation; the total of combined Lines and Analog trunks are *not* to exceed 16 on the Master *SLC ConnectReach* system.

Analog Voice Interface Considerations

FXS

On-premises loop lengths of hookup wire

The talk battery of the FXS interface is –25 V DC at 25 mA. Based on a typical 330-ohm telephone plus 150 ohms of loop resistance at 25 mA, the FXS interface of the *SLC ConnectReach* system supports the following on-premises loop lengths of hookup wire.

Loop Length (Feet)	Wire Gauge (AWG)
2,850	24
1,750	26

Ringer equivalent number (REN)

Cadence ringing

For cadence ringing, the FXS interface of the *SLC ConnectReach* system supports a ringer equivalent number (REN) of five per channel, with a maximum of 75 REN per system.

Continuous ringing

For continuous ringing, the FXS interface of the *SLC ConnectReach* system supports a REN of 1.5 per channel, with a maximum of 25 REN per system.

Minimum ringing voltage

The minimum ringing voltage supplied by the FXS interface of the *SLC ConnectReach* system is 42.5 V_{rms} at 20 Hz.

AT&T Publication 43801 specifies that the AC ringing signal is to be superimposed on the ring lead only, with the tip lead grounded. The *SLC ConnectReach* system generates a balanced AC voltage between the tip and ring leads. AT&T Publication 43801 also specifies that ringing on a ground-start line may be tripped by either grounding the ring lead or going off-hook. However, a ground-start device connected to the *SLC ConnectReach* system can only trip ringing by going off-hook.

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FXS (Continued)

T1 state transitions

In some cases, invalid T1 state transitions are ignored.

Using ESF

When using ESF, the SLC ConnectReach system ignores all transitions where the A and C bits have different values. (For example, a transition from 1010 to 1000 will be ignored.)

E&M trunks

On E&M trunks, the SLC ConnectReach system ignores the B (and for ESF, the D) bits. (For example, a transition from 1111 to 1010 will be ignored on an E&M trunk.)

Can never happen

Some state transitions that *can never happen* are ignored. [For example, on loop- or ground-start trunks, a transition from 0000 (ringing) to 0100 (current feed reversal) is ignored, since ringing only occurs on incoming calls, and current feed reversal only occurs after an outgoing call is answered.]

FXO

REN

The *SLC ConnectReach* system presents a REN equivalent of 1.5 at the FXO interface port.

Alarm Relay

Improper Function

Four conditions

The *SLC ConnectReach* system supports an alarm relay that indicates when the unit is not functioning properly and one or more of the yellow or red status LEDs are illuminated. The alarm contacts are assigned to pins 25 and 50 of the **VOICE CHANNELS** connector. For information about the **VOICE CHANNELS** connector pin assignments, refer to Chapter 2, "Product Description" The alarm contacts may be connected to an external alarm or a trunk bypass unit. Refer to the description of peripheral equipment located in Chapter 2, "Product Description", for more information. One of the following four conditions will cause the alarm relay to close.

a. Power fails.

b. *SLC ConnectReach* system fails.

c. Network T1/DSX-1 alarm is enabled and the network T1/DSX-1 link fails.

d. Secondary/fractional T1/DSX-1 alarm is enabled and the secondary/fractional T1/DSX-1 link fails.

FXO card

Disable the network T1/DSX-1 alarm when the *SLC ConnectReach* system has an FXO card used with LCR and a trunk bypass unit is connected. If the T1 link fails, calls will automatically be rerouted out the FXO port, which is connected to the trunk bypass. If the network T1/DSX-1 alarm is enabled, calls will be rerouted out the FXS port and within the bypass unit causing connection problems.

Provisioning the *SLC*® -2000 RT/HDT

6

Contents

About This Chapter 6-2

- Introduction 6-2

CIT Setup and Connection 6-3

- Connect CIT and Set Baud Rate at UIP 6-3
- Set Up CIT 6-5

DT Server Preparation, Installation, and Provisioning 6-6

- Configure MDS for FITL Operation 6-6
- Option and Install DT Server in MDS 6-7
- Provision DT Server from CIT 6-10

DS0 Cross-Connections 6-12

- Establishing Cross-Connections from the CIT 6-12

Provision Channel Unit(s) at *SLC*® *ConnectReach*™ System 6-14

- Using the CIT to Provision Channel Unit(s) 6-14

T1 Cross-Connections 6-24

- Establishing T1 Cross-Connections from the CIT 6-24

About This Chapter

Introduction

Contents

This chapter contains the following procedures that must be performed from a *SLC*®-2000 remote terminal/host digital terminal (RT/HDT) location before the *SLC*® *ConnectReach*™ Access System can be placed in-service:

- Configure the metallic distribution shelf (MDS) for fiber in the loop (FITL) operation
- Option and install the distant terminal (DT) Server in the metallic distribution shelf (MDS)
- Provision the DT Server
- Establish cross-connections for each DS0 time slot in the network T1/DSX-1 signal
- Provision the *SLC ConnectReach* system channel units.

Since a craft interface terminal (CIT) will be used at the *SLC*-2000 RT/HDT to perform most of these procedures, the information necessary to setup and connect the CIT will also be included in this chapter.

CIT Setup and Connection

Connect CIT and Set Baud Rate at UIP

Procedure

Use the following procedure to connect the CIT to the *SLC*-2000 RT/HDT user interface panel (UIP) and set the baud rate at the UIP:

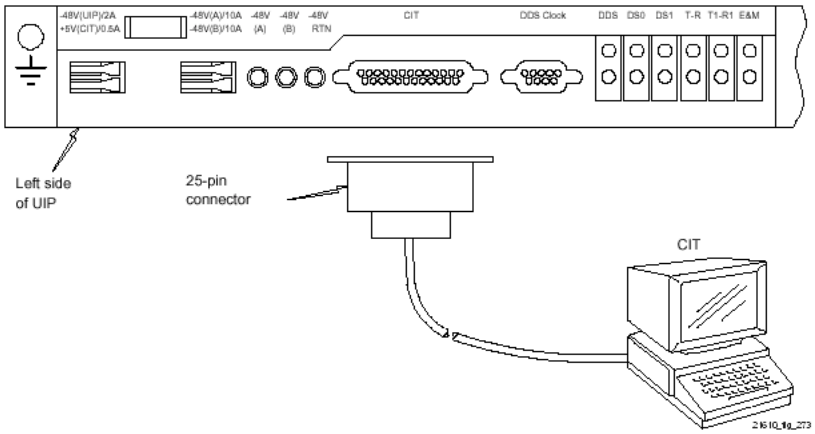
Step	Procedure
1	Obtain the following equipment: a. *IBM** compatible personal computer (PC) running terminal emulator software using *MS-DOS*† operating system, Release 3.0 or later with a serial port. or an American standard code for information interchange (ASCII) terminal. **NOTE:** Refer to the "Ordering" chapter in document 363-208-000, *SLC-2000 Access System, Applications, Planning, and Ordering Guide*, for a partial summary of compatible CIT terminals, PCs, and modems. b. RS-232 cable to connect PC **Serial** port to user interface panel **CIT** port. **NOTE:** In this procedure it is assumed you are familiar with the characteristics and operating procedures of your terminal or PC and the *MS-DOS* operating system.

* Registered trademark of International Business Machines Corporation.
† Registered trademark of Microsoft Corporation.

(Continued on next page)

Connect CIT and Set Baud Rate at UIP (Continued)

Procedure (continued)

Step	Procedure
2	Press the cover of the UIP to gain access to the CIT port. Connect CIT terminal to **CIT** port by connecting one end of an RS-232 cable to the **COM1** port of the CIT (use a 9-pin to 25-pin converter, if necessary) and the other end of the cable to the UIP **CIT** port (see the following figure). 
3	Press the UIP **Escape** button and then the **Scroll Menu** down arrow button until ***SET-BAUD: <ent>*** is displayed. Press the UIP **Enter** button then the **Scroll Menu** down arrow button until the desired baud rate is displayed (9,600 is the default for the terminal emulator software, **SYSCTL**, and UIP). Press **Enter** to set the CIT baud rate. **Stop! End of Procedure.**

Set Up CIT

Procedure

Use the following procedure to set the terminal parameters of the CIT and select the appropriate subsystem in preparation to enter commands:

Step	Procedure
1	Turn on the CIT and set the terminal parameters as follows (consult your terminal's manual for setup procedures): ■ Full duplex ■ 8 data bits ■ 1 start bit ■ 1 stop bit ■ No flow control ■ Baud rate set the same as the ***SET-BAUD*** UIP command. **NOTE:** If using a PC as a CIT terminal, run the *CTRM* terminal emulator software.
2	Enter a question mark (?) or RETURN. The CIT prompts with: **`/* Enter 1 to continue */`** **`subsystem =`**
3	Enter **`1`**.
4	The CIT will respond with "**`login`** <" (enter **`LUC01`**, **`LUC02`**, or **`LUC03`**) and "**`password`**" (enter **`SLC-2000`**). Response: The CIT will display a SONET alarm summary generated by the **`rtrv-alm: all`** command. The CIT will then display a prompt. To move to the DLC subsystem side, enter **`dlc`**.
5	You are ready to enter commands. Refer to document 363-208-003, SLC*-2000 Access System, Commands and Messages*, for available commands. To end a CIT session, enter **`logout`** and disconnect the CIT. **Stop! End of Procedure.**

DT Server Preparation, Installation, and Provisioning

Configure MDS for FITL Operation

Introduction

This section contains the procedure for using the CIT to configure the metallic distribution shelf (MDS) for fiber in the loop (FITL) operation.

Procedure

Before installing the DT Server card in the MDS, the MDS must be configured for FITL operation using the following procedure.

Step	Procedure
1	Remove the metallic distribution controller (**MDC**) units from the shelves being configured.
2	Use the **`ED-DISTN`** CIT command to configure the metallic distribution shelf for FITL. The syntax for the **`ED-DISTN`** command is: `ED-DISTN::`*`aid`*`::::dmode=fitl;` where the value for *aid* is the MDS number (1—8) assigned as follows: ■ **1** for the 1st (lowest) MDS ■ **2** for the 2nd MDS ■ **3** for the 3rd MDS ■ **4** for the 4th MDS ■ **5** for the 5th MDS ■ **6** for the 6th MDS ■ **7** for the 7th MDS ■ **8** for the 8th (uppermost) MDS.
3	Replace the **MDC** units removed in Step **1** and allow time for them to initialize. **Stop! End of Procedure.**

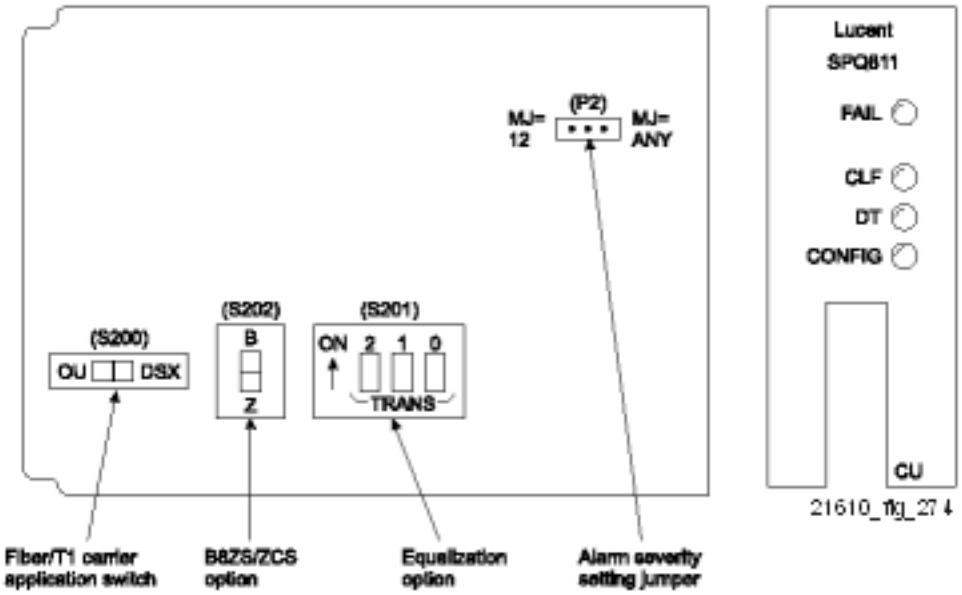
Option and Install DT Server in MDS

Introduction

This procedure covers setting the physical option switches on the side of an *SPQ*809, *SPQ*810, or *SPQ*811 DT Server card and installing the DT Server in the appropriate slot in the MDS.

DT Server optioning procedure

This procedure is to be performed when setting the option switches located on the side of the DT Server card (refer to the following figure).



(Continued on next page)

Option and Install DT Server in MDS (Continued)

DT Server optioning procedure (continued)

Step	Procedure
1	On the DT Server printed circuit board, set the **OU**/**DSX** switch toward **DSX**.
2	Set the **B**/**Z** switch toward **B**.
3	Set the DSX equalization **TRANS-0,1,2** option switches as required (refer to the following table).

Equalization Switch (TRANS)			Distance to DSX-1 (Note)
2	**1**	**0**	**(in Feet)**
OFF	OFF	ON	0 to 132
OFF	ON	OFF	133 to 265
OFF	ON	ON	266 to 398
ON	OFF	OFF	399 to 532
ON	OFF	ON	533 to 655

Note: These distances are for ABAM cable used in the central office (CO). Refer to 915-710-115 for calculations for other types of cable used for collocated remote terminal (RT) and T1 extension applications.

Stop! End of Procedure.

(Continued on next page)

Option and Install DT Server in MDS (Continued)

Install DT Server

It is suggested that the DT Server card be installed in the MDS after the *SLC ConnectReach* system has been configured and installed at the customer site to avoid unnecessary alarms at the CO and RT.

Use the following procedure to install the DT Server card:

Step	Procedure
1	Verify that the option switches on the DT Server card are set correctly (refer to the previous procedure).
2	Verify that the *SLC ConnectReach* system has been configured and turned up.
3	Install the DT Server in the appropriate channel unit slot in the appropriate MDS. Response: All alarms clear within 3 minutes.
4	Press the UIP **LED Test** button and verify that all DT Server card light emitting diodes (LEDs) light. If all LEDs do not light, replace the DT Server and repeat this procedure from Step **1**. **Stop! End of Procedure.**

Provision DT Server from CIT

Introduction

This section contains the procedure for provisioning the DT Server channel unit for use with the channel units located in the *SLC ConnectReach* system. The DT Server units that are acceptable for use with the *SLC ConnectReach* system are *SPQ*809, *SPQ*810, or *SPQ*811. This procedure assumes that the *SLC*-2000 Access System is equipped with the enhanced fiber-in-the-loop (FITL) feature that allows service to 1,152 plain old telephone service (POTS) lines. The enhanced FITL feature permits a 24-line DT Server card to be installed in MDS slot 1, 5, 9, 13, 17, or 21 and a 12-line DT Server card to be installed in MDS slot 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, or 23. An existing 768-line FITL system can be converted to the 1,152 enhanced FITL feature using procedures located in document 363-208-001, SLC*-2000 Access System, User/Service Manual*.

Determine DT Server AID

From the work order record detail (WORD) document, determine the DT Server AID address.

The AID has the following syntax:

`dt-Shelf#-CU#`
or
`cu-Shelf#-CU#`

where:
`Shelf#`: Shelf number {1-8}
`CU#`: First slot label number in the leftmost slot that the DT Server unit is installed in {1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, or 23}.

example: *dt-1-1*

Procedure

Use the following procedure to provision the DT Server card slot:

NOTE:
The DT Server card slot can be provisioned before or after the DT Server is installed in the MDS.

Step	Procedure
1	If necessary, perform the procedure presented earlier in this chapter in the section entitled “CIT Set Up and Connection” to set up and connect the CIT.

(Continued on next page)

Provision DT Server from CIT (Continued)

Procedure (continued)

Step	Procedure
2	At the CIT prompt, enter the **`rtrv-dt`** command to review the time slot allocation of the DT Server serving the *SLC ConnectReach* system. Response: The CIT will print a message indicating the *Lines Provisioned Value, DT Mode, DT Type, DT Address, Available Bandwidth,* and *CLEI Code* for the DT Server slot whose AID you entered.
3	If the following parameters do not agree with the parameters displayed on the CIT, proceed to Step **4**. Otherwise, press the DELete or CANcel key, enter **`logoff`**, and disconnect the CIT (DT Server parameters are already set correctly). ■ dttype=crdt ■ dtmode=quad ■ lines=12 or 24.
4	At the CIT prompt, press the DELete or CANcel key and enter the **`ed-dt`** command.
5	At the **`address=`** prompt, enter the DT Server AID determined previously.
6	At the **`dttype=`** prompt, enter crdt.
7	At the **`lines=`** prompt, enter 12 or 24.
8	At the **`dtmode=`** prompt, enter quad.
9	After all parameters have been entered, you will see a confirmation message preceded by a caution message. The parameter settings will be listed. Then the following will appear. **Execute? (y/n or CANcel/DELete to quit) =** If you enter “y”, the provisioning data just entered will be applied. If you enter “n”, you will be brought back to the **`ED-DT address=`** prompt and the provisioning data just entered will be ignored. If you press the “CANcel/DELete” key, you will be dropped out of the **`ED-DT`** command back to the system prompt and the provisioning data just entered will be ignored.
10	Enter “**`y`**” to provision the DT Server slot. **Stop! End of Procedure.**

DS0 Cross-Connections

Establishing Cross-Connections from the CIT

Introduction

The *SLC ConnectReach* system provides up to 24 DS0s for a variety of voice-grade and data services. Most voice-grade services interface with the *SLC ConnectReach* system through either a current feed or current sink circuit card. The DS0s containing the voice-grade services interface with the *SLC*-2000 RT/HDT through the network T1/DSX-1 port. At the RT/HDT, the time slot interchange (TSI) provides a digital cross-connect system (DCS)-type capability that allows these DS0s configured for switched telephony to be mapped through a TR-303 or TR-08 local digital switch (LDS) interface using the **ENT-CRS-T0** command at the craft interface terminal (CIT). The voice-grade services include the following:

- Analog voice frequency (VF) POTS Service
- Locally switched special services
- Services provided with the *BOX** Feature
- Direct Inward Dialing (DID) services to a private branch exchange (PBX)
- Analog trunk groups using the *LCR** feature.

The following is a list of the voice-grade circuit cards in the *SLC ConnectReach* system:

- **SPQ*443 channel unit*** — This circuit card is associated with the correct D-bank signaling for a digital PBX or key system connected to the *SLC ConnectReach* system through the secondary/fractional T1/DSX-1 port. Using the RT/HDT CIT, the DS0s supported by this channel unit emulation are normally cross-connected to the trunk side of an LDS interface.
- **SPQ*456 channel unit*:** This circuit card is associated with current sink service for DID applications, services provided by the *LCR* feature using analog circuits or trunk groups, and services provided by the *BOX* feature on inward bound trunks.
- **SPQ*440(C,D) channel unit*:** This circuit card is associated with analog voice service to the secondary/fractional T1/DSX-1 port and current feed VF-type service such as POTS and services provided by the *BOX* feature. Using the RT/HDT CIT, the DS0s supported by this channel unit emulation are normally cross-connected to a TR08 or TR-303 interface.

(Continued on next page)

*Trademark of VINA Technologies, Inc.

Establishing Cross-Connections from the CIT (Continued)

Introduction (continued)

At the *SLC*-2000 HDT, the **ENT-CRS-T0** command is also used to cross-connect DS0s providing data services to an INA DS1 that interfaces with a data network such as the Internet or a private corporate network through a frame relay network. The only circuit card associated with the *SLC ConnectReach* system data services is the *SPQ*452. The *SPQ*452 office channel unit (OCU) data port circuit card is normally associated with the DS0 data channel bandwidth through the Ethernet port. It usually provides data services but will also support some services associated with the secondary/fractional T1/DSX-1 port.

Entering ENT-CRS-T0 command

The following procedure should be used to enter T0 cross-connects at the CIT.

Step	Procedure
1	If necessary, perform the procedure presented earlier in this chapter in the section entitled “CIT Setup and Connection” to set up and connect the CIT.
2	At the CIT prompt, enter the **rtrv-crs-t0::***address* command to obtain a T0 cross-connect report showing the channel address cross-connected together. Enter the **dlt-crs-t0** to delete all T0 cross-connections for the channel unit slots being equipped.
3	Execute the **ent-crs-t0::***address1*,*address2* command at the CIT for the DS0 time slot to be cross-connected (for example, ent-crs-t0::v3dp-1-5,dtdp-2-1-1-1). (Refer to document 363-208-003, SLC-*2000 Access System, Commands and Messages for* additional information concerning CIT commands.)
4	Repeat Steps **2** and **3** for each DS0 time slot to be cross-connected.
5	Press DELete or CANcel key. Then enter **logoff** and disconnect the CIT. **Stop! End of Procedure.**

Provision Channel Unit(s) at *SLC®* *ConnectReach™* System

Using the CIT to Provision Channel Unit(s)

Overview

This procedure uses a craft interface terminal (CIT) at the *SLC*-2000 remote terminal/host digital terminal (RT/HDT) to set provisioning parameters on the channel units located at the *SLC ConnectReach* system.

Defining ENT-T0 and ED-T0 commands

The *SLC ConnectReach* system channel units [*SPQ*®440(C,D), *SPQ*443, *SPQ*452, or *SPQ*456] can be provisioned using either the **ENT-T0** or **ED-T0** command specifying the access identifier (AID) address of the channel unit. The provisioning data that is stored in memory is used by the channel unit to determine what circuit function to provide and what parameter values to use. The **RTRV-T0** command can be used to review the provisioning parameters for a channel. You should use the **RTRV-T0** command to verify the drop address before setting provisioning information. Verifying provisioning will not change an in-service circuit.

The **ENT-T0** and **ED-T0** commands use channel addresses in the form of:

dtdp-{metallic distribution shelf number}-{DT Server slot}- {DT channel unit slot number}-{DS0 of the channel unit}

Where “DT Server slot” is the MDS channel unit slot number where the DT Server is installed.

The use of the **ED-T0** or **ENT-T0** command is possible by means of remote provisioning where a CIT is connected to the user interface panel (UIP) CIT jack at the remote terminal (RT).

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Defining ENT-T0 and ED-T0 commands (continued)

Once a CIT is connected to the UIP, you must log in to the digital loop carrier (DLC) subsystem to execute the **ED-T0** or **ENT-T0** command. The **ED-T0** or **ENT-T0** CIT commands can be executed in two ways, "*expert*" or "*prompted*". The *expert*, or command mode, syntax allows you to provision channel provisionable parameters (all or some) with a one-line command. All provisionable parameters not entered in this one-line command retain their current values or are initialized to the default values. The **ED-T0** or **ENT-T0** command is entered as follows:

ED-T0::*address***:::***clei,functioncode***:***param1=val1,param2=val2,...***;**
ENT-T0::*address***:::***clei,functioncode***:***param1=val1,param2=val2,...***;**

where *address* is the channel *address* (AID),
clei and *functioncode* determine the channel function.
param=value are provisionable parameters for the particular channel unit function selected, for example:

```
ED-T0::dtdp-1-1-1-1:::SAC1AE,fxs:imp=600,
bal=2,xmt(gn)=2,rcv(gn)=8.5,sl=2,rls=n;
```

As the name *expert* implies, this command syntax should be used with caution only by experienced craft personnel. Refer to the **ENT-T0** DLC subsystem command in 363-208-003, SLC*-2000 Access System, Commands and Messages*, for a list of the functional *COMMON LANGUAGE** channel unit.

The steps in this procedure cover the *prompted* command entry method. The *prompted* command entry method is started by entering only **ED-T0** or **ENT-T0** at the prompt. A menu will prompt you to select a channel *address*. Subsequent menus will prompt for *COMMON LANGUAGE CLEI* code, function code, and provisioned parameter values. At any time you can enter "**?**" for help.

NOTE:
This procedure does not provide information to determine parameter values. It assumes a work order record detail (WORD) or equivalent document will provide all parameter values needed to provision the circuit.

* Common Language is a registered trademark of Telcordia Technologies, Inc. CLLI, CLFI, CLCI, CLEI, NC/NCI, Locatelt, and TeleHunt are trademarks of Telcordia Technologies, Inc. Functional *COMMON LANGUAGE CLEI* codes are the first six characters/digits of the channel unit *COMMON LANGUAGE CLEI* code and are used in the **ED-T0** or **ENT-T0** command.

Using the CIT to Provision Channel Unit(s) (Continued)

Determine circuit address

From the work order record detail (WORD) document, determine the circuit AID address, functional *CLEI* code, and what channel unit circuit function code is to be provisioned.

The circuit AID address syntax appears as follows:
:*dtdp-m-ms-s-c*
where *m* = the MDS shelf number {1-8}
where *ms* = the DT Server channel slot number (in MDS shelf) {1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, and 23}
where *s* = the *SLC ConnectReach* system channel unit number {1-6}
where *c* = the DS0 of the channel unit {1-4}.

Channel unit provisioning parameters

The *SLC ConnectReach* system can emulate four different types of voice channel units: *SPQ*440(C,D), *SPQ*443, *SPQ*452, and *SPQ*456. The following descriptions provide the function code, *CLEI,* and provisioning parameters for each of these channel units.

*SPQ*440(C,D) (Analog Line, Current Feed)

All four channels of the *SPQ*440(C,D) channel unit must be provisioned.

Function code: DFLT

CLEI: Other

Provisioning parameter:

Provisioning Parameter	WORD Abbreviation	Value
rls=Redlined	RLS	NO or YES (customer's choice)

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Channel unit provisioning parameters (continued)

*SPQ*443 (Analog Line)

Function codes: FXS, DPO, TO

CLEI: SAC1AE

Provisioning parameters:

Provisioning Parameter	WORD Abbreviation	Value
imp=Impedance	IMP	600 (default)
bal=Balance	BAL	3 (default)
xmtgn=TransmitGain	XMT(GN)	–1.0 (default)
rcvgn=ReceiveGain	RCV(GN)	–8.0 (default)
sl=Slope	SL	0 (default)
oht=OnHookTransmission	OHT	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Channel unit provisioning parameters (continued)

*SPQ*452 (Data)

Function code: OCU

CLEI: 5SCTFF

The following guidelines should be used when provisioning the *SPQ*452 channel unit:

1. To add one 64-kb/s DS0 channel, provision *circuit 1* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	NONE (default)
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

2. To add two 64-kb/s DS0 channels, provision *circuit 1* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	SCEC
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Channel unit provisioning parameters (continued)

3. To add three 64-kb/s DS0 channels, provision *circuit 1* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	SCEC
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

Then, provision *circuit 3* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	NONE (default)
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Channel unit provisioning parameters (continued)

4. To add four 64-kb/s DS0 channels, provision *circuit 1* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	SCEC
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

Then, provision *circuit 3* of the *SPQ*452 with the following parameter values:

Provisioning Parameter	WORD Abbreviation	Value
rate=Subscriber data rate	RATE	64 kb/s
ec=Error correction	EC	SCEC
zc=All-zero-code allowed	ZC	YES*
scc=Secondary channel used	SCC	YES*
qm=Quality monitoring	QM	NO (default)
rls=Redlined	RLS	NO or YES (customer's choice)

* ZC and SCC are automatically set to YES when RATE = 64.

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Channel unit provisioning parameters (continued)

*SPQ*456 (DID, FXO-Loop, FXO-Ground, Current Sink)

All four channels of the *SPQ*456 channel unit must be provisioned.

Function code: RVT

CLEI: SACPDC

Provisioning parameters:

Provisioning Parameter	WORD Abbreviation	Value
ls=Transmission loss	LS	2.5 dB (default)
rls=Redlined	RLS	NO or YES (customer's choice)

Entering RTRV-T0 command

Enter the **`RTRV-T0:dtdp-`***`{1-8}-{1,3,5,7,9,11,13,15,17,19,21,23}-{1-6}-{1-4}`* command for the channel address you plan to provision.

Using the information retrieved using the **`RTRV-T0`** command, verify that this circuit is actually the one that you want to provision. Contact your supervisor, if necessary.

Entering the provision data

Step	Procedure
1	If necessary, perform the procedure presented earlier in this chapter in the section entitled "CIT Set Up and Connection" to set up and connect the CIT.
2	At the CIT prompt, enter the **`ENT-T0`** command.
3	**NOTE:** For help, type "**?**" for acceptable input parameters. At the **`address=`** prompt, enter the channel access identifier address in the syntax as determined previously.

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Entering the provision data (continued)

Step	Procedure
4	**NOTE:** Whenever you are given a "**`/*Select from */`**" list, you can make the choice by entering the item number or entering the associated text or any portion of the text (uppercase or lowercase) that is discernible from other entries (for example, you can enter "1" or "sac1ae" to choose the *COMMON LANGUAGE CLEI* code SAC1AE). You can also select the [default] (enclosed in brackets) by pressing **ENTER** or **RETURN**. At the **`CLEI=`** prompt, enter the *COMMON LANGUAGE CLEI* code.
5	At the **`FunctionCode=`** prompt, enter the circuit function code.
6	**NOTE:** For help, type "**?**" for acceptable input parameter values. From the WORD document, enter the required parameter values when prompted.

(Continued on next page)

Using the CIT to Provision Channel Unit(s) (Continued)

Entering the provision data (continued)

Step	Procedure
7	After all parameters have been entered, you will see a confirmation or error message preceded by one or more caution messages. The channel provisioning settings will be listed. Then the following will appear: **Execute? (y/n or CANcel/DELete to quit) =** If you enter “y”, the provisioning data just entered will be applied. If you enter “n”, you will be brought back to the **`ENT-T0 address=`** prompt and the provisioning data just entered will be ignored. If you press “CANcel/DELete” keys, you will be dropped out of the **`ENT-T0`** command back to the system prompt and the provisioning data just entered will be ignored. If the channel slot cannot be provisioned as requested (for example, because of channel unit limitations), the following message will be displayed. Report this trouble to your supervisor. **IDNV /* Input, data not valid** **Cannot support CLEI code** *XXXXXX* **for line address */** *XXXXXX* is the functional *CLEI* code entered, and *address* is the metallic distribution shelf and channel number selected.
8	Enter “**`y`**” to provision the channel. **Stop! End of Procedure.**

T1 Cross-Connections

Establishing T1 Cross-Connections from the CIT

Introduction

If the *SLC*-2000 RT/HDT is connected to metallic feeders, then the physical T1 feeders must be cross-connected to the appropriate logical DS1 feeders of TR-08 or TR-303 virtual remote terminals (VRTs) or logical integrated network access (INA) using the craft interface terminal (CIT).

For INA applications, the framing format and line coding must also be set after the cross-connections have been made. Use the CIT `ED-INA` command to set the framing format to extended superframe (ESF) and the `ED-T1` command to set the line coding to bipolar 8 zero substitution (B8ZS).

Entering ENT-CRS-T1 command

The following procedure should be used to enter T1 cross-connects at the CIT.

Step	Procedure
1	If necessary, perform the procedure presented earlier in this chapter in the section entitled “CIT Setup and Connection” to set up and connect the CIT.
2	Are cross-connections for a TR-08, TR-303, or INA circuit? If **TR-08**, then continue with Step **3**. If **TR-303** or **INA**, then proceed to Step **5**.
3	Execute the **`init-crs-t1::`***address* command at the CIT to establish a standard T1 cross-connection between the physical and logical feeder DS1s of the desired TR-08 VRT (for example, `init-crs-t1::vrt-5`). (Refer to document 363-208-003, SLC-*2000 Access System, Commands and Messages for* additional information concerning CIT commands.)
4	Repeat Step **3** for all TR-08 VRTs to be cross-connected. **Stop! End of Procedure.**

(Continued on next page)

Establishing T1 Cross-Connections from the CIT (Continued)

Entering ENT-CRS-T1 command (continued)

Step	Procedure
5	Using the CIT, enter the following command: **`ENT-CRS-T1::`***Address1*`,`*Address2* Where: *Address1* = physical feeder access identifier (AID) (for example, `a-1&&2-all`) *Address2* = VRT feeder or logical INA AID [for example, `v3fdr-1-1&&8` (VRT feeder) or `ina-17&&28` (INA feeder)] **NOTE:** The command `ENT-CRS-T1::a-all,v3fdr-1-all` will cross-connect all 28 physical DS1s to all 28 logical DS1s on the TR-303 VRT. Refer to document 363-208-003, SLC*-2000 Access System, Commands and Messages*, for other cross-connection configurations and CIT commands. **Stop! End of Procedure.**

SLC ConnectReach System Monitoring

7

Contents

About This Chapter 7-3

- Introduction 7-3

Using the Statistics Command to Display System Elements Status 7-4

- Entering the Statistics Mode 7-4
- Displaying Statistics for IP 7-7
- Displaying Statistics for QOS 7-9
- Displaying Statistics for ARP 7-10
- Displaying Statistics for ICMP 7-11
- Displaying Statistics for TCP 7-14
- Displaying Statistics for UDP 7-15
- Displaying Statistics for Interfaces 7-17
- Displaying Statistics for Firewall 7-18
- Displaying Statistics for NAT and PAT 7-20
- Displaying Statistics for DHCP 7-20
- Displaying Statistics for PPP 7-21
- Displaying Statistics for a T1 Interface 7-22
- Displaying Statistics for Voice Channels 7-29
- Displaying Statistics for the Frame Relay Interface 7-32
- Displaying Statistics for the WAN Frame Relay Interface 7-36
- Displaying Statistics for the IP Protocols 7-41
- Displaying Statistics for Route 7-46
- Displaying Statistics for the *SLC® ConnectReach™* System 7-48

Miscellaneous Monitoring Commands 7-49
- Introduction 7-49
- Display Current Version of System Software 7-50
- Displaying Hardware Configuration 7-51
- Using the Traceroute Command 7-52

About This Chapter

Introduction

Contents

This chapter contains procedures for displaying various data stored in the *SLC*® *ConnectReach*™ system, including system elements status and performance, by means of a local or remote provisioning terminal or a craft interface terminal (CIT) at the *SLC*-2000 Access System remote terminal/host digital terminal (RT/HDT).

Using the Statistics Command to Display System Elements Status

Entering the Statistics Mode

General

You can use the `statistics` command with the appropriate options to display the configuration settings and the status of the following system elements associated with the *SLC ConnectReach* system:

- Internet protocol (IP)
- Quality of service (QOS)
- Address resolution protocol (ARP)
- Internet control message protocol (ICMP)
- Transport control protocol (TCP)
- User datagram protocol (UDP)
- Interfaces
- Firewall
- Network address translation (NAT)
- Dynamic host configuration protocol (DHCP)
- Point-to-point protocol (PPP)
- T1 interface
- Voice channels
- Frame relay interface
- Routing.

Most statistics displays give you a real-time view of counters for parameters in the system. Others tell about interfaces, security, usage, and routing.

In addition to the statistics command, you can use syslog to create a log of messages reporting significant events occurring on the *SLC ConnectReach* system. See “Configuring SYSLOG” on page 4-146 for details.

(Continued on next page)

Entering the Statistics Mode (Continued)

Entering the statistics command

To display statistics for the *SLC ConnectReach* system, you must first switch to the statistics mode by entering the `statistics` command at the Main Menu prompt (`> statistics`).

The prompt changes to the statistics prompt [`(statistics) >`] where you can enter statistics command options.

Entering the statistics command options

Use the following procedure to enter the desired statistics command option(s):

1. At the statistics prompt [`(statistics) >`], enter the appropriate statistics command option from the following table.
2. When you are done, enter the `Exit` command to return to the Main Menu.

(Continued on next page)

Entering the Statistics Mode (Continued)

Entering the statistics command options

.

To …	Enter this command
Display statistics for IP*	`ip`
Display statistics for QOS	`Qos`
Display statistics for QOS	`qos`
Display statistics for ARP	`arp-table-info`
Display statistics for ICMP*	`icmp`
Display statistics for TCP*	`tcp`
Display statistics for UDP*	`udp`
Display statistics for the interfaces	`interfaces`
Display statistics for Firewall	`Firewall`
Display statistics for NAT	`NAT`
Display statistics for DHCP	`DHCP`
Display statistics for PPP	`PPP`
Display statistics for the T1 Interface	`T1`
Display statistics for voice channels	`voice-states`
Display statistics for the frame relay interface	`frame`
Display the lower protocol layer statistics for the WAN Frame Relay Interface	`show-frinterface`
Display statistics for a specific Frame Relay pvc or all pvcs	`show-pvc`
Display statistics for supported IP protocols	`show-ipsummary`
Display statistics for routing	`routes`
Display statistics for the *AnyMedia ConnectReach* Terminal	`ConnectReach`
Access on-line assistance	`Help`
Exit the Statistics submenu and return to the Main prompt	`exit`

* IP, ICMP, TCP, and UDP statistics reports are intended for advanced users who are familiar with Ethernet networks.

Displaying Statistics for IP

Entering the IP command

IP, or Internet Protocol, is the network layer protocol in the TCP/IP protocol stack. IP specifies the format and addressing scheme of packets. It does not establish a connection between the sender and receiver of these packets, however. TCP and UDP carry out the connection-making function.

To display the statistics for IP, enter the `IP` command at the statistics prompt. For example:

```
(statistics)> ip
```

Example of IP statistics report

The following is an example of an IP statistics report that will be displayed on the PC monitor screen.

```
total         794
badsum        0
tooshort      0
toosmall      0
badhlen       0
badlen        0
fragments     0
fragdropped   0
fragtimeout   0
forward       0
cantforward   11
redirectsent  0
fastpath      0
```

(Continued on next page)

Displaying Statistics for IP (Continued)

Example of IP statistics report (continued)

The meanings of the statistics are provided in the following table.

Statistic	Definition
total	The number of packets processed since reset.
badsum	The number of packets with bad checksums.
tooshort	The number of packets that are below the minimum length.
toosmall	The number of packets with less than the minimum amount of data.
badhlen	The number of packets with headers that are either too long or too short.
badlen	The number of packets that are either too long or too short.
fragments	The number of packets so long they had to be fragmented.
fragdropped	The number of fragments that have been dropped (not received).
fragtimeout	The number of events in which there is a time out due to a delayed fragment.
forward	The number of packets forwarded to the host.
cantforward	The number of packets not forwarded because no route could be found.
redirectsent	The number of packets that were redirected to take the shortest route.
fastpath	The number of packets with no special needs or problems that have been forwarded by means of the fastest path inside the *SLC® ConnectReach™* system.

Displaying Statistics for QOS

Entering the QOS command

Quality of service (QOS) is a networking term that specifies a service level.

To display the statistics for QOS, enter the `QOS` command at the statistics prompt. For example:

```
(statistics)> qos
```

Example of QOS statistics report

The following is an example of a QOS statistics report that will be displayed on the PC monitor screen.

```
QOS PACKET STATISTICS
IP QOS is enabled
Highpriority packets Tx : 52
Low Priority packets TX : 395
Highpriority packets Tx Errors 0
```

Displaying Statistics for ARP

Entering the ARP command

Address Resolution Protocol (ARP) is a TCP/IP protocol used to convert IP addresses to physical addresses, such as Ethernet (MAC) addresses for devices. At the statistics prompt, enter the `arp-table-info` command to display the ARP table of IP to MAC address mappings. The results will appear as follows (the name of the device for the IP address may also be shown):

```
192.168.0.1 at 0:60:49:00:02:87
192.168.0.2 at 0:b0:d0:a5:c8:19
```

Displaying Statistics for ICMP

Entering the ICMP command

Internet control message protocol (ICMP) is a low-level protocol that supports functions such as echo requests (such as Ping), and displays messages such as `Host not available` or `Network unreachable`.

To display the statistics for ICMP, enter the `ICMP` command at the statistics prompt. For example:

```
(statistics)> ICMP
```

Example of ICMP statistics report

The following is an example of an ICMP statistics report that will be displayed on the PC monitor screen.

```
ICMP:
    2   call to icmp_error
    0   error not generated because old message was icmp
    Output histogram:
             echo reply: 1
    0   message with bad code fields
    0   message < minimum length
    0   bad checksum
    0   message response generated
    Input histogram:
             echo reply: 12
             destination unreachable: 6
    0   message response generated
```

Displaying Statistics for TCP

Entering the TCP command

Transport control protocol (TCP) is the transport layer protocol of the TCP/IP stack. It enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent. All of the statistics other than the first two refer to control packets.

At the statistics prompt, enter the TCP command to display TCP statistics. For example:

```
(statistics)> TCP
```

Example of TCP statistics report

The following is an example of a TCP statistics report that will be displayed on the PC monitor screen.

```
TCP:
        713     packet sent
                290     data packet
                33      data packet (28299 byte) retransmitted
                221     ack-only packet (98 delayed)
                0       URG only packet
                0       window probe packet
                91      window update packet
                80      control packet
        750     packet received
                303     ack (for 113493 bytes)
                24      duplicate ack
                0       ack for unsent data
                394     packet (96285 byte) received in-sequence
                5       completely duplicate packet (725 byte)q
                0       packet with some dup. data (0 byte duped)
                33      out-of-order packet (15872 byte)
                2       packet (2 bytes) of data after window
                2       window probe
                2       window update packet
                5       packet received after close
                0       discarded for bad checksum
                0       discarded for bad header offset field
                0       discarded because packet too short
```

(Continued on next page)

Displaying Statistics for TCP (Continued)

Example of TCP statistics report (continued)

```
30      connection request
32      connection accept
59      connection established (including accepts)
60      connection closed (including 0 drop)
3       embryonic connection dropped
269     segment updated rtt (of 0 attempt)
37      retransmit timeout
        0       connection dropped by rexmit timeout
0       persist timeout
0       keepalive timeout
        0       keepalive probe sent
        0       connection dropped by keepalive
```

The meanings of the abbreviated statistic names in the report are shown in the following table. For detailed descriptions of these statistics, see your TCP documentation.

Statistic	Definition
ack-only	Acknowledgment only packets
URG only	Packets sent with URG (urgent) only
control packet	Packets sent with SYN, FIN, or RST
ack	Received acknowledgment packets
duplicate ack	Received duplicate acknowledgment packets
ack for unsent data	Received acknowledgments for unsent data
segment updated rtt	Number of times sends succeeded

Displaying Statistics for UDP

Entering the UDP command

User datagram protocol (UDP) is a simple, datagram (packet)-oriented transport layer protocol, used by SNMP.

To display the statistics for user datagram protocol (UDP), enter the UDP command at the statistics prompt. For example:

```
(statistics)> udp
```

Example of UDP statistics report

The following is an example of a UDP statistics report that will be displayed on the PC monitor screen.

```
UDP:
   81   total packets
   44   input packets
   37   output packets
   0    incomplete header
   0    bad data length field
   0    bad checksum
   16   broadcasts received with no ports
   0    full socket
```

Displaying Statistics for Interfaces

Entering the interfaces command

The interfaces display tells you the status and configured parameters of the network interfaces on the Multiservice Xchange.

To display the statistics for interfaces, enter the `interfaces` command at the statistics prompt. For example:

```
(statistics)> interfaces
```

Example of interfaces statistics report

The following is an example of an interfaces statistics report that will be displayed on the PC monitor screen.

```
cpm0 (unit number 0):
     Flags: (0x63) UP BROADCAST ARP RUNNING
     Internet address: 207.104.144.180
     Broadcast address: 207.104.144.255
     Netmask 0xffffff00 Subnetmask 0xffffff00
     Ethernet address is 00:60:49:f0:00:05
     Metric is 0
     Maximum Transfer Unit size is 1500
     85999 packets received; 1480 packets sent
     0 input errors; 1480 output errors
     0 collisions
lo (unit number 0):
     Flags: (0x69) UP LOOPBACK ARP RUNNING
     Internet address: 127.0.0.1
     Netmask 0xff000000 Subnetmask 0xff000000
     Metric is 0
     Maximum Transfer Unit size is 4096
     0 packets received; 0 packets sent
     0 input errors; 0 output errors
     0 collisions
```

(Continued on next page)

Displaying Statistics for Interfaces (Continued)

Example of interfaces statistics report (continued)

The report contains a section for each available network interface on the *SLC ConnectReach* system. Each section begins with a code identifying the interface the section describes. The possible codes are shown in the following table.

Code	Interface	Comments
`cpm0-0`	10Base-T	Normal interface to primary Ethernet network. (cpm0-1 is the secondary Ethernet)
`lo`	10Base-T	Loopback interface. Always reported, even when the link is not in loopback mode. Address shown is the standard loopback IP address.
`fr 0-29`	Network T1/DSX-1 [1st frame relay permanent virtual circuit (PVC)]	Present only if encapsulation is set to frame relay.
`sppp`	Network T1/DSX-1 [point-to-point protocol (PPP) interface]	Present only if encapsulation is set to PPP.
`hdlc`	Network T1/DSX-1 [high-level data link control (HDLC) interface]	Present only if encapsulation is set to HDLC.
`fd1`	FDL interface	Present only if IP over facility data link (FDL) is enabled
`ATM 0-4`	Network T1 (RFC 1483 pvc)	Present only if data PVC is set to RFC 1483.

If you are unable to make a data or voice connection across the *SLC ConnectReach* system, check the Interface statistics to determine which interface is not functioning. In particular, if the flags line indicates “DOWN” for any interface you expect to see “UP,” check the physical connection for that interface.

Displaying Statistics for Firewall

Entering the firewall command

The firewall statistics relate to IP filtering.

To see the number of packets passed or filtered out by the firewall, enter the `firewall` command at the statistics prompt. For example:

```
(statistics)> firewall
```

Example of firewall statistics report

The following is an example of a firewall statistics report that will be displayed on the PC monitor screen.

```
IN (from WAN to LAN) [currently enabled]
Number of packets passed 75389
Number of packets failed 13

OUT (from LAN to WAN) [Currently enabled]
Number of packets passed 116
Number of packets failed 83

IP Forwarding is enabled
```

This is a status report only; no errors are reported.

Displaying Statistics for NAT and PAT

Entering the NAT command

Network address translation (NAT) is an Internet standard that allows a LAN to use one set of IP addresses for internal (LAN) traffic and another set of IP addresses for external traffic. This conserves global IP addresses, and can be used to ensure security; in effect, the internal IP addresses are hidden from all devices outside the LAN. Also, in/out requests can be qualified or authenticated.

To display the statistics for NAT, enter the NAT command at the statistics prompt. For example:

```
(statistics)> NAT
```

Example of NAT statistics report

The following is an example of an NAT statistics report that will be displayed on the PC monitor screen.

```
NAT IP Packets                          :     4614
NAT IP Outbound Packets                 :     14
NAT IP Inbound Packets                  :     4600
NAT IP Fragments                        :     0
NAT IP Packets Dropped                  :     215
NAT IP Packets Translated               :     0
NAT TCP Packets Translated              :     0
NAT UDP Packets Translated              :     0
NAT ICMP Packets Translated             :     0
NAT IP Packets Passed Thru              :     0
NAT Sessions in Use                     :     0
NAT Sessions Allocated                  :     0
NAT Sessions Freed                      :     0
NAT Sessions Refused                    :     4614
NAT Sequence Adjusts in Use             :     0
NAT Stress Recovery                     :     0
NAT Norm Recovery                       :     19
```

(Continued on next page)

Displaying Statistics for NAT and PAT (Continued)

Example of NAT statistics report (continued)

```
*********PAT Statistics*********
Of the above the following are PAT Stats:
PAT Sessions in Use              :        0
PAT Sessions Freed               :        0
PAT Sessions Refused             :        0
```

For further information on NAT statistics, refer to RFC 1631.

Displaying Statistics for DHCP

Entering the DHCP command

Dynamic host configuration protocol (DHCP) is used by the *SLC ConnectReach* system to dynamically assign IP addresses so PCs and other workstations can connect to the network and perform common network functions without an administrator having to assign IP addresses manually.

To see the currently assigned IP addresses and the medium access control (MAC) addresses of the devices to which they are assigned, enter the DHCP command at the statistics prompt. For example:

```
(statistics)> dhcp
```

Example of DHCP statistics report

The following is an example of a DHCP statistics report that will be displayed on the PC monitor screen.

```
IP-address       ethernet address
168.192.100.11   00:c0:ff:11:22:ce   hostname1
168.192.100.23   00:c0:ff:11:22:33   hostname2   expired
```

This is a status report only; no errors are reported.

The hostname field will be *hostname unknown* if the *SLC ConnectReach* system has been running for an interval shorter than the DHCP lease time.

The *expired* tag appears if the network application running on the client computer allowed the DHCP lease to expire (usually because the computer was powered off while the application was running).

Displaying Statistics for PPP

Entering the PPP command

Point-to-point protocol (PPP) allows a computer to connect to a remote network or device over either a synchronous interface or a standard dial-up telephone line and modem.

To display the statistics for point-to-point protocol (PPP), enter the PPP command at the statistics prompt. For example:

```
(statistics)> PPP
```

Example of PPP statistics report

The following is an example of a PPP statistics report that will be displayed on the PC monitor screen.

```
                    Point to Point Protocol

Link Control Protocol Status = OPENED
Internet Protocol Control Protocol Status = OPENED
```

This is a status report only; no errors are reported.

Displaying Statistics for a T1 Interface

Entering the T1 command

To view statistics on a T1 line or set a loopback on the line for diagnostic purposes, enter the T1 command at the statistics prompt. For example:

```
(statistics)> T1
```

At the `statistics:T1` prompt, enter the appropriate T1 interface command option and the appropriate parameters from the following table to specify which line to monitor, which privilege level you have, and the time period you want to monitor.

Enter this command …	…and specify this parameter…	…and this parameter	…and this time period
report	network, secondary	carrier, user	hour, day
clearReport	network, secondary		
statusReport	network, secondary		
setLoopback	network, secondary	payload, line, AIS	[5]…20 min
clearLoopback	network, secondary	payload, line, AIS	
usageReport	hours [8]		

Displaying Statistics for a T1 Interface (Continued)

Example of T1 line statistics report

At the statistics:T1 prompt, enter the following commands:

```
(statistics:T1)> report network carrier hour
```

The following is an example of a T1 line statistics report that will be displayed on the PC monitor screen.

```
Network Carrier ONE HOUR REPORT
ESF Counter: 36855
Current Interval Time: 818              Valid Intervals: 19

                 BPV   CRC   ES   UAS   BES   SES   CSS   LOFC
Current Count    0     0     0    0     0     0     0     0
24-Hour Count    4     0     0    0     0     0     0     1

Interval 1       0     0     0    0     0     0     0     0
Interval 2       0     0     0    0     0     0     0     0
Interval 3       0     0     0    0     0     0     0     0
Interval 4       0     0     0    0     0     0     0     0
```

NOTE: BPV= bipolar violationBES=bursty seconds

CRC= CRC errors SES = severely error seconds
ES = error seconds CSS = counted slip seconds
UAS = unavailable seconds LOFC = loss of frame count

Refer to TR-54016 or ANSI T1.403 for additional information.

If the count of bipolar violations (BPV) is high, verify that the T1 line coding format is set correctly. If the line is set to bipolar 8 zero substitution (B8ZS) line coding when it should be set to alternate mark inversion (AMI), this would cause bipolar violations.

If you suspect a problem with the T1 line, enter the same `report` command several times in succession. If the Current Count field for any condition increments rapidly, a problem with the physical connection is indicated. If the Current Count field increments gradually, verify whether the error rates fall within the carrier's guaranteed Quality of Service. If they do not, contact the carrier.

(Continued on next page)

Displaying Statistics for a T1 Interface (Continued)

Clearing statistics on a T1 line

At the statistics:T1 prompt, enter either the `clearReport network` or `clearReport secondary/fractional` to select the network T1 line or the secondary/fractional T1/DSX-1 line, respectively. For example:

```
(statistics:T1)> clearReport network
```

The *SLC ConnectReach* system maintains two sets of statistics records, one called the carrier database and the other called the user database. Initially, both sets are identical. When you clear statistics, you clear only the user database. The entire carrier database is always retained, so that statistics records are available even if the user database is cleared.

Displaying status on a T1 line

At the statistics:T1 prompt, enter either the `statusReport network` or `statusReport secondary/fractional` command to select the network T1/DSX-1 line or the secondary/fractional T1/DSX-1 line, respectively. For example:

```
(statistics:T1)> statusreport network
```

A report similar to the following example is displayed for the T1 line you specified:

```
Network T1 LINE STATUS
Loss of Signal        : NO
Unavailable State     : NO
Loss of Frame         : NO
Receive AIS           : NO
Receive RAI           : NO
Transmit RAI          : NO
Transmit AIS          : NO
Loopback Status       : OFF
```

(Continued on next page)

Displaying Statistics for a T1 Interface (Continued)

Displaying status on a T1 line (continued)

If “NO” is displayed after any of the conditions in the status report, this is an indication that no error is detected by the *SLC ConnectReach* system. If “Yes” is displayed, this is an indication that the corresponding error condition has been detected.

T1 line error conditions and the corresponding corrective actions are listed in the following table.

Condition	Corrective Action
Loss of Signal	A problem with the wiring exists. Check the physical connection. Contact the carrier if necessary.
Unavailable State	The most recent 10 or more seconds have been flagged Errored Seconds. A problem with the T1 line exists. Contact the carrier.
Loss of Frame	The line is configured for the wrong framing format. Verify with the carrier whether the framing format should be changed.
Receive AIS	Alarm Indication Signal (AIS). Loop has been placed down at the remote end. Contact the carrier.
Receive RAI	Remote Alarm Indicator (RAI). This indicates an error at the remote end. Contact the carrier.
Transmit RAI	Errors in these categories usually indicate that the T1 line is incorrectly configured. Check that the *SLC ConnectReach* system configuration matches the carrier’s configuration of the line.
Transmit AIS	

(Continued on next page)

Displaying Statistics for a T1 Interface (Continued)

Setting loopback on a T1 line

The `setloopback` command is used to place the T1 circuit into the loopback mode. The following types of loopback are possible:

- A payload loopback unframes then reframes prior to echoing bits.
- A line loopback simply echoes bits.

At the statistics:T1 prompt, enter the `setloopback` command and the appropriate T1 line parameters from the following table.

The device which is both the source and destination of the T1 stream needs to be internally clocked. The other T1 device should be network clocked.

Enter this command at the Statistics:T1 prompt …	…and specify this T1 line parameter…	…and this parameter	…and this timeout value
`setloopback`	`network, fractional`	`payload, line, AIS`	`[5]...20`

For example:

```
(statistics:T1)> setloopback network line 10
```

NOTE:
The alarm indication signal (AIS) is a blue alarm, not a loopback.

The time-out limit (which is expressed in minutes) ensures that the T1 line reverts to normal operation automatically after the specified time elapses, preventing unnecessary downtime.

The *SLC ConnectReach* system responds to remote channel service unit (CSU) and data service unit (DSU) loopback requests in accordance with AT&T Publication 43801. The *SLC ConnectReach* system does not respond to remote fractional loopback requests in the V.54 or T1.403 (annex B) specifications.

(Continued on next page)

Displaying Statistics for a T1 Interface (Continued)

Clearing loopback on a T1 line

The `clearloopback` command is used to clear a loopback that has been established on a T1 line.

At the statistics:T1 prompt, enter the `clearloopback` command and the appropriate parameters for a T1 line from the following table.

Enter this command at the Statistics:T1 prompt …	…and specify this T1 line parameter…	…and this parameter
`clearloopback`	`network, fractional`	`payload, line, AIS`

For example:

```
statistics:T1)> clearloopback network line
```

Displaying usage report

The `usageReport` command is used to see a display that compares the relative amounts of data and voice usage of the current line to the *SLC ConnectReach* system. The default time period is 8 hours.

At the statistics:T1 prompt, enter the `usageReport` command and specify the number of hours if different from the default of 8 hours.

For example:

```
(statistics:T1)> usageReport 4
```

(Continued on next page)

Displaying Statistics for a T1 Interface (Continued)

Displaying usage report (continued)

A report similar to the following example is displayed.

```
T1 usage samples during previous 4 hours:

                 data transmit      data receive       voice
                 min   avg   max  | min   avg   max  | min   avg   max
15  min  ago:    0%    0%    12%  | 0%    3%    74%  | 0%    1%    7%
30  min  ago:    0%    1%    30%  | 0%    6%    99%  | 0%    6%    7%
45  min  ago:    0%    1%    18%  | 0%    6%    77%  | 0%    5%    14%
60  min  ago:    0%    1%    24%  | 0%    16%   100% | 0%    2%    7%
75  min  ago:    0%    1%    12%  | 0%    16%   100% | 0%    0%    0%
90  min  ago:    0%    0%    9%   | 0%    3%    97%  | 0%    4%    7%
105 min  ago:    0%    0%    10%  | 0%    1%    47%  | 0%    1%    7%
120 min  ago:    0%    1%    25%  | 0%    2%    92%  | 0%    0%    7%
135 min  ago:    0%    1%    60%  | 0%    1%    64%  | 0%    1%    7%
150 min  ago:    0%    0%    10%  | 0%    0%    38%  | 0%    0%    0%
165 min  ago:    0%    0%    8%   | 0%    0%    11%  | 0%    0%    0%
180 min  ago:    0%    0%    5%   | 0%    0%    4%   | 0%    0%    0%
195 min  ago:    0%    0%    5%   | 0%    0%    11%  | 0%    0%    0%
210 min  ago:    0%    0%    15%  | 0%    0%    10%  | 0%    0%    0%
225 min  ago:    0%    0%    1%   | 0%    0%    11%  | 0%    0%    0%
240 min  ago:    0%    0%    1%   | 0%    0%    2%   | 0%    0%    0%
```

The Usage Report data is displayed in 15 minute increments. Voice DS0s are sampled once every minute with the minimum, maximum, and average minutes displayed. Data DS0s are monitored by counting the total number of bytes sent during a 1-minute interval.

The Usage Report is an indicator of efficient DS0 assignment. If the following example were the case for an extended period of time, reallocating the DS0s would improve the overall use of the T1 line:

— 16 voice DS0s showing a maximum minute of 10 percent

— Eight data DS0s showing an average minute of 90 percent.

Displaying Statistics for Voice Channels

Entering the voice-states command

To display voice channel statistics, enter the `voice-states` command at the statistics prompt.

For example:

```
(statistics)> voice-states
```

If the LCR/DID application is being used for voice, then a report similar to the following example is displayed:

```
Switched Digital Trunks
DS0 RxA RxB Dest      State
--- --- --- --------  -----
1   0   1   Line 5    Active
2   0   1   Line 7    Active
3   1   1             Idle
4   1   1             Idle
5   1   1             Idle
6   1   1             Idle
7   1   1             Idle
8   1   1             Idle


Switched Analog Trunks
Ch# CdA CdB Dest      State
--- --- --- --------  -----
9   0   0             Idle
10  0   0             Idle
11  0   0             Idle
12  0   0             Idle
13  0   0             Idle
14  0   0             Idle
15  0   0             Idle
16  0   0             Idle
```

(Continued on next page)

Displaying Statistics for Voice Channels (Continued)

Entering the voice-states command (continued)

```
Switched Analog Trunks
Ch# CdA CdB Dest      State
--- --- --- --------  -----
1   1   1             Idle
2   1   1             Idle
3   1   1             Idle
4   1   1             Idle
5   0   1   DigTrk 1  Active  *05*12018889902
6   1   1             Idle
7   1   1   DigTrk 2  Active
8   1   1             Idle
```

```
Channel Bank
DS0 SLIC#  RxA RxB Dest      State
--- -----  --- --- --------  -----
1   1      0   1   Line 5    Active
2   2      0   1   Line 7    Active
3   3      1   1             Idle
4   4      1   1             Idle
5   5      1   1             Idle
6   6      1   1             Idle
7   7      1   1             Idle
8   8      1   1             Idle
```

If voice connections are not operating as expected, use the `diagnose` command, discussed later in this chapter, to test the channel. In the diagnose mode, the display will show statistics for states, such as diagnostic ringing, diagnostic tone1k, etc.

(Continued on next page)

Displaying Statistics for Voice Channels (Continued)

Entering the voice-states command (continued)

The following table lists the possible channel states that may appear in the State column of the voice channel statistics report.

State	Description
`active`	A call is currently active on the channel.
`idle`	The channel is currently idle (no call is active).
`ringing`	The channel is in ringing mode either by means of the `Diagnose` command, discussed later in this chapter, or because an incoming connection is being requested on the channel.
`tone1k`	The channel has been put in tone1k mode either by the `Diagnose` command, discussed later in this chapter, or by the carrier. In this mode, a phone attached to the channel will emit an audible 1-kHz tone.
`reversal`	The channel has been put in reversal mode either by the `Diagnose` command, discussed later in this chapter, or by means of carrier signaling.
`not active`	Hardware to support the channel is present in the *SLC ConnectReach* system, but the channel has not been enabled (refer to 4, "Configuring the SLC® ConnectReach™ System.").

Displaying Statistics for the Frame Relay Interface

Entering the frame command

The `frame` command is used to display a frame relay traffic statistics report.

At the statistics prompt, enter the `frame` command:

```
(statistics)> frame
```

The prompt changes to the statistics:frame prompt where you can enter the commands from the following table. These let you see statistics for permanent virtual circuits (PVCs) or local management interface (LMI).

To	Enter this command…	….and one of these options
Display one or all PVCs	`PVC`	`(1...30), all`
Display LMI	`LMI`	
Exit this submenu	`Exit`	

If the PVC command is entered with the parameter *all*, a report similar to the following example is displayed:

(Continued on next page)

Displaying Statistics for the Frame Relay Interface (Continued)

Entering the frame command (continued)

FRAME RELAY PVC STATISTICS

PVC	Enabled	UP/DOWN	DLCI	RxFrames	TxFrames
PVC1	Enabled	UP	101	213	0
PVC2	Enabled	UP	102	213	420
PVC3	Disabled	DOWN	103	213	0
PVC4	Disabled	DOWN	104	213	0
PVC5	Disabled	DOWN	105	213	0
PVC6	Disabled	DOWN	106	213	0
PVC7	Disabled	DOWN	107	213	0
PVC8	Disabled	DOWN	108	213	0
PVC9	Disabled	DOWN	109	213	0
PVC10	Disabled	DOWN	110	213	0
PVC11	Disabled	DOWN	111	213	0
PVC12	Disabled	DOWN	112	213	0
PVC13	Disabled	DOWN	113	213	0
PVC14	Disabled	DOWN	114	213	0
PVC15	Disabled	DOWN	115	213	0
PVC16	Disabled	DOWN	116	213	0
PVC17	Disabled	DOWN	117	213	0
PVC18	Disabled	DOWN	118	213	0
PVC19	Disabled	DOWN	119	213	0
PVC20	Disabled	DOWN	120	213	0
PVC21	Disabled	DOWN	121	213	0
PVC22	Disabled	DOWN	122	213	0
PVC23	Disabled	DOWN	123	213	0
PVC24	Disabled	DOWN	124	213	0
PVC25	Disabled	DOWN	125	213	0
PVC26	Disabled	DOWN	126	213	0
PVC27	Disabled	DOWN	127	213	0
PVC28	Disabled	DOWN	128	213	0
PVC29	Disabled	DOWN	129	213	0
PVC30	Enabled	UP	130	213	0

(Continued on next page)

Displaying Statistics for the Frame Relay Interface (Continued)

Entering the frame command (continued)

The report should be reviewed for the following indications and the appropriate action taken:

- If the status of a PVC is “DOWN,” first verify that the *SLC ConnectReach* system is configured correctly, then contact the carrier.
- If the number of packets sent and received is zero for a PVC, either the *SLC ConnectReach* system is configured incorrectly, or there is no traffic between the local area network (LAN) and the wide area network (WAN). Verify the *SLC ConnectReach* system configuration. You can use the `ping` command to generate traffic, and verify whether frame counts have incremented. Also, use the `log` command to see if any simple network management protocol (SNMP) link-down traps have been logged.
- If the cyclic redundancy check (CRC) error count increments rapidly, a problem with the physical connection is indicated. If the field increments gradually, verify whether the error rates fall within the carrier’s guaranteed Quality of Service. If they do not, contact the carrier.

If the local management interface (`LMI`) command is entered, a report similar to the following example is displayed:

```
FRAME RELAY LMI STATISTICS
--------------------------
Total Status Enquires Sent:              535
Full Status Enquires Sent:               90
Total Status Responses Received:         535
Full Status Enquires Received:           90
Invalid LMI Messages Received:           0

Last Sequence Number Received:           25
Local Sequence Number:                   25
Sequence Number Sync Errors:             0

Total Receive CRC Errors:                0
Total Low Buffer Drops:                  0
Total Queue Full Drops:                  0
Total Circuit Errors:                    0
Total Send Data Errors:                  0
```

(Continued on next page)

Displaying Statistics for the Frame Relay Interface (Continued)

Entering the frame command (continued)

The definitions of the LMI statistics are shown in the following table.

Statistic	Definition
`Status Enquires`	Query of the other end of the connection to see if the link with the frame relay switch is active.
`Full Status Enquires`	Query of the other end of the connection for all information on every path in every PVC.
`CRC Errors`	Cyclic redundancy checks of HDLC frames.
`Low Buffer Drops`	Number of packets dropped due to the high priority queue being full. If it is high, it indicates the system cannot generate more packets due to traffic.
`Queue Full Drops`	Number of packets dropped due to a full queue; it indicates that the link is too busy, and the rate of sending needs to be reduced.
`Circuit Errors`	Errors due to the LMI link down, for any of various reasons.
`Send Data Errors`	Typically, the sum of Low Buffer Drops and Queue Full drops; if the number is greater that this sum, it indicates other problems sending data.

If invalid LMI messages are received, the configuration of the *LMI-type* parameter on the Config:Frame-relay menu is incorrect. Verify the correct setting with the carrier.

If the cyclic redundancy check (CRC) error count increments rapidly, a problem with the physical connection is indicated. If the field increments gradually, verify whether the error rates fall within the carrier's guaranteed Quality of Service. If they do not, contact the carrier.

Displaying Statistics for the WAN Frame Relay Interface

Introduction

At the statistics prompt, enter the `show-frinterface` command to see the lower protocol layer statistics for the WAN Frame Relay interface on the *SLC ConnectReach* system:

```
(statistics)> show-frinterface
```

A report of the LMI and Interface/Driver status similar to the following example is displayed:

```
Frame-Relay Interface
            LMI Status
                  LMIState: UP
                  TotalStatEnqTx: 0 TotalStatRespRx: 0
                  FullStatEnqTx: 0 FullStatRespRx: 0
                  InvalidLMIMsgsRx: 0
                  LastSeqNumRx: 1
                  LocalSeqNum: 1
                  SeqNumSyncErrors: 0
            Interface/Driver Status
                  State: UP
                  MTU: 1500 Bandwidth (Kbytes/sec): 192
                  TxFrames: 20 TxOctects: 160
                  TxFrameFails: 0 TxErrorStatus: 0
                  RxFrames: 20 RxOctects: 160
                  RxErrorFrames: 0 RxOverruns: 0
                  RxCrcErrors: 0 RxLengthErrors: 0
            Interface/Driver Cumulative Status
                  Elapsed Seconds: 1507
                  5MinAverageBandwithUtilization
                        Rx (Kbytes/sec): 42 (21.8%)
                        Tx (Kbytes/sec): 42 (21.8%)
                  5MinTxFrames: 20 5MinTxOctects: 160
                  5MinRxFrames: 20 5MinRxOctects: 160
                  30SecTxFrames: 5 30SecTxOctects: 40
                  30SecRxFrames: 5 30SecRxOctects: 40
```

(Continued on next page)

Displaying Statistics for the WAN Frame Relay Interface (continued)

Introduction (continued)

The fields displayed, and the corresponding MIB fields, are described in the following table.

Frame Relay Interface Statistics Descriptions

Display Field	Corresponding MIB Field	Description
LMI Status		
LMIState	frDlcmiState	State of LMI over the Link: UP — LMI configured and communicating with far-end DOWN — LMI configured, but not communicating with far-end Inactive — LMI not configured See RFC-1315 for details
TotalStatEnqTx	N/A	Total Status Enquiries sent
TotalStatRespRx	N/A	Total Status Response Messages received
FullStatEnqTx	N/A	Full Status Enquiries sent
FullStatRespRx	N/A	Full Status Response messages received
InvalidLMIMsgsRx	N/A	Number of invalid LMI messages received
LastSeqNumRx	N/A	Last sequence number received
LocalSeqNum	N/A	Local sequence number
SeqNumSyncErrors	N/A	Sequence number error count
Interface/Driver Status		
State	ifAdminStatus, ifOperStatus	Interface status
MTU	ifMtu	Maximum Transfer Unit
Bandwidth	ifSpeed	Interface Data Rate in kilobytes per second
TxFrames	ifOutUcastPkts	Number of packets transmitted for this interface
TxOctets	ifOutOctets	Number of octets transmitted for this interface
TxFrameFails	ifOutDiscards	Number of discarded transmit packets for this interface
TxErrorStatus	N/A	Number of Transmission errors for this interface
RxFrames	ifInUcastPkts	Number of packets received for this interface
RxOctets	ifInOctets	Number of octets received for this interface
RxErrorFrames	ifInErrors	Number of packets received in error for this interface
RxOverruns	N/A	Number of receive overruns at the driver
RxCrcErrors	N/A	Number of receive CRC errors from driver
RxLengthErrors	N/A	Number of receive frame length errors from driver

Display Field	Corresponding MIB Field	Description
Interface/Driver Cumulative Status		
Elapsed Seconds	N/A	Time in seconds the FR Interface has been running
5MinAverageBandwidthUtilization	N/A	Bandwidth consumed divided by bandwidth available during past 5 minute period (by 30-second intervals); separated into Receive and Transmit categories
5MinTxFrames	N/A	Number of Frames transmitted in the last 5 minutes
5MinTxOctets	N/A	Number of octets transmitted in the last 5 minutes
5MinRxFrames	N/A	Number of Frames received in the last 5 minutes
5MinRxOctets	N/A	Number of octets received in the last 5 minutes
30SecTxFrames	N/A	Number of Frames transmitted in the last 30 seconds
30SecTxOctets	N/A	Number of octets transmitted in the last 30 seconds
30SecRxFrames	N/A	Number of Frames received in the last 30 seconds
30SecRxOctets	N/A	Number of octets received in the last 30 seconds

Displaying Statistics for Frame Relay PVCs

Introduction

At the statistics prompt, enter the `show-pvc` command to see statistics for a specific Frame

Relay pvc or all pvcs on the *SLC ConnectReach* system:

```
(statistics)> show-pvc
```

Enter the parameter to see the statistics, as detailed in the following table.

To	Enter this command	...and one of these options
Display one or all PVCs.	`show-pvc`	`(1...30), all`
Display online help	`Help`	
Exit this submenu	`Exit`	

A report of the current pvc statistics similar to the following example is displayed:

```
Frame-Relay PVC
              Name: PVC2
              DLCI: 506 PvcState: ACTIVE Interface: FR
              IPAddr: 192.168.11.2
              RxFrames: 4742472 RxOctets: 1027355809
              TxFrames: 6108392 TxOctets: 762619571
```

(Continued on next page)

Displaying Statistics for Frame Relay PVCs (continued)

Introduction (continued)

The fields displayed, and the corresponding MIB fields, are described in the following table:

Display Field	Corresponding MIB Field	Description
`Name`	`frCircuitIfIndex`	Name assigned to this PVC. There is a one-to-one correspondence to the index in the MIB. See RFC-1315.
`DLCI`	`frCircuitDlci`	Circuit Number; see RFC-1315
`Interface`	`N/A`	Indicates the lower protocol layer interface
`PvcState`	`frCircuitState`	State of this circuit
`IPAddr`	`N/A`	IP address for this PVC
`TxFrames`	`frCircuitSentFrames`	Number of frames transmitted from IAD on this circuit
`TxOctets`	`frCircuitSentOctets`	Number of octets transmitted from IAD on this circuit
`RxFrames`	`frCircuitReceivedFrames`	Number of frames received by IAD on this circuit
`RxOctets`	`frCircuitReceivedOctets`	Number of octets received by IAD on this circuit

Displaying Statistics for IP Protocols

introduction

At the statistics prompt, enter the **show-ipsummary** command to see statistics for the various IP protocols in use on the *SLC ConnectReach* system:

```
(statistics)> show-ipsummary
```

A report of the current pvc statistics similar to the following example is displayed:

```
Ip Statistics
      IpForwarding: Enabled DefaultTTL: 0
      InReceives: 0 InHdrErrors: 0 InAddrErrors: 0
      ForwDatagrams: 0 InDelivers: 0
Fragment Statistics
      ReassemblyTimeout: 0 ReassemblyReqds: 0
      ReassemblymFails: 0
ICMP Statistics
      InMsgs: 0 InErrors: 0 InDestUnreachs: 0 InTimeExcds: 0
      InRedirects: 0 InEchos: 0 InEchoReps: 0
      OutMsgs: 0 OutErrors: 0 OutDestUnreachs: 0
            OutTimeExcds: 0
      OutRedirects: 0 OutEchoReps: 0
UDP Statistics
      RxPackets: 2864479 TxPackets: 133209 NoPorts: 2823631
TCP Statistics
      TxTotalPackets: 29 TxDataPackets: 12 TxDataOctets:
            3603
      RexmitPackets: 0 RexmitOctets: 0
      RxTotalPackets: 29 RxDataPackets: 6 RxDataOctets:
            2632
      RtoAlgorithm: 4 RtoMin: 1000 RtoMax: 64000
      ActiveOpens: 0 PassiveOpens: 6 AttemptFails: 0
      EstabResets: 0 CurrEstab: 1
```

(Continued on next page)

Displaying Statics for IP Protocols

Introduction (continued)

The fields displayed (grouped by protocol) and the corresponding MIB fields, are described in the following table.

Display Field	Corresponding MIB Field	Description
	ipGroup	
`IpForwarding`	`ipForwarding`	Indicates whether this device is acting as an IP gateway, and therefore whether it forwards packets.
`DefaultTTL`	`ipDefaultTTL`	The default value inserted into the Time-To-Live (TTL) field of the IP header of packets originating at this device, whenever a TTL value is not supplied by the transport layer protocol.
`InReceives`	`ipInReceives`	The number of input packets received from interfaces, including those received in error.
`InHdrErrors`	`ipInHdrErrors`	The number of input packets discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, TTL exceeded, errors in processing their IP options, etc.
`InAddrErrors`	`ipInAddrErrors`	The number of input packets discarded because the IP address in their IP header's destination field was not valid at this entity. Includes invalid addresses (e.g., 0.0.0.0) and addresses of unsupported classes (e.g., Class E). If device is not an IP Gateway and therefore does not forward packets, this counter includes packets discarded because the destination address was not a local address.
`ForwDatagrams`	`ipForwDatagrams`	The number of input packets for which this device was not their final IP destination, as a result of which an attempt was made to find a rout to forward them to that final destination. If device is not an IP Gateway, this counter will include only those packets which were Source-Routed via this device, and the Source-Route option processing was successful.

Display Field	Corresponding MIB Field	Description
InDelivers	ipInDelivers	The total number of input packets successfully delivered to IP user-protocols (including ICMP).
ReassemblyTimeout	ipReasmTimeout	The maximum number of seconds which received fragments are held while they are awaiting reassembly at this device.
ReassemblyReqds	ipReasmReqds	The number of IP fragments received that needed to be reassembled at this device.
ReassemblyFails	ipReasmFails	The number of failures detected by the IP reassembly algorithm (for whatever reason: timed out, errors, etc). Note that this is not necessarily a count of discarded IP fragments, since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received.
icmpGroup		
InMsgs	icmpInMsgs	The number of ICMP messages which the device received. Note that this counter includes all those counted by icmpInErrors.
InErrors	icmpInErrors	The number of ICMP messages which the device received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc).
InDestUnreachs	icmpInDestUnreachs	The number of ICMP Destination Unreachable messages received.
InTimeExcds	icmpInTimeExcds	The number of ICMP Time Exceeded messages received.
inRedirects	icmpinRedirects	The number of ICMP Redirect messages received.
inEchos	icmpinEchos	The number of ICMP Echo (request) messages received.
InEchoReps	icmpInEchoReps	The number of ICMP Echo Reply messages received.
InTimestamps	icmpInTimestamps	The number of ICMP Timestamp (request) messages received.
OutMsgs	icmpOutMsgs	The number of ICMP messages which this device attempted to send. Note that this counter includes all those counted by icmpOutErrors.

Display Field	Corresponding MIB Field	Description
OutErrors	icmpOutErrors	The number of ICMP messages which this device did not send due to problems discovered within ICMP, such as a lack of buffers. This value should not include errors discovered outside the ICMP layer, such as the inability of IP to route the resultant packet. In some implementations there may be no types of error that contribute to this counter's value.
OutDestUnreachs	icmpOutDestUnreachs	The number of ICMP Destination Unreachable messages sent.
OutTimeExcds	icmpOutTimeExcds	The number of ICMP Time Exceeded messages sent.
OutRedirects	icmpOutRedirects	The number of ICMP Redirect messages sent.
OutEchoReps	icmpOutEchoReps	The number of ICMP Echo Reply messages sent.
udpGroup		
RxPackets	udpInDatagrams	The number of UDP packets delivered to UDP users.
TxPackets	udpOutDatagrams	The number of UDP packets sent from this device.
NoPorts	udpNoPorts	The number of received UDP packets for which there was no application at the destination port.
tcpGroup		
TxTotalPackets	tcpOutSegs	The number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
TxDataPackets	N/A	Internally Managed
TxDataOctets	N/A	Internally Managed
RexmitPackets	tcpRetransSegs	The number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted octets.
RexmitOctets	N/A	Internally Managed
RxTotalPackets	tcpInSegs	The number of segments received, including those received in error. This count includes segments received on currently established connections.
RxDataPackets	N/A	Internally Managed
RxDataOctets	N/A	Internally Managed

Display Field	Corresponding MIB Field	Description
RtoAlgorithm	tcpRtoAlgorithm	The algorithm used to determine the timeout value used for retransmitting unacknowledged octets.
RtoMin	tcpRtoMin	The minimum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre (3), this type of object has semantics of the LBOUND quantity described in RFC 793.
RtoMax	tcpRtoMax	The maximum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre (3), this type of object has semantics of the UBOUND quantity described in RFC 793.
ActiveOpens	tcpActiveOpens	The number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
PassiveOpens	tcpPassiveOpens	The number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
AttemptFails	tcpAttemptFails	The number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN RCVD state.
EstabResets	tcpEstabResets	The number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSED-WAIT state.
CurrEstab	tcpCurrEstab	The number of TCP connections for which the current state is either ESTABLISHED or CLOSED-WAIT.

Displaying Statistics for Route

Entering the route command

The `route` command is used to display the routing table for the *SLC ConnectReach* system.

At the statistics prompt, enter the `route` command:

```
(statistics)> route
```

A Route Net Table report similar to the following example is displayed, showing the network IP address, the network mask, the Gateway (`GW` — the IP address of the next hop router), the Distance (or the number of hops) in the route, the interface (`Intf` — `fr` stands for Frame Relay and qu stands for Ethernet), the flags, the status, and the number of interfaces that are referenced by the current route:

```
ConnectReach Routing Table
Network        Mask           GW             Dist Intf Flags State Ref
1.0.0.0        255.0.0.0      1.1.1.1        2    fr0  R     G     1
13.0.0.0       255.0.0.0      207.242.96.201 1    fr0  S     G     1
14.0.0.0       255.0.0.0      207.242.96.201 1    fr0  S     G     1
100.0.0.0      255.0.0.0      207.242.96.1   1    qu0  S     G     1
200.200.100.0  255.255.255.0  207.242.96.176 2    qu0  R     G     1
200.200.200.0  255.255.255.0  207.242.96.176 1    qu0  S     G     1
207.242.96.0   255.255.255.0  207.242.96.201 1    qu0  D     G     2
213.213.213.0  255.255.255.0  213.213.213.1  1    fr1  D     G     1
0.0.0.0        0.0.0.0        207.242.96.201 0    fr0  F     G

Flags: D->Direct S->Static F->Default R->RIP
State: G->Good P->Suspect B->Bad
Total number of routes: 9
```

(Continued on next page)

Displaying Statistics for Route (Continued)

Entering the route command (continued)

This is a status report only; no errors are reported. The Ref column indicates the number of interfaces associated with each route. Only routes that are up are displayed. The routing table is updated once every 30 seconds. A description of the possible routing states follows:

Good	A direct, static, or default route is good if the associated interface is up. A routing information protocol (RIP) route has a good state if it has been heard from in the last 60 seconds.
Suspect	This state applies to RIP routes only. A RIP route is suspect if it has not been heard from in the last 60 seconds.
Bad	This state applies to RIP and static routes only. A route in a bad state is about to be deleted. It is kept on the routing table for 3 minutes during which routing neighbors are notified of its state. It takes 94 seconds for a RIP route to go from suspect to bad.

Displaying Statistics for the *SLC®* *ConnectReach™* System

Entering the ConnectReach command

The `ConnectReach` command is used to display a *SLC ConnectReach* system status report.

At the statistics prompt, enter the `ConnectReach` command:

```
(statistics)> ConnectReach
```

A ConnectReach status report similar to the following example is displayed.

```
        LAPD state: S2
   Transport state: UP
     Messages sent: 15876
    Messages rec'd: 16264
   Sanity timeouts: 4
     Send failures: 0
   Checksum errors: 0
             GBits: 0x0
```

Miscellaneous Monitoring Commands

Introduction

Definition of miscellaneous monitoring commands

This section provides procedures for using the miscellaneous monitoring commands and the displays resulting from the use of these commands. The commands described include the following:

- Version
- Show-hardware-config
- Traceroute.

Display Current Version of System Software

Entering the version command

The `version` command is used to display the current version of the *SLC ConnectReach* system software and uptime information; that is, how long the *SLC ConnectReach* system has been running since the last power-on or reboot.

At the Main Menu prompt, enter the `version` command:

Example:

> **`version`**

The following is an example of the display obtained when the `version` command is entered.

```
******* System Image Boot *******

ConnectReach system(3.6.3)
Built: Apr 6 1998, 15:24:47
NVRAM version 0107
PB $Id: romInit.s,v 1.3 1997/03/07 23:44:27 dab Exp $

Copyright 1996-1998 VINA Technologies, Inc.

System running for   18 day 22 hour 29 mins 13 secs
```

The version information can be interpreted as follows:

`ConnectReach` `system (3.6.3)`	System image version
`NVRAM version 0107`	Configuration partition version
`PB $Id: romInit.s,v 1.3…`	Protected boot version

Displaying Hardware Configuration

Entering the show hardware command

The `show hardware` command is used to display the current hardware configuration for the *SLC ConnectReach* system. This command displays information such as the unit's serial number, the Ethernet address, the amount of main memory, and the presence or absence of optional hardware components, such as the digital signal processor (DSP).

At the Main Menu prompt, enter the `show-hardware` command:

> **`show-hardware`**

Information about the current hardware configuration for the *SLC ConnectReach* system is displayed. Abbreviations in the following sample display include: digital signal processor (DSP), processor version register (PVR), and memory management unit (MMU).

```
Hardware configuration:

Hardware version 0006
Serial number 0000000000323
Ethernet address 00.60.49.00.02.8C
Analog channels 1-8 are type FXS
Analog channels 9-16 are type FXO revision A
4194304 bytes of main memory
No SIMM memory present
Secondary T1 is not present
DSP is present
```

Using the Traceroute Command

Entering the traceroute command

The *traceroute* command allows you to trace the routing history between two points on an IP network. Traceroute sends three separate packets with the time to live (TTL) field set to the lowest number possible. When the packets reach the first router, three timeout messages are returned to the *SLC ConnectReach* system by means of the Internet control message protocol (ICMP). Three more packets are sent with the TTL field incremented by one. These packets pass the first router, know as a hop, and reach the second router. This process continues until the hop count reaches 30 or the destination address is reached.

For example:

```
>traceroute www.yahoo.com

traceroute to www.yahoo.com (204.71.200.68): 1-30 hops, 28 byte
packets

207.247.10.49 (207.247.10.49) 16.66ms 16.66ms 0.0ms

464.Hssi2-0.GW3.EWR1.ALTER.NET (157.130.1.77) 83.33ms 66.66ms
83.33ms

116.ATM3-0.XR1.EWR1.ALTER.NET. (146.188.177.174) 66.66ms 66.66ms
66.66ms

293.ATM6-0.XR1.NYC1.ALTER.NET. (146.188.177.153) 66.66ms 66.66ms
83.33ms

137.39.23.202 (137.39.23.202) 66.66mv (ttl=247!) 66.66ms (ttl=247!)
83.33ms (ttl=247!)

pos2-1-155M.cr1.NYC2.gblx.net (206.132.249.185) 66.66ms (ttl=247!)
66.66ms (ttl=247!) 66.66ms (ttl=247!)

pos7-0-622M.cr2.SNV.gblx.net. (206.132.151.22) 150ms (ttl=245!)
133ms (ttl=245!)

pos1-0-2488M.hr8.SNV.gblx.net. (206.132.254.41) 133ms (ttl=244!)
150ms (ttl=244!) 150ms (ttl=244!)

www.yahoo.com (204.71.200.68) 150ms (ttl=244!) 133ms (ttl=244!)
133ms (ttl=244!)
```

(Continued on next page)

Using the Traceroute Command (Continued)

Entering the traceroute command (continued)

Some routers do not reply with a timeout message. In those instances, an "*" will be placed in the time field. The `ttl` is displayed with a number and an exclamation point (for example, `ttl=125!`) when the response packet returns an unexpected value for the `ttl`. Refer to the following table for a listing of some of the possible codes.

Code	Comments
!H	host unreachable
!N	network unreachable
!P	protocol unreachable
!S	source route failed
!F	fragmentation needed

Configure/Monitor and Upgrade Software for the *SLC ConnectReach* System Using a Web Browser

8

Contents

About This Chapter 8-2

- Introduction 8-2

Preparing/Accessing the *SLC® ConnectReach™* System 8-3

- Preparing the *SLC ConnectReach* System for Access Using a Web Browser 8-3
- Accessing the *SLC ConnectReach* System Using a Web Browser 8-4

Executing Commands from the Main Menu 8-6

- Displaying Selected Menu Screens 8-6
- Using a Web Browser to Execute a Ping Command 8-16
- Using a Web Browser to Upgrade Software 8-17
- Using a Web Browser to Reboot the *SLC ConnectReach* System 8-23
- Using a Web Browser to Exit the *SLC ConnectReach* System Utility 8-25

About This Chapter

Introduction

Contents

This chapter explains the use of a Web browser in configuring and monitoring the *SLC® ConnectReach™* system. The information covered in this chapter includes the following:

- Preparing the *SLC ConnectReach* system for access by a Web browser
- Configuring the *SLC ConnectReach* system
- Displaying logs and statistics
- Upgrading the *SLC ConnectReach* system with new software
- Rebooting the *SLC ConnectReach* system
- Exiting the *SLC ConnectReach* system Utility.

NOTE:
Although a Web browser can be used to configure and monitor the *SLC ConnectReach* system, it *cannot* be used to provision the *SLC*-2000 remote terminal/host digital terminal (RT/HDT) host.

Preparing/Accessing the *SLC®* *ConnectReach™* System

Preparing the *SLC ConnectReach* System for Access Using a Web Browser

Required items

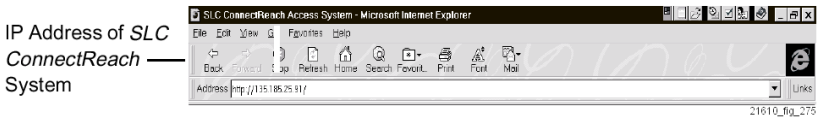
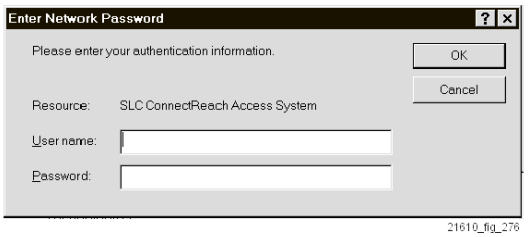
Before you can use a Web browser to configure and monitor the *SLC ConnectReach* system, you must:

- Verify that the *SLC ConnectReach* system has been installed and connections made to the Ethernet or T1 network according to the procedures contained in Chapter 5, "Installation".
- Configure the *SLC ConnectReach* system for an Ethernet or Network T1/DSX-1 connection, including an Internet protocol (IP) address, subnet mask, and broadcast address according to the procedure in Chapter 4, "Configuring the SLC® ConnectReach™ System".
- Have a Web browser, such as Netscape Navigator or Microsoft Internet Explorer, running on a provisioning terminal (computer) that is connected to the same network [local area network (LAN) or wide area network (WAN)] as the *SLC ConnectReach* system. The hypertext transfer protocol (HTTP) interface supports the following browsers:
  - Netscape Navigator 3.x and above
  - Microsoft Internet Explorer 4.x and above.

Accessing the *SLC ConnectReach* System Using a Web Browser

Logging in to the *SLC ConnectReach* system

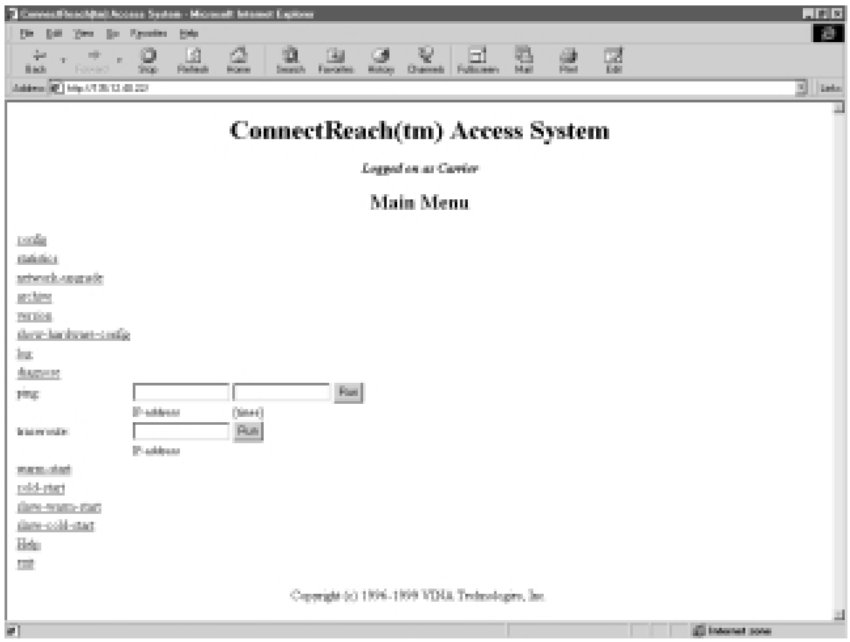
Use the following procedure to access and log in to the *SLC ConnectReach* system:

Step	Procedure
1	Start a Web browser on the computer.
2	In the Web browser, enter the IP address or host name assigned to the *SLC ConnectReach* system in the **Location**/**Address** box and press the **Return**/**Enter** key. The following figure shows an IP address entered in the **Location** text box in the Microsoft Internet Explorer browser.  **NOTE:** If you are connecting to the *SLC ConnectReach* system from the local area network (LAN), the IP address should be the *SLC ConnectReach* system's address on the LAN. If you are connecting to the *SLC ConnectReach* system from the wide area network (WAN), the IP address should be the *SLC ConnectReach* system's address on the link to the central office (CO).
3	The *SLC ConnectReach* system prompts you to enter a login name and password in the User name and Password dialog boxes, as shown in the following figure.  **NOTE:** If no login name and password are assigned, leave the Name and Password dialog box blank, and click OK.

(Continued on next page)

Accessing the *SLC ConnectReach* System Using a Web Browser (Continued)

Logging in to the *SLC ConnectReach* system (continued)

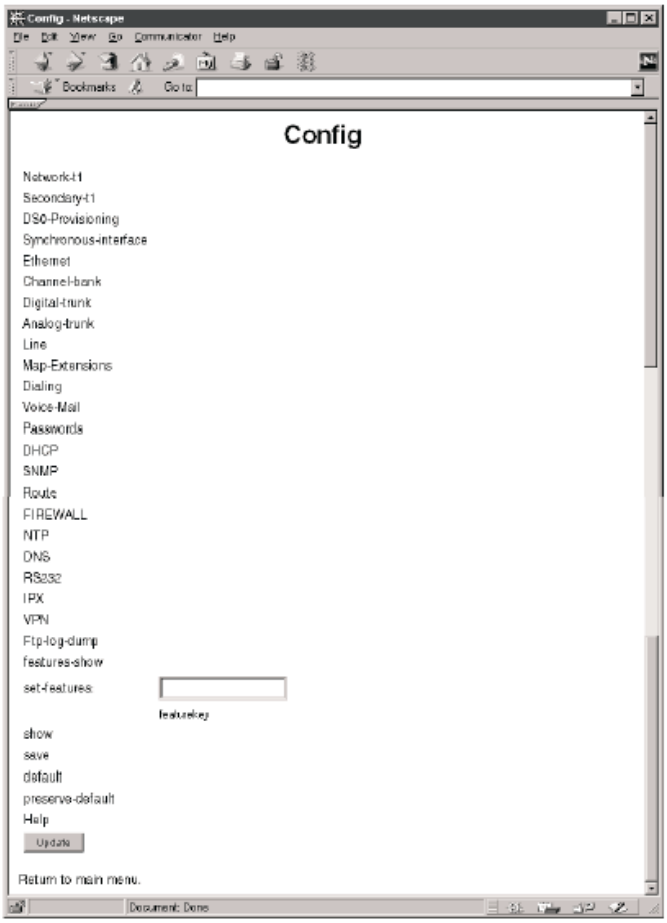
Step	Procedure
4	After you log in, the *SLC ConnectReach* system Main Menu appears. The following figure shows an example of the Main Menu.  21610_fig_277

Executing Commands from the Main Menu

Displaying Selected Menu Screens

Display config submenu

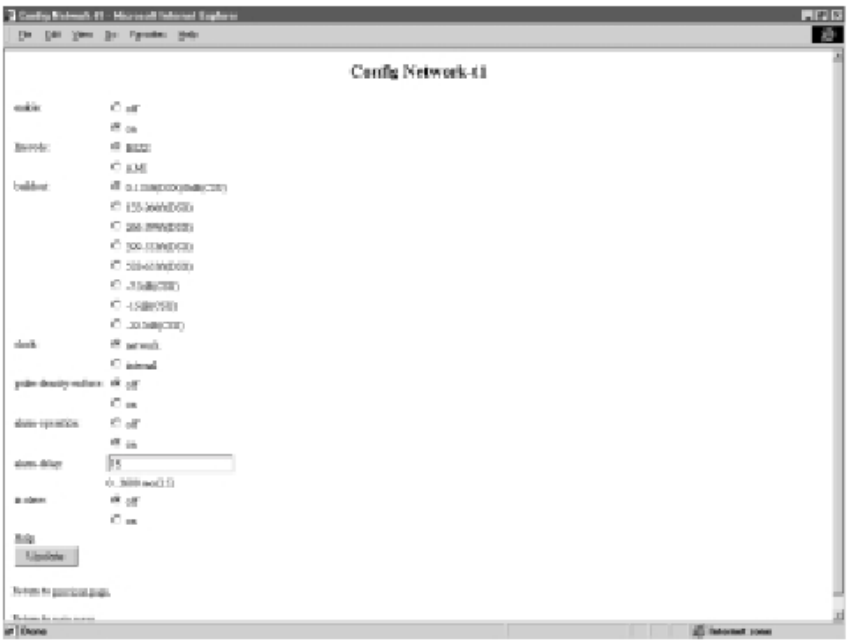
The following procedure is used to display the configuration submenu and make necessary changes to the configuration settings:

Step	Procedure
1	In the *SLC ConnectReach* system Main Menu, click the `config` command. Refer to the following figure for a sample of the Config submenu that appears. 

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display config submenu (continued)

Step	Procedure
2	In the Config submenu, click a command to change configuration settings for that command. For example, if you click the `Network-t1` command in the Config submenu, the parameters for configuring the network T1/DSX-1 interface appear, as shown in the following figure. For details about each configuration setting, refer to Chapter 4, "Configuring the SLC® ConnectReach™ System".  21610_fig_279

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display config submenu (continued)

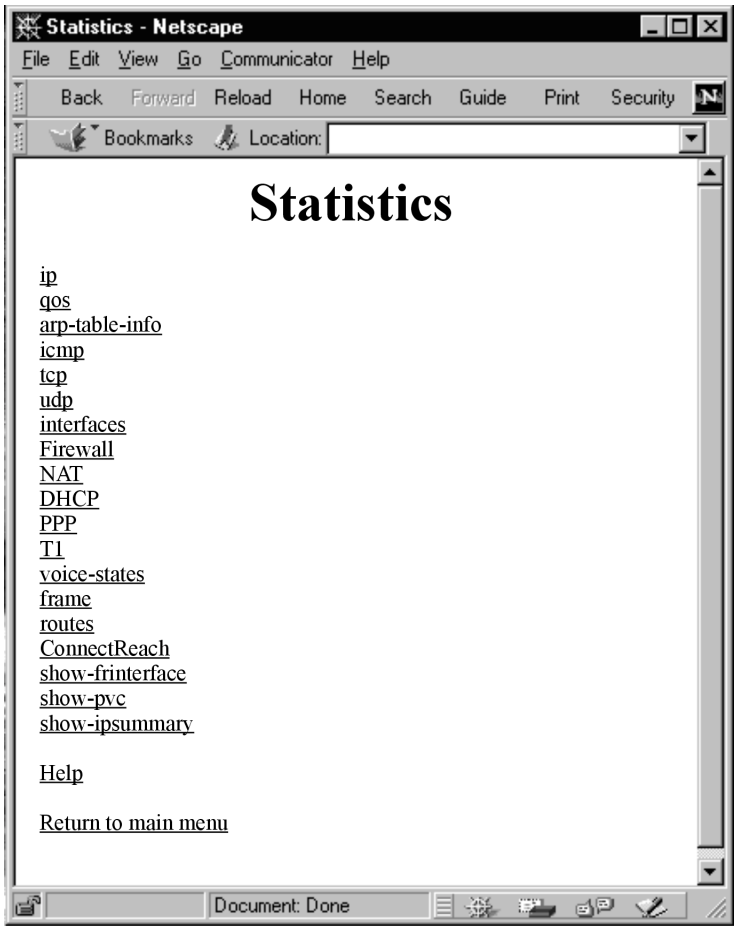
Step	Procedure
3	Change the configuration settings as necessary, and then click the `Update` button in the Configuration screen to store the new settings in a temporary memory buffer in the *SLC ConnectReach* system.
4	To return to the Config screen, click the `Previous Page` command at the bottom of the Config Network-T1 screen.
5	To save your settings in nonvolatile random access memory (NVRAM) in the *SLC ConnectReach* system, click the `save` command in the Config screen.
6	To return to the Main Menu, click the `Main Menu` command at the bottom of the Config screen. Some parameters take effect as soon as you click the `save` command, but others require that you reboot the *SLC ConnectReach* system. See the detailed descriptions of configuration parameters in Chapter 4, "Configuring the SLC® ConnectReach™ System", for information on whether the parameters require a reboot to take effect. **NOTE:** In most cases, if a reboot is required, you click the `warm-start` command. However, if you change the beginning channel number of any range in the DS0 Provisioning menu and do a warm-start, the system will automatically prompt you that it will perform a cold-start. Refer to the section entitled “Using a Web Browser to Reboot the *SLC ConnectReach* system”, located later in this chapter, for information on the warm-start and cold-start commands. **Stop! End of Procedure.**

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display statistics submenu

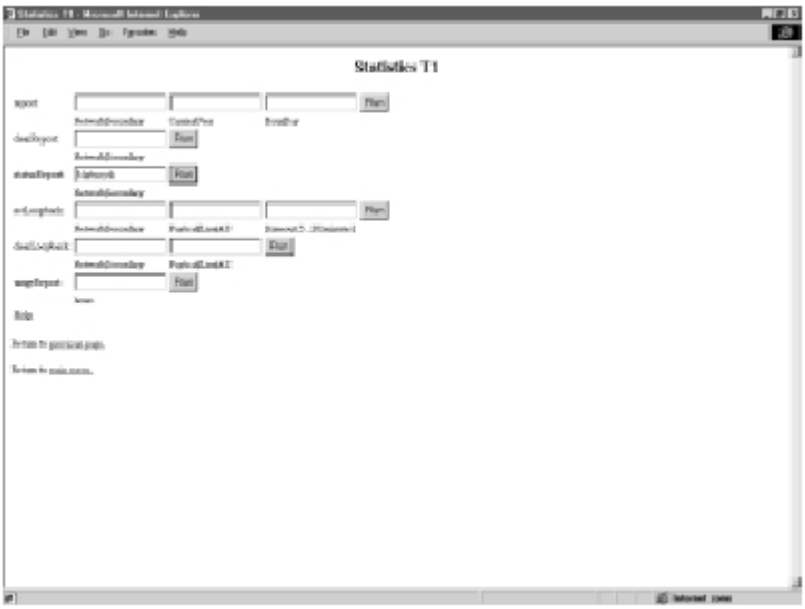
The following procedure is used to display the statistics submenu, select a report from the submenu to be displayed, and enter any options associated with the report:

Step	Procedure
1	In the *SLC ConnectReach* system Main Menu, click the `statistics` command. Refer to the following figure for a sample of the Statistics screen that appears. For details about each option for the Statistics command, refer to Chapter 7, "SLC ConnectReach System Monitoring".  21610_fig_281

(Continued on next page)

Displaying Selected Menu Screens (Continued)

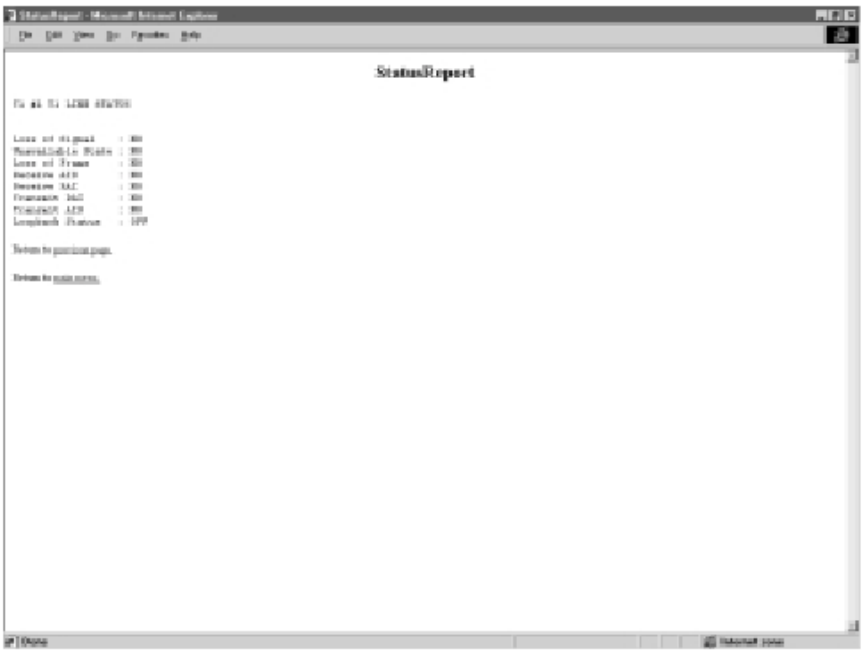
Display statistics submenu (continued)

Step	Procedure
2	In the Statistics screen, click a command to display a statistics report. For example, if you click the T1 command in the Statistics screen, the Statistics T1 screen appears, as shown in the following figure. This screen lists the options for running the T1 performance reports.  21610_fig_282
3	Enter the options for the report you want to run. For example, to run a status report on the Network T1/DSX-1 interface, enter Network in the text field next to the statusReport command.

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display statistics submenu (continued)

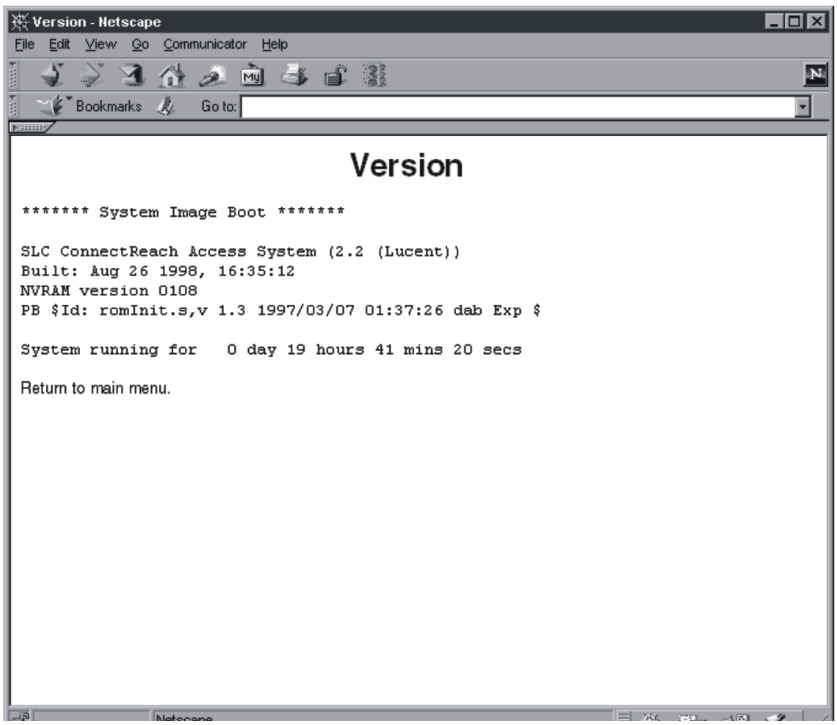
Step	Procedure
4	Click the Run button next to the command for the report you want to run. For example, if you click the Run button next to statusReport, a report similar to the example shown in the following figure is displayed.  21610_fig_283
5	To return to the previous screen, click the `previous page` command at the bottom of the screen. **Stop! End of Procedure.**

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display version information

The following procedure is used to display the version screen:

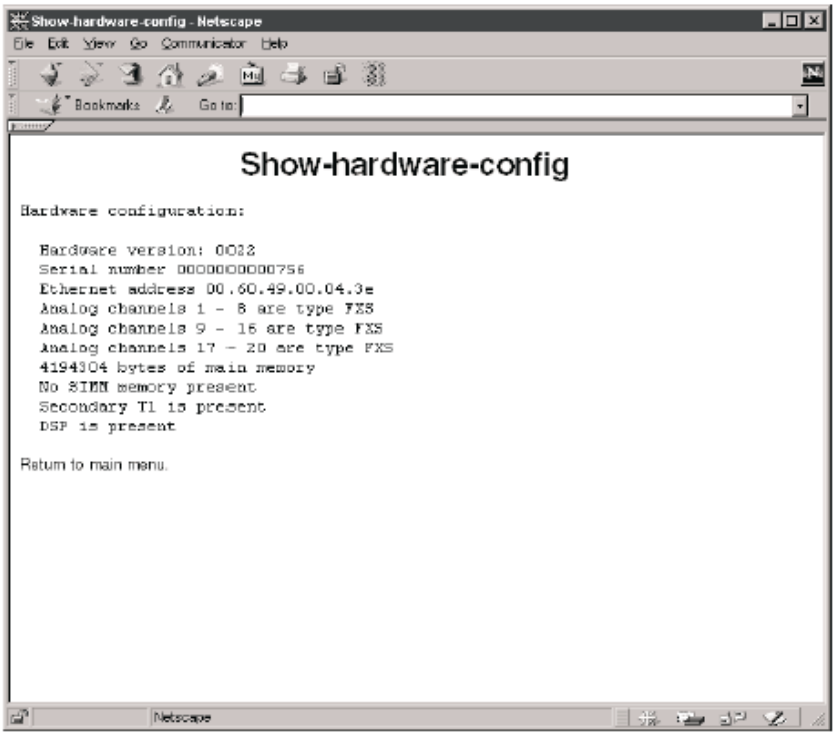
Step	Procedure
1	In the *SLC ConnectReach* system Main Menu, click the `version` command. The Version screen appears. An example of the Version screen is shown in the following figure. 
2	To return to the Main Menu, click the `Main Menu` command at the bottom of the Version screen. **Stop! End of Procedure.**

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display hardware configuration

The following procedure is used to display the hardware configuration screen:

Step	Procedure
1	In the *SLC ConnectReach* system Main Menu, click `show-hardware-config` command. The show-hardware-config screen appears. An example of the show-hardware-config screen is shown in the following figure.  21610_fig_285
2	To return to the Main Menu, click the Main Menu command at the bottom of the show-hardware-config screen. **Stop! End of Procedure.**

Display logs of events and errors

The *SLC ConnectReach* system keeps logs of various kinds of events and errors. The following procedures describe how to access, clear, start, stop, and view the status of the logs. For more information about interpreting the logs, refer to Chapter 9, "Software Upgrade, Maintenance, and Trouble Clearing".

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display logs of events and errors (continued)

To Display a Log Screen and Set Parameters

Step	Procedure
1	In the *SLC ConnectReach* system Main Menu screen, click the `log` command and the Log screen appears. Refer to the following figure for a sample of the Log screen that appears. 21610_fig_286
2	In the Log screen, next to either the `Eventdump`, `T1dump`, or `Accessdump` option, enter the maximum number of log event records you want to display.
3	Click the Run button next to the option. **Stop! End of Procedure.**

(Continued on next page)

Displaying Selected Menu Screens (Continued)

Display logs of events and errors (continued)

To Clear the Log

Step	Procedure
1	In the text box next to the `Clear` option, enter one of the parameters listed in the following table. **To Clear …** — **…Enter this option** The event log — `event` The T1 line log — `t1` All logs — `all`
2	Click the Run button next to the `Clear` option. **Stop! End of Procedure.**

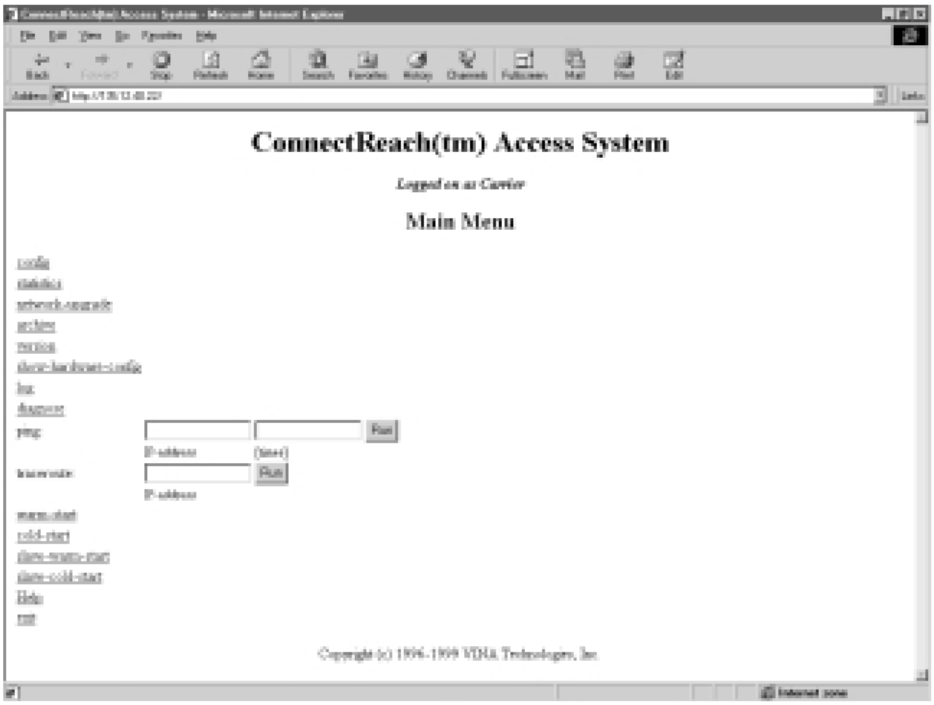
To Stop, Start, or View Status of the Log

- To stop the log from running, click the `stop` command in the Log screen.
- To start the log, click the `continue` command in the Log screen.
- To display the status of the log, click the `status` command in the Log screen.

Using a Web Browser to Execute a Ping Command

Selecting the ping command

The `ping` command is available on the *SLC ConnectReach* system Main Menu screen, as shown in the following figure.



21610_fig_277

Step	Procedure
1	In the *IP-address* text box, enter either a host name or the IP address for the system you want to ping.
2	In the *times* text box, enter the number of times you want the ping to be repeated. If you do not specify repetitions, one ping is sent.
3	Click the Run button next to the `ping` command. **Stop! End of Procedure.**

Using a Web Browser to Upgrade Software

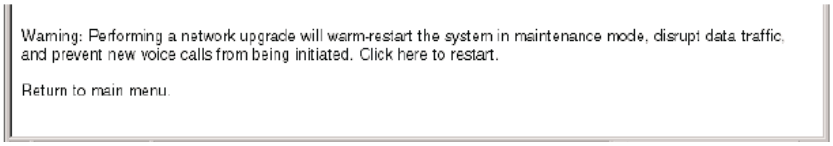
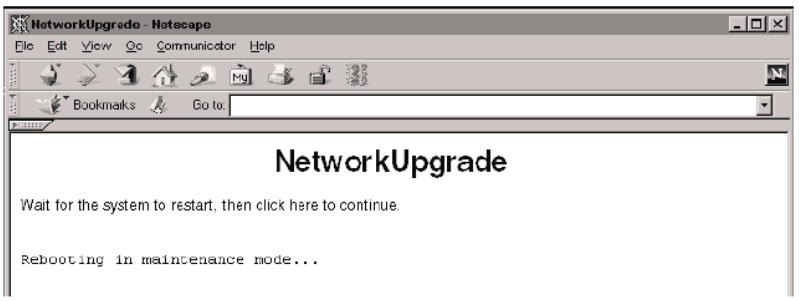
Displaying and using the network-upgrade screen

Step	Procedure
1	In the *SLC ConnectReach* system Main Menu, click the `network-upgrade` command and the network-upgrade screen will appear (refer to the following figure). 21610_fig_287
2	In the network upgrade screen, click the Update button to restart the *SLC ConnectReach* system in the maintenance mode. In maintenance mode, data traffic from the LAN to the WAN and vice versa is blocked in order to allocate sufficient memory to accommodate the download.

(Continued on next page)

Using a Web Browser to Upgrade Software (Continued)

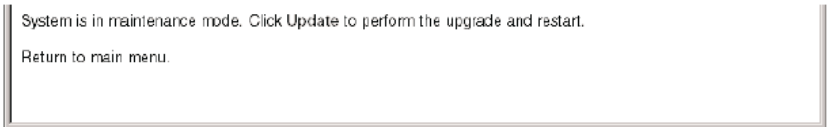
Displaying and using the network-upgrade screen (continued)

Step	Procedure
3	After you click the Update button, the network upgrade screen refreshes. Read the warning displayed at the bottom of the screen (shown in the following figure) and follow the instructions to continue.  While the *SLC ConnectReach* system is rebooting, the screen shown below appears.  21610_fig_289
4	Wait approximately 30 seconds and then click on the location indicated to continue with the procedure.
5	When the login screen appears, enter your login name and password.

(Continued on next page)

Using a Web Browser to Upgrade Software (Continued)

Displaying and using the network-upgrade screen (continued)

Step	Procedure
6	In the Main Menu screen, click the `network-upgrade` command. The network upgrade screen appears again. Note that at the bottom of the screen, new instructions are displayed, as shown in the following figure. 
7	The following table describes the parameters used for a network upgrade. To download from Lucent Technologies' FTP site directly to the *SLC ConnectReach* system, set the version parameter to the version you want to download and enter the password to your e-mail address. The remainder of the parameters are preset for Lucent Technologies' FTP site. **Next to this option** / **Specify this information** `server-ipaddr` — IP address of the file transfer protocol (FTP) server on which the software is located. `version` — Version string of the software you want to download. `user` — Name for logging on to the FTP server. `password` — Password for logging on to the FTP server, this is your email address. `host-download-directory` — Directory on the FTP server in which the new software is located.

(Continued on next page)

Using a Web Browser to Upgrade Software (Continued)

Displaying and using the network-upgrade screen (continued)

Step	Procedure

8	To start the download, click the Update button.
	
	As the download occurs, progress messages similar to the following are displayed at the bottom of the screen:
	
	`1 meg of RAM allocated for preparing flash`
	`using version <24A1>`
	`Opening FTP connection to`
	`flash:/download/lucent.st_rom.24A1`
	`Downloading 425632 bytes`
	`Read 0 of 425632 bytes`
	…
	`Read 425632 of 425632 bytes`
	`downloaded standalone boot from`
	`/download/lucent.st_rom.24A1`
	`Checksum ffff5b80 OK.`
	`DONE`

9	After the download completes, the *SLC ConnectReach* system saves the new software in the system image partition of Flash memory and performs a warm restart. During this process, messages similar to the following are displayed at the bottom of the screen:
	
	`Saving image`
	`using version <24A1>`
	`using 1 meg buffer allocated at 0x81de724`
	`writing standalone section (425644 bytes starting @`
	`0x20000`
	`Time spent: 27 seconds`
	`Wrote standalone section OK`
	`DONE`
	`Rebooting …`

10	Wait approximately 60 seconds and then select the ***Back*** button on your browser. The Network-upgrade screen appears. Select ***main menu***, enter your user name and password when prompted, and then select ***version*** to verify the software. **Stop! End of Procedure.**

(Continued on next page)

Using a Web Browser to Upgrade Software (Continued)

Downloading a software upgrade to a PC

The following procedure should be used to download a software upgrade to a PC for later use.

NOTE:
The PC used to communicate with the *SLC ConnectReach* system must be equipped with an FTP server program. The FTP server program used must be configured to allow file access to the location on the PC where the software file is to be saved. The user name and password in the Network-upgrade menu must match a user name and password in the FTP server program. All parameters in the Network-upgrade menu would then reflect the FTP server program on that PC.

(Continued on next page)

Using a Web Browser to Upgrade Software (Continued)

Downloading a software upgrade to a PC (continued)

Step	Procedure
1	Set the address location of your browser to: ftp://lucentftp: connectreach@www2.vina-tech.com/connectreach/. Press the **Enter**/**Return** key.
2	**NOTE:** The software is stored in a file named **vina.st_rom.*xxx***, where the suffix ***xxx*** is the version string (for example, **305** is Software Release 3.05). Since the FTP server may be case sensitive, enter all alphabetic characters exactly as they appear in the file suffix. From the list of files appearing on the screen, click on the desired version of *SLC ConnectReach* system software **NOTE:** It is important to specify the correct version number. If a version older than the one presently running on the *SLC ConnectReach* system is accidentally specified, the download will still take place and the old software will overwrite the new software.
3	Save the appropriate software file to a location on your PC. Since some Web browsers may replace the first period in the software file name with an underscore, verify that the software file name matches the file name in the directory listing shown under /ConnectReach. If the two file names do not match exactly, the network upgrade will not work properly. **Stop! End of Procedure.**

Using a Web Browser to Reboot the *SLC ConnectReach* System

Performing a warm-start reboot

The `warm-start` command is typically used when you have changed and saved configuration values and want the *SLC ConnectReach* system to begin using the new values. Note that if you change the starting channel of any range of voice or data channels, you must use the `cold-start` command to begin using the new values.

Using the `warm-start` command to reboot a *SLC ConnectReach* system providing TR-08 service and feeding a *SLC*-2000 HDT only affects data and new voice connections. Existing voice connections may have their speech path interrupted for up to one tenth of a second during the restart process. During the time it takes the system software to reinitialize and read the saved configuration information (up to 35 seconds), new voice connections cannot be made and data connections will be interrupted. Using the `warm-start` command to rebooting a *SLC ConnectReach* system providing TR-303 service drops all existing calls.

To initiate a `warm-start` command, click the `warm-start` command on the *SLC ConnectReach* system Main Menu (shown in the following figure). The *SLC ConnectReach* system terminates your hytertext transfer protocol (HTTP) session and reboots.

21610_fig_277

(Continued on next page)

Using a Web Browser to Reboot the *SLC ConnectReach* System (Continued)

Performing a warm-start reboot (continued)

NOTE:
If you change the beginning channel number of any range in the DS0 Provisioning menu and do a warm-start, the system will automatically prompt you that it will perform a cold-start.

Performing a cold-start reboot

Performing a `cold-start` command is the equivalent of cycling power to the *SLC ConnectReach* system. All connections (both voice and data) are interrupted, and new connections cannot be made during the time it takes for the hardware to initialize and run the self-test routines and the system software to initialize and read saved configuration information (approximately 35 seconds).

The `cold-start` command is used when an error condition can only be resolved by completely reinitializing the *SLC ConnectReach* system. In addition, a cold start is required if you change the starting channel of any range of voice or data channels.

To initiate a `cold-start` command, click the `cold-start` command on the *SLC ConnectReach* system Main Menu (shown in the previous figure). The *SLC ConnectReach* system terminates your HTTP session and reboots.

Using a Web Browser to Exit the *SLC ConnectReach* System Utility

Entering the exit command

When you are finished using a Web browser to configure and monitor the *SLC ConnectReach* system, you should click the `exit` command in the Main Menu.

The *SLC ConnectReach* system Utility allows only one management session at a time. Exiting the *SLC ConnectReach* system Utility allows another administrator to connect to the *SLC ConnectReach* system and configure or monitor it.

A *SLC ConnectReach* system management session can override another session.

- If another session is already in progress, and you start a new session, you will be notified that another user is logged in, and asked whether you wish to override that user.
- If you have a management session in progress, and another administrator overrides your session, you will be notified that your session has been overridden.

Software Upgrade, Maintenance, and Trouble Clearing

9

Contents

About This Chapter 9-2

- Introduction 9-2

Maintenance Procedures 9-3

- Upgrading the *SLC® ConnectReach™* System with New Software 9-3
- Using the Archive Command to Upload/Download Configuration Settings 9-13
- Rebooting the *SLC ConnectReach* System 9-20

Trouble Clearing Procedures 9-22

- Using the LED Status Indicators to Isolate Troubles 9-22
- Using the Self-Test Results to Detect Troubles 9-24
- Displaying a Time-Stamped Log of Events 9-26
- Preparing the *SLC ConnectReach* System for Channel Testing 9-28
- Check the Operational State of a Node on the LAN/WAN 9-31
- Disaster Recovery 9-32
- T1 Line Test Equipment 9-33

About This Chapter

Introduction

Contents

This chapter provides procedures required for maintaining and correcting trouble conditions that may occur on the *SLC® ConnectReach™* system. The maintenance procedures are performed on an “as needed” basis and include the following procedures:

- Upgrading the *SLC ConnectReach* system with new software
- Archiving the current configuration and accessing archived configurations
- Rebooting the *SLC ConnectReach* system.

The trouble clearing procedures help locate the source of trouble when the *SLC ConnectReach* system or associated lines are not operating properly. The following procedures and information are included in the trouble clearing area:

- Understanding the light emitting diode (LED) status indicators and self-test results
- Disaster recovery
- Connecting T1 line test equipment to the *SLC ConnectReach* system with T1/DSX-1 network interface.

Maintenance Procedures

Upgrading the *SLC® ConnectReach™* System with New Software

Introduction

The *SLC ConnectReach* system software can be upgraded with new software in either of the following three ways:

- Connecting a computer directly to the **RS-232** port by means of a null modem cable and using Xmodem commands to transfer the new software from the local computer
- Using a remote computer to dial up a modem connected to the *SLC ConnectReach* system **RS-232** port and using Xmodem commands to transfer the new software from the remote system
- Downloading the new software from a file transfer protocol (FTP) server on the T1 line or Ethernet network.

NOTE:
Upgrading the *SLC ConnectReach* system with new software does not normally affect the current configuration settings which are stored separately from the system software.

Software upgrade from a local computer

The steps to upgrade the *SLC ConnectReach* system software using a local computer connected to the **RS-232** port by means of a null modem cable are contained in the following procedure:

Step	Procedure
1	Start a terminal application and enter your login name and password at the login prompt.
2	At the Main prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
3	At the network-upgrade prompt, enter the `prepare` command: `(Network-upgrade)>` **`prepare`**

(Continued on next page)

Upgrading the *SLC® ConnectReach™* System with New Software (Continued)

Software upgrade from a local computer (continued)

Step	Procedure
4	The *SLC ConnectReach* system will ask for confirmation that you want to perform a warm restart and enter the maintenance mode. Enter "**y**." **NOTE:** While the unit is in the maintenance mode, data traffic from the LAN to the WAN and vice versa are blocked in order to free enough memory to accommodate the download.
5	When the *SLC ConnectReach* system boots in the maintenance mode, you are prompted for your login name and password. Enter the carrier login name and password.
6	At the Main menu prompt, enter the `xmodem-download` command. **`> xmodem-download`** The system responds with: `1 meg of ram allocated for preparing flash` followed by: `CCCCCC` While the `CCCCCC` string is progressing across the screen, start a file transfer using the terminal emulator
7	From the terminal application, send the file using the xmodem protocol. In Hyperterminal, a Windows application, select Transfer from the menu bar and select Send File. When the Send File dialog box appears, select the Xmodem protocol and enter the path and file name. If binary or American standard code for information interchange (ASCII) is an option, choose binary.

(Continued on next page)

Upgrading the *SLC® ConnectReach™* System with New Software (Continued)

Software upgrade from a local computer (continued)

8	After the transfer completes, the following message will appear on the screen and the system will reboot: `Transfer complete.... Saving image`
9	After the system has rebooted, verify that the system is running the new software. Check the version number using the `version` command at the Main Menu prompt or by viewing the version number that appears on the screen after rebooting. `SLC ConnectReach System (x.xx)` Where `x.xx` is the software version. **Stop! End of Procedure.**

Software upgrade from a remote computer

The steps to upgrade the *SLC ConnectReach* system software using a remote computer and a modem connected to the **RS-232** port are contained in the following procedure:

Step	Procedure
1	From the remote computer, start a terminal application and dial the modem connected to the *SLC ConnectReach* system.
2	At the login prompt, enter your login name and password.
3	At the Main menu prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
4	At the network-upgrade prompt, enter the `prepare` command. `(Network-upgrade)>` **`prepare`**

(Continued on next page)

Upgrading the *SLC® ConnectReach™* System with New Software (Continued)

Software upgrade from a remote computer (continued)

Step	Procedure
5	The *SLC ConnectReach* system asks you to confirm that you want to perform a warm restart and enter maintenance mode. Enter "**y**."
6	Dial the modem connected to the *SLC ConnectReach* system again. When the *SLC ConnectReach* system boots in the maintenance mode, you are prompted for your login name and password. Enter the carrier login name and password.
7	At the Main Menu prompt, enter the `xmodem-download` command. > **`xmodem-download`** The system responds with: `1 meg of ram allocated for preparing flash` followed by: `CCCCCC`
8	While the `CCCCCC` string is progressing across the screen, start an Xmodem transfer of the new software. Be sure to use Xmodem as your protocol in your terminal application. In Hyperterminal, a Windows application, select Transfer from the menu bar and select Send File. When the Send File dialog box appears, select the Xmodem protocol and enter the path and file name. If binary or American standard code for information interchange (ASCII) is an option, choose binary. After the transfer completes, the following message will appear on the screen and the system will reboot: `Transfer complete.... Saving image`

(Continued on next page)

Upgrading the *SLC® ConnectReach™* System with New Software (Continued)

Software upgrade from a remote computer (continued)

Step	Procedure
9	Dial the modem connected to the *SLC ConnectReach* system again. After the system has rebooted, verify that the system is running the new software. Check the version number using the `version` command at the Main Menu prompt or by viewing the version number that appears on the screen after rebooting. `SLC ConnectReach System (x.xx)` Where `x.xx` is the software version. **Stop! End of Procedure.**

Software upgrade from the network

NOTE:
The procedures to upgrade the *SLC ConnectReach* system software from the network are for future use only since the Lucent Technologies network upgrade server site is presently unavailable.

There are two procedures for upgrading the *SLC ConnectReach* system software from the network — normal upgrade and custom upgrade. Both procedures are identical with one exception, the normal upgrade procedure uses default (user supplied) values already in the system for the network upgrade commands whereas, the custom upgrade procedure requires that these network command values be specified.

The software to be downloaded is stored at the FTP server in a file named lucent.st_rom.*xxx*, where the suffix *xxx* is the version string you must enter with the `version` command. The FTP server may be case-sensitive, so be sure to enter any alphabetic characters exactly as they appear in the file suffix.

(Continued on next page)

Upgrading the *SLC ConnectReach* System with New Software (Continued)

Software upgrade from the network (continued)

NOTE:
Be sure to specify the correct version number. If more than one version is present in the download directory, and you accidentally specify an older version than the *SLC ConnectReach* system is already running, the download will still take place, and the old software will overwrite the new software.

After the download completes, the *SLC ConnectReach* system Utility saves the software in the system image partition of Flash memory and performs a warm restart. Refer to the section entitled “Rebooting the *SLC ConnectReach* system”, located later in this chapter, for a description of the difference between warm-start and cold-start.

Normal Network Upgrade

The network upgrade server is by default Lucent’s server; therefore, it is not necessary to specify the server or the software release. However, the domain name service (DNS) server must be configured and enabled for the network-upgrade to function. Refer to Chapter 4, "Configuring the SLC® ConnectReach™ System" for information on configuring the DNS server. For all normal upgrades, proceed as follows:

Step	Procedure
1	At the Main Menu prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
2	Set the version to the one you want to download (for example, Software Release 3.0.2 would be entered as **`ver 302`**) `(Network-upgrade)>` **`ver`** *XXXX*
3	Set the user to anonymous: `(Network-upgrade)> user` **`anonymous`**
4	Set the password to an email address (the Lucent support address is used as an example here): `Enter password:` **`support@lucent.com`**

(Continued on next page)

Upgrading the *SLC ConnectReach* System with New Software (Continued)

Software upgrade from the network (continued)

Step	Procedure
5	Validate the password by entering it a second time at the prompt: `Validate password`: **`support@lucent.com`**
6	To save the settings, enter the save command: `(Network-upgrade)>` **`save`**
7	At the network-upgrade prompt, enter the `prepare` command: `(Network-upgrade)>` **`prepare`**
8	The *SLC ConnectReach* system asks you to confirm that you want to perform a warm restart and enter maintenance mode. Enter "**y**." While the unit is in maintenance mode, data traffic from the local area network (LAN) to the wide area network (WAN) and vice versa is blocked in order to free enough memory to accommodate the download.
9	When the *SLC ConnectReach* system boots in maintenance mode, you are prompted for your login name and password. Enter the carrier login name and password.
10	At the Main Menu prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
11	Execute the download: `(Network-upgrade)>` **`download`** **Stop! End of Procedure.**

(Continued on next page)

Upgrading the *SLC ConnectReach* System with New Software (Continued)

Software upgrade from the network (continued)

Custom Network Upgrade

The DNS server must be configured and enabled for the network-upgrade to function. Refer to Chapter 4, "Configuring the SLC® ConnectReach™ System", for information on configuring the DNS server. To specify a particular Internet protocol (IP) address or software release, proceed as follows:

Step	Procedure
1	At the Main Menu prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
2	At the network-upgrade prompt, enter the commands shown in the following table.

Enter this command...	...and specify this value	Comments
`server-ipaddr`	*`name, ip-addr`*	Host name or IP address of the network upgrade server to which the software is to be downloaded.
`version`	`rel`	Version of the software.
`user`	*`username`*	Username valid on the network upgrade server. For Lucent's FTP site, username = anonymous.
`password`	*`password`*	Password for the username. For Lucent's FTP site, password = your email address.
`host-download-directory`	`/t1-int/release`	The directory where the software files will be stored.
`prepare`		
`download`		

3	Enter the `save` command to save the new settings. The `prepare` command will restore the settings to the last saved values.
4	To save the settings enter the `save` command `(Network-upgrade)>` **`save`**

(Continued on next page)

Upgrading the *SLC ConnectReach* System with New Software (Continued)

Software upgrade from the network (continued)

Step	Procedure
5	At the network-upgrade prompt, enter the `prepare` command: `(Network-upgrade)>` **`prepare`**
6	The *SLC ConnectReach* system asks you to confirm that you want to perform a warm restart and enter maintenance mode. Enter "**y**." While the unit is in maintenance mode, data traffic from the local area network (LAN) to the wide area network (WAN) and vice versa is blocked in order to free enough memory to accommodate the download.
7	When the *SLC ConnectReach* system boots in maintenance mode, you are prompted for your login name and password. Enter the carrier login name and password.
8	At the Main Menu prompt, enter the `network-upgrade` command: `>` **`network-upgrade`**
9	Execute the download: `(Network-upgrade)>` **`download`** **Stop! End of Procedure.**

After the download completes, the *SLC ConnectReach* system saves the software in the system image partition of Flash memory and performs a warm restart.

To download from Lucent Technologies' FTP site directly to the *SLC ConnectReach* system, set the parameters as shown in the following figure. Setting the `version` command to *rel* will ensure you download the most current software.

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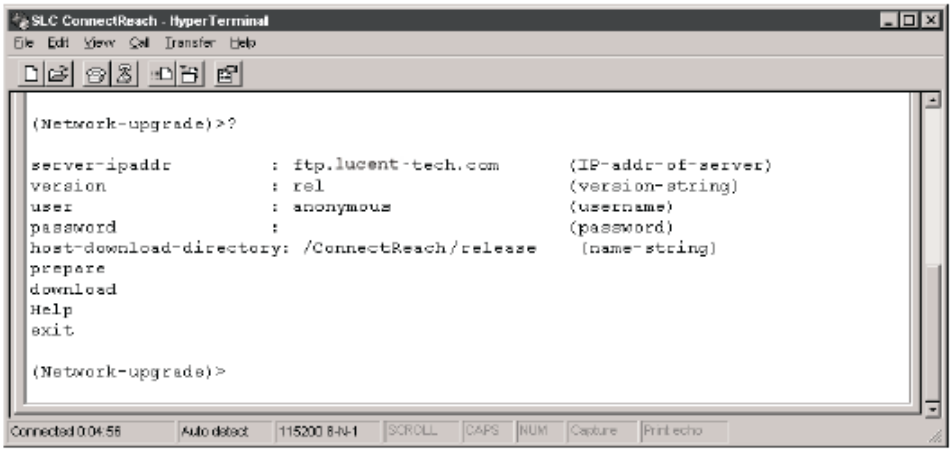
Upgrading the *SLC ConnectReach* System With New Software (Continued)

Software upgrade from the network (continued)

.



21610_fig_291

You may also download the upgrade to a personal computer (PC) for later use. The PC used to communicate with the *SLC ConnectReach* system must have an FTP server. All parameters in the network-upgrade menu would then reflect the FTP server on that PC.

Using the Archive Command to Upload/ Download Configuration Settings

Introduction

The `Archive` command is useful in two Scenarios:

- If you have set up a customized configuration that required many parameters to be changed, you can use the `archive` command to upload the configuration to a local computer. In the event that the *SLC ConnectReach* system loses the configuration information stored in nonvolatile random access memory (NVRAM), you can use the `archive` command to download the saved configuration information rather than entering all of it again.
- If you are installing multiple *SLC ConnectReach* system units, and all the units will have nearly identical configurations, the `archive` command allows you to set up one configuration, then download it to multiple units. On individual units, you only need to set those parameters that differ from other units.

You can upload and download configurations over either the RS-232 connection or over the Ethernet or T1 network (refer to Chapter 5, "Installation", for connection to the RS-232 port). An archived configuration file is stored as American standard code for information interchange (ASCII) text. The file has two parts:

- A listing similar to the `Config:Show` command, including the values of all configuration parameters
- A hexadecimal representation of the configuration.

The following sections describe the procedures for uploading and downloading configurations over the network and over the RS-232 port.

NOTE:
You can only use the archive command to download configuration information to a *SLC ConnectReach* system that is running the same version of the software as the *SLC ConnectReach* system from which the configuration was taken.

(Continued on next page)

Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Uploading the current configuration over the network to an FTP server

Use the following procedure to upload and store the current configuration settings on an FTP server:

Step	Procedure
1	At the Main prompt, enter the `archive` command: `> archive`
2	At the Archive prompt, enter the `net-upload` command: `(archive)> net-upload`
3	At the Archive:Net-upload prompt, enter the commands shown in the following table.
4	To save the settings, enter the `save` command. `(archive)> save`
5	To start the upload, enter the `do-upload` command: `(archive)> do-upload` **Stop! End of Procedure.**

Enter this command...	...and specify this value	Comments
`server-ipaddr`	*name, ip-addr*	Host name or IP address of the FTP server to which the configuration is to be uploaded.
`filename`	*pathname*	Path and file name of the file to be saved on the FTP server. The file should have a .txt suffix.
`user`	*username*	Username valid on the FTP server.
`password`	*password*	Password for the username.

(Continued on next page)

Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Downloading an archived configuration over the network from an FTP server

Use the following procedure to download archived configuration settings from an FTP server to a *SLC ConnectReach* system over the network:

Step	Procedure
1	At the Main prompt, enter the `archive` command: `>` **`archive`**
2	At the Archive prompt, enter the `net-download` command: `(archive)>` **`net-download`**
3	At the Archive:Net-download prompt, enter the commands shown in the following table. **Enter this command... / ...and specify this value / Comments** `server-ipaddr` — *`name, ip-addr`* — Host name or IP address of the FTP server on which the configuration is stored. `filename` — *`pathname`* — Pathname of the file on the FTP server. `user` — *`username`* — Username valid on the FTP server. `password` — *`password`* — Enter the password for the username.
4	To start the download, enter the `do-download` command: `(archive)>` **`do-download`**
5	After the download completes, save your changes: `(archive)>` **`save`** `(archive)>` **`exit`**

(Continued on next page)

Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Downloading an archived configuration over the network from an FTP server (continued)

Step	Procedure
6	On the Main Menu, use the `warm-restart` command to reboot the *SLC ConnectReach* system: > **`warm-start`** **NOTE:** If the download configuration changes the beginning channel number of any range in the DS0 Provisioning menu, you must use the `cold-start` command to reboot the *SLC ConnectReach* system. **Stop! End of Procedure.**

Uploading the current configuration using a modem

Use the following procedure to upload and store the current configuration settings on a remote computer:

NOTE:
The archived configuration will be stored in the file and location you specify when you start a text capture.

Step	Procedure
1	From the remote computer, start a terminal application and dial the modem connected to the *SLC ConnectReach* system.
2	At the login prompt, enter your login name and password.
3	At the Main Menu prompt, enter the `archive` command. > **`archive`**

(Continued on next page)

Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Uploading the current configuration using a modem (continued)

Step	Procedure
4	Start a text capture in HyperTerminal by selecting Transfer, Capture Text, and entering a meaningful file name with a .TXT extension (for example, Lucent34.TXT) and then select Start. **NOTE:** When using Windows HyperTerminal, make sure the file name specified is unique. If the same file name is used more than once, the information is appended to the existing file. This creates a problem when it becomes time to do a tty download.
5	At the Archive prompt, enter the `tty-upload` command. `(archive)>` **`tty-upload`**
6	When the Archive prompt returns, stop the text capture by selecting Transfer, Capture Text, and Stop. This will close the text file.
7	To return to the Main Menu, enter the `exit` command twice. (Archive:tty-upload)> exit (Archive)> exit **Stop! End of Procedure.**

(Continued on next page)

Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Downloading an archived configuration using a modem

Use the following procedure to download archived configuration settings from a remote computer to a *SLC ConnectReach* system using a modem:

NOTE:
To ensure proper transfer of archived configuration settings, set the baud rate of the *SLC ConnectReach* system and the FTP server terminal emulator to 9,600 baud.

NOTE:
The archived configuration must be present on the computer from which you perform the procedure, or on a network drive to which the computer has access.

Step	Procedure
1	From the remote computer, start a terminal application and dial the modem connected to the *SLC ConnectReach* system.
2	At the login prompt, enter your login name and password.
3	At the Main Menu prompt, enter the `archive` command. `>` **`archive`**
4	At the Archive prompt, enter the `tty-download` command. `(archive)>` **`tty-download`**
5	The system responds with the following message: `Set your terminal program to send the text file now...`
6	Use HyperTerminal to send the configuration data by selecting Transfer, Send Text File, and specifying the same file name used for the upload procedure.

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Using the Archive Command to Upload/ Download Configuration Settings (Continued)

Downloading an archived configuration using a modem (continued)

Step	Procedure
7	After the download completes, the system responds with: `Configuration downloaded successfully.` Save your changes: (Archive)> **`save`** `(archive)>` **`exit`**
8	At the Main Menu, use the `warm-start` command to reboot the *SLC ConnectReach* system: > **`warm-start`** **NOTE:** If the download configuration changes the beginning channel number of any range in the DS0 Provisioning menu, you must use the `cold-start` command to reboot the *SLC ConnectReach* system. **Stop! End of Procedure.**

Rebooting the *SLC ConnectReach* System

Introduction

There are two methods of rebooting the *SLC ConnectReach* system; the warm-start reboot and the cold-start reboot. A description of each method is given in the following sections. The method you use to reboot the *SLC ConnectReach* system depends on what you need to accomplish.

Performing a warm-start reboot

The `warm-start` command is typically used when you have changed and saved configuration values and want the *SLC ConnectReach* system to begin using the new values.

NOTE:
If you change the beginning channel number of any range in the DS0 Provisioning menu and do a warm-start, the system will automatically prompt you that it will perform a cold-start.

Using the `warm-start` command to reboot a *SLC ConnectReach* system providing TR-08 service and feeding a *SLC*-2000 HDT only affects data and new voice connections. Existing voice connections may have their speech path interrupted for up to one tenth of a second during the restart process. During the time it takes the system software to reinitialize and read the saved configuration information (up to 35 seconds), new voice connections cannot be made and data connections will be interrupted. Using the `warm-start` command to rebooting a *SLC ConnectReach* system providing TR-303 service drops all existing calls.

To initiate a warm-start reboot, select the `warm-start` command from the *SLC ConnectReach* system Main Menu.

Performing a cold-start Reboot

Performing a `cold-start` command is the equivalent of cycling power to the *SLC ConnectReach* system. All connections (both voice and data) are interrupted, and new connections cannot be made during the time it takes for the hardware to initialize and run the self-test routines and the system software to initialize and read saved configuration information (approximately 35 seconds).

The `cold-start` command is used when an error condition can only be resolved by completely reinitializing the *SLC ConnectReach* system. In addition, a cold start is required if you change the starting channel of the analog range in the DS0-provisioning menu.

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Rebooting the *SLC ConnectReach* System (Continued)

Performing a cold-start Reboot (continued)

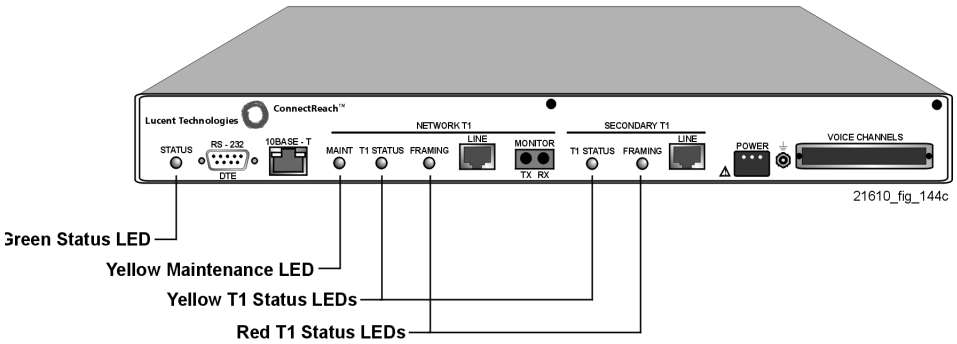
To initiate a cold-start reboot, select the `cold-start` command from the *SLC ConnectReach* system Main Menu. The *SLC ConnectReach* system terminates your hypertext transfer protocol (HTTP) session and reboots.

Trouble Clearing Procedures

Using the LED Status Indicators to Isolate Troubles

Understanding the LED status indicators

The faceplate of the *SLC ConnectReach* system unit is equipped with six LED status indicators as shown in the following figure.



T1 / DSX-1

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Using the LED Status Indicators to Isolate Troubles (Continued)

Understanding the LED status indicators (continued)

The following table lists the possible states of each LED and indicates the condition that corresponds to each state.

When the Green Status LED is...	Then...
On	The self-test was successful; no packets are being sent/received.
Flashing	The self-test was successful; data packets are being sent /received on the T1 line.
Off	The self-test failed. For details about status codes, refer to the following section entitled “Using the Self-Test Results to Detect Troubles”.
When the Yellow Maintenance LED is...	**Then...**
On	There is a network loopback occurring on the network T1 line.
Flashing	A diagnose command is active or the *SLC® ConnectReach™* system is in the maintenance mode.
Off	The unit is operating normally.
When the Yellow T1 Status LED is...	**Then...**
On	There has been a yellow alert in the last second.
Flashing in 500-ms intervals	There have been one or more bipolar violations in the last second.
Off	The unit is operating normally.
When the Red T1 Framing LED is...	**Then...**
On	There is a red alarm condition. Refer to the following section entitled “Using the Self-Test Results to Detect Troubles”.
Flashing in 500-ms intervals	There is framing bit error rate greater than $10E^5$ in the last second.
Off	The unit is operating normally.

NOTE:
The Secondary/Fractional T1/DSX-1 LEDs operate only if a Secondary/Fractional T1/DSX-1 line is installed and enabled.

Using the Self-Test Results to Detect Troubles

Self-test results

After the *SLC ConnectReach* system boots up, the unit performs a self-test. The results of the test are indicated by the illumination of a combination of LEDs. The following table describes the combination for each test result.

LED Indicator					
Green STATUS	**Yellow MAINT**	**Yellow T1 STATUS**	**Red T1 FRAMING**	**Condition**	**Recoverable/ Not Recoverable**
ON or *flashing*	OFF	OFF	OFF	The *SLC® ConnectReach™* system passed all tests and is functioning normally.	Normal operating condition
OFF	OFF	OFF	OFF	No power available to the *SLC ConnectReach* system.	Recoverable*
OFF	OFF	OFF	ON	System image check sum failed.	Recoverable†
OFF	OFF	ON	OFF	The NVRAM check sum failed.	Recoverable‡
OFF	ON	OFF	OFF	The flash *protected boot* code check sum failed.	Not recoverable§
OFF	ON	OFF	ON	An Ethernet loopback failed.	Not recoverable§
OFF	ON	ON	OFF	Codec loopbacks failed.	Not recoverable§
OFF	ON	ON	ON	Code execution from protected boot.	Not recoverable§
OFF	OFF	ON	ON	A random access memory (RAM) test failed.	Not recoverable§

* If the self-test indicates that no power is available to the *SLC ConnectReach* system, first verify that the AC power cord is plugged into a functional AC outlet or that the DC power cord is plugged into a functional DC power source. If the power source is verified to be functional, replace the power cord.

† If the system image check sum fails, you must connect a modem to the **RS-232** port and download a new system image (refer to “Upgrading the *SLC ConnectReach* System with New Software” located in this chapter).

‡ If the nonvolatile random access memory (NVRAM) check sum fails, it is because some part of the stored configuration has become corrupted. Since it is not possible to determine which part of the data is corrupted, you should completely reconfigure the *SLC ConnectReach* system, save the new configuration, reboot, and observe the self-test LEDs again.

§ Nonrecoverable errors indicate a *SLC ConnectReach* system hardware failure. You must replace the failed *SLC ConnectReach* system with a new unit. After installing the new unit, you must configure the replacement with the same configuration settings as the original unit.

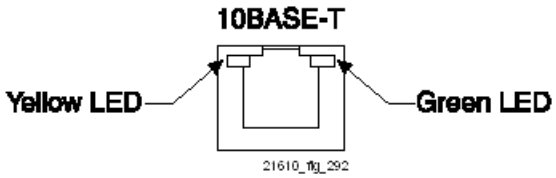
(Continued on next page)

Using the Self Test Results to Detect Troubles (Continued)

Ethernet port LEDs

The Ethernet port has two built-in LEDs that are located on the **10BASE-T** connector (refer to the following figure for location), they are as follows:

- The green “link integrity” LED. This LED lights when the link between the *SLC ConnectReach* system and the Ethernet hub is functioning.
- The yellow “activity” LED. This LED blinks when the *SLC ConnectReach* system transmits or receives data to and from the Ethernet port.



Displaying a Time-Stamped Log of Events

Entering the log command

The `log` command is used to display a time-stamped log of events that occur in the *SLC ConnectReach* system, such as logins, HTTP or console commands, and errors. You can also display a log of the T1 line that records information such as alarms and line-up or line-down conditions.

At the Main Menu prompt, enter the `log` command followed by an option obtained from the following table.

For example:

> **`log eventdump`**

To…	Enter this command…
Display the log for the *SLC® ConnectReach™* system	`log eventdump`
Display the log for the T1 line	`log t1dump`
Clear the log for the *SLC ConnectReach* system	`log clear event`
Clear the log for the T1 line	`log clear t1`
Clear the log for both the *SLC ConnectReach* system and the T1 line	`log clear all`
Stop all logging	`log stop`
Resume all logging	`log continue`
Determine whether the log is running or stopped	`log status`

(Continued on next page)

Displaying a Time-Stamped Log of Events (Continued)

Entering the log command (continued)

NOTE:
Log eventdump 10 shows the first ten events in the log. Log eventdump -10 shows the last ten events in the log. The log status is also displayed. The reset counters include Reset Status Register (RDR), cookie and endCookie (which count the number of times that the log is discarded due to problems at the beginning or end), death (which counts restarts due to suspended tasks), taskDie (which counts restarts due to running out of memory), and watchDog (which is currently unused, but which can be used to count restarts due to hung tasks).

The following is an example of the display obtained when the `log` command is entered.

```
 > log eventdump
0/00:00:00.000000000 httpd
0/00:00:00.000000030 ?083fd66c maxMemRecs 500 maxEventRecs 500
0/00:03:04.000011056 httpd 207.104.144.199 started HTML
   session
Log: max 500 cur 3. log is running

> log status
Log status:
memMax 500,cur 327 eventMax 500,cur 6 t1Max 500,cur 2
inFilter mask 0x00000000 level 0, outFilter mask 0x00000000
   level 0
log is running
Reset counters:
RSR 002 cookie 1 endCookie 0
death 0 taskDie 0 watchDog 0
```

Preparing the *SLC ConnectReach* System for Channel Testing

Entering the diagnose command

The `diagnose` command is used to set a given channel to a known state so that channel testing can be performed using external test equipment (which could be a telephone).

NOTE:
The `diagnose` command applies to lines [foreign exchange station (FXS)], analog trunks [foreign exchange office (FXO)], and digital trunks (T1).

Use the following procedure to configure a channel for testing:

Step	Procedure
1	At the Main Menu prompt, enter the `diagnose` command: `>` **`diagnose`** The prompt changes to the diagnose prompt: `(diagnose)>`
2	Identify the channel that you wish to test using the appropriate command from the following table. For example: `(diagnose)>` **`set-analog-channel 7`**
3	Set the channel to the appropriate state (refer to the following table). For example: `(diagnose)>` **`busy`**

To …	Enter this command…	…and specify this parameter
Identify a channel to be tested	`set-analog-channel`	`[0] (1…24)`
Identify a channel to be tested	`set-digital-trunk`	`[0] (1…24)`
Set the channel to normal state	`normal`	
Set the channel to idle state	`idle`	
Set the channel to busy state	`busy`	
Set the channel to ringing state	`ringing`	
Set the channel to tone1k state	`tone1k`	
Set the channel to reversal state	`reversal`	
Set the channel to voice state	`voice-states`	
Get online assistance	`Help`	
Exit the Diagnose submenu and return to the Main Menu	`exit`	

(Continued on next page)

Preparing the *SLC ConnectReach* System for Channel Testing (Continued)

Entering the diagnose command (continued)

Step	Procedure
4	Using the external test equipment, verify that the channel is in the specified state.
5	When you have completed testing, set the channel back to normal state using the `normal` command.
6	Enter the `exit` command to return to the Main Menu. **Stop! End of Procedure.**

Definition of diagnose command options

The diagnose command options are described as follows:

Normal In normal mode, signaling passes through from the T1 line to the phone, and the channel is able to process calls normally. All the remaining modes interrupt the T1 signaling and force a state other than normal.

Idle When set to idle mode, a connected phone should detect tip open on the channel (for example, a dial tone). If it does, the line should be able to receive calls when reset to normal mode.

Busy When set to busy, a connected phone should detect tip closed on the channel (for example, a busy signal). If it does, the line should be able to receive calls when reset to normal mode.

Ringing When set to ringing mode, a connected phone should ring for 2 seconds on and 4 seconds off. If it does, the line should be able to receive calls when reset to normal mode.

(Continued on next page)

Preparing the *SLC ConnectReach* System for Channel Testing (Continued)

Definition of diagnose command options (continued)

Tone1k	When set to tone1k mode, the line should emit a constant 1-kHz tone audible on a connected phone. If it does, the line should be able to receive calls when reset to normal mode.
Reversal	When set to reversal mode, the polarity of tip and ring are reversed for the channel. To verify that the line is in reversal mode, use external test equipment. If the test equipment indicates that tip and ring are in fact reversed, the line should be able to receive calls when reset to normal mode.

Check the Operational State of a Node on the LAN/WAN

Entering the ping command

With the `ping` command, you can test whether a node on the LAN/WAN is operational. The `ping` command sends an Internet control message protocol (ICMP) echo packet to the target node; if the node is powered on and correctly connected to the network, it returns an ICMP response packet.

At the Main Menu prompt, enter the `ping` command, followed by either the host name or the IP address of the node to be pinged, and the number of times to ping. If you do not specify a number of repetitions, the default is one.

For example:

```
> ping 111.222.33.1 2
```

In this example, the node whose IP address is 111.222.33.1 is sent two ICMP echo packets.

If the node or the network connection to the node is operational, you should see the response within a few seconds. If the node or network is not operational, the `ping` attempt times out after 10 seconds. To stop a `ping` before the 10-second interval elapses, simply press any key.

The response to the above example might look like this:

```
PING 111.222.33.1: 64 data bytes
64 bytes from 111.222.33.1: icmp_seq=0. time=0. ms
64 bytes from 111.222.33.1: icmp_seq=1. time=0. ms

----111.222.33.1 PING Statistics----
2 packets transmitted, 2 packets received, 0% packet loss
round-trip (ms) min/avg/max = 0/0/0
```

Disaster Recovery

Procedure for recovery from loss of system image

If a catastrophic failure causes the *SLC ConnectReach* system to lose its system image, the *SLC ConnectReach* system boots from the software in the protected boot area of memory. In protected boot mode, you can download new software by means of the **RS-232** port. After the download is complete, the *SLC ConnectReach* system automatically restarts in normal mode. For information about downloading software by means of the **RS-232** port, refer to the sections entitled “Software upgrade from a remote computer” and “Software upgrade from a local computer”, located earlier in this chapter.

After downloading new software, you should verify that the unit’s configuration settings are intact. If the configuration stored in NVRAM has been lost, you must reconfigure the unit as if it were a new installation unless you have archived a copy of the latest configuration settings. Maintaining current archive copies of the configuration settings will facilitate the process of reconfiguration. In the event of catastrophic failure, you can download the archived configuration rather than reenter it from scratch. Refer to the section entitled “Using the Archive Command to Upload/Download Configuration Settings”, located earlier in this chapter, for information on the Archive command.

It is recommended that you keep an up-to-date record of the *SLC ConnectReach* system’s configuration settings. You can keep a record in any or all of the following ways:

- Keep an updated copy of the Preinstallation Worksheet that records all the configuration information gathered at the time of the initial installation. If you change the configuration later, update the worksheet accordingly.
- Print a configuration report using the `Show` command in the Config submenu. If you change the configuration later, print a new report and save it in either electronic or hard copy form.
- Use the `Archive` command in the Main Menu to upload a copy of the current configuration to a local or remote computer. If you change the configuration later, upload a new copy of the configuration.

T1 Line Test Equipment

Connection information

In the event that it becomes necessary to connect test equipment to the **NETWORK T1 MONITOR** connector on the front panel of the *SLC ConnectReach* system with T1 network interface, ***be sure the test equipment is operating in bridge mode***. Otherwise, the test equipment can terminate the T1 line, thereby reducing T1 receive signal strength to the *SLC ConnectReach* system.

IP Network Addresses

A

Contents

About This Appendix A-2

- Introduction A-2

IP Network Addresses Description A-3

- Introduction A-3
- Address Classes A-4
- Subnets and Netmasks A-7
- Private IP Network Addresses A-9

About This Appendix

Introduction

Contents

This appendix briefly describes Internet protocol (IP) network addresses. Detailed specifications are available in Request for Comment (RFC) documents. RFC documents can be obtained by means of a hypertext transfer protocol (HTTP) or anonymous file transfer protocol (FTP) from various Internet sites.

IP Network Addresses Description

Introduction

General

Each host on the network (that is, each individual machine connected to the network) has an IP address that uniquely identifies it.

Each IP address is a 32-bit value. A portion of the address identifies the network, while another portion identifies the host on that network.

The 32-bit IP address is commonly represented as four 8-bit decimal values. Each decimal value is separated from other values by dots (.). This notation is known as “dotted decimal.” Since each decimal value represents eight binary digits, the maximum dotted decimal value is 255. The following is an example of a dotted decimal IP address: 161.62.63.64.

Address Classes

Introduction

Five network classes are used to group networks according to the number of hosts on the network.These network classes are listed in the following table.

Network Class	Number of Hosts
Class A	Can contain millions of hosts.
Class B	Can contain thousands of hosts.
Class C	Can contain up to 254 hosts.
Class D	Used to address a group of computers all at one time (“multicast” addresses).
Class E	Reserved.

The following sections describe these five network classes.

Class A networks

As shown in the following figure, the uppermost bit of a class A network address is always 0. The next 7 bits define the network and the last 24 bits define the host. This allows 128 class A networks.

```
                    1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

0	Network	Host

The following table lists the address ranges and their status.

Address Range	Status
0.0.0.0	Reserved
1.0.0.0 through 126.0.0.0	Available
127.0.0.0	Reserved

(Continued on next page)

Address Classes (Continued)

Class B networks

As shown in the following figure, class B networks use the uppermost 2 bits as 1,0, the next 14 bits define the network, and the last 16 bits define the hosts. This allows up to 16,384 class B networks.

```
                    1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

1 0	Network	Host

The following table lists the address ranges and their status.

Address Range	Status
128.0.0.0	Reserved
128.1.0.0 through 191.254.0.0	Available
191.255.0.0	Reserved

Class C networks

As shown in the following figure, class C networks use the uppermost 3 bits as 1,1,0, the next 21 bits define the network and the last 8 bits define the hosts. This allows up to 2,097,152 class C networks.

```
                    1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

1 1 0	Network	Host

The following table lists the address ranges and their status.

Address Range	Status
192.0.0.0	Reserved
192.0.1.0 through 223.255.254.0	Available
223.255.255.0	Reserved

(Continued on next page)

Address Classes (Continued)

Class D networks

IP multicasting uses class D network addresses. As shown in the following figure, class D networks use the uppermost 4 bits as 1,1,1,0. The remaining 28 bits are used for multicast groups of computers. RFC 1112 describes multicast groups.

```
                    1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

1 1 1 0	Multicast Address

The following table lists the address range and status.

Address Range	Status
224.0.0.0 through 255.255.255.254	Reserved for use by IP multicast traffic

Class E networks

As shown in the following figure, class E networks use the uppermost 4 bits as 1,1,1,1. Class E networks are reserved for future use. The only class E address currently used is 255.255.255.255, which is a global broadcast address.

```
                    1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
```

1 1 1 1	Reserved

Subnets and Netmasks

Subnet description

Subnets are logical partitions of a single network. Subnets are created for administrative or technical reasons, isolating similar network traffic or similar network technology to one area of the network. RFC 950 explains the Internet Standard Subnetting Procedure.

Subnets are created by partitioning the host field of the network address. Each partition defines a subnet. For example, Class C networks use the last 8 bits to define the host. To divide this network into two subnets with an equal number of addresses in each, 1 bit of the host field is used. The broadcast address differs for each subnet, thus broadcasts only reach those hosts in the subnet.

The following table lists some subnet examples.

Network	No. Subnets	No. Subnet Bits	Broadcast Address
192.86.85.0	0	0	192.86.85.255
192.86.85.0	2	1	
		when 0: 192.86.85.1 through 192.86.85.126	192.86.85.127
		when 1: 192.86.85.129 through 192.86.85.254	192.86.85.255
192.86.85.0	8	3	
		when 000: 192.86.85.1 through 192.86.85.30	192.86.85.31
		when 001: 192.86.85.33 through 192.86.85.62	192.86.85.63
		when 010: 192.86.85.65 through 192.86.85.94	192.86.85.95
		when 011: 192.86.85.97 through 192.86.85.126	192.86.85.127
		when 100: 192.86.85.129 through 192.86.85.158	192.86.85.159
		when 101: 192.86.85.161 through 192.86.85.190	192.86.85.191
		when 110: 192.86.85.193 through 192.86.85.222	192.86.85.223
		when 111: 192.86.85.223 through 192.86.85.254	192.86.85.255

Subnets and Netmasks (Continued)

Netmask description

Subnet partitions are identified by a netmask. The netmask is the network address with ones in each subnet bit location. The following table lists some examples.

Network	Number of Partitions	Number of Subnet Bits	Netmask
192.86.85.0	0	0	192.86.85.0 (no subnet)*
192.86.85.0	2	1	192.86.85.128 (decimal 128 equals binary 10000000)
192.86.85.0	8	3	192.86.85.224 (decimal 224 equals binary 11100000)

* A generic form of this netmask, 255.255.255.0, is sometimes used in place of the specific form.

Private IP Network Addresses

Description

A “private” network is one in which devices on a local area network (LAN) either do not require any access to other networks, or the devices need access to only a limited set of internetwork services that can be handled by an application proxy such as NAT. Examples of such services include email, World Wide Web, FTP, and Telnet connections.

In a private network, addresses are obtained from a common pool of addresses; and although the addresses are always unique among the devices on the LAN, they are not guaranteed to be unique on the Internet. Therefore, to prevent confusion over packet destinations, these private addresses cannot be visible to the Internet. Instead, the application proxy must intercept all incoming traffic and manage the mapping of packets to the appropriate destination on the private network.

This allows an Internet service provider to allocate only one unique IP address to the site: the address of the *SLC® ConnectReach™* system on its link to the service provider. A range of IP addresses from the common pool are then used for all of the user devices on the LAN.

Suggested private networks are defined in RFC 1918, which lists the pool of IP addresses from which private network addresses may be selected. This pool is shown in the following table.

.

Address Class	Range of Addresses
Class A	10.0.0.0 through 10.255.255.255
Class B	172.16.0.0 through 172.31.255.255
Class C	192.168.0.0 through 192.168.255.255

The default IP address assigned to the *SLC ConnectReach* system (192.168.0.1) is a class C private network address. If the *SLC ConnectReach* system is configured to run dynamic host configuration protocol (DHCP) and use private network addresses, the addresses allocated by DHCP are derived from the same class C network.

Configuration Examples

B

Contents

About This Appendix B-2

- Introduction B-2

Examples of the Different Methods of Configuring the *SLC® ConnectReach™* System B-3

- Quickstart Configuration Example B-3
- Customized Configuration Example B-7
- ConnectReach Channel Assignments and CU Provisioning Example B-14
- LCR/DID Configuration Example B-14
- NAT Examples B-18

About This Appendix

Introduction

Contents

This appendix contains examples of configuration sessions, ranging from an extremely simple configuration in which only the absolute minimum of parameters are specified to a more complex configuration requiring many parameters to be changed.

Examples of the Different Methods of Configuring the *SLC® ConnectReach™* System

Quickstart Configuration Example

Configuration site conditions

This configuration applies to sites that:

- Use private Internet protocol (IP) network addresses.
- Have a telephone system and T1 link to the central office (CO) for which the *SLC® ConnectReach™* system defaults are appropriate. Chapter 4, "Configuring the SLC® ConnectReach™ System", describes the defaults for all parameters.

Configuration list

If these conditions are met, you only need to configure the following:

- Synchronous interface encapsulation scheme and addresses [including data link connection identifier (DLCI), if encapsulation is set to frame relay]
- Site domain name
- Default route
- Voice and data channel assignments
- Login names and passwords.

(Continued on next page)

Quickstart Configuration Example (Continued)

Example

The following is an example of the configuration session. In this example, all commands are entered in their full form for easier reading. However, you can abbreviate any commands to the minimum number of characters that uniquely identify the command.

```
******* System Image Boot *******
ConnectReach(tm) Access System(5.0.1 build 10)
Built: Jan 15 2002, 12:28:05
NVRAM version 0115
PB $Id: romInit.s,v 1.3 1997/03/07 01:37:26 dab Exp $
Copyright 1996 - 1999 VINA Technologies, Inc.
> config
(config)> Network-t1
(config:Network-t1)> enable on
(config:Network-t1)> framing ESF
(config:Network-t1)> linecode B8ZS
(config:Network-t1)> clock network
(config:Network-t1)> !
(config)> ds0- rovisioning
(config:DS0-provisioning)> analog-end 12
(config:DS0-provisioning)> data-begin 13
(config:DS0-provisioning)> data-end 24
(config:DS0-provisioning)> ConnectReach
(config:DS0-provisioning:ConnectReach)> 1-4 440
(config:DS0-provisioning:ConnectReach)> 5-8 440
(config:DS0-provisioning:ConnectReach)> 9-12 440
(config:DS0-provisioning:ConnectReach)> 13-16 452
(config:DS0-provisioning:ConnectReach)> 17-20 452
(config:DS0-provisioning:ConnectReach)> 21-24 452
(config:DS0-provisioning)> !
(config)> synchronous-interface
(config:Synchronous-interface)> enca sulation frame-relay
(config:Synchronous-interface)> modify-enca -data
(config:Frame-relay)> PVC1
(config:Frame-relay:PVC1)> DLCI 379
(config:Frame-relay:PVC1)> i -address 199.199.199.99
(config:Frame-relay:PVC1)> netmask 255.255.255.0
(config:Frame-relay:PVC1)> !
(config:Frame-relay)> !
(config)> channel-bank
(config:channel-bank)> begin 1
(config:channel-bank)> end 12
```

(Continued on next page)

Quickstart Configuration Example (Continued)

Example (continued)

```
(config:channel-bank)> signaling loo -gnd
(config:channel-bank)> analog-interface fxs-loo
(config:channel-bank)> !
(config)> dhc
(config:DHCP)> enable on
(config:DHCP)> domain telco.net
(config:DHCP)>!
(config)> route
(config:IPRoute)> default 199.199.199.100
(config:IPRoute)> !
(config)> NAT
(config:NAT)> enable on
(config:NAT)> Dynamic
(config:NAT:Dynamic)> 1Grou
(config:NAT:Dynamic:Group1)> enable on
(config:NAT:Dynamic:Group1)> Lan-Start 192.168.0.2
(config:NAT:Dynamic:Group1)> Lan-End 192.168.0.254
(config:NAT:Dynamic:Group1)> Wan-Start 199.199.199.99
(config:NAT:Dynamic:Group1)> Wan-End 199.199.199.99
(config:NAT:Dynamic:Group1)> !
(config:NAT)> !
(config)> password
(config:Password)> user customer
Enter password:
Validate password:
(config:Password)> carrier telco
Enter password:
Validate password:
(config:Password)> !
(config)> save
Verifying system configuration...
Do you really want to update the system NVRAM
configuration [n]y: y
Updating Flash NVRAM... wait
DONE
(config)> exit
> warm-start
Warning: Data traffic will be interrupted...
continue? [y/n] y :resetting...
```

(Continued on next page)

Quickstart Configuration Example (Continued)

Example (continued)

NOTE:
If you change the beginning channel number of the range of data channels and do a warm-start, the system will automatically prompt you that it will perform a cold-start.

The next time you connect to the *SLC ConnectReach* system, you will be prompted for a login name and password. If you want access to the full set of *SLC ConnectReach* system configuration and monitoring commands, log in with the carrier name and password (“telco” in the previous example).

Customized Configuration Example

Configuration site conditions

This configuration applies to sites that:

- Do not use private IP network addresses.
- Have a telephone system and T1 link to the CO for which the *SLC ConnectReach* system defaults are not always appropriate. Chapter 4, "Configuring the SLC® ConnectReach™ System", describes the defaults for all parameters.

Configuration settings that need verification

Under these conditions, you need to verify the settings of all configuration parameters and determine which need to be adjusted.

(Continued on next page)

Customized Configuration Example (Continued)

Example

The following is an example of this type of configuration session on a system with T1/DSX-1 interface. In this example, all commands are entered in their full form for easier reading.

The example assumes that the site has been assigned a range of unique IP addresses to be used on the Ethernet network. The simple network management protocol (SNMP) host is a device on network 123.45.67.0, and access to the *SLC ConnectReach* system is restricted to traffic from that network only. A secondary permanent virtual circuit (PVC) is constructed, and a route to the access network by means of the secondary PVC is declared. The secondary T1/DSX-1 interface is connected to a private branch exchange (PBX) or key service unit (KSU) and is DS0 voice channels and 12 DS0 data channels. In addition, the service provider requires all WAN addresses to have a numbered interface.

```
******* System Image Boot *******
ConnectReach(tm) Access System(5.0.1 build 10)
Built: Jan 15 2002, 12:28:05
NVRAM version 0115
PB $Id: romInit.s,v 1.3 1997/03/07 01:37:26 dab Exp $
Copyright 1996 - 1999 VINA Technologies, Inc.
logged on as Carrier
> conf
(config)> Network-t1
(config:Network-t1)> enable on
(config:Network-t1)> framing ESF
(config:Network-t1)> linecode B8ZS
(config:Network-t1)> clock network
(config:Network-t1)> !
(config)> secondary-t1
(config:Secondary-t1)> enable on
(config:Secondary-t1)> !
(config)> ds0- rovisioning
(config:DS0-provisioning)> analog-begin  0
(config:DS0-provisioning)> analog-end  0
(config:DS0-provisioning)> sec-voice-begin 1
(config:DS0-provisioning)> sec-voice-end 12
(config:DS0-provisioning)> data-begin 13
(config:DS0-provisioning)> data-end 24
```

(Continued on next page)

Customized Configuration Example (Continued)

Example (continued)

```
(config:DS0-provisioning)> ConnectReach
(config:DS0-provisioning:ConnectReach)> 1-4 443
(config:DS0-provisioning:ConnectReach)> 5-8 443
(config:DS0-provisioning:ConnectReach)> 9-12 443
(config:DS0-provisioning:ConnectReach)> 13-16 452
(config:DS0-provisioning:ConnectReach)> 17-20 452
(config:DS0-provisioning:ConnectReach)> 21-24 452
(config:DS0-provisioning)> !
(config)> synchronous-interface
(config:Synchronous-interface)> modify-enca -data
(config:Frame-relay)> PVC1
(config:Frame-relay:PVC1)> dlci 358
(config:Frame-relay:PVC1)> i -address 199.188.177.166
(config:Frame-relay:PVC2)> netmask 255.255.255.0
(config:Frame-relay:PVC1)> !
(config:Frame-relay)> PVC2
(config:Frame-relay:PVC2)> dlci 19
(config:Frame-relay:PVC2)> i -address 299.88.77.6
(config:Frame-relay:PVC2)> netmask 255.255.255.0
(config:Frame-relay:PVC2)> !
(config:Frame-relay)> lmi-ty e Q.933-annex-a
(config:Frame-relay)> !
(config)> ethernet
(config:Ethernet)> i -address 211.22.33.1
(config:Ethernet)> netmask 255.255.255.0
(config:Ethernet)> !
(config)> route
(config:IPRoutes)> default 199.188.177.1
(config:IPRoutes)> add 123.45.67.0 255.255.255.0 PVC2
(config:IPRoutes)> !
(config)> asswords
(config:Password)> user customer
Enter password:
Validate password:
(config:Password)> carrier sysadm
Enter password:
Validate password:
(config:Password)> !:ConnectReach)>
```

(Continued on next page)

Customized Configuration Example (Continued)

Example (continued)

```
(config)> dhc
(config:DHCP)> start-i  211.22.33.2
(config:DHCP)> end-i  211.22.33.54
(config:DHCP)> rivate-network off
(config:DHCP)> dns-server 199.188.177.5
(config:DHCP)> domain is .net
(config:DHCP)> !
(config)> snm
(config:SNMP)> snm -host 123.45.67.89
(config:SNMP)> cold-start on
(config:SNMP)> warm-start on
(config:SNMP)> link-down on
(config:SNMP)> link-u  on
(config:SNMP)> login-failures on
(config:SNMP)> !
(config)> dns
(config:DNS)> enable off
(config:DNS)> !
(config)> save
Verifying system configuration...
Do you really want to update the system NVRAM
configuration [n]\y: y
Updating Flash NVRAM... wait
DONE
(config)> exit
> cold-start
Warning: Voice and Data traffic will be interrupted...
continue? [n]\y: y
resetting...
```

NOTE:
Because this configuration has changed the beginning channels of both voice and data ranges, the `cold-start` command must be used for the new settings to take effect.

The next time you connect to the *SLC ConnectReach* system, you will be prompted for a login name and password. If you want access to the full set of *SLC ConnectReach* system configuration and monitoring commands, log in with the carrier name and password (“sysadm” in the previous example).

ConnectReach Channel Assignments and CU Provisioning Example

Assumptions

The following assumptions were used in developing the examples in this section:

- Channels 1 through 6 are connected to telephone sets through the **VOICE CHANNELS** port.
- Channels 9 through 14 are connected to a digital private branch exchange
- (PBX) through the **SECONDARY/FRACTIONAL T1** port.
- Channels 17 through 24 are connected to an Ethernet ring through the **10BASE-T** port.

Channel assignments example

Assign channel units to DS0 channel ranges using the following procedure:

Go to the config/DS0 menu. Use the ConnectReach command to assign channel units to DS0s as follows:

```
(config:DS0-provisioning:ConnectReach) > 1- 4 440
(config:DS0-provisioning:ConnectReach) > 5- 8 440
(config:DS0-provisioning:ConnectReach) > 9- 12 443
(config:DS0-provisioning:ConnectReach) > 13- 16 443
(config:DS0-provisioning:ConnectReach) > 17- 20 452
(config:DS0-provisioning:ConnectReach) > 21- 24 452
```

(Continued on next page)

ConnectReach Channel Assignments and CU Provisioning Example (Continued)

CU provisioning example

Use a craft interface terminal (CIT) connected to the SLC-2000 host digital terminal (HDT) user interface panel (UIP) to provision the SLC ConnectReach channel units as follows:

1. Enter the following **ED-T0** commands to provision the SPQ ® 440 channel units in slot numbers 1 through 6:

```
ED-T0::dtdp-1-1-1-1:::other,DFLT:rls=n;
ED-T0::dtdp-1-1-1-2:::other,DFLT:rls=n;
ED-T0::dtdp-1-1-1-3:::other,DFLT:rls=n;
ED-T0::dtdp-1-1-1-4:::other,DFLT:rls=n;
ED-T0::dtdp-1-1-1-5:::other,DFLT:rls=n;
ED-T0::dtdp-1-1-1-6:::other,DFLT:rls=n;
```

2. Enter the following **ED-T0** commands to provision the SPQ443 channelunits in slot numbers 9 through 14:

```
ED-T0::dtdp-1-1-1-9:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;

ED-T0::dtdp-1-1-1-10:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;

ED-T0::dtdp-1-1-1-11:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;

ED-T0::dtdp-1-1-1-12:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;

ED-T0::dtdp-1-1-1-13:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;

ED-T0::dtdp-1-1-1-14:::SAC1AE,fxs:imp=600,bal=2,
xmt (gn)=2,rcv (gn)=8.5,sl=2,oht=n,rls=n;
```

(Continued on next page)

ConnectReach Channel Assignmentsand CU Provisioning Example (Continued)

CU provisioning example (continued)

3. Enter the following **ED-T0** commands to provision the SPQ452 channel units in slot numbers 17 through 24:

```
ED-T0::dtdp-1-1-1-17:::5SCTFF,ocu:rate=64,ec=scec,
qm=n,rls=n;

ED-T0::dtdp-1-1-1-19:::5SCTFF,ocu:rate=64,ec=scec,
qm=n,rls=n;

ED-T0::dtdp-1-1-1-21:::5SCTFF,ocu:rate=64,ec=scec,
qm=n,rls=n;

ED-T0::dtdp-1-1-1-23:::5SCTFF,ocu:rate=64,ec=scec,
qm=n,rls=n;
```

LCR/DID Configuration Example

Quickstart assumptions

The local call routing/direct inward dial (LCR*/DID) telephony quickstart makes the following assumptions:

- One or more DS0s on the Network T1/DSX-1 connect to a long distance carrier.
- At least one foreign exchange office (FXO) card is present, and it is used to connect to a local carrier.

If these assumptions do not apply to your configuration, refer to Chapter 4, "Configuring the SLC® ConnectReach™ System", for more detailed instructions.

Configuration setting example

The following is an example of the procedure for configuring the *SLC ConnectReach* system in the LCR/DID mode:

1. Go to the config/Network menu. Set `enable` to ***ON***. Set `framing` to ***ESF***. Set `linecode` to ***B8ZS***. Set clock to ***network***.
2. Go to the config/DS0 menu. Set `analog-begin` and `analog-end` to the first and last DS0 numbers used for digital trunks. Use the `ConnectReach` command to assign channel units to designated DS0 channels.
3. Go to the config/channel-bank menu. Set `signaling` to *unconfigured*. Use the `copy-to-channel-data` command. This takes all voice DS0s out of channel bank mode.
4. Go to the config/digital-trunk menu. Set `begin` and `end` to the first and last DS0 numbers used for digital trunks. Set `signaling` to match the trunk type as configured in the central office. Inspect the other parameters for accuracy. In most cases, they will not need modification. Use the `copy-to-channel-data` command. This puts the selected range of DS0s into LCR/DID mode and configures them as digital trunks.
5. Go to the config/analog-trunk menu. Set `begin` and `end` to the first and last cable pairs on the voice channels connector used for analog trunks. Set `signaling` to match the trunk type as configured in the central office. Inspect the other parameters for accuracy. In most cases, they will not need modification. Use the `copy-to-channel-data` command. This configures the analog trunks.

(Continued on next page)

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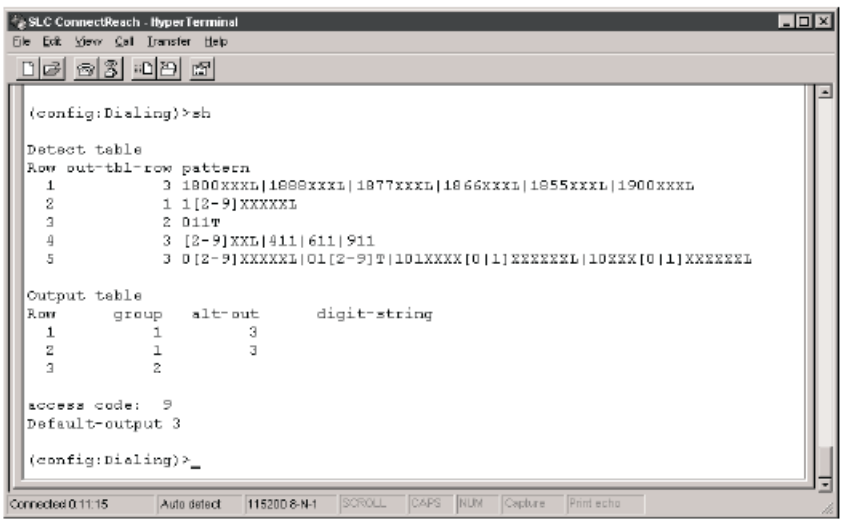
LCR/DID Configuration Example (Continued)

Configuration setting example (continued)

6. Go to the config/line menu. Set `begin` and `end` to the first and last FXS ports used for phones. Set the signaling to match the line type of the phones. Inspect the other parameters for accuracy. In most cases, they will not need modification. Use the `copy-to-channel-data` command. This configures the lines.

7. Go to the config/dialing menu. Use the `show-all` command to inspect the system defaults. The default routes all direct dialed long distance and international calls over the digital trunks; and all local, toll-free and operator-assisted calls over the analog trunks. Refer to the following figure for more detail.



21610_fig_293

8. If there are any seven-digit calls that are to be routed over the digital trunks (seven-digit long distance call), enter the following commands:

```
detect-insert 6 4 AAA|BBB|CCC| |YYY

output-insert 4 1 - 1ZZZ
```

where AAA through YYY are the exchanges to be rerouted, and ZZZ is the local area code to be prefixed to the digital trunk. Eliminate the “1” before ZZZ if it is not required.

(Continued on next page)

LCR/DID Configuration Example (Continued)

Configuration setting example (continued)

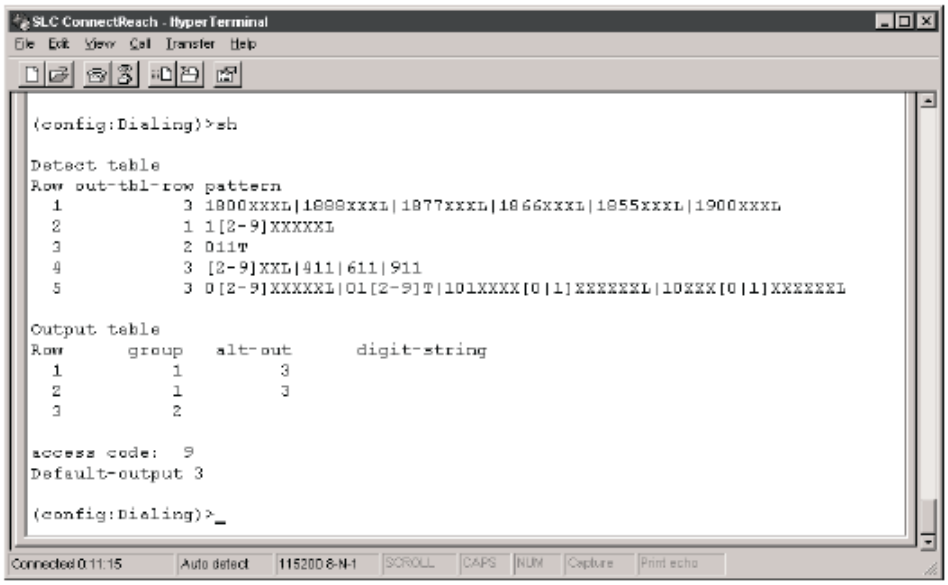
9. If there are any ten digit calls that are to be routed over the analog trunks (ten-digit local call), enter the following command:

   `detect-insert 7 3 1AAAAAA|1BBBBBB| |ZZZZZZ`

   where AAAAAA through ZZZZZZ are the area code and exchanges to be rerouted.

Dialing table default entries

The following is a description of the dialing table default entries shown in the following figure. The dialing table is displayed using the `configure-dialing-show-all` commands.



21610_fig_293

Detect-table *row 1* routes toll free calls (900 service is toll free to the recipient) to *output-row* 3, which, in turn, routes them to trunk group *2*.

(Continued on next page)

LCR/DID Configuration Example (Continued)

Dialing table default entries (continued)

Detect-table *row 2* routes United States long distance calls to *output-row 1*, which, in turn, routes them to trunk group *1* with an *alternate* route to trunk group *2* (*output-row 3*).

Detect-table *row 3* routes international calls to *output-row 2*, which, in turn, routes them to trunk group *1* with an *alternate* route to trunk group *2* (*output-row 3*).

Detect-table *row 4* routes local calls, including information, service repair, and emergency calls, to *output-row 3*, which, in turn, routes them to trunk group *2*.

Detect-table *row 5* routes credit card calls to *output-row 3*, which, in turn, routes them to trunk group *2*.

The default for all other calls is *output-row 3*, which, in turn, routes them to trunk group *2*.

NAT Examples

Example 1

This is an example of a many-to-one connection, including TCP, UDP, and ICMP connections. All the LAN private addresses on 192.168.1.0 network will be mapped to one Internet address, 200.200.200.1.

```
(config:NAT:Dynamic:Group1)> enable on
(config:NAT:Dynamic:Group1)> LAN-Range 192.168.1.1 192.168.1.254
(config:NAT:Dynamic:Group1)> WAN-Range 200.200.200.1 200.200.200.1
```

Example 2

In this one-to-one example, the address 192.168.1.100 will always be mapped to the address 200.200.200.2. Only Outbound (from LAN to WAN) connections will be allowed.

```
(config:NAT:Static:Group2)> enable on
(config:NAT:Static:Group2)> LAN-Range 192.168.1.100 192.168.1.100
(config:NAT:Static:Group2)> WAN-Range 200.200.200.2 200.200.200.2
(config:NAT:Static:Group2)> ALLOW-INBOUND OFF
```

Example 3

In this example, all IP packets with the source or destination on the network 207.242.96.0 will be passed through NAT (in other words, these packets will not be translated).

```
(config:NAT:PassGroup2)> enable on
(config:NAT:PassGroup2)> LAN-Range 207.242.96.1 207.242.96.254
```

Example 4

In this example, the LAN range 192.168.1.101—192.168.1.254 will be mapped dynamically (at random) to the WAN range 200.200.200.3—200.200.200.6. For example, all TCP connections from 192.168.1.107 might be mapped to some TCP connections of IP address 200.200.200.5.

```
(config:NAT:Static:Group4)> enable on
(config:NAT:Static:Group4)> LAN-Range 192.168.1.101 192.168.1.254
(config:NAT:Static:Group4)> WAN-Range 200.200.200.3 200.200.200.6
```

Custom Firewall Configurations

C

Contents

About This Appendix C-2

- Introduction C-2

Configuring IP Filter Groups C-3

- Configuring IP Filter Groups C-3

About This Appendix

Introduction

Contents

This appendix describes the customized Firewall configurations Internet Protocol (IP) filtering.

Configuring IP Filter Groups

Configuring IP Filter Groups

Configuration procedure

There are four IP filter groups: inbound and outbound (each one containing up to sixteen different IP filters). An IP filter can filter IP packets based on source and/or destination IP address, and/or based on any known application (protocol). Examples of IP filters include, but are not limited to the following:

- Deny all packets from certain IP addresses/networks.
- Deny all packets from certain source IP addresses/networks to certain destination IP addresses/networks.
- Deny all Telnet session requests coming into this interface.
- Permit all pings coming from certain IP addresses/networks.
- Deny all transport control protocol (TCP) packets coming to certain destination IP addresses/networks.
- Permit all TCP sessions that are established.
- Permit all user datagram protocol (UDP) packets with UDP ports greater than (any number).
- Deny all IP packets of IP type 1 coming from certain IP addresses/ networks.
- Permit all hypertext transfer protocol (HTTP) (www) packets from any source to any destination.
- Permit mail protocol only to the particular IP addresses/networks.

NOTE:
For all IP filtering used in conjunction with NAT, you must use the NATed IP addresses in filters, not the original IP addresses.

The filter syntax is as follows:

Filter*n*	permit/deny/clear [dst [net mask]] [src [net mask] [All | keyword | default [tcpport/uddport/iptype/ cmp #]] [est]

(Continued on next page)

Configuring IP Filter Group (Continued)

Configuration procedure (continued)

Remarks

The order of the filter statements is important!

Once the filter matches, the action (permit/deny) is immediately performed.

The source (src) and destination (dst) parameters are specified with an IP address and netmask or one of the following words: eth0, eth1, pvcn (where n is any number from one to thirty), ppp0, hdlc0.

Filter 1 has the highest priority and so on.

The **defaultAction** specifies what to do with the packet in the default case. **defaultAction permitAll** is the only factory default statement.

"All" means all packets.

"Keyword" can be one of the following words: Telnet, FTP, SMTP, HTTP, PING, RIP, ICMP, TFTP, bootp, gopher, DNS, SNMP, NTP, OSPF, NFS, FTP-data, RSVP, NHRP, POP2, POP3

"**Default**" means all of the following protocols: Telnet, FTP, SMTP, DNS, HTTP, PING, POP2, POP3

The parameters tcpport, udpport, and iptype are each followed by a setting for the cmp. **Cmp** can be one of the following: **>**, **<**, **=**, **!=**

Est means to apply this access list to already established TCP connections.

All [ ] parameters above are optional. The only required parameters are Action and Protocol.

One distinguishable feature of the IP Filter implementation is the presence of the special "default" keyword. This specifies the normal protocols that a typical server would support, that is, those protocols that should be permitted: Telnet, FTP, SMTP, DNS, HTTP, PING, POP2, POP3. The default keyword is very useful in cases where access is allowed for just one server on the local area network (LAN) [for all the traffic coming from the wide area network (WAN) side].

Enter a question mark to view the settings.

>(Config:IPFirewall:InFilterGroup) **?**

(Continued on next page)

Configuring IP Filter Group (Continued)

Configuration procedure (continued)

A sample of the Inbound Filter Group settings is as follows:

Filter1	permit	src pvc2 ping
Remarks	Filter 1 permits all ping packets coming from PVC2.	
Filter2	permit	dst 207.104.144.153. 255.255.255.255 default
Remarks	Filter 2 permits all packets destined to the host 207.104.144.153. The keyword **default** refers to the common server protocols (FTP, SMTP, DNS, HTTP, and PING). Note that a particular host is specified as the destination by the netmask 255.255.255.255: the destination address is formed by applying the netmask (255.255.255.255) to the address (207.104.144.153), resulting in the single (host) address 207.104.144.153.	
Filter3	permit	ping
Remarks	Filter 3 permits all (ICMP) PING packets to pass.	
Filter4	permit	207.104.144.0 255.255.255.0 smtp
Remarks	Filter 4 permits all SMTP packets to pass addressed from/to any host on the network 207.104.144.0.	
Filter5	permit	1.1.1.1 255.0.0.0 tcp = 29 est
Remarks	Filter 5 permits all packets using TCP port 29 from/to any host on the network 1.0.0.0 (the network 1.0.0.0 is the result of applying the netmask 255.0.0.0 to 1.1.1.1).	
Filter6	permit	207.104.144.0 255.255.255.0 All
Remarks	Filter 6 permits all packets from/to the network 207.104.144.0 to pass.	
Filter7		
Filter8		
defaultAction	denyAll	
Remarks	DefaultAction drops all packets that do not match any of the above filter specifications.	

(Continued on next page)

Configuring IP Filter Group (Continued)

Examples of using IP filter groups

The following examples describe how to use IP filter groups.

Example 1

Allow only pings packets to get through from WAN.

Enter a question mark after the Inbound Filter command to view the settings.
`>(Config:IPFirewall:INFilterGroup) ?`

IP Inbound Filter settings for Example 1 are as follows:

Filter1	permit ping
defaultAction	denyAll

Example 2

Do not allow any HTTP (www) sessions requests coming from WAN side (except for already established ones).

Enter a question mark after the Inbound Filter command to view the settings.
`>(Config:IPFirewall:INFilterGroup) ?`

IP Inbound Filter settings for Example 2 are as follows:

Filter1	permit http est
Filter2	deny http
defaultAction	permitAll

User Interface

D

Contents

About This Appendix D-2

- Introduction D-2

Business OfficeXchange Features D-3

- Transferring a Call to Another Phone D-3
- Consultation Hold Feature D-4
- Three-Way Calling D-5
- Call Waiting D-6
- Feature Codes D-7

About This Appendix

Introduction

Contents

This appendix includes the instructions for using the Business OfficeXchange* (BOX*) features on a single line telephone.

* Trademark of VINA Technologies, Inc.

Business OfficeXchange Features

Transferring a Call to Another Phone

Procedure

Use the following procedure to transfer a call from your phone to another phone:

NOTE:
"Flash" means press and release the receiver button quickly; or if your phone is equipped with a **FLASH** button, press the **FLASH** button.

While connected to a call:

Step	Procedure
1	Flash. You will hear a dial tone.
2	Dial the extension or phone number of the phone you are transferring the call to.
3	At this point you have the following options available to you: ■ Hang up and the call will be transferred. ■ Announce the call to the receiving party and then hang up. The call will be transferred. If there is no answer, flash the hook again to return to the first party.

Depending on the caller's connection and the receiver's connection to the phone company, this feature may not be available. This condition is only for outside to outside transfers. If the transfer cannot be completed, you will hear a fast busy tone. At this point you may flash to return to the first party.

Consultation Hold Feature

Procedure

The consultation hold feature allows you to alternate between two calls. Use the following procedure to alternate between two calls:

NOTE:
"Flash" means press and release the receiver button quickly; or if your phone is equipped with a **FLASH** button, press the **FLASH** button.

While connected to a call:

Step	Procedure
1	Flash. You will hear a dial tone.
2	Dial the second extension or phone number. The second party answers.
3	To alternate between the two parties, flash the hook twice within a 3-second interval.

A single flash activates three-way calling. If either of the other parties flashes their receiver, the flash is ignored. If any one of the three parties hangs up, the remaining two parties retain their connection. This feature's availability is dependent on the phone company connection of the two outside parties.

Three-Way Calling

Procedure

Use the following procedure to set up a three-way call between your phone and two other parties

NOTE:
"Flash" means press and release the receiver button quickly; or if your phone is equipped with a **FLASH** button, press the **FLASH** button.

Step	Procedure
1	Follow the instructions for consultation hold discussed previously.
2	Flash. This causes all three parties to be conferenced together.

If either of the other parties flashes, the flash is ignored. If any one of the three parties hangs up, the remaining two parties retain their connection. This feature's availability is dependent on the phone company connection of the two outside parties.

Call Waiting

Procedure

When you are on the line and a second call is coming in, you will hear a call waiting tone. To retrieve an incoming call while on another call, flash.

You may use consultation hold to switch between calls. If your administrator has configured your phone system for call forward busy, then call waiting will be disabled. In call forward busy, a second call will automatically be forwarded to another extension (for example, voice mail or the operator).

Feature Codes

Introduction

Feature codes are sets of numbers that are entered at the telephone keypad in order to implement or cancel certain BOX features. To enter the feature codes, lift the telephone receiver and dial the feature code followed by the extension number, if appropriate. The following table provides dialing instructions when entering feature codes. If a feature code has been programmed with a code that is different from the one in the table, make note of it in the table.

Feature	Feature Code	Additional Dialing Required?
Cancel Call Waiting	*70	No
Call Pickup	*1	No
Direct Call Pickup	*5	Extension number
Call Forward Variable	*72	Extension number
Cancel Call Forward Variable	*73	No
Pager	*3	No
Digital Direct Access	*40	Trunk number
Analog Direct Access	*41	Trunk or line number
Cancel Busy Redial	*42	No

Cancel call waiting

This feature code disables call waiting for the next call. A second dial tone is provided after dialing the feature code. Canceling call waiting allows for modem data transfer without the interference of the call waiting tone.

Call pickup

Dialing the call pickup feature code causes a ringing line in the user's pickup group to be answered. Each line may be assigned to a call pickup group.

Direct call pickup

This feature allows call pickup outside the answerer's pickup group. To activate this feature, dial the directed call pickup feature code followed by the extension number.

(Continued on next page)

Feature Codes (Continued)

Call forward

This feature forwards calls from one extension to another extension or trunk. An incoming call may be forwarded as many as ten times. To activate call forwarding:

Step	Procedure
1	The user dials the call forward feature code followed by the number of the forwarding location.
2	The software places a call to the forwarding location. If the line is answered, forwarding is enabled. If the line is not answered, the user must place a second call to the same number within 60 seconds. The user will hear a confirmation tone (same as call waiting). Each time the forwarded line is called, there will be a short ring to remind you that you have call forwarding activated. If your phone system is equipped with a voice mail system, the call forward variable may be used to immediately forward all calls to voice mail. Obtain a voice mail extension from your administrator and enter it as the forwarding location. **Stop! End of Procedure.**

Cancel call forward

To cancel call forwarding, the user dials the cancel call forward feature code and a confirmation tone is sounded.

Pager

The pager feature allows for paging capability by dialing the pager feature code.

Digital direct access

This feature is used for diagnostics and is not included in the quick reference guide. If direct trunk select is enabled, the user may enter the feature code followed by the trunk number to test a specific trunk.

Analog direct access

This feature is similar to digital direct access. It is not included in the quick reference guide. The user enters the feature code followed by the analog line number to test a line or analog trunk.

(Continued on next page)

Feature Codes (Continued)

Busy redial

This feature is used when you are given a busy signal when dialing another line or a fast busy signal when making an outgoing call.

To activate busy redial, flash, listen for a second dial tone, and hang up. You will be called back with an internal distinctive ring when the called line is available or an outgoing line becomes free. In the case of an outgoing call, the number dialed is remembered and redialed.

If you do not answer the distinctive ringing within six rings, the busy redial feature is canceled.

Cancel busy redial

To cancel the busy redial feature, lift the receiver and dial the cancel busy redial feature code.

EZ Config

E

Contents

About This Appendix E-2

- Introduction E-2

Initial Setup E-3

- Connecting a Palmtop or Laptop to the SLC ConnectReach System E-3

Using EZConfig E-4

- Initial Configuration of the SLC ConnectReach System E-4

About This Appendix

Introduction

Contents

EZConfig allows an installer to initialize the SLC ® ConnectReach ™ system with the minimum required settings necessary for the networks operations center (NOC) to have access through the HyperText Transfer Protocol (HTTP) management feature. EZConfig uses HTTP to communicate between an Internet browser and the *SLC ConnectReach* system. The Internet browser may be on a palmtop PC running Windows* CE or a laptop/notebook.

This appendix describes the procedure for configuring the *SLC ConnectReach* system with EZConfig. Topics covered include:

- Connecting a palmtop or laptop to the *SLC ConnectReach* system
- Configuring the network interface card on the palmtop or laptop
- Setting up an Internet browser for initial access to the *SLC ConnectReach* system
- Using EZConfig.

* Windows is a registered trademark of Microsoft Corporation.

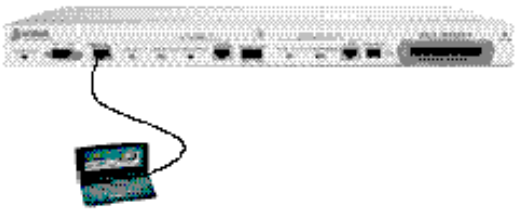
Initial Setup

Connecting a Palmtop or Laptop to the *SLC ConnectReach* System

Requirements

There are two physical requirements to connect a palmtop or laptop to the SLC ConnectReach system:

- An installed network interface card on the palmtop or laptop.
- An Ethernet cross-over cable to connect the **10Base-T** port on the *SLC ConnectReach* system to the network interface card on the palmtop or laptop (Refer to the following figure).



Configuring the network interface card

The network interface card needs to be configured with transport control protocol/Internet protocol (TCP/IP) and the following TCP/IP settings:

- The IP address is set to 192.168.0.2
- The netmask is set to 255.255.255.0.

Configuring the browser

The Internet Explorer for Windows CE browser is recommended for use with a palmtop. Either the Netscape or Internet Explorer browsers may be used with a laptop. The following browser configurations should be set for EZConfig:

1. Set the homepage of the browser to: **192.168.0.1/ez**. With this setting the EZConfig program will start each time the browser is started.
2. Turn off the cache function in the browser. This will allow the screen to get refreshed from the *SLC ConnectReach* system and not the browser's cache function,

NOTE:
The configuration settings for the browser and the network interface card are based on the *SLC ConnectReach* system being set to the default settings. If the *SLC ConnectReach* system's settings are not defaulted, EZConfig will not function.

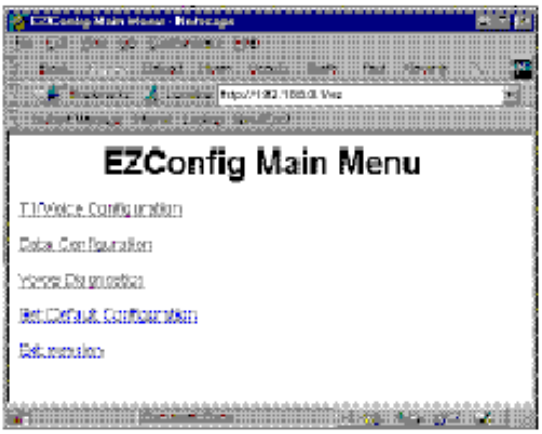
Using EZConfig

Initial Configuration of the *SLC ConnectReach* System

Introduction

Only the most commonly used settings are available in EZConfig. If the settings required for an HTTP connection to the NOC are not included in the EZConfig menus, the *SLC ConnectReach* system will need to be configured using the methods described in 4, "Configuring the SLC® ConnectReach™ System."

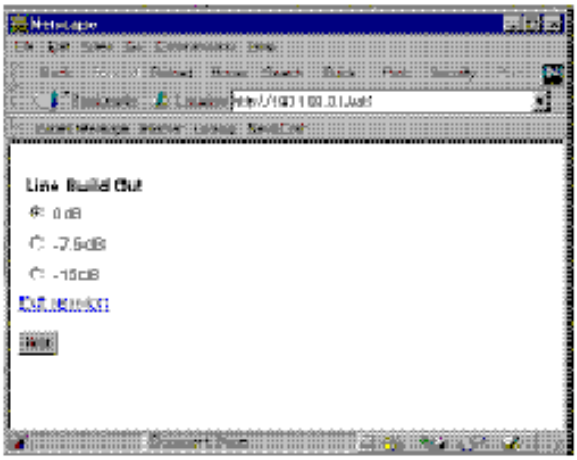
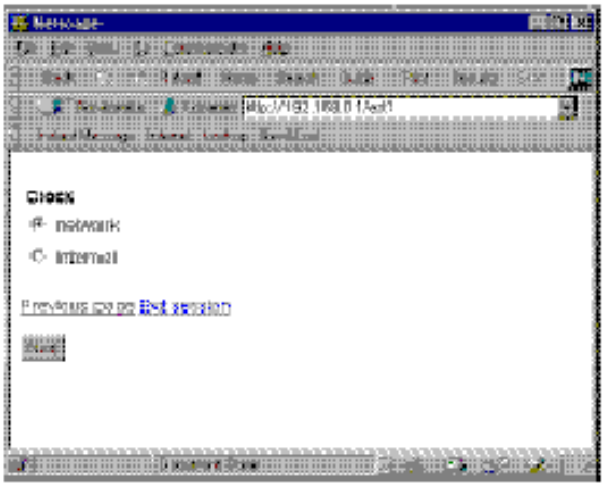
Procedure

Action/Prompt/Response	Screen Display
1. To begin configuring the *SLC ConnectReach* system, select **T1/ Voice Configuration**.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

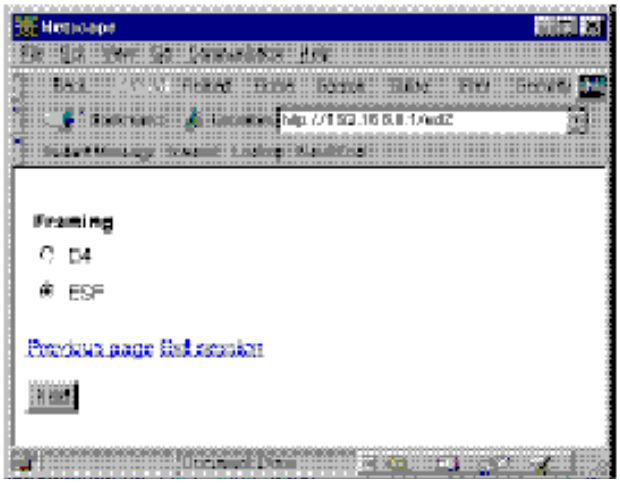
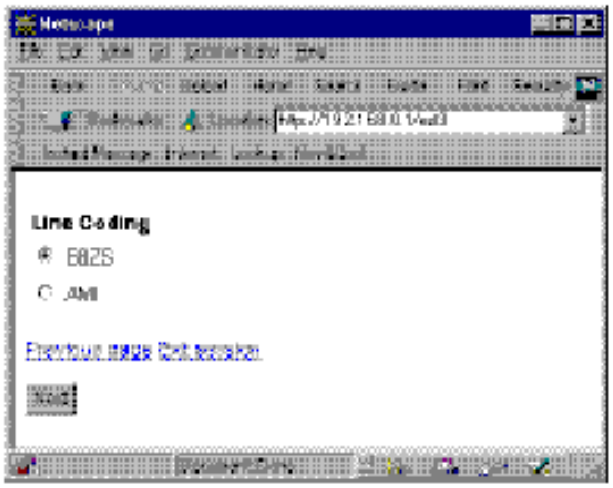
Procedure (continued)

Action/Prompt/Response	Screen Display
2. Select the line build out required by the NOC and click on the **Next** button	
3. Select the clock setting. If the clock is provided by the network T1 provider, select **network**. If the *SLC ConnectReach* system is to be the clock source, select **internal**. Click on the **Next** button.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

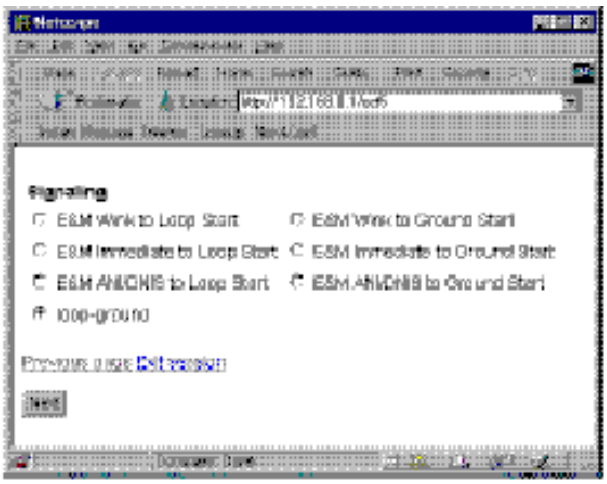
Procedure (continued)

Action/Prompt/Response	Screen Display
4. Select the T1 framing required by the NOC, and click on the **Next** button.	
5. Select the line coding required by the NOC, and click on the **Next** button.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

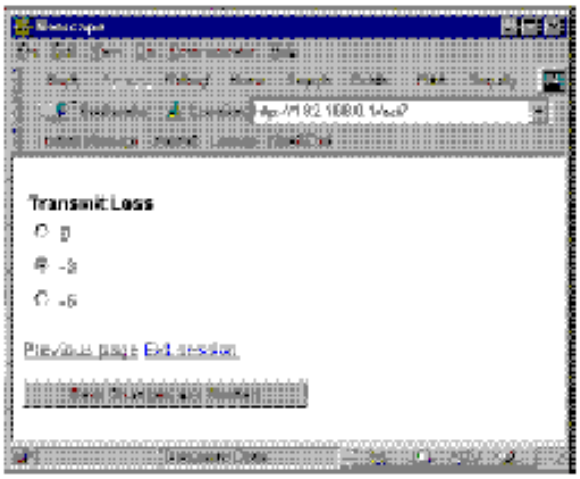
Procedure (continued)

Action/Prompt/Response	Screen Display
6. Select the trunk processing alarm state required by the NOC. Select **idle** to place the trunks in an idle state if there is a problem. Select **busy** to "busy out" the trunks if a problem occurs. Click on the **Next** button.	
7. Select the trunk to line signaling conversion used and click on the **Next** button.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

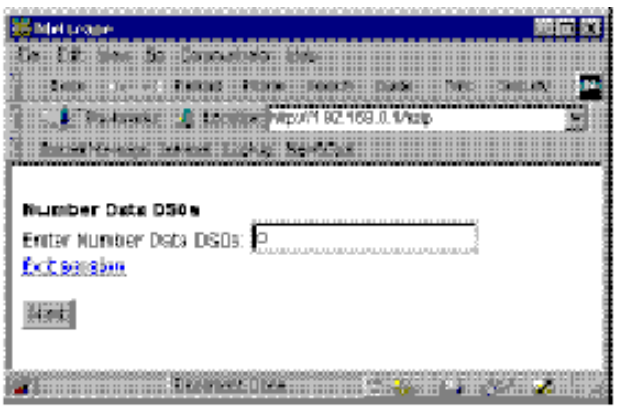
Procedure (continued)

Action/Prompt/Response	Screen Display
8. Select the analog line to network T1 receive loss and click on the **Next** button.	
9. Select the analog line to network T1 transmit loss and click on the **Save Changes and Restart** button.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

Procedure (continued)

Action/Prompt/Response	Screen Display
10. EZConfig will save the configuration changes to the NVRAM, restart the *SLC ConnectReach* system and return to the main menu. Restarting the *SLC ConnectReach* system will take a moment, please wait a few seconds before clicking on another link. To configure the data parameters, click on the **Data Configuration** button.	
11. Enter the number of DS0s being used for data and click the **Next** button.	

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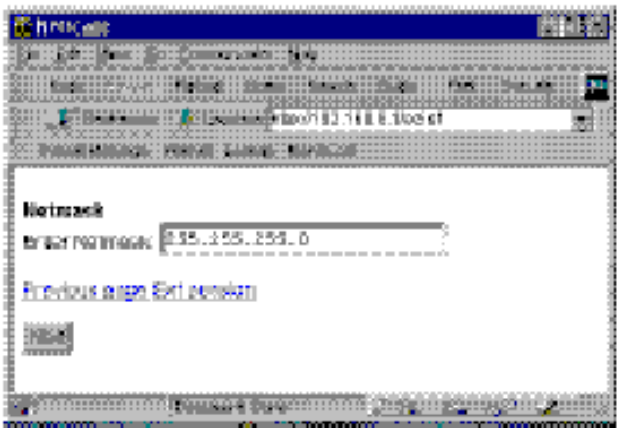
Initial Configuration of the *SLC ConnectReach* System (Continued)

Procedure (continued)

Action/Prompt/Response	Screen Display
12. Enter the WAN IP address, including the periods (for example, 207.242.96.208) Click the **Next** button.	
13. Enter the WAN netmask, including the periods. Click the **Next** button.	

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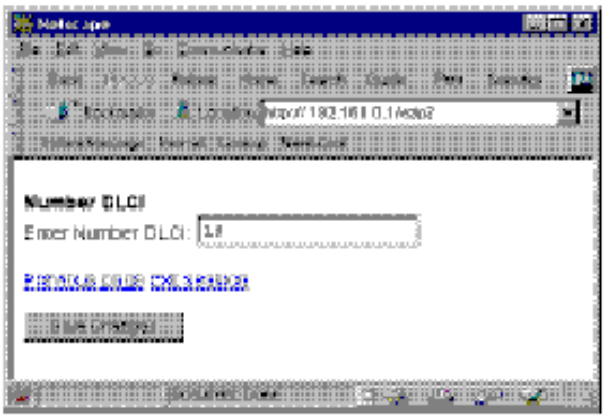
Initial Configuration of the *SLC ConnectReach* System (Continued)

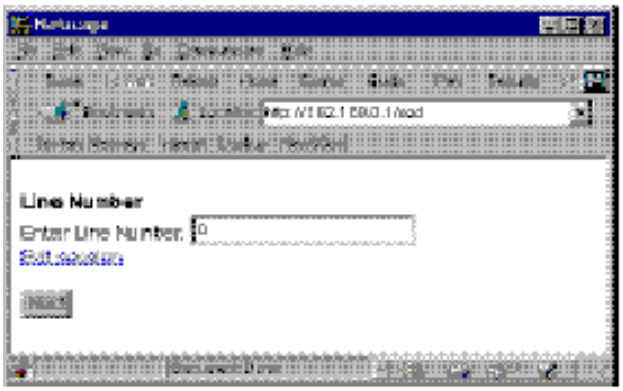
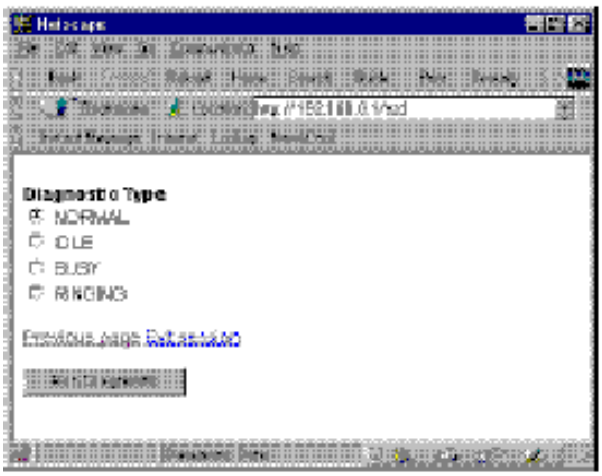
Procedure (continued)

Action/Prompt/Response	Screen Display
14. Enter the DLCI and click the **Save Changes** button.	
15. EZConfig will save the configuration changes to the NVRAM, restart the *SLC ConnectReach* system and return to the main menu. Restarting the *SLC ConnectReach* system will take a moment, please wait a few seconds before clicking on another link. To run voice diagnostics, click on the **Voice Diagnostics** button.	

(Continued on next page)

Initial Configuration of the *SLC ConnectReach* System (Continued)

Procedure (continued)

Action/Prompt/Response	Screen Display
16. Enter the voice line number to be tested and click the **Next** button.	
17. Enter the voice line diagnostic type and click the **Run Diagnostic** button.	

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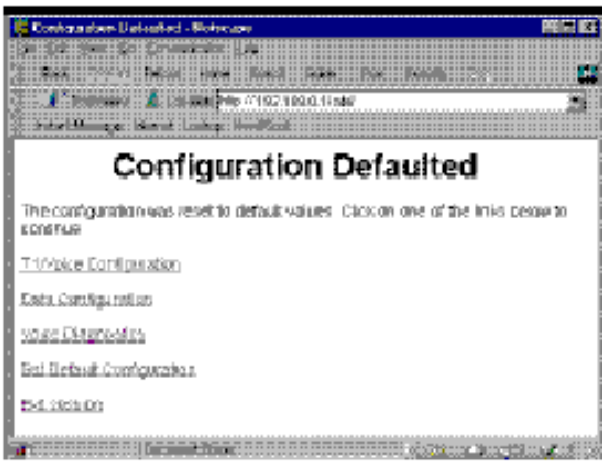
Initial Configuration of the *SLC ConnectReach* System (Continued)

Procedure (continued)

Action/Prompt/Response	Screen Display
18. The diagnostics information will be displayed. To continue with another line number or diagnostic type, use the **Back** button or arrow on your browser.	
19. To set the *SLC ConnectReach* system to the factory default settings, click on **Set Default Configuration**. This screen will appear. **WARNING:** *Setting the SLC ConnectReach system to the factory default settings will erase all previous changes.*	

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Initial Configuration of the *SLC ConnectReach* System (Continued)

Procedure (continued)

Action/Prompt/Response	Screen Display
20. To exit EZConfig, click on the **Exit Session** button. The exit screen will appear.	
Stop! End of Procedure.	

Configuring Enterprise NAT

F

About This Appendix

Introduction

Contents

This Appendix describes the configuration and applications of Enterprise NAT.

Enterprise NAT Overview

Two utilizations of network address translation (NAT) are supported on the *SLC ConnectReach* system; NAT that allows translation of internal (LAN) IP addressed workstations to external (WAN) addresses (LAN-to-WAN), and Enterprise NAT, which allows translation of IP addresses for workstations at remote offices to WAN IP addresses (WAN-to-WAN), by means of Frame Relay PVCs.

NOTE:
NAT for allowing the translation of LAN IP addressed workstations to WAN addresses is described in the *Configuring NAT and PAT* on page 4-119.

To configure Enterprise NAT, you can use procedures to:

- Translate ranges of IP addresses of remote workstations to WAN IP addresses
- Configure a permanent virtual circuit (PVC) to allow incoming IP packets (IN) from a remote workstation
- Configure a PVC to allow IP packets to pass through NAT, both incoming and outgoing (PASS), in order to manage a Corporate HQ site and remote sites from a remote network operations center (NOC).

If you want to provide internet access for both Corporate HQ and remote sites, configure another PVC to be the default WAN interface, as described in the *Configuring Routes* on page 4-112.

If you need to bypass the NAT module, configure IP Packet Filtering groups for this purpose, as described in the *Configuring IP Packet Filters to Bypass NAT* on page F-11.

The following sections cover each of the ENAT procedures. For an example of Enterprise NAT configuration, see *Enterprise NAT Example* on page F-9. For details on NAT configuration, see *Configuring NAT and PAT* on page 4-119.

IP Address Translation for Enterprise NAT

Introduction

NAT allows the translation of any range of LAN IP addresses to another range of WAN IP addresses. The key difference between NAT in previous VINA products and Enterprise NAT is that with Enterprise NAT, the LAN side of the *remote* workstation can be logically attached to the LAN side of the Corporate HQ network. It is as if a PC on the remote LAN becomes part of the Corporate HQ LAN. This allows the Corporate HQ site to manage Internet access and provide remote LAN connectivity to the Corporate LAN.

NOTE:
Because not only LAN but also WAN IP addresses can now be translated, the ranges are referred to as the *In* range and the *Out* range.

(Continued on next page)

IP Address Translation for Enterprise NAT (Continued)

Procedure

The translation procedure is as follows.

Step	Procedure

1	At the config prompt, enter the **NAT** command:
	
	`(config)> NAT`
	
	The prompt changes to the config:NAT prompt.
	
	`(config:NAT)>`

2	At the config:NAT prompt, enter the **enable on** command, and then **Dynamic** command. Typically, you will want to establish dynamic allocation so you can translate many connections to one connection, thereby reducing the number of WAN IP addresses used and providing security. The prompt changes to the config:NAT prompt. `(config:NAT:Dynamic)>`
3	At the config:NAT:Dynamic prompt, enter the group to be configured. For example: `(config:NAT:Dynamic)> 1` The prompt changes to the submenu-group that is to be configured. For example: (config:NAT:Dynamic:Group1)>

(Continued on next page)

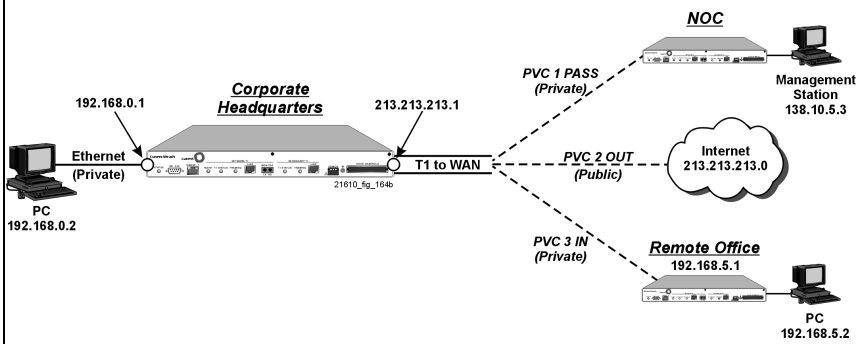
IP Address Translation for Enterprise NAT (Continued)

Procedure (continued)

Step	Procedure
4	At the submenu-group prompt enter the **enable on** command, then the **Start** and **End** commands for the *in* range and the *out* range. See the table below; the IP addresses refer to the commands used in the ENAT example (shown in the figure below) to create Group1. **About *in* and *out* ranges.** The *in* range is the LAN side of the Corporate Headquarter network. The *out* range is the WAN side of the Corporate Headquarter's router module.

Enter this command...	...and specify this value	Comments
`enable`	`[off] | on`	Enables dynamic allocation.
`in-Start`	`192.168.0.1` (for example)	Enter the starting LAN or WAN IP address for the range.
`in-End`	`192.168.0.254` (for example)	Enter the ending LAN or WAN IP address for the range.
`out-Start`	`213.213.213.1` (for example)	Enter the starting WAN IP address for the range.
`out-End`	`213.213.213.1` (for example)	Enter the ending WAN IP address for the range.

Three Different FR PVCs configured for Enterprise NAT



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IP Address Translation for Enterprise NAT (Continued)

Procedure (continued)

Step	Procedure
5	To create a second group enter a number for it, and then another set of **Start** and **End** commands. In the example, Group 2 has an in-Start address of 192.168.5.1 and an in-End address of 192.168.5.254, while the out-Start address is 213.213.213.1 and out-End address of 213.213.213.1. **Stop! End of Procedure.**

Normal operation of Dynamic NAT does not allow incoming IP packets. For the ENAT example in this Appendix, the NOC needs incoming access to the Corporate HQ LAN IP address (192.168.0.1) for management purposes. This is achieved by the use of a PVC, as described in the next section.

PVC Configuration for ENAT

Each PVC submenu allows the user to configure the **DLCI** (Data Link Connection Identifier), IP commands and NAT (ENAT) options. There are three possible settings for NAT; they are *Pass*, *In* and *Out*.

Setting the NAT option to *Pass* allows all incoming and outgoing IP packets to bypass the dynamic NAT translation function on the designated PVC (in the ENAT example, PVC1allows the management PC at the NOC to bypass NAT).

When a PVC has a NAT setting of *In*, the PVC is logically connected to the LAN (IN) side of the VINA router (in the ENAT example, the logical connection is to 192.168.0.1).

When a PVC has a NAT setting of *Out*, the PVC is logically connected to the WAN (OUT) side of the VINA router (in the ENAT example, the logical connection is to 212.213.213.1).

In order for these NAT options to be effective, NAT must be enabled, as described in the previous section.

Procedure

Use the following procedure to configure PVCs for Enterprise NAT.

Step	Procedure
1	To navigate to PVC configuration, enter the **configuration**, **synchronous-interface**, and **modify-encap-data** commands. The prompt changes to the config:FrameRelay prompt.(config:Frame-relay)>

(Continued on next page)

PVC Configuration for ENAT (Continued)

Procedure (continued)

Step	Procedure

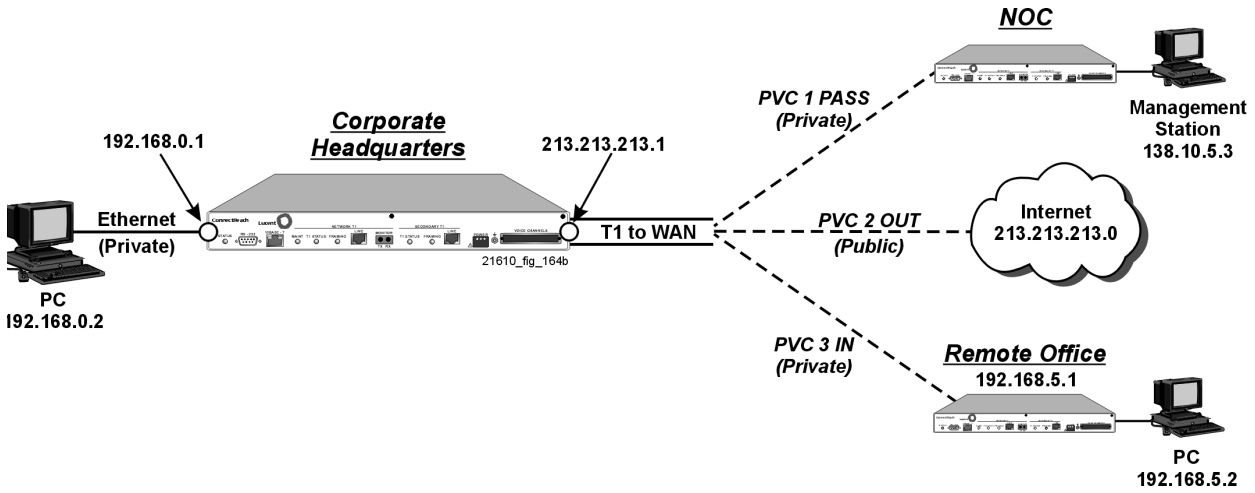
2	At the config:Frame-relay prompt, enter **PVC n** where n is any number from one to thirty.
	`(config:Frame-relay)> PVC 1`
	The prompt changes to the config:FrameRelay:PVC1 prompt.
	`(config:FrameRelay:PVC1)>`

3	At the config:FrameRelay:PVC1 prompt, enter the **ip-address** command, and either **enet** (to assign the primary Ethernet IP address for NAT incoming or pass-through), or the WAN IP address for NAT outgoing.
4	Enter the **NAT** command, and one of the following options; **PASS –** allows all IP packets to pass through (incoming and outgoing) on the designated PVC; typically used to bypass the NAT firewall for management access. **IN –** allows incoming IP packets only for the specified PVC; typically used for WAN access by a workstation in a remote office **OUT –** allows outgoing IP packets only for the specified PVC; typically used for WAN access by a workstation on a local LAN. **Stop! End of Procedure.**

Enterprise NAT Example

You can configure a PVC to allow IP address translations that create private communication ‘links’ between workstations in remote offices and the Internet. You can also use a PVC to communicate between a network manager’s workstation at a remote office (an NOC, for example), and a centrally located *SLC ConnectReach* system. In Figure F-1 three PVCs are shown, all of which have been configured with NAT on the *SLC ConnectReach* system at the Corporate Headquarters.

Three Different FR PVCs configured for Enterprise NAT



PVC 1 is configured with the NAT setting PASS, so that the Network manager at the NOC can pass packets directly through NAT to the *SLC ConnectReach* system at the Corporate Headquarters office.

PVC 2 is configured with the NAT setting OUT, so that the PC on the Corporate Headquarters Ethernet can have its IP address translated to a WAN (Internet Access) address.

PVC 3 is configured with the NAT setting IN, so that the PC at the Remote Office can have its IP address translated to a WAN (Internet Access) address.

NOTE:
This configuration does not address Firewall issues; if there is a Firewall, the source (138.10.5.1 255.255.255.0) and destination (192.168.0.1 255.255.255.0) IP addresses for the management traffic must be permitted by an IP filter.

(Continued on next page)

Enterprise NAT Example (Continued)

The key commands to create this configuration at the Corporate Headquarters *SLC ConnectReach* system are the following (menu navigation commands have been omitted)

```
>(Config:NAT)> enable on
>(Config:NAT:Dynamic:Group1)> enable on
>(Config:NAT:Dynamic:Group1)> in-start 192.168.0.1
>(Config:NAT:Dynamic:Group1)> in-end 192.168.0.254
>(Config:NAT:Dynamic:Group1)> out-start 213.213.213.1
>(Config:NAT:Dynamic:Group1)> out-end 213.213.213.1
>(Config:NAT:Dynamic:Group2)> in-start 192.168.5.1
>(Config:NAT:Dynamic:Group2)> in-end 192.168.5.254
>(Config:NAT:Dynamic:Group2)> out-start 213.213.213.1
>(Config:NAT:Dynamic:Group2)> out-end 213.213.213.1
```

(For details on these NAT commands, see *Configuring NAT and PAT* on page 4-119.)

```
(config:FrameRelay:PVC1)> ip-addr Enet
(config:FrameRelay:PVC1)> NAT PASS
(config:FrameRelay:PVC2)>ipaddr 213.213.213.1
(config:FrameRelay:PVC2)> NAT OUT
(config:FrameRelay:PVC3)> IP-address Enet
(config:FrameRelay:PVC3)> NAT IN
```

(For details on these Frame Relay commands, see *Configuring using the PVC submenu commands* on page 4-42.)

```
(config:IPRoutes)> default PVC2
```

(For details, see *Configuring Routes* on page 4-112 in this Guide.)

```
(config:Ethernet)> IP-address 192.168.0.1
```

(For details, see the *Configuring the Ethernet Interface* on page 4-49.)

Configuring IP Packet Filters to Bypass NAT

Introduction

If you need to bypass the NAT module from an IP host or from all hosts on a network, you can use the following procedures. The filters can be used on both source and destination IP addresses.

In order for host A to bypass the NAT module to host B, and vice versa, where host A is located on the WAN side of the *SLC ConnectReach* system, and host B is located on the LAN side of the *SLC ConnectReach* system, take these steps:

1. To navigate to IP Packet Filter Group configuration, enter the **configuration** and **IPFirewall** commands, and, for the Inbound Firewall Group, enter **INFilterGroup**.
2. At the config:IPFirewall:INFilterGroup prompt, enter the following

   1 deny dst B 255.255.255.255 src A 255.255.255.255 NAT
3. Exit the INFilterGroup menu, enter the **OUTFilterGroup** command, then enter

   1 deny dst A 255.255.255.255 src B 255.255.255.255 NAT

Procedure

In order for all hosts on network A to bypass the NAT module if destined for all hosts on Network B (and vice versa), assuming that network A is on the WAN side of the *SLC ConnectReach* system, and network B is on the LAN side of the *SLC ConnectReach* system, take these steps:

Step	Procedure
1	To navigate to IP Packet Filter Group configuration, enter the **configuration** and **IPFirewall** commands, and, for the Inbound Firewall Group, enter **INFilterGroup**.
2	At the config:IPFirewall:INFilterGroup prompt, enter the following 1 deny dst netB maskB src netA maskA NAT
3	Exit the INFilterGroup menu, enter the **OUTFilterGroup** command, then enter 1 deny dst netA maskA src netB maskB NAT **NOTE:** The *SLC ConnectReach* system has 64 filters in both OUT and IN Filter Groups. The first filter has the highest priority. Therefore, it is best to use the last filters for ‘deny...NAT’ commands. Keep in mind, however, that higher priority filters can cancel those below them in the order.

Glossary

10Base-T — A widely used standard for Ethernet networks and T1 services using twisted-pair wiring as the physical medium.

A

Address Digits — The digits that specify the destination (or source) of a call, such as dial tone multifrequency (DTMF), multifrequency (MF), and pulse.

AIS — Alarm Indication Signal. Sometimes called a blue alarm or blue signal. In T1, the AIS indicates to the far end of the line that the near end has detected a transmission fault at the far end. The AIS sends ones in all bits of all time slots.

AMI — Alternate Mark Inversion. Digital transmission requires that each consecutive pulse be transmitted at opposite polarity or voltage.

ANI — Automatic Number Identification. Imbedded in the phone call is a series of digits that tell you the phone number of the phone calling you. This identification could be used to search a database for customer information.

Answer Supervision — A means by which a private branch exchange (PBX) tells a central office (CO) that an incoming call has been answered.

AOR — Addressable Office Repeater.

ARP — Address Resolution Protocol. A basic level protocol within the transport control protocol/Internet protocol (TCP/IP) group that “maps” IP addresses to Ethernet addresses.

ATM — Asynchronous Transfer Mode. A high-speed connection-oriented multiplexing and switching method utilizing fixed-length cells to support multiple types of traffic. It is asynchronous in the sense that it is not time dependent.

B

B8ZS — Bipolar 8 Zero Substitution. A line coding format in which a bipolar violation code is substituted for a string of eight zeros.

badlen — In statistics reports, such as IP statistics, the number of packets that are either too long or too short.

badhlen — In statistics reports, such as IP statistics, the number of packets with headers that are either too long or too short.

badsum — In statistics reports, such as IP statistics, the number of packets with bad checksums.

BER — Bit Error Rate. Errored bits over total bits.

Bipolar — An intelligence-carrying voltage that turns both negative and positive in relation to a base reference of zero.

Blue Alarm — See AIS.

BOX — Business OfficeXchange. An integrated voice switch incorporating key system functionality.

BPV — Bipolar violation. The digital data format consists of pulses at opposite polarity or voltage. Two consecutive pulses of the same polarity are considered a bipolar violation.

BRI — Basic Rate Interface. BRI has two bearer B-channels at 64 kilobits per second (kbps) and a data D-channel at 16 kb/s.

Browser — See Web Browser.

BSP — Broadband Service Provider. Provides broadband data service as well as Internet Access (*see ISP*).

C

cantforward — In statistics reports, such as IP statistics, the number of packets not forwarded because no route could be found.

CAS — Channel Associated Signaling. A form of circuit state signaling in which control signals are carried in the same channel along with voice and data signals. Also known as robbed bit signaling (RBS).

CIR — Committed Information Rate

CIT — Craft Interface Terminal. An American standard code for information interchange (ASCII) terminal or a personal computer (PC) running software that emulates an ASCII terminal. The CIT is used to access the SLC ®-2000 Access System software for system turnup, administration, provisioning, and maintenance.

CLOC — Loopback - toward customer side at slave unit.

CO — Central office.

cpm0-1 — Normal interface to the local Ethernet network; used in Interface statistics.

CRC — Cyclic Redundancy Check. Error detection technique that derives a binary number by reading an incoming block of data and compares it with a number transmitted with the data.

CREM — Loopback - toward customer side at master unit.

CSMA/CD — Carrier Sense Multiple Access Collision Detect. Media-access mechanism wherein devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays retransmissions from those devices for some random length of time. CSMA/CD access is used by Ethernet and IEEE 802.3.

CSS — Counted Slip Seconds. Used in T1 line statistics.

CSU — Channel Service Unit. A CSU terminates a T1 digital circuit at the customer site. The CSU performs certain line-conditioning functions, ensures network compliance with Federal Communications Commission (FCC) rules, and responds to loopback commands. The CSU also ensures proper ones density in transmitted bit stream and performs bipolar-violation correction.

D

D4 — A framing format that uses a 12-bit pattern repeating sequence for the location of the framing bits. Also referred to as Superframe (SF) format.

dB — Decibel, a unit of measure of relative power, expressed as the ratio of two values. dB = 10 log P1 P2, where P1 and P2 are the power levels in watts.

Delay Dial — A type of trunk signaling for incoming and outgoing calls. With this signaling, the SLC® ConnectReach™ system sends an off-hook pulse until it is ready to receive digits.

DHCP — Dynamic Host Configuration Protocol. Acting as a DHCP server, the SLC ConnectReach system dynamically assigns IP addresses and other configuration parameters needed by personal computers (PCs) or workstations to connect to the Internet and perform common network functions.

Dial Supervision — The method for originating address digit transmission such as wink start and delay start.

DID — Direct Inward Dial. A DID trunk passes the last two to four digits of a phone number to the PBX or hybrid phone system. At this point the digits are either modified by the phone system or used as is to connect to an internal extension. This allows outside calls to reach an internal extension directly by dialing a seven-digit number.

DLCI — Data Link Connection Identifier. The frame relay virtual circuit number corresponding to a particular destination. The DLCI is part of the frame relay header.

DM — Degraded Minute. Minute during which the estimated error rate exceeds 1E-6 but does not exceed 1E-3 (see G.821 [15]).

DNIS — Dialed Number Identification Service. DNIS provides the number the caller dialed. Used with 800 and 900 lines, DNIS capabilities allow one trunk group to be used for multiple service applications.

DNS — Domain Name Service. A DNS server resolves an Internet domain name, such as lucent.com, to an IP address. A DNS proxy manages Internet name resolution requests on behalf of devices on a private network.

DPT/DPO — Dial Pulse Terminating/Originating.

DS0 — Digital or data signal level 0. The basis of a 64-kbps digital data stream.

DS1 — Digital signal level 1. The 1.544-Mb/s T1 line.

DSP — Digital Signal Processor. A specialized digital microprocessor that performs calculations on digitized signals that were originally analog (for example, voice) and then sends the results on.

DT — Distant Terminal. A compact cost effective terminal that is normally located near or at the customer's premises to provide a full range of narrowband services including POTS, special services, and integrated services digital network. The DT interfaces to a SLC-2000 host digital terminal (HDT) by means of a DT Server card located in the metallic distribution shelf assembly.

DTE — Data Terminal Equipment. The name applied to a piece of equipment such as personal computers,

systems network architecture (SNA) control units, automatic teller machines, reservation terminals, etc.

DTMF — Dual Tone Multifrequency. A type of signaling consisting of a push button or touchtone dial that sends out two discrete tones which are picked up and interpreted by telephone switches.

E

E&M Signaling — Conventional telephony arrangement that uses separate leads called, respectively, the "E" ("ear") lead and "M" ("mouth") lead, for signaling and supervisory purposes. In the SLC ConnectReach system, references to E&M signaling refer to a signaling type supported on DID trunks. It does not refer to the E&M signaling used over metallic leads with older transmission equipment.

ENAT — Enterprise Network Address Translation. Used in T1 line statistics. A utilization of Network Address Translation (NAT) that allows translation of IP addresses for workstations at remote offices to WAN IP addresses (WAN-to-WAN) by means of Frame Relay PVCs.

ES — Errored Seconds.

ESF — Extended Superframe Format. A framing format that allows a maintenance channel and error-detection capability on a DS1.

Ethernet — A standard networking protocol widely used in local area networks for connecting often dissimilar devices. Invented by the Xerox Corporation and developed jointly by Xerox, Intel, and Digital Equipment Corporation. Ethernet networks use carrier sense multiple access/collision detect (CSMA/CD) and run over a variety of cable types at 10 or 100 Mbps. Ethernet is similar to the IEEE 802.3 series of standards.

F

fastpath — In statistics reports, such as IP statistics, the number of packets sent by means of the fastpath route.

FDL — Facility Data Link. An embedded overhead channel with the ESF format traditionally used for maintenance messaging within a carrier network. FDL uses the 193rd bit and is a four kb/s bandwidth.

Firewall — A combination of hardware and software which limits the exposure of a computer or group of computers to an attack from outside. A network-level firewall, or packet filter, examines traffic at the network protocol packet level.

fragments — In statistics reports, such as IP statistics, the number of packets so long they had to be fragmented.

fragtimeout — In statistics reports, such as IP statistics, the number of events in which there is a time-out due to a delayed fragment.

Frame Relay — A packet switching protocol that performs error checking and efficiently handles high-speed, bursty data over wide area networks.

Framing Bit — A bit used for frame synchronization.

Framing Error — Occurs when framing bits are set improperly, or when the two ends of a circuit are configured for different framing formats.

FTP — File Transfer Protocol. A protocol used for reliable file transfers.

FXO — Foreign Exchange Office. An analog trunk interface which may be connected to a PBX or to the local public switched telephone network (PSTN) central office. The FXO interface may be configured in either loop-start or ground-start mode.

FXS — Foreign Exchange Station. An analog line interface which may be connected to a PBX or directly to a telephone station set. The FXS interface may be configured in either loop-start or ground-start mode.

G

Gateway — A combination of hardware and software that links two different types of networks.

Ground-Start/Loop-Start — Two common telephone trunk signaling schemes. In ground-start signaling, the device at one end of the connection grounds one side of the line and the device at the other end detects the presence of the ground. In loop-start signaling, one device closes the loop and the resulting current flow is detected by the device at the other end. PBX systems usually are connected to ground-start trunks, and single telephone lines and key systems to loop-start trunks. The *SLC ConnectReach* system supports both, and automatically detects for channel bank which signaling scheme is used on a line-by-line basis.

H

HDLC — High-level Data Link Control. A communications protocol for point-to-point and multipoint communications that reduces the likelihood of errors.

HLU — HiGain Line Unit (master).

HRU — HiGain Remote Unit (slave).

Host Number — The low bits of an IP address which corresponds to those bits in the associated subnet mask which have 0's.

HTTP — HyperText Transfer Protocol. The protocol used for communication between World Wide Web servers and Web browsers.

I

ICMP — Internet Control Message Protocol. A low-level protocol that supports functions such as echo requests and "host not available" messages.

Immediate Start — A type of trunk signaling for incoming and outgoing calls. This signaling indicates that the originating trunk goes off-hook, and maintains this condition for at least 150 milliseconds. Then the originating trunk sends out digits.

Incoming — A call that comes from the CO to a user on the SLC ConnectReach system.

Internet — Largest global internetwork, connecting tens of thousands of networks worldwide and having a "culture" that focuses on research and standardization based on real-life use.

IOR — Intelligent Office Repeater.

IP — Internet Protocol. The network-layer protocol in the TCP/IP protocol stack.

IP Address — A 32-bit address (specified as x.y.z.w) which is assigned to hosts in a TCP/IP Internet. This 32-bit address is comprised of a network portion and a host portion.

IP Unnumbered Interface — This describes an interface that does not consume a unique IP address.

IR — Intelligent Repeater.

ISDN — Integrated Services Digital Network. A switched digital network from the local or long-distance exchange carrier to the subscriber. There are two types of service: Basic Rate Interface (BRI) and Primary

ISP — Internet Service Provider. A company that provides access to the Internet. For a monthly fee, the service provider gives you a software package, username, password and access phone number. Equipped with a modem, you can then log on to the Internet and browse the World Wide Web and send and receive e-mail.

L

LAN — Local Area Network. A short distance data communications network (typically within a building or campus) used to link computers and peripheral devices [such as printers, compact disc-read only memories (CD-ROMs), modems] under some form of standard control.

LCR — Local Call Routing. (Also known as Least Cost Routing.) A telephone system feature that automatically selects the most economical route available for an outgoing call.

LCV — Line Code Violation. Occurrence of either a Bipolar Violation (BPV) or Excessive Zeroes (EXZ) error event.15]).

LES — Line Errored Second. Second when one or more line code violations (LCVs) have occurred.

LMI — Local Management Interface. A specification for the use of frame-relay products that defines a method of exchanging status information between devices such as routers.

Local Loop — The voice-band channel connecting the subscriber to the CO. Sometimes called subscriber loop.

LOFC — Loss of Frame. Used in T1 line statistics.

Loop-down — Disarm loopback.

Loop-up — Arm loopback.

Loop-Start — See Ground-Start.

LOS — Loss of Signal (T1).

LSB — Least Significant Bit/Byte.

M

Margin — The difference (in dB) between existing noise and acceptable noise.

Master — A module that operates at the central control point.

MDS — Metallic Distribution Shelf. A two-shelf assembly that provides control and distribution for DS0-based metallic services using common units and channel units. It also provides control and distribution for DS0-based 12- and 24-line fiber-in-the-loop services using common units and distant terminal Servers.

MSB — Most Significant Bit/Byte.

MTU — Maximum Transmission Unit. Largest unit data that can be transported on a transmission link.

N

NAT — Network Address Translation. An Internet standard that allows a LAN to use one set of IP addresses for an internal traffic and another set of IP addresses for external traffic.

Netmask — Also called subnet mask. When this value is viewed as a 32-bit binary number, the high bits have 1's. These 1's "mask off" the network and host number.

Network Number — The high bits of an IP address which correspond to those bits in the associated subnet mask which have 1's.

NLOC — Loopback - toward network side at master unit.

NOC — Network Operations Center.

NREM — Loopback - toward network side at slave unit.

NTP — Network Time Protocol. Developed to provide an accepted concept of time among Internet hosts around the world.

Null modem — Small box or cable used to join computing devices directly, rather than over a network.

NVRAM — Non-Volatile Random Access Memory. A type of memory that retains its contents when power is turned off.

O

OAM&P — Operations, Administration, Maintenance, and Provisioning.

Off-Hook — Off-hook condition indicates that the circuit is in the active state (that is, busy). The opposite condition is on-hook (idle).

Outgoing — A call that comes from a user on the SLC ConnectReach system to the CO.

P

Packet Filtering — The recognition and selective transmission or blocking of bundles of data based on destination addresses or other packet contents.

PAT — Port Address Translation. Allows users on thepublic (WAN) side of a network to access spesific applications or services on the private (LAN) side of the network.

Pattern — One or more sequences separated by "|," followed by an optional time-out. Example: 92[2-3] | 95x matches 922, or 923, or 950, or 951...959.

PBX — Private Branch Exchange. A customer telephone system that emulates a carrier branch exchange office.

PCV — Path Coding Violations. A count of frame synchronization bit errors in D4 format, or CRCs in the ESF format.

Ping — A command that sends an ICMP echo packet to a node on an IP network. The target node (if operational) returns an ICMP response packet to the originator. Commonly used to indicate that both the target node and the network path to it are functioning properly.

POP — Post Office Protocol. A protocol used to retrieve e-mail from a mail server. POP2 requires simple mail transfer protocol (SMTP) to send messages whereas, POP3 can be used with or without SMTP.

PPP — Point-to-Point Protocol. A protocol that allows a computer to connect to a remote network or device over either a synchronous interface or a standard dial-up telephone line and modem.

PRI — Primary Rate Interface. PRI in the United States provides 23 B-channels with a D-channel transmitting at 1.544 Mb/s. European PRI has 30 B-channels with a D-channel and transmits at 2.048 Mb/s. Also, Priority/Severity field for syslog messages.

Protocol — An agreed-upon format for transmitting data between two devices. The protocol determines the following:

- The type of error checking to be used
- Data compression method, if any
- How the sending device will indicate that it has finished sending a message
- How the receiving device will indicate that it has received a message.

Proxy Server — A server that sits between a client application, such as a Web browser, and a real server. It intercepts all requests to the real server to see if it can fulfill the requests itself. If not, it forwards the request to the real server.

Pulse Attenuation — The amount of signal power loss over the T1 span. Valid range is 1 to 32 dB.

PVC — Permanent Virtual Circuit. A logical link established in a packet network assuring an available connection and bandwidth for subscribers without actually having to set aside physical facilities. A PVC emulates a dedicated physical connection across a wide area network (WAN).

PVR — Processor Version Register. Displayed as part of hardware configuration statistics.

Pulse Density — The ratio of ones to zeros in a digital data stream. The ones density rule requires at least three ones in a sampled byte of information.

Q

QOS — Quality of Service. A networking term that specifies a service level.

R

RAI — Remote Alarm Indication. A signal transmitted in the outgoing direction when a terminal determines that if has lost the incoming signal. RAI is commonly called the Yellow Alarm signal.

RBS — Robbed Bit Signaling (see CAS).

Red Alarm — In T1, a red alarm is generated when a locally detected error such as loss of synchronization exists for 2.5 seconds.

redirectsent — In statistics reports, such as IP statistics, the number of packets that were redirected to take the shortest route.

REN — The Ringer Equivalency Number indicates the number of ringers that may be connected to a single telephone line. If the number of ringers exceeds the REN of the line, some or all of the ringers may not operate.

RFC — Request for Comment. A documentation mechanism for developing TCP/IP standards, procedures, and specifications.

RIP — Routing Information Protocol. A protocol defined by RFC 1058 that specifies how routers exchange routing table information. With RIP, routers periodically exchange entire tables.

Ring — One conductor of a telephone wire pair, designated by R.

Router — Network layer device that uses one or more metrics to determine the optimal path along which network traffic should be forwarded. Routers forward packets from one network to another based on network layer information.

S

SAP — Service Advertising Protocol. A protocol used to identify the services and addresses of servers attached to the network.

Sequence — One or more digits, range of digits, x, or local, defined in the detect-string parameter of the Dialing table, that matches a given sequence. Example: 51092[3-5] matches 510923, or 510924, or 510925.

SES — Severe Error Seconds. Used in T1 line statistics.

SEFS — Severely Errored Frame Second. Second with Severely Errored Frames (SEFs); an SEF occurs when 2 or more frame bit errors are detected in a 3ms window of time.

SF — Superframe format. Another name for D4 format. See D4.

Slave — A module that operates at the remote end of the circuit.

Smart-Jack — A RJ48X jack, single-line, 4-wire, T/R, T1/R1, 1.544 Mb/s, eight position. (RJ means a jack registered with the FCC.)

SMTP — Simple Mail Transfer Protocol. A protocol for sending e-mail messages between servers.

SNMP — Simple Network Management Protocol. SNMP is a network management protocol that allows a network manager to communicate with devices over an IP network and allows a device to send alarm and status messages to an SNMP network management system located either on the LAN or on a remote network.

SNR — Signal-to-Noise Ratio.

SNRHIGH — Signal-to-Noise Ratio/High.

SNRLOW — Signal-to-Noise Ratio/Low.

SONET — Synchronous Optical Network. An ANSI standard for fiber optic transmission; rate varies from 51.8 Mb/s to 2.48 Gb/s.

sppp — Network T1 PPP interface code; used in Interface statistics.

Subnet — Logical partitions of a single network.e to send alarm andstatus

T

T1 — A digital line that carries data at 1.544 Mb/s. Fractional T1 refers to data transmission between 56 kb/s and 1.544 Mb/s. The SLC ConnectReach system provides twenty-four 64-kb/s “fractions,” or channels, which may be allocated for either voice or data traffic.

T1 Multiplexer — A device that can multiplex 24 channels at 64 kb/s onto a single digital signal.

TCP — Transport Control Protocol. The primary transport-layer protocol of the TCP/IP protocol stack.

TDM — Time Division Multiplexing. A multiplexing technique that allows all channels to use one transmission link, but not at the same time. Each channel is sampled in sequence resulting in interleaving of samples from each channel in time. The sampling rate is 8,000 times per second.

Telnet — A TCP/IP protocol offering a line-oriented connection over the LAN/WAN. Telnet is typically used to remotely log on to an Internet device or host.

Tip — One conductor of a telephone wire pair, designated by T.

Tip Status — Transmission state of an unconfigured channel. In the channel-bank menu, the tip status is either busy or idle.

tone1k — A mode for voice channel; in this mode, a phone attached to the channel will emit an audible 1-kHz tone. Typically, this mode is used for diagnosis.

tooshort — In statistics reports, such as IP statistics, the number of packets that are below the minimum length.

toosmall — In statistics reports, such as IP statistics, the number of packets with less than the minimum amount of data.

TR08—A defacto Bellcore standard for adapting to a single T1 link.

Trunk — A transmission channel connecting two switching devices.

Trunk Signaling — The handshaking used to communicate on a trunk such as loop-start and ground-start.

TTL — Time-To-Live. Mechanism used in IP protocol to ensure that errant packets are killed. Typically, TTL begins at 255 seconds when a packet arrives at a device, and decrements until the packet exits. At 0 (Time-To-Die, or TTD), if the packet has not exited, it is killed.

U

UAS — Unavailable Seconds. A one second interval during which service was not available; an unavailable signal state is declared after 10 consecutive SESs.

UDP — User Datagram Protocol. An alternate transport-layer protocol of the TCP/IP protocol stack.

URG — Urgent; as in TCP statistics, “URG only” packets.

V

VFDE— Voice-Frequency Data Enhancement.

VPN — Virtual Private Network. A means by which ISPs can connect remote offices of a company by means of the Internet.

W

WAN — Wide Area Network. A data network typically extending a LAN outside the building, over telephone carrier lines to link to other LANs in remote buildings in possibly remote cities.

Web Browser — A software application used to locate and display World Wide Web (WWW) pages.

Wink Delay — A type of trunk signaling for incoming call. This signaling allows ANI and DNIS numbers to be used with standard loop-start cards (that is, voice mail, fax) without the need for special signaling converters. This is done by providing a “wink back” to the carrier after the analog line is answered so that any digits delivered by the carrier may be received from the analog port.

Wink Start — The most common type of trunk signaling for incoming and outgoing calls. After the SLC ConnectReach system detects the trunk going off-hook on an incoming call, it transmits a 200-millisecond off-hook pulse, then returns to the on-hook state. The originating trunk detects this “wink back,” waits at least 210 milliseconds, sends out digits, and then rings the analog line. When the call is answered, the SLC ConnectReach system transmits an off-hook pulse.

WINS — Windows* Internet Naming Service. A system that determines the IP address associated with a particular network computer. This is called name resolution. WINS supports network client and server computers running Windows and can provide name resolution for other computers with special arrangements.

* Windows is a registered trademark of Microsoft Corporation

WWW — World Wide Web. A system of Internet servers that support specially formatted documents. The documents are formatted in a language called hypertext markup language (HTML) that supports links to other documents, as well as graphics, audio, and video files. This means you can jump from one document to another simply by clicking on hot spots.arrier after the analog

X

Xmodem — One of the most popular file-transfer protocols. Although Xmodem is a relatively simple protocol, it is fairly effective at detecting errors. It works by sending blocks of data together with a checksum and then waiting for acknowledgment of the block's receipt. The waiting slows down the rate of data transmission considerably, but it ensures accurate transmission.ciated with a particular

Y

Yellow Alarm— A yellow alert is a T1 alarm signal sent back toward the source of a failed transmit circuit. The alert sends zeros in bit two of all time slots. Also see RAI.

Z

ZBTSI — Zero-Byte Time-Slot Interchange. Used with T-carrier extended superframe format (ESF). One area of the ESF frame carries information locating eight consecutive zeros in the data.

Index

Numerics

10Base-T port, 2-11
363-205-010, ix
363-208-000, xxi
363-208-003, xxi

A

About this Information Product
  Electronic and alternative media, xxiv
  How to Comment, xxvi
  How to Order CIPs, xxv
AC power
  Connecting, 5-42, 5-49
  Requirements, 5-7
AC ringing signal, 5-52
Accessing the *SLC ConnectReach* system
  Using Telnet, 4-166
Address
  IP, 4-51
  Private network, A-9
Address classes, A-4
  Class D networks, A-6
Alarm operation
  Secondary/fractional T1/DSX-1, 4-30
Alarm relay, 5-55
Analog direct access, 4-85, D-8
Analog trunks
  Configuring, 4-68
Analog voice interface specifications, 5-52
Application proxy, 3-3
Archive
  Command, 9-13
  File format, 9-13
Archiving the current configuration, 9-13
ARP
  Configuring, 4-116
ARP (Address Resolution Protocol)
  Statistics, 7-10
Assigning
  Login names and passwords, 4-102

B

Battery backup, 2-26
Benefits, 1-8
Bridge mode, 9-33
Business OfficeXchange (BOX), 4-80
  Call forward, 4-82
  Call pickup group, 4-83
  Call transfer, 4-81
  call transfer, D-3
  Call waiting, 4-82
  call waiting, D-6
  Consultation hold, 4-81
  consultation hold, D-4
  Direct trunk select, 4-82
  Distinctive ring, 4-81
  feature codes, D-7
  Three-way calling, 4-81, D-5
  User interface, D-2
Busy redial, D-9

C

Cable connections, 5-33
Cables, 5-9, 5-33
  Construction, 5-34
Call forward, 4-82
  Variable, 4-84, D-8
Call pickup, 4-84, D-7
Call pickup group, 4-83
Call transfer, 4-81, D-3
Call waiting, 4-82, D-6
Cancel busy redial, 4-85, D-9
Cancel call forward variable, 4-85, D-8
Cancel call waiting, 4-84, D-7
Channel unit provisioning, 6-14
  Configuration example, B-11
Channel-bank
  Configuring, 4-52
CIT set up and connection, 6-3
Clearing
  Log, 9-26
  T1 line statistics, 7-24
ClearReach feature, 1-5
CLEI code, 6-16
Clock
  Secondary T1/DSX-1 interface, 4-28
Cold-start command, 4-20
Commands
  Archive, 9-13
  Cold-start, 4-20
  Config, 4-19
  Default, 4-164
  Diagnose, 9-28
  Encapsulation, 4-40
  Exit, 4-14, 8-25
  Features-show, 4-160
  Log, 9-26
  Main menu, 4-14
  Modify-encap-data, 4-40
  Network upgrade, 9-7

Ping, 8-16, 9-31
Preserve-default, 4-164
Save, 4-19, 4-20, 8-9
Show, 9-32
Warm-start, 4-20, 8-23
Xmodem download, 9-5
Config command, 4-19
Configuration
Archive file format, 9-13
Channel unit provisioning example, B-11
Commands, list of, 4-17
Customized, 3-7
Displaying current settings, 4-160
Examples, B-1
LCR/DID example, B-14
Quickstart, 3-5
Remote, 3-4
Saving, 4-20, 8-9
Setting default values, 4-164
Configuring
Analog trunks, 4-68
ARP, 4-116
Channel-bank, 4-52
Default firewall, 4-127
Default IP filter, 4-129
Default IP filter plus server, 4-131
DHCP, 4-108
Dialing, 4-89
Digital trunks, 4-62
DNS, 4-138
DS0 provisioning, 4-32
Enternprise NAT, F-1
Ethernet interface, 4-49
Extensions, 4-87
FTP log dump, 4-156
Lines, 4-74
NAT, 4-121
Network T1/DSX-1 interface, 4-22
NTP, 4-137
Passwords, 4-102
PAT, 4-120
Routes, 4-112
RS-232 port, 4-154
Secondary/Fractional T1/DSX-1 interface, 4-27
Synchronous interface, 4-39
SYSLOG, 4-146
Telnet port, 4-17
Using a Web browser, 8-6
Voice mail, 4-97
Web browser port, 4-17
Connecting
AC power, 5-42, 5-49
Cables, 5-33
Ethernet cable, 5-41
Network T1/DSX-1, 5-41
Secondary frame ground, 5-42, 5-49
ConnectReach channel assignments
Configuration example, B-11
Consultation hold, 4-81, D-4
Courses
Training, xxii
Craft interface terminal set up and connection, 6-3
Cross-connections, DS0, 6-12
Cross-connections, T1, 6-24
Customer support
NKC, xx
Customized configuration example, B-7

D

DC power requirements, 5-7
Default
Command, 4-164
Configuration settings, 4-164
Modem settings, 4-5
Description
System, 1-3
Desktop mount, 5-31
Detect table, 4-91
Diagnose command, 9-28
Dialing
Configuring, 4-89
Detect table, 4-91
Output table, 4-92
DID
Analog interface for channel bank, 4-55
Digital trunk, routing, 4-63
Received digits, 4-94
Digital direct access, 4-85, D-8
Digital trunks
Configuring, 4-62
Direct call pickup, 4-84, D-7
Direct trunk select, 4-82
Disaster recovery, 9-32
Displaying
Current configuration settings, 4-160
DHCP statistics, 7-20
Firewall statistics, 7-17
Frame relay interface statistics, 7-32
Frame Relay PVCs statistics, 7-39
Hardware configuration, 7-51
Hardware configuration using a Web browser, 8-13
Interface statistics, 7-15
IP protocols statistics, 7-41
Log, 9-26
Route statistics, 7-46
T1 interface statistics, 7-22
T1 status, 7-24
T1 usage report, 7-27
TCP statistics, 7-12
UDP statistics, 7-14
Version number, 7-50
Voice channels statistics, 7-29
WAN Frame Relay Interface statistics, 7-36
Distinctive ring, 4-81

Documentation plan, xxi
Documentation support
One-time orders, xxv
Standing order list, xxv
Domain Name Service (DNS)
Configuration Proxy, 4-138
DHCP, 4-108
DS0 cross-connections, 6-12
DS0 provisioning
Configuring, 4-32
DT Server AID, 6-10
Dynamic Host Configuration Protocol (DHCP)
Configuration, 4-108
Statistics, 7-20

E

Electrostatic discharge considerations, xviii
Wrist strap, xviii, xix
Encapsulation
Command, 4-40
Entering
Login names, 4-21
Enterprise NAT, F-1
PVC, F-7
Environmental requirements, 5-8
ESD Considerations, xviii
Wrist strap, xviii, xix
ESD grounding stud, xix
Ethernet interface
Cable connection, 5-41
Configuring, 4-49
Default IP address, 4-49
Netmask, 4-51
Port LEDs, 9-25
Example
Channel unit provisioning, B-11
ConnectReach channel assignments, B-11
customized configuration, B-7
LCR/DID configuration, B-14
Quickstart configuration, B-3
Exit command, 4-14
Extensions
Configuring, 4-87
EZConfig, E-1

F

Far end disconnect, 4-75
Feature codes, 4-84
Analog direct access, 4-85, D-8
Busy redial, D-9
Call forward variable, 4-84, D-8
Call pickup, 4-84, D-7
Cancel busy redial, 4-85, D-9
Cancel call forward variable, 4-85, D-8
Cancel call waiting, 4-84, D-7
Digital direct access, 4-85, D-8
Direct call pickup, 4-84, D-7
Pager, 4-85, D-8
Features, 1-10
Features-show command, 4-160
Firewall
custom Configuration, C-2
Custom IP filter configuration, C-3
Default configuration, 4-127
Statistics, 7-17
viewing settings, 4-133
FRACTIONAL T1 LINE port, 2-12
Frame ground
Second connection, 5-42, 5-49
Frame relay
Statistics, 7-32
Synchronous interface, 4-41
FTP log dump
Configuring, 4-156

G

Gains, adjusting
Digital trunks, 4-64
Green Ethernet link integrity LED, 9-25
Green status LED, 9-23
Ground-start,ringing, 5-52

H

Hardware configuration
Displaying, 7-51
HDLC inversion, 4-39
High-level Data Link Control (HDLC)
Synchronous interface, 4-48
How to Order CIPs
Document standing order list, xxv
One-time document orders, xxv

I

icmpGroup, Statistics, 7-43
Installation
Preinstallation planning, 3-1
Requirements, 5-6
Interface
Ethernet, 4-51
Statistics, 7-15

Interfaces
  Network, 1-6
Internet Control Message Protocol (ICMP)
  Statistics, 7-11
Inverse Address Resolution Protocol (InARP), 4-42
IP
  Address, A-2
  Configuring address for Ethernet, 4-51
  Default Ethernet address, 4-49
  Netmask, A-7
  Private network, A-9
  Statistics, 7-7
  Subnet, A-7
IP filter, 4-127
  Custom configuration, C-3
  Default configuration, 4-129, 4-131
IP unnumbered
  Synchronous interface, 4-39
ipGroup, Statistics, 7-42

L

LCR/DID
  Configuration example, B-14
LED
  Green Ethernet link integrity, 9-25
  Green status, 9-23
  Red T1 framing, 9-23
  Status indicators, 9-22
  Yellow activity, 9-25
  Yellow maintenance, 9-23
  Yellow T1 status, 9-23
Lines
  BOX features, 4-80
  Configuring, 4-74
  Far end disconnect, 4-75
  Feature codes, 4-84
  Polarity reversal, 4-76
LMI type, 4-41
Log
  Clearing, 9-26
  Clearing using a Web browser, 8-15
  Displaying, 9-26
  Displaying using a Web browser, 8-13
Logging in to the*SLC ConnectReach* system
  Carrier level privilege, 4-107
Login Names
  Assigning, 4-102
Login names
  Adding password, 4-103
  Entering, 4-21
Loop length, 5-52
Loopback
  Setting on a T1 line, 7-26
Lucent Technologies contacts
  NetCare Knowledge Center, xx
  NKC, xx

M

Main menu
  Commands, 4-14
Map extensions, 4-87
Modem
  Cables, 4-4
Modify-encap-data command, 4-40
Mounting positions, 2-8
Mounting the*SLC ConnectReach* system, 5-21

N

NAT
  Configuring, 4-121
  Statistics, 7-18, 7-19
National Product Training Center, xxii
Netmask, A-7
  Ethernet interface, 4-51
Network
  Address classes, A-4
  Interfaces, 1-6
  IP address, A-2
  Private, 3-3, A-9
NETWORK T1 line MONITOR port, 2-12
Network T1/DSX-1
  Cable connection, 5-41
  Configuring, 4-22
Network T1/DSX-1 LINE port, 2-11
Network upgrade, 9-5, 9-7
NKC (NetCare Knowledge Center), xx
Non-volatile RAM (NVRAM), 4-19
NTP
  Configuring, 4-137

O

Output table, 4-92
Overriding another management session, 4-15, 8-25

P

Pager, 4-85, D-8
Paging/amplifier unit, 2-25
Password
  Assigning, 4-102

Changing, 4-107
Configuring, 4-102
PAT
Configuring, 4-120
Statistics, 7-18, 7-19
Peripheral hardware equipment, 2-25
Battery backup, 2-26
Paging/amplifier unit, 2-25
Trunk bypass unit, 2-27
Ping command, 9-31
Point-to-Point Protocol (PPP), 4-48
Polarity reversal, 4-76
POWER port, 2-13
Power requirements, 2-8, 5-7
PPP
Statistics, 7-21
preconfiguration
worksheet, 3-10
Preinstallation
Planning, 3-1
Worksheet, 3-8
Preparing for access by a Web browser, 8-3
Preserve-default
Command, 4-164
Private network, 3-3, 4-49, A-9
DHCP, 4-108
Product training, xxii
Product training catalog, xxii
Protocol
DHCP, 4-108
HDLC, 4-48
ICMP, 7-11
PPP, 4-48
SNMP, 4-110
UDP, 7-14
PVC
Enterprise NAT, F-7

Q

Quickstart configuration, 3-5
Example, B-3

R

Rack mount, 5-22
Reason for reissue, x
Rebooting the*SLC ConnectReach* System, 9-20
Rebooting with a Web browser, 8-23
Recovering from system failure, 9-32
Red T1 framing LED, 9-23
References to related documents, ix, xxi
Related documents
363-205-010 (Series 5 applications and planning guide), ix
363-208-000 (applications, planning, and ordering guide), xxi
363-208-003 (commands and messages), xxi
Remote configuration, 3-4
Requirements
AC power, 5-7
DC power, 5-7
Environment, 5-8
RFC
1112, A-6
1293, 4-42
1490, 4-41
1918, 4-49, A-9
950, A-7
Ringer Equivalency Number (REN), 5-52
RIP
Synchronous interface, 4-39
Route
Statistics, 7-46
Routes
Configuring, 4-112

S

Save command, 4-19, 4-20
Saving configuration settings, 4-19, 4-20
Using a Web browser, 8-9
SECONDARY T1 LINE port, 2-12
Secondary T1/DSX-1
Clock, 4-28
Secondary/Fractional T1/DSX-1
Configuring, 4-27
Security, 1-12
Self-test results, 9-24
Setting
Features, 4-158
Setting loopback on a T1 line, 7-26
Sevice level agreement (SLA), 4-43
Shipping specifications, 5-8
Show command, 9-32
show-frinterface, 7-36
show-ipsummary, 7-41
show-pvc, 7-39
Simple Network Management Protocol (SNMP), 4-110
T1 traps, 4-111
Site requirements, 3-8, 5-6
SOCKS
Application proxy, 3-3
Specifications
Analog voice interface, 5-52
REN, 5-52
*SPQ*440C channel unit
Description, 2-4
*SPQ*440D channel unit
Description, 2-4

*SPQ*443 channel unit
Description, 2-5
Provisioning, 6-17
*SPQ*452 channel unit
Description, 2-5
Provisioning, 6-18
*SPQ*456 channel unit
Description, 2-6
Statistics
ARP, 7-10
Clearing, 7-24
DHCP, 7-20
Firewall, 7-17
Frame relay interface, 7-32
ICMP, 7-11
icmpGroup, 7-43
Interfaces, 7-15
IP, 7-7
ipGroup, 7-42
NAT, 7-18, 7-19
PAT, 7-18, 7-19
PPP, 7-21
Route, 7-46
show-frinterface, 7-36
show-ipsummary, 7-41
show-pvc, 7-39
T1 interface, 7-22
T1 usage report, 7-27
TCP, 7-12
tcpGroup, 7-44
UDP, 7-14
udpGroup, 7-44
Voice channels, 7-29
STATUS LED, 2-16
Subnet, A-7
Synchronous interface
Configuring, 4-39
Frame relay, 4-41
High-level Data Link Control (HDLC), 4-48
IP unnumbered, 4-39
PPP, 4-48
RIP, 4-39
SYSLOG
Configuring, 4-146
System description, 1-3

T

T1
Clearing loopback, 7-27
Clearing statistics, 7-24
Cross-connections, 6-24
Displaying statistics, 7-22
Setting loopback, 7-26
State transitions, ignored, 5-53
Status, 7-24
Line error conditions, 7-25
Traps, SNMP, 4-111
Usage report, 7-27
TCP
Statistics, 7-12
tcpGroup, Statistics, 7-44
Telnet port
Configuring, 4-17
Telnet session, 4-166
Template archive, 4-161
Test equipment
Bridge mode, 9-33
Three-way calling, 4-81, D-5
TR4610 training course, xxiii
Trademarks, xv
Training courses, xxii
Troubleshooting, 9-1
Trunk bypass unit, 2-27

U

udpGroup, Statistics, 7-44
Upgrade software, 8-17
Upgrading software, 9-3
Use the CIT to Provision Channel Unit(s), 6-14
User Datagram Protocol (UDP)
Statistics, 7-14
User interface, D-1, E-1
BOX, D-2
User/Service manual
Audience, ix
User/Service manual content
Document, viii

V

Version
Displaying, 7-50
Displaying using a Web browser, 8-12
Voice channels
Statistics, 7-29
VOICE CHANNELS port, 2-13
Voice mail
Configuring, 4-97
Voice mail system, 2-25
Profiles, 4-99

W

Wall mount, 5-25
Warm-start command, 4-20, 8-23

Warranty repair/replacement, xx
Web browser
  Configuring, 8-6
  Configuring port, 4-17
  Displaying statistics, 8-9
  Exit command, 8-25
  Log
    Clearing, 8-15
    Displaying, 8-13
  Logging in to the *SLC ConnectReach* system, 8-4
  Ping command, 8-16
  Preparing *SLC ConnectReach* system for access, 8-3
  Save command, 8-9
  Upgrade software, 8-17
WORD document, 6-16
Work order record detail (WORD) document, 6-16
Worksheet
  Preinstallation, 3-8
worksheet, preconfiguration, 3-10
Wrist Strap, xix

X

Xmodem download, 9-5

Y

Yellow Ethernet activity LED, 9-25
Yellow maintenance LED, 9-23
Yellow T1 status LED, 9-23