General DataComm
The Best Connections in the Business

SpectraComm IP-DSL.BIS

Secure and Resilient LAN Extension over Copper Loops

Highlights

- Reliable routing or Ethernet extension
- Supports scalable high performance LAN via 10/100BASE-T Ethernet
- Transports data at rates up to 11.3 Mbps using G.shdsl.bis
- Operates as 2-wire (single loop) or 4-wire (two loop)
- In 4-wire mode, supports auto-fallback to single loop operation, and auto-restoral when recovered.
- Increased revenues and service offerings
- Extended reach without the need for repeaters
- Scalable Telco-tough NEBS Level III-compliant packaging for the Central Office or remote sites
- Expedited Forwarding PHB for IP DiffServ applications

Introduction

As IP equipment is introduced into networks, SCIP-DSL provides two access modes for LAN-attached IP devices and legacy (craft) devices. Either mode can be conducted over the G.shdsl network, or over a dial-up PSTN.

- In router mode, the SCIP provides management access by extending the internal network to remote locations where separate IP networks are required.
- In LAN-X mode, the SCIP can be deployed as an Ethernet extension device for those remote locations where a single 'flat' IP network is required.

Connectivity via IP Routing

Figure 1 demonstrates the SpectraComm IP-DSL as a static router, forwarding IP data between a local and remote location via G.shdsl. The SCIP also connects to craft ports of up to eight co-located devices. Dial-in users can be authorized for read or read-write access to remote devices over the private switched telephone network.

Connectivity via LAN-Extension

Figure 2: When placed in LAN-extension mode, SCIP-DSL extends carrier or enterprise local area networks. Deployed in pairs, SCIP cards are connected to their separate LANs via the Ethernet interface and are connected to each other 'back-to-back' via 2-wire or 4-wire copper loops. GDC's Ethernet extension (LAN-X) is used as the link layer WAN protocol.
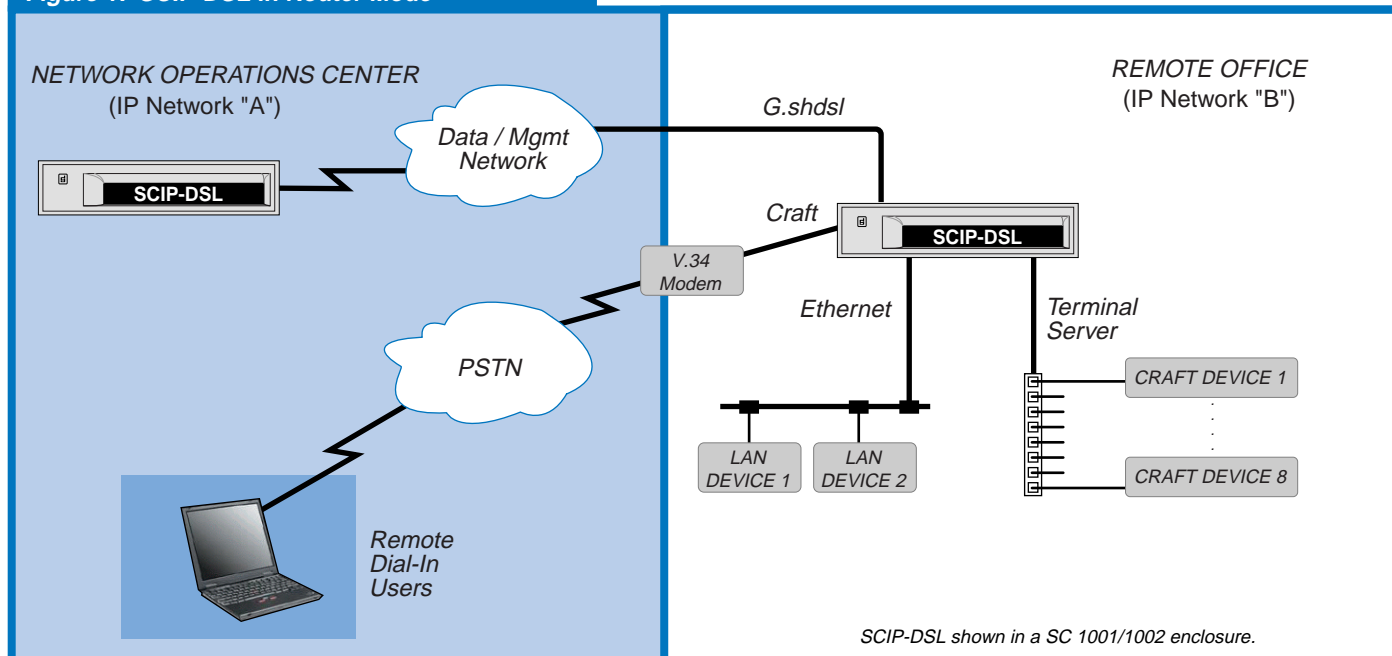
Robust Recovery

In the event of a loop failure, SCIP-DSL in 4-wire mode performs auto-fallback to single loop operation, and two-loop restoral when the failed loop recovers. SCIP-DSL can also auto-adapt the data rate based on line length and current conditions. Auto-fallback, Auto-restoral and Auto Rate Adaptation are individually enabled/disabled.

Switched Ethernet Applications

When additional NEBS-compliant Ethernet connectivity is required, SCIP can integrate with SpectraComm Ethernet Switch (SC-ES) cards which provide scalable IP.

Figure 1: SCIP-DSL in Router Mode

NETWORK OPERATIONS CENTER
(IP Network "A")

SCIP-DSL

Data / Mgmt Network

G.shdsl

Craft

V.34 Modem

PSTN

Remote Dial-In Users

REMOTE OFFICE
(IP Network "B")

SCIP-DSL

Ethernet

Terminal Server

LAN DEVICE 1

LAN DEVICE 2

CRAFT DEVICE 1

CRAFT DEVICE 8

SCIP-DSL shown in a SC 1001/1002 enclosure.

SCIP ROUTER APPLICATIONS

Figure 1 shows the primary application of the SCIP-DSL in static router mode, providing NEBS-compliant IP connectivity to the carrier or enterprise internal network and between managed sites.

SCIP-DSL can be located anywhere in the network; for example SCIP-DSL can be located within the Central Office's environment as part of the inside plant, or located in a remote office or CEV-Hut environment as part of the outside plant.

With SCIP-DSL routers deployed in all remote offices, virtually all remote devices can be connected back to the NOC through their Ethernet LAN ports or their craft ports. In addition, the SCIP's exclusive use of static routes provides reduced IP traffic in the carrier or enterprise network.

SCIP LAN-X APPLICATIONS

Figure 2 shows SCIP-DSL in LAN-X mode of operation where a NOC extends its Ethernet network via one or more pairs of SCIPs connected 'back-to-back' over 2-wire copper G.shdsl loops. This configuration provides NEBS-compliance and extends carrier or enterprise networks; any remote device can be accessed from the NOC via SCIP. The Ethernet can be extended within a building (i.e., between floors) or, more typically, across a WAN connection.

SCIP-DSL can be located anywhere in the carrier or enterprise network; for example, in the Central Office environment as part of the inside plant, or located in a remote office or CEV-Hut environment as part of the outside plant.

SCIP-DSL in LAN-X mode emulates a "flat" IP network, in that inband management is conducted in one direction from a specified SCIP port at the NOC to the remote site(s).

Figure 2: SCIP-DSL in LAN-X Mode

SCIP-DSL shown installed in SpectraComm Standalone Enclosures.
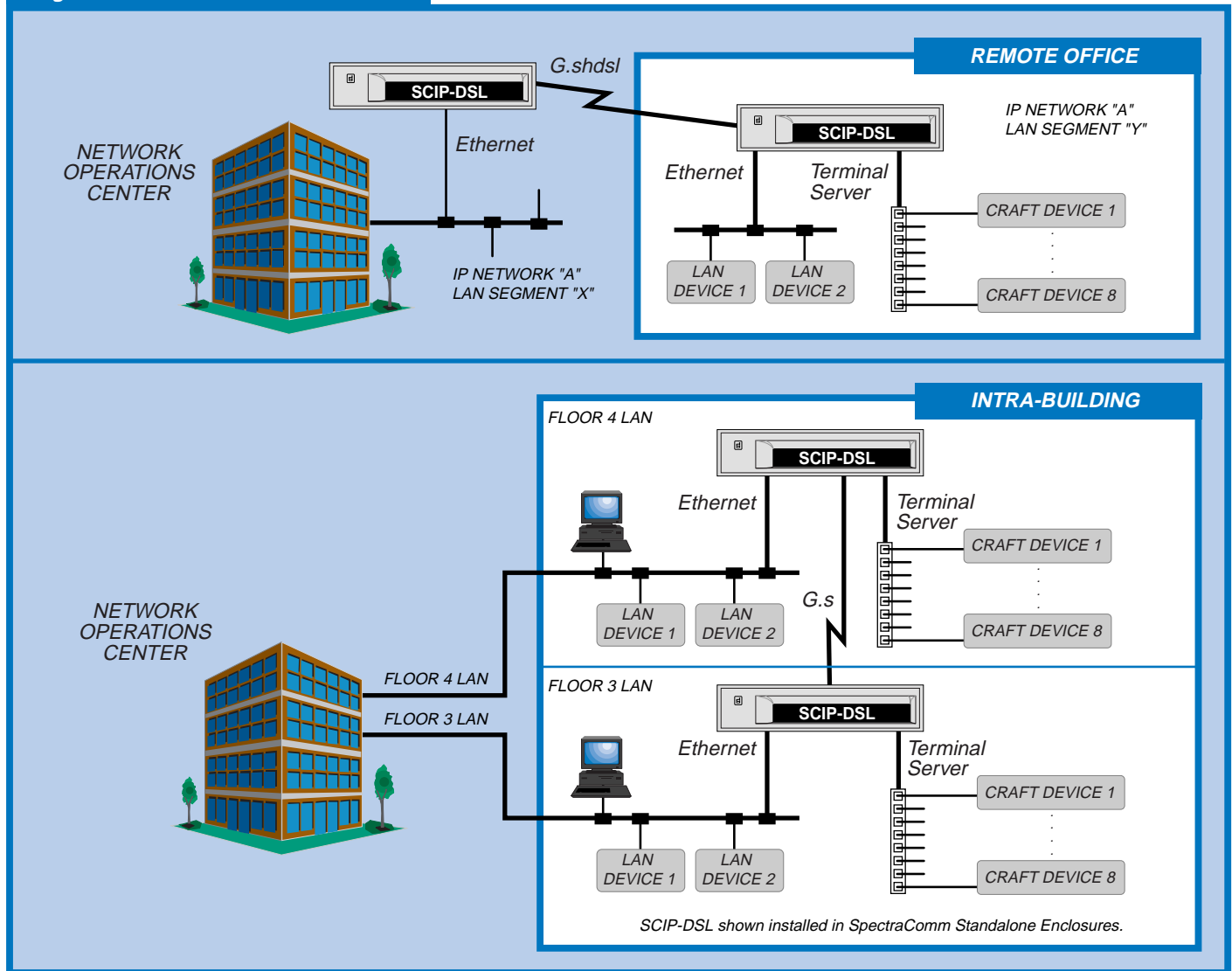
ADDITIONAL FEATURES

- Employs GDC's 'Smart CLI', an interactive command line interface, and the intuitive web (HTTP) interface.
- Remote access to eight craft devices and two LAN switching devices.
- Transports data at rates of 192 Kbps to 5.6 Mbps (2-wire) or 384 Kbps to 11.3 Mbps (4-wire) using the standard G.shdsl interface.
- Provides Telnet 'cut-thru' to terminal server ports.
- Frame Relay or PPP for link layer encapsulation of IP traffic
- Efficient configuration of multiple SCIPs via ASCII batch file upload/download
- High performance 'run from ram' architecture includes Running, Primary and Standby versions of software.
- Software can be upgraded via TFTP or FTP.
- Supports an external V.34 modem at the craft interface.
- Secure SCIP configuration via dial-up connectivity.
- Supports Spanning Tree Protocol (STP) which eliminates loops and provides fault tolerance
- Supports MACL (Media Access Control List) Security which identifies invalid users by their MAC address.
- Supports Ethernet broadcast limiting, Ethernet jumbo packets, and priority queueing of IP traffic marked for expedited forwarding.
- Provides Auto Rate Adaptation which negotiates the optimal data rate for SCIP-DSL devices on either end of the link, based on length and condition of the circuit.

NEBS-Compliant - Telco Tough

The SCIP-DSL is NEBS Level III compliant and can be deployed in the 16-slot SC 5000 high density shelf or the 2-slot SC 2000 low density shelf. Non-NEBS standalone applications can use a single SCIP-DSL card in SpectraComm AC or DC standalone enclosures.

Flexible and Scalable Connectivity

Any SpectraComm device, from SC 202 to SC 800 T3, can be co-located in the shelf with SCIP-DSL cards, providing a unified, flexible, managed shelf environment that is scalable to carrier or enterprise network requirements. Typical shelf configurations can include SCIP-DSL cards with SpectraComm Ethernet Switch cards (SC-ES 9-Port or SC-ES 18-Port), along with GDC modems, CSU/DSUs, LTUs multiplexers and transport devices.

SCIP-DSL and SCES Applications

In applications with SC-ES cards, several 10/100B-T Ethernet devices can be connected on the same network segment at maximum speed and improved LAN performance. In a SC 5000 shelf at a remote site, the SC-ES 9-port or SC-ES 18-port device connects to one of SCIP-DSL's two ethernet ports, for a maximum of 36 ports attached to each SCIP-DSL card. A SCIP and SCES application can extend carrier or enterprise management networks to reach remote devices attached to a scalable Ethernet LAN.

Your Connectivity Requirements	SCIP-DSL Solutions
Local legacy devices and two local LANs	The terminal server connects to up to eight legacy device craft port; the Ethernet interface connects to two hosts, hubs or switches, reaching devices attached to associated LANs.
Remote legacy devices via G.shdsl	The G.s interface connects to SCIP-DSL at the remote site, reaching up to eight remote legacy devices.
LAN-attached devices at remote sites on the same IP network (i.e., a flat IP network)	SCIP LAN-extension reaches any LAN or craft-attached device at remote sites.
LAN-attached devices at remote sites on separate IP networks	SCIP static routing reaches LAN or craft devices at remote sites; static routes required.
Local or remote switched Ethernet devices	SCIP and SC-ES cards provides switched connectivity to remote sites (SC-ES 9-Port switch or SC-ES 18-port switch)
Secure and authenticated access for remote users	Password-protected access to SCIP via an external modem. Integrates with optional TACACS+ Authentication via LAN or an external GDC modem, and a customer-supplied TACACS+ server. Supports SNMP traps for all interfaces from illegal MAC addresses link up/down, and several other alarms. Integrates with optional SSH via SSH Server for CLI, SSH "cut-thru" terminal server, and SSH Client for dial-in connections.

SCIP-DSL MANAGEMENT INTERFACES

SC-IP-DSL configuration is managed through SMART CLI, an interactive command line interface, or through graphical user interface (GUI) web screens. Through these interfaces, authorized users can monitor or configure any SCIP-DSL in the network from a terminal or Telnet connection or through any popular web browser.

Secure Access and Protection

Management access at CLI and web interfaces is protected by several SCIP-DSL security features:
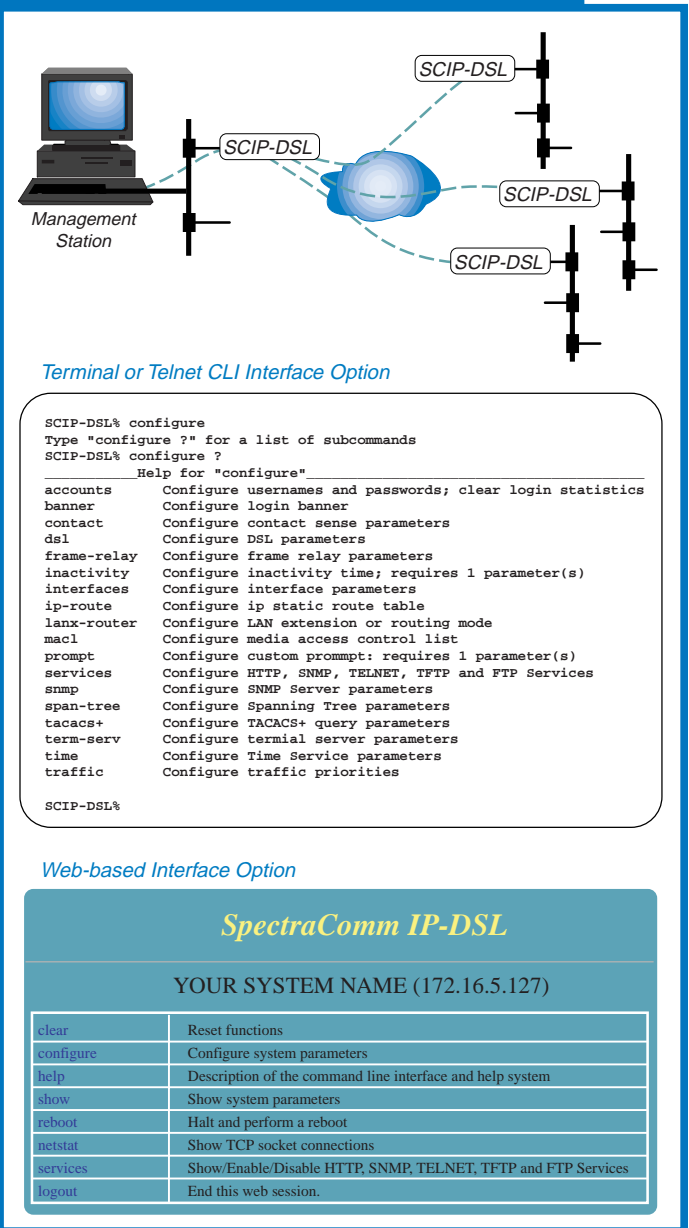
- User- and Supervisor-level password protection authorizes every access attempt.

- Inactivity logoff prevents hacks through 'left on' equipment.

- Enable/Disable of SNMP, HTTP, FTP and TFTP services deters hacking through these protocols.

- Enable/Disable management traffic, by interface for provider and customer access schemes.

- Enable/disable Auto-fallback and Auto-Restoral

- Supports DSL or DDS network access via synchronous DTE interface to an external DSU (UAS611 DSU or SC521A/S DSU, respectively).

- Supports TACACS+ authentication protocol (optional) which centralizes security at a network access server.

- Supports SNMP traps for a variety of events.

- Supports SSH protocol (optional) which uses encryption and RSA keys for added security.

SMART CLI Features

General DataComm's SMART CLI has a look and feel that will be familiar to most field personnel, with the benefit of several enhancements over most standard CLIs, such as:

- Recognition and auto-expansion of abbreviated commands and sub-commands.

- Auto-prompts for required command arguments.

- General help at the command prompt.

- Context-sensitive help at the command string.

- Command line recall for easy re-entry or review of previous commands.

- Advanced utility for generating downloadable ASCII configuration files as batch scripts.

- SCIP-DSL upgrades via TFTP or FTP downloads of software versions and configuration data.

- Command entry from a Telnet or terminal connection, or using a standard browser.

Figure 5: SCIP Management Interface Options

Management Station

SCIP-DSL

Terminal or Telnet CLI Interface Option

```
SCIP-DSL% configure
Type "configure ?" for a list of subcommands
SCIP-DSL% configure ?
_____Help for "configure"_____
accounts      Configure usernames and passwords; clear login statistics
banner        Configure login banner
contact       Configure contact sense parameters
dsl           Configure DSL parameters
frame-relay   Configure frame relay parameters
inactivity    Configure inactivity time; requires 1 parameter(s)
interfaces    Configure interface parameters
ip-route      Configure ip static route table
lanx-router   Configure LAN extension or routing mode
macl          Configure media access control list
prompt        Configure custom prommpt: requires 1 parameter(s)
services      Configure HTTP, SNMP, TELNET, TFTP and FTP Services
snmp          Configure SNMP Server parameters
span-tree     Configure Spanning Tree parameters
tacacs+       Configure TACACS+ query parameters
term-serv     Configure terminal server parameters
time          Configure Time Service parameters
traffic       Configure traffic priorities

SCIP-DSL%
```

Web-based Interface Option

SpectraComm IP-DSL	
YOUR SYSTEM NAME (172.16.5.127)	
clear	Reset functions
configure	Configure system parameters
help	Description of the command line interface and help system
show	Show system parameters
reboot	Halt and perform a reboot
netstat	Show TCP socket connections
services	Show/Enable/Disable HTTP, SNMP, TELNET, TFTP and FTP Services
logout	End this web session.

Centralized and Versatile Options

Figure 3 illustrates SCIP-DSL centralized management in the Carrier's network. From the central site, SCIP-DSL can be accessed via a craft connection from a VT100-compatible terminal, via a Telnet connection, or via a web interface. The maximum number of concurrent management sessions is determined by your workstation capabilities.

SCIP-DSL Physical Specifications

Single-slot Blade Dimensions
Width: 178 mm (7.0 in.)
Height: 21 mm (0.81 in.)
Depth: 241 mm (9.5 in.)
Weight: 0.28 kg (10 oz) Shipping Weight: 0.74 kg (1 lb 10 oz)

Environmental Specifications

Operating Ambient Temperature:
0 to 50 degrees C (32 to 122 degrees F)

Non-Operating Ambient Temperature:
-40 to 70 degrees C (-40 to 158 degrees F)

Relative Humidity: 5% - 90% non-condensing
Altitude: -60 to 4,000 m (-197 to 13,123 ft)

Electrical Specifications

Power (AC or DC), voltage, frequency, and fusing
determined by your SpectraComm shelf or enclosure.
Power Dissipation: 6 Watts maximum

Security and Authentication

Username and Password verification
Multi-level permissions: User (Read-only), Supervisor (Read-Write), or Administrator (Read-Write and special functions)
Individual disable/enable HTTP, SNMP, TFTP and FTP
HTTP, Telnet, FTP and TFTP timeouts
MACL (Media Access Control List) Security
TACACS+ Authentication Protocol (optional)
SSH Protocol (optional)

Compliance & Compatibility

Designed for NEBS Level III compliance
EMI: FCC Part 15 Class A Approved
Telco: FCC Part 68 Approved
ISO 9001: 2000 Certified
Safety: UL Approved

Management Options

Command line interface via VT100-compatible terminal.
Command line interface via Telnet interface.
Command line interface via web (HTTP) interface;
Embedded webserver agent using PC browser (Supports HTML).
SNMP support for standard statistics: RFC 1213;
MIB for Network Management of TCP/IP-based Internets MIB2;
RFC 1398; Ethernet MIB
IP DiffServ Expedited Forwarding PHB (RFC 2598).

Operational Specifications

Modes of Operation
Router mode: Static routing between any two SCIP-DSL interfaces (IP version 4)

LAN-X mode: Ethernet extension via SCIP-DSL to SCIP-DSL over WAN-G.shdsl interface

Physical Interfaces
Front Panel Craft Port: ASYNC V.24/V.28, TIA/EIA-232 for connection to standard VT100-compatible terminal.

Front Panel Ethernet Ports (2): Full duplex 10/100BaseT Ethernet, ANSI/IEEE 802.3).
Terminal Server Ports (8): ASYNC V.24/V.28, TIA/EIA-232 for connecting up to eight devices.

WAN Ports (2): Standard ITU-T G.shdsl.

G.shdsl Maximum Performance Without Repeaters

	26-gauge (4mm) wire)			
	1 loop (2-wire)		2 loops (4-wire)	
Timeslots/ Loop	Rate (kbps)	Reach (kft)	Rate (kbps)	Reach (kft)
88	5632	5.5	11264	5.5
80	5120	6.0	10240	6.0
72	4608	6.5	9216	6.5
64	4096	7.0	8192	7.0
36	2304	11.5	4608	11.5
31	1984	12.5	3968	12
26	1664	12.5	3328	12.5
24	1536	13	3072	13
21	1344	13	2688	13
10	640	17	1280	15.5
6	384	19	768	18.5
3	192	20.5	384	19.5

Note: Timeslots/Loop values are tested points of N x 64 Kbps configuration options.

SCIP-DSL Diagnostics, Alarms and SNMP Traps

Inject CRCs/Pulse Template
Line Loopback
Remote Loopback
Local Self Test
End-to-End Self Test

Loss of Signal (LOS) alarm
Cyclic Redundancy Check (CRC) error alarm
Loss of Sync Word (LOSWD) defect
Loss of Sync Word (LOSWF) failure
Signal to Noise Ratio (SNR) alarm
Attenuation alarm

Cold Start trap
LinkUp/Down traps for ethernet0, serial0, serial1
Up/Down traps for etherswitch ports 1 and port 2
Contact Sense trap for Start/Stop
Contact Sense trap for Active/Clear
MACL Violation trap
Authentication Failure trap

USDA
RUS Accepted

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