Lucent Technologies
Bell Labs Innovations

# Stinger®

## ADSL 24-Port Line Interface Module (LIM) Guide

For software version 9.2-167
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# About This Guide

## What is in this guide

This guide describes how to configure and monitor the Stinger ADSL 24-port line interface module (LIM) 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 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 ***`italics`***—see *Italics*, below). If you could enter the characters but are not specifically instructed to, they do not appear in boldface. |
| *Italics* | 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. |

<table>
<tr><th>Convention</th><th>Meaning</th></tr>
<tr><td>[ ]</td><td>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.</td></tr>
<tr><td>|</td><td>Separates command choices that are mutually exclusive.</td></tr>
<tr><td>></td><td>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.</td></tr>
<tr><td>Key1-Key2</td><td>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.)</td></tr>
<tr><td>Press Enter</td><td>Means press the Enter, or Return, key or its equivalent on your computer.</td></tr>
<tr><td>Note:</td><td>Introduces important additional information.</td></tr>
<tr><td>Caution:</td><td>Warns that a failure to follow the recommended procedure could result in loss of data or damage to equipment.</td></tr>
<tr><td>Warning:</td><td>Warns that a failure to take appropriate safety precautions could result in physical injury.</td></tr>
<tr><td>Warning:</td><td>Warns of danger of electric shock.</td></tr>
</table>

# *Stinger documentation set*

The Stinger documentation set consists of the following manuals, which can be found at `http://www.lucentdocs.com/ins`:

- **Read me first:**
  - *Edge 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 unit. 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.

- 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 use the command-line interface to configure Asynchronous Transfer Mode (ATM) operations on a Stinger unit. The guide explains how to configure permanent virtual circuits (PVCs), and shows how to use standard ATM features such as quality of service (QoS), connection admission control (CAC), and subtending.
  - *Stinger Private Network-to-Network Interface (PNNI) Supplement*. Provides quick-start instructions for configuring PNNI and soft PVCs (SPVCs), and describes the related profiles and commands in the Stinger command-line interface.
  - *Stinger SNMP Management of the ATM Stack Supplement.* Describes SNMP management of ATM ports, interfaces, and connections on a Stinger unit to provide guidelines for configuring and managing ATM circuits through any SNMP management utility.
  - *Stinger T1000 Module Routing and Tunneling Supplement.* Describes how to configure the Layer 3 routing and virtual private network (VPN) capabilities supported by a Stinger T1000 module.
  - *TAOS RADIUS Guide and Reference*. Describes how to set up a TAOS 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 an ADSL 24-Port Line Interface Module (LIM)

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The Stinger asymmetric digital subscriber line (ADSL) 24-port line interface module (LIM) provides 24 ADSL interfaces that support high-speed asymmetric data transfer using the ANSI discrete multitone (DMT), G.lite, and G.dmt ADSL protocols.

One version of the ADSL 24-port LIM, product code STGR-LIM-AD-24, supports the Stinger FS and Stinger LS chassis.

## *Installing an ADSL 24-port LIM*

Install the ADSL 24-port LIM in the same manner as other LIMs. See the *Stinger Getting Started Guide* for details. After installation, the module must be configured following the instructions in this guide.

# *Module specifications*

Table 1-1 lists specifications for the ADSL 24-port LIM.

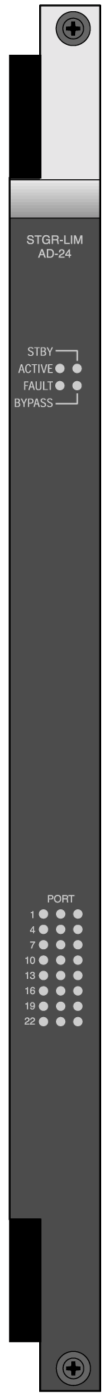
*Table 1-1. ADSL 24-port LIM specifications*

| Category | Specification |
|---|---|
| Physical dimensions | Height: 15 inches (38.1cm).<br>Width: 1.06 inches (2.69cm).<br>Depth: 8 inches (20.3cm).<br>Weight: 1.5 pounds (0.68kg). |
| Power requirements | 106.56 W. |
| Temperature range | FS/LT version: 32°F to 131°F (0°C to 55°C)<br>RT version: -40°F to 149°F (-40°C to 65°C) |
| Interface standards | ANSI T1E1.4/99-006 (draft). |
| Network Timing Reference (NTR) | An 8kHz reference clock is provided over the ADSL line for any CPE with the capability to recover it. |
| Physical connectors | USOC RJ21X 50-pin telco connector. Must meet JIS C5973 standards. |

# *Status indicators*

Several status lights on the front panel of the ADSL 24-port LIM indicate the status of the module and its ports. Figure 1-1 shows the front panel and status lights of the ADSL 24-port LIM.

*Figure 1-1. ADSL 24-port LIM*



## Interpreting ADSL 24-port LIM 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 1-2 explains the ADSL 24-port LIM status lights.

*Table 1-2. ADSL 24-port LIM 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 | 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.<br>If the light is not illuminated, the port is inactive. |

# *Configuring ATM ADSL-DMT interfaces*

A Stinger unit creates an AL-DMT profile for each ADSL-DMT interface in the system. For example, for an ASL-DMT LIM installed in slot 14, the system creates the following profiles:

```
admin> dir al-dmt
    28  06/20/1999 00:27:37  { shelf-1 slot-14 1 }  1:14:1
    28  06/20/1999 00:27:37  { shelf-1 slot-14 2 }  1:14:2
    28  06/20/1999 00:27:37  { shelf-1 slot-14 3 }  1:14:3
    28  06/20/1999 00:27:37  { shelf-1 slot-14 4 }  1:14:4
    28  06/20/1999 00:27:37  { shelf-1 slot-14 5 }  1:14:5
    28  06/20/1999 00:27:37  { shelf-1 slot-14 6 }  1:14:6
    28  06/20/1999 00:27:37  { shelf-1 slot-14 7 }  1:14:7
    28  06/20/1999 00:27:37  { shelf-1 slot-14 8 }  1:14:8
    28  06/20/1999 00:27:37  { shelf-1 slot-14 9 }  1:14:9
    29  06/20/1999 00:27:37  { shelf-1 slot-14 10 }  1:14:10
    29  06/20/1999 00:27:37  { shelf-1 slot-14 11 }  1:14:11

....
```

## Overview of the AL-DMT profile parameters

Various discrete multitone (DMT) standards define the fast and interleave data latencies for each direction (upstream and downstream) of ADSL transmission. In the Stinger AL-DMT profiles, you set parameters to specify the data rate, signal quality and power, and data delay of the interface. The Stinger unit references these parameters in the training process.

The following sets of parameters are active in the current software version:

- Line activation and DMT parameters
- Rate adaptive mode parameters
- Power spectral density (PSD) and power-level parameters
- Fast and interleaved bit-rate parameters
- Interleaving delay parameters
- Noise margin parameters
- Dynamic rate adaptive parameters
- Trellis encoding
- Automatic Gain Control

The following AL-DMT features are not currently supported, but will be soon:

- Mixed latency
- Dynamic rate adaptation

These features are not present in the current software version. However, the parameters related to these features are present in the AL-DMT profile.

## ADSL protocol support

The ADSL 24-port LIM supports the following protocols:

- ANSI DMT—ANSI T1.413.2
- G.dmt—ITU 992.1
- G.lite—ITU 992.2, ITU 994.1

By setting the `line-code` parameter in the `al-dmt : line-config` profile to `auto-select`, the LIM automatically detects and configures itself with the correct ADSL protocol. This is the optimum setting for the ADSL 24-port LIM.

No matter which protocol is used, in general, the AL-DMT profile parameters remain the same and are configured in the same way. Exceptions are the `line-latency-down` and `line-latency-up` parameters. When the G.lite protocol is specified or detected, these parameters are automatically set to the value `interleave`.

## Line activation and DMT parameters

Each direction of traffic (upstream and downstream) on an ADSL-DMT line can have a different minimum and maximum bit rate. The ADSL 24-port LIM supports dual latency, which can use both the fast and interleaved channels in both directions, but does not support mixed latency, which can use a different channel in each direction.

The AL-DMT profile and its Line-Config subprofile contain the following parameters, shown with default values, for activating and setting up the AL-DMT line. Most of these profile parameters are described in the following table. The Rate-Adaptive mode and power parameters are described separately.

```
[in AL-DMT/{ any-shelf any-slot 0 }]
name = ""
physical-address* = { any-shelf any-slot 0 }
enabled = no
sparing-mode = inactive
```

```
[in AL-DMT/{ any-shelf any-slot 0 }:line-config]
trunk-group = 0
nailed-group = 1
vp-switching-vpi = 15
activation = static
call-route-info = { any-shelf any-slot 0 }
rate-adapt-mode-up = automatic-at-startup
rate-adapt-mode-down = automatic-at-startup
rate-adapt-ratio-up = 100
rate-adapt-ratio-down = 100
max-aggr-power-level-up = 13
max-aggr-power-level-down = 20
max-power-spectral-density = 40
line-code = auto-select
line-latency-down = fast
line-latency-up = fast
trellis-encoding = yes
upstream-start-bin = 6
upstream-end-bin = 31
downstream-start-bin = 32
downstream-end-bin = 255
```

| Parameter | Specifies |
|---|---|
| Name | Name of the interface. The default value is the interface address in *shelf*`:`*slot*`:`*port* format (for example, `1:2:3`), but you can assign a text string of up to 16 characters. |
| Physical-Address | Physical address of the interface in the Stinger unit. |
| Enabled | Enables the ADSL-DMT interface. An ADSL-DMT line is disabled until you activate the line in the AL-DMT profile. |

| Parameter | Specifies |
|---|---|
| Sparing-mode | Enables or disables port redundancy (sparing) and specifies the mode.<br>The default value, `inactive`, disables LIM port redundancy (sparing).<br>The `automatic` setting activates automatic sparing for the port. The values of the error threshold parameters specified in the `auto-lim-sparing-config:lim-sparing-config [`*`slot number`*`]`profile are used.<br>The `manual` setting deactivates the LIM port and reestablishes the connection on the same port of the spare LIM. |
| Trunk-Group | *Not currently used*. Leave the default value (zero). |
| Nailed-Group | Nailed-group number for the ADSL-DMT physical interface. A Connection or RADIUS profile uses this number to specify the interface.<br>Because each interface is assigned a unique default number, you do not need to modify the value of this parameter. If you assign a new value, it must be a number from 1 through 1024 that is unique within the system. |
| VP-Switching-VPI | The virtual path identifier (VPI) to use for virtual path (VP) switching on the LIM port. The default is 15. All other VPIs are used for virtual channel (VC) switching. |
| Activation | *Not currently used*. Leave the default value (`static`). |
| Call-Route-Info | *Not currently used*. Leave the default value (the zero address). |
| Line-Code | The DMT line code to be used for training. Valid values are `auto-select`, `ansi-dmt`, `g.lite`, and `g.dmt`. The default value is `auto-select` which enables automatic detection of the ADSL line coding. |
| Line-Latency-Down | Latency path (`fast` or `interleave`) to be used for downstream data transport. Default value is `interleave` for G.lite and `fast` for all other line code.<br>For related settings, see “Fast and interleaved bit-rate parameters” on page 1-10. |
| Line-Latency-Up | Latency path (`fast` or `interleave`) to be used for upstream data transport. Default value is `interleave` for G.lite and `fast` for all other line code.<br>For related settings, see “Fast and interleaved bit-rate parameters” on page 1-10. |
| Trellis-Encoding | Enable or disable trellis encoding. Trellis encoding is specified in the DMT standard. Disabling this parameter (`no`) can increase performance, but at the cost of becoming noncompliant with the standard. The default is `yes`. |

| Parameter | Specifies |
|---|---|
| Upstream-Start-Bin | Starting frequency bin for upstream transmission. Valid range is 0 through 31 for the 24-port LIM. The default value is 6. |
| Upstream-End-Bin | Ending frequency bin for upstream transmission. Valid range is 0 through 31 for the 24-port LIM. The default value is 31. |
| Downstream-Start-Bin | Starting frequency bin for downstream transmission. Valid range is 32 through 255 for the 24-port LIM. The default value is 32. |
| Downstream-End-Bin | Ending frequency bin for downstream transmission. Valid range is 32 through 255 for the 24-port LIM. The default value is 255. |

The upstream and downstream start and end bins define the frequency ranges for upstream and downstream data. The frequency for a particular bin is defined as the bin number multiplied by 4.3125kHz. You must also make sure to adjust the `Max-Bitrate` and `Min-Bitrate` parameters to match the frequency range defined by the start and end bin numbers.

You can use the bitrate parameters to adjust the frequency content of the ADSL signals. For example, splitterless ANSI DMT can be supported by appropriate adjustment of the frequency range. This eliminates the need for splitters or filters at the subscriber location.

## Rate-adaptive mode parameters

The Rate-Adapt-Mode-Up and Rate-Adapt-Mode-Down parameters specify rate-adaptive operations from the subscriber (upstream) or to the subscriber (downstream). Dynamic rate adaptation is not currently supported, so you must choose between the values `automatic-at-startup` (the default) and `operator-controlled`.

*Automatic-at-startup* rate adaptation means that the rate is selected during the training (startup) process. The line initializes at a minimum specified bit rate and target noise margin. If the line fails to achieve the minimum bit rate in either direction, it cannot start, and it sends a message that the requested bit rate was too high. If the line can support a bit rate that is higher than the minimum and not higher than the maximum bit rate, it can train up to a higher rate within the acceptable noise margin. Each direction can have a different minimum and maximum bit rate and use the fast or interleaved ADSL channel. Dual latency can use both the fast and interleaved channels in both directions. (Mixed latency, which can use a different channel in each direction, is not currently supported.)

*Operator-controlled* rate adaptation means that the line must start at and maintain a specific planned bit rate with an acceptable target noise margin. If the line fails to achieve the planned bit rate in either direction, it fails to start, and reports that the requested bit rate was too high. The line does not use a higher bit rate, even if it can support one.

For details about specifying bit rates, see “Fast and interleaved bit-rate parameters” on page 1-10. For information about defining acceptable noise margins, see “Noise margin parameters” on page 1-12.

The Al-Dmt Line-Config subprofile contains the following parameters, shown with default values, defining how rate adaptation will operate on the line:

```
[in AL-DMT/{ any-shelf any-slot 0 }:line-config]
rate-adapt-mode-up = automatic-at-startup
rate-adapt-mode-down = automatic-at-startup
rate-adapt-ratio-up = 100
rate-adapt-ratio-down = 100
```

| Parameter | Specifies |
|---|---|
| Rate-Adapt-Mode-Up | Rate-adaptive mode for upstream training. The default is `automatic-at-startup`. With the setting `operator-controlled` the line trains upstream using a constant planned bit rate. The `dynamic` setting is not currently supported. |
| Rate-Adapt-Mode-Down | Rate-adaptive mode for downstream training. The default is `automatic-at-startup`. With the setting `operator-controlled`, the line trains downstream using a constant planned bit rate. The `dynamic` setting is not currently supported. |
| Rate-Adapt-Ratio-Up | *Not supported in this release.* Ratio for distributing excess upstream bit rate among the fast and interleaved channels when dual latency is supported. |
| Rate-Adapt-Ratio-Down | *Not supported in this release.* Ratio for distributing excess downstream bit rate among the fast and interleaved channels when dual latency is supported. |

## Power-level parameters and Power Spectral Density (PSD)

Maximum aggregate power level is the maximum output power allowed on the line at the transmitter output. This value is expressed in decibels with reference to one milliwatt (dBm), where zero dBm equals 1 milliwatt. It is defined for both directions. If you lower the default value, the line consumes less power and has less capacity. The default value is the maximum allowed setting.

Power spectral density (PSD) is the power of a signal per unit of frequency, the dimensions are those of a power divided by Hertz. In the Al-Dmt line configuration subprofile, the `max-power-spectral-density` parameter specifies the PSD allowed on the line at the transmitter output, expressed in dBm/Hz. It is defined for the downstream direction only, with a valid range of -34 through -52 in even-number increments. If you lower the value from its default value of -40, the line consumes less power but also has a lower capacity. Increasing the value can boost the PSD to achieve a higher capacity.

Following are the Al-Dmt line configuration subprofile parameters, shown with default values, for configuring power:

```
[in AL-DMT/{ any-shelf any-slot 0 }:line-config]
max-aggr-power-level-up = 13
max-aggr-power-level-down = 20
max-power-spectral-density = 40
gain-default = 16-db
```

| Parameter | Specifies |
|---|---|
| Max-Aggr-Power-Level-Up | Maximum aggregate power level on the upstream channel. Valid range is from 0dBm through 13dBm. |
| Max-Aggr-Power-Level-Down | Maximum aggregate power level on the downstream channel. Its valid range is from 0dBm through 20dBm. |
| Max-Power-Spectral-Density | Maximum PSD in both directions. Its valid range is from 34 through 52 in even-number increments. If you specify an odd number, the system uses the even-number setting below that number. The actual value used is the negative value of the number that is specified. |
| Gain-Default | The default gain value in dB (16dB or 20dB) for automatic gain control (AGC). The optimum value for downstream transmission is 20dB. The optimum value for upstream transmission is 16dB. |

## Fast and interleaved bit-rate parameters

Bit-rate parameters specify minimum, maximum, and planned upstream and downstream bit rates for a rate-adaptive connection. Bit rates depend on the physical interface (the line to which the central office equipment (COE) and customer premises equipment (CPE) are connected) and the ADSL interleaved or fast channel.

The Line-Latency-Up and Line-Latency-Down settings (`fast` or `interleave`) determine which channel is used in each direction. For more information, see “Line activation and DMT parameters” on page 1-6.

The following sample configuration of the Fast-Path-Config subprofile, bit-rate parameter settings indicate use of the fast channel for both upstream and downstream traffic. This is the default. Note that in the current software version, both upstream and downstream traffic must use the same channel.

```
[in AL-DMT/{ any-shelf any-slot 0 }:fast-path-config]
min-bitrate-up = 128
min-bitrate-down = 128
max-bitrate-up = 1000
max-bitrate-down = 8000
planned-bitrate-up = 512
planned-bitrate-down = 1000
```

The following sample configuration of the Interleave-Path-Config subprofile, bit-rate parameter settings indicate the use of the interleave path channel for both upstream and downstream traffic.

```
[in AL-DMT/{ any-shelf any-slot 0 }:interleave-path-config]
min-bitrate-up = 128
min-bitrate-down = 128
max-bitrate-up = 1000
max-bitrate-down = 8000
planned-bitrate-up = 512
planned-bitrate-down = 1000
```

| Parameter | Specifies |
|---|---|
| Min-Bitrate-Up | Minimum bit rate for upstream traffic, from 0Kbps through 1024Kbps. When the automatic rate-adaptive mode is in use, the line initializes at this upstream rate or fails to initialize.<br>The default value for the ADSL 24-port LIM is 128Kbps.<br>**Note:** Not configured for operator-controlled rate adaptation. |
| Min-Bitrate-Down | Minimum bit rate for downstream traffic, from 0Kbps through 8192Kbps. When the automatic rate-adaptive mode is in use, the line either initializes at this downstream rate or fails to initialize.<br>The default value for the ADSL 24-port LIM is 128Kbps.<br>**Note:** Not configured for operator-controlled rate adaptation. |
| Max-Bitrate-Up | Maximum bit rate for upstream traffic, from 0Kbps through 2,000Kbps.<br>The default value for the ADSL 24-port LIM is 1000Kbps.<br>**Note:** Not configured for operator-controlled rate adaptation. |
| Max-Bitrate-Down | Maximum bit rate for downstream traffic, from 0Kbps through 15,000Kbps.<br>The default value for the ADSL 24-port LIM is 8000Kbps.<br>**Note:** Not configured for operator-controlled rate adaptation. |
| Planned-Bitrate-Up | Constant bit rate for upstream traffic when operator-controlled rate-adaptive mode is in use. Valid values are from 0Kbps through 2,000Kbps.<br>The default value for the ADSL 24-port LIM is 512Kbps.<br>**Note:** Not configured for automatic-at-startup rate adaptation. |
| Planned-Bitrate-Down | Constant bit rate for downstream traffic when operator-controlled rate-adaptive mode is in use. Valid values are from 0Kbps through 15,000Kbps.<br>The default value for the ADSL 24-port LIM is 1000Kbps.<br>**Note:** Not configured for automatic-at-startup rate adaptation. |

## Interleaving delay parameters

Data interleaving increases the ability of the system to tolerate noise on the line. However, it also increases the latency (delay) of the data traffic. When using the interleave channel, determine the maximum amount of latency by considering the type of traffic sent on the line. The more tolerant of delay the traffic is, the higher these settings can be.

Following are the Al-Dmt profile parameters shown with default values for specifying the maximum tolerable delay for interleaver/deinterleaver operations:

```
[in AL-DMT/{ any-shelf any-slot 0 }:interleave-path-config]
max-delay-up = 16
max-delay-down = 16
```

| Parameter | Specifies |
|---|---|
| Max-Delay-Up | Maximum milliseconds of delay allowed in the upstream direction as a result of interleaving data. The valid range is 0 through 64. |
| Max-Delay-Down | Maximum milliseconds of delay allowed in the downstream direction as a result of interleaving data. The valid range is 0 through 64. |

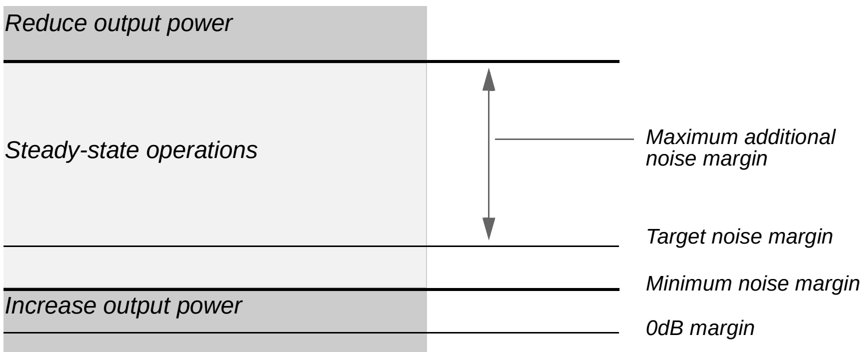
## Noise margin parameters

The bit-error rate (BER) is the percentage of erroneous bits in the total number of transmitted bits. The noise margins can be controlled to ensure that the line provides a BER of $10^{-7}$or better, as required by DMT standards.

Noise margins are defined in decibels (dB). A BER of $10^{-7}$represents 0dB. The line tolerates a certain level of random frequency voltage (noise) with respect to its received signal. If the maximum noise level is exceeded, the ADSL transceiver unit (ATU) attempts to reduce the far-end output power. If the noise drops below a minimum margin, the ATU attempts to increase the far-end power output until the noise level is at or above the configured minimum.

Although the noise-margin settings can be from 1dB through 31dB, the modem software limits the maximum noise margin to 15dB. If you specify a setting greater than 15dB, the modem software uses 15dB. Figure 1-2 illustrates the relationship of margin parameters to power adjustments.

*Figure 1-2. Relationship between noise margin parameters and power adjustments*



On many loops, the Stinger unit uses large power margins. To avoid excessive power margins, you can configure the Stinger unit with a maximum downstream noise margin value that it translates into a maximum power output value. The Stinger unit reduces the transmit power by a maximum of 12dB to achieve the desired maximum downstream noise margin. On clean short loops with low requested rates, the margin might still be high but the output power down is reduced. Power savings are more significant on short loops where the requested downstream rates are less than the maximum possible—the lower the requested rate, the more transmit power is saved. For a system with typical noise patterns, set the maximum margin to a value close to 8dB. For a system with greater noise patterns, you can set a higher value.

The following sample configuration enables power management on an ADSL 24-port LIM and sets the maximum power margin value to 10:

```
[in AL-DMT/{ shelf-1 slot-2 1 }:margin-config]
admin> set max-add-noise-margin-down = 10
admin> set max-margin-enabled = yes
```

You cannot set a value for the `max-add-noise-margin-down` parameter to a value that is less than that of the `target-noise-margin-down` parameter. Doing so causes the system to generate the following error message:

```
error: Setting in MARGIN not supported for card.
```

For a system with typical noise patterns, set the maximum margin to a value close to 8. For a system with greater noise patterns, you can set a higher value.

**Note:** The minimum noise margin parameters and the `max-add-noise-margin-up` parameter are not used by ADSL 24-port LIMs and are not detailed here. Consult documentation for the ADSL G.lite LIM for additional information about setting the noise margin parameters.

Following are the Al-Dmt profile parameters shown with default values for configuring the noise margins on the ADSL-DMT line for the ADSL 24-port LIMs:

```
[in AL-DMT/{ any-shelf any-slot 0 }:margin-config]
target-noise-margin-up = 6
target-noise-margin-down = 6
max-add-noise-margin-down = 10
max-margin-enabled = yes
```

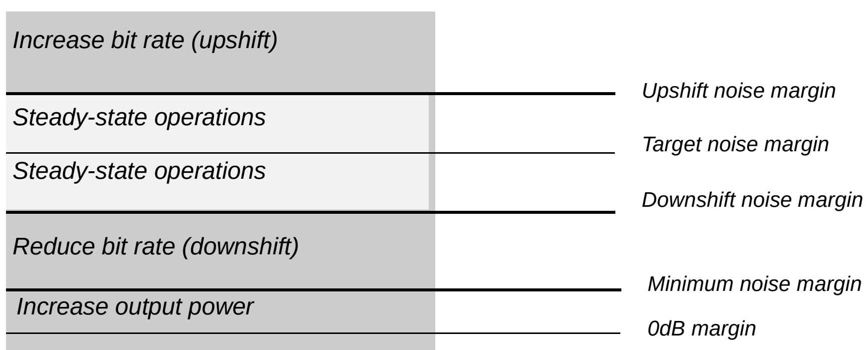
| Parameter | Specifies |
|---|---|
| `target-noise-margin-up` | Upstream noise margin, relative to 0dB, that must be present before the line can initialize successfully and rate adapt during normal operations. The valid range is 0dB through 31dB, with a practical limitation of 15dB set by the modem software.<br>The default for the ADSL 24-port LIM is 6db. |
| `target-noise-margin-down` | Downstream noise margin, relative to 0dB, that must be present before the line can initialize successfully and rate adapt during normal operations. The valid range is 0dB through 31dB, with a practical limitation of 15dB set by the modem software.<br>The default for the ADSL 24-port LIM is 6dB. |

| Parameter | Specifies |
|---|---|
| `max-add-noise-margin-down` | Maximum downstream noise margin beyond the `target-noise-margin-up` setting the line tolerates, relative to 0dB, before attempting to reduce power output. The valid range is 0dB through 31dB, with a practical limitation of 15dB set by the modem software.<br>On a system with typical noise patterns, Lucent recommends approximately 8dB. |
| `max-margin-enabled` | Enables or disables the maximum downstream noise margin.<br>• `yes`—Use the maximum downstream noise margin set with the `add-max-noise-margin-down` parameter.<br>• `no`—Ignore the maximum downstream noise margin setting. |

## Dynamic rate-adaptive noise margin parameters

Dynamic rate adaptation is not yet supported. Therefore, if you set any of the parameters described in this section, the modem retrains with its previous behavior. When dynamic rate adaptation is in use, the line adjusts its bit rate dynamically (it *upshifts* to increase its bit rate or *downshifts* to reduce it) on the basis of specified noise margins and intervals for which a noise level is maintained, provided that the maximum or minimum bit rate has not been reached. Figure 1-3 illustrates the relationship between margins and dynamic rate adaptation.

*Figure 1-3. Future support: Noise margins and dynamic rate adaptation relationship*




When dynamic rate adaptation is supported, the following parameters will configure it:

```
[in AL-DMT/{ any-shelf any-slot 0 }:margin-config]
ra-downshift-margin-up = 0
ra-downshift-int-up = 0
ra-downshift-margin-down = 0
ra-downshift-int-down = 0
ra-upshift-margin-up = 0
ra-upshift-int-up = 0
ra-upshift-margin-down = 0
ra-upshift-int-down = 0
```

| Parameter | Specifies |
|---|---|
| Ra-Downshift-Margin-Up | *Not currently used*. Upstream noise margin relative to 0dB. If the noise level remains at this value for more than the specified time interval, the line reduces its upstream bit rate. The valid range is 1dB through 31dB. |
| Ra-Downshift-Int-Up | *Not currently used*. Number of seconds (1 through 255) the downshift noise margin may be maintained before the line reduces its upstream bit rate. |
| Ra-Downshift-Margin-Down | *Not currently used*. Downstream noise margin relative to 0dB. If the noise level remains at this value for more than the specified time interval, the line reduces its downstream bit rate. The valid range is 1dB through 31dB. |
| Ra-Downshift-Int-Down | *Not currently used.* Number of seconds (1 through 255) the downshift noise margin may be maintained before the line reduces its downstream bit rate. |
| Ra-Upshift-Margin-Up | *Not currently used*. Upstream noise margin relative to 0dB. If the noise level remains at this value for more than the specified time interval, the line increases its upstream bit rate.The valid range is 1dB through 31dB. |
| Ra-Upshift-Int-Up | *Not currently used*. Number of seconds (1 through 255) the upshift noise margin can be maintained before the line increases its upstream bit rate. |
| Ra-Upshift-Margin-Down | *Not currently used.* Downstream noise margin relative to 0dB. If the noise level remains at this value for more than the specified time interval, the line increases its downstream bit rate. The valid range is 1dB through 31dB. |
| Ra-Upshift-Int-Down | *Not currently used*. Number of seconds (1 through 255) the upshift noise margin can be maintained before the line increases its downstream bit rate. |

# *Configuring call-control*

Using the call-control procedures, you can configure the Stinger to allow connections to be established even when the line state is not fully up. You can configure the unit to use these procedures system-wide or on a per-port basis on the DS3-ATM, OC3-ATM, and E3-ATM trunk modules and on the SDSL, ADSL, and SHDSL/HDSL2 LIMs.

The call-control mechanism enables the Stinger unit to establish and maintain soft PVCs (SPVCs) across port state changes. This allows xDSL subscribers to establish connections on LIM interfaces in the operating states before they are fully trained, as well as in the standard port-up state (in which the modem has successfully trained up). SPVC connections are accepted when the modem has not fully trained up to the port-up state. If a LIM interface with an active SPVC connection changes from a port-up state to the state it was in before it was fully trained, the SPVC remains connected. Connections are broken only if the physical slot or line stops operating or is disabled by an administrator.

By default, the Stinger unit monitors the physical line state of its interfaces and allows connections to be established only when the line state is fully up.

Following are examples of the relevant parameters, shown with default settings:

```
[in SYSTEM]
ignore-lineup = no

[in SDSL/{ any-shelf any-slot 0 }]
ignore-lineup = system-defined

[in DS3-ATM/{ any-shelf any-slot 0 }]
ignore-lineup = system-defined
```

| Parameter | Specifies |
|---|---|
| `ignore-lineup` | In the System Profile, enables or disables the Stinger system's ability to ignore line status when determining whether calls are established or not. Specify one of the following values:<br>• `no` (the default)—The Stinger call-control mechanism allows calls to be established when the line state is up and disallow calls when the line state is down.<br>• `yes`—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. |
| `ignore-lineup` | In a Line Profile, specifies whether the line status of a slot has an effect on the Stinger call control mechanism on the specified port. Specify one of the following values:<br>• `system-defined` (the default)—Sets the Stinger to inherit the Ignore-Lineup value from the system profile.<br>• `no`—Sets the Stinger call-control mechanism to ignore the systemwide 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.<br>• `yes`—Sets the Stinger call-control mechanism to ignore 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. |

The commands in the following example configure the unit to use the new call-control procedures systemwide:

```
admin> read system
SYSTEM read

admin> set ignore-lineup = yes

admin> write
SYSTEM written
```

When call-control is enabled systemwide, you can disable it on specific interfaces by modifying the line profile. The commands in the following example disable call-control procedures on port one of the SDSL 48-port LIM in slot 12:

```
admin> read sdsl { 1 12 1 }
SDSL/{ shelf-1 slot-12 1 } read
admin> set ignore-lineup = no
admin> write
SDSL/{ shelf-1 slot-12 1 } written
```

# *Modifying call control to support dual latency*

Dual latency splits a DSL data stream into multiple subchannels to transport data in parallel. The number of subchannels depends on the transmission technology. DMT currently supports two subchannels. Very high bit-rate DSL (VDSL) supports up to five.

Dual latency allows you to set different characteristics for each subchannel, for example `fast` on one subchannel and `interleave` on another. (See "Fast and interleaved bit-rate parameters" on page 1-10.) Because `fast` latency is ideal for voice or video (which requires minimal delays) and `interleave` is better suited for data applications (which tolerate greater delays), dual latency is a good solution for voice over ATM or voice over IP. In this case you would run the voice over the `fast` subchannel and the data over the `interleave` subchannel in parallel for both upstream and downstream.

To obtain dual latency operation, you must set `line-latency` to `both` in the AL-DMT line profile as well as set `sub-channel` to `2` in ATM-QOS. If latency is not set to `both`, even if you set `sub-channel` to `2` in ATM-QOS, only the lower subchannel is used. When dual latency is in effect, subchannel 1 is the `fast` channel and subchannel 2 is the `interleave` subchannel.

To understand how DMT prioritizes bandwidth allocation between the two subchannels, bear in mind that the dual latency scheme is intended for latency-sensitive applications that use the `fast` path. While training, the bandwidth requirements in the `fast-path-config` subprofile are considered first, and only after they are met are the `interleave-path-config` subprofile settings used for the `interleave` path. For example, assume you have a setting of 128Kbps symmetric in the Fast-Path-Config subprofile (four compressed voice channels ) and 8128Kbps and 1024Kbps in the Interleave-Path-Config subprofile. When training, first 128Kbps symmetrical are allocated to the `fast` subchannel, then whatever is left of the line's capacity is used for the `interleave` subchannel.

## Provisioning a dual latency deployment

The following sample procedure shows how to provision a dual latency deployment with two virtual channels, one using `fast` latency for four voice channels over ATM (128Kbps bandwidth) with `vpi=0`, and `vci=40` and the other one using `interleave` latency for data with `vpi=0`, and `vci=55`.

### *Setting latency*

Both upstream and downstream latencies must be set to `both`. You cannot have dual latency in one direction and single latency in the other. Enable the line and set latency as follows:

```
super> read al-dmt {1 6 2}
AL-DMT/{ shelf-1 slot-6 2 } read
super> set en = yes
```

```
super> set line line-latency-down = both
super> write
error: Setting in LINE not supported for card.
super> set line line-latency-up = both
super> write
AL-DMT/{ shelf-1 slot-6 2 } written
LOG notice, Shelf 1, Slot 6, Time: 10:43:12--
Line 2 INS
admin>  get al-dmt {1 6 2} line
[in AL-DMT/{ shelf-1 slot-6 2 }:line-config]
nailed-group = 252
vp-switching-vpi = 15
rate-adapt-mode-up = automatic-at-startup
rate-adapt-mode-down = automatic-at-startup
rate-adapt-ratio-up = 100
rate-adapt-ratio-down = 100
max-aggr-power-level-up = 13
max-aggr-power-level-down = 20
max-power-spectral-density = 40
line-code = auto-select
line-latency-down = both
line-latency-up = both
trellis-encoding = yes
gain-default = 20-db
upstream-start-bin = 6
upstream-end-bin = 31
downstream-start-bin = 32
downstream-end-bin = 255
loop-back = none
bit-swapping = yes
fbm-dbm-mode = fbm
```

## *Setting the bandwidth*

Set the maximum bandwidth for the `fast` (voice) channel and the `interleave` (data) channel as follows:

```
admin> read al-dmt {1 6 2}
AL-DMT/{ shelf-1 slot-6 2 } read
admin> list fast
[in AL-DMT/{ shelf-1 slot-6 2 }:fast-path-config]
min-bitrate-up = 32
min-bitrate-down = 32
max-bitrate-up = 1000
max-bitrate-down = 8000
planned-bitrate-up = 512
planned-bitrate-down = 1000
admin> set max-bitrate-up = 128
admin> set max-bitrate-down = 128
admin> list
[in AL-DMT/{ shelf-1 slot-6 2 }:fast-path-config (changed)]
```

```
min-bitrate-up = 32
min-bitrate-down = 32
max-bitrate-up = 128
max-bitrate-down = 128
planned-bitrate-up = 512
planned-bitrate-down = 1000
```

```
admin> list .. interleave
[in AL-DMT/{ shelf-1 slot-6 2 }:interleave-path-config]
min-bitrate-up = 32
min-bitrate-down = 32
max-bitrate-up = 1000
max-bitrate-down = 8000
planned-bitrate-up = 512
planned-bitrate-down = 1000
max-delay-up = 16
max-delay-down = 16
```

```
admin> set max-bitrate-down = 8128
admin> set max-bitrate-up = 1024
admin> write
AL-DMT/{ shelf-1 slot-6 2 } written
```

## *Setting QoS profiles*

Set up the QoS profiles for each latency as follows:

```
admin> new atm-qos voice
ATM-QOS/voice read
admin> list
[in ATM-QOS/voice (new)]
contract-name* = voice
traffic-descriptor-index = 0
traffic-descriptor-type = noclp-noscr
atm-service-category = cbr
peak-rate-kbits-per-sec = 16
peak-cell-rate-cells-per-sec = 37
sustainable-rate-kbits-per-sec = 16
sustainable-cell-rate-cells-per-sec = 37
ignore-cell-delay-variation-tolerance = yes
cell-delay-variation-tolerance = 20
ignore-max-burst-size = yes
max-burst-size = 4
aal-type = aal-0
early-packet-discard = no
partial-packet-discard = no
tag-or-discard = discard
sub-channel = 1
```

**Note:** Use subchannel one for `fast` latency.

```
admin> write
ATM-QOS/voice written
```

```
admin> new atm-qos data
ATM-QOS/data read
```

```
admin> list
[in ATM-QOS/default]
contract-name* = default
traffic-descriptor-index = 1
traffic-descriptor-type = noclp-noscr
atm-service-category = ubr
peak-rate-kbits-per-sec = 0
peak-cell-rate-cells-per-sec = 0
sustainable-rate-kbits-per-sec = 0
sustainable-cell-rate-cells-per-sec = 0
ignore-cell-delay-variation-tolerance = yes
cell-delay-variation-tolerance = 0
ignore-max-burst-size = yes
max-burst-size = 0
aal-type = aal-0
early-packet-discard = no
partial-packet-discard = no
tag-or-discard = discard
sub-channel = 2
```

**Note:** Use subchannel two for `interleave` latency.

```
admin> write
ATM-QOS/data written
```

## *Setting the connection profiles*

Set up the connection profiles for each virtual channel as follows:

```
admin> new conn voice-6-2
CONNECTION/voice-6-2 read
admin> set active = yes
admin> set atm-options vpi = 0
admin> set atm-options vci = 40
admin> which -n {1 6 2}
Nailed group corresponding to port { shelf-1 slot-6 2 } is 252
admin> set atm-options nailed = 252
admin> set atm-connect vpi = 0
admin> set atm-connect vci = 100
admin> set atm-connect nailed = 801
admin> list atm-qos-options
[in CONNECTION/voice-6-2:atm-qos-options]
usr-up-stream-contract = default
usr-dn-stream-contract = default
admin> set usr-up = voice
admin> set usr-dn = voice
admin> write
CONNECTION/voice-6-2 written
```

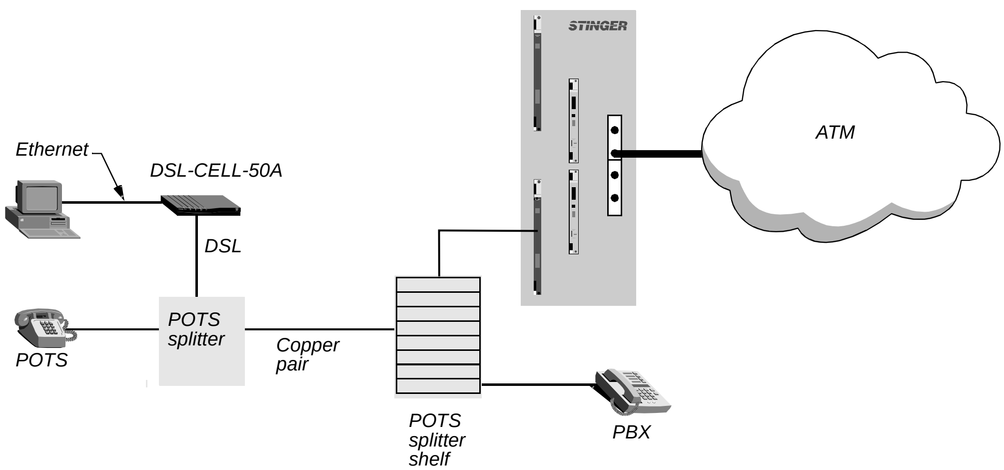
```
admin> new conn data-6-2
CONNECTION/data-6-2 read
admin> set active = yes
admin> set atm-options vpi = 0
admin> set atm-options vci = 55
```

```
admin> set atm-options nailed = 252
admin> set atm-connect vpi = 0
admin> set atm-connect vci = 100
admin> set atm-connect nailed = 801
admin> list atm-qos-options
[in CONNECTION/voice-6-2:atm-qos-options]
usr-up-stream-contract = default
usr-dn-stream-contract = default
admin> set usr-up = data
admin> set usr-dn = data
admin> write
CONNECTION/data-6-2 written
```

# Examples of ADSL-DMT interface configuration

In Figure 1-4, an ADSL-DMT interface in a Stinger unit is configured to support a rate-adaptive connection to a DSL-CELL-50A CPE.

*Figure 1-4. ADSL ATM LIM configuration*




The following commands configure the interface to use a constant, planned (operator-controlled) bit rate of 56Kbps upstream and 1.5Mbps downstream, using the fast channel in both directions:

```
admin> read al-dmt { 1 3 4 }
AL-DMT/{ shelf-1 slot-3 4 } read

admin> set enabled = yes

admin> set line-config line-latency-up = fast

admin> set line-config line-latency-down = fast

admin> set line-config rate-adapt-mode-up = operator-controlled

admin> set line-config rate-adapt-mode-down = operator-controlled

admin> set fast-path-config planned-bitrate-up = 56

admin> set interleave-path-config planned-bitrate-down = 1500
```

```
admin> write
AL-DMT/{ shelf-1 slot-3 4 } read
```

The following commands configure the interface to automatically select the best possible rate at startup time. They specify a possible upstream bit-rate range of 56Kbps through 256Kbps and a possible downstream bit-rate range of 512Kbps through 1.5Mbps. They also specify use of the interleaved channel in both directions.

```
admin> read al-dmt { 1 3 4 }
AL-DMT/{ shelf-1 slot-3 4 } read

admin> set enabled = yes

admin> set line-config rate-adapt-mode-up = automatic-at-startup

admin> set line-config rate-adapt-mode-down = automatic-at-startup

admin> set line-config line-latency-up = interleave

admin> set line-config line-latency-down = interleave

admin> set interleave-path-config min-bitrate-up = 56

admin> set interleave-path-config max-bitrate-up = 256

admin> set interleave-path-config min-bitrate-down = 512

admin> set interleave-path-config max-bitrate-up = 1500

admin> write
AL-DMT/{ shelf-1 slot-3 4 } read
```

The following commands reserve VPI 7 for VP switching on the interface:

```
admin> read al-dmt { 1 3 4 }
AL-DMT/{ shelf-1 slot-3 4 } read

admin> set line-config vp-switching-vpi = 7

admin> write
AL-DMT/{ shelf-1 slot-3 4 } read
```

# *Checking status of ADSL-DMT interface*

The system creates an Al-Dmt-Stat profile for each ADSL-DMT interface. The profiles provide statistics and connection status. Following are the relevant parameters, shown with sample settings for an active line:

```
[in AL-DMT-STAT/{ shelf-1 slot-3 4 }]
physical-address* = { shelf-1 slot-3 4 }
line-state = active
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
```

```
physical-status = { 0 coe port-up 128 2944 fast fast 1.4.1 2 0 1 init-+
physical-statistic = { { 1 1 1 } yes 3 passed 3 6 56 19 5 41 11 0 0 0 +}
```

| Parameter | Specifies |
|---|---|
| Line-State | The overall state of the line. Values are:<br>• `does-not-exist`—Link is not physically present on board.<br>• `disabled`—Line is disabled.<br>• `active`—Multipoint is established. |
| Spare-Physical-Address | Shelf, slot, and port number of the spare (redundant) LIM. |
| Sparing-State | The state of the redundancy function. If redundancy is not enabled, `sparing-none` is the value. If sparing is enabled and the LIM slot is a primary LIM, the value can be `primary-active` or `primary-inactive`. If sparing is enabled and the LIM slot is the secondary (spare) LIM, the value can be `secondary-active` or `secondary-inactive`. |
| Sparing-Change-Reason | How redundancy is activated. Valid values are `inactive`, `manual` and `automatic`. |
| Sparing-Change-Time | The time that the last change in redundancy state occurred. |
| Sparing-Change-Counter | Each redundancy change, for example, primary to secondary, secondary to primary, increments the counter. The counter is reset when the Stinger starts or restarts. |
| VPI-VCI-Range | The valid range of VPI and VCI for the circuits established for the line. This range can change only after LIM reboot. |
| VP-switching-VPI | The VPI to be used for the VP switching. The rest of the VPIs are used for the VC switching. |

## Checking status of the physical interface

The Physical-Status subprofile provides information about the physical interface. The interface uses its unused bandwidth to run a continuous bit-error-rate test (BERT), so bit-error counts are always available without explicitly running a BERT and disrupting data transmission. Integrated BERT results are displayed by the Accum-Bit-Err, Num-Sec-Valid, and Num-Sec-Invalid parameters.

Following are the Physical-Status parameters shown with sample settings for an active interface:

```
[in AL-DMT-STAT/{ shelf-1 slot-3 4 }:physical-status]
if-group-index = 0
unit-type = coe
dev-line-state = port-up
up-stream-rate-fast = 0
down-stream-rate-fast = 0
up-stream-rate-interleave = 128000
down-stream-rate-interleave = 2944000
up-stream-latency = interleave
down-stream-latency = interleave
firmware-ver = 1.4.1
```

```
ansi-adsl-ver = 2
initial-adsl-ver = 0
hardware-ver = 1
modem-hw-state = init-ok
accum-bit-err = 0
num-sec-valid = 91
num-sec-invalid = 0
operational-mode = g.lite
```

| Parameter | Indicates |
|---|---|
| IF-Group-Index | SNMP interface group index of the line. |
| Unit-Type | Operating mode (should always be COE). |
| Dev-Line-State | The current state of the interface. Valid values are as follows:<br>• `down`—Either there is no connection or the interface is disabled.<br>• `activation`—Interface is trying to train but not detecting a modem on the other end.<br>• `training`—Training with a modem on the other end.<br>• `port-up`—Interface is successfully trained up.<br>• `failed`—Interface failed training (usually a log message gives the reason).<br>• `loopback`—Interface is in special loopback test mode. |
| Up-Stream-Rate-Fast | Upstream data rate in bps when latency is `fast`. Zero means that latency is set to `interleave` or the data rate is unknown. |
| Down-Stream-Rate-Fast | Downstream data rate in bps when latency is `fast`. Zero means that latency is set to `interleave` or the data rate is unknown. |
| Up-Stream-Rate-Interleave | Upstream data rate in bps when latency is `interleave`. Zero means that latency is set to `fast` or the data rate is unknown. |
| Down-Stream-Rate-Interleave | Downstream data rate in bps when latency is `interleave`. Zero means that latency is set to `fast` or the data rate is unknown. |
| Up-Stream-Latency | Operational upstream latency (`none`, `fast`, or `interleave`). The `none` setting indicates that the line is not operational. |
| Down-Stream-Latency | Operational downstream latency (`none`, `fast`, or `interleave`). The `none` setting indicates that the line is not operational. |
| Firmware-Ver | Version number of the ADSL modem firmware. |
| ANSI-ADSL-Ver | Supported issue of the ANSI T1.413 standard (Issue 2). |
| Hardware-Ver | Hardware version of the ADSL modem. |

| Parameter | Indicates |
|---|---|
| Modem-Hw-State | State of the interface after initialization. Valid values are `init-ok` (all is well), `bad-sdram`, `bad-cache`, or `bad-cache-sdram`. The last three values imply memory problems, probably associated with a self-test failure. |
| Accum-Bit-Err | Number of actual bit errors detected during the continuous BERT. |
| Num-Sec-Valid | How many seconds were error free during the continuous BERT. |
| Num-Sec-Invalid | How many error seconds were detected during the continuous BERT. |
| Operational-Mode | ADSL coding protocol as automatically detected or set by user. Valid values are `ANSI dmt`, `g.lite`, or `g.dmt`. |

## Displaying ADSL-DMT port status and nailed groups

To display the nailed-group numbers for ADSL-DMT lines, use the Dmtal command. For example, the following command output shows the nailed-group numbers for an ADSL-DMT module in slot 4:

```
admin> dmtal -a
All ADSL lines:
(dvOp   dvUpSt  dvRq    sAdm    nailg)
Line    {    1  4  1 }       (Up      Idle    UP      UP     00151)
Line    {    1  4  2 }       (Up      Idle    UP      UP     00152)
Line    {    1  4  3 }       (Up      Idle    UP      UP     00153)
Line    {    1  4  4 }       (Up      Idle    UP      UP     00154)
Line    {    1  4  5 }       (Up      Idle    UP      UP     00155)
Line    {    1  4  6 }       (Up      Idle    UP      UP     00156)
Line    {    1  4  7 }       (Up      Idle    UP      UP     00157)
Line    {    1  4  8 }       (Up      Idle    UP      UP     00158)
Line    {    1  4  9 }       (Up      Idle    UP      UP     00159)
Line    {    1  4 10 }       (Up      Idle    UP      UP     00160)
Line    {    1  4 11 }       (Up      Idle    UP      UP     00161)
....
```

## Obtaining statistics about operations

The Physical-Statistic subprofile enables you to check interface operations. Following are the Physical-Statistic parameters shown with sample settings for an active interface:

```
[in AL-DMT-STAT/{ shelf-1 slot-3 4 }:physical-statistic]
line-up-timer = { 0 0 1 }
rx-signal-present = yes
up-dwn-cntr = 3
self-test = passed
noise-margin-down = 6
attenuation-down = 56
output-power-down = 19
```

```
noise-margin-up = 5
attenuation-up = 41
output-power-up = 11
near-end-fec = 0
near-end-crc = 0
near-end-hec = 0
far-end-fec = 10
far-end-crc = 0
far-end-hec = 0
received-rs-blcks = 104073
transmitted-rs-blocks = 416772 incoming-cells = 92
outgoing-cells = 100
```

| Parameter | Indicates |
|---|---|
| Line-Up-Timer | How long the interface has been up (days, hours, and minutes in {*dd hh mm*} format. |
| RX-Signal-Present | Receiving (`yes`) or not receiving (`no`) signal from the CPE. |
| Up-Down-Cntr | Number of times the link has transitioned from an Up state to a Down state since the module was last reset. |
| Self-Test | Whether the port has passed the modem chipset self-test. |
| Noise-Margin-Down | Current downstream noise margin in dB. |
| Attenuation-Down | Current downstream attenuation in dB. |
| Output-Power-Down | Current downstream aggregate power level in dBm. |
| Noise-Margin-Up | Current upstream noise margin in dB. |
| Attenuation-Up | Current upstream attenuation in dB. |
| Output-Power-Up | Current upstream aggregate power level in dBm. |
| Near-End-FEC | Forward error correction (FEC) errors detected by the COE ADSL transceiver unit (ATU). |
| Near-End-CRC | Cyclic redundancy check (CRC) errors detected by the COE ATU. |
| Near-End-HEC | Header error control (HEC) errors detected by the COE ATU. |
| Far-End-FEC | Forward error correction (FEC) errors detected by the CPE ATU. |
| Far-End-CRC | Cyclic redundancy check (CRC) errors detected by the CPE ATU. |
| Far-End-HEC | Header error control (HEC) errors detected by the CPE ATU. |
| Received-Rs-Blcks | Number of received Reed-Solomon blocks. Enabled on 24-port and 48-port LIMs only. |
| Transmitted-Rs-Blocks | Number of transmitted Reed-Solomon blocks. |
| Incoming-Cells | Number of incoming cells. |
| Outgoing-Cells | Number of outgoing cells. |

# Configuring LIM and LIM Port Redundancy 2



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-PR) for line protection.

**Note:** Some older Stinger units 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 2-7.

## *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 unit 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.

In the same way, a unit can be equipped with the following module pairs:

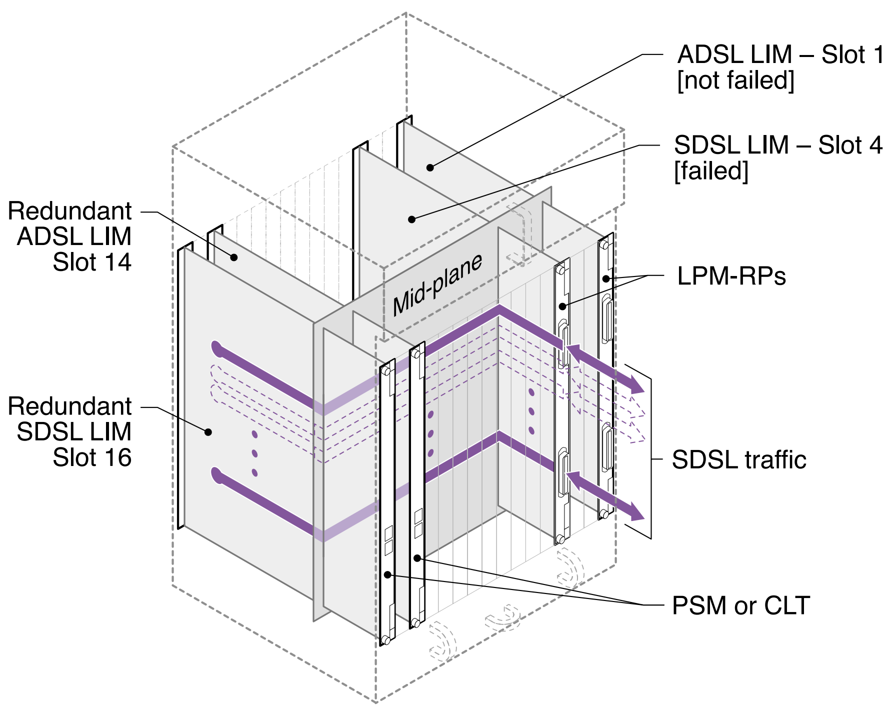
- 6 SDSL LIM–LPM-RP pairs
- 1 SDSL–PSM pair or SDSL–CLT module pair
- 6 ADSL LIM–LPM-RP pairs
- 1 ADSL–PSM pair or ADSL–CLT module pair

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 as shown here.

*Figure 2-1. LIM redundancy in a Stinger FS unit*




## 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 separately 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.<br>• `inactive` setting—disables the LIM redundancy function.<br>• `manual` setting—deactivates the LIM specified in the `manually-spared-slot-number` parameter, terminating its connections and then reestablishing them on the spare LIM. For more information, see "Manual LIM redundancy" on page 2-4.<br>• `automatic` 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 parameter 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, referring to Figure 2-1, suppose that the SDSL LIM in slot 4 fails. 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 units 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 |
|---|---|
| `active` | When redundancy mode is set to `automatic`, this parameter enables or disables the LIM slot to participate in automatic LIM redundancy. Only slots for which this parameter is set to `yes` can be backed up by the spare. The default value is `yes`. |
| `error-averaging-period` | Number of seconds during which the number of errors specified by `error-threshold` must be observed on the line before the modem is considered nonfunctional. The default value is `10`. |
| `error-threshold` | Number of errors that can occur during the specified `error-averaging-period` interval before a modem on this LIM is considered nonfunctional. The default value is `100`. |
| `up-down-threshold` | Number of times during the specified `error-averaging-period` interval that the line is connected and disconnected by the modem before the modem is considered nonfunctional. The default value is `3`. |

| Parameter | Specifies |
|---|---|
| `modem-failure-threshold` | 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. Enter the `dir lim-sparing-config` command to verify that the profile has been created.

For example, suppose a Stinger FS unit 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 unit 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 read-only values:

```
[in LIM-SPARING-STATUS]
spare-slot-type = none
sparing-mode = primary-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, `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`. |
| `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 `inactive`, `automatic`, and `manual`. |
| `sparing-change-time` | Time that the last change in redundancy state occurred. |

| Parameter | Indicates |
|---|---|
| `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 `yes` and `no`. |
| `lim-status-ok` | Valid values are `yes` and `no`. |
| `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 unit 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 information.

```
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 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.

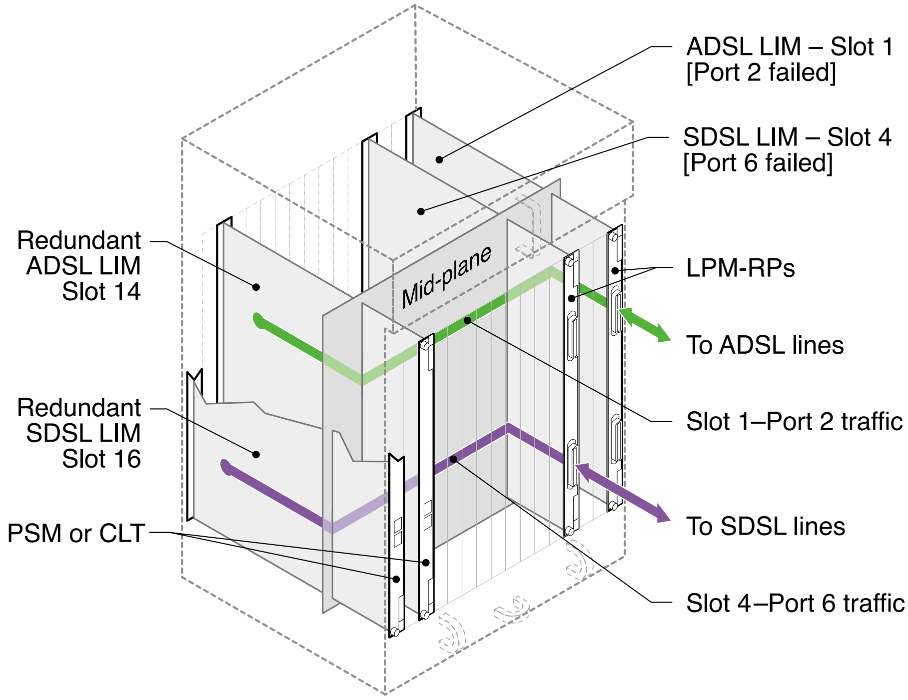
More than one kind of LIM port can be backed up. An additional LIM-PSM pair (or LIM-CLT module pair) of another type installed in a Stinger unit can be used to back up other LIMs of that type in the system. For example, a spare SDSL LIM in slot 16 can back up any failed port on any other SDSL LIMs in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




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 |
|---|---|
| `sparing-mode` | Enables or disables port redundancy and specifies the mode. You can set the following port-redundancy modes:<br>• `inactive`—disables LIM port redundancy. This is the default.<br>• `manual`—deactivates the LIM port and then reestablishes the connection on the same port of the spare LIM.<br>• `automatic`—activates automatic redundancy for the port. The error threshold parameters specified in the `Auto-LIM-Sparing-Config` subprofile of the LIM-Sparing-Config [*slot number*]profile are used. |

## 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 unit 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 `error-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 read-only 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
```

| Parameter | Indicates |
|---|---|
| `spare-physical-address` | Shelf, slot, and port number of spare LIM. |

| 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`. |
| `sparing-change-reason` | How redundancy is activated. Valid values are `inactive`, `manual`, and `automatic`. |
| `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 unit is turned on. |