

Lucent Technologies
Bell Labs Innovations



Stinger[®]

T1 and E1 Modules Guide

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Contents

Customer Service	iii
About This Guide	xi
What is in this guide.....	xi
What you should know	xi
Documentation conventions.....	xi
Stinger documentation set.....	xii
Chapter 1 Configuring T1 and E1 Modules	1-1
Introducing the T1 and E1 modules.....	1-1
Overview of supported features	1-3
Interpreting T1 or E1 module status lights.....	1-4
Installing a T1 or E1 module.....	1-5
Profiles associated with a T1 or E1 module.....	1-6
IMAGroup profile.....	1-6
Connection profile	1-12
IMAHW-Config profile.....	1-16
DS1-ATM profile	1-17
DS1-ATM-Stat profile	1-23
IMA-Group-Stat profile	1-28
Slot-Static-Config profile	1-34
High-Speed-Slot-Static-Config profile	1-36
Configuring T1 or E1 module connections.....	1-38
Configuring a long-haul line interface unit (LIU)	1-39
Sample ATM configuration.....	1-39
Sample IMA configuration	1-41
Configuring LIM-to-trunk VP switching.....	1-43
Configuring multiple VPCs on T1 or E1 LIMs	1-46
Enabling LIM-to-trunk virtual path switching on T1 and E1 LIMs	1-46
Configuring multiple VPIs per interface	1-46
Trunk-side connection admission control (CAC).....	1-47
Trunk-side CAC support on T1 and E1 modules	1-48
Command for displaying bandwidth statistics.....	1-48
Commands for checking T1 or E1 module performance.....	1-49
PNNI support on T1/E1 modules.....	1-49
T1 and E1 module specifications	1-49
Specifications common to all T1 and E1 modules	1-49
Specifications unique to T1 modules (STGR-LIM-T1)	1-51
Specifications unique to E1 modules (STGR-LIM-E1)	1-51
Compliance with IMA specifications	1-52
Compliance with ATM specifications	1-54

Chapter 2	Configuring LIM and LIM Port Redundancy	2-1
	Overview of LIM and LIM port redundancy	2-1
	Configuring LIM redundancy	2-1
	Overview of the LIM-Sparing-Config profile	2-2
	Manual LIM redundancy	2-4
	Automatic LIM redundancy.....	2-4
	LIM redundancy with IRMs and LPM-Rs.....	2-6
	Checking LIM redundancy status	2-8
	Checking status with the Rearslot command.....	2-9
	Configuring LIM port redundancy.....	2-9
	Enabling LIM port redundancy.....	2-11
	Manual LIM port redundancy.....	2-12
	Automatic LIM port redundancy	2-12
	Checking the status of extended LIM port redundancy.....	2-13

Figures

Figure 1-1	Inverse multiplexing bandwidth gain	1-3
Figure 1-2	T1 module (STGR-LIM-T1-24)	1-4
Figure 1-3	Sample ATM configuration links	1-40
Figure 1-4	Sample IMA configuration links	1-41
Figure 2-1	LIM redundancy in a Stinger FS	2-2
Figure 2-2	LIM port redundancy on a Stinger FS	2-11

Tables

Table 1-1	Stinger modules for T1 applications	1-2
Table 1-2	Stinger modules for E1 applications	1-2
Table 1-3	T1 and E1 module status lights	1-5
Table 1-4	Using the virtual patch switching parameters	1-45
Table 1-5	Effects of virtual path switching settings for T1 and E1 modules	1-46
Table 1-6	T1 and E1 module common specifications	1-49
Table 1-7	T1-specific specifications	1-51
Table 1-8	E1-specific specifications	1-51
Table 1-9	IMA specifications	1-52
Table 1-10	ATM specifications	1-54

About This Guide

What is in this guide

This guide describes how to configure and monitor the Stinger T1 and E1 modules and includes configuration examples and module specifications. This guide also describes how to configure LIM redundancy.



Warning: Before installing your Stinger unit, be sure to read the safety instructions in the *Edge Access and Broadband Access Safety and Compliance Guide*. For information specific to your unit, see the “Safety-Related Physical, Environmental, and Electrical Information” appendix in the *Getting Started Guide* for your Stinger unit.

What you should know

To make use of the procedures and sample configurations in this guide, you should have a general knowledge of Stinger products and a working knowledge of the command-line interface. You should understand the fundamental concepts of digital subscriber line (DSL) technology and be familiar with the relationship between DSL interfaces and associated configuration profiles.




Documentation conventions

Following are the special characters and typographical conventions that might be used in this manual:

Convention	Meaning
Monospace text	Represents text that appears on your computer’s screen, or that could appear on your computer’s screen.
Boldface monospace text	Represents characters that you enter exactly as shown (unless the characters are also in <i>italics</i> —see <i>Italics</i> , below). If you could enter the characters but are not specifically instructed to, they do not appear in boldface.
<i>Italics</i>	Represent variable information. Do not enter the words themselves in the command. Enter the information they represent. In ordinary text, italics are used for titles of publications, for some terms that would otherwise be in quotation marks, and to show emphasis.

About This Guide

Stinger documentation set

Convention	Meaning
[]	Square brackets indicate an optional argument you might add to a command. To include such an argument, type only the information inside the brackets. Do not type the brackets unless they appear in boldface.
	Separates command choices that are mutually exclusive.
>	Points to the next level in the path to a parameter or menu item. The item that follows the angle bracket is one of the options that appear when you select the item that precedes the angle bracket.
Key1-Key2	Represents a combination keystroke. To enter a combination keystroke, press the first key and hold it down while you press one or more other keys. Release all the keys at the same time. (For example, Ctrl-H means hold down the Control key and press the H key.)
Press Enter	Means press the Enter, or Return, key or its equivalent on your computer.
Note:	Introduces important additional information.
 Caution:	Warns that a failure to follow the recommended procedure could result in loss of data or damage to equipment.
 Warning:	Warns that a failure to take appropriate safety precautions could result in physical injury.
 Warning:	Warns of danger of electric shock.

Stinger documentation set

The Stinger documentation set consists of the following manuals, which can be found at <http://www.lucent.com/support> and <http://www.lucentdocs.com/ins>.

- **Read me first:**
 - *Edge Access and Broadband Access Safety and Compliance Guide*. Contains important safety instructions and country-specific information that you must read before installing a Stinger unit.
 - *TAOS Command-Line Interface Guide*. Introduces the TAOS command-line environment and shows you how to use the command-line interface effectively. This guide describes keyboard shortcuts and introduces commands, security levels, profile structure, and parameter types.
- **Installation and basic configuration:**
 - *Getting Started Guide* for your MAX platform. Shows how to install your Stinger chassis and hardware. This guide also shows you how to use the command-line interface to configure and verify IP access and basic access security on the unit, and how to configure Stinger control module redundancy on units that support it.

- Module guides. For each Stinger line interface module (LIM), trunk module, or other type of module, an individual guide describes the module's features and provides instructions for configuring the module and verifying its status.
- **Configuration:**
 - *Stinger ATM Configuration Guide*. Describes how to integrate the MAX into the ATM and Digital Subscriber Line (DSL) access infrastructure. The guide explains how to configure PVCs, and shows how to use standard ATM features such as quality of service (QoS), connection admission control (CAC), and subbanding.
 - *Stinger IP2000 Configuration Guide*. For MAX systems with the IP2000 control module, this guide describes how to integrate the system into the IP infrastructure. Topics include IP-routed switch-through ATM PVCs and RFC 1483 PVCs that terminate on the IP2000, IEEE 802.1Q VLAN, and forwarding multicast video transmissions on DSL interfaces.
 - *Stinger Private Network-to-Network Interface (PNNI) Supplement*. For the optional PNNI software, this guide provides quick-start instructions for configuring PNNI and soft PVCs (SPVCs), and describes the related profiles and commands.
 - *Stinger SNMP Management of the ATM Stack Supplement*. Describes SNMP management of ATM ports, interfaces, and connections on a MAX unit to provide guidelines for configuring and managing ATM circuits through any SNMP management utility.
 - *Stinger T1000 Module Routing and Tunneling Supplement*. For the optional T1000 module, this guide describes how to configure the Layer 3 routing and virtual private network (VPN) capabilities.
- **RADIUS: TAOS RADIUS Guide and Reference**. Describes how to set up a unit to use the Remote Authentication Dial-In User Service (RADIUS) server and contains a complete reference to RADIUS attributes.
- **Administration and troubleshooting: Stinger Administration Guide**. Describes how to administer the Stinger unit and manage its operations. Each chapter focuses on a particular aspect of Stinger administration and operations. The chapters describe tools for system management, network management, and Simple Network Management Protocol (SNMP) management.
- **Reference:**
 - *Stinger Reference*. An alphabetic reference to Stinger profiles, parameters, and commands.
 - *TAOS Glossary*. Defines terms used in documentation for Stinger units.

Configuring T1 and E1 Modules

Introducing the T1 and E1 modules	1-1
Overview of supported features	1-3
Interpreting T1 or E1 module status lights.	1-4
Installing a T1 or E1 module	1-5
Profiles associated with a T1 or E1 module.	1-6
Configuring T1 or E1 module connections	1-38
Configuring LIM-to-trunk VP switching.	1-43
Configuring multiple VPCs on T1 or E1 LIMs	1-46
Trunk-side connection admission control (CAC)	1-47
Commands for checking T1 or E1 module performance.	1-49
PNNI support on T1/E1 modules.	1-49
T1 and E1 module specifications.	1-49

A Stinger T1 or E1 module provides 8 or 24 T1 or E1 interfaces that can support high-speed transfer of Asynchronous Transfer Mode (ATM) cells.

Introducing the T1 and E1 modules

A T1 or E1 module supports the following ATM connection modes:

- *ATM mode (UNI)*. Each T1 or E1 interface can connect to one or more ATM links using user-network interface (UNI) signaling.
- *ATM mode (PNNI)*. Configured to act as a trunk, a T1 or E1 module (with single interfaces or interfaces grouped in IMA mode) can provide interfaces to the ATM core network using Private Network-to-Network Interface (PNNI) signaling. PNNI software is enabled through a special Lucent Technologies software license.
- *IMA mode*. Under a special software license from Lucent Technologies, the module can use inverse multiplexing to aggregate the bandwidth of up to eight T1 or E1 interfaces as a single logical port for one or more ATM links.

In this guide, single T1 or E1 interfaces or a group of T1 or E1 interfaces configured in IMA mode are referred to as *logical ports*.

Configuring T1 and E1 Modules

Introducing the T1 and E1 modules

Both the T1 and E1 modules are available in two versions, as described in Table 1-1 and Table 1-2.

Table 1-1. Stinger modules for T1 applications

Product code	Description
STGRRT-LIM-T1-8	Provides up to 8 T1 interfaces for use in Stinger RT units, and is designed for their operating environment.
STGRRT-LIM-T1-24	Provides up to 24 T1 interfaces for use in Stinger RT units, and is designed for their operating environment.
STGR-LIM-T1-8	Provides up to 8 T1 interfaces for use in Stinger FS and LS units, and is designed for their operating environment.
STGR-LIM-T1-24	Provides up to 24 T1 interfaces for use in Stinger FS and LS units, and is designed for their operating environment.

Table 1-2. Stinger modules for E1 applications

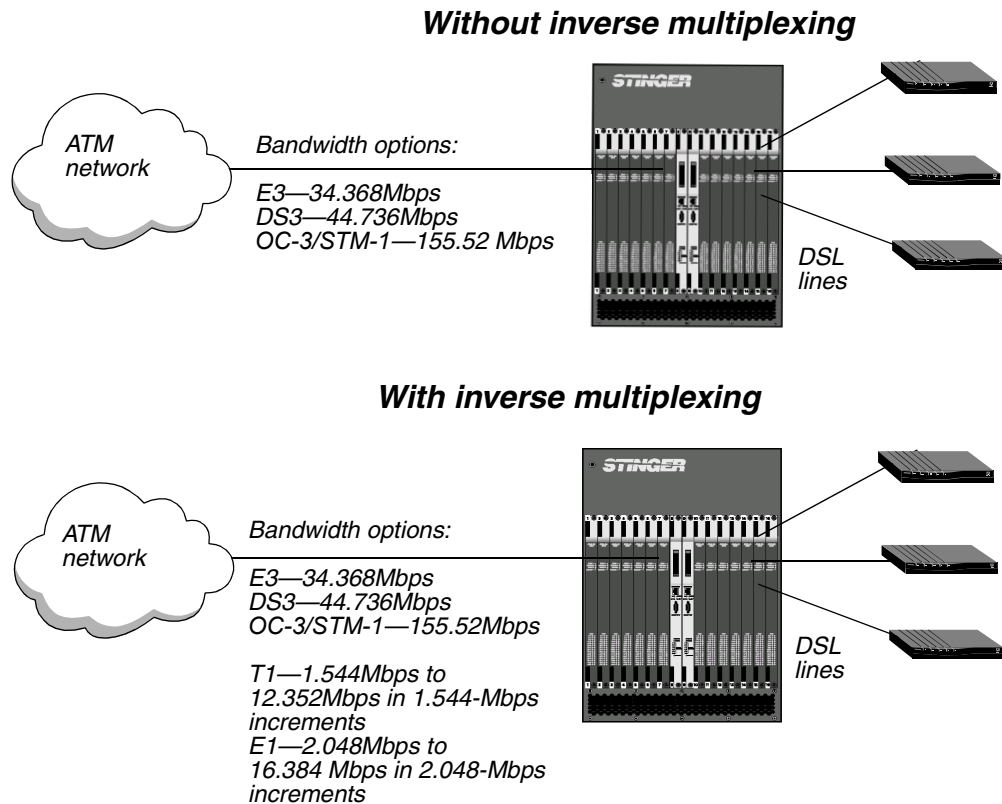
Product code	Description
STGRRT-LIM-E1-8	Provides up to 8 E1 interfaces for use in Stinger RT units, and is designed for their operating environment.
STGRRT-LIM-E1-24	Provides up to 24 E1 interfaces for use in Stinger RT units, and is designed for their operating environment.
STGR-LIM-E1-8	Provides up to 8 E1 interfaces for use in Stinger FS and LS units, and is designed for their operating environment.
STGR-LIM-E1-24	Provides up to 24 E1 interfaces for use in Stinger FS and LS units, and is designed for their operating environment.

Information in this guide applies to all models of T1 and E1 modules unless otherwise specified.

With inverse multiplexing, ATM cells are distributed in round-robin fashion across multiple T1 or E1 interfaces. This distribution method allows the total bandwidth of multiple T1 or E1 lines to be used for outgoing ATM traffic from a Stinger unit when the full bandwidth of a DS3, E3, or OC3 line is not needed.

Figure 1-1 illustrates the bandwidth flexibility that a Stinger unit gains with the implementation of inverse multiplexing.

Figure 1-1. Inverse multiplexing bandwidth gain



Note: With a 24-port T1 or E1 module, up to 3 logical ports of up to 12.352Mbps (T1) or 16.384Mbps (E1) can be created.

Overview of supported features

A T1 or E1 module for a Stinger unit has the following capabilities and compliances:

- Either 8 or 24 T1 or E1 ports, depending on the model
- Support for up to 384 virtual channels (VCs) per module, or up to 384 virtual channels per port, in ATM mode
- Quality of service (QoS) support for constant bit rate (CBR), variable bit rate-real time (VBR-RT), variable bit rate-non real time (VBR-NRT), and unspecified bit rate (UBR) service categories
- Connection admission control (CAC) to track how much guaranteed bandwidth has been allocated and for specifying an oversubscription factor for trunk interfaces.
- Ability to configure multiple virtual path connections (VPCs) over each of a T1 or E1 module's ATM or IMA interfaces, making it possible to set up one for each class of service.
- Cell buffers of up to 8 MB for both incoming and outgoing traffic
- Traffic policing by means of the dual leaky bucket algorithm, also known as the generic cell rate algorithm (GCRA)

Configuring T1 and E1 Modules

Interpreting T1 or E1 module status lights



- Traffic shaping for each logical port in both ATM and IMA modes
- Operation, administration, and maintenance (OAM) support
- Local and remote loopback testing functions
- Support for Private Network-to-Network Interface (PNNI) protocols, including dynamic hierarchical routing for ATM networks and signaling for establishing connections dynamically across ATM networks (requires a Lucent Technologies PNNI software license)
- Compliant with the following standards:
 - ITU-T I.432 recommendation for performing ATM framing by cell delineation
 - ITU-T G.803 and G.804 recommendations for performing cell mapping into T1 and E1 transmission systems
 - ATM Forum T1 physical interface specification AF-PHY-0016.000 (T1 models)
 - ATM Forum E1 physical interface specification AF-PHY-0064-000 (E1 models)
 - ATM Forum inverse multiplexing specification v1.1, AF-PHY-086.001 (This module is also backward compatible with ATM Forum specification v1.0, AF-PHY-0086.000.)

Figure 1-2 (left) illustrates the T1 model (STGR-LIM-T1-24).

Figure 1-2. T1 module (STGR-LIM-T1-24)

Interpreting T1 or E1 module status lights

All status lights illuminate briefly upon startup or restart, then remain dark until the module passes its power-on self test (POST). When the module passes the POST and becomes operational, the ACTIVE light illuminates. It is the only light that is on during normal operation.

Table 1-3 explains the T1 and E1 module status lights.

Table 1-3. T1 and E1 module status lights

Light	Color	Indication
STBY	Orange	The module is a designated spare. The control module switches traffic to the module if one of the other modules fails.
ACTIVE	Green (see note below)	The module or port is fully operational and no errors have been detected.
FAULT	Orange	The module failed to pass its POST.
BYPASS	Orange	The module is in bypass mode. (The module redundancy feature is activated.)
PORT	Green	The local and remote ends of the physical line have achieved frame synchronization, and the local end of the ATM link has achieved cell delineation. If the light is not illuminated, the port is inactive.



Note: On a few T1 and E1 modules manufactured in late 2000, the ACTIVE LED is red. This does not affect the operation of the module. When the ACTIVE LED is lit, the module is fully operational, regardless of whether a red or green LED is installed in the module.

Installing a T1 or E1 module

A T1 or E1 module is installed in the same manner as any other module. (For details, see the *Getting Started Guide* for your unit.) After installation, the module must be connected and configured according to the instructions in this guide.

After installing and connecting the T1 or E1 facilities to their associated Stinger line protection module (LPM), you verify the connection by checking the module's status lights. Using the new TAOS profiles for the module, you then configure a connection to the ATM link. Check the status of the connection with two new status profiles, and check module performance with new TAOS commands.

Profiles associated with a T1 or E1 module

Profiles that are created when a T1 or E1 module is installed and configured in a Stinger unit include the following:

Profile	Description
IMAGroup	Created when you enter the command <code>new imagroup</code> to establish an IMA port. All group-related IMA parameters are stored in this profile.
Connection	Created and administered as in all other Stinger modules.
IMAHW-Config	Used to configure hardware-specific parameters that are common to the IMA chip. For example, because the 24-port T1 and E1 modules contain three chips, three profiles are created. However, because the 8-port T1 and E1 modules each contain a single chip, only one profile is created.
DS1-ATM	Created by the system for each T1 or E1 link when a module is installed. This profile is used to configure the front-end framing, cell delineation, and per-link IMA-specific features of a T1 or E1 link. Per-link IMA-specific parameters are stored in the IMA-Option-Config subprofile of the <code>line-config</code> profile.
DS1-ATM-Stat	Created by the system for each T1 or E1 link when a module is installed. This profile is used to determine the status and statistics for an individual T1 or E1 link. IMA-specific statistics are stored in the IMA-Link-Status and IMA-Line-Statistic subprofiles.
IMA-Group-Stat	Created only after you have properly configured an <code>imagroup</code> profile and associated DS1-ATM profile.
Slot-Static-Config	Used to configure LIM-to-trunk virtual path connections, and for specifying the priority the slot uses in flexible queuing, for 8-port and 24-port T1 or E1 modules.
High-Speed-Slot-Static-Config	Created by the system for each T1 or E1 interface and each configured IMA interface. This profile is used to configure auxiliary ATM parameters for trunk interfaces

IMAGroup profile

The IMAGroup profile configures an inverse multiplexing ATM IMA port. When you enter the command `new imagroup`, a new profile is created to establish all group-related IMA parameters. Following are the parameters of an IMAGroup profile with sample settings:

```
[in IMAGROUP/test (new)]  
name* = test
```

```
active = no
nailed-group = 0
group-symmetry-mode = symmetric-operation
version = v1-1
do-version-fallback = no
ignore-lineup = system-defined
lasr = yes
ne-tx-clk-mode = ctc
tx-min-num-links = 1
rx-min-num-links = 1
ima-id = 0
frame-length = 128
diff-delay-max = 25
check-far-end-ima-id = no
expected-far-end-ima-id = 0
far-end-check-frame-length = no
expected-far-end-frame-length = 128
atm-if-delay = 0
tpp-test-link = 0
tpp-test-pattern = -1
tpp-state = disabled
vp-switching-vpi = 15
```

Parameter	Description
name	Assigns a name to a profile, interface, user, route, host, module, or the Stinger system itself. Specify a descriptive name with no embedded spaces.
active	Specifies whether the profile is enabled or disabled. Valid values are as follows: <ul style="list-style-type: none">• Yes—Specifies that the profile is active.• No—Specifies that the profile is inactive. This is the default.
nailed-group	Specifies a nailed group number associated with a physical line, channel, or interface. Specify an integer from 0 through 1024. The default is 0 (zero). <ul style="list-style-type: none">• In the ATM-Options subprofile, the Nailed-Group value specifies the nailed group number associated with the physical interface used by the first side of the circuit.• In the ATM-Connect-Options subprofile, the Nailed-Group value specifies the nailed group number associated with the physical interface used by the second side of the circuit.

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Description
	<ul style="list-style-type: none">In the DS3-ATM profile, the Nailed-group number indicates the HDSL2 physical interface. A Connection or RADIUS profile specifies this number to make use of the interface. Each interface is assigned a unique default number, so you do not need to modify this parameter. If you assign a new value, it must be a number from 1 through 1024 that is unique within the system.In the OC3-ATM profile, and the Line-Config subprofile of the AL-DMT profile, a Connection or RADIUS profile specifies this number to make use of the interface. Each interface is assigned a unique default number, so you do not need to modify this parameter. If you assign a new value, it must be a number from 1 through 1024 that is unique within the system.
<code>group-symmetry-mode</code>	Specifies the symmetry mode of the inverse multiplexing ATM (IMA) group to which this link belongs.
<code>version</code>	IMA specification version. Valid settings include the following: <ul style="list-style-type: none"><code>v1-0</code>: ATM Forum IMA version 1.0<code>v1-1</code>: ATM Forum IMA version 1.1
<code>do-version-fallback</code>	Specifies whether the Stinger automatically falls back to the earlier version of inverse multiplexing ATM (IMA) if the far end Stinger is detected to be the earlier version. If <code>No</code> is specified when this is detected, the unit moves to the <code>configAborted</code> state. Valid values are as follows: <ul style="list-style-type: none"><code>Yes</code>—Specifies that the unit falls back from version 1.1 to version 1.0.<code>No</code>—Specifies that the unit does not fall back, but moves to the <code>configAborted</code> state. This is the default.
<code>ignore-lineup</code>	This parameter is used differently in the System profile and in the Line profile. In the System profile, specifies whether the Stinger unit ignores line status when determining whether calls are established. In the Line profile, specifies whether the line status of a slot determines the Stinger call control mechanism on a specified port.

Parameter	Description
	<p>In the System profile, specify one of the following values for this parameter:</p> <ul style="list-style-type: none">• <code>no</code>—The Stinger call-control mechanism allows calls to be established when the line state is up and disallows calls when the line state is down. This is the default.• <code>yes</code>—The Stinger call-control mechanism ignores the line state and allows calls to be established on a port as long as the specified slot is operational and the specified port is enabled. <p>In the Line profile, specify one of the following values for this parameter:</p> <ul style="list-style-type: none">• <code>system-defined</code>—Sets the Stinger to inherit the Ignore-Lineup value from the system profile. This is the default.• <code>no</code>—Sets the Stinger call-control mechanism to ignore the system-wide Ignore-Lineup setting and allow calls to be established when the line state is operational and disallow calls on the port when the line state is down.• <code>yes</code>—Sets the Stinger call-control mechanism to ignore both the line state and the systemwide setting and allow calls to be established on the specified port as long as the specified slot is operational and the specified port is enabled.
<code>lasr</code>	<p>Specifies whether link addition and slow recovery (LASR) procedures are enabled or disabled.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>Yes</code>—Specifies that LASR is enabled. This is the default.• <code>No</code>—Specifies that LASR is disabled.

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Description
<code>ne-tx-clk-mode</code>	<p>Specifies the mode of the inverse multiplexing ATM (IMA) Group Clocking.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>ctc</code>—Common transmit clock. Transmit clocks of the links within the IMA group are derived from the same clock source.• <code>itc</code>—Independent transmit clock. Transmit clocks of the links within the IMA group are derived from their respective receive clocks, as, for example, when <code>group-symmetry-mode</code> is set to <code>symmetric-operation</code>.
<code>tx-min-num-links</code>	<p>Specifies the minimum number of active transmission (Tx) links required for an inverse multiplexing ATM (IMA) group to remain in operational state.</p> <p>Specify a number from 1 through 8.</p>
<code>rx-min-num-links</code>	<p>Specifies the minimum number of receiving links to be active in order for the inverse multiplexing ATM (IMA) group to remain in the operational state.</p> <p>Specify a number from 1 through 8.</p>
<code>ima-id</code>	<p>Specifies the inverse multiplexing ATM (IMA) identifier of the IMA group.</p> <p>Specify a number from 0 (zero) through 255.</p>
<code>frame-length</code>	<p>Specifies the frame length for the IMA group.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>32</code>—IMA frame is 32 cells long.• <code>64</code>—IMA frame is 64 cells long.• <code>128</code>—IMA frame is 128 cells long. This is the default.• <code>256</code>—IMA frame is 256 cells long.
<code>diff-delay-max</code>	<p>Specifies the maximum differential delay of the inverse multiplexing for Asynchronous Transfer Mode (ATM) group in milliseconds. For example, if line 1 in the IMA group has a delay of 10 milliseconds, line 2 has a delay of 25 milliseconds, and line 3 has a delay of 5 milliseconds, the maximum differential delay among the 3 lines is 25 minus 5, or 20 milliseconds.</p> <p>Specify a number from 0 (zero) through 281. The default is 25.</p>

Parameter	Description
<code>check-far-end-ima-id</code>	<p>Specifies whether the verification of the the far-end IMA ID during group startup is enabled or disabled.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• Yes—Specifies that this check is enabled.• No—Specifies that this check is not enabled. This is the default.
<code>expected-far-end-ima-id</code>	<p>Specifies a number to check against the IMA ID at the far end. If the parameter <code>check-far-end-ima-id</code> is set to Yes, the far-end inverse multiplexing ATM (IMA) ID is compared against this number (the <code>expected-far-end-ima-id</code>) during group startup, and the group state machine (GSM) moves to <code>ConfigAborted</code> if there is no match.</p> <p>Specify a number from 0 (zero) through 255.</p>
<code>far-end-check-frame-length</code>	<p>Specifies whether to check/compare the expected frame length with the far-end frame length during group start up.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• Yes—Specifies that this check is enabled.• No—Specifies that this check is not enabled. This is the default.
<code>expected-far-end-frame-length</code>	<p>Specifies a length value to check against the frame length at the far end. If the parameter <code>far-end-check-frame-length</code> is set to Yes, then the far-end inverse multiplexing ATM (IMA) value is compared against this number (the <code>expected-far-end-frame-length</code>) during group startup, and the group state machine (GSM) moves to <code>ConfigAborted</code> if there is no match.</p> <p>Enumerated field, values:</p> <ul style="list-style-type: none">• 32—IMA frame is 32 cells long.• 64—IMA frame is 64 cells long.• 128—IMA frame is 128 cells long.• 256—IMA frame is 256 cells long.
<code>atm-if-delay</code>	<p>Specifies the minimum time in seconds for IMA data cell rate (IDCR) changes between the subsequent ATM layer. Pertains to inverse multiplexing ATM (IMA).</p> <p>Valid range is from 0 through 2147483647.</p>

Parameter	Description
tpp-test-link	Specifies a Simple Network Management Protocol (SNMP) interface as the test link for use in the test pattern procedure. Valid range is from -1 through 24.
tpp-test-pattern	Indicates a number that specifies the test pattern transmitted in the IMA control protocol (ICP) cell (octet 17) on the link during the inverse multiplexing ATM (IMA) test pattern procedure. Valid range is from -1 through 255.
tpp-state	Enables or disables the test pattern procedure. Valid values are as follows: disabled— Test pattern procedure is currently disabled on this link. operating— Test pattern procedure is currently operating on this link.
vp-switching-vpi	Specifies the virtual path identifiers (VPIs) that the system uses for VP switching on the line interface module (LIM) port. Specify a VPI from 1 through 31. The default is 15.

Connection profile

Following is a Connection profile with sample settings:

```
[in CONNECTION/test (new)]
station* = test
active = no
encapsulation-protocol = atm-circuit
called-number-type = national
dial-number = ""
clid = ""
auto-profiles = yes
ip-options = { yes yes 0.0.0.0/0 0.0.0.0/0 1 60 120 no 0 0.0.0.0
routing-off ""+
bridging-options = { 0 no }
session-options = { "" "" no 120 no-idle 120 "" 0 disabled autobaud
784000 9280+
telco-options = { ans-and-orig no ft1 1 no no 56k-clear 0 "" "" no 0
any }
ppp-options = { no-ppp-auth none "" none "" "" "" "" stac 1524 no 600
600 no 15+
mp-options = { 1 1 2 }
mpp-options = { "" quadratic transmit 1 1 15 5 10 70 }
fr-options = { "" 16 "" transparent-link no "" 16 "" }
```


Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Specifies
<code>called-number-type</code>	<p><i>Not currently used in the Frame Relay Profile.</i> Specifies the type of phone number entered in the Connection profile. When the Stinger dials an outgoing call, the carrier uses the value of Called-Number-Type in a Connection profile to interpret the dialed phone number.</p> <p>Specify one of the following values:</p> <ul style="list-style-type: none">• <code>Unknown</code>—The phone number is of an unknown type.• <code>International</code>—Phone numbers outside the U.S.• <code>National</code>—Phone numbers within the U.S. This is the default.• <code>Local</code>—Phone numbers within your Centrex group.• <code>Abbrev</code>—Add-on numbers only.• <code>Network-Specific</code>—The dialed network interprets the phone number. This setting uses <code>TypeOfNumber=3</code> in the called party's Information Element.
<code>dial-number</code>	<p>Specifies the phone number used to dial the connection.</p> <p>Specify the phone number of the remote station. You can enter up to 24 characters. The default is null.</p>
<code>clid</code>	<p>Specifies the phone number of the remote station (the calling line ID). If the CLID is present for an incoming call, the Stinger can use the CLID value for CLID authentication before answering the call.</p> <p>Specify the calling party's phone number. You can enter up to 24 characters. The default is null.</p>
<code>auto-profile</code>	<p>Specifies whether the automatic creation of an accessory profile for ATM termination and ATM circuit is enabled or disabled when the LAN session is established on the IDSL line interface module.</p> <p>When PPP transparent circuit or Frame Relay circuit encapsulation is configured for connection profiles assigned to the Stinger IDSL LIM, accessory profiles for ATM termination and ATM circuit are created automatically when the LAN session is established on the interface. The accessory profiles are created with the station name set to the station name of the parent PPP transparent circuit or Frame Relay circuit connection profile. The suffix <code>SYXA</code> is added to the accessory ATM termination profile name, and the suffix <code>SYXC</code> is added to the accessory ATM circuit profile name.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>Yes</code>—Specifies that automatic profile creation is enabled. This is the default.• <code>No</code>—Specifies that automatic profile creation is disabled.

Parameter	Specifies
<code>ip-options</code>	<i>Not currently used.</i> Subprofile containing IP routing settings.
<code>bridging-options</code>	Bridging specific configuration options. Complex field, cannot be set directly.
<code>session-options</code>	<i>Not currently used.</i> Subprofile that specifies session settings not specific to any encapsulation method or network protocol.
<code>telco-options</code>	Subprofile that enables you to set telephone company options for a connection.
<code>ppp-options</code>	Subprofile that contains settings for Point-to-Point Protocol (PPP) calls. The Stinger unit also uses the <code>ppp-options</code> settings for the PPP variants, Multilink Protocol (MP) and Multilink Protocol Plus (MP+).
<code>mp-options</code>	<i>Not currently used.</i> Connection subprofile containing Multilink Protocol (MP) encapsulation settings.
<code>mpp-options</code>	<i>Not currently used.</i> Answer-Defaults subprofile containing Multilink Protocol Plus (MP+) encapsulation settings.
<code>fr-options</code>	Subprofile containing settings for Frame Relay settings.
<code>tcp-clear-options</code>	<i>Not currently used.</i> Subprofile with default setting for TCP Clear connections.
<code>answer-options</code>	<i>Not currently used.</i> Type(s) of calls enabled by the Connection profile—incoming calls, outgoing calls, or both.
<code>usrRad-options</code>	<i>Not currently used.</i> Subprofile that defines connection-specific RADIUS accounting options.
<code>calledNumber</code>	<i>Not currently used.</i> For called-number authentication, the number the remote end called to establish the connection. In many cases, the number is the same as the <code>dial-number</code> setting, but without a trunk group or dial prefix.
<code>cross-connect-index</code>	Indicates the cross-connect index in the AToM MIB. For related information, see the <i>Stinger Private Network-to-Network Interface (PNNI) Supplement</i> . Read-only field.
<code>atm-options</code>	Subprofile containing options for configuring an Asynchronous Transfer Mode (ATM) terminating connection or the first (incoming) leg of an ATM circuit.
<code>atm-connect-options</code>	Subprofile containing options for configuring the second leg of an ATM circuit.
<code>atm-qos-options</code>	<i>Not currently used.</i> Traffic contract name(s) for the upstream and downstream traffic on the ATM circuit.
<code>atm-aal-options</code>	AAL Configuration options. Complex field, cannot be set directly.

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Specifies
<code>conn-user</code>	<p>Specifies whether a soft virtual path connection (SPVC) is for a user or for a signaling channel.</p> <p>The field is read-only and has one of two values:</p> <ul style="list-style-type: none"><code>default</code>—represents any normal user connection.<code>cpcs</code>—(common part convergence sublayer) indicates that the profile was created automatically for use by the ATM signaling control channel.

IMAHW-Config profile

Following are the parameters for the IMAHW-Config profile, shown with sample settings.

```
[in IMAHW-CONFIG/{ shelf-1 slot-3 1 }]
name = 1:3:1
physical-address* = { shelf-1 slot-3 1 }
alpha-ima-value = 2
beta-ima-value = 2
gamma-ima-value = 1
alpha-cell-delin-value = 7
delta-cell-delin-value = 6
```

Parameter	Specifies
<code>name</code>	<p>Assigns a name to a profile, interface, user, route, host, module, or the Stinger system itself. Specify a descriptive name with no embedded spaces.</p>
<code>physical-address</code>	<p>Identifies the physical address of an interface.</p> <p>The physical address has the format <code>{ shelf slot item }</code>, where:</p> <ul style="list-style-type: none"><code>shelf</code> is the shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.<code>slot</code> is the number of the item's expansion slot. Physical expansion slots are numbered from 1 through 16, starting with 1 for the slot just below the shelf controller module. The slot value 17, <code>controller</code>, or <code>c</code> specifies the shelf controller module. For example, to address the first slot on shelf 1: <code>{ 1 1 0 }</code><code>item</code> is the item on the module. Items are numbered starting with 1 for the leftmost item on the module. An item number of 0 (zero) denotes the entire slot. For example, to address line 48 on an SDSL module in slot 2 on shelf 1: <code>{ 1 2 48 }</code>

Parameter	Specifies
alpha-ima-value	Specifies the alpha value used to specify the number of consecutive invalid IMA Control Protocol (ICP) cells to be detected before changing to IMA HUNT state from the SYNC state. Specify the number 1 or the number 2.
beta-ima-value	Specifies the number of consecutive invalid IMA Control Protocol (ICP) cells to be detected before moving to the IMA HUNT state from the SYNC state. Valid numbers range from 1 through 5.
gamma-ima-value	Used for inverse multiplexing ATM (IMA). The gamma value used to specify the number of consecutive valid IMA Control Protocol (ICP) cells to be detected before moving to IMA SYNC state from the PRESYNC state. Specify a number from 1 through 5.
alpha-cell-delin-value	Specifies the cell delineation alpha value. This value designates the number of consecutive cells with incorrect header error checks (HEC) to leave the SYNC state to go to the HUNT state. Specify a number from 1 through 16.
delta-cell-delin-value	Specifies the number of consecutive cells with correct header error count (HEC) to leave the PRESYNC state to go to the SYNC state. Specify a number from 1 through 16. The default is 6.

DS1-ATM profile

Following are the parameters for the DS1-ATM profile, shown with sample settings.

```
[in DS1-ATM/{ shelf-1 slot-3 9 }]
name = 1:3:9
physical-address* = { shelf-1 slot-3 9 }
enabled = no
sparing-mode = inactive
line-config = { esf b8zs 109 no-loopback not-eligible high-priority
none no-cod+
admin> list line-config
[in DS1-ATM/{ shelf-1 slot-3 9 }:line-config]
frame-type = esf
encoding = b8zs
nailed-group = 109
loopback = no-loopback
clock-source = not-eligible
clock-priority = high-priority
FDL = none
send-code = no-code
front-end-type = short-haul
line-length = 1-133
```

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

```
line-build-out = 0-db
pcm-mode = clear-channel
coset-enabled = yes
scrambling-enabled = no
hec-correction-enabled = no
vp-switching-vpi = 15
ima-option-config = { { 8 3 fast auto 10 0 } { 3 fast 10 100 auto 10
2500 10000+
```

```
admin> list ima-option-config
```

```
[in DS1-ATM/{ shelf-1 slot-3 9 }:line-config:ima-option-config]
```

```
txlink-config = { 8 3 fast auto 10 0 }
```

```
rxlink-config = { 3 fast 10 100 auto 10 2500 10000 10 }.
```

Parameter	Description
name	Assigns a name to a profile, interface, user, route, host, module, or the Stinger system itself. Specify a descriptive name with no embedded spaces.
physical-address	Identifies the IMA line configuration within the Stinger system. The <code>physical-address</code> parameter is a complex field that cannot be set directly.
enabled	Specifies whether DS-ATM interface is enabled or disabled. Valid values are as follows: <ul style="list-style-type: none">• <code>Yes</code>—Specifies that the interface is enabled.• <code>No</code>—Specifies that the interface is disabled. This is the default.
sparing-mode	Enables or disables sparing, and specifies the sparing mode to use. Specify one of the following values: <ul style="list-style-type: none">• <code>Manual</code>—Enables sparing.• <code>Inactive</code>—Disables LIM port sparing. This is the default.• <code>Automatic</code>—Activates automatic sparing for the port. The values of the error threshold parameters in the <code>auto-lim-sparing-config</code> ><code>lim-sparing-config</code> [<i>slot number</i>] profile are used.
line-config	A subprofile containing line configuration options for the ATM-DS1 module.

Parameter	Description
frame-type	<p>The super-framing mode that is used on the physical link(s). Valid settings include the following:</p> <ul style="list-style-type: none">• d4• esf• g703
encoding	<p>The layer 1 line encoding used for the physical link(s). Valid settings include the following:</p> <ul style="list-style-type: none">• ami• b8zs• hdb3
nailed-group	<p>Specifies the group index that this link belongs to. A numeric value from 1 to 2048.</p>
loopback	<p>Specifies the loopback mode. Valid settings include the following:</p> <ul style="list-style-type: none">• no-loopback—(the default) the interface is operating normally.• fe-loopback—(front-end loopback) received data is transmitted back to the far-end by the transceiver at the near-end.• line-loopback—the received data is looped back to the far-end without doing any reframing of the T1/E1 frame.• remote-loopback—remote payload loopback. The received payload on the line is transmitted back to the far-end by reframing the payload at the near-end transmitter.• local-loopback—local loopback. The transmitted data is looped back to the near-end receiver by the local transceiver.
clock-source	<p>Specifies whether the unit obtains the system clock signal from the port. In an IDSL profile this parameter specifies whether the unit obtains the system clock signal from the IDSL line. Valid values are as follows:</p> <ul style="list-style-type: none">• eligible—Specifies that the line can be used as the master clock source.• not-eligible—Specifies that the line can not be used as the master clock source.

Parameter	Description
<code>clock-priority</code>	<p>Assigns a clock priority to an interface. When multiple interfaces are eligible to be the clock source for synchronous transmissions, the Stinger uses the value you specify to select an interface as the master clock source. If multiple interfaces are eligible to be the clock source and each interface has an equal Clock-Priority value, the Stinger chooses a clock source at random.</p> <p>Specify one of the following values:</p> <ul style="list-style-type: none">• <code>high-priority</code>—Specifies the highest priority. The Stinger chooses an interface with this priority setting as the clock source over other interfaces with a lower priority. If more than one interface has the highest priority, the first available interface becomes the clock source.• <code>middle-priority</code>—Specifies the second priority. The Stinger chooses an interface with this priority setting if every interface with a high-priority setting is unavailable. If more than one interface has a middle-priority setting, the first available middle-priority interface becomes the clock source. This is the default.• <code>low-priority</code>—Specifies the lowest priority. The Stinger chooses an interface with this priority only if every interface with a higher priority setting is unavailable. If more than one interface has a low-priority setting, the first available low-priority interface becomes the clock source. <p>Once the Stinger chooses an interface as the clock source, it uses that interface until it becomes unavailable, or a until a higher-priority source becomes available.</p>
<code>FDL</code>	<p>The Facilities Data Link (FDL) type used for end-to-end performance monitoring.</p> <p>The FDL type can be set with the following options:</p> <ul style="list-style-type: none">• <code>none</code>—(the default) no FDL is used.• <code>AT&T</code>—supports the ESF FDL exchange as recommended by AT&T Technical publication, Pub 54016.• <code>ansi</code>—supports the FDL exchange as recommended by ANSI T1.403.• <code>sprint</code>—supports the FDL exchange as recommended by Sprint.

Parameter	Description
<code>send-code</code>	<p>The type of code to be sent across the DS1 interface.</p> <p>Valid settings include the following:</p> <p>The <code>send-code</code> parameter can assume the following code pattern values:</p> <ul style="list-style-type: none">• <code>No Code</code>—send looped or normal data.• <code>Line Code</code>—send a request for a line loopback.• <code>Payload Code</code>—send a request for a payload loopback.• <code>Reset Code</code>—send a loopback termination request.• <code>QRS/PRBS</code>—send a Quasi-Random Signal (QRS) test pattern.• <code>Pattern</code>—send a 511 bit fixed test pattern.• <code>3 in 24 Pattern</code>—send a fixed test pattern of 3 bits set in 24.• <code>1 in 16 Pattern</code>—send a fixed test pattern of 1 bit set in 16.• <code>All Ones</code>—send a fixed test pattern of all 1s (ones).• <code>All Zeros</code>—send a fixed test pattern of all 0s (zeros).• <code>Alternating 1s/0z</code>—send a fixed test pattern of alternating 1s (ones) and 0s (zeros).• <code>Double Alternating 1s/0z</code>—send a fixed test pattern of double alternating 1s (ones) and 0s (zeros).• <code>(2²⁰ - 1) Pattern Type</code>—send the Pseudo Random Pattern type (2²⁰ - 1) (ITU-T recommendation O.151).
<code>front-end-type</code>	<p>Front end type of the E1 transceiver. Valid settings include the following:</p> <ul style="list-style-type: none">• <code>short-haul</code>—Short Haul• <code>long-haul</code>—Long Haul (120 Ohm termination only)
<code>line-length</code>	<p>Specifies the length of the physical line in feet for connecting to short-haul digital cross-connect (DSX) devices.</p>

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Description
	Valid values are as follows:
	<ul style="list-style-type: none">1-133—Equivalent to 0.3m through 40.5m. This is the default.134-266—Equivalent to 40.8m through 81.1m.267-399—Equivalent to 81.4m through 121.6m.400-533—Equivalent to 121.9m through 162.5m.534-655—Equivalent to 162.8m through 199.6m.
line-build-out	Line buildout value for CSU lines. Valid settings include the following: <ul style="list-style-type: none">0-db—This is the default.7.5-db15-db22.55-db
pcm-mode	<i>Not currently used.</i> Number of active channels in PCM highway. Valid settings include the following: <ul style="list-style-type: none">isdn—Use 23 channels to carry the cellsclear-channel—Use 24 channels to carry the cells
coset-enabled	Selecting <i>yes</i> signifies that the ATM Forum polynomial (coset polynomial) be added to HEC before the HEC verification of a received cell. In the transmit direction, this selection enables generation of a HEC with the coset polynomial value. Selecting <i>no</i> signifies that the ATM Forum polynomial (coset polynomial) not be added to HEC before HEC verification of a received cell. In the transmit direction, selecting <i>no</i> enables generation of a HEC without the coset polynomial value.
scrambling-enabled	Selecting <i>yes</i> enables the descrambling of received cells on the link. The payload of transmitted cells is scrambled. Selecting <i>no</i> disables the descrambling of received cells on the link. The payload of transmitted cells is not scrambled.
hec-correction-enabled	Selecting <i>yes</i> enables correction of cells received with a single-bit error in the HEC. Selecting <i>no</i> disables correction of cells received with a single-bit error in the HEC.

Parameter	Description
vp-switching-vpi	Numeric field from 1 through 31. VPI used for VP switching. The rest of the valid VPIs in the valid VPI-VCI range are used for the VC switching. Changes in this range take effect immediately. When changing this value, all connections on this port's LIM are dropped to make this new value effective immediately. Valid only when the port is in ATM mode.
ima-option-config	A subprofile for configuration of an inverse multiplexing ATM (IMA) interface.
txlink-config	A subprofile for configuring the transmitting link in an inverse multiplexing ATM (IMA) connection.
rxlink-config	A subprofile for configuration of the receiving link in an inverse multiplexing ATM (IMA) connection.

DS1-ATM-Stat profile

Following are the parameters for the DS1-ATM-Stat profile, shown with sample settings.

```
[in DS1-ATM-STAT/{ shelf-1 slot-3 9 }]
physical-address* = { shelf-1 slot-3 9 }
line-mode=uni
line-state = disabled
loss-of-carrier = True
loss-of-sync = False
ais-receive = True
yellow-receive = False
ber-receive = False
carrier-established = False
cell-delineation = False
network-loopback = False
spare-physical-address = { any-shelf any-slot 0 }
sparing-state = sparing-none
sparing-change-reason = unknown
sparing-change-time = 0
sparing-change-counter = 0
vpi-vci-range = vpi-0-15-vci-32-127
vp-switching-vpi = 15
ima-link-status = { not-in-group not-in-group not-in-group
not-in-group no-fail+
ima-link-statistic = { 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 }
```

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

```
send-code-status = disabled
pattern-test-status = none
```

Parameter	Description
<code>physical-address</code>	<p>Identifies the physical address of an interface.</p> <p>The physical address has the format <code>{ shelf slot item }</code>, where:</p> <ul style="list-style-type: none"><code>shelf</code> is the shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.<code>slot</code> is the number of the item's expansion slot. Physical expansion slots are numbered from 1 through 16, starting with 1 for the slot just below the shelf controller module. The slot value 17, <code>controller</code>, or <code>c</code> specifies the shelf controller module. For example, to address the first slot on shelf 1: <code>{ 1 1 0 }</code><code>item</code> is the item on the module. Items are numbered starting with 1 for the leftmost item on the module. An item number of 0 (zero) denotes the entire slot. For example, to address line 48 on an SDSL module in slot 2 on shelf 1: <code>{ 1 2 48 }</code>
<code>line-mode</code>	<p>Indicates whether the mode in which this line is operating is user-to-network-interface (UNI) or inverse multiplexing ATM (IMA).</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none"><code>uni</code>—Link operates in UNI mode.<code>ima</code>—Link operates in IMA mode.
<code>line-state</code>	<p>Indicates the overall state of a line. The Line-State setting is read only. You cannot set Line-State directly.</p>
<code>loss-of-carrier</code>	<p>Indicates a loss of carrier on the DS1 ATM line.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none"><code>false</code>—Indicates no loss of carrier.<code>true</code>—Indicates a loss of carrier.
<code>loss-of-sync</code>	<p>Indicates a loss of synchronization on the DS1 ATM line.</p> <p>Valid values for this read-only parameter are as follows:</p> <ul style="list-style-type: none"><code>true</code>—Indicates a loss of synchronization.<code>false</code>—Indicates no loss is indicated.

Parameter	Description
<code>ais-receive</code>	<p>Indicates whether the remote end is sending an alarm indication signal (AIS) on the line. The remote end sends an AIS (instead of normal data) to take the line out of service.</p> <p>The AIS-Receive setting is read-only. Values are as follows:</p> <ul style="list-style-type: none">• <code>True</code>—Indicates that the remote end is sending an AIS.• <code>False</code>—Indicates that the remote end is not sending an AIS.
<code>yellow-receive</code>	<p>Indicates whether the local device has received a loss-of-frame (Yellow Alarm) indication. A Yellow Alarm indicates that a device on the line has detected framing errors in the signal.</p> <p>Valid values for this read-only setting are:</p> <ul style="list-style-type: none">• <code>true</code>—Indicates that the local device has received a Yellow Alarm indication.• <code>false</code>—Indicates that the local device has not received a Yellow Alarm indication.
<code>ber-receive</code>	<p>Indicates whether the bit-error rate threshold has been reached or not.</p> <p>Read-only display. True indicates that the bit-error rate threshold has been reached. False indicates that it has not been reached.</p>
<code>carrier-established</code>	<p>Indicates whether there are no error conditions on the physical line connection.</p> <p>Valid values for this read-only parameter are as follows:</p> <ul style="list-style-type: none">• <code>true</code>—Indicates there are no error conditions.• <code>false</code>—Indicates there are error conditions.
<code>cell-delineation</code>	<p>Indicates that ATM cell delineation (cell transfer below specified HEC level) has been reached.</p> <p>Valid values for this read-only display are as follows:</p> <ul style="list-style-type: none">• <code>true</code>—Indicates cell-delineation has been reached.• <code>false</code>—Indicates cell-delineation has not been reached.

Parameter	Description
<code>network-loopback</code>	<p>Indicates whether there is a line looped back out to the network.</p> <p>For this read-only parameter, valid values are <code>true</code> and <code>false</code>. <code>True</code> indicates that a line is looped back to the network. <code>False</code> indicates that no line is looped back to the network.</p>
<code>spare-physical-address</code>	<p>Specifies the sparing peer of this trunk port. If the current port is the primary trunk port, the value identifies its spare (secondary) trunk port. If the current port is the secondary trunk, the value identifies the primary trunk port.</p> <p>In the DS3-ATM or OC3-ATM profile, specify a complex value that includes the shelf number, slot number and item (port) number of the spare trunk port. To specify the values, include both <code>spare-physical-address</code> and the relevant subfield in each <code>Set</code> command.</p>
<code>sparing-state</code>	<p>State of the sparing function. Specifies or indicates, depending upon the profile in which it occurs, whether the sparing function for the port is enabled or disabled.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>sparing-none</code>—Redundancy is not enabled. This is the default.• <code>primary-active</code>—Redundancy is enabled. This primary line is active, with an inactive secondary line.• <code>primary-inactive</code>—Redundancy is enabled. This primary line is inactive, with an active secondary line.• <code>secondary-active</code>—Redundancy is enabled. The secondary line is active and primary line is inactive.• <code>secondary-inactive</code>—Redundancy is enabled. The secondary line is inactive and the primary line is active.• <code>not-applicable</code>—Indicates that LIM redundancy is not applicable to this module. <p>Note: In the DS3-ATM-Stat and OC3-ATM-Stat profiles, the <code>Sparing-State</code> value is read only.</p>

Parameter	Description
<code>sparing-change-reason</code>	<p>Indicates how the sparing setup has been activated.</p> <p>Valid values are</p> <ul style="list-style-type: none">• <code>inactive</code>—Sparing is not currently activated on this LIM.• <code>manual</code>—The sparing setup has been manually activated.• <code>automatic</code>—The sparing setup has been automatically activated.
<code>sparing-change-time</code>	<p>Indicates the time that the last change in the sparing state occurred.</p> <p>The Sparing-Change-Time value is a read-only display set by the system.</p>
<code>sparing-change-counter</code>	<p>Displays a read-only count of each sparing change, including primary to secondary, secondary to primary, and so on.</p> <p>The counter is reset on power up of the Stinger.</p>
<code>vpi-vci-range</code>	<p>Specifies a virtual path identifier/virtual channel identifier (VPI/VCI) range.</p> <p>You can use the VPI-VCI-Range value to select the best combination of VPI and VCI bit sizes to fit the list of supported VPI/VCI pairs obtained from the network provider. The new values take effect as soon as you write the profile.</p>
<code>vp-switching-vpi</code>	<p>Specifies the virtual path identifiers (VPIs) that the system uses for VP switching on the line interface module (LIM) port.</p> <p>Specify a VPI from 1 through 31. The default is 15.</p>
<code>ima-link-status</code>	<p>Subprofile of the DS1-ATM-Stat profile that indicates read-only status of the inverse multiplexing ATM (IMA) link.</p>
<code>ima-link-statistic</code>	<p>Subprofile of the DS1-ATM- Stat profile indicates read-only statistics of the inverse multiplexing ATM (IMA) link.</p>

Parameter	Description
<code>send-code-status</code>	This value indicates the current state of the Send Code. Valid settings include the following: <ul style="list-style-type: none"><code>disabled</code>—send code procedure is currently disabled on this link.<code>line-loopback</code>—line loopback has been requested to the remote end.<code>payload-loopback</code>—payload loopback has been requested to the remote end.
<code>pattern-test-status</code>	This value indicates the result of the Pattern test. Enumerated field values: <ul style="list-style-type: none"><code>none</code>—no pattern test has been executed on this link.<code>in-sync</code>—pattern test indicates that the line is synchronized.<code>lost-sync</code>—pattern test indicates that the line has lost synchronization.

IMA-Group-Stat profile

Following are the parameters for the IMA-Group-Stat profile, shown with sample settings.

```
[in IMA-GROUP-STAT/ima3_1]
name* = ima3_1
physical-address = { shelf-1 slot-3 25 }
near-end-ima-group-state = operational
failure-status = no-failure
far-end-txclock-mode = ctc
tx-timing-ref-link = 0
rx-timing-ref-link = 0
rx-ima-id = 0
rx-frame-length = 128
least-delay-link = 0
diff-delay-max-obs = 0
running-secs = 1435
tx-avail-cellrate = 2147488176
rx-avail-cellrate = 4493
tx-num-config-links = 2
rx-num-config-links = 2
tx-num-active-links = 1
rx-num-active-links = 1
tx-oam-label-value = 3
rx-oam-label-value = 3
last-change-time = 52
tpp-test-link = 1
tpp-test-pattern = 100
tpp-test-status = link-fail
valid-intervals = 0
```

```
invalid-intervals = 96
vpi-vci-range = vpi-0-15-vci-32-127
vp-switching-vpi = 0
ima-group-statistic = { 40 0 6571424 }
nailed-group = 310
```

Parameter	Description
<code>name</code>	Assigns a name to a profile, interface, user, route, host, module, or the Stinger system itself. Specify a descriptive name with no embedded spaces.
<code>physical-address</code>	<p>Identifies the physical address of an interface.</p> <p>The physical address has the format <code>{ shelf slot item }</code>, where:</p> <ul style="list-style-type: none">• <code>shelf</code> is the shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.• <code>slot</code> is the number of the item's expansion slot. Physical expansion slots are numbered from 1 through 16, starting with 1 for the slot just below the shelf controller module. The slot value 17, <code>controller</code>, or <code>c</code> specifies the shelf controller module. For example, to address the first slot on shelf 1: <code>{ 1 1 0 }</code>• <code>item</code> is the item on the module. Items are numbered starting with 1 for the leftmost item on the module. An item number of 0 (zero) denotes the entire slot. For example, to address line 48 on an SDSL module in slot 2 on shelf 1: <code>{ 1 2 48 }</code>
<code>near-end-ima-group-state</code>	Indicates the current operational state of the near-end inverse multiplexing ATM (IMA) Group State Machine.
<code>failure-status</code>	Indicates the current failure status of the IMA group (the reason why the group traffic state machine is in the down state).

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Description
<code>far-end-txclock-mode</code>	<p>Indicates the transmit clocking mode used by the far-end inverse multiplexing ATM (IMA) group.</p> <p>Valid values for this read-only parameter are as follows</p> <ul style="list-style-type: none">• <code>ctc</code>—Common transmit clock: transmit clock of the links within IMA group derived from same clock source• <code>itc</code>—Independent transmit clock: transmit clock of the links within IMA group derived from their respective receive clocks
<code>tx-timing-ref-link</code>	<p>Indicates the index of the transmit timing reference link to be used by the near-end for inverse multiplexing ATM (IMA) data cell clock recovery from the Asynchronous Transfer Mode (ATM) layer.</p> <p>Valid values for this read-only parameter are from 0 (zero) through 24. The distinguished value of 0 (zero) is used if no link has been configured in the IMA group, or if the transmit timing reference link has not yet been selected.</p>
<code>rx-timing-ref-link</code>	<p>Indicates the index of the receive timing reference link. This index is used by the near end for inverse multiplexing ATM (IMA) data cell clock recovery. The Rx-Timing-Ref-Link is used to recover the clock from the physical layer and uses that recovered clock as a reference when it delivers cells to the higher layer, which is the ATM layer.</p> <p>Specify a number from 0 (zero) through 24. The distinguished value of 0 (zero) may be used if no link has been configured in the IMA group, or if the receive timing reference link has not yet been detected.</p>
<code>rx-ima-id</code>	<p>Indicates the inverse multiplexing ATM (IMA) ID currently in use by the near-end IMA function.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 255.</p>
<code>rx-frame-length</code>	<p>Indicates the value of inverse multiplexing ATM (IMA) frame length as received from remote IMA function.</p> <p>Valid values for this read-only parameter are:</p> <ul style="list-style-type: none">• <code>32</code>—IMA frame is 32 cells long• <code>64</code>—IMA frame is 64 cells long• <code>128</code>—IMA frame is 128 cells long• <code>256</code>—IMA frame is 256 cells long

Parameter	Description
<code>least-delay-link</code>	<p>Indicates the index of the link configured in the inverse multiplexing ATM (IMA) group which has the smallest link propagation delay.</p> <p>Valid range is from 0 (zero) through 24. The distinguished value of 0 (zero) is used if no link has been configured in the IMA group, or if the link with the smallest link propagation delay has not yet been determined.</p>
<code>diff-delay-max-obs</code>	<p>Indicates the latest maximum differential delay observed (in milliseconds) between the links having the least and most link propagation delay, among the receive links that are currently configured in the inverse multiplexing for ATM (IMA) group.</p> <p>Range of values for this read-only parameter is from 0 (zero) through 2147483647.</p>
<code>running-secs</code>	<p>Indicates the number of seconds since this inverse multiplexing ATM (IMA) group has been in the operational state.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 2147483647.</p>
<code>tx-avail-cellrate</code>	<p>Indicates the current cell rate (truncated value in cells per second) provided by this inverse multiplexing ATM (IMA) group in the transmit direction, considering all the transmit links in the active state.</p> <p>Valid range for this read-only value is from 0 (zero) through 2147483647.</p>
<code>rx-avail-cellrate</code>	<p>Indicates the current cell rate (truncated value in cells per second) provided by this inverse multiplexing ATM (IMA) group in the receive direction, considering all the receive links in the Active state.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 2147483647.</p>
<code>tx-num-config-links</code>	<p>Indicates the number of links that are configured to transmit in this inverse multiplexing ATM (IMA) group. This parameter overwrites the value of the <code>imaGroupNumRxActLinks</code> attribute when the IMA group is configured in the Symmetrical Configuration group symmetry mode.</p> <p>Valid range is from 0 (zero) through 24.</p>

Configuring T1 and E1 Modules

Profiles associated with a T1 or E1 module

Parameter	Description
<code>rx-num-config-links</code>	<p>Indicates the number of links that are configured to receive in this inverse multiplexing ATM (IMA) group.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 24.</p>
<code>tx-num-active-links</code>	<p>Indicates the number of links which are configured to transmit and are currently active in this inverse multiplexing ATM (IMA) group.</p> <p>Valid range for this read only value is from 0 (zero) through 24.</p>
<code>rx-num-active-links</code>	<p>Indicates the number of links that are configured to receive and are currently active in this inverse multiplexing ATM (IMA) group.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 24.</p>
<code>tx-oam-label-value</code>	<p>Indicates the IMA operations and maintenance (OAM) label value transmitted by the near end (NE) inverse multiplexing ATM (IMA) unit.</p> <p>Valid values for this read-only parameter are from 1 (one) through 255.</p>
<code>rx-oam-label-value</code>	<p>Indicates the inverse multiplexing ATM (IMA) OAM Label value transmitted by the far end (FE) IMA unit. A value of 0 likely means that the IMA unit has not received an Administration, Operations, and Maintenance (OAM) label from the FE IMA unit at this time.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 255.</p>
<code>last-change-time</code>	<p>The number of seconds or milliseconds that have lapsed since the inverse multiplexing ATM (IMA) group last changed state.</p> <p>Valid range is from 0 (zero) through 2147483647.</p>
<code>tpp-test-link</code>	<p>Specifies a Simple Network Management Protocol (SNMP) interface as the test link for use in the test pattern procedure.</p> <p>Valid range is from -1 through 24.</p>
<code>tpp-test-pattern</code>	<p>Indicates a number that specifies the test pattern transmitted in the IMA control protocol (ICP) cell (octet 17) on the link during the inverse multiplexing ATM (IMA) test pattern procedure.</p>

Parameter	Description
<code>tpp-test-status</code>	<p>Indicates the current state of the test pattern procedure.</p> <p>Valid values are as follows:</p> <ul style="list-style-type: none">• <code>Disabled</code>—Test pattern procedure is currently disabled on this link.• <code>Operating</code>—Test pattern procedure is currently operating on this link.• <code>Link-fail</code>—Test pattern procedure has failed on this link.
<code>valid-intervals</code>	<p>Indicates the number of previous 15-minute intervals for which valid data was collected.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 96. The value is 96 unless the inverse multiplexing ATM (IMA) link was added to the IMA group within the last 24 hours, in which case the value is the number of complete 15-minute intervals since the link was added to an IMA group.</p>
<code>invalid-intervals</code>	<p>Indicates the number of 15-minute intervals for which no valid data is available.</p> <p>Valid range for this read-only parameter is from 0 (zero) through 96.</p>
<code>vpi-vci-range</code>	<p>Specifies a virtual path identifier/virtual channel identifier (VPI/VCI) range.</p> <p>You can use the VPI-VCI-Range value to select the best combination of VPI and VCI bit sizes to fit the list of supported VPI/VCI pairs obtained from the network provider. The new values take effect as soon as you write the profile.</p>
<code>vp-switching-vpi</code>	<p>Specifies the virtual path identifiers (VPIs) that the system uses for VP switching on the line interface module (LIM) port.</p> <p>Specify a VPI from 1 through 31. The default is 15.</p>
<code>ima-group-statistic</code>	<p>Subprofile of the IMA-group-stat profile indicates read-only status of the IMA group.</p>
<code>nailed-group</code>	<p>Specifies a nailed group number associated with a physical line, channel, or interface.</p> <p>Specify an integer from 0 (zero) through 1024. The default is 0 (zero).</p>

Parameter	Description
	<ul style="list-style-type: none">• In the ATM-Options subprofile, the Nailed-Group value specifies the nailed group number associated with the physical interface used by the first side of the circuit.• In the ATM-Connect-Options subprofile, the Nailed-Group value specifies the nailed group number associated with the physical interface used by the second side of the circuit.• In the DS3-ATM profile, the Nailed-Group number indicates the HDSL2 physical interface. A Connection or RADIUS profile specifies this number to make use of the interface. Each interface is assigned a unique default number, so you do not need to modify this parameter. If you assign a new value, it must be a number from 1 through 1024 that is unique within the system.• In the OC3-ATM profile, and in the Line-Config subprofile of the AL-DMT profile, a Connection or RADIUS profile specifies this number to make use of the interface. Each interface is assigned a unique default number, so you do not need to modify this parameter. If you assign a new value, it must be a number from 1 through 1024 that is unique within the system.

Slot-Static-Config profile

Following are the parameters for the `slot-static-config` profile, shown with sample settings:

```
[in SLOT-STATIC-CONFIG/{ shelf-1 slot-3 0 }]  
name = 1:3  
physical-address* = { shelf-1 slot-3 0 }  
atm-parameters = { low-priority }  
interface-type = default  
use-vp-switching-workaround = no  
need-max-vpswitching-vpis = no
```

Parameter	Description
physical-address	<p>Identifies the physical address of an interface.</p> <p>The physical address has the format <code>{ shelf slot item }</code>, where:</p> <ul style="list-style-type: none">• <code>shelf</code> is the shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.• <code>slot</code> is the number of the item's expansion slot. Physical expansion slots are numbered from 1 through 16, starting with 1 for the slot just below the shelf controller module. The slot value 17, <code>controller</code>, or <code>c</code> specifies the shelf controller module. For example, to address the first slot on shelf 1: <code>{ 1 1 0 }</code>• <code>item</code> is the item on the module. Items are numbered starting with 1 for the leftmost item on the module. An item number of 0 (zero) denotes the entire slot. For example, to address line 48 on an SDSL module in slot 2 on shelf 1: <code>{ 1 2 48 }</code>
atm-parameters	<p>A subprofile used to specify the relative priority of Asynchronous Transfer Mode (ATM) cells coming in from this line interface module (LIM) or control module slot.</p> <p>A slot's incoming priority is used to select the appropriate outgoing queue that is associated with the outgoing port from the internal ATM cell processing engine. All ports on this slot and all ATM service categories share the same incoming priority. An outgoing port (from the internal ATM cell processing engine) can have multiple queues associated with a given quality of service (QoS).</p> <p>The <code>incoming-priority</code> parameter is used to select which queue to use among all the queues associated with the given QoS.</p> <p>Specify one of the following:</p> <ul style="list-style-type: none">• <code>high-priority</code>—ATM cells incoming from this LIM or control module slot have a higher priority than others.• <code>low-priority</code>—ATM cells incoming from this LIM or control module slot have a lower priority than others. This is the default.

Parameter	Description
interface-type	<p>The type of LIM installed in the slot. All slots are set to default at initialization.</p> <p>Modifying this field does not affect non-HDSL/SHDSL cards. Specify one of the following:</p> <ul style="list-style-type: none"> default—G.SHDSL is used as the default for slots with HDSL2/G.SHDSL cards. Non-HDSL2/G.SHDSL LIMs default to their card types. g-shdsl—HDSL2 LIM with G.SHDSL interface type. hds12—HDSL2 LIM with HDSL2 interface type. <p>HDSL2 and SHDSL LIMs support HDSL2 and G.SHDSL modem technologies.</p>
use-vp-switching-workaround	<p>Specifies whether VP-switching is used between this LIM and the trunk module. (See “Configuring LIM-to-trunk VP switching” on page 1-43.)</p> <p>Specify one of the following values:</p> <ul style="list-style-type: none"> yes—LIM-to-trunk virtual path connections will be configured for connections originating from this slot. no (the default)—LIM-to-trunk virtual path connections will not be configured for connections originating from this slot.
need-max-vpswitching-vpis	<p>Whether the maximum number of LIM-to-trunk VP-switching VPIs to be configured on the slot is 6 or 12. You must enable the use-vp-switching-workaround parameter for the settings to apply. (See “Configuring LIM-to-trunk VP switching” on page 1-43.)</p> <p>Specify one of the following values:</p> <ul style="list-style-type: none"> yes—Up to 12 error-free LIM-to-trunk VP connections can be configured for connections originating from this slot. Enabling this parameter disables operations and maintenance (OAM) functionality for ATM-circuit connections. OAM functionality for ATM (terminating) connections are still supported. no (the default)—Up to 6 LIM-to-trunk VP connections can be configured for connections originating from this slot.

High-Speed-Slot-Static-Config profile

Following are parameters for the High-Speed-Slot-Static-Config profile, shown with sample settings:

```
[in HIGH-SPEED-SLOT-STATIC-CONFIG/{ shelf-1 trunk-module-1 1 }
name=""
physical-address* = { shelf-1 trunk-module-1 1 }
atm-parameters = { low-priority }
```

```
trunk-cac-config = { yes "" 155520 10 }
```

Parameter	Description
<code>name</code>	Assigns a name to the interface. Specify a descriptive name with no embedded spaces.
<code>physical-address</code>	Identifies the physical address of an interface. The physical address has the format <code>{ shelf slot item }</code> , where: <ul style="list-style-type: none"><code>shelf</code> is the shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.<code>slot</code> is the number of the item's expansion slot. Physical expansion slots are numbered from 1 through 16, starting with 1 for the slot just below the shelf controller module. The slot value 17, <code>controller</code>, or <code>c</code> specifies the shelf controller module. For example, to address the first slot on shelf 1: <code>{ 1 1 0 }</code><code>item</code> is the item on the module. Items are numbered starting with 1 for the leftmost item on the module. An item number of 0 (zero) denotes the entire slot. For example, to address line 48 on an SDSL module in slot 2 on shelf 1: <code>{ 1 2 48 }</code>
<code>atm-parameters</code>	<p>A subprofile used to specify the relative priority of ATM cells coming in from this LIM.</p> <p>A slot's incoming priority is used to select the appropriate outgoing queue that is associated with the outgoing port from the internal ATM cell processing engine. All ports on this slot and all ATM service categories share the same incoming priority. An outgoing port (from the internal ATM cell processing engine) can have multiple queues associated with a given quality of service (QoS).</p> <p>The <code>incoming-priority</code> parameter is used to select which queue to use among all the queues associated with the given QoS. Specify one of the following:</p> <ul style="list-style-type: none"><code>high-priority</code>—ATM cells incoming from this LIM or control module slot have a higher priority than others.<code>low-priority</code>—ATM cells incoming from this LIM or control module slot have a lower priority than others. This is the default.

Parameter	Description
<code>trunk-cac-config</code>	<p>A subprofile that the system creates for each port. The <code>enable</code> parameter specifies whether CAC is enabled on the port specified in the <code>port-num</code> parameter (read-only). The <code>line-rate</code> parameter (read-only) indicates the maximum data rate for the port specified in the <code>port-num</code> parameter.</p> <p>The <code>over-subscription</code> parameter specifies the allowed oversubscription to the line rate for CAC. Oversubscription modifies the allowed bandwidth on a port. The allowed bandwidth on a trunk port is equal to <code>line-rate</code> multiplied by <code>over-subscription</code> divided by 10 ($\text{line-rate} * \text{over-subscription} / 10$). The values for <code>over-subscription</code> range from 0 (zero) to 10240, with a default value of 10. The default value (10) limits the port to accept only connections that do not exceed <code>line-rate</code>. Values from 1 to 9 limit the allowed bandwidth to a value less than <code>line-rate</code>. A value of 0 (zero) disables the port from taking part in any CAC and the bandwidth is advertised as 0.</p> <p>Example <code>trunk-cac-config</code> subprofile parameters follow: <code>enable = yes</code> <code>port-num = 1:3:1</code> <code>line-rate = 1536</code> <code>over-subscription = 20</code></p>

Configuring T1 or E1 module connections

To set up ATM or IMA ports for a T1 or E1 module, apply the following procedure after installing the module and connecting the physical T1 or E1 line to its associated LPM. The ATM and IMA procedures are somewhat different, as shown in the examples that follow the general procedure.

Step	Explanation
1 Configure the <code>ds1-atm</code> profile for the physical link.	<p>A nailed group must be assigned to each <code>ds1-atm</code> profile. Physical lines that are part of the same IMA group <i>must</i> have the same nailed group number assigned in their respective <code>ds1-atm</code> profiles.</p> <p>Physical lines that are used to support ATM ports must each have a unique nailed group number.</p>
2 Create and configure an <code>imagroup</code> profile.	<p>When you are using the IMA mode, <code>ds1-atm</code> profiles are bound to the <code>imagroup</code> profile by the nailed group number. The same nailed group number used in the <code>ds1-atm</code> profiles must also be assigned to the <code>ima-group</code> profile.</p> <p>This step is unnecessary for DS1 lines that support ATM ports.</p>

Step	Explanation
3 Create and configure a connection profile.	The connection profile is created and assigned the nailed group, virtual path identifier (VPI), and virtual channel identifier (VCI) information needed to associate an individual ATM link with a T1 interface, E1 interface, or IMA group.

Configuring a long-haul line interface unit (LIU)

The long-haul line interface unit supports T1 and E1 connections without the need for an external channel service unit (CSU) device. In addition, the long-haul line interface unit also supports T1 or E1 connections to a digital cross-connect (DSX) device. Both the T1 and E1 modules also support earlier versions of the line interface unit.

After you reboot, the Stinger displays one of the following Syslog messages, depending on the line interface unit that is detected on the slot:

```
LOG notice, Shelf 1, Slot 6, Time: 11:51:26--
```

```
Short-haul only DS1 card detected
```

```
LOG notice, Shelf 1, Slot 2, Time: 11:51:24--
```

```
Short/Long-haul DS1 capable card detected
```

For example, to configure the interface on port 1 in slot 4 for long haul and line buildout to 7.5dB, enter the following commands in the `line-config` subprofile:

```
admin> read ds1-atm {1 4 1}
DS1-ATM/{ shelf-1 slot-4 1 } read
admin> set enabled=yes
admin> set line-config front-end-type=long-haul
admin> set line-config line-build-out=7.5-db
admin> write -f
```

Line-buildout options include the following::

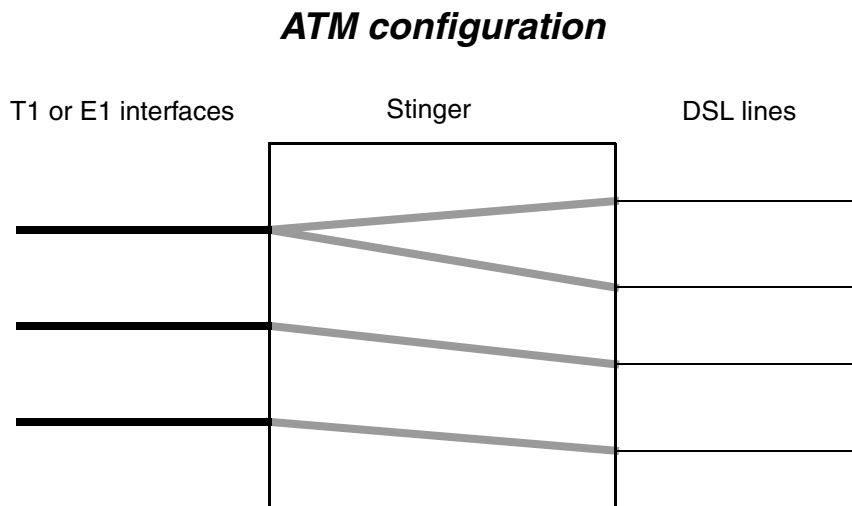
- 0-db for no buildout
- 7.5-db for 7.5 decibels of line buildout
- 15-db for 15 decibels of line buildout
- 22.55-db for 22.5 decibels of line buildout

See the *Stinger Reference* for more information.

Sample ATM configuration

This example illustrates the configuration used to establish a connection between an ATM port on DS1 interface 4 of an IMA module and an individual ATM link. The T1 or E1 module is located in slot 11 of a Stinger unit. The `ds1-atm` profile has a default nailed group number of 503. The ATM link has a nailed group number of 501, a VPI of 0, and a VCI of 36. Figure 1-3 shows the type of linkage that the ATM configuration creates.

Figure 1-3. Sample ATM configuration links



To configure the connection between the ATM port on the DS1 interface of the module and the ATM link, the administrator in this example proceeds as follows:

- 1 Verify the presence of the DS1 interfaces.

```
admin> dir ds1-atm
43  08/22/2000 19:46:14 { shelf-1 slot-11 1 } 1:11:1
49  08/22/2000 19:46:14 { shelf-1 slot-11 2 } 1:11:2
49  08/22/2000 19:46:14 { shelf-1 slot-11 3 } 1:11:3
46  08/22/2000 19:46:14 { shelf-1 slot-11 4 } 1:11:4
46  08/22/2000 19:46:14 { shelf-1 slot-11 5 } 1:11:5
46  08/22/2000 19:46:14 { shelf-1 slot-11 6 } 1:11:6
...
47  08/22/2000 19:46:14 { shelf-1 slot-11 24 } 1:11:24
```

- 2 Configure the ds1-atm profiles.

The administrator enables ds1-atm interface 4. Because it is assumed that the interface has a default nailed group number of 503, this value does not need to be set.

```
admin> read ds1-atm { 1 11 4 }
DS1-ATM/{ shelf-1 slot-11 4 } read
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 slot-11 4 } written
```

- 3 Create a connection profile.

The administrator creates a connection profile named uni-conn to associate the DS1-ATM interface (nailed group 503) with the individual ATM link (nailed group 501, VPI 0, VCI 36). This association is made by means of the default connection type atm-circuit.

```
admin> new connection uni-conn
CONNECTION/uni-conn read
admin> set active = yes
admin> set atm-options nailed = 503
admin> set atm-options vpi = 0
```

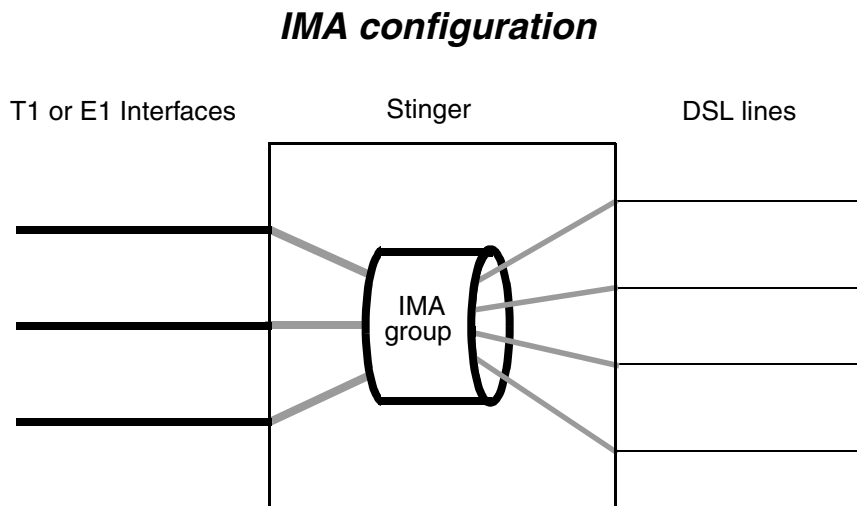
```
admin> set atm-options vci = 36
admin> set atm-connect = 501
admin> set atm-connect vpi = 0
admin> set atm-connect vci = 36
admin> write
CONNECTION/uni-conn written
```

Sample IMA configuration

This example illustrates how to create a group of interfaces using the first three DS1 links. The module is located in slot 11 of a Stinger unit. The interfaces are assigned the IMA group name `ima1`, and nailed group number 200. A connection to a subscriber link is set up. The subscriber link has the nailed group number 501.

Figure 1-4 shows the type of linkage that the IMA configuration creates.

Figure 1-4. Sample IMA configuration links



Note: An IMA group can consist of up to eight line interfaces (ds1-atm profiles). On 24-port T1 or E1 modules, the line interfaces must be within one of three interface groups: ds1-atm interfaces 1 through 8, 9 through 16, or 17 through 24. Furthermore, an IMA group cannot consist of interfaces within more than one of these interface groups. For example, ds1-atm interfaces 8 and 9 can not be configured in the same IMA group.

To configure the IMA group connection to the ATM link, the administrator in this example proceeds as follows:

- 1 Verify the presence of the DS1 interfaces.

```
admin> dir ds1-atm
43 08/22/2000 19:46:14 { shelf-1 slot-11 1 } 1:11:1
49 08/22/2000 19:46:14 { shelf-1 slot-11 2 } 1:11:2
49 08/22/2000 19:46:14 { shelf-1 slot-11 3 } 1:11:3
46 08/22/2000 19:46:14 { shelf-1 slot-11 4 } 1:11:4
46 08/22/2000 19:46:14 { shelf-1 slot-11 5 } 1:11:5
46 08/22/2000 19:46:14 { shelf-1 slot-11 6 } 1:11:6
...
47 08/22/2000 19:46:14 { shelf-1 slot-11 24 } 1:11:24
```

- 2 Configure the ds1-atm interfaces.

The administrator enables the interfaces for the first three lines and assigns the group number 200. All three links are initially in ATM mode, and can be configured individually for connections to separate ATM streams.

```
admin> read ds1-atm { 1 11 1 }
DS1-ATM/{ shelf-1 slot-11 1 } read
admin> set line-config nailed-group = 200
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 slot-11 1 } written
admin> read ds1-atm { 1 11 2 }
DS1-ATM/{ shelf-1 slot-11 2 } read
admin> set line-config nailed-group = 200
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 slot-11 2 } written
admin> read ds1-atm { 1 11 3 }
DS1-ATM/{ shelf-1 slot-11 3 } read
admin> set line-config nailed-group = 200
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 slot-11 3 } written
```

- 3 Create an IMA group.

The administrator creates an imagroup profile named ima1. When the profile is written, the system inactivates the ATM ports on the DS1 links and creates an IMA group consisting of those links.

```
admin> new imagroup ima1
IMAGROUP/ima1 read
admin> set active = yes
admin> set nailed = 200
admin> write
IMAGROUP/ima1 written
```

4 Create a connection profile.

The administrator creates a connection profile to link the IMA group (nailed group 200) with the individual ATM link (nailed group 501, VPI 0, VCI 35). This association is made by means of the default connection type `atm-circuit`.

```
admin> new connection ima1
CONNECTION/ima1 read
admin> set active = yes
admin> set atm-options nailed = 200
admin> set atm-options vpi = 0
admin> set atm-options vci = 35
admin> set atm-connect = 501
admin> set atm-connect vpi = 0
admin> set atm-connect vci = 35
admin> write
CONNECTION/ima1 written
```

Assigning a nailed group number to a ds1-atm profile

When configuring a ATM port or an IMA group, consider the following:

- When you configure physical lines as ATM ports, be sure to assign unique nailed group numbers to the corresponding `ds1-atm` profiles.
- When you configure physical lines to be part of an IMA group, be sure to assign the *same* nailed group number to all the corresponding `ds1-atm` profiles.
- When several lines are part of an IMA group and you disable the IMA group, either by deactivating or deleting the IMA group profile, the links do not restart in ATM mode. All these links have the same nailed group number, which is an invalid configuration for ATM mode. If you want the links to operate in ATM mode, you must assign unique nailed group numbers to the different links by configuring the `ds1-atm` profiles. After you do so, the ATM ports on the different links will be reactivated.
- If an ATM port is active and another ATM port is configured on a second link with the same nailed group, the second port will not be activated. The following message is logged:

```
Line <#> not activated:multiple ds1-atm lines with same nailed
group on this slot\
```

Configuring LIM-to-trunk VP switching

Virtual path (VP) switching allows for more efficient provisioning of Stinger units. Instead of configuring multiple virtual channel connections between a T1 or E1 module and a trunk module, you can configure a single virtual path connection. The individual virtual channel connections must be part of the same port on the T1 module (IMA group or ATM port) and have the same VPI value.

To use the virtual path switching feature, you designate a LIM to be used specifically for configuring LIM-to-trunk virtual path connections, and the system allocates internal resources to that LIM.

Use the following procedure to configure LIM-to-trunk virtual path switching on the Stinger unit:

- 1 Configure the desired `vp-switching-vpi` value in the `ds1-atm` profile for the LIM. For example, to set the `vp-switching-vpi` parameter to 12 and the nailed group to 105 for port 5 on a Stinger T1 or E1 module in slot 3, enter the following commands:

```
admin> read ds1-atm {1 3 5}
admin> set line-config vp-switching-vpi=12
admin> set line-config nailed-group = 105
admin> write -f
```

Note: If a segment of the virtual path connection terminates on an IMA group, you must configure the `vp-switching-vpi` parameter for the IMA group in the IMA group profile and in the `ds1-atm` profiles for the DS1-ATM lines that are part of that IMA group. (See “Sample IMA configuration” on page 1-41.)

- 2 Configure the `slot-static-config` profile for the LIM slot specified in step 1. To set the maximum number of VP connections to 12 for the slot, proceed as follows:

```
admin> read slot-static-config {1 3 0}
admin> set use-vp-switching-workaround=yes
admin> set need-max-vpswitching-vpis=yes
admin> write -f
```

Note: The preceding steps disable OAM functionality for ATM-circuit connections on the slot. OAM functionality for terminating connections on the slot is still supported. If you require OAM functionality on ATM-circuit connections, disable the `need-max-vpswitching-vpis` parameter as follows:

```
admin> set need-max-vpswitching-vpis=no
```

- 3 Configure the virtual path connection from the LIM port to the trunk port. For example, if the egress (outbound) virtual path identifier (VPI) is 15 on DS3 trunk port {1 18 1}, with a nailed group of 851, proceed as follows:

```
admin> read connection lim-trk
admin> set active=yes
admin> set atm-options nail=105
admin> set atm-options vpi=12
admin> set atm-options vp-switching=yes
admin> set atm-connect-options nail=851
admin> set atm-connect-options vpi=15
admin> set atm-connect-options vp-switching=yes
admin> write -f
```

Table 1-4 shows how to use the virtual path switching parameters (use-vp-switching-workaround and need-max-vpswitching-vpis) to configure 6 or 12 LIM-to-trunk connections, and to disable LIM-to-trunk virtual path switching.

Table 1-4. Using the virtual patch switching parameters

use-vp-switching-workaround parameter setting	need-max-vpswitching-vpis parameter setting	Results
yes	yes	Enables you to configure up to 12 VP-switching VPIs on the slot Disables OAM functionality for ATM-circuit connections Disables LIM-to-LIM functionality for that slot
yes	no	Enables you to configure up to 6 VP-switching VPIs if the LIM is placed in slots 1 through 7 or up to 5 VP-switching VPIs if the LIM is placed in slots 10 through 16. Disables LIM-to-LIM functionality for that slot
no	no	Disables VP-switching without packet errors.

Note: Changing the settings for the use-vp-switching-workaround or need-max-vpswitching-vpis parameters causes all connections on that slot to be broken and then reestablished. This process ensures that the system allocates the correct resources on the backplane.

Be aware of the following caveats when using the use-vp-switching-workaround and need-max-vpswitching-vpis parameters:

- Enabling both the use-vp-switching-workaround and need-max-vpswitching-vpis parameters for a slot guarantees that up to 12 LIM-to-trunk VP-switching VPIs will be free from any packet errors.
- Enabling both the use-vp-switching-workaround and need-max-vpswitching-vpis parameters for a slot disables OAM (for atm-circuit connections) and disables LIM-to-LIM VC connections from working on that LIM slot.

If you set the use-vp-switching-workaround parameter to yes, but set the need-max-vpswitching-vpis parameter to no, LIM-to-LIM virtual channel connections will not work on a slot if the internal VPI allocated on the backplane conflicts with the slot number in which the T1 or E1 module is installed. If you must host both LIM-to-trunk virtual path connections and LIM-to-LIM virtual channel connections on the same slot, Lucent recommends that you install the T1 or E1 module in slots 1 through 7 of the Stinger chassis. If you do not plan to configure LIM-to-LIM virtual channel connections on that module, you can install the T1 or E1 module in any slot.

Configuring multiple VPCs on T1 or E1 LIMs

Because the constituent VCIs that are transported within a VPI cannot be distinguished, it is sometimes recommended to configure multiple VPCs per port—one for each class of service. While this is not possible on most LIM interfaces, you can configure multiple VPCs over each of a T1 or E1 module's ATM or IMA interfaces. However, doing so disables any LIM-to-LIM functions for the slot in which the module is installed, and can also disable F4 operations, administration, and maintenance (OAM) monitoring on ATM circuits for the slot. (For details, see Table 1-5.)

Enabling LIM-to-trunk virtual path switching on T1 and E1 LIMs

To enable T1 and E1 modules to support LIM-to-trunk virtual path switching, you must configure the following parameters, shown with default values for a T1 or E1 module in slot 3:

```
[in SLOT-STATIC-CONFIG/{ shelf-1 slot-3 0 }]  
use-vp-switching-workaround = no  
need-max-vpswitching-vpis = no
```

The effects of these parameters are described in Table 1-5:

Table 1-5. Effects of virtual path switching settings for T1 and E1 modules

use-vp-switching-workaround	need-max-vpswitching-vpis	Result
yes	yes	Up to 12 virtual-path-switching VPIs can be configured on the module. F4-OAM functionality for ATM circuits and LIM-LIM functionality are disabled for the slot.
yes	no	Up to 6 virtual-path-switching VPIs can be configured if the module is installed in slot 1 through 7, and up to 5 virtual-path switching VPIs if the module is in slot 10 through 16. LIM-to-LIM functionality is disabled for the slot.
no	no	Virtual path switching is not supported for the slot.

Configuring multiple VPIs per interface

For T1 or E1 modules only, the meaning of the following parameter differs from its meaning for all other LIMs.

```
[in DS1-ATM/{ any-shelf any-slot 0 }:line-config]  
vp-switching-vpi =
```

Parameter	Modified setting
<code>vp-switching-vpi</code>	For an interface on a T1 or E1 module, this parameter specifies the minimum VPI value to be used for virtual path switching. All VPIs from the specified value through the top of the VPI range specified in the slot's <code>vpi-vci-range</code> parameter are allocated for virtual path switching.

With the sample setup used in this example, VPIs 9, 10, 11, 12, 13, 14, and 15 are allocated for virtual path switching on the configured ATM interface of a T1 or E1 module in slot 3.

The following commands configure the `slot-static-config` profile for the LIM slot:

```
admin> read slot-static-config { 1 3 0 }
SLOT-STATIC-CONFIG/{ shelf-1 slot-3 0 } read
admin> set use-vp-switching-workaround = yes
admin> write -f
SLOT-STATIC-CONFIG/{ shelf-1 slot-3 0 } written
```

The following commands configure ATM interface 5 with a minimum VPI of 9:

```
admin> read ds1-atm { 1 3 5 }
DS1-ATM/{ shelf-1 slot-3 5 } read
admin> set enabled = yes
admin> set line-config vp-switching-vpi = 9
admin> set line-config nailed-group = 105
admin> write -f
DS1-ATM/{ shelf-1 slot-3 5 } written
```

Note: If one side of the VPC terminates on an IMA group, the `vp-switching-vpi` parameter must be configured in the `imagroup` profile for that interface.

The following commands configure LIM slot 3 to support VPIs from 0 to 15:

```
admin> read atm-config
ATM-CONFIG read
admin> set slot-vpi-vci-range 3 = vpi-0-15-vci-32-127
admin> write -f
ATM-CONFIG written
```

With these settings, the system allocates all VPIs from 9 through 15 for virtual path switching.

Trunk-side connection admission control (CAC)

To manage delay variation and other transmission characteristics, ATM switches negotiate QoS parameters with other switches between two end points. To ensure that the guaranteed characteristics can be delivered, Stinger units use connection admission control (CAC), which keeps track of how much guaranteed bandwidth has been allocated and allows you to specify an oversubscription factor for trunk interfaces.

Without CAC oversubscription, a T1/E1 interface operating as a trunk port accepts connections up to its capacity. A specified oversubscription factor enables the port to exceed

Configuring T1 and E1 Modules

Trunk-side connection admission control (CAC)

its capacity only by the specified factor, after which it rejects connections. When a connection is actually ready to be established (when the port is operational and connected), the Stinger unit performs the CAC check and either accepts or rejects the connection on the basis of current bandwidth usage and availability.

This section describes CAC settings specific to the T1/E1 module. For a more general and detailed description of CAC configuration, see the *Stinger ATM Configuration Guide*.

Trunk-side CAC support on T1 and E1 modules

CAC is supported on individual T1 or E1 lines, and on grouped IMA interfaces.

The system creates a `high-speed-slot-static-config` profile for each T1 or E1 interface and each configured IMA interface. CAC oversubscription on these interface types works just as it does on other trunk interfaces in Stinger units.

For example, the following command shows the bandwidth of a T1 line. (Unrelated command output is not shown in this sample.)

```
admin> atmcacstat -p
CONTROL MODULE TRUNK PORTS AND IMA PORTS B/W CONFIG
...
PORT {1 3 1} (ima-24t1-card) (ACTIVE) (PRIMARY)
Stream  Total BW          Gtd BW  Gtd Allocated  Gtd Available
UP      1536                   1536    224             1312
DN      1536                   1536    224             1312
```

The following commands configure CAC oversubscription for the line:

```
admin> read high-speed-slot-static-config { 1 3 1 }
HIGH-SPEED-SLOT-STATIC-CONFIG/{ shelf-1 slot-3 1 } read
admin> set trunk-cac-config over-subscription = 20
admin> list trunk-cac-config
[in HIGH-SPEED-SLOT-STATIC-CONFIG/{ shelf-1 slot-3 1
}:trunk-cac-config]
enable = yes
port-num = 1:3:1
line-rate = 1536
over-subscription = 20
admin> write -f
HIGH-SPEED-SLOT-STATIC-CONFIG/{ shelf-1 slot-1 9 } written
```

Command for displaying bandwidth statistics

The `atmcacstat` command shows the bandwidth statistics with oversubscription:

```
admin> atmcacstat -p
CONTROL MODULE TRUNK PORTS AND IMA PORTS B/W CONFIG
...
PORT {1 3 1} (ima-24t1-card) (ACTIVE) (PRIMARY)
Stream  Total BW          Gtd BW  Gtd Allocated  Gtd Available
UP      3072                   3072    224             2848
```

DN 3 072 3 072 224 2848

For more details, see the *Stinger Reference* or the *Stinger Administration Guide*.

Commands for checking T1 or E1 module performance

The following IMA-specific commands, available from the TAOS command-line interface, provide information about IMA performance:

- **imalines**—Displays the status of all T1 or E1 lines, or those that are in use, free, or disabled, on any IMA modules in a Stinger unit.
- **imagroups**—Displays the status of any IMA groups that have been created, or those that are in use, free, or disabled, on any T1 or E1 modules in a Stinger unit
- **ima-tpp**—Supports the implementation of the IMA test pattern procedure for testing connectivity according to ATM Forum IMA specifications AF-PHY-0086.000, AF-PHY-0086.001, and optional specification O-31. With this command the user can initiate a test pattern procedure that can detect misconfigured IMA connections.

See the *Stinger Reference* for more information about these commands.

PNNI support on T1/E1 modules

With a Lucent Technologies PNNI software license enabled on the Stinger system, T1/E1 interfaces can be configured to route to the ATM core network using PNNI signaling. For detailed information on how to configure PNNI operations and soft permanent virtual circuits (SPVCs), see the *Stinger Private Network-to-Network Supplement*.

T1 and E1 module specifications

Stinger modules for T1 and E1 connections share common specifications and also have their own unique specifications. Stinger T1 and E1 modules conform to certain ATM Forum requirements for IMA and to requirements of the ATM Forum and the ITU-T for ATM.

Specifications common to all T1 and E1 modules

Table 1-6 lists the specifications that are applicable to all Stinger T1 and E1 modules.

Table 1-6. T1 and E1 module common specifications

Specification	Description
Transmission convergence sublayer	ITU-T G.704

Table 1-6. T1 and E1 module common specifications (continued)

Specification	Description
Clocking options	The reference clock source can be derived from one of the following inputs for the whole Stinger shelf: <ul style="list-style-type: none"> • BITS input to the Stinger • Any trunk or module line input • Local oscillator in the control module
Loopback options	Local—digital Local—analog (full local loopback) Remote
Alarms detected	Loss of signal (LOS) Out of Frame (OOF) Remote Alarm Indication (RAI) Alarm Indication Signal (AIS) Loss of Cell Delineation (LOCD)
DS1 MIB supported	RFC 1406
Operating humidity	10% to 90%, noncondensing
Storage humidity	10% to 90%, noncondensing
Ambient operating temperature	FS/LT version: 32°F to 131°F (0°C to 55°C) RT version: -40°F to 149°F (-40°C to 65°C)
Storage temperature	-40°F to 176° F (-71°C to 80°C)
Maximum rate of temperature change	54°F/hour (30°C/hour)
Operating altitude	0 to 13,123 feet (0 to 4000 meters)
IMA compliance	Compliant with ATM Forum IMA specifications v1.0 (AF-PHY-0086.000) and v1.1 (AF-PHY-0086.001)
Maximum physical lines per IMA group	8
QoS types supported	CBR, RT-VBR, NRT-VBR, and UBR
Traffic policing method	Dual leaky bucket algorithm, conforming to UNI 3.1
Discard policies	Early packet discard (EPD), partial packet discard (PPD), and queue length exceed

Specifications unique to T1 modules (STGR-LIM-T1)

Table 1-7 lists the specifications that apply only to T1 models.

Table 1-7. T1-specific specifications

Specification	Description
Line code	G.703 bipolar 8-zero substitution (B8ZS) or alternate mark inversion (AMI)
Frame format	Extended superframe (ESF) (ANSI T1.408) or D4
Line rate	1.544 Mbps (\pm 50 bps)
Impedance	100 ohms
Line buildout options (short-haul)	< 133 feet = 0.6dB 134 to 266 feet = 1.2dB 267 to 399 feet = 1.8dB 400 to 533 feet = 2.4dB 534 to 655 feet = 3.0dB
Line buildout options (long-haul)	0dB 7.5dB 15dB 22.5dB
Cell rate	3623 cells/second (ATM mode)
IMA differential delay	Up to 281 ms among IMA group constituents

Specifications unique to E1 modules (STGR-LIM-E1)

Table 1-8 lists specifications that apply only to E1 models.

Table 1-8. E1-specific specifications

Specification	Description
Line code	High-density bipolar (HDB3)
Frame format	ITU-T G.704
Line rate	2.048 Mbps (\pm 50 bps)
Impedance	120 ohms

Table 1-8. E1-specific specifications (continued)

Cell rate	4528 cells/second (ATM mode)
IMA differential delay	Up to 225 ms among IMA group constituents

Compliance with IMA specifications

Table 1-9 details how the T1 and E1 modules conform to the IMA requirements of the ATM Forum.

Table 1-9. IMA specifications

Specification	Description
Mandatory specifications	Compliant with all mandatory specifications of v1.0 and v1.1 ATM Forum IMA specifications.
Optional Specification O-1	Uniform distribution of IMA Control Protocol (ICP) cells within an IMA frame.
Optional Specifications O-2 and O-3	User can configure IMA frame sizes of 32, 64, 128 (the default), or 256.
Optional Specification O-4	User can configure the IMA-ID and LID.
Optional Specifications O-9 and O-10	Supports Independent Transmit Clock (ITC) and Common Transmit Clock (CTC) modes.
Optional Specification O-11	Indicates an incoming stuff event in the 4th, 3rd, and 2nd ICP cells preceding the event.
Optional Specification O-12	At least one ICP cell with correct cyclic redundancy check (CRC) required to process the incoming stuff event code.
Optional Specification O-13	User can configure maximum differential delay among IMA group constituents.
Optional Specification O-14	Supports inhibited, failed, fault, or misconnected report causes for unusable links.
Optional Specification O-15	User can increase the minimum number of links in a group to keep it from entering an alarm (nonoperational) state if constituent links fail.
Optional Specification O-16	User can configure the values of alpha () (links 1 through 8), beta () (links 9 through 16), and gamma () (links 17 through 24) per link set to control the IMA Frame Sync procedure.

Table 1-9. IMA specifications (continued)

Specification	Description
Optional Specification O-17	Transitions from any state to hunt state when cells are no longer being received from the physical layer.
Optional Specification O-18	Maintains IMA frame synchronization when one of the two SICP cells has a header error control (HEC) or CRC error.
Optional Specification O-20	Out-of-IMA-frame anomalies maintained.
Optional Specification O-21	Far-end transmit failure count maintained.
Optional Specification O-22	Far-end receive failure count maintained.
Optional Specifications O-23 and O-24	Count stuff events inserted in transmit or receive directions.
Optional Specification O-25	Far-end group failure count maintained.
Optional Specifications O-26 and O-27	IMA performance parameters are accessible via SNMP for 15-minute and 24-hour intervals, and since startup. (Only total statistics are provided because startup statistics are available from the command line.)
Optional Specifications O-28 and O-29	Implementation-specific transmit fault or receive fault conditions are declared at the near end.
Optional Specification O-30	For loss of IMA frame (LIF), link out-of-dialog synchronization (LODS), remote failure indicator (RFI)-IMA, and fault failures, the user can specify the default checking time for initiating an alarm condition, and the default persistence time for retiring the alarm condition.
Optional Specification O-31	Conforms with the test pattern procedure for testing connectivity.
Optional Specifications O-32 and O-33	Supports the IMA MIB and SNMP-based management.

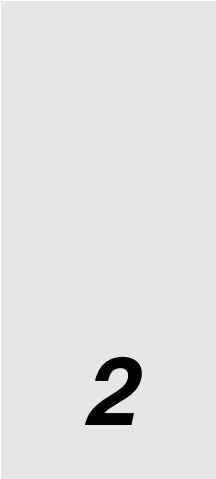
Compliance with ATM specifications

Table 1-10 details ATM specifications supported by the T1 and E1 modules.

Table 1-10. ATM specifications

Specification	Description
UNI support	Compliant with ATM Forum specifications for UNI 3.0 and 3.1.
Virtual path (VP) and virtual channel (VC) connections	Supports up to 384 permanent virtual channels (PVCs) per port and up to 384 PVCs per IMA module. Supports one permanent virtual path (PVP) per port, specified by the <code>vp-switching-vpi</code> parameter in the <code>ds1-atm</code> profile or in the <code>imagroup</code> profile.
VPI-VCI values	VPI and VCI combined must occupy no more than 11 bits. Following are the available options: <ul style="list-style-type: none">• 2-bit VPI with 9-bit VCI (VPI: 0-3, VCI: 32-511)• 3-bit VPI with 8-bit VCI (VPI: 0-7, VCI: 32-255)• 4-bit VPI with 7-bit VCI (VPI: 0-15, VCI 32-127)• 5-bit VPI with 6-bit VCI (VPI: 0-31, VCI: 32-63)
QoS types	CBR, RT-VBR, NRT-VBR, and UBR.
Traffic policing	Dual leaky bucket policing per UNI 3.1.
Discard policies	Early packet discard (EPD), partial packet discard (PPD), queue length exceeded.
HEC	Supports ITU I.432. Users have the option of omitting the coset polynomial while calculating HEC.
Payload scrambling	Can be configured by the user.

Configuring LIM and LIM Port Redundancy



2

- Overview of LIM and LIM port redundancy 2-1
- Configuring LIM redundancy 2-1
- Configuring LIM port redundancy 2-9

You can configure LIM and LIM port redundancy for more than one kind of LIM in a single Stinger chassis. For example, a single Stinger unit with both asymmetric digital subscriber line (ADSL) and symmetric digital subscriber line (SDSL) LIMs can be configured with a spare ADSL LIM and a spare SDSL LIM.

Overview of LIM and LIM port redundancy

A spare LIM can replace an entire failed LIM or a single failed port. LIM redundancy transfers *all* logical connections from a failed LIM to the spare LIM. LIM port redundancy transfers the logical connection from a particular failed *port* on a LIM to the corresponding port on the spare LIM. The remaining ports on the spare LIM remain available to provide additional LIM port redundancy.

Each LIM to be used as a spare must have either a path selector module (PSM) or copper loop test (CLT) module plugged in behind or next to it in place of a line protection module (LPM). All other LIMs must use an LPM with port redundancy (LPM-RP) for line protection.

Note: Some older Stinger systems are equipped with an interface redundancy module (IRM) located behind the spare LIM, and LPMs with redundancy (LPM-R) located behind the LIMs to be backed up. In this case, additional configuration steps might be needed. For more information, see “LIM redundancy with IRMs and LPM-Rs” on page 2-6.

Configuring LIM redundancy

LIM redundancy provides a one-to-one backup function for LIMs. Each type of LIM to be backed up requires a spare LIM with a PSM or CLT module plugged in behind or next to it. For example, a Stinger FS configured with 14 ADSL 24-port LIMs can be set up with the following module pairs:

- 13 pairs each consisting of an ADSL LIM and an LPM-RP
- 1 pair consisting of an ADSL LIM and a PSM or CLT module

The resulting system has 13 active ADSL LIMs and one spare that can be substituted for any one of the 13 LIMs if a failure occurs.

Configuring LIM and LIM Port Redundancy

Configuring LIM redundancy

In the same way, a system can be set up with the following module pairs:

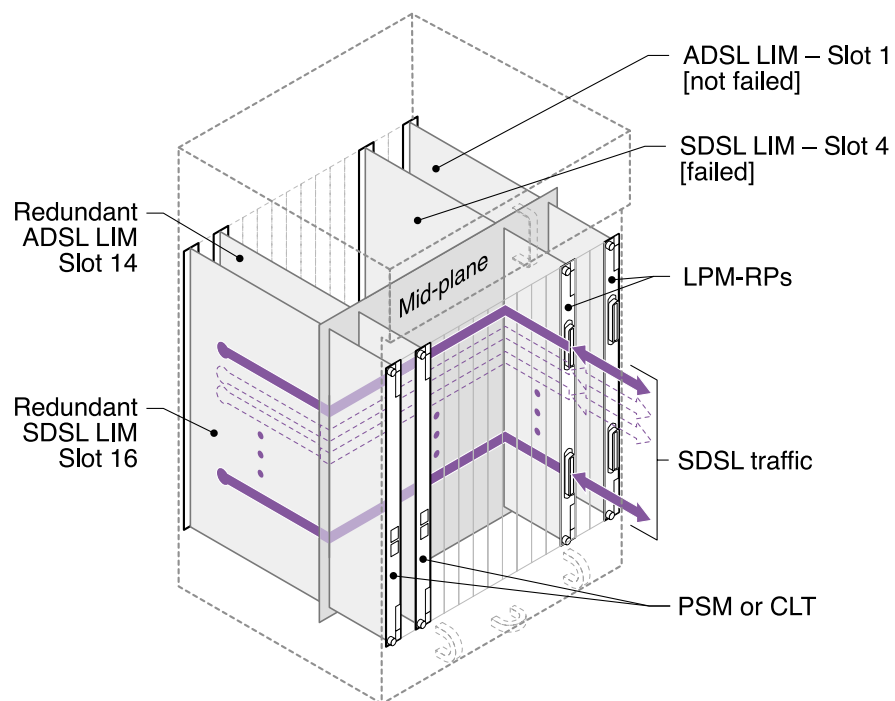
- 6 SDSL LIM–LPM-RP pairs
- 1 SDSL–PSM pair or SDSL–CLT module pair
- 6 ADSL LIM–LPM-RP pairs
- 1 ADSL–PSM pair or ADSL–CLT module pair

The resulting system has 6 active SDSL LIMs and 6 active ADSL LIMs, with 1 spare LIM of each type available in case of failure.

When the redundancy function is invoked, the primary LIM is deactivated. Its logical connections are terminated and reestablished on the spare (secondary) LIM. When the redundancy function is disabled, the spare LIM is deactivated. Its logical connections are terminated and reestablished on the primary LIM.

Figure 2-1 illustrates LIM redundancy for a failed SDSL LIM in slot 4 of a Stinger FS chassis. A Stinger LS chassis has its LPMs and PSMs or CLT modules *next to* its LIMs rather than behind them.

Figure 2-1. LIM redundancy in a Stinger FS



Overview of the LIM-Sparing-Config profile

When a Stinger unit is booted, it checks for the presence of PSMs or CLT modules. A LIM-Sparing-Config profile is created for each PSM or CLT module detected. You manage LIM redundancy by configuring the LIM-Sparing-Config profile on a spare LIM of the same type as the LIM to be backed up.

Following is a listing of a LIM-Sparing-Config profile with all parameters set to their default values:

```
[in LIM-SPARING-CONFIG/{ any-shelf any-slot 0 }]
physical-address* = { any-shelf any-slot 0 }
spare-slot-type = none
sparing-mode = inactive
spare-slot-number = slot-16
manually-spared-slot-number = any-slot
auto-lim-sparing-config = { [ { yes 10 100 12 } { yes 10 100 12 } { yes
10 100 +
```

The Auto-LIM-Sparing-Config subprofiles are discussed in “Automatic LIM redundancy” on page 2-4.

Parameter	Specifies
spare-slot-type	Type of spare LIM installed in the slot. This value is automatically detected and set by the software when the Stinger powers up.
sparing-mode	Enable/disable redundancy. You can enable two LIM redundancy modes. The <i>inactive</i> setting disables the LIM redundancy function. The <i>manual</i> setting deactivates the LIM specified in the <i>manually-spared-slot-number</i> parameter, terminating its connections and then reestablishing them on the spare LIM. For more information, see “Manual LIM redundancy” on page 2-4. The <i>automatic</i> setting allows automatic LIM redundancy to be activated as defined in the Auto-LIM-Sparing-Config subprofile. See “Automatic LIM redundancy” on page 2-4.
spare-slot-number	Number of the slot containing the spare LIM and PSM or CLT module. This value is automatically set by the software when the Stinger unit is turned on.
manually-spared-slot-number	Slot number of the primary LIM to be manually deactivated and replaced by the spare LIM.

For example, suppose a Stinger unit is configured with an ADSL LIM in slot 1 and an SDSL LIM in slot 4. Slot 14 contains a spare ADSL LIM with a PSM, and slot 16 contains a spare SDSL LIM also with a PSM.

The system creates two LIM-Sparing-Config profiles like the following:

```
admin> dir lim-sparing-config
      72  06/20/1999 01:21:15 { shelf-1 slot-14 0 }
      72  06/21/1999 17:14:09 { shelf-1 slot-16 0 }
```

The spare ADSL LIM has the following profile:

```
admin> read lim-sparing-config { 1 14 0 }
LIM-SPARING-CONFIG/{ shelf-1 slot-14 0 } read
```

```
admin> list
[in LIM-SPARING-CONFIG/{ shelf-1 slot-14 0 }]
physical-address* = { shelf-1 slot-14 0 }
spare-slot-type = al-dmtadsl-atm-card
sparing-mode = inactive
spare-slot-number = slot-14
manually-spared-slot-number = slot-any
auto-lim-sparing-config = { [ { yes 10 100 12 } { yes 10 100 12 } { yes
10 100 +
```

Similarly, you can display the profile for the spare SDSL LIM:

```
admin> read lim-sparing-config { 1 16 0 }
LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } read
admin> list
[in LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 }]
physical-address* = { shelf-1 slot-16 0 }
spare-slot-type = sdsl-atm-card
sparing-mode = inactive
spare-slot-number = slot-16
manually-spared-slot-number = slot-any
auto-lim-sparing-config = { [ { yes 10 100 12 } { yes 10 100 12 } { yes
10 100 +
```

Manual LIM redundancy

You can invoke the redundancy function manually by setting the `sparing-mode` parameter to `manual`. To disable manual redundancy, set the `sparing-mode` parameter to `inactive`.

If manual redundancy is currently in use, setting the parameter to `inactive` causes the spare LIM to become inactive again, terminating its connections and then reestablishing them on the primary LIM that was replaced.

For example, suppose that the SDSL LIM in slot 4 fails (see Figure 2-1). To enable the spare SDSL LIM in slot 16, proceed as follows:

```
admin> read lim-sparing-config { 1 16 0 }
LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } read
admin> set manually-spared-slot-number = 4
admin> set sparing = manual
admin> write
LIM-SPARING-CONFIG/{ shelf-1 slot-160 } written
LOG notice, Shelf 1, Slot 8, Time: 01:30:02--
    LIM 16 ACTIVATED as spare for LIM 4
```

Automatic LIM redundancy

Automatic LIM redundancy detects a LIM failure and automatically sets up all the virtual channels of that LIM on the spare. When automatic LIM redundancy is activated, the primary LIM is monitored. If modem errors exceed the specified thresholds, all connections to the primary LIM are transferred to the spare (secondary) LIM.

Monitoring continues on the secondary LIM. If modem errors exceed thresholds, the connections are transferred back to the primary LIM and the automatic redundancy process stops. You can restart the process by resetting the system or by setting the `sparing-mode` parameter to `inactive` and then back to `automatic`.

The parameters related to automatic LIM redundancy are found in the Auto-LIM-Sparing-Config subprofiles. The subprofiles are numbered according to the LIM slot numbers. These subprofiles apply only to those LIMs that are of the same type as the LIM specified by the `spare-slot-type` parameter in the LIM-Sparing-Config profile.

For example, suppose slot 16 in a Stinger FS contains a spare SDSL LIM, slots 1 through 7 contain SDSL LIMs, but slots 10 through 15 contain ADSL LIMs. Only the parameters contained in LIM-Sparing-Config subprofiles 1 through 7 are applied to automatically replace the SDSL LIMs in slots 1 through 7.

Note: Following an automatic LIM or LIM port redundancy switchover, some sessions might not start up even though the physical port switchover is successful.

Following is a listing of an Auto-LIM-Sparing-Config subprofile with all parameters set to their default values:

```
[in LIM-SPARING-CONFIG:auto-lim-sparing-config:lim-sparing-config[1]]
active = yes
error-averaging-period = 10
error-threshold = 100
up-down-threshold = 3
modem-failure-threshold = 12
```

Parameter	Specifies
<code>active</code>	When redundancy mode is set to <code>automatic</code> , this parameter enables or disables the LIM slot to participate in automatic LIM redundancy. Only slots for which this parameter is set to <code>yes</code> can be backed up by the spare. The default value is <code>yes</code> .
<code>error-averaging-period</code>	Number of seconds during which the number of errors specified by <code>error-threshold</code> must be observed on the line before the modem is considered nonfunctional. The default value is 10.
<code>error-threshold</code>	Number of errors to occur during the specified <code>error-averaging-period</code> interval before a modem on this LIM is considered nonfunctional. The default value is 100.
<code>up-down-threshold</code>	Number of times during the specified <code>error-averaging-period</code> interval that the line is connected and disconnected by the modem before the modem is considered nonfunctional. The default value is 3.
<code>modem-failure-threshold</code>	Number of modems on this LIM that are considered nonfunctional before this LIM is considered nonfunctional. The default value is 12.

To activate automatic LIM redundancy for a particular LIM, you must set the following two parameters:

- In the LIM-Sparing-Config profile for the spare LIM, set the following `active` parameter to `yes`: `Auto-LIM-Sparing-Config > LIM-Sparing-Config [slot number of backed-up LIM] > active`.
- In the LIM-Sparing-Config profile for the spare LIM, set the `sparing-mode` parameter to `automatic`.

For example, if you install a spare SDSL LIM in slot 15 of a Stinger FS unit and want to activate automatic LIM redundancy for the SDSL LIMs in slots 1 through 7, proceed as follows:

- 1 List the Auto-LIM-Sparing-Config profile for slot 1.

```
admin> list 1
[in LIM-SPARING-CONFIG/{ shelf-1 slot-15 0 }
:auto-lim-sparing-config:lim-sparing-config[1]]
active = yes
error-averaging-period = 10
error-threshold = 100
up-down-threshold = 3
modem-failure-threshold = 12
```

Because the Auto-LIM-Sparing-Config subprofiles are numbered according to the LIM slot numbers, the `list 1` command here lists the LIM-Sparing-Config subprofile for the LIM in slot 1.

Note that the `active` parameter is set to `yes`. Because this is the default value for all seven slots, you do not have to set it unless you have previously changed it.

- 2 Set the redundancy mode.

```
admin> list
[in LIM-SPARING-CONFIG/{ shelf-1 slot-15 0 }]
physical-address* = { shelf-1 slot-15 0 }
spare-slot-type = sdsl-atm-card
sparing-mode = inactive
spare-slot-number = slot-15
manually-spared-slot-number = any-slot
auto-lim-sparing-config = { [ { yes 10 100 3 12 } { yes 10}]}
admin> set sparing-mode = automatic
admin> write
LIM-SPARING-CONFIG/{ shelf-1 slot-15 0 } written
```

Assuming that the `active` parameters in the LIM-Sparing-Config subprofiles for slots 2 through 7 are also set to the default, LIM redundancy is now activated for the SDSL LIMs in slots 1 through 7.

LIM redundancy with IRMs and LPM-Rs

When you upgrade the software to TAOS 7.11.4 or later, a previously existing LIM-Sparing-Config profile is automatically converted to a redundancy profile indexed to the spare LIM slot. Use the `dir lim-sparing-config` command to verify that the profile has been created.

For example, suppose a Stinger FS already has a spare SDSL LIM and IRM installed and configured in slot 16 before the software upgrade. Enter the `dir` command to show the profile:

```
admin> dir lim-sparing-config
      213  06/20/1999 02:25:18  { shelf-1 slot-16 0 }
```

Then list the profile:

```
admin> read lim-sparing-config { 1 16 0 }
admin> list
[in LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } ]
physical-address* = { shelf-1 slot-16 0 }
spare-slot-type = sdsl-atm-card
sparing-mode = inactive
spare-slot-number = slot-16
manually-spared-slot-number = any-slot
if-sparing-config = [ any-slot any-slot any-slot any-slot any-slot
any-slot any+
auto-lim-sparing-config = { [ { yes 10 100 3 12 } { yes 10 100 3 12 } } {
yes 10 +
```

If a profile exists, nothing further needs to be done until the LIM redundancy function is activated. If no profile exists, you must create the profile manually for the slot number containing the spare LIM and IRM. All the LIMs to be backed up must have either LPM-Rs or LPM-RPs installed in the slots behind or next to them.

When the profile is created, the software automatically assigns a value to the `spare-slot-type` and `spare-slot-number` parameters.

For example, if a Stinger has an SDSL LIM and an IRM installed in slot 16, and it also has an SDSL LIM with an LPM-R installed in slot 4, you must first create a LIM-Sparing-Config profile for slot 16:

```
admin> new lim-sparing-config { 1 16 0 }
LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } read

admin> write
LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } written

admin> list
[in LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } (new)]
physical-address* = { shelf-1 slot-16 0 }
spare-slot-type = sdsl-atm-card
sparing-mode = inactive
spare-slot-number = slot-16
manually-spared-slot-number = any-slot
if-sparing-config = [ any-slot any-slot any-slot any-slot any-slot
any-slot any+
auto-lim-sparing-config = { [ { yes 10 100 3 12 } { yes 10 100 3 12 } } {
yes 10 +
```

Suppose the SDSL LIM in slot 4 fails. You can then activate manual LIM redundancy as follows:

```
admin> set manually-spared-slot-number = 4
admin> set sparing-mode = manual
admin> write
```

```
LIM-SPARING-CONFIG/{ shelf-1 slot-16 0 } written
LOG notice, Shelf 1, Slot 8, Time: 26:30:01--
    LIM 16 ACTIVATED as spare for LIM 4
```

Checking LIM redundancy status

You can check the status of LIM redundancy by examining the LIM-Sparing-Status profile. Following are the parameters with sample values:

```
[in LIM-SPARING-STATUS]
spare-slot-type = none
sparing-mode = inactive
spare-slot-number = any-slot
spared-slot-number = any-slot
sparing-change-reason = unknown
sparing-change-time = 0
sparing-change-counter = 0
lim-sparing-status = [ { yes yes sparing-none } { yes yes sparing-none
} { yes +
```

A LIM-Sparing-Status subprofile is defined for each slot as follows:

```
[in LIM-SPARING-STATUS:lim-sparing-status[1]]
active = yes
lim-status-ok = yes
sparing-state = sparing-none
```

Parameter	Indicates
spare-slot-type	Shelf, slot, and port number of the spare LIM.
sparing-mode	State of the redundancy function. If redundancy is not enabled, <code>sparing-none</code> is the value. If redundancy is enabled and the LIM slot is a primary LIM, the value can be <code>primary-active</code> or <code>primary-inactive</code> . If redundancy is enabled and the LIM slot is the secondary (spare) LIM, the value can be <code>secondary-active</code> or <code>secondary-inactive</code> .
spare-slot-number	Slot number of the spare LIM for that type of LIM.
spared-slot-number	Slot number of the LIM being replaced by the spare LIM.
sparing-change-reason	How redundancy is activated. Valid values are <code>inactive</code> , <code>automatic</code> , and <code>manual</code> .
sparing-change-time	Time that the last change in redundancy state occurred.
sparing-change-counter	Number of redundancy changes (for example, primary to secondary or secondary to primary). The counter is reset to zero each time the Stinger is turned on.
active	Valid values are <code>yes</code> and <code>no</code> .
lim-status-ok	Valid values are <code>yes</code> and <code>no</code> .

Parameter	Indicates
sparing-state	State of the redundancy function. If redundancy is not enabled, sparing-none is the value. If redundancy is enabled and the LIM slot is a primary LIM, the value can be primary-active or primary-inactive. If redundancy is enabled and the LIM slot is the secondary (spare) LIM, the value can be secondary-active or secondary-inactive. A value of not-applicable indicates that LIM redundancy is not applicable to this module.

Checking status with the Rearslot command

The `rearslot` command shows the status of all the slots used for LPMs, PSMs, and CLT modules. It also reports on the status of the midplane redundancy bus. Slots that are equipped with IRMs or LPM-Rs are reported as `Empty` by the `rearslot` command.

Note: When a copper loop is being tested on a Stinger LS with a PSM or a CLT module, the `rearslot` command does not display any midplane sparing bus usage.

For example, suppose that a Stinger FS is equipped with ADSL LIMs and SDSL LIMs. The ADSL 24-port LIM in slot 1 has failed and is being replaced by the ADSL 24-port LIM in slot 14. The `rearslot` command reports the following.

```
admin> rearslot
  Slot      Slot ID
[  1 ]      91  24 port Enhanced LPM
[  2 ]         0  Empty ( IRM, LPM )
[  3 ]         0  Empty ( IRM, LPM )
[  4 ]      92  48 port Enhanced LPM)
[  5 ]         0  Empty ( IRM, LPM )
[  6 ]         0  Empty ( IRM, LPM )
[  7 ]         0  Empty ( IRM, LPM )
[ 10 ]         0  Empty ( IRM, LPM )
[ 11 ]         0  Empty ( IRM, LPM )
[ 12 ]         0  Empty ( IRM, LPM )
[ 13 ]         0  Empty ( IRM, LPM )
[ 14 ]      93  Path Selector Module ( PSM )
[ 15 ]         0  Empty ( IRM, LPM )
[ 16 ]      94  Copper Loop Tester ( CLT )

Midplane sparing bus usage :
  4          4          3          2          1
8765 4321 0987 6543 2109 8765 4321 0987 6543 2109 8765 4321
.... .... .... .... .... .... XXXX XXXX XXXX XXXX XXXX XXXX
```

Configuring LIM port redundancy

LIM port redundancy allows an individual port of a LIM to be backed up by the corresponding port of a spare LIM. The LIM to be backed up (the primary LIM) must be of the same type as

Configuring LIM and LIM Port Redundancy

Configuring LIM port redundancy

the spare. The remaining ports on the spare LIM remain available to back up other failed ports on any LIMs of the same type in the system. In this release, T1 and E1 modules support port redundancy only if the module is operating in user-to-network interface (UNI) mode.

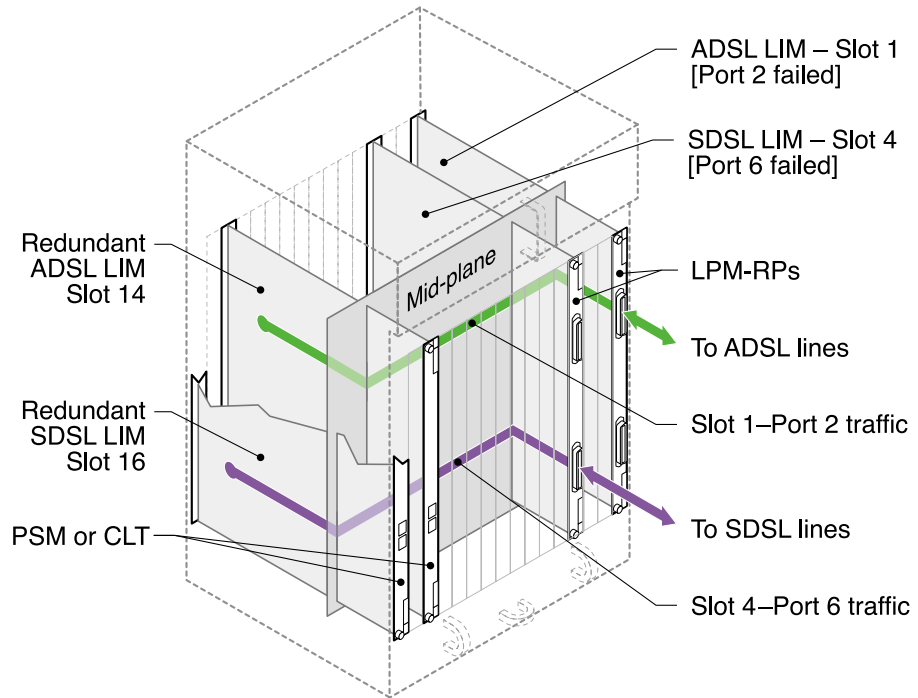
More than one kind of LIM port can be backed up. An additional LIM-PSM pair (or LIM-CLT module pair) of another type installed in a Stinger can be used to back up other LIMs of that type in the system. For example, a spare SDSL LIM in slot 16 can back up any failed port on any other SDSL LIMs in a Stinger FS chassis. Likewise, a spare ADSL LIM in slot 14 can back up any failed ADSL ports.

However, because the midplane redundancy bus in a Stinger chassis contains only one path for each port number, port redundancy can back up only one path of a particular number at a time. For example, suppose port 1 on an SDSL LIM fails and is replaced. As long as redundancy is active on that port, no other failed SDSL or ADSL port 1 on that unit can be replaced by a spare LIM port.

For example, port 2 on an ADSL LIM in slot 1 can be backed up by port 2 of the spare ADSL LIM in slot 14. A subsequent failure of port 6 on an SDSL LIM in slot 4 can be backed up by port 6 on the spare SDSL LIM in slot 16. This example is illustrated for a Stinger FS chassis in Figure 2-2. A Stinger LS chassis has its LPMs and PSMs or CLT modules *next to* its LIMs rather than behind them.

Note: Following an automatic LIM or LIM port redundancy switchover, some sessions might not start up even though the physical port switchover is successful.

Figure 2-2. LIM port redundancy on a Stinger FS



When a port on a LIM that is being backed up is replaced, the virtual channels for that port are terminated and set up on the spare. All other line parameters are also transferred to the spare port.

Enabling LIM port redundancy

Redundancy for a particular slot and port is controlled by the `sparing-mode` parameter in the appropriate LIM profile.

The `sparing-mode` parameter appears in all LIM profiles, as in the following SDSL profile for slot 2, port 6:

```
[in SDSL/{ shelf-1 slot-2 6 }]  
name = 1:2:32  
physical-address* = { shelf-1 slot-2 6 }  
enabled = yes  
sparing-mode = inactive  
line-config = { 0 232 15 static { any-shelf any-slot 0 }  
singlebaud 784000 2720+
```

Parameter	Specifies
<code>sparing-mode</code>	<p>Enables or disables port redundancy and specifies the mode. You can enable two port-redundancy modes.</p> <p>The default value, <code>inactive</code>, disables LIM port redundancy.</p> <p>The <code>manual</code> setting deactivates the LIM port and then reestablishes the connection on the same port of the spare LIM.</p> <p>The <code>automatic</code> setting activates automatic redundancy for the port. The error threshold parameters specified in the Auto-LIM-Sparing-Config subprofile of the LIM-Sparing-Config [<i>slot number</i>] profile are used.</p>

Manual LIM port redundancy

You can invoke the redundancy function manually by setting the `sparing-mode` parameter in the LIM profile to `manual`. The connection on the primary LIM is transferred to the spare (secondary) LIM. To disable manual port redundancy, set the `sparing-mode` parameter to `inactive`.

If manual redundancy is currently in use, setting the parameter to `inactive` causes the spare LIM port to become inactive again, terminating its connections and then reestablishing them on the primary LIM port that was replaced.

For example, suppose a Stinger FS is equipped with an ADSL LIM in slot 1 and an SDSL LIM in slot 4. Spare LIMs are located in slots 14 and 16 respectively. Port 2 fails on the ADSL LIM, and port 6 fails on the SDSL LIM. To provide redundancy for these ports, proceed as follows:

- 1 Activate redundancy for failed port 2 in slot 1.

```
admin> read al-dmt {1 1 2}
admin> set sparing-mode = manual
admin> write
LOG notice, Shelf 1, Slot 8, Time: 11:58:49--
LIM 14 port 2 ACTIVATED as spare for LIM 1 Port 2
```

- 2 Activate redundancy for failed port 6 in slot 4.

```
admin> read sdsl {1 4 6}
admin> set sparing-mode = manual
admin> write
LOG notice, Shelf 1, Slot 8, Time: 12:07:51--
LIM 16 port 6 ACTIVATED as spare for LIM 4 Port 6
```

Automatic LIM port redundancy

Automatic LIM port redundancy detects a LIM port failure and automatically transfers the port connection to the same port on the spare LIM. When automatic LIM port redundancy is activated, the primary LIM port is monitored. If modem errors exceed the specified thresholds, the port connection to the primary LIM is transferred to the spare (secondary) LIM.

Monitoring continues on the secondary LIM port. If modem errors again exceed thresholds, the connection is transferred back to the primary LIM port and the automatic redundancy process stops. You can restart the process by resetting the system or by setting the `sparing-mode` parameter to `inactive` and then back to `automatic`.

The parameters used for automatic LIM port redundancy are found in the `Auto-LIM-Sparing-Config` subprofile of the `LIM-Sparing-Config` profile for the spare LIM of the same type.

For example, suppose you want to set up automatic port redundancy for port 1 in an SDSL LIM in slot 5 with an error threshold of 50. The spare SDSL LIM is located in slot 16 of a Stinger FS.

The threshold parameters reside in the `Auto-LIM-Sparing-Config` subprofile of the `LIM-Sparing-Config` profile in slot 16.

- 1 List the parameters.

```
admin> list 1
[in LIM-SPARING-CONFIG/{ shelf-1 slot-16 0
}:auto-lim-sparing-config:lim-sparing-config[1]]
active = yes
error-averaging-period = 10
error-threshold = 100
up-down-threshold = 3
modem-failure-threshold = 12
```

- 2 Set the threshold parameter.

```
admin > set error-threshold = 50
admin > write
SDSL/{ shelf-1 slot-16 0 } written
```

- 3 Activate automatic redundancy for port 1 in slot 5.

```
admin > read sdsl {1 5 1}
admin > set sparing-mode = automatic
admin > write
SDSL/{ shelf-1 slot-5 1 } written
```

Checking the status of extended LIM port redundancy

The line status profile for a particular LIM shows port redundancy status for the selected port, and information about a spare LIM if one exists. The LIM line status profiles have five parameters to indicate the port redundancy status.

Following are the relevant parameters shown with sample settings for an active line using an SDSL LIM:

```
[in SDSL-STAT/{ shelf-1 slot-4 6 }]
spare-physical-address = { shelf-1 slot-16 6 }
sparing-state = primary-inactive
sparing-change-reason = manual
sparing-change-time = 309108872
sparing-change-counter = 1
```

Configuring LIM and LIM Port Redundancy

Configuring LIM port redundancy

Parameter	Indicates
<code>spare-physical-address</code>	Shelf, slot, and port number of spare LIM.
<code>sparing-state</code>	State of the redundancy function. If redundancy is not enabled, <code>sparing-none</code> is the value. If redundancy is enabled and the LIM slot is a primary LIM, the value can be <code>primary-active</code> or <code>primary-inactive</code> . If redundancy is enabled and the LIM slot is the secondary (spare) LIM, the value can be <code>secondary-active</code> or <code>secondary-inactive</code> .
<code>sparing-change-reason</code>	How redundancy is activated. Valid values are <code>inactive</code> , <code>manual</code> , and <code>automatic</code> .
<code>sparing-change-time</code>	Time that the last change in redundancy state occurred.
<code>sparing-change-counter</code>	Number of redundancy changes (for example, primary to secondary or secondary to primary). The counter is reset to zero each time the Stinger is turned on.