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- Software and hardware options
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- Type of computer you are using
- Description of the problem

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About This Guide

What is in this guide

This guide explains how to perform the following installation and basic configuration tasks on a Stinger MRT-2 (Micro-Remote Terminal-2) unit:

- Physical installation of a Stinger MRT-2 unit
- Connection of an administrative terminal to a Stinger MRT-2
- Configuration of a Stinger MRT-2 for basic network connectivity

This guide also provides Stinger MRT-2 technical specifications and an operational overview of the Stinger MRT-2. When you finish performing the instructions in this guide, your Stinger MRT-2 will be installed and you will be able to access it via a Telnet connection for further configuration.

What you should know

**Warning** Before installing your Stinger MRT-2 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 Appendix D, “Safety-Related Electrical, Physical, and Environmental Information,” in this guide.

The procedures in this guide require you to understand and follow the safety practices at your site, as well as those identified in this guide. Before installing any hardware, check the installation location for adequate temperature, humidity, and electrical requirements. Work closely with the network manager and other systems integration personnel to ensure a functional installation.

Documentation conventions

Following are all the special characters and typographical conventions used in this manual:

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<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monospace text</td>
<td>Represents text that appears on your computer's screen, or that could appear on your computer's screen.</td>
</tr>
<tr>
<td>Boldface monospace text</td>
<td>Represents characters that you enter exactly as shown (unless the characters are also in <em>italics</em>—see <em>italics</em>, below). If you could enter the characters but are not specifically instructed to, they do not appear in boldface.</td>
</tr>
</tbody>
</table>
**About This Guide**

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

---

<table>
<thead>
<tr>
<th><strong>Convention</strong></th>
<th><strong>Meaning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Italics</td>
<td>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.</td>
</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>&gt;</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 Ctrl 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><img src="note.png" alt="Note" /></td>
<td>Introduces important additional information.</td>
</tr>
<tr>
<td><img src="caution.png" alt="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><img src="warning.png" alt="Warning" /></td>
<td>Warns that a failure to take appropriate safety precautions could result in physical injury.</td>
</tr>
<tr>
<td><img src="warning.png" alt="Warning" /></td>
<td>Warns of danger of electric shock.</td>
</tr>
</tbody>
</table>
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 shows you how to use the command-line interface to configure and verify IP access and basic access security on the unit.

  The Getting Started Guides for Stinger models with redundant control modules describe configuration of this feature.

  The *Stinger MRT Getting Started Guide* describes the features and basic configuration of the trunk modules that are specific to a Stinger MRT.

  - The *Stinger MRT-2 Getting Started Guide* describes the features and basic configuration of the trunk modules that are specific to a Stinger MRT-2.

  - Module guides for each type of module designed for the Stinger FS, Stinger FS+, Stinger LS, or Stinger RT, 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 IP2000 Configuration Guide*. For Stinger 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*. 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 Simple Network Management Protocol (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.

- **RADIUS**: *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:**
About This Guide
Stinger documentation set

- *TAOS Glossary*. Defines terms used in documentation for Stinger units.
Introduction to the Stinger MRT-2

The Stinger MRT-2 overview

The Stinger MRT-2 (MRT2U-AD-72S-56K-MODEL) is a small temperature-hardened version of the Stinger unit, designed to be installed in outdoor enclosures in remote locations. The MRT-2 chassis is 17.4-inches wide and 3.5-inches high. It is designed to occupy 2U (3.5 inches) of vertical space in standard 19-inch racks, or racks with at least 17.72 inches of space between the mounting rails.

The operating temperature of the installation environment can range between -40°F (-40°C) and 149°F (+65°C). For more information, see “Operating environment” on page D-5.

The Stinger MRT-2 chassis has an integrated design, unlike the chassis of larger Stinger LS and Stinger FS models which have numerous slots that accept different types of plug-in modules. The Plug-in modules for the larger Stinger LS and Stinger FS support the following functions.

- General control and configuration of the Stinger unit (control modules)
- Connection to subscriber lines (line interface modules or LIMs)
- Protection of the unit from transient subscriber line conditions (line protection modules or LPMs)
- Connection to various types of ATM links (trunk modules)

All the hardware and capabilities associated with the control module, LIMs, and LPMs on the larger Stinger LS and Stinger FS models are integrated into the Stinger MRT-2 chassis.

Depending on bandwidth requirements, a specially designed trunk module that supports OC3/STM1, DS3, T1, or E1 service can be installed in the Stinger MRT-2 chassis. Each Stinger MRT-2 chassis is equipped with a pair of STS-3 connectors that can forward (cascade) traffic through multiple Stinger MRT units in a common location to a single unit with a trunk module.

The Stinger MRT-2 also incorporates integrated line splitters to provide asymmetric digital subscriber line (ADSL) and analog telephone (POTS) service over a single pair...
of wires. For details of model number designations, and line capabilities, see Table 1-2.

Virtual slot conventions for the Stinger MRT

All of the highly integrated Stinger MRT units use the same TAOS software as larger Stinger units. In the larger Stinger units TAOS uses the physical slot number in which modules are installed to access the parameters of those modules and configure them. In Stinger MRT units, functions are grouped into virtual slots, so that they can be accessed and configured by the TAOS software in a manner similar to other Stinger models.

Table 1-1 compares the physical slot locations of modules installed in a Stinger FS with the virtual slot locations for the same functions integrated into a Stinger MRT-2. These virtual slot positions are used in examples throughout this document.

Table 1-1. Stinger MRT-2 virtual slots

<table>
<thead>
<tr>
<th>Module type</th>
<th>Stinger FS location</th>
<th>Stinger MRT-2 virtual location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line interface module (LIM)</td>
<td>Slots 1 through 7 Slots 10 through 16</td>
<td>Virtual slot 1</td>
</tr>
<tr>
<td>Control module</td>
<td>Slots 8 and 9</td>
<td>Virtual slot 8</td>
</tr>
<tr>
<td>Trunk modules</td>
<td>Slots 17 and 18</td>
<td>Virtual slot 17 (built-in STS-3) Virtual slot 18 (trunk module)</td>
</tr>
</tbody>
</table>

Stinger MRT-2 products

Trunk modules for the Stinger MRT-2 are ordered separately, the base chassis is supplied with a blank faceplate covering the trunk module slot. Optional software is available that enables additional capabilities of the T1 trunk module of the Stinger MRT-2.

Table 1-2 contains a list of some of the Stinger MRT-2 products that are currently available. For additional information, contact your Lucent Technologies sales representative.

Table 1-2. Stinger MRT-2 products and product codes

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRT2U-AD-72S-56K-MODEL</td>
<td>Complete Stinger MRT-2 chassis, 17.4-inch (44.196cm) wide (includes 72 ADSL ports with splitters, and a blank face plate for the trunk module slot).</td>
</tr>
<tr>
<td>MRT19-TM-OC3-2</td>
<td>OC3 trunk module for the Stinger MRT-2 and MRT 19 chassis.</td>
</tr>
</tbody>
</table>
Table 1-2.  *Stinger MRT-2 products and product codes*

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRT19-TM-DS3-2</td>
<td>DS3 trunk module for the Stinger MRT-2 and MRT 19 chassis.</td>
</tr>
<tr>
<td>MRT19-TM-T1E1</td>
<td>T1 or E1 trunk module for the Stinger MRT-2 and MRT 19.</td>
</tr>
<tr>
<td>MRT2U-SP-FAN</td>
<td>Replacement fan module for the MRT-2.</td>
</tr>
<tr>
<td>MRT-SO-8T1E1</td>
<td>Software for upgrading the default 4-port operation of the T1 and E1 trunk module to 8 T1 or E1 ports.</td>
</tr>
<tr>
<td>MRT-SO-IMA</td>
<td>Software to enable inverse multiplexing over ATM (IMA) with the T1 and E1 trunk module.</td>
</tr>
</tbody>
</table>
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Before you begin ......................................................... 2-1
Required tools and equipment ......................................... 2-2
Preventing static discharge damage .................................. 2-2
Unpacking the Stinger MRT-2 ........................................... 2-4
Verifying the hardware configuration ............................... 2-4

Selecting an installation site

Before you choose a setup location for a Stinger MRT-2 unit, read and follow the site and electrical requirements defined in the *Edge Access and Broadband Access Safety and Compliance Guide*.

Select the setup location carefully. Keep in mind that the unit requires proper ventilation and space for current and future cabling requirements.

**Caution** At least 1 inch (2.5cm) of clear space must remain on both sides of the MRT-2 chassis to ensure sufficient air flow. The Stinger MRT-2 pulls air in from the right side of the chassis and exhausts air from the left side of the chassis.

A Stinger MRT-2 can be mounted in a number of ways, depending on the space that is available. You can rack-mount the Stinger MRT-2 chassis in an equipment rack or outdoor cabinet with mounting rails that are 17.72 inches (45.0cm) apart. Optional mounting hardware is also available for mounting the Stinger MRT-2 chassis between mounting rails spaced 23 inches (58.42cm) apart. For more information, contact your Lucent Technologies sales representative.

Before you begin

**Warning** Before installing your Stinger MRT-2 unit, be sure to read the safety instructions in the *Edge Access and Broadband Access Safety and Compliance Guide*. Also read Appendix D, “Safety-Related Electrical, Physical, and Environmental Information,” in this guide for information specific to your product.

**Caution** Before handling Stinger MRT-2 components, ensure that your work area is free from common plastics and that you are properly grounded with an antistatic
Preparing for the Installation

Required tools and equipment

To install and configure Stinger MRT-2 hardware, you need the following tools and equipment:

- Console terminal connection to the serial (CONSOLE) port to configure the unit
- ASCII or VT100 console terminal (Internal Lucent number: ITE-6938) or equivalent with the following setup:
  - 9600bps
  - Direct connection
  - 8 data bits
  - No parity
  - 1 stop bit
  - No flow control
- RS-232 straight-through modem cable for connecting the console terminal or equivalent to the unit (Internal Lucent number for 15 foot DB9M to DB9F straight-through cable: ITE-6801)
- Antistatic wrist strap (Internal Lucent order number: R-4987C)
- Number 2 Phillips screwdriver
- 1/8-inch and 3/16-inch standard screwdrivers
- (Optional) Ethernet LAN connection for connecting the unit to the Ethernet (Internal Lucent number for a 7-foot cable: ITE-7131, and for a 12-foot cable: ITE-7180)
- A CLETOP fiber cleaning tool, if an OC3 trunk module is being installed

Preventing static discharge damage

Modules and semiconductor devices in general can be easily and permanently damaged due to electrostatic discharge during installation or removal. A person walking across a floor can generate electrostatic voltages in excess of 5000V. Although you might not notice a discharge of less than 3500V, discharges below 100V can damage semiconductor components.

You can destroy a component without noticing any electrostatic discharge. Because these discharges have very little current, they are harmless to people.

To prevent damage to components from electrostatic discharge, always follow the proper guidelines for equipment handling and storage.

Use a wrist strap

To reduce the static potential on your body by proper grounding, wear an approved antistatic wrist strap (Figure 2-1) when installing, removing, or handling modules, or while handling any Lucent device containing semiconductor components.
Caution  Correct use of an approved antistatic wrist strap is the only reliable way to prevent damage to components by electrostatic discharge from your body.

Figure 2-1. Wrist grounding strap

To minimize entanglement, right-handed people can wear the strap on the left hand. Plug the other end of the wrist strap into the grounding jack provided on most Lucent products, as shown in Figure 2-2.

Figure 2-2. Wrist strap plugged into a grounding jack

If a grounding jack is not available, use an alligator clip to connect the strap to electrical ground.
Use the following two simple tests to verify that the wrist strap is functioning properly:

- Measure the resistance between the wrist strap and its grounding plug. Overall resistance between these two points must be approximately 1 Megohm. If it is not, replace the strap.
- Physically examine the strap for visible damage. If you see any damage, replace the strap.

**Remove plastics from your work area**

Work areas must be kept clear of common plastics, such as the following items:

- Polystyrene packing containers
- Clear plastic bags
- Plastic drinking cups
- Food wrappers
- Clear cellophane tape

These types of common plastic materials can carry a static charge that is not easily discharged to ground and must not make direct contact with modules or any other solid state components.

**Store components properly**

Protect modules immediately after removal from a chassis by placing them in their original factory packing materials. Storage in approved antistatic packaging is acceptable when factory packaging is unavailable.

**Caution** Never place unprotected modules directly on ungrounded metal shelving or on ungrounded carts without insulating surfaces.

**Unpacking the Stinger MRT-2**

The Stinger MRT-2 unit is delivered in a protective shipping carton, with the ordered trunk module installed.

Before you remove the Stinger unit from the shipping carton, check for damage. If you see any damage, follow the instructions described in your product warranty.

To unpack the unit:

1. Open the carton and remove all enclosed packing materials. Save the packing materials in case you need to repack the unit later.
2. Carefully remove the unit from the shipping carton.
3. Verify that the contents of the carton match the items listed on the packing slip.

**Verifying the hardware configuration**

Stinger MRT-2 units have an integrated design that includes a -48Vdc power supply and all the capabilities associated with control modules, line interface modules (LIMs), and line protection modules (LPMs) of other Stinger models. Trunk modules designed for use in a Stinger MRT-2 can be installed to support different types of...
trunk connections. The trunk module ordered with the unit is installed prior to shipment. Check the unit to verify that it is configured as ordered and to identify the connection points for power and data. The cable connectors and power supply inlets are located at the front of the chassis.

Note The system software configuration is stored in onboard nonvolatile RAM (NVRAM).

Stinger MRT-2 interfaces

Figure 2-3 shows the location of all terminals and ports on the Stinger MRT-2 chassis. Trunk port connections, which vary depending on the trunk module that is installed, are not shown.

Figure 2-3. Stinger MRT-2 chassis connectors

STS-3 cascading connectors

Each Stinger MRT and MRT-2 unit is equipped with a pair of STS-3 connectors. These connectors can connect multiple units that are installed in a single location. The STS-3 connectors allow creation of ATM links to carry traffic from a Stinger MRT or MRT-2 unit that is not equipped with a trunk module to a unit that is equipped with a trunk module. Several units can be linked together so that traffic can be combined in a cascading fashion, until it reaches a single unit with a line to the distant ATM switch. This can be managed in two ways.

- Configured ATM connections—ATM connections can be configured to so that traffic from all the units is combined in a cascading fashion, until it reaches the unit with the link to the remote ATM switch.

- Hosted (master/slave) connections—It is also possible for the unit with the link to the remote ATM switch to act as the host (master) unit for the other MRT or MRT-2 units. These other units become hosted (slave) units. All connections between units are configured automatically by the TAOS software, and all
Preparing for the Installation
Verifying the hardware configuration

administration for the group is performed on the TAOS interface of the master unit. For details about this type of configuration, see Appendix B, “Hosted Operation of Cascaded Stinger MRT units.”

**Note** Lucent Technologies recommends connecting no more than three Stinger MRT or MRT-2 units in cascading fashion or five units in a hosted system configuration. Although the units can support longer distances, Lucent recommends that cascading or hosted units be no more than 10 feet (3.05m) from each other.

**Shelf ID switch**

The shelf ID switch is used to designate the shelf number that will be associated with the chassis in a hosted system configuration. See, “Configuring the remote shelves” on page B-3 for details.

**Trunk module location**

A Stinger MRT-2 can contain a trunk module that supports OC3/STM1, DS3, T1, or E1 service. Each trunk module supports connection to either optical or copper media, depending on the type of module supplied. There is a single physical slot on the front of the Stinger MRT-2 for installation of the trunk module. This slot is referred to by the operating system as virtual slot 18.

**Caution** Do not remove or replace the trunk module while the Stinger MRT-2 unit is operating. Be sure to remove power from the unit before removing or replacing a trunk module.

**Note** Trunk modules are not interchangeable between all Stinger MRT and MRT-2 units. Trunk modules manufactured for installation in the Stinger MRT 23 cannot be installed in the Stinger MRT-2. Verify that you have the correct trunk module as identified in Table 1-2 on page 1-2.

Figure 2-4 shows the location of the trunk module in the front of a Stinger MRT-2. An OC3-ATM trunk module is shown installed.
**Preparing for the Installation**

Verifying the hardware configuration

---

**Figure 2-4. Stinger MRT-2 trunk module location**

![Grounding terminal](image)

![Trunk module (slot 18)](image)

**Caution**  Wear an antistatic wrist strap before handling any of the unit components. For more information, see “Preventing static discharge damage” on page 2-2.

**OC3/STM1-ATM trunk modules**

Figure 2-5 shows the location of the optical fiber connections on an OC3-ATM trunk module for the Stinger MRT-2 chassis.

*Figure 2-5. OC3-ATM trunk module for the MRT-2 chassis*

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**DS3-ATM trunk modules**

Figure 2-6 shows the location of the coaxial connections on a DS3-ATM trunk module for the Stinger MRT-2.
Preparing for the Installation

Verifying the hardware configuration

Figure 2-6. DS3-ATM trunk module for the MRT-2 chassis

Figure 2-7 shows the location of the RJ-47 connections on the 8-port T1 or E1 trunk module for the Stinger MRT-2.

Figure 2-7. T1 or E1 trunk module for the MRT-2 chassis

T1 and E1 trunk modules

Figure 2-7 shows the location of the RJ-47 connections on the 8-port T1 or E1 trunk module for the Stinger MRT-2.
Installing a Stinger MRT-2

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Before you begin

Verify that you have completed the following tasks:
- Selected the installation site
- Unpacked the Stinger MRT-2
- Gathered the tools and equipment needed for installation
- Verified the trunk module installed in the unit

⚠️ Warning  Before installing the Stinger MRT-2 hardware, be sure to read the safety instructions in the *Edge Access and Broadband Access Safety and Compliance Guide*. See Appendix D, “Safety-Related Electrical, Physical, and Environmental Information” for information specific to your product.

Identifying and installing mounting brackets

You can mount the Stinger MRT-2 horizontally in equipment racks or outdoor cabinets using mounting rails that have 19 inches between the mounting points and a minimum clearance of 17.72 inches between the rails. Brackets are also available for mounting the MRT-2 in standard 23 inch-wide equipment racks.
Mounting brackets for the Stinger MRT-2

Mounting brackets are available for installing the Stinger MRT-2 chassis horizontally in standard 19-inch (48.26cm) EIA Equipment racks, and ETSI cabinets that have a minimum of 17.72 inches (45.0cm) of space between the mounting rails. Forward positioning of the chassis can be modified using chassis mounting points at the front or midpoint of the Stinger MRT-2 chassis. Two mounting adapters and four 8-32 1/4 inch screws are supplied with the Stinger MRT-2 unit.

19-inch ETSI mounting brackets for the Stinger MRT-2

The Stinger MRT-2 can be mounted horizontally in a standard ETSI 19-inch wide rack, using chassis mounting points at the front or midpoint of the Stinger MRT-2 chassis. Use the supplied screws to attach the brackets to the Stinger MRT-2 chassis.

Figure 3-1. 19-inch rack mounting brackets for the Stinger MRT-2

Warning  The weight and position of hardware within the cabinet might make the cabinet top-heavy or unstable. Take all necessary precautions to anchor the cabinet securely before installing the unit.

Installing the 19-inch ETSI mounting brackets on the Stinger MRT-2

The 19-inch mounting brackets for the Stinger MRT-2 can be installed to align the front or mid-point of the chassis with the rails of the 19-inch rack. This is accomplished by attaching the brackets to the front or mid-point mounting holes of the chassis as shown in Figure 3-2.

To install the mounting brackets onto the unit:

1  Position the brackets to align with the mounting holes at the front or midpoint of the Stinger MRT-2 chassis.

2  Place a mounting bracket onto one side of the Stinger unit, lining up the three screw holes on the bracket with three bracket holes on the side of the unit. You can use bracket holes near the front of the unit or near the midpoint of the unit, as shown in Figure 3-2.
3 Using a number 2 Phillips screwdriver, install the 1/4-inch flathead screws (supplied with the brackets) through the mounting bracket holes into the unit, as shown in Figure 3-2.

Caution Failure to use the proper screws might damage the unit.

4 Repeat step 1 and step 2 to install the second mounting bracket onto the other side of the unit.

EIA mounting brackets for the Stinger MRT-2

The Stinger MRT-2 can be mounted horizontally in an EIA rack or enclosure with mounting rails at least 17.72-inches apart. Mounting points at the front or midpoint of the Stinger MRT-2 chassis can be used to position the chassis as needed. Use the supplied screws to attach the brackets to the Stinger MRT-2 chassis.
Warning  The weight and position of hardware within the cabinet might make the cabinet top-heavy or unstable. Take all necessary precautions to anchor the cabinet securely before installing the unit.

Installing the EIA mounting brackets on the Stinger MRT-2

The EIA mounting brackets for the Stinger MRT-2 can be installed to align the front or the mid-point of the chassis with the rails of the equipment rack. This is accomplished by attaching the brackets to the front or mid-point mounting holes of the chassis, as shown in Figure 3-4.

To install the mounting brackets onto the unit:

1  Position the brackets to align with the mounting holes at the front or midpoint of the Stinger MRT-2 chassis.

2  Place a mounting bracket onto one side of the Stinger unit, lining up the three screw holes on the bracket with three bracket holes on the side of the unit. You can use the bracket holes near the front of the unit or near the midpoint of the unit, as shown in Figure 3-4.

Figure 3-4. Installing EIA brackets on the MRT-2

3  Using a number 2 Phillips screwdriver, install the 1/4-inch flathead screws (supplied with the brackets) through the mounting bracket holes into the unit, as shown in Figure 3-4.

Caution  Failure to use the proper screws might damage the unit.

4  Repeat step 1 and step 2 to install the second mounting bracket onto the other side of the unit.

23-inch mounting brackets for the Stinger MRT-2

The Stinger MRT-2 can be mounted horizontally in a 23-inch rack, using chassis mounting points at the front and midpoint of the Stinger MRT-2 chassis. Use the supplied screws to attach the brackets to the Stinger MRT-2 chassis.
Warning  The weight and position of hardware within the cabinet might make the cabinet top-heavy or unstable. Take all necessary precautions to anchor the cabinet securely before installing the unit.

Installing the 23-inch mounting brackets on the Stinger MRT-2

The 23-inch mounting brackets for the Stinger MRT-2 can be installed to align the front or mid-point of the chassis with the rails of the 23-inch rack. This is accomplished by rotating the brackets to position them as shown in Figure 3-6.

To install the mounting brackets onto the unit:

1. Rotate the brackets to align the front or midpoint of the Stinger MRT-2 chassis with the mounting rails of the equipment rack, as shown in Figure 3-6.

2. Place a mounting bracket onto one side of the Stinger unit, lining up the four screw holes on the bracket with the four bracket holes on the side of the unit, as shown in Figure 3-6.
3 Using a number 2 Phillips screwdriver, install the 1/4-inch flathead screws that are supplied with the brackets through the mounting bracket holes into the unit, as shown in Figure 3-6.

**Caution** Failure to use the proper screws may damage the unit.

4 Repeat step 1 and step 2 to install the second mounting bracket onto the other side of the unit.

**Mounting the MRT-2 in an equipment rack**

Once the appropriate mounting brackets have been installed on a Stinger MRT-2 chassis it can be mounted in an equipment rack or cabinet. Position the unit for installation, keeping in mind that cables connect to the front of the unit.

**Note** The procedure for installing the unit into a cabinet requires that you supply a minimum of four cross-head screws of the appropriate size to support the unit in the cabinet rack.
Mounting the Stinger MRT-2 in smaller equipment racks

The Stinger MRT-2 can be mounted horizontally in a 19-inch wide-rack, using the ETSI mounting brackets, or in a 17.72-inch wide-rack, using the EIA mounting brackets. Use the supplied screws to attach the brackets to the Stinger MRT-2 chassis.

To rack-mount a Stinger MRT-2 horizontally into a standard 19-inch or 17.72-inch equipment rack:

1. Align the screw holes on the mounting bracket with the screw holes on the equipment rack, as shown in Figure 3-7.
2. Using a number 2 Phillips screwdriver, install cross-head screws of the appropriate size through the lower mount holes of each bracket and into the equipment rack.
Installing a Stinger MRT-2
Mounting the MRT-2 in an equipment rack

Figure 3-7. Placing Stinger MRT-2 chassis in a smaller equipment rack

1. Install and tighten the upper mounting screws.
2. Tighten the lower mounting screws.

**Warning** The weight and position of hardware within the cabinet might make the cabinet top-heavy or unstable. Take all necessary precautions to anchor the cabinet securely before installing the unit.
Mounting the Stinger MRT-2 unit in a 23-inch rack

To rack-mount a Stinger MRT-2 horizontally into a standard 23-inch (58.42cm) equipment rack:

1. Align the screw holes on the mounting bracket with the screw holes on the equipment rack, as shown in Figure 3-8.
2. Using a number 2 Phillips screwdriver, install cross-head screws of the appropriate size through the lower mounting holes of each bracket and into the equipment rack.

Figure 3-8. Placing the Stinger-2 chassis in a 23-inch rack

3. Install and tighten the upper mounting screws.
4. Tighten the lower mounting screws.

Installing and removing trunk modules

A Stinger MRT-2 trunk module can be replaced for maintenance purposes, or to change the type of outbound (egress) line used by the unit. Trunk modules for the MRT-2 and MRT 19 are slightly different from those for the MRT 23, and are not interchangeable. When changing trunk modules, be sure that you use a trunk module that is designed for the MRT-2 chassis.

**Caution** Wear an antistatic wrist strap before handling any of the unit components. For more information, see “Preventing static discharge damage” on page 2-2.

**Warning** If power to the unit is not turned off, an electrical energy hazard is present within the card cage. Remove all metallic objects from hands and wrist to prevent bridging of live contact points.
Installing a trunk module

To install a trunk module:

1. Put on the antistatic wrist strap and connect it to ground potential.
2. Verify that power to the Stinger MRT-2 unit has been disconnected or turned off.
3. Turn the trunk module so that the connector is above the printed circuit board, and the circuit board is aligned to slide into the guide track near the bottom of the trunk module slot, as shown in Figure 3-9.

Figure 3-9. Installing an MRT-2 trunk module

4. Slide the trunk module into the trunk module slot until the connector on the module comes in contact with the connector within the chassis. Do not force the card into the slot.
5. Firmly press the module completely into the slot to engage the connector on the card with the connector in the chassis.
6. Using a number 2 Phillips screwdriver, carefully tighten both locking screws on the trunk module. Do not overtighten.

Removing a trunk module

To remove a trunk module:

1. Put on the antistatic wrist strap and connect it to ground potential.
2. Disconnect or turn off power to the unit.
3. Using a number 2 Phillips screwdriver, loosen the locking screws located on both sides of the trunk module, shown in Figure 3-9. Other screwdrivers might damage the screw heads.
4. Grasp the locking screws firmly and pull the trunk module clear of its connector within the chassis.
5. Carefully slide the trunk module out of the chassis, and place it into an antistatic container.
MRT-2 cooling

Fans used for cooling the Stinger MRT-2 are housed in a replaceable cooling module (MRT2U-SP-FAN). If a fan in the Stinger MRT-2 cooling module fails, the cooling module cannot be replaced while the Stinger unit is in service.

**Caution** You must remove power from an operating Stinger unit before attempting to replace the cooling module.

You can monitor fan status remotely in Stinger MRT-2 units by creating an alarm profile, as described in the *Stinger Administration Guide*.

**Caution** 50-pin connectors used on the Stinger MRT-2 must have cables that extend from the left side of the connectors. These cables must be routed to the left side of the chassis to avoid blocking air-flow from the cooling module.

Fans used for cooling the MRT-2 are not field replaceable.

Replacing the cooling module on the Stinger MRT-2

Use the following procedure to replace the cooling module on a Stinger MRT-2.

1. Remove power from the unit, and put on the antistatic wrist strap connected to ground.
2. Loosen the locking screws on both sides of the old cooling module and pull old cooling module from the chassis, as shown in Figure 3-10.

![Figure 3-10. Removing the cooling module of a Stinger MRT-2](image)

3. Align the slot on the bottom of the new cooling module with the alignment studs inside the bottom of the Stinger MRT-2 chassis and slide new cooling module straight into the Stinger MRT-2 chassis, as shown in Figure 3-11.
4. Firmly press the module completely into the chassis to engage the power connector on the module with the connector in the chassis.
5 Firmly press the module completely into the slot to engage the connector on the module with the connector in the chassis.

6 Using a number 2 Phillips screwdriver, carefully tighten the locking screws on the cooling module. Do not overtighten.

Connecting cables to a Stinger MRT-2 unit

Once the Stinger MRT-2 is set up in the desired location, connect the unit to the local subscriber lines or to its frame access point by attaching the appropriate cables to the 50-pin RJ-21 LINE connectors. For cable pinouts, see “Pinouts for subscriber line DSL connections” on page C-4.

With the proper equipment, you can also make the following additional connections:

- For voice service, connect the unit to the voice switch or its frame access point by attaching the appropriate cables to the 50-pin POTS connectors. For cable pinouts, see “Pinouts for POTS connections to a voice switch” on page C-8.

- Connect the Stinger to the ATM network by attaching the copper or fiber connections to the trunk module.

- To connect a serial cable to the unit’s CONSOLE port for initial configuration, see “Making the initial administrative connection” on page 6-2.

- The Stinger MRT-2 unit has an internal analog modem that supports dial-in administrative connections. To connect an analog POTS line to the internal modem, see “Connecting to and configuring an internal modem” on page 6-12.
To connect an external modem to the unit’s CONSOLE port for administrative use, see “Connecting to and configuring an external modem” on page 6-11.

50-pin connectors details

50-pin connectors are used on the Stinger MRT-2 chassis to provide connections for subscriber DSL lines and POTS connections to the voice switch. These 50-pin connectors can be secured to the chassis by three mechanisms shown in Figure 3-12. It is recommended that you use these mechanisms to make the connectors as secure as possible.

- An anchor screw on the far end of the connector can be screwed into a fitting on the chassis.
- A locking tab under the cable side of the connector automatically secures the connector upon installation.
- A nylon cinch-tie can be used to secure the cable end of the connector to a tie-down fitting on the chassis. If the connectors you are using have a slot to accept the connector locking tab, use of a nylon cinch-tie is optional.

![Figure 3-12. 50-pin connector security mechanisms](image)

Connecting the subscriber lines

The 50-pin LINE connectors for the subscriber lines, and the POTS connectors for connections to analog voice service are all connected in the same way. Cables are routed toward the left side of the MRT-2 chassis provide for removal and replacement of the cooling module, as shown in Figure 3-13 on page 3-14.

To connect the cables to the line ports of the Stinger MRT-2:

1. Carefully insert the 50-pin RJ-21 connectors of the subscriber line cables on the line connectors of the Stinger MRT-2 chassis, as shown in Figure 3-13 on page 3-14.
Installing a Stinger MRT-2
Connecting cables to a Stinger MRT-2 unit

Figure 3-13. Connecting the 50-pin connectors to the Stinger MRT-2

![Figure 3-13](image_url)

**Note** See Figure 3-12 for details of the connector locking tab, anchor screw, and cable cinch-tie.

2 Push the cable connectors onto the chassis connectors until each locking tab is engaged.

3 Tighten the anchor screw on each cable connector.

4 Secure the cable connectors to the chassis with a cable cinch-tie around the connectors and through the security fixtures on the left side of the line connectors on the chassis. (Optional, if your cable connectors have a slot to engage the locking tab.)

### Disconnecting a 50-pin connector

The locking tab on the 50-pin connectors used on the Stinger MRT-2 make these connectors less likely to become loose during operation. However, these tabs require additional attention when disconnecting the 50-pin connectors from the Stinger chassis.

Lucent Technologies recommends that you use the tip of a small probe or small screwdriver to disengage the latch when removing a 50-pin connector as described in, “Recommended method to disconnect a 50-pin connector.” However, if no such tool is available, the connector can be removed by gently rocking the opposite end of the connector away from the chassis and pulling as described in, “Alternate method to disconnect a 50-pin connector.”

### Recommended method to disconnect a 50-pin connector

To remove a 50-pin connector from the Stinger MRT-2 chassis perform the following steps:

1 Completely loosen the anchor screw on the connector

2 Using a small pair of diagonal cutters, cut the nylon tie-down strap, if equipped.
3  Depress the connector latch with a small probe or screwdriver, while gently pulling the connector away from the chassis, as shown in Figure 3-14.

Figure 3-14. Removing the 50-pin connector (recommended method)

Alternate method to disconnect a 50-pin connector

If a probe, small screwdriver, or similar tool is not available to disengage the connector latch, the 50-pin connector may be removed by carefully performing the following steps:

1  Completely loosen the anchor screw on the connector
2  Using a small pair of diagonal cutters, cut the nylon tie-down strap.
3  Carefully rock the anchor screw away from the chassis slightly and pull the connector away from the chassis in a diagonal direction away from the anchor screw, as shown in Figure 3-15.

Caution  Use care when rocking the connector. Forcing the anchor screw away from the chassis at too great an angle can crack the 50-pin connector.
Connecting the STS-3 cascading connections

The STS-3 connectors can be used with Category 5 unshielded twisted pair (UTP) cable to connect multiple Stinger MRT or MRT-2 units together that are installed in a single location. Traffic from the multiple units can be combined for transmission through a single link from one of the units to a remote ATM switch. This can be managed in two ways.

- Configured ATM connections—ATM connections can be configured so that traffic from all the units is combined in a cascading fashion, until it reaches the unit with the link to the remote ATM switch.
- Hosted (master/slave) connections—It is also possible for the unit with the link to the remote ATM switch to act as the host (master) unit for the other MRT or MRT-2 units. These other units become hosted (slave) units. All connections between units are configured automatically by the TAOS software, and all administration for the group is performed on the TAOS interface of the master unit. For details about this type of configuration, see Appendix B, “Hosted Operation of Cascaded Stinger MRT units.”

The STS-3 ports are labeled EXP1 and EXP2. Both ports have identical capabilities, and can be used interchangeably for unit-to-unit connections. To avoid confusion Lucent recommends that you adopt a consistent physical protocol for connecting the units. For example, in Figure 3-16 on page 3-17, the EXP2 connector of one Stinger MRT-2 unit connects to the EXP1 connector of the next unit in sequence. The EXP1 and EXP2 connectors are connected by crossover cables, terminated with RJ-45 connectors. For connector details, see “STS-3 (synchronous transport signals-3) connector specifications” on page C-3.
Although the STS interfaces are permanently installed in the MRT-2 chassis, the TAOS software addresses them as slot 17 to maintain command-line-interface consistency with other Stinger models.

**Connecting the trunk module**

The trunk module cables are either coaxial (for DS3), shielded dual pair with RJ-48 connectors (for T1 or E1), or fiber optic (for OC-3/STM-1 optical).

For additional details about configuring the trunk modules, see the chapter in this guide that deals with the appropriate trunk module.

Inform your service provider that the equipment is connected, so the provider can enable the line.

**OC3/STM1-ATM trunk module connections**

An OC3-ATM trunk module requires duplex SC fiber optic cable. The following illustration shows this type of connection to the trunk module for a Stinger MRT-2.

**Caution** If excess fiber optic cable is found at the location of a Stinger MRT-2, bind the excess cable length in a figure-eight pattern. Do not wind excess cable into circular coils.

To connect the cables to an OC3-ATM trunk module, align the small rectangular key on the head of the cable connector with the slot in the connector on the trunk.
Installing a Stinger MRT-2
Connecting cables to a Stinger MRT-2 unit

module and carefully insert the head of each cable into the proper connector on the trunk module. See Figure 3-17.

Note Clean any fiber optic cables prior to connecting them.

Figure 3-17. Connecting an OC3-ATM trunk module

DS3-ATM trunk module connections

Connect the DS3 line to the RX LN and TX LN connectors on a DS3-ATM trunk module, using two 75-ohm coaxial cables (RG 59/U), as shown in Figure 3-18. The illustration shows this connection to the trunk module for a Stinger MRT-2.

Figure 3-18. Connecting DS3-ATM trunk modules

T1 or E1 trunk module connections

The T1 or E1 trunk module uses standard dual shielded pair cabling, terminated with RJ-48 connectors. The following illustration shows this connection to the trunk module for a Stinger MRT-2.
Connect the cables to a T1 or E1 trunk module by aligning the clip on the RJ-48 connector of the cable with the clip slot of the trunk module port and carefully inserting the connector into the proper port on the trunk module, as shown in Figure 3-19.

*Figure 3-19. Connecting a T1 or E1 trunk module*

### Network management connections

The Stinger MRT-2 can support three types of network management connections for communication with the unit:

- Serial connection of a console terminal to the female DB-9 serial port (labeled CONSOLE) on the chassis, by an RS-232 shielded straight-through cable. For details, see “Making the initial administrative connection” on page 6-2.

- Dial-in connection through a modem.
  - An external modem can be connected to the serial (CONSOLE) connection of the Stinger MRT-2 with an RS-232 shielded crossover cable. For details, see “Connecting to and configuring an external modem” on page 6-11.
  - The MRT-2 is equipped with an internal autoanswer modem that can be connected directly to a telephone line via the RJ-11 jack labeled MODEM. For details, see “Connecting to and configuring an internal modem” on page 6-12.

- Network connection through an Ethernet network via the Ethernet RJ-45 interface on the unit, by a 10BaseT unshielded twisted pair (UTP) cable. For details, see “Connecting to an Ethernet LAN” on page 6-10.

See Appendix C, “Cables and Connectors” for details about cable pinouts.

### System clocking

A Stinger MRT-2 has three possible timing sources:

- External. The Stinger MRT-2 can accept timing from a T1 line, E1 line, or a building integrated timing supply (BITS) clock.

- Trunk. The unit can accept timing from an OC3 or DS3 line clock.

- Internal clock source. If the selected clock sources fail, the system is automatically reconfigured so that it is synchronized with the internal clock.

The T1, E1, or BITS timing inputs comply with ANSI T1.102 for T1, and ITU G.704 for E1. The system timing is configured via the TAOS command line interface.
Installing a Stinger MRT-2
Alarm monitoring

Alarm monitoring

The ALARM RELAY connector has outputs that allow a Stinger MRT-2 to be monitored remotely by another device. This connector also has inputs that allow a Stinger MRT-2 to perform remote monitoring of up to four other devices.

Connecting to monitor Stinger MRT-2 alarm status

A Stinger MRT-2 unit can monitor itself for major and minor alarm conditions and illuminate appropriate status lights on the chassis. In addition, you can connect audio and visual alarms (normally open, or normally closed) to monitor the unit remotely for these conditions.

Alarm relays operate during loss of power, during hardware failure, or whenever a Stinger MRT-2 is being reset, such as during its power-on self test (POST). During normal operation, the alarm relays remain idle.

The gauge of the wire you use to connect to the Stinger MRT-2 alarm relay must be based on the current flow of the circuit that the relay is attached to and the capacity of the alarm relay. Because the Stinger alarm relay can carry a maximum of 2 amps, 18 AWG to 20 AWG (0.8mm² to 0.5mm²) wire is adequate.

To connect a remote alarm indicator, use a male DB-15 connector to attach a 15-lead cable to the ALARM RELAY connector of the Stinger MRT-2 unit. Then attach wire from the pins of the DB-15 connector to the remote indicator according to Table 3-1.

Table 3-1. Alarm connector pinouts for Stinger MRT-2 alarms

<table>
<thead>
<tr>
<th>DB-15 connector pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Alarm relay 1: normally closed</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Alarm relay 1: common</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Alarm relay 1: normally open</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Alarm relay 2: normally closed</td>
</tr>
<tr>
<td>Pin 5</td>
<td>Alarm relay 2: common</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Alarm relay 2: normally open</td>
</tr>
</tbody>
</table>

For information about defining and maintaining alarms to monitor the Stinger MRT-2 unit, see the Stinger Administration Guide.

Connecting a Stinger MRT-2 to monitor the alarm status of other devices

The connection to each external device consists of a pair of 24-to-28-gauge wires. One wire supplies ground, and the other monitors the alarm status of the remote device by applying 3.3Vdc, which draws less than 10mA of current through the closed contacts of the alarm relay on the remote device. For a complete listing of the pinout arrangement of all alarm connectors on the DB-15 connector, see “Alarm connector pinouts” on page C-2.
To monitor a remote device, use a male DB-15 connector to attach a 15-lead cable to the ALARM RELAY connector of a Stinger MRT-2 unit. Then attach wire from the pins of the DB-15 connector to the remote devices that will be monitored, according to Table 3-2.

Table 3-2. Alarm connector pinouts for monitoring the alarm status of remote devices

<table>
<thead>
<tr>
<th>DB-15 connector pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 7</td>
<td>Status relay 3</td>
</tr>
<tr>
<td>Pin 8</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 9</td>
<td>Not used</td>
</tr>
<tr>
<td>Pin 10</td>
<td>Status relay 4</td>
</tr>
<tr>
<td>Pin 11</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 12</td>
<td>Status relay 5</td>
</tr>
<tr>
<td>Pin 13</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 14</td>
<td>Status relay 6</td>
</tr>
<tr>
<td>Pin 15</td>
<td>Ground</td>
</tr>
</tbody>
</table>
Determining the Operating Status

Before you begin

Before you begin, verify that the following tasks are complete:

- Physically install the Stinger MRT-2 hardware
- Connected cables and console terminal to the Stinger MRT-2
- Set up the workstation to configure the Stinger MRT-2
- Connected the workstation to the Stinger MRT-2
- (Optional) Connected the system clock source
- (Optional) Connected the remote alarms

Power requirements

The Stinger MRT-2 operates on -48Vdc. It has two pair of power input terminals that allow it to be connected to redundant power sources. The Stinger MRT-2 units have a maximum power requirement of 180 watts. The dc power source for the Stinger MRT-2 must be protected by a 5-amp fuse. For model-specific details, see Table D-1 on page D-1.

Connecting power to a Stinger MRT-2 unit

Caution Before connecting power, see the Edge Access and Broadband Access Safety and Compliance Guide for safety instructions and circuit regulatory information.
Warning  Verify that the power is off or disconnected at the source before beginning this procedure.

To connect the unit to dc power:

1 Verify that the correct power source is available for the Stinger MRT-2.

Caution The -48Vdc power source must include a double pole circuit breaker to provide a method of disconnecting the unit from power, as required by national and international safety standards UL 1950 and IEC/EN60950.

2 Verify that the dc power cables comply with national standards and specifications as described in IEC 60950 and are terminated in number 10 ring lugs.

Note Minimum wire size for up to 6A is 0.75mm² or 18 AWG

3 Locate the power terminal strip on the front of the unit and remove the plastic shield by squeezing the clips on each side of the shield and pulling the shield away from the unit, as shown Figure 4-1.

Figure 4-1. Removing the power terminal shield of a Stinger MRT-2

4 Using Figure 4-2 as a guide, attach a power cable to each set of power connectors as follows. Both power cables must be connected at all times when the unit is in operation.
   - Using a number 2 Phillips screwdriver, remove the screws for the -48Vdc and return connections.
   - Insert one screw into each of the ring lugs on the power leads.
   - Reinstall each screw with its power lead onto the appropriate power terminal position.

Note You can ground the chassis to the enclosure by attaching a grounding cable to the ground terminal on the front of the unit.
Monitoring backup power to a Stinger MRT-2

The power input components of the Stinger MRT-2 are integrated into the chassis and are not field replaceable. Two input connections are provided so that redundant sources can provide power to a Stinger MRT-2.

Power sources that have alarm capabilities can be monitored by the Stinger MRT-2. You can do this by connecting the alarm leads from each power source to the DB-15 ALARM RELAY connector, described in “Connecting a Stinger MRT-2 to monitor the alarm status of other devices” on page 3-20. When a power source fails, an alarm will be generated from the Stinger MRT-2 unit.

A power source that provides switch-over capability between primary and secondary power supplies can be monitored by connecting the switch-over status signal to the ALARM RELAY connector. When a failure of the primary power supply causes a switch-over to the secondary power supply, an alarm will be generated from the Stinger unit.

Turning on power to a Stinger MRT-2 unit

To turn on power to a Stinger MRT-2 unit:

1. Make sure that input and return connectors from a dc power source are properly attached to the unit. (For instructions, see “Connecting power to a Stinger MRT-2 unit” on page 4-1.)

2. Turn on the power source for the connectors that are attached to the unit.

3. Observe the following behavior on the unit’s status lights to verify that the unit is operating normally. (For more information about status light behavior, see “Status lights” on page 4-4.)
Determining the Operating Status

Turning off power to a Stinger MRT-2 unit

– All Stinger status lights momentarily turn ON just after startup.
– The MAJOR alarm status light turns ON at startup. It remains ON while the unit runs its POST in the boot loader. It continues to remain lit while the unit loads its operational code from flash memory. If the unit successfully loads its operational image from flash memory and again passes POST, the MAJOR status light turns OFF. If the MAJOR status light remains ON or blinks continuously, it indicates a failure.
– After startup, all 10 line STATUS lights and the MINOR alarm status light turn OFF. Then after the system comes up, each light monitors a particular status as described in “Status lights.”

Turning off power to a Stinger MRT-2 unit

To turn off power to a Stinger MRT-2 unit, turn off the power source for the connectors that are attached to the unit.

Warning Do not remove the connectors from the Stinger MRT-2 power terminals while their power source is still supplying voltage.

Status lights

The indicator lights on a Stinger MRT-2 indicate the status of the unit. They also indicate the status and activity on lines connected to the unit, and the presence of a major or minor alarm condition. For information about the status lights for a trunk module, see the configuration chapter for that module.

Figure 4-3 shows the locations of the Stinger MRT-2 status lights.

Figure 4-3. Stinger MRT-2 status light locations

All status lights momentarily turn ON just after startup, and all 10 line STATUS lights turn OFF. After the system comes up, each light monitors a state as described on
Table 4-1. Status lights on the Stinger MRT-2

<table>
<thead>
<tr>
<th>Status light</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet 10BT link</td>
<td>Green</td>
<td>ON</td>
<td>An established link connection is present on the Ethernet interface.</td>
</tr>
<tr>
<td>Ethernet 10BT activity</td>
<td>Amber</td>
<td>ON</td>
<td>Traffic is detected on the Ethernet interface.</td>
</tr>
<tr>
<td>MAJOR</td>
<td>Red</td>
<td>ON</td>
<td>The unit has detected a major alarm. For information about configuring major alarms, see the Stinger Administration Guide. The MAJOR alarm status light is ON at startup. It remains ON until the unit passes all POST tests. It then stays OFF until a major alarm occurs. If the unit fails POST, the MAJOR alarm status light remains ON.</td>
</tr>
<tr>
<td>MINOR</td>
<td>Red</td>
<td>ON</td>
<td>The unit has detected a minor alarm. For information about configuring minor alarms, see the Stinger Administration Guide. The MINOR alarm status light is ON at startup. It remains ON until the unit passes all POST tests. It then stays OFF until a minor alarm occurs. If the unit fails POST, the MINOR alarm status light remains ON.</td>
</tr>
<tr>
<td>STATUS</td>
<td>Green</td>
<td>ON</td>
<td>The corresponding port is fully operational. The 10 STATUS lights indicate the status of up to 10 LINE ports at a time, depending on the indication of the 7-segment GROUP indicator.</td>
</tr>
</tbody>
</table>
Determining the Operating Status

Monitoring the status of the DSL ports

All DSL ports on the MRT-2 chassis are monitored in groups of 10, using the 10 status lights that are provided. A selector toggle switch steps the 10 LEDs from monitoring one group of 10 ports to the next group of 10 ports.

The specific group of ports that is being monitored is indicated by a 7-segment LED that is adjacent to the selector toggle switch. For example, status light 4 displays the status of port 4 if the 7-segment LED displays a zero. If the 7-segment LED displays a 1, the same status light indicates the status of port 14. The port group selector switch and the group indicator LED are shown in Figure 4-4.

![Figure 4-4. The port group selector switch and group indicator LED](image)

### Table 4-1. Status lights on the Stinger MRT-2 (continued)

<table>
<thead>
<tr>
<th>Status light</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP</td>
<td>Red (7-segment)</td>
<td>Displays a 7-segment digit</td>
<td>The group of 10 LINE ports whose status is currently being displayed by the STATUS lights, as follows: 0—LINE ports 1 through 10 1—LINE ports 11 through 20 2—LINE ports 21 through 30 3—LINE ports 31 through 40 4—LINE ports 41 through 50 5—LINE ports 51 through 60 6—LINE ports 61 through 70 7—LINE ports 71 through 72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooling system status</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
<td>ON</td>
<td>The fans in the MRT-2 cooling system are running at normal speed to cool the system.</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>ON</td>
<td>The fans in the MRT-2 are running at full speed to cool the system.</td>
</tr>
</tbody>
</table>
Stinger MRT-2 Operational Overview

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Stinger MRT-2 ATM switching overview ............................................. 5-2
Stinger MRT-2 configuration overview ................................................... 5-2
Stinger MRT-2 management features .................................................... 5-4
What’s next ......................................................................................... 5-6

This chapter describes the basic operation of the Stinger MRT-2 unit as a stand-alone DSL access multiplexer. Multiple Stinger MRT and MRT-2 units can also connected together as a hosted system. Hosted operation is described in Appendix B, “Hosted Operation of Cascaded Stinger MRT units.”

Stinger MRT-2 operation as a DSL access multiplexer

The Stinger MRT-2 contains integrated splitters. These splitters provide ADSL and analog POTS service over the same pair of wires to the subscriber. The separation of the ADSL data and analog voice signal is an electronic function of the splitters. It does not require configuration. Other models of the Stinger MRT that do not contain splitters only provide ADSL or SHDSL data service.

A Stinger MRT-2 operates as an ATM switch-through digital subscriber line access multiplexer (DSLAM) that uses integrated splitters to provide analog voice service over the same pair of subscriber wires. The MRT-2 switches data from multiple ADSL subscribers onto a high-speed ATM backbone and splits the voice signal for connection to a POTS switch. The separation of the ADSL data and analog voice signal is an electronic function of the splitters and does not require configuration. Figure 5-1 shows this type of operation.
Stinger MRT-2 Operational Overview
Stinger MRT-2 ATM switching overview

Figure 5-1. Example of DSLAM operations with splitters for POTS service

Stinger MRT-2 ATM switching overview

A Stinger MRT-2 unit receives cells on a link that is identified by a pair of unique attributes. These attributes are known as the virtual path identifier (VPI) and the virtual channel identifier (VCI). The Stinger MRT-2 switches cells from an incoming link to an outgoing link, based on the VPI and VCI attributes of each link. The connection between these links is a static configuration entered by an administrator.

This guide covers only basic installation information and configuration of the Stinger MRT-2 unit. More detailed information about configuring the unit to support ATM traffic can be found in the Stinger ATM Configuration Guide.

Stinger MRT-2 configuration overview

Before you configure a Stinger MRT-2 unit, create a diagram that illustrates how the unit will interoperate with your current network configuration. Creating a comprehensive network diagram helps prevent problems during installation and configuration, and can help in troubleshooting any problems later.

Stinger MRT-2 configuration tasks include the following:
Stinger MRT-2 Operational Overview
Stinger MRT-2 configuration overview

- Configuring the basic administrative parameters
- Configuring the DSL lines
- Configuring the trunk module
- Defining ATM traffic contracts
- Configuring management connections, either locally or through RADIUS
- Saving a backup copy of the system configuration

(For a summary of where to find additional specific configuration information, see Table 5-1 on page 5-6.)

**Administrative configuration**

Each Stinger MRT-2 has an RS-232 serial port (labeled CONSOLE) and a 10BaseT Ethernet port that can be used to connect to the Stinger MRT-2 to perform administrative functions. The Stinger MRT-2 also has an internal analog modem that can be used for dial-in administrative connections.

The serial port is for system management from a local workstation. It is also the standard port for error output, stack traces, and messages in the event of a system crash. Until you have configured IP addresses on the system’s Ethernet interface, you can use a local terminal or workstation connected to the serial port of the Stinger MRT-2 to configure the unit.

The system’s 10BaseT Ethernet port is intended for light administrative and management traffic. Once you have assigned an IP address, you can telnet into the unit from a local host and download configuration files from a TFTP server to the Stinger system. A Stinger unit has a range of options for configuring IP and for protecting the unit from unauthorized administrative access.

The internal modem is intended for administrative connections over an analog POTS line. For modem connection and configuration details, see “Connecting to and configuring an internal modem” on page 6-12.

**Line configuration**

Stinger MRT-2 units support ASDL over POTS service. Each port on a Stinger MRT-2 has a variety of configuration options, including line rates and bandwidth. The way you configure each line depends on the model you have purchased, and your connectivity needs.

For specific information about line configuration, see Chapter 7, “Configuring the ADSL Line Interfaces.”

**Trunk module configuration**

A Stinger MRT-2 can be equipped with a trunk module that supports E1, T1, OC3/STM1, or DS3 service. The trunk module can connect the Stinger to another ATM switch. The line configuration includes settings that must match between the local and far-end switch interfaces.

When a trunk module is installed in a Stinger MRT-2 unit, use of the `show` command gives the appearance of two trunk modules, as shown in the following example:

```
admin> show
Shelf 1 (standalone):
```
The information displayed for trunk-module-1 is related to the self-contained STS-3 interfaces on the Stinger MRT-2 chassis. Although these interfaces are permanently installed on the chassis, to maintain the consistency of the command-line interface with other Stinger models TAOS identifies them as being installed in slot 17.

Although the physical connection for the STS-3 interfaces uses CAT 5, UTP cable, the configuration of the STS-3 connection is identical to the configuration of an OC3 line. For specific information about STS-3 configuration, see Chapter 9, “Configuring an OC3-ATM Trunk Module.”

The information displayed for trunk-module-2 is related to the trunk module that is installed in the single trunk module slot (see Figure 2-4 on page 2-7). To maintain the consistency of the command line interface with other Stinger models, this module is identified by TAOS as being installed in slot 18.

For specific information about trunk module configuration, see the chapter for the desired trunk module.

System clocking modes

The Stinger MRT-2 requires a clock source for its timing subsystem. By default, it uses a built-in 8kHz clock as its timing source. You can configure the system to take its clock source from a trunk port or from an external building integrated timing supply (BITS) clock connected to the BITS connector of the Stinger MRT-2.

For detailed configuration information see “Configuring system clocking (optional)” on page 6-19.

Stinger MRT-2 management features

To enable you to configure the system and monitor its activity, Stinger MRT-2 units support profiles, commands, and status windows in the command-line interface. Stinger MRT-2 units also support SNMP management, RADIUS profiles, and the ability to upload (back up) and download software and configuration files via TFTP or serial connections.

A Stinger MRT-2 system provides several permission levels to control the management and configuration functions that are accessible in the command-line interface. For information about User profiles and other management features, see the Stinger Administration Guide.

Using the command-line interface

The Stinger command-line interface provides access to commands, profiles, and status windows. You must use the command-line interface to provide the initial system and IP configuration for the unit, although you can choose to perform subsequent configuration tasks remotely through a Telnet session or SNMP, or by downloading configuration files via TFTP.
For an introduction to the command-line interface and its shortcuts, see the *TAOS Command-Line Interface Guide*.

**Onboard flash memory and software updates**

You can perform software upgrades of the onboard flash memory in the field. You upgrade the Stinger MRT-2 unit by accessing it locally through its serial (CONSOLE) port and downloading software upgrades from a TFTP server. For details, see the *Stinger Administration Guide*.

**SNMP support**

In addition to managing a Stinger MRT-2 unit by means of the command-line interface, you can manage the unit by using an SNMP management station such as the NavisAccess™ product. A Stinger MRT-2 unit can generate SNMP traps (event notifications) to indicate alarm conditions, and it relies on SNMP community strings to implement SNMP security.

For information about using SNMP with Stinger MRT-2 units, see the *Stinger Administration Guide*, the *Stinger SNMP Management of the ATM Stack Supplement*, and the documentation for Navis™ network management software.

**RADIUS support**

You can use RADIUS to store user profiles for ATM circuits and terminating connections. The RADIUS server must be compliant with vendor-specific attributes (VSAs), as defined in RFC 2138. To use RADIUS, you must also configure the Stinger MRT-2 unit to communicate with the RADIUS server.

For information about configuring and using RADIUS, see the *TAOS RADIUS Guide and Reference*.

**Tracking system activity**

A Stinger MRT-2 unit supports many commands for monitoring system activity. To display the commands that are available with the permission settings in the current User profile, enter the `help` (or `?`) command. The following example shows the commands available for the `admin` login. The left column shows command names, and the right column shows the command `class`, which determines the permissions required to use the command.

```
admin> ?
  ?                          ( user )
  arptable                  ( system )
  auth                      ( user )
  callroute                 ( diagnostic )
  clear                     ( user )
  clock-source              ( diagnostic )
  clr-history               ( system )
  connection                ( system )
  date                      ( update )
  debug                     ( diagnostic )
  delete                    ( update )
  device                    ( diagnostic )
  dir                       ( system )
```
Stinger MRT-2 Operational Overview

What’s next

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<tr>
<th>Configuration task</th>
<th>Location</th>
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<td>“Making the initial administrative connection” on page 6-2</td>
</tr>
<tr>
<td>Set up basic access security</td>
<td>“Restricting administrative access” on page 6-3</td>
</tr>
<tr>
<td>Configure IP</td>
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</tr>
<tr>
<td>Configure the unit to use RADIUS</td>
<td>TAOS RADIUS Guide and Reference</td>
</tr>
<tr>
<td>Configure the unit’s lines</td>
<td>Chapter 7, “Configuring the ADSL Line Interfaces.”</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Configuration task</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking line port status</td>
<td>Chapter 7, “Configuring the ADSL Line Interfaces.”</td>
</tr>
<tr>
<td>Configure the unit’s trunk lines</td>
<td>Chapter 8, “Configuring T1 and E1 Trunk Modules.”</td>
</tr>
<tr>
<td></td>
<td>Chapter 9, “Configuring an OC3-ATM Trunk Module.”</td>
</tr>
<tr>
<td></td>
<td>Chapter 10, “Configuring a DS3-ATM Trunk Module.”</td>
</tr>
<tr>
<td>Checking trunk status</td>
<td>Chapter 8, “Configuring T1 and E1 Trunk Modules.”</td>
</tr>
<tr>
<td></td>
<td>Chapter 9, “Configuring an OC3-ATM Trunk Module.”</td>
</tr>
<tr>
<td></td>
<td>Chapter 10, “Configuring a DS3-ATM Trunk Module.”</td>
</tr>
<tr>
<td>Define ATM traffic contracts</td>
<td><em>Stinger ATM Configuration Guide</em></td>
</tr>
<tr>
<td>Configure ATM circuits</td>
<td><em>Stinger ATM Configuration Guide</em></td>
</tr>
<tr>
<td>Configure virtual path switching</td>
<td><em>Stinger ATM Configuration Guide</em></td>
</tr>
<tr>
<td>Check details about parameters and commands</td>
<td><em>Stinger Reference</em></td>
</tr>
<tr>
<td>Use SNMP with the unit</td>
<td><em>Stinger Administration Guide</em> and the <em>Stinger SNMP Management of the ATM Stack Supplement</em></td>
</tr>
<tr>
<td>Configure login permissions</td>
<td><em>Stinger Administration Guide</em></td>
</tr>
<tr>
<td>Back up the system configuration</td>
<td><em>Stinger Administration Guide</em></td>
</tr>
<tr>
<td>Test lines and ports</td>
<td><em>Stinger Administration Guide</em></td>
</tr>
</tbody>
</table>
Configuring Administrative Access, System Timing, and Startup Settings

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This chapter describes the tasks necessary for basic configuration of the Stinger MRT-2 unit as a stand-alone unit. Multiple Stinger MRT and MRT-2 units can also be connected together as a hosted system. Details of configuration for hosted operation are described in Appendix B, “Hosted Operation of Cascaded Stinger MRT units.” However, you must be familiar with the basic information described here, before attempting to configure a hosted system.

**Administrative configuration overview**

Administrative configuration includes the following tasks:

- Connecting a console workstation to the CONSOLE serial port on the Stinger MRT-2 unit
- Logging into the Stinger unit
- Changing default security settings to protect the unit
- Configuring IP to make the system accessible over its administrative network by Telnet, SNMP, and Ping
- Connecting and configuring additional types of administrative access
- Configuring RADIUS access (if appropriate) (See the TAOS RADIUS Guide and Reference.)
- Configuring system clocking (if appropriate)
Making the initial administrative connection

The serial port of a Stinger MRT-2 is used for initial configuration from a console device, or to reconfigure the unit from a console after NVRAM has been cleared.

After configuring the unit initially, you can connect as follows for dial-in administrative access:

- Connect an external modem to the serial port. (See “Connecting to and configuring an external modem” on page 6-11.)
- Connect the internal modem to an analog POTS line. (See “Connecting to and configuring an internal modem” on page 6-12.)

For other types of administrative connections, see “Additional administrative connections and configuration” on page 6-9.

Figure 6-1 shows a cable connection from the Stinger MRT-2 to a console terminal.

To connect the console terminal to the Stinger MRT-2, connect one end of a shielded straight-through cable to the CONSOLE port on the chassis. Then connect the other end of the shielded straight-through cable to the serial port on the console device.

The CONSOLE port on the Stinger MRT-2 consists of a female DB-9 connector. Examine the serial connector of your PC or dumb terminal to ensure that your shielded straight-through cable has the proper connectors. If needed, you can use DB-9-to-DB-25 converters or gender converters to complete this connection.

For detailed information about the pinouts on the CONSOLE serial port, see “CONSOLE port and cable pinouts” on page C-1.
Logging into the Stinger MRT-2

To configure the unit initially, or after using the `nvram` command to clear its NVRAM, you must connect a workstation to the Stinger MRT-2 CONSOLE port.

After connecting the management workstation, launch a communications program that supports terminal emulation. Make sure that the terminal emulation settings specify 9600bps, 8 data bits, 1 stop bit, and no parity or flow control.

The default settings for the serial port profile allow anyone connecting to the CONSOLE port to access the system as the administrative (admin) user, without logging in or being authenticated. When you connect to an unconfigured Stinger MRT-2 to which power has been applied, you are presented with the prompt for the admin user:

```
admin>
```

After you have supplied basic IP information, as described in “Providing a basic system IP configuration” on page 6-6, you can access the Stinger command-line interface by using Telnet from an IP host. Or, you can log in by using an SNMP management station, such as NavisAccess™, from an IP host. These types of connections require that you authenticate a User profile and supply a password to acquire administrative permissions.

During basic configuration, Lucent Technologies recommends that you also configure the serial port to require username and password authentication. For details, see “Restricting administrative access.”

For details about User profiles, see the Stinger Administration Guide.

Restricting administrative access

Each Stinger unit is shipped from the factory with its security features set to defaults that allow you to easily access the unit so you can configure it without any restrictions. Before you bring the unit online, you must change the default security settings to protect the configured unit from unauthorized access.

Changing defaults for serial-port logins

The factory default setting for the serial interface specifies that any connection to that interface will use the admin User profile. To help protect the system from unauthorized administrative access on the serial interface, change the following default setting:

```
[in SERIAL/{ shelf-1 control-module 2 }]
user-profile = admin
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>User-Profile</td>
<td>Name of the User profile to be used for logins on the Stinger MRT-2 serial port. User profiles set permissions and other parameters for logins to the Stinger command-line interface. If no name is specified, the system prompts for both the name and password of a User profile, as it does for Telnet logins.</td>
</tr>
</tbody>
</table>
A Stinger MRT-2 unit automatically creates a Serial profile for administrative access. To list the Serial profiles, use the `dir` command as follows:

```
admin> dir serial
12 10/20/2000 02:57:48 { shelf-1 first-control-module 2 }
```

**Note** The designation `first-control-module` refers to the control module in slot 8 on larger models of the Stinger. Although control module functions are integrated into the chassis of the Stinger MRT-2, TAOS uses a virtual location of slot 8 to access profiles and settings associated with these functions. This behavior is reflected in the configuration example that follows.

To make serial logins more secure, modify the Serial profile of the Stinger MRT-2 to specify a null User profile name, as shown in the following example. Anyone trying to establish a connection through the serial port is then required to provide a username and password.

```
admin> read serial {1 8 2}
SERIAL/{ shelf-1 first-control-module 2 } read
admin> set user-profile =
admin> write
SERIAL/{ shelf-1 first-control-module 2 } written
```

## Changing the default admin password

Because the `admin` user profile controls permissions that enable most levels of activity, access to that login must be carefully restricted. To protect the `admin` login, change its well-known default password the first time you log into the unit. Following is the password parameter, shown with its factory default setting:

```
[in USER/admin]
password = "Ascend"
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Password</td>
<td>Text string of up to 20 characters, which must be entered by a user to log in with permissions authorized by the <code>admin</code> profile. The value is case sensitive.</td>
</tr>
</tbody>
</table>

You can specify any password up to 20 characters. All future logins governed by the `admin` User profile must provide the new password.

For example, the following commands change the admin password to `x1!35DPG`:

```
admin> read user admin
USER/admin read
admin> set password = x1!35DPG
admin> write
USER/admin written
```

When an administrator telnets into the Stinger unit, the system prompts for the name and password of a User profile and authenticates the information before allowing the Telnet session. For example:

```
% telnet 1.1.1.1
Trying 1.1.1.1...
```
Connected to 1.1.1.1
Escape character is '^[].
User: admin
Password: x1!35DPG

Setting a Telnet password

A Telnet password is a global, systemwide password required for Telnet logins to the unit. The Telnet password is required before the system accepts the connection and prompts for the username. Following are the default parameters associated with Telnet logins to a Stinger unit:

```
[in IP-GLOBAL]
telnet-password = ""
user-profile = ""
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telnet-Password</td>
<td>Text string of up to 20 characters, required from all users requesting a Telnet session. A user is allowed three attempts, with 60 seconds per attempt, to enter the correct password. A third unsuccessful attempt terminates the login process. The value is case sensitive.</td>
</tr>
<tr>
<td>User-Profile</td>
<td>Name of a default User profile for authenticating all Telnet logins. If no name is specified, the system prompts the user to enter the name of a User profile.</td>
</tr>
</tbody>
</table>

For example, the following commands set the Telnet password to dpg01!:

```
admin> read ip-global
IP-GLOBAL read
admin> set telnet-password = dpg01!
admin> write
IP-GLOBAL written
```

When a Telnet password has been specified, the system requires a two-tier password authentication for Telnet logins, first the Telnet password, then the username and its associated password. For example:

```
% telnet 1.1.1.1
<stinger01> Enter Password: dpg01!
Trying 1.1.1.1...
Connected to 1.1.1.1
Escape character is '^[].
User: admin
Password: **********
```

If the user enters an incorrect Telnet password, the system prompts again, allowing up to three attempts before timing out. If the user specifies the correct password, the connection is established and the user is prompted to enter the name and password of a valid User profile.
Providing a basic system IP configuration

To enable Telnet and SNMP access to the unit, and to allow connectivity between the unit and local IP hosts, you must assign IP addresses to the Stinger MRT-2 Ethernet port and configure basic IP routing.

Note A Stinger MRT-2 unit does not require IP routing to operate as a DSLAM. IP routing is not used by the DSLAM activities. The system does not provide IP routing for DSLAM user data.

IP address syntax

The Stinger MRT-2 unit uses dotted decimal notation (not hexadecimal) for IP addresses. Netmask information is appended to the IP address after a forward slash (/).

Netmasks

If no netmask is specified, the unit uses a default mask based on the class of the IP address that is supplied. Table 6-1 shows address classes and the number of network bits in the default mask for each class.

Table 6-1. IP address classes and number of network bits

<table>
<thead>
<tr>
<th>Class</th>
<th>Address range</th>
<th>Default network bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>0.0.0.0 through 127.255.255</td>
<td>8</td>
</tr>
<tr>
<td>Class B</td>
<td>128.0.0.0 through 191.255.255</td>
<td>16</td>
</tr>
<tr>
<td>Class C</td>
<td>192.0.0.0 through 223.255.255</td>
<td>24</td>
</tr>
</tbody>
</table>

For example, a class C address, such as 198.5.248.40, has 24 network bits, leaving 8 bits for the host portion of the address. If no subnet mask is specified for a class C address, the Stinger uses the default mask of 24 bits, as shown in Figure 6-2.

Figure 6-2. Default netmask for class C IP address

![Default netmask for class C IP address](image)

By default, this address is displayed as 198.5.248.40/24

Subnets

Subnets are permitted under the same syntax. A subnet address specifies a number of network bits that does not adhere to the Class A, B, or C network limits. For example, the following address specifies a 29-bit subnet:

\[ \text{ip-address} = 198.5.248.40/29 \]
In this address, 29 bits of the address are used to specify the network. The three remaining bits are used to specify eight addresses on the subnet. With three bits used to specify hosts on a 29-bit subnet, eight different bit combinations are possible. Of those eight possible host addresses, two are reserved:

- 000 — Reserved for the network (base address)
- 001
- 010
- 100
- 110
- 101
- 011
- 111 — Reserved for the broadcast address of the subnet

**Note** Early implementations of TCP/IP did not allow zero subnets (subnets with the same base address as a class A, B, or C network). For example, the subnet 192.32.8.0/30 was illegal because it had the same base address as the class C network 192.32.8.0/24, while the subnet 192.32.8.4/30 was legal. Modern implementations of TCP/IP support zero subnets, and the Stinger MRT-2 implementation of RIP treats these subnets the same as any other network. Make sure that you treat zero subnets consistently throughout your network. Otherwise, you can encounter routing problems.

Table 6-2 shows subnet masks and prefix lengths for a class C network.

**Table 6-2. Decimal subnet masks and prefix lengths**

<table>
<thead>
<tr>
<th>Subnet mask</th>
<th>Number of host addresses</th>
<th>Prefix length</th>
</tr>
</thead>
<tbody>
<tr>
<td>255.255.255.0</td>
<td>254 hosts + 1 broadcast address, 1 network base address</td>
<td>/24</td>
</tr>
<tr>
<td>255.255.255.128</td>
<td>126 hosts + 1 broadcast address, 1 network base address</td>
<td>/25</td>
</tr>
<tr>
<td>255.255.255.192</td>
<td>62 hosts + 1 broadcast address, 1 network base address</td>
<td>/26</td>
</tr>
<tr>
<td>255.255.255.224</td>
<td>30 hosts + 1 broadcast address, 1 network base address</td>
<td>/27</td>
</tr>
<tr>
<td>255.255.255.240</td>
<td>14 hosts + 1 broadcast address, 1 network base address</td>
<td>/28</td>
</tr>
<tr>
<td>255.255.255.248</td>
<td>6 hosts + 1 broadcast address, 1 network base address</td>
<td>/29</td>
</tr>
<tr>
<td>255.255.255.252</td>
<td>2 hosts + 1 broadcast address, 1 network base address</td>
<td>/30</td>
</tr>
<tr>
<td>255.255.255.254</td>
<td>Invalid mask (no hosts)</td>
<td>/31</td>
</tr>
<tr>
<td>255.255.255.255</td>
<td>1 host—a host route</td>
<td>/32</td>
</tr>
</tbody>
</table>
The broadcast address of any subnet has the host portion of the IP address set to all 1s (ones). The network address (or base address) represents the network itself, because the host portion of the IP address is all 0s (zeros). For example, supposing that the Stinger MRT-2 configuration assigns the following address to a remote router:

198.5.248.120/29

The Ethernet network attached to that router has the following address range:

198.5.248.120 – 198.5.248.127

A host route is a special-case IP address with a prefix length of /32. For example:

198.5.248.40/32

Host routes are routes to a single host, rather than to a network or subnet. This is determined by the fact that a 32-bit netmask does not allow for any host addresses on the network, other than the single address that is specified. It is, in effect, a one-address subnet.

Assigning the Ethernet IP addresses

A Stinger MRT-2 unit creates an IP interface for the Ethernet port on the chassis. Use the dir command to list the IP interface, as follows:

```
admin> dir ip-interface
18  11/03/2000 16:36:32  { { any-shelf any-slot 0 } 0 }
29  11/03/2000 16:27:57  { { shelf-1 first-control-module 1 } 0 }
```

**Note** The designation **first-control-module** refers to the control module in slot 8 on larger models of the Stinger. Although control module functions are integrated into the chassis of the Stinger MRT-2, TAOS uses a virtual location of slot 8 to access profiles and settings associated with these functions. This behavior is reflected in the configuration example that follows.

The following commands assign the address 1.1.1.1/24:

```
admin> read ip-interface { { shelf-1 8 1 } 0 }
IP-INTERFACE/{ { shelf-1 first-control-module 1 } 0 } read
admin> set ip-address = 1.1.1.1/24
admin> write
IP-INTERFACE/{ { shelf-1 first-control-module 1 } 0 } written
```

After you assign IP addresses, you can verify that the Stinger MRT-2 unit is a valid IP host on its configured network by pinging other network hosts, as shown in the following example:

```
admin> ping 1.1.1.56
PING 1.1.1.56: 56 Data bytes
64 bytes from 1.1.1.56: icmp_seq=0 ttl=255 time=0 ms
64 bytes from 1.1.1.56: icmp_seq=3 ttl=255 time=0 ms
^C
--- 1.1.1.56: Ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max = 0/0/0 ms
```
Configuring a default route

A default route is a static route that specifies a destination for addresses that are not on the local network and to which a known route does not exist. The default route is generally the IP address of an external router that has more route information about how specific destinations can be reached. When the default route is configured, the Stinger MRT-2 unit routes all IP packets with unknown destinations to the specified external router. If no default route is defined, the unit drops IP packets for which it has no route.

Figure 6-3 shows the Stinger MRT-2 Ethernet interfaces on a subnet, connected to the same Ethernet segment as a local backbone router. In this network, the Stinger MRT-2 can use the local router as its default route.

Assuming a local router as the unit’s default route, or gateway, enables the Stinger MRT-2 unit to pass all IP packets with an unrecognized address to that router, so its own routing tables can remain small. The external router maintains larger routing tables, and assumes the responsibility and overhead of routing most packets.

For example, the following commands define a default route to the LAN router in Figure 6-3:

```
admin> new ip-route default
    IP-ROUTE/default read
admin> set gateway-address = 1.1.1.3
admin> set active-route = yes
admin> write
    IP-ROUTE/default written
```

The system can support multiple default routes. The profile name does not have to be default. The only requirements are that the destination address must be zero, and Gateway-Address must specify a valid, accessible router.

For information about other settings in the IP-Route profile, see the Stinger Reference.

Additional administrative connections and configuration

Administration of the Stinger MRT-2 can be managed from a remote workstation over several different types of connections.

- An Ethernet LAN
- An analog modem (internal or external)
A terminating permanent virtual circuit (PVC)

The following information provides background to help you set up and configure the Stinger MRT-2 for these administrative connections.

Connecting to an Ethernet LAN

After the IP address of the Stinger MRT-2 has been configured, and the unit has been connected to a network, an administrative Telnet connection can be established through the network. (To configure an IP address, see “Assigning the Ethernet IP addresses” on page 6-8.)

Figure 6-4 shows an Ethernet network connection from the Stinger unit to the management workstation.

*Figure 6-4. Ethernet connection*

To connect a management workstation to the Stinger using an indirect Ethernet connection:

2. Connect the other end of the Ethernet cable to the local LAN.
3. Ensure that the management workstation has connectivity to the LAN on which the unit resides. (See “Verifying a LAN connection for administrators” on page 6-10.)
4. Ensure the Ethernet transceivers are connected properly to the network.

Verifying a LAN connection for administrators

To enable administrators to log into the Stinger MRT-2 unit’s interface from IP hosts, you must also make sure your local network can route to the unit. Your network router must have network connectivity through intermediate routers so that the
Configuring Administrative Access, System Timing, and Startup Settings

Additional administrative connections and configuration

An administrative host can access the Stinger MRT-2 via its IP address. You can test this connectivity by pinging the unit from the local host. For example, the following command entered on a local host tests connectivity to a Stinger MRT-2 with an IP address of 1.1.1.128:

```
% ping 1.1.1.128
PING 1.1.1.128 (1.1.1.128): 56 Data bytes
64 bytes from 1.1.1.128: icmp_seq=0 ttl=255 time=0 ms
64 bytes from 1.1.1.128: icmp_seq=7 ttl=255 time=0 ms
^C
--- 1.1.1.128 Ping statistics ---
8 packets transmitted, 8 packets received, 0% packet loss
round-trip min/avg/max = 0/0/0 ms
```

Connecting to and configuring an external modem

To configure an administrative connection with an external modem, connect the modem to the Stinger MRT-2 serial (CONSOLE) port with a null modem (crossover) cable. In addition, you might need a DB-25-to-DB-9 adapter. Figure 6-5 shows the administrative connection with a modem to the Stinger MRT-2 unit.

Figure 6-5. Administrative connection with a modem to the Stinger MRT-2 unit

The modem you use to connect to the Stinger MRT-2 unit must be configured as follows:

- Dumb mode. Dumb mode causes the modem to ignore data on the receive data (RD) lead.
- Ignore on-to-off transitions of the data-terminal ready (DTR) lead.
- Autoanswer enabled.
- 8 bits, 1 stop bit, and no parity.

Configure the following AT commands on the modem:

- `at&d0` Ignore DTR state.
- `ats0=1` Answer automatically after one ring.
- `ate0` No echo (required).
- `at&c0` Assert the data carrier detect (DCD) signal.
Connecting to and configuring an internal modem

The internal modem of the Stinger MRT-2 is configured by default to automatically answer any incoming calls. For this reason, you need only connect the telephone line to the RJ-11 jack on the face of the unit. Figure 6-6 shows a connection for an internal modem.

![Connection for internal modem diagram]

Configuring an internal modem

Use the Modem profile to set the autoanswer, country code, and inactivity time-out configuration of the modem. Following is a sample of this profile with its default settings:

```
[in MODEM/{ shelf-1 first-control-module 3 }]
physical-address* = { shelf-1 first-control-module 3 }
auto-answer = on
country-code = unitedstates
inactivity-time = 0
```

The `auto-answer` parameter has two valid settings:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Specifies</th>
</tr>
</thead>
<tbody>
<tr>
<td>on</td>
<td>The internal modem automatically answers any incoming call and attempts to negotiate modem protocols with the caller.</td>
</tr>
<tr>
<td>off</td>
<td>The internal modem ignores incoming calls.</td>
</tr>
<tr>
<td>primary-only</td>
<td>Not valid for the Stinger MRT-2.</td>
</tr>
</tbody>
</table>
If the Stinger MRT-2 unit is equipped with an internal domestic modem, the only valid setting for the `country-code` parameter is `unitedstates`. If the unit is equipped with an international modem, the `country-code` parameter can be set to support the national regulations of several specific countries.

You can use the `cmmodemShowCountries` command to check for the presence of an international modem. When used on units equipped with an international modem, this command will display a list of valid country code settings for the `country-code` parameter. When used on units with a domestic modem, no response will be displayed. The default setting `unitedstates` is the only valid setting for the `country-code` parameter on units with domestic modems.

The `inactivity-time` setting controls the number of seconds of inactivity that must elapse before a connection to the internal modem is dropped. Valid entries are from 0 to 255 seconds. A setting of 0 disables this feature, and allows the connection to remain active indefinitely.

**Administrative terminating PVC connections**

After the IP address of the Stinger MRT-2 has been configured, and the trunk module of the unit has been connected to an ATM switch, you can establish an administrative Telnet connection through a PVC that has been configured to terminate as an IP connection within the unit.

(To configure an IP address, see “Assigning the Ethernet IP addresses” on page 6-8. To connect the trunk module to an ATM switch, see the applicable trunk module chapter.)

To establish a Telnet connection to the Stinger MRT-2, you must use a workstation that has IP access to the network that is at the far end of the ATM link.

**Overview of a terminating ATM connection**

A terminating ATM connection is a PVC that is not switched through the system and forwarded out to the ATM network. Instead, this type of connection terminates in the Stinger MRT-2 system itself and is passed up to the IP router for further handling. As an example of a terminating routed IP connection, Figure 6-7 shows an administrative Telnet or SNMP login from a remote workstation (4.4.4.1/24) to the Stinger MRT-2 interface across an ATM trunk.
A terminating connection uses a single physical interface in a Stinger MRT-2 unit, such as the trunk interface shown in Figure 6-7. It is an ATM connection that carries IP packets, which are reassembled in the Stinger MRT-2 unit and then handled as regular IP traffic.

The profile for a terminating connection must specify the far-end IP address, and it can set a number of other routing-related values. The profile must also specify the ATM characteristics of the connection—for example, a virtual path identifier (VPI) and virtual channel identifier (VCI) assignment, a nailed group, and the type of protocol multiplexing to use for the ATM adaptation layer 5 (AAL5).

Overview of terminating PVC settings

A terminating PVC can be configured in a single connection or RADIUS profile. The cells received on the connection are reassembled into IP packets. The connections are not password authenticated.

For information about configuring a RADIUS profile, see the *TAOS RADIUS Guide and Reference*.

*Local Connection profile settings*

Following are the connection parameters (shown with sample settings) for ATM terminating connections:

```
[in CONNECTION/management]
station* = management
active = yes
encapsulation-protocol = atm
```
Configuring Administrative Access, System Timing, and Startup Settings

Additional administrative connections and configuration

[in CONNECTION/"":ip-options]
ip-routing-enabled = yes
remote-address = 3.3.3.3/24

[in CONNECTION/"":atm-options]
atm1483type = aal5-llc
vpi = 0
vci = 35
nailed-group = 1
cast-type = p2p
conn-kind = pvc
vp-switching = no

[in CONNECTION/"":atm-qos-options]
usr-up-stream-contract ="
usr-dn-stream-contract ="

**Parameter** | **Setting**
---|---
station | Name of the far-end device.
active | Enable/disable the profile for active use.
encapsulation-protocol | Encapsulation protocol to use for the connection. This parameter must be set to atm for terminating connections.
ip-options: | Enable/disable IP routing for the interface. IP routing must be enabled (as it is by default) for terminating connections.
ip-options: ip-routing-enabled | IP address of the far-end device, which can include a subnet specification. If it does not include a subnet mask, the router software in the Stinger MRT-2 unit assumes a default subnet mask that is based on address class. (For related information, see “Netmasks” on page 6-6.)

atm-options: atm1483type | Method of multiplexing Layer-3 packets into ATM cells. Valid values are AAL5-LLC and AAL5-VC.
atm-options:vpi | VPI for the connection. For a discussion of valid VPI values, see the Stinger ATM Configuration Guide.
atm-options:vci | VCI for the connection. For a discussion of valid VCI values, see the Stinger ATM Configuration Guide.
atm-options: nailed-group | Number of the dedicated (nailed) group for the physical interface used by the connection. (Use the `which` command to display a port’s nailed-group number. For details, see the Stinger ATM Configuration Guide.)
atm-options: cast-type | Connection topology type. Only the default point-to-point (p2p) value is valid.
atm-options: conn-kind | Kind of connection. Because the Private Network-to-Network Interface (PNNI) protocol is not supported on the Stinger MRT-2 at this time, pvc (the default) is the only valid setting.
### Configuring Administrative Access, System Timing, and Startup Settings

Additional administrative connections and configuration

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>atm-options:</code> vp-switching</td>
<td>Not used for terminating connections. (See the Stinger ATM Configuration Guide.)</td>
</tr>
<tr>
<td><code>atm-qos-options:</code></td>
<td>Name of <code>atm-qos</code> profile to be applied to upstream traffic. See the Stinger ATM Configuration Guide.</td>
</tr>
<tr>
<td><code>usr-up-stream-contract</code></td>
<td>Name of the <code>atm-qos</code> profile to be applied to downstream traffic. See the Stinger ATM Configuration Guide.</td>
</tr>
</tbody>
</table>

**IP information**

When a Stinger MRT-2 unit starts up, it creates a routed interface for terminating connections specified in local connection profiles. For those connections defined in RADIUS profiles, a Stinger unit creates a routing interface when a session becomes active.

The IP address of the far-end device is the minimum IP information that must be supplied in the profile. The default settings for the `ip-options` subprofile enable IP routing. They also enable Van Jacobson header compression and turn off RIP, which is appropriate for many IP connections. You can change these defaults, or set a variety of routing and service parameters (which are described in the Stinger Reference). The far-end device specifies the Stinger MRT-2 unit’s IP address as its destination.

**Typical terminating PVC configuration for an administrative connection**

A Stinger MRT-2 unit establishes a PVC to a far-end unit on the basis of the VPI-VCI assignment and other ATM parameters. For an IP-routed connection, the unit then validates the far-end device’s IP address. After the connection has been established, users can Telnet across the connection or access the Stinger MRT-2 from an SNMP management station.

In the example illustrated in Figure 6-8, a Stinger MRT-2 unit has a connection or RADIUS profile for the DSLTNT® unit, and vice versa. The ATM PVC between the two units allows an administrator at the DSLTNT® side to connect to the Stinger unit, where he or she can authenticate the appropriate user profile for an administrative session.
Figure 6-8. Management connection from a remote network

Figure 6-8 shows the IP address of 1.1.1.128/24 assigned to the Stinger MRT-2.

**Sample Stinger MRT-2 configuration**

In Figure 6-8, the connection from the Stinger MRT-2 to the DSLTNT® unit uses an OC3-ATM interface. The following commands create a local connection profile and specify the IP address of the DSLTNT® unit:

```
admin> new connection dsltnt-1
CONNECTION/dsltnt-1 read
admin> set active = yes
admin> set encapsulation-protocol = atm
admin> set ip-options remote-address = 3.3.3.3/24
```

The following commands specify the AAL5 multiplexing method and assign VCI 101 to the link:

```
admin> set atm-options atm1483type = aal5-llc
admin> set atm-options vci = 101
```

The following commands display the nailed-group number of the OC3 trunk interface (trunk module 1, port 2) and assign it to the PVC:

```
admin> which -n {1 18 2}
Nailed group corresponding to port { shelf-1 trunk-module-1 1 } is 852
admin> set atm-options nailed-group = 852
```

The following commands assign an upstream and downstream quality of service (QoS) contract and write the profile:

```
admin> set atm-qos-options usr-up-stream-contract = cbr
admin> set atm-qos-options usr-dn-stream-contract = cbr
```
admin write
CONNECTION/ds1nt-1 read

Following is a comparable definition in a RADIUS profile:
permconn-ST-1 Password = "ascend"
   Service-Type = Outbound,
   Framed-Protocol = ATM-1483,
   User-Name = "ds1nt-1",
   Framed-IP-Address = 3.3.3.3,
   Framed-IP-Netmask = 255.255.255.0,
   Ascend-ATM-Group = 852,
   Ascend-Route-IP = Route-IP-Yes,
   Ascend-ATM-Vci = 101,
   Ascend-QOS-Upstream = "cbr",
   Ascend-QOS-Downstream = "cbr"

Sample far-end DSLTNT configuration

In this example, the DSLTNT® unit has a DS3 interface to the ATM network. The following command displays the nailed-group value assigned to the DS3-ATM interface used for this connection:
admin> get atm-ds3 {1 7 1} line-config nailed-group
[in ATM-DS3/{ shelf-1 slot-7 1 }:line-config]
nailed-group = 70

The following commands on the DSLTNT® unit configure a connection profile for the Stinger MRT-2 connection using the unit’s IP address and VCI 101:
admin> read connection stinger-1
CONNECTION/stinger-1 read
admin> set active = yes
admin> set encapsulation = atm
admin> set ip-options remote-address = 1.1.1.128/24
admin> set telco-options call-type = ft1
admin> set telco-options nailed-group = 70
admin> set atm-options vci = 101
admin> write
CONNECTION/stinger-1 written

For more details about creating connection profiles on DSLTNT® units, see the DSLTNT® documentation.

Checking the status of a terminating PVC

For examples of commands you can use to check connection status of virtual links and connections, see the Stinger ATM Configuration Guide. The same commands apply to terminating or cross-connected PVCs.

For terminating PVCs, the values in the atmvcc-stat and atmpvc-stat profiles are slightly different for terminating connections. Following are the relevant parameters (shown with sample settings):
Configuring Administrative Access, System Timing, and Startup Settings

Configuring system clocking (optional)

The Stinger MRT-2 requires a clock source for its timing subsystem. By default, it uses a built-in 8kHz clock as its timing source. You can configure the system to take its clock source from a trunk port or from an external building integrated timing supply (BITS) clock connected to the Stinger BITS connector.

Following is the relevant TAOS parameter, shown with its default value:

```
[in SYSTEM]
system-8k-clock = controller
```

**Parameter**  **Setting**

**System-8K-Clock**  Source for the master system clock.

- With the default **controller** setting, the Stinger MRT-2 unit uses the built-in 8kHz clock.
- If set to **lim-or-trunk-module**, the unit obtains its clock signal from a trunk port that has been configured as an eligible clock source, using the ports in order of their priority. If no eligible trunk ports are available, it uses the internal clock.
- If set to **bits**, the unit sources its clock from the BITS T1 framer on its BITS connector.

Using the BITS clock source

The following commands cause the system to first attempt to use a BITS clock as its clock source, and to use the built-in clock only if it does not find a valid BITS signal:

```
admin> read system
SYSTEM read
admin> set system-8k-clock = bits
admin> write
SYSTEM written
```
Configuring Administrative Access, System Timing, and Startup Settings

Configuring system clocking (optional)

Loss of BITS signal indications and fall-back

If the system-8K-clock parameter in the system profile is set to bits and the system detects a loss of signal, it displays the following message:
LOG alert, Shelf 1, Controller-1, Time: 17:02:01--
BITS clock source has been lost - 8kHz clock is free running

If no other clock source is eligible, the system then displays the following message:
LOG notice, Shelf 1, Controller-1, Time: 17:02:01
Master clock source changed to local oscillator

When the Stinger unit recovers the BITS signal, it displays the following messages:
LOG alert, Shelf 1, Controller-1, Time: 17:02:03--
BITS clock source has been recovered - 8kHz clock is locked
LOG notice, Shelf 1, Controller-1, Time: 17:02:03--
Master clock source changed to T1 framer

If the Stinger MRT-2 unit detects a T1 signal in the BITS input, it prioritizes the clock source list as follows:
- If the system-8K-clock parameter of the system profile is set to bits, its priority is set to the highest (1) and the T1 framer is selected regardless of other available clock sources and priorities.
- If the system-8K-clock parameter of the system profile is set to a value other than bits, its priority is set as the lowest (3) and the T1 framer is selected as a clock source only if no other slot clock sources are available.

Changing the BITS clock source

The following examples show how to change system-8K-clock parameter setting from bits to lim-or-trunk-module and use the slot-clock-source command to view the changes in clock source priority.
admin> set system-8k-clock = bits
admin> write
LOG notice, Shelf 1, Controller-1, Time: 17:55:34--
Master clock source changed to T1 framer
SYSTEM written
admin> slot-clock-source
Master line: T1 framer
Source List:
Source: line 1 Available* priority: 2
Source: line 2 Available* priority: 1
Source: T1 framer Available* priority: 1

admin> set system-8k-clock = lim-or-trunk-module
admin> write
LOG notice, Shelf 1, Controller-1, Time: 17:56:05--
Master clock source changed to slot-1/8 line 2
SYSTEM written
admin> slot-clock-source
Configuring Administrative Access, System Timing, and Startup Settings

Configuring system clocking (optional)

Using a trunk module clock source

The following commands cause the system to first attempt to use a trunk port as its clock source, and to use the built-in clock only if it finds no ports that are eligible clock sources:

```
admin> read system
SYSTEM read
admin> set system-8k-clock = lim-or-trunk-module
admin> write
SYSTEM written
```

Configuring trunk ports as eligible clock sources

The DS3-ATM and OC3-ATM profiles support Clock-Source and Clock-Priority parameters for specifying whether the port can be used to source the ATM network clock and use it as the master clock for the unit. Each of the trunk ports can be configured as eligible or ineligible for this use, and can be assigned a high, middle, or low priority for being elected as the clock source. Following are the relevant parameters, shown with default settings:

```
[ in DS3-ATM/ { any-shelf any-slot 0 } : line-config ]
clock-source = not-eligible
clock-priority = middle-priority

[ in OC3-ATM/ { any-shelf any-slot 0 } : line-config ]
clock-source = not-eligible
clock-priority = middle-priority
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock-source</td>
<td>Enable/disable obtaining the system clock signal from the port. By default, ports are not eligible clock sources.</td>
</tr>
<tr>
<td>clock-priority</td>
<td>Priority of the interface as the system's clock source (high, middle, or low priority). Once the Stinger MRT-2 unit chooses a clock source, it uses that source until the interface becomes unavailable or a higher-priority source becomes available.</td>
</tr>
</tbody>
</table>

If more than one line is eligible to be the clock source, the system chooses the one with the highest priority, as specified by the Clock-Priority setting. If multiple sources of equal priority are present, the system selects the first valid clock source. (A clock source is valid if the Clock-Source parameter is set to eligible and the DS3 or OC interface is synchronized.)
Configuring Administrative Access, System Timing, and Startup Settings
Retaining basic configuration settings for remote administration

Once it has selected a clock source, the system uses that source until the source becomes unavailable or a higher-priority source becomes available. If no eligible external sources exist, the system uses an internal clock.

Typical trunk port clock source configurations

The following sample commands configure both ports of the a DS3-ATM module as eligible clock sources, with the first port assigned a higher priority for this use:

```
admin> read ds3-atm { 1 trunk-module-2 1 }
DS3-ATM/{ shelf-1 trunk-module-1 1 } read
admin> set line-config clock-source = eligible
admin> set line-config clock-priority = high
admin> write
DS3-ATM/{ shelf-1 trunk-module-2 1 } written
admin> read ds3-atm { 1 trunk-module-2 2 }
admin> set line-config clock-source = eligible
admin> set line-config clock-priority = low
admin> write

Additional information about configuring OC3-ATM and DS3-ATM trunk modules can be found in the chapter dealing with the desired module.

Retaining basic configuration settings for remote administration

In TAOS 9.2-167 and later, you can store minimal system configuration information in a file called default.cfg to enable the system to start up with some configuration information, even after you issue the nvram command. This feature enables setups with requirements for inband management to clear nonvolatile RAM (NVRAM) and restart the Stinger MRT-2 unit with a minimal configuration, such as the Ethernet configuration and some ATM connection configurations, so that inband management can proceed.

You can save a minimal configuration to the default.cfg file in a directory of flash memory. After you issue the nvram command, the unit reboots and checks NVRAM for configuration information.

The system searches for a default.cfg file in the flash directory /directory, then in directory/current.

If the system finds a default.cfg file, it loads the saved configuration to NVRAM and restarts with the minimal configuration information from the default.cfg file. If you save more than one default.cfg file in the flash directories, the software processes the first default.cfg file that it finds based on the order listed in the preceding section. If the system finds no default.cfg file, then no configuration file is loaded from flash and the system restarts without any configuration, as in previous software releases.
Storing a partial configuration for restart after clearing NVRAM

To enable a Stinger MRT-2 unit to start up with some minimal configuration information after you have issued the `nvram` command, you must create a `default.cfg` file. If you want to include password information in the file, you must first change a default setting to allow passwords to appear in the file.

Allowing password information in the `default.cfg` file

By default, administrative profiles do not display password information when you are viewing or listing information for them or other user profiles. If you want to include password information for administrative profiles in the `default.cfg` file, you must change this default setting for the profile under which you are logged in. Otherwise, instructions in the `default.cfg` file that reconfigure the administrative profiles will not contain the passwords associated with those profiles.

If you are logged in under the `admin` profile, set that profile so that it displays passwords, as in the following example. Passwords for any administrative or user profiles will then be included in the `default.cfg` file that you create while logged in under this profile.

```
admin> read user admin
USER/admin read
admin> set allow-password = yes
admin> write
USER/admin written
```

**Caution** After you create the `default.cfg` file, you must change the `allow-password` parameter back to `no`. Otherwise, passwords for any administrative or other user profiles that are listed while you are using the `admin` profile are displayed on screen in clear text.

**Caution** If you create a `default.cfg` file that contains any password information, be sure to safeguard the file. Password information in the file is in clear text, and can be read by anyone with access to the file.

Creating the `default.cfg` file

Proceed as follows to create a `default.cfg` file. You can limit the contents of this file to include only the minimal profiles needed to restore inband management connections by using the `-p` option with the `save` command. For details on the `save` command syntax and options, see the *Stinger Reference*.

1. Save configuration information to a default file `default.cfg`. The `default.cfg` file must contain enough configuration information, such as Ethernet and some ATM configuration, for the system to establish inband management. For example:

   ```
   admin> save flash 1/default.cfg
   configuration being saved to flash file default.cfg...
   configuration saved to flash.
   ```

   **Note** To minimize the time that the system takes to load the configuration from flash, Lucent recommends that you limit the size of the `default.cfg` file to 1Mb or less.
2 Verify that the default.cfg file has been saved successfully. For example:

```bash
admin> ls
ls Flash card 1:
/: 
default.cfg              38253 Sat Sep 11 14:17:40 2003
/current:                      
mrtcm.ffs             3183285 Fri Sep 10 13:17:14 2003 Version 9.5-206
mrtdmf.ffs             736964 Sat Sep 11 7:33:16 2003 Version 9.5-206
```

3 Use the cat command to display the default.cfg file and verify that it contains enough information to establish an inband management connection and provide the network operations center (NOC) access to the Stinger MRT-2 unit.

```bash
admin> cat flash 1/default.cfg
```

### Restarting with a partial configuration

Enter the nvram command:

```bash
admin> nvram
```

The unit displays the following output:

```
Please stand by. nvram was rebuilt, waiting to load from default.cfg ...
****** WARNING ***** WARNING ***** WARNING ***** WARNING ***** WARNING ***** WARNING System Integrity checking in restoring from default.cfg will take a few minutes. User must not make changes to system profile(s) at this time.
****** WARNING ***** WARNING ***** WARNING ***** WARNING ***** WARNING configuration being restored from flash file 1/default.cfg...
Please stand by, default.cfg was loaded, resetting controller(s) ...
Secondary controller is not available, Reboot only the primary
Please stand by. System reset in progress...configuration loaded from flash.
```

After the system has reset, profile values from the default.cfg file are used to configure the Stinger MRT-2 unit. If inband management is supported by the information in the default.cfg file, it is restored after the restart.

### Saving and loading a backup configuration

You can save and reload selected profiles or the full configuration of a Stinger unit. Reloading a saved configuration will reconfigure the parameters of the Stinger unit to the parameters of the saved configuration. If you are using a remote administrative connection to the Stinger unit, be careful not to overwrite and loose the configuration for your connection when restoring a full configuration to the unit.

**Caution** If the configuration for your remote connection is not included in the full configuration being restored, your remote connection will be lost.

### Saving the configuration

The save command saves all configured profiles, all profiles of a specified type, or a specific profile to a file on a local disk or to a file on a network host. You can then use that file to restore the Stinger unit’s configuration. To maintain redundancy functionality in units with dual control modules, copy the configuration on the
primary control module to the secondary control module. For syntax information, see the Stinger Reference.

**Note** To save passwords, you must have sufficient permissions to view password fields. (For a discussion of permissions, see the Stinger Administration Guide.) Without this permission, passwords are not properly saved.

### Saving the full configuration to a local file

To save the full Stinger configuration to a file on the system you are using for administrative access to the Stinger unit, enable the capture function in your VT100 emulation software, specify a file name, and enter the `save` command as follows:

```
admin> save -a console
```

The `-a` option saves all parameters, even those that are set to their default values. You might want to print a copy of the configuration for later reference.

The entire configuration is written as text to the specified file. This method allows you to cut and paste the configuration to other devices.

### Saving the configuration to a network host

To save the configuration on a network host, you must specify the hostname and the full path of a filename. In the following example, `host1` is the network host and `saved.cfg` is the filename:

```
admin> save -a network host1 saved.cfg
```

configuration being saved to host 10.65.212.19 file saved.cfg...

connection saved.

### Restoring the configuration

You can restore a configuration that you saved with the `save` command by means of the `load` command. The `load` command uploads a code image to flash or loads the text of configuration commands from a saved file as a configuration script. The code image or configuration text can be located on the disk of the PC you are using for the terminal session with the Stinger unit, on a network host that supports TFTP, or on the PCMCIA flash card file system of the control module.

For syntax information, see the Stinger Reference.

**Note** You must reset the Stinger unit after reloading a configuration.

### Restoring from a local file

Before you start the restore procedure, verify that your terminal emulation program has an autotype (or ASCII file upload) feature. Autotype allows your emulator to transmit a text file over its serial port as that file is displayed on your screen. You must also verify that the data rate of your terminal emulation program is set to 9600 baud or lower and that the `term-rate` parameter in the `system` profile is set to the same rate. Speeds higher than 9600 baud might cause transmission errors.

To restore a configuration from a file on the system you are using for administrative access to the Stinger unit, enter the following `load` command, and set your VT100 emulation software to send the saved configuration file.
Restoring from a network host

To restore a configuration from a file on a network host, enter the `load` command as follows:

```
admin> load config network hostname filename
```

Replace `hostname` with the name of the host and `filename` with the name of the file in which the configuration is stored.

To load a configuration file named `unit.cfg` from network host 10.8.7.2 to the PCMCIA flash card in slot 1, proceed as follows:

```
admin> load config network 10.8.7.2 /unit.cfg
```

For more detailed information about Stinger configuration, see the *Stinger Administration Guide*. 
Configuring the ADSL Line Interfaces

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The Stinger MRT-2 provides ADSL interfaces that support high-speed asymmetric data transfer using the ANSI discrete multitone (DMT), G.lite, and G.dmt ADSL protocols.

Configuring ATM ADSL-DMT interfaces

A Stinger MRT-2 unit creates an AL-DMT profile for each of its ADSL-DMT interfaces as shown in the following profile listing:

```
admin> dir al-dmt
 35 10/02/2001 11:51:13  { shelf-1 slot-1 1 }  1:1:1
 39 10/02/2001 11:51:13  { shelf-1 slot-1 2 }  1:1:2
 39 10/02/2001 11:51:13  { shelf-1 slot-1 3 }  1:1:3
 39 10/02/2001 11:51:13  { shelf-1 slot-1 4 }  1:1:4
 39 10/02/2001 11:51:13  { shelf-1 slot-1 5 }  1:1:5
 39 10/02/2001 11:51:13  { shelf-1 slot-1 6 }  1:1:6
 39 10/02/2001 11:51:13  { shelf-1 slot-1 7 }  1:1:7
 39 10/02/2001 11:51:13  { shelf-1 slot-1 8 }  1:1:8
 39 10/02/2001 11:51:13  { shelf-1 slot-1 9 }  1:1:9
 40 10/02/2001 11:51:13  { shelf-1 slot-1 10 }  1:1:10
 40 10/02/2001 11:51:13  { shelf-1 slot-1 11 }  1:1:11 ....
```

The Stinger MRT-2 creates a total of 72 interfaces within the AL-DMT profile.

Note The TAOS software addresses the DSL interfaces of the Stinger MRT-2 unit as slot 1, although they are permanently installed, to maintain command-line-interface consistency with other Stinger models.
Overview of the AL-DMT profile

Various discrete multitone (DMT) standards define the fast and interleaved 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 MRT-2 unit uses 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 ADSL-DMT features are not currently supported:

- Dual 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 Stinger MRT-2 supports the following protocol standards:

- ANSI T1.413 Issue 2—full rate
- ITU G.992.1—G.dmt
- ITU G.992.2—G.lite
- ITU G.994.1—G.hs
- ITU G.997.1—physical layer management

By setting the line-code parameter in the Line-Config subprofile to auto-select, the Stinger MRT-2 automatically detects and configures itself with the correct ADSL protocol. This is the optimum setting for the Stinger MRT-2.

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 unit does not support dual latency, which can use both the fast and interleaved channels in both directions.
AL-DMT profile

The AL-DMT profile contains the following parameters and subprofiles, shown with default values, for activating and setting up an AL-DMT line. These profile and subprofile parameters are described in subsequent sections of this chapter.

```
[in AL-DMT/{ any-shelf any-slot 0 }]
  name = ""
  physical-address* = { any-shelf any-slot 0 }
  enabled = no
  ignore-lineup = system-defined
  line-config = { 1 15 automatic-at-startup automatic-at-startup 100 100 13 20 40+
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Name of the interface. The default value is the interface address in shelf:sport format (1:1:1 through 1:1:72 on the Stinger MRT-2), but you can assign a text string of up to 16 characters.</td>
</tr>
<tr>
<td>physical-address</td>
<td>Specifies the physical address of the interface in the Stinger unit.</td>
</tr>
<tr>
<td>enabled</td>
<td>Enable/disable the ADSL-DMT interface. An ADSL-DMT line is disabled until you activate the line in the AL-DMT profile.</td>
</tr>
</tbody>
</table>

Line-Config subprofile

The Line-Config subprofile parameters configure an ADSL-DMT line. The parameters activate and set up the line and are shown with default values. The rate adaptive and power parameters are described in succeeding sections.

```
[in AL-DMT/{ any-shelf any-slot 0 }:line-config]
  nailed-group = 1
  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 = fast
  line-latency-up = fast
  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
```
### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>nailed-group</td>
<td>Specifies the nailed-group number for the ADSL-DMT physical interface. A Connection or RADIUS profile uses this number to specify the interface. 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 to 1024 that is unique within the system.</td>
</tr>
<tr>
<td>vp-switching-vpi</td>
<td>Specifies the virtual path identifier (VPI) to use for virtual path (VP) switching on the DSL port. The default is 15. All other VPIs are used for virtual channel (VC) switching.</td>
</tr>
<tr>
<td>line-code</td>
<td>Specifies 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.</td>
</tr>
<tr>
<td>line-latency-down</td>
<td>Specifies the latency path (fast or interleave) to be used for downstream data transport. The default value is interleave for G.lite and fast for all other line protocols. For related settings, see “Fast and interleaved bit-rate parameters” on page 7-7.</td>
</tr>
<tr>
<td>line-latency-up</td>
<td>Specifies the 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 protocols. For related settings, see “Fast and interleaved bit-rate parameters” on page 7-7.</td>
</tr>
<tr>
<td>trellis-encoding</td>
<td>Enable/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.</td>
</tr>
<tr>
<td>upstream-start-bin</td>
<td>Specifies the starting frequency interval (or bin) for upstream transmission. The valid range is 0 to 31. The default value is 6.</td>
</tr>
<tr>
<td>upstream-end-bin</td>
<td>Specifies the ending frequency bin for upstream transmission. The valid range is 0 to 31. The default value is 31.</td>
</tr>
<tr>
<td>downstream-start-bin</td>
<td>Specifies the starting frequency bin for downstream transmission. The valid range is 32 to 255. The default value is 32.</td>
</tr>
</tbody>
</table>
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. (For information on these parameters, see “Fast and interleaved bit-rate parameters” on page 7-7.)

You can use the bit rate 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. Splitterless ANSI DMT eliminates the need for splitters or filters at the subscriber location.

For optimum performance under most conditions, bit swapping can be turned on for all interfaces. The following example shows how to enable bit swapping for the first interface of a Stinger MRT-2:

```
admin> read al-dmt {1 1 1}
AL-DMT/{ shelf-1 slot-1 1 } read
admin> set line-config bit-swapping = yes
admin> write
```

### Rate-adaptive mode parameters

The rate-adapt-mode-up and rate-adapt-mode-down parameters in the Line-Config subprofile 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, which can use both the fast and interleaved channels in both directions, 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

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>downstream-end-bin</td>
<td>Specifies the ending frequency bin for downstream transmission. The valid range is 32 to 255. The default value is 255.</td>
</tr>
<tr>
<td>loop-back</td>
<td>Provides a digital or analog loopback on the ADSL interface when set to digital or analog. No loopback is present when the default value of none is set.</td>
</tr>
<tr>
<td>bit-swapping</td>
<td>Used as a noise compensation feature on Annex A full-rate lines. For optimum performance under most conditions, set this parameter to yes.</td>
</tr>
</tbody>
</table>
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 7-7. For information about defining acceptable noise margins, see “Noise margin parameters” on page 7-10.

The following parameters in the Line-Config subprofile, shown with default values, define how rate adaptation operates 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
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>rate-adapt-mode-up</td>
<td>Specifies the 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.</td>
</tr>
<tr>
<td>rate-adapt-mode-down</td>
<td>Specifies the 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.</td>
</tr>
<tr>
<td>rate-adapt-ratio-up</td>
<td>Not currently supported. Ratio for distributing the excess upstream bit rate among the fast and interleaved channels when dual latency is supported.</td>
</tr>
<tr>
<td>rate-adapt-ratio-down</td>
<td>Not currently supported. Ratio for distributing the excess downstream bit rate among the fast and interleaved channels when dual latency is supported.</td>
</tr>
</tbody>
</table>

**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 0 (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. In the Line-Config 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 to -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 Line-Config 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 = 20-db
```

### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>max-aggr-power-level-up</td>
<td>Specifies the maximum aggregate power level on the upstream channel. The valid range is from 0dBm to 13dBm (the default).</td>
</tr>
<tr>
<td>max-aggr-power-level-down</td>
<td>Specifies the maximum aggregate power level on the downstream channel. Its valid range is from 0dBm to 20dBm (the default).</td>
</tr>
<tr>
<td>max-power-spectral-density</td>
<td>Specifies the maximum PSD in both directions. Its valid range is from 34 to 52 in even-number increments. The default value is 40. 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.</td>
</tr>
<tr>
<td>gain-default</td>
<td>Specifies 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 (the default).</td>
</tr>
</tbody>
</table>

### 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 in the Line-Config subprofile (fast or interleave) determine which channel is used in each direction. For more information, see “Line activation and DMT parameters” on page 7-2.

### Fast-Path-Config subprofile

The following configuration shows the default settings for the Fast-Path-Config subprofile. The bit-rate parameter settings indicate use of the fast channel for both upstream and downstream traffic. 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 Interleave-Path-Config profile contains a similar group of parameters. For an explanation of these parameters, see “Interleave-Path-Config subprofile” on page 7-8.

**Setting the fast-path bit rate for maximum performance**

For optimum performance under most conditions, fast-path bit rates can be configured as shown in the following example, which indicates how the bit rates are set for the first interface of a Stinger MRT-2:

```
admin> read al-dmt {1 1 1}
AL-DMT/{ shelf-1 slot-1 1 } read
admin> set fast-path-config max-bitrate-up = 1280
admin> set fast-path-config max-bitrate-down = 12480
admin> set fast-path-config min-bitrate-up = 32
admin> set fast-path-config min-bitrate-down = 32
admin> write
```

**Interleave-Path-Config subprofile**

In the following default 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:

```
[min-bitrate-up = 128
min-bitrate-down = 128
max-bitrate-up = 1024
max-bitrate-down = 8000
planned-bitrate-up = 1024
planned-bitrate-down = 1000]
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>min-bitrate-up</td>
<td>Specifies the minimum bit rate for upstream traffic, from 0Kbps to 1024Kbps. When the automatic rate-adaptive mode is in use, the line initializes at this upstream rate or fails to initialize. The default value for the Stinger MRT-2 is 128Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is operator-controlled.</td>
</tr>
<tr>
<td>min-bitrate-down</td>
<td>Specifies the minimum bit rate for downstream traffic, from 0Kbps to 8192Kbps. When the automatic rate-adaptive mode is in use, the line either initializes at this downstream rate or fails to initialize. The default value for the Stinger MRT-2 is 128Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is operator-controlled.</td>
</tr>
</tbody>
</table>
Configuring the ADSL Line Interfaces
Configuring ATM ADSL-DMT interfaces

## Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>max-bitrate-up</td>
<td>Specifies the maximum bit rate for upstream traffic, from 0Kbps to 2,000Kbps. The default value for the Stinger MRT-2 is 1024Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is operator-controlled.</td>
</tr>
<tr>
<td>max-bitrate-down</td>
<td>Specifies the maximum bit rate for downstream traffic, from 0Kbps to 15,000Kbps. The default value for the Stinger MRT-2 is 8000Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is operator-controlled.</td>
</tr>
<tr>
<td>planned-bitrate-up</td>
<td>Specifies the constant bit rate for upstream traffic when operator-controlled rate-adaptive mode is in use. Valid values are from 0Kbps to 2000Kbps. The default value for the Stinger MRT-2 is 1024Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is automatic-at-startup.</td>
</tr>
<tr>
<td>planned-bitrate-down</td>
<td>Specifies the constant bit rate for downstream traffic when operator-controlled rate-adaptive mode is in use. Valid values are from 0Kbps to 15,000Kbps. The default value for the Stinger MRT-2 is 1000Kbps. <strong>Note</strong> This parameter does not apply when the rate adaptation is automatic-at-startup.</td>
</tr>
</tbody>
</table>

### 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 Interleave-Path-Config subprofile 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
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>max-delay-up</td>
<td>Specifies the maximum milliseconds of delay allowed in the upstream direction as a result of interleaving data. The valid range is 0 to 64. The default value is 16.</td>
</tr>
<tr>
<td>max-delay-down</td>
<td>Specifies the maximum milliseconds of delay allowed in the downstream direction as a result of interleaving data. The valid range is 0 to 64. The default value is 16.</td>
</tr>
</tbody>
</table>
Setting the interleave bit-rate for optimum performance

For optimum performance when using the Stinger MRT-2, under most conditions interleave bit rates can be configured as shown in the following example. The example shows how the bit rates are set for the first interface of a Stinger MRT-2.

```
admin> read al-dmt {1 1 1}
AL-DMT/ { shelf-1 slot-1 1 } read
admin> set interleave-path-config max-bitrate-up = 1280
admin> set interleave-path-config max-bitrate-down = 12480
admin> set interleave-path-config min-bitrate-up = 32
admin> set interleave-path-config min-bitrate-down = 32
admin> write
```

Margin-Config subprofile

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 margin parameters

The Margin-Config subprofile contains the parameters that configure noise margins. 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 to 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 7-1 illustrates the relationship of margin parameters to power adjustments.

```
Figure 7-1. Relationship between noise margin parameters and power adjustments
```

Reduce output power

<table>
<thead>
<tr>
<th>Steady-state operations</th>
<th>Maximum additional noise margin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target noise margin</td>
</tr>
<tr>
<td></td>
<td>Minimum noise margin</td>
</tr>
<tr>
<td></td>
<td>0dB margin</td>
</tr>
</tbody>
</table>

Increase output power

The target noise margin parameters are supported by the Stinger MRT-2. The minimum noise margin and maximum additional noise margin parameters are not used and are not detailed here. Consult the Stinger ADSL 48-port G.lite Line Interface Module (LIM) Guide, at http://www.lucentdocs.com/ins or http://www.lucent.com/support, for additional information about setting the noise margin parameters.
Following are the Margin-Config subprofile parameters (shown with default values) for configuring the target noise margins on the ADSL-DMT line for the Stinger MRT-2:

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>target-noise-margin-up</td>
<td>Specifies the 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 to 31dB, with a practical limitation of 15dB set by the modem software. The default for the Stinger MRT-2 is 6dB.</td>
</tr>
<tr>
<td>target-noise-margin-down</td>
<td>Specifies the 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 to 3dB, with a practical limitation of 15dB set by the modem software. The default for the Stinger MRT-2 is 6dB.</td>
</tr>
</tbody>
</table>

**Note** The dynamic rate-adaptive noise margin parameters in this subprofile are not currently supported for the Stinger MRT-2. If you set any of these parameters, the modem re-trains with its previous behavior.

**Configuring call control**

Using the call-control procedures, you can configure the Stinger MRT-2 to allow connections to be established even when the line is not enabled fully. You configure the unit to use these procedures systemwide or on a per-port basis on the DS3-ATM and OC3-ATM trunk modules and on the ADSL lines.

The call control mechanism enables the Stinger MRT-2 unit to establish and maintain soft PVCs (SPVCs) across port state changes. This feature allows xDSL subscribers to establish connections on interfaces in operating states before the interfaces are fully trained, as well as in the standard port-up state (in which the modem has successfully trained). SPVC connections are accepted when the modem has not fully trained up to the port-up state. If an 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 MRT-2 unit monitors the physical line state of its interfaces and allows connections to be established only when the line is fully connected.

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

```
[in SYSTEM]
ignore-lineup = no
```
Configuring the ADSL Line Interfaces

Configuring call control

Parameter | Setting
--- | ---
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:
- 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.
- 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:
- system-defined (the default)—Sets the Stinger to inherit the ignore-lineup value from the System profile.
- no—Sets the Stinger call-control mechanism to ignore the systemwide setting and allows calls to be established when the line is operational and disallow calls on the port when the line state is DOWN.
- yes—Sets the Stinger call-control mechanism to ignore the line state and the systemwide setting and allows 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 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 1 of the Stinger MRT-2:

```
admin> read al-dmt { 1 1 1 }
SDSL/{ shelf-1 slot-1 1 } read
admin> set ignore-lineup = no
admin> write
SDSL/{ shelf-1 slot-1 1 } written
```
Examples of ADSL-DMT interface configuration

In Figure 7-2, an ADSL-DMT interface in a Stinger MRT-2 unit is configured to support a rate-adaptive connection to a CellPipe™ 50A CPE. Splitters in the unit and at the subscriber location allow analog voice service to be delivered over the same pair of wires.

Figure 7-2. ADSL ATM 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 1 4 }
AL-DMT/{ shelf-1 slot-1 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-1 4 } written
```

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 to 256Kbps and a possible downstream bit-rate range of 512Kbps to 1.5Mbps. They also specify use of the interleaved channel in both directions.

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

The following commands reserve virtual path identifier (VPI) 7 for virtual path (VP) switching on the interface:
admin> read al-dmt { 1 1 4 }
AL-DMT/{ shelf-1 slot-1 4 } read
admin> set line-config vp-switching-vpi = 7
admin> write
AL-DMT/{ shelf-1 slot-1 4 } written

Checking the status of an ADSL-DMT interface

The system creates a read-only 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:

Parameter: line-state
Setting: Indicates the overall state of the line. Possible values are as follows:
does-not-exist—Link is not physically present on board.
disabled—Line is disabled.
active—Multipoint is established.

Parameter: vpi-vci-range
Setting: Indicates the valid range of VPI and virtual channel identifier (VCI) for the circuits established for the line. This range can change only after reboot.

Parameter: vp-switching-vpi
Setting: Indicates the VPI to be used for the VP switching. The rest of the VPIs are used for the virtual circuit (VC) switching.
Checking status of the physical interface

The Physical-Status subprofile provides information about the physical interface. The interface runs a continuous bit-error-rate test (BERT) over its unused bandwidth, 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 subprofile parameters shown with sample settings for an active interface:

```
[in AL-DMT-STAT/{ shelf-1 slot-1 4 }:physical-status]
if-group-index = 0
unit-type = coe
dev-line-state = down
up-stream-rate-fast = 0
down-stream-rate-fast = 0
up-stream-rate-interleave = 0
down-stream-rate-interleave = 0
up-stream-latency = none
down-stream-latency = none
firmware-ver = 000
ansi-adsl-ver = 4
hardware-ver = 14
modem-hw-state = init-ok
accum-bit-err = 0
num-sec-valid = 0
num-sec-invalid = 0
operational-mode = unknown
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>if-group-index</td>
<td>Indicates the SNMP interface group index of the line.</td>
</tr>
<tr>
<td>unit-type</td>
<td>Indicates the operating mode, which must always be COE.</td>
</tr>
<tr>
<td>dev-line-state</td>
<td>Indicates the current state of the interface. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>down—Either there is no connection or the interface is disabled.</td>
</tr>
<tr>
<td></td>
<td>activation—Interface is trying to train but not detecting a modem on the other end.</td>
</tr>
<tr>
<td></td>
<td>training—Interface is training with a modem on the other end.</td>
</tr>
<tr>
<td></td>
<td>port-up—Interface is successfully trained up.</td>
</tr>
<tr>
<td></td>
<td>failed—Interface failed training (usually a log message gives the reason).</td>
</tr>
<tr>
<td>up-stream-rate-fast</td>
<td>Indicates the upstream data rate in bits per second when latency is fast. Zero means that latency is set to interleave or the data rate is unknown.</td>
</tr>
</tbody>
</table>
Configuring the ADSL Line Interfaces

Checking the status of an ADSL-DMT interface

Obtaining statistics about operations

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

```
[in AL-DMT-STAT/{ shelf-1 slot-1 4 }:physical-statistic]
line-up-timer = { 0 0 0 }
rx-signal-present = no
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>down-stream-rate-fast</td>
<td>Indicates the downstream data rate in bits per second when latency is fast. Zero means that latency is set to interleave or the data rate is unknown.</td>
</tr>
<tr>
<td>up-stream-rate-interleave</td>
<td>Indicates the upstream data rate in bits per second when latency is interleave. Zero means that latency is set to fast or the data rate is unknown.</td>
</tr>
<tr>
<td>down-stream-rate-interleave</td>
<td>Indicates the downstream data rate in bits per second when latency is interleave. Zero means that latency is set to fast or the data rate is unknown.</td>
</tr>
<tr>
<td>up-stream-latency</td>
<td>Indicates the operational upstream latency (none, fast, or interleave). The none setting indicates that the line is not operational.</td>
</tr>
<tr>
<td>down-stream-latency</td>
<td>Indicates the operational downstream latency (none, fast, or interleave). The none setting indicates that the line is not operational.</td>
</tr>
<tr>
<td>firmware-ver</td>
<td>Indicates the version number of the ADSL modem firmware.</td>
</tr>
<tr>
<td>ansi-adsl-ver</td>
<td>Indicates the supported issue of the ANSI T1.413 standard (Issue 2).</td>
</tr>
<tr>
<td>hardware-ver</td>
<td>Indicates the hardware version of the ADSL modem.</td>
</tr>
<tr>
<td>modem-hw-state</td>
<td>Indicates the 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.</td>
</tr>
<tr>
<td>accum-bit-err</td>
<td>Indicates the number of actual bit errors detected during the continuous BERT.</td>
</tr>
<tr>
<td>num-sec-valid</td>
<td>Indicates how many seconds were error free during the continuous BERT.</td>
</tr>
<tr>
<td>num-sec-invalid</td>
<td>Indicates how many error seconds were detected during the continuous BERT.</td>
</tr>
<tr>
<td>operational-mode</td>
<td>Indicates ADSL coding protocol as automatically detected or set by user. Valid values are ANSI dmt, g.lite, or g.dmt. An unknown indication is displayed when the line is not operational.</td>
</tr>
</tbody>
</table>
### Parameter | Setting
--- | ---
line-up-timer | Indicates how long the interface has been up (days, hours, and minutes in \(dd hh mm\) format).
rx-signal-present | Indicates whether the interface is receiving (yes) or not receiving (no) a signal from the CPE.
up-down-cntr | Indicates the number of times the link has changed from an UP state to a DOWN state since the unit was last reset.
self-test | Indicates whether the port has passed the modem chipset self-test.
noise-margin-down | Indicates current downstream noise margin in decibels.
attenuation-down | Indicates current downstream attenuation in decibels.
output-power-down | Indicates current downstream aggregate power level in dBm.
noise-margin-up | Indicates current upstream noise margin in decibels.
attenuation-up | Indicates current upstream attenuation in decibels.
output-power-up | Indicates current upstream aggregate power level in dBm.
near-end-fec | Indicates forward error correction (FEC) errors detected by the COE ADSL transceiver unit (ATU).
near-end-crc | Indicates cyclic redundancy check (CRC) errors detected by the COE ATU.
near-end-hec | Indicates header error control (HEC) errors detected by the COE ATU.
far-end-fec | Indicates forward error correction (FEC) errors detected by the CPE ATU.
Configuring the ADSL Line Interfaces

ADSL line specifications

### Parameter | Setting
---|---
far-end-crc | Indicates cyclic redundancy check (CRC) errors detected by the CPE ATU.
far-end-hec | Indicates header error control (HEC) errors detected by the CPE ATU.
received-rs-blcks | Indicates the number of received Reed-Solomon data blocks.
transmitted-rs-blocks | Indicates the number of transmitted Reed-Solomon data blocks.
incoming-cells | Indicates the number of incoming cells.
outgoing-cells | Indicates the number of outgoing cells.

### Displaying ADSL-DMT port status and nailed groups

To display the nailed-group numbers for ADSL-DMT lines, use the `dmtal` command, as in the following example:

```
admin> dmtal -a
All ADSL lines:
```

```
Line { 1 1 1 } (Down Idle 00000 DOWN DOWN 00001)
Line { 1 1 2 } (Down Idle 00000 DOWN DOWN 00002)
Line { 1 1 3 } (Down Idle 00000 DOWN DOWN 00003)
Line { 1 1 4 } (Down Idle 00000 DOWN DOWN 00004)
Line { 1 1 5 } (Down Idle 00000 DOWN DOWN 00005)
Line { 1 1 6 } (Down Idle 00000 DOWN DOWN 00006)
Line { 1 1 7 } (Down Idle 00000 DOWN DOWN 00007)
Line { 1 1 8 } (Down Idle 00000 DOWN DOWN 00008)
Line { 1 1 9 } (Down Idle 00000 DOWN DOWN 00009)
Line { 1 1 10 } (Down Idle 00000 DOWN DOWN 00010)
Line { 1 1 11 } (Down Idle 00000 DOWN DOWN 00011)
```

### ADSL line specifications

ADSL lines on the Stinger MRT-2 support the following ADSL standards:
- ANSI T1.413 Issue 2 (full-rate)
- ITU G.992.1 (G.dmt)
- ITU G.992.2 (G.lite)
- ITU G.994.1 (G.hs)
- ITU G.997.1 (physical layer management)

ADSL lines on the Stinger MRT-2 support the following maximum performance for G.dmt and G.lite ADSL lines:
- G.dmt—8.064Mbps maximum DS, 1.024Mbps maximum US
- G.lite—3Mbps maximum DS, 864Mbps maximum US
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Checking the Base profile for software licenses ............................... 8-2
Overview of supported features ..................................................... 8-3
Installing a T1 or E1 trunk module ................................................ 8-3
Connecting a T1 or E1 trunk module ............................................. 8-4
Interpreting T1 or E1 module status lights ..................................... 8-4
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Commands for checking T1 or E1 IMA performance ....................... 8-35
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A Stinger MRT-2 T1 or E1 trunk module provides four or eight T1 or E1 interfaces that can support high-speed transfer of Asynchronous Transfer Mode (ATM) cells.

After installing the trunk module and connecting the T1 or E1 facilities, you configure a connection to the ATM link. Check the status of the connection with two status profiles, and check module performance with TAOS commands.

**Note** The TAOS software addresses the single trunk module slot of the Stinger MRT-2 as slot 18. This is consistent with the number of the second trunk module slot in larger Stinger models.
Introducing the T1 and E1 trunk modules

All T1 and E1 trunk modules contain eight RJ-48 connectors. Customers who do not require more than four T1 or E1 links can purchase the module with only four active ports. Customers who require more than four T1 or E1 links can activate all eight ports under software license from Lucent Technologies.

A T1 or E1 module supports two ATM connection modes:

- **UNI mode.** Each individual T1 or E1 interface can connect to one or more ATM links through User-to-Network Interface (UNI) ports.

- **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. Up to four inverse multiplexing over ATM (IMA) groups can be created.

In this guide, a T1 or E1 interface configured in UNI mode or a group of T1 or E1 interfaces configured in IMA mode is referred to as a **logical port.**

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 MRT-2 unit when the full bandwidth of a DS3, E3, or OC3 line is not needed.

Checking the Base profile for software licenses

Check the base profile to determine whether a Stinger MRT-2 system has the following optional software licenses installed:

- Eight-port software license—makes ports 5 through 8 of a T1 or E1 trunk module available for use

- IMA software license—allows you to configure a T1 or E1 trunk module in IMA mode

For information about obtaining and enabling Lucent Technologies software licenses, contact your Lucent sales representative.

Verifying the eight-port license

Enter the following command to determine whether the eight-port software license is enabled:

```
admin> get base dual-slot-t1-enabled
[in BASE:dual-slot-t1-enabled]
dual-slot-t1-enabled = yes
```

The system sets this parameter to yes when the eight-port software license is installed. If dual-slot-t1-enabled is set to no in the base profile, and you attempt to configure ports 5 through 8, you receive an error message.

Verifying the IMA license

Enter the following command to determine whether the IMA license is enabled:

```
admin> get base ima-enabled
[in BASE:ima-enabled]
ima-enabled = yes
```
Configuring T1 and E1 Trunk Modules

Overview of supported features

A T1 or E1 trunk module for a Stinger MRT-2 unit has the following capabilities and compliances:
- Four or eight active T1 or E1 ports
- Support for up to 384 virtual channels (VCs), or up to 384 virtual channels per port, in UNI or IMA mode
- Quality of service (QoS) support for constant bit rate (CBR), variable bit rate (VBR)-real time, VBR-nonreal time, and unspecified bit rate (UBR) service categories
- Cell buffers of up to 8MB 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)
- Traffic shaping for each logical port in both UNI and IMA modes
- Operation, Administration, and Maintenance (OAM) support
- Local and remote loopback testing functions
- 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 8-1 illustrates an example of a T1 or E1 trunk module on a the Stinger MRT-2.

Figure 8-1. T1 or E1 trunk module for a Stinger MRT-2

Installing a T1 or E1 trunk module

A T1 or E1 module is installed in the same manner as any trunk module. (For details, see “Installing a trunk module” on page 3-10.) After installation, the module must be connected and configured according to the instructions in this guide.
Connecting a T1 or E1 trunk module

The T1 or E1 trunk module uses standard dual shielded-pair cabling, terminated with RJ-48 connectors.

To connect the cables to a T1 or E1 trunk module, align the clip on the RJ-48 connector of the cable with the clip slot of the trunk module port and carefully insert the connector into the proper port on the trunk module, as shown in Figure 8-2.

Figure 8-2. Connecting a T1 or E1 trunk module for the MRT-2

Inform your service provider that the equipment is connected so the provider can activate the line.

Interpreting T1 or E1 module status lights

The RJ-48 connector for each port of the T1 or E1 trunk module is equipped with a green and an orange status light. Table 8-1 explains the function of these status lights.

Table 8-1. T1 and E1 trunk module port connector status lights

<table>
<thead>
<tr>
<th>Status light</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange</td>
<td>ON</td>
<td>An alarm condition exists—the line is out of synchronization.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>No alarm condition exists, or the port is inactive.</td>
</tr>
<tr>
<td>Green</td>
<td>ON</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>The line is out of synchronization, or the port is inactive.</td>
</tr>
</tbody>
</table>
Profiles associated with a T1 or E1 module

The following profiles are associated with a T1 or E1 module installed and configured in a Stinger MRT-2.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1-ATM</td>
<td>Created by the system for each T1 or E1 link when a module is installed. Use this profile to configure the front-end framing and cell delineation features of a T1 or E1 link. For more information, see “DS1-ATM profile” on page 8-6. Per-link IMA-specific parameters are stored in the IMA-Option-Config subprofile of the line-config profile.</td>
</tr>
<tr>
<td>DS1-ATM-Stat</td>
<td>Created by the system for the T1 or E1 link when a module is installed. Use this profile to determine the status and statistics for an individual T1 or E1 link. For more information, see “DS1-ATM-Stat profile” on page 8-12. IMA-specific statistics are stored in the IMA-Link-Status and IMA-Line-Statistic subprofiles.</td>
</tr>
<tr>
<td>Slot-Static-Config</td>
<td>Created by the system for the T1 or E1 module when a module is installed. The t1e1-trunk-card-mode parameter lets you configure the T1 or E1 trunk module to support either T1 or E1 lines. For more information, see “Slot-Static-Config profile” on page 8-15.</td>
</tr>
<tr>
<td>Base</td>
<td>The dual-slot-t1-enabled parameter verifies whether the eight-port software license for the T1 or E1 module has been installed. The ima-enabled parameter verifies whether the IMA software license has been installed. For more information, see “Checking the Base profile for software licenses” on page 8-2.</td>
</tr>
<tr>
<td>IMAgroup</td>
<td>Created when you enter the command new imagroup to establish an IMA port. All group-related IMA parameters are stored in this profile. For more information, see “IMAgroup profile” on page 8-16.</td>
</tr>
<tr>
<td>IMAHW-Config</td>
<td>Used to configure hardware-specific parameters that are common to the IMA chip. For more information, see “IMAHW-Config profile” on page 8-21.</td>
</tr>
<tr>
<td>IMA-Group-Stat</td>
<td>Created only after you have properly configured an imagroup profile and associated DS1-ATM profile. Use this profile to determine the status and statistics for an IMA group. For more information, see “IMA-Group-Stat profile” on page 8-22.</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules  

**DS1-ATM profile**

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

```
[in DS1-ATM/{ shelf-1 slot-18 1 }]
name = 1:18:1
physical-address* = { shelf-1 slot-18 1 }
enabled = no
sparing-mode = inactive
line-config = { esf b8zs 109 no-loopback not-eligible high-priority none
no-cod+}

[in DS1-ATM/{ shelf-1 slot-18 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
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+ }

[in DS1-ATM/{ shelf-1 slot-18 1 }:line-config:ima-option-config]
rxlink-config = { 8 3 fast auto 10 0 }
rxlink-config = { 3 fast 10 100 auto 10 2500 10000 10 }
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Assigns a name to the DS1-ATM profile. Specify a descriptive name with no embedded spaces.</td>
</tr>
</tbody>
</table>

---

**Note**  The IMA profiles are available only if the IMA software license has been installed on the unit.
### Configuring T1 and E1 Trunk Modules

**DS1-ATM profile**

**physical-address**
Identifies the physical location of the DS1-ATM line within the Stinger MRT-2 system, in the format `{shelf slot item}`. On a Stinger MRT-2, the shelf number is always 1 and the T1 or E1 slot number is always 18. The item number indicates the line number. The system supplies the value for this parameter.

**enabled**
Specifies whether this DS1-ATM interface is enabled or disabled.
Valid values are as follows:
- Yes—Specifies that the interface is enabled.
- No—Specifies that the interface is disabled. This is the default.

**spare-mode**
Not used on the Stinger MRT-2

**line-config**
A subprofile containing line configuration options for the DS1-ATM link.

**line-config:frame-type**
The super-framing mode that is used on the physical link.
Valid values are as follows:
- d4 (T1 only)
- esf (T1 only)
- g703 (E1 only)

**line-config:encoding**
The Layer 1 line encoding used for the physical link.
Valid values are as follows:
- ami (T1 only)
- b8zs (T1 only)
- hdb3 (E1 only)

**line-config:nailed-group**
Specifies the group index that this link belongs to, a numeric value from 1 through 2048.
### Configuring T1 and E1 Trunk Modules

**DS1-ATM profile**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>line-config:loopback</td>
<td>Specifies the loopback mode. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>- no-loopback—(the default) The interface is operating normally.</td>
</tr>
<tr>
<td></td>
<td>- fe-loopback—Front-end loopback. Received data is transmitted back to the far end by the transceiver at the near end.</td>
</tr>
<tr>
<td></td>
<td>- line-loopback—The received data is looped back to the far end without doing any reframing of the T1 or E1 frame.</td>
</tr>
<tr>
<td></td>
<td>- remote-loopback—Remote payload loopback. The received payload on the line is transmitted back to the far-end by a reframing of the payload at the near-end transmitter.</td>
</tr>
<tr>
<td></td>
<td>- local-loopback—Local loopback. The transmitted data is looped back to the near-end receiver by the local transceiver.</td>
</tr>
<tr>
<td>line-config:clock-source</td>
<td>Specifies whether the unit obtains the system clock signal from the port. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>- eligible—Specifies that the line can be used as the master clock source.</td>
</tr>
<tr>
<td></td>
<td>- not-eligible—Specifies that the line cannot be used as the master clock source.</td>
</tr>
<tr>
<td></td>
<td>For more information, see “Configuring system clocking (optional)” on page 6-19.</td>
</tr>
<tr>
<td>line-config:clock-priority</td>
<td>Assigns a clock priority to an interface. When multiple interfaces are eligible to be the clock source for synchronous transmissions, the Stinger MRT-2 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 MRT-2 chooses a clock source at random. Specify one of the following values:</td>
</tr>
<tr>
<td></td>
<td>- high-priority—Specifies the highest priority. The Stinger MRT-2 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.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Setting</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>• <strong>middle-priority</strong>—Specifies the second priority. The Stinger MRT-2 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.</td>
</tr>
<tr>
<td></td>
<td>• <strong>low-priority</strong>—Specifies the lowest priority. The Stinger MRT-2 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.</td>
</tr>
<tr>
<td>line-config:FDL</td>
<td><em>(Not currently supported for the Stinger MRT-2.)</em> The facilities data link (FDL) type used for end-to-end performance monitoring. The FDL type can be set with the following options:</td>
</tr>
<tr>
<td></td>
<td>• <strong>none</strong>—(the default) No FDL is used.</td>
</tr>
<tr>
<td></td>
<td>• <strong>AT&amp;T</strong>—Supports the extended super frame (ESF) FDL exchange as recommended by AT&amp;T Technical publication, Pub 54016.</td>
</tr>
<tr>
<td></td>
<td>• <strong>ansi</strong>—Supports the FDL exchange as recommended by ANSI T1.403.</td>
</tr>
<tr>
<td></td>
<td>• <strong>sprint</strong>—Supports the FDL exchange as recommended by Sprint.</td>
</tr>
<tr>
<td>line-config:send-code</td>
<td><em>(Not currently supported for the Stinger MRT-2)</em> The type of test code pattern to be sent across the DS1 interface. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>The <strong>send-code</strong> parameter can assume the following code patterns:</td>
</tr>
<tr>
<td></td>
<td>• <strong>No Code</strong>—(the default) Send looped or normal data.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Line Code</strong>—Send a request for a line loopback.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Setting</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Payload Code</td>
<td>Send a request for a payload loopback.</td>
</tr>
<tr>
<td>Reset Code</td>
<td>Send a loopback termination request.</td>
</tr>
<tr>
<td>QRS/PRBS</td>
<td>Send a Quasi-Random Signal (QRS) test pattern.</td>
</tr>
<tr>
<td>Pattern</td>
<td>Send a 511-bit fixed test pattern.</td>
</tr>
<tr>
<td>3 in 24 Pattern</td>
<td>Send a fixed test pattern of 3 bits set in 24.</td>
</tr>
<tr>
<td>1 in 16 Pattern</td>
<td>Send a fixed test pattern of 1 bit set in 16.</td>
</tr>
<tr>
<td>All Ones</td>
<td>Send a fixed test pattern of all ones.</td>
</tr>
<tr>
<td>All Zeros</td>
<td>Send a fixed test pattern of all zeros.</td>
</tr>
<tr>
<td>Alternating Ones/Zeros</td>
<td>Send a fixed test pattern of alternating ones and zeros.</td>
</tr>
<tr>
<td>Double Alternating Ones/Zeros</td>
<td>Send a fixed test pattern of double alternating ones and zeros.</td>
</tr>
<tr>
<td>(2**20 - 1) Pattern Type</td>
<td>Send the pseudo random pattern type (2**20 - 1) (ITU-T recommendation O.151.)</td>
</tr>
</tbody>
</table>

**line-config:front-end-type**

Front end type of the E1 transceiver. Valid values are as follows:

- **short-haul**—Short haul (35ohm termination only).
- **long-haul**—Long haul (120ohm termination only).

**line-config:line-length**

Specifies the length of the physical line in feet for connecting to short-haul digital cross-connect (DSX) devices.

Valid values, in feet, are as follows:

- **1-133**—Equivalent to 0.3m to 40.5m. This is the default.
- **134-266**—Equivalent to 40.8m to 81.1m.
- **267-399**—Equivalent to 81.4m to 121.6m.
- **400-533**—Equivalent to 121.9m to 162.5m.
- **534-655**—Equivalent to 162.8m to 199.6m.
Configuring T1 and E1 Trunk Modules

DS1-ATM profile

Parameter | Setting
--- | ---
line-config:line-build-out | Line buildout value for channel service unit (CSU) lines. Valid values are as follows:
- 0dB—This is the default.
- 7.5dB
- 15dB
- 22.55dB

line-config:pcm-mode | Not currently used. Number of active channels in a pulse code modulation (PCM) stream. Valid values are as follows:
- isdn—Use 23 channels to carry the cells.
- clear-channel—Use 24 channels to carry the cells.

line-config:coset-enabled | Selecting yes signifies that the ATM Forum polynomial (coset polynomial) be added to header error control (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 no signifies that the ATM Forum polynomial (coset polynomial) not be added to the HEC before HEC verification of a received cell. In the transmit direction, selecting no enables generation of a HEC without the coset polynomial value.

line-config:scrambling-enabled | Selecting yes enables the descrambling of received cells on the link. The payload of transmitted cells is scrambled.
Selecting no disables the descrambling of received cells on the link. The payload of transmitted cells is not scrambled.

line-config:hec-correction-enabled | Selecting yes enables correction of cells received with a single-bit error in the HEC.
Selecting no disables correction of cells received with a single-bit error in the HEC.

line-config:vp-switching-vpi | VPI used for VP switching, a value from 1 through 31. 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. The unit drops all connections to make a new value effective immediately.
This parameter is valid only when the port is in UNI mode.
## Configuring T1 and E1 Trunk Modules

### 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-18 9 }]
physical-address* = { shelf-1 slot-18 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
sparking-change-reason = unknown
sparking-change-time = 0
sparking-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 not-in-group no-fail+ }
ima-link-statistic = { 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 }
send-code-status = disabled
pattern-test-status = none
```

### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical-address</td>
<td>Identifies the physical address of an interface. The physical address has the format <code>{shelf slot item}</code>.</td>
</tr>
<tr>
<td>shelf</td>
<td>The shelf in which the item resides. Since a Stinger unit is a single-shelf system, the shelf number is always 1.</td>
</tr>
</tbody>
</table>
The trunk module of the Stinger MRT-2 is referred to as slot 18.

An item number of 0 (zero) denotes the entire slot. For example, line 4 on a T1 module has the following address:

\{ 1 18 4 \}

### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>slot</strong></td>
<td>The number of the item’s expansion slot.</td>
</tr>
<tr>
<td><strong>item</strong></td>
<td>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, line 4 on a T1 module has the following address:</td>
</tr>
<tr>
<td><strong>line-mode</strong></td>
<td>Indicates whether the mode in which this line is operating is user-to-network-interface (UNI) or inverse multiplexing over ATM (IMA). Valid values are as follows:</td>
</tr>
<tr>
<td><strong>line-state</strong></td>
<td>Indicates the overall state of a line. The Line-State setting is read-only. You cannot set Line-State directly.</td>
</tr>
<tr>
<td><strong>loss-of-carrier</strong></td>
<td>Indicates a loss of carrier on the DS1-ATM line. Valid values are as follows:</td>
</tr>
<tr>
<td><strong>loss-of-sync</strong></td>
<td>Indicates a loss of synchronization on the DS1-ATM line. Valid values for this read-only parameter are as follows:</td>
</tr>
<tr>
<td><strong>ais-receive</strong></td>
<td>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. The AIS-Receive setting is read-only. Values are as follows:</td>
</tr>
<tr>
<td>Parameter</td>
<td>Setting</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| yellow-receive     | 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. Valid values for this read-only setting are as follows:  
|                    | - true—Indicates that the local device has received a Yellow Alarm indication.  
|                    | - false—Indicates that the local device has not received a Yellow Alarm indication. |
| ber-receive        | Indicates whether the bit error rate threshold has been reached or not. Valid values for this read-only parameter are as follows:  
|                    | - true—Indicates that the bit error rate threshold has been reached.  
|                    | - false—Indicates that the bit error rate threshold has not been reached. |
| carrier-established| Indicates whether there are no error conditions on the physical line connection. Valid values for this read-only parameter are as follows:  
|                    | - true—Indicates there are no error conditions.  
|                    | - false—Indicates there are error conditions. |
| cell-delineation   | Indicates that ATM cell delineation (cell transfer below a specified HEC level) has been reached. Valid values for this read-only display are as follows:  
|                    | - true—Indicates cell delineation has been reached.  
|                    | - false—Indicates cell delineation has not been reached. |
| network-loopback   | Indicates whether there is a line looped back out to the network. Valid values for this read-only display are as follows:  
|                    | - true—Indicates that a line is looped back to the network.  
|                    | - false—Indicates that no line is looped back to the network. |
| spare-physical-address | Not used on the Stinger MRT-2.                                      |
| sparing-state      | Not used on the Stinger MRT-2.                                      |
Configuring T1 and E1 Trunk Modules

Slot-Static-Config profile

The setting of the `t1e1-trunk-card-mode` parameter in the Slot-Static-Config profile for the T1 or E1 trunk module allows the module to be configured to support either T1 or E1 lines. This setting and the indication for the module that is displayed with the `show` command indicate which type of line is currently supported by the trunk module.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>sparing-change-reason</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>sparing-change-time</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>sparing-change-counter</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>vpi-vci-range</td>
<td>Indicates a virtual path identifier-virtual channel identifier (VPI-VCI) range. The system uses 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.</td>
</tr>
<tr>
<td>vp-switching-vpi</td>
<td>Indicates the virtual path identifiers (VPIs) that the system uses for VP switching on the DS1-ATM port.</td>
</tr>
<tr>
<td>ima-link-status</td>
<td>Subprofile of the DS1-ATM-Stat profile that indicates read-only status of the IMA link.</td>
</tr>
<tr>
<td>ima-link-statistic</td>
<td>Subprofile of the DS1-ATM-Stat profile that indicates read-only statistics of IMA link.</td>
</tr>
<tr>
<td>send-code-status</td>
<td>Indicates the current state of a send code procedure. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>■ disabled—Send code procedure is currently disabled on this link.</td>
</tr>
<tr>
<td></td>
<td>■ line-loopback—Line loopback has been requested to the remote end.</td>
</tr>
<tr>
<td></td>
<td>■ payload-loopback—Payload loopback has been requested to the remote end.</td>
</tr>
<tr>
<td>pattern-test-status</td>
<td>Indicates the result of a pattern test. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>■ none—No pattern test has been executed on this link.</td>
</tr>
<tr>
<td></td>
<td>■ in-sync—Pattern test indicates that the line is synchronized.</td>
</tr>
<tr>
<td></td>
<td>■ lost-sync—Pattern test indicates that the line has lost synchronization.</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules

IMAgroup profile

The following steps show how to verify the mode of the T1 or E1 trunk module, and how to use this setting to change the type of line supported by it from T1, its default mode, to E1.

1 Use the `show` command to verify the current mode of the trunk module. In the following example, the system supports a T1 trunk module:

```
admin> show
Shelf 1 (standalone):
   { shelf-1 slot-1 0 }   Reqd  Oper   Slot Type
   { shelf-1 trunk-module-1 0 } UP    UP     oc3-atm-trunk-daughter-card
   { shelf-1 trunk-module-2 0 } UP    UP     ima-8t1-trunk-daughter-card
```

2 Change the Slot-Static-Config profile so that the module will support E1 lines. For example:

```
admin> read slot-static-config {1 18 0}
SLOT-STATIC-CONFIG/{shelf-1 trunk-module-2 0} read
admin> list
   [in SLOT-STATIC-CONFIG/{shelf-1 trunk-module-2 0}]
   name = 1:18
   physical-address* = {shelf-1 trunk-module-2 0}
   atm-parameters = {low-priority}
   t1e1-trunk-card-mode = t1
admin> set t1e1-trunk-card-mode = e1
admin> write
LOG alert, Shelf 1, Controller, Time: 10:21:41--
   trunk card mode changed from T1 to E1, atmtrunkreset 18 now ...
SLOT-STATIC-CONFIG/{shelf-1 trunk-module-2 0} written
```

3 Use the `show` command to verify that the trunk module configuration has changed to support E1 lines.

```
admin> show
Shelf 1 (standalone):
   { shelf-1 slot-1 0 }   Reqd  Oper   Slot Type
   { shelf-1 trunk-module-1 0 } UP    UP     oc3-atm-trunk-daughter-card
   { shelf-1 trunk-module-2 0 } UP    UP     ima-8e1-trunk-daughter-card
```

**Note** If the NVRAM command is used to clear the NVRAM of the Stinger MRT-2, the `t1e1-trunk-card-mode` setting reverts to `t1`.

IMAgroup profile

The IMAgroup profile configures an inverse multiplexing over 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

Parameters:

**name**
Assigns a name to the IMAgroup profile. Specify a descriptive name with no embedded spaces.

**active**
Specifies whether the profile is enabled or disabled. Valid values are as follows:
- **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 to 1024. The default is 0 (zero).

**group-symmetry-mode**
Specifies if the IMA group to which this link belongs is set for symmetrical operation. Currently, **symmetric-operation** is the only setting supported.

**version**
IMA specification version. Valid values are as follows:
- **v1-0**—ATM Forum IMA version 1.0
- **v1-1**—ATM Forum IMA version 1.1
## IMAgroup profile

### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
</table>
| do-version-fallback     | Specifies whether the Stinger MRT-2 automatically falls back to the earlier version of IMA if the far-end unit is detected to be running the earlier version. If No is specified when an earlier version is detected, the unit moves to the configAborted state. Valid values are as follows:  
  - **Yes**—Specifies that the unit falls back from version 1.1 to version 1.0.  
  - **No**—Specifies that the unit does not fall back, but moves to the configAborted state. This is the default. |
| ignore-lineup           | This parameter is used differently in the System profile and in the Line profile.  
  
  In the **System profile**, specifies whether the Stinger MRT-2 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.  
  
  In the **System profile**, specify one of the following values for this parameter:  
  - **no**—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. This is the default.  
  - **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.  
  
  In the **Line profile**, specify one of the following values for this parameter:  
  - **system-defined**—Sets the Stinger MRT-2 to inherit the Ignore-Lineup value from the System profile. This is the default.  
  - **no**—Sets the Stinger call-control mechanism to ignore the system-wide Ignore-Lineup setting and allows calls to be established when the line state is operational and disallow calls on the port when the line state is DOWN. |
### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>yes</code></td>
<td>Sets the Stinger call-control mechanism to ignore both the line state and the system-wide setting and allows calls to be established on the specified port as long as the specified slot is operational and the specified port is enabled.</td>
</tr>
<tr>
<td><code>lasr</code></td>
<td>Specifies whether link addition and slow recovery (LASR) procedures are enabled or disabled. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>- Yes—Specifies that LASR is enabled. This is the default.</td>
</tr>
<tr>
<td></td>
<td>- No—Specifies that LASR is disabled.</td>
</tr>
<tr>
<td><code>ne-tx-clk-mode</code></td>
<td>Specifies the mode of the IMA group clocking. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>- <code>ctc</code>—Common transmit clock. Transmit clocks of the links within the IMA group are derived from the same clock source.</td>
</tr>
<tr>
<td></td>
<td>- <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>.</td>
</tr>
<tr>
<td><code>tx-min-num-links</code></td>
<td>Specifies the minimum number of active transmission (Tx) links required for an ATM group to remain in operational state. Specify a number from 1 through 8.</td>
</tr>
<tr>
<td><code>rx-min-num-links</code></td>
<td>Specifies the minimum number of receiving links to be active in order for the IMA group to remain in the operational state. Specify a number from 1 through 8.</td>
</tr>
<tr>
<td><code>ima-id</code></td>
<td>Specifies the IMA identifier of the IMA group. Specify a number from 0 (zero) to 255.</td>
</tr>
<tr>
<td><code>frame-length</code></td>
<td>Specifies the frame length for the IMA group. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>- 32—IMA frame is 32 cells long.</td>
</tr>
<tr>
<td></td>
<td>- 64—IMA frame is 64 cells long.</td>
</tr>
<tr>
<td></td>
<td>- 128—IMA frame is 128 cells long. This is the default.</td>
</tr>
<tr>
<td></td>
<td>- 256—IMA frame is 256 cells long.</td>
</tr>
</tbody>
</table>
### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>diff-delay-max</strong></td>
<td>Specifies the maximum differential delay of the inverse multiplexing for IMA 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 three lines is 25 minus 5, or 20 milliseconds. Specify a number between from 0 (zero) through 281. The default is 25.</td>
</tr>
<tr>
<td><strong>check-far-end-ima-id</strong></td>
<td>Specifies whether the verification of the far-end IMA ID during group startup is enabled or disabled. Valid values are as follows: ■ Yes—Specifies that this check is enabled. ■ No—Specifies that this check is not enabled. This is the default.</td>
</tr>
<tr>
<td><strong>expected-far-end-ima-id</strong></td>
<td>Specifies a number to check against the IMA ID at the far end. If the parameter check-far-end-ima-id is set to yes, then the far-end IMA ID is compared against this number (the expected far-end IMA ID) during group startup, and the unit moves to the ConfigAborted state if there is no match. Specify a number from 0 (zero) through 255.</td>
</tr>
<tr>
<td><strong>far-end-check-frame-length</strong></td>
<td>Specifies whether to check or compare the expected frame length with the far-end frame length during group startup. Valid values are as follows: ■ Yes—Specifies that this check is enabled. ■ No—Specifies that this check is not enabled. This is the default.</td>
</tr>
<tr>
<td><strong>expected-far-end-frame-length</strong></td>
<td>Specifies a number to check against the IMA ID at the far end. If the parameter check-far-end-ima-id is set to yes, then the far-end IMA ID is compared against this number (the expected far-end IMA ID) during group startup, and the unit moves to the ConfigAborted state if there is no match. Specify a number from 0 (zero) through 255.</td>
</tr>
<tr>
<td><strong>atm-if-delay</strong></td>
<td>Specifies the minimum time in seconds for IMA data cell rate (IDCR) changes between the subsequent ATM layer. The valid range is from 0 (zero) through 2147483647.</td>
</tr>
</tbody>
</table>
### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>tpp-test-link</td>
<td>Specifies a Simple Network Management Protocol (SNMP) interface as the test link for use in the test pattern procedure. The valid range is from -1 through 24.</td>
</tr>
<tr>
<td>tpp-test-pattern</td>
<td>Indicates a number that specifies the test pattern transmitted in the IMA Control Protocol (ICP) cell (octet 17) on the link during the IMA test pattern procedure. The valid range is from -1 through 255.</td>
</tr>
<tr>
<td>tpp-state</td>
<td>Enables or disables the test pattern procedure. Valid values are as follows:</td>
</tr>
<tr>
<td></td>
<td>disabled—Test pattern procedure is currently disabled on this link.</td>
</tr>
<tr>
<td></td>
<td>operating—Test pattern procedure is currently operating on this link.</td>
</tr>
<tr>
<td>vp-switching-vpi</td>
<td>Specifies the virtual path identifiers (VPIs) that the system uses for VP switching on the DS1-ATM port. Specify a VPI from 1 through 31. The default is 15.</td>
</tr>
</tbody>
</table>

**IMAHW-Config profile**

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

```plaintext
[in IMAHW-CONFIG/{ shelf-1 slot-18 1 }]
name = 1:18:1
physical-address* = { shelf-1 slot-18 1 }
alpha-ima-value = 2
beta-ima-value = 2
gamma-ima-value = 1
alpha-cell-delin-value = 7
delta-cell-delin-value = 6
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Assigns a name to a profile, interface, user, route, host, module, or the Stinger MRT-2 system itself. Specify a descriptive name with no embedded spaces.</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules

IMA-Group-Stat profile

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

```
[in IMA-GROUP-STAT/ima1]
name* = ima1
physical-address = { shelf-1 trunk-module-2 9 }
near-end-ima-group-state = operational
far-end-ima-group-state = operational
failure-status = no-failure
far-end-txclock-mode = ctc
rx-timing-ref-link = 1
rx-ima-id = 0
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical-address</td>
<td>Identifies the physical address of an interface.</td>
</tr>
<tr>
<td></td>
<td>The physical address has the format <code>{shelf slot item}</code>.</td>
</tr>
<tr>
<td></td>
<td>- shelf is the shelf in which the item resides. Since a Stinger MRT-2</td>
</tr>
<tr>
<td></td>
<td>unit is a single-shelf system, the shelf number is always 1.</td>
</tr>
<tr>
<td></td>
<td>- slot is the number of the item’s expansion slot. The slot number for</td>
</tr>
<tr>
<td></td>
<td>the trunk module in the Stinger MRT-2 is 18.</td>
</tr>
<tr>
<td></td>
<td>- item is the item on the module. An item number of 1 (one) denotes the</td>
</tr>
<tr>
<td></td>
<td>entire slot.</td>
</tr>
<tr>
<td>alpha-ima-value</td>
<td>Specifies the alpha value of consecutive invalid IMA Control Protocol</td>
</tr>
<tr>
<td></td>
<td>(ICP) cells to be detected before the line changes to the IMA HUNT state</td>
</tr>
<tr>
<td></td>
<td>from the SYNC state. Specify the number 1 or the number 2.</td>
</tr>
<tr>
<td>beta-ima-value</td>
<td>Specifies the number of consecutive invalid IMA Control Protocol (ICP)</td>
</tr>
<tr>
<td></td>
<td>cells to be detected before the line changes to the IMA HUNT state from</td>
</tr>
<tr>
<td></td>
<td>the SYNC state. Valid numbers range from 1 through 5.</td>
</tr>
<tr>
<td>gamma-ima-value</td>
<td>Specifies the gamma value of consecutive valid IMA Control Protocol</td>
</tr>
<tr>
<td></td>
<td>(ICP) cells to be detected before the line changes to the IMA SYNC state</td>
</tr>
<tr>
<td></td>
<td>from the PRESYNC state. Specify a number from 1 through 5.</td>
</tr>
<tr>
<td>alpha-cell-delin-</td>
<td></td>
</tr>
<tr>
<td>value</td>
<td>Specifies the number of consecutive cells with incorrect header error</td>
</tr>
<tr>
<td></td>
<td>control (HEC) that must be detected for the line to leave the SYNC state</td>
</tr>
<tr>
<td></td>
<td>to go to the HUNT state. Specify a number from 1 through 16.</td>
</tr>
<tr>
<td>delta-cell-delin-</td>
<td></td>
</tr>
<tr>
<td>value</td>
<td>Specifies the number of consecutive cells with correct header error</td>
</tr>
<tr>
<td></td>
<td>control (HEC) that must be detected for the line to leave the PRESYNC</td>
</tr>
<tr>
<td></td>
<td>state to go to the SYNC state. Specify a number from 1 through 16. The</td>
</tr>
<tr>
<td></td>
<td>default is 6.</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules

IMA-Group-Stat profile

rx-frame-length = 128
least-delay-link = 1
diff-delay-max-obs = 0
running-secs = 114
tx-avail-cellrate = 7188
rx-avail-cellrate = 7188
tx-num-config-links = 2
rx-num-config-links = 2
tx-num-active-links = 2
rx-num-active-links = 2
tx-oam-label-value = 3
rx-oam-label-value = 3
last-change-time = 380716615
tpp-test-link = 0
tpp-test-pattern = 255
tpp-test-status = disabled
valid-intervals = 0
invalid-intervals = 96
vpi-vci-range = vpi-0-255-vci-32-2047
vc-switching-vpi = ""
ima-group-statistic = { 0 0 0 }

**Parameter** | **Setting**
--- | ---
name | Name of the IMA group profile.
physical-address | Identifies the physical address of an interface.
The physical address has the format \{shelf slot item\}.

- **shelf** is the shelf in which the item resides. Since a Stinger MRT-2 unit is a single-shelf system, the shelf number is always 1.
- **slot** is the number of the item’s expansion slot. The trunk module of the Stinger MRT-2 is referred to as slot 18.
- **item** is the number of the group. Groups are numbered from 9 to 12 by the TAOS operating system. For example, the first IMA group on a T1 module in a Stinger MRT-2 has the following address:

\{ 1 18 9 \}

near-end-ima-group-state | Indicates the current operational state of the near-end IMA group.
far-end-ima-group-state | Indicates the current operational state of the far-end IMA group.
failure-status | Indicates the current failure status of the IMA group (the reason why the group has failed).
Configuring T1 and E1 Trunk Modules
IMA-Group-Stat profile

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>far-end-txclock-mode</td>
<td>Indicates the transmit clocking mode used by the far-end ATM group.</td>
</tr>
<tr>
<td></td>
<td>Valid values for this parameter are as follows:</td>
</tr>
<tr>
<td></td>
<td>- ctc—Common transmit clock: transmit clocks of</td>
</tr>
<tr>
<td></td>
<td>the links within the IMA group derived from the same clock source.</td>
</tr>
<tr>
<td></td>
<td>- itc—Independent transmit clock: transmit clock of</td>
</tr>
<tr>
<td></td>
<td>the links within the IMA group derived from their respective receive</td>
</tr>
<tr>
<td></td>
<td>clocks.</td>
</tr>
<tr>
<td>tx-timing-ref-link</td>
<td>Indicates the index of the transmit timing reference link to be used by</td>
</tr>
<tr>
<td></td>
<td>the near end for IMA data cell clock recovery from the ATM layer.</td>
</tr>
<tr>
<td></td>
<td>Valid values for this parameter range from 0 (zero) through 24. The</td>
</tr>
<tr>
<td></td>
<td>distinguished value of zero is used if no link has been configured in</td>
</tr>
<tr>
<td></td>
<td>the IMA group, or if the transmit timing reference link has not yet</td>
</tr>
<tr>
<td></td>
<td>been selected.</td>
</tr>
<tr>
<td>rx-timing-ref-link</td>
<td>Indicates the index of the receive timing reference link. This index is</td>
</tr>
<tr>
<td></td>
<td>used by the near end for 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. Valid values range from 0 (zero) through 24. The distinguished value of 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.</td>
</tr>
<tr>
<td>rx-ima-id</td>
<td>Indicates the IMA ID currently in use by the near-end IMA function.</td>
</tr>
<tr>
<td></td>
<td>Valid values for this parameter range from 0 (zero) through 255.</td>
</tr>
<tr>
<td>rx-frame-length</td>
<td>Indicates the value of the IMA frame length as received from the remote</td>
</tr>
<tr>
<td></td>
<td>IMA function.</td>
</tr>
<tr>
<td></td>
<td>Valid values for this parameter are as follows:</td>
</tr>
<tr>
<td></td>
<td>- 32—IMA frame is 32 cells long.</td>
</tr>
<tr>
<td></td>
<td>- 64—IMA frame is 64 cells long.</td>
</tr>
<tr>
<td></td>
<td>- 128—IMA frame is 128 cells long.</td>
</tr>
<tr>
<td></td>
<td>- 256—IMA frame is 256 cells long.</td>
</tr>
<tr>
<td>least-delay-link</td>
<td>Indicates the index of the link configured in the IMA group that has the</td>
</tr>
<tr>
<td></td>
<td>smallest link propagation delay.</td>
</tr>
<tr>
<td></td>
<td>Valid values range from 0 (zero) through 24. The distinguished value of</td>
</tr>
<tr>
<td></td>
<td>zero is used if no link has been configured in the IMA group, or if</td>
</tr>
<tr>
<td></td>
<td>the link with the smallest link propagation delay has not yet been</td>
</tr>
<tr>
<td></td>
<td>determined.</td>
</tr>
</tbody>
</table>
### Parameter Setting

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>diff-delay-max-obs</td>
<td>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 IMA group. Valid values for this parameter range from 0 (zero) through 2147483647.</td>
</tr>
<tr>
<td>running-secs</td>
<td>Indicates the number of seconds since this IMA group has been in the operational state. Valid values for this parameter range from 0 (zero) through 2147483647.</td>
</tr>
<tr>
<td>tx-avail-cellrate</td>
<td>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. Valid values for this parameter range from zero to 2147483647.</td>
</tr>
<tr>
<td>rx-avail-cellrate</td>
<td>Indicates the current cell rate (truncated value in cells per second) provided by this IMA group in the receive direction, considering all the receive links in the Active state. Valid values for this parameter range from 0 (zero) through 2147483647.</td>
</tr>
<tr>
<td>tx-num-config-links</td>
<td>Indicates the number of links that are configured to transmit in this IMA group. This parameter overwrites the value of the imaGroupNumRxActLinks attribute when the IMA group’s group-symmetry-mode parameter is set to symmetric-operation. Valid values range from 0 (zero) through 24.</td>
</tr>
<tr>
<td>rx-num-config-links</td>
<td>Indicates the number of links that are configured to receive in this IMA group. Valid values for this parameter range from 0 (zero) through 24.</td>
</tr>
<tr>
<td>tx-num-active-links</td>
<td>Indicates the number of links that are configured to transmit and are currently active in this IMA group. Valid values for this parameter range from 0 (zero) through 24.</td>
</tr>
<tr>
<td>rx-num-active-links</td>
<td>Indicates the number of links that are configured to receive and are currently active in this IMA group. Valid values for this parameter range from 0 (zero) through 24.</td>
</tr>
<tr>
<td>tx-oam-label-value</td>
<td>Indicates the IMA operations and maintenance (OAM) label value transmitted by the near-end IMA unit. Valid values for this parameter range from 1 (one) through 255.</td>
</tr>
</tbody>
</table>
# Configuring T1 and E1 Trunk Modules

**IMA-Group-Stat profile**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>rx-oam-label-value</td>
<td>Indicates the IMA OAM label value transmitted by the far-end IMA unit. A value of 0 likely means that the IMA unit has not received an OAM label from the far-end IMA unit at this time. Valid values for this parameter range from 0 (zero) through 255.</td>
</tr>
<tr>
<td>last-change-time</td>
<td>The timestamp indicating the number of seconds or milliseconds that have elapsed since the last time the IMA group changed state. Valid values range from 0 (zero) through 2147483647.</td>
</tr>
<tr>
<td>tpp-test-link</td>
<td>Specifies the SNMP interface to be used as the test link in the test pattern procedure. Valid values range from -1 to 24.</td>
</tr>
<tr>
<td>tpp-test-pattern</td>
<td>Indicates a number that specifies the test pattern transmitted in the IMA Control Protocol (ICP) cell (octet 17) on the link during the IMA test pattern procedure.</td>
</tr>
</tbody>
</table>
| tpp-test-status         | Indicates the current state of 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.  
  - Link-fail—Test pattern procedure has failed on this link. |
| valid-intervals         | Indicates the number of previous 15-minute intervals for which valid data was collected. Valid values for this parameter range from 0 (zero) through 96. The value is 96 unless the 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. |
| invalid-intervals       | Indicates the number of 15-minute intervals for which no valid data is available. Valid values for this parameter range from 0 (zero) through 96. |
| vpi-vci-range           | Specifies a virtual path identifier-virtual channel identifier (VPI-VCI) range. This value indicates the best combination of VPI and VCI bit sizes to fit the list of supported VPI-VCI pairs obtained from the network provider. |
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 = ""
cid = ""
auto-profile = 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 "" }
tcp-clear-options = { "" 0 "" 0 "" 0 no "" 0 no "" 0 0 }
answer-options = { }
usrRad-options = { global 0.0.0.0 1646 "" 1 acct-base-10 }
calledNumber = ""
cross-connect-index = 0
atm-options = { aal5-llc 0 35 1 p2p pvc no
00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:+
atm-connect-options = { aal5-llc 0 35 1 p2p pvc no
00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:00:+
atm-qos-options = { default default }
atm-aal-options = { no aal-0 1 1 }
conn-user = default
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>vc-switching-vpi</td>
<td>Specifies the virtual path identifiers (VPIs) that the system uses for VC switching on the DS1-ATM port. Valid values range from 1 to 31.</td>
</tr>
<tr>
<td>ima-group-statistic</td>
<td>Subprofile of the IMA-Group-Stat profile that indicates the status of the IMA group.</td>
</tr>
</tbody>
</table>

In a Connection profile, specifies the name of the CPE or remote device on the inbound side of the circuit.

You can enter up to 31 characters. The value you specify is case sensitive, and must exactly match the name of the remote device. If you are not sure about the exact name, contact the administrator of the remote network. The default is null.
### Configuring T1 and E1 Trunk Modules

**Connection profile**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>active</td>
<td>Enable/disable the connection. You must change the default (no) value to yes to activate the connection for use.</td>
</tr>
<tr>
<td>encapsulation-protocol</td>
<td>Specifies the encapsulation method to use for the connection. Both sides of the connection must support the specified encapsulation method. Usually, encapsulation protocols have their own configuration options within the subprofile of a Connection profile. Specify one of the following values:</td>
</tr>
<tr>
<td></td>
<td>- ATM—Specifies an ATM connection in routed mode. Packets arriving on the connection are routed at OSI Layer 3.</td>
</tr>
<tr>
<td></td>
<td>- ATM-Circuit—Specifies point-to-point switch-through ATM connections. This is the default.</td>
</tr>
<tr>
<td></td>
<td>- ATM-Frame-Relay-Circuit—Specifies an ATM-to-frame relay link.</td>
</tr>
<tr>
<td></td>
<td>- ATM-IMA—Specifies an ATM IMA link.</td>
</tr>
<tr>
<td>called-number-type</td>
<td>Not currently used. Specifies the type of telephone number entered in the Connection profile. When the Stinger MRT-2 dials an outgoing call, the carrier uses the value of Called-Number-Type in a Connection profile to interpret the dialed phone number. Specify one of the following values:</td>
</tr>
<tr>
<td></td>
<td>- Unknown—Telephone number is of an unknown type.</td>
</tr>
<tr>
<td></td>
<td>- International—Telephone numbers outside the U.S.</td>
</tr>
<tr>
<td></td>
<td>- National—Telephone numbers within the U.S. This is the default.</td>
</tr>
<tr>
<td></td>
<td>- Local—Telephone numbers within your Centrex group.</td>
</tr>
<tr>
<td></td>
<td>- Abbrev—Add-on numbers only.</td>
</tr>
<tr>
<td></td>
<td>- Network-Specific—The dialed network interprets the telephone number. This setting uses TypeOfNumber=3 in the called party’s information element.</td>
</tr>
<tr>
<td>dial-number</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>clid</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>auto-profile</td>
<td>Not used on the Stinger MRT-2.</td>
</tr>
<tr>
<td>ip-options</td>
<td>Not currently used. Subprofile containing IP routing settings.</td>
</tr>
<tr>
<td>bridging-options</td>
<td>Bridging specific configuration options that are set by the system.</td>
</tr>
<tr>
<td>session-options</td>
<td>Not currently used. Subprofile that specifies session settings not specific to any encapsulation method or network protocol.</td>
</tr>
</tbody>
</table>
Configuring T1 or E1 module connections

To set up UNI or IMA ports for a T1 or E1 module, apply the following procedure after installing the module and connecting it to the physical T1 or E1 line. The UNI and IMA configuration procedures are somewhat different, as shown in the examples that follow the general procedure.
Configuring T1 and E1 Trunk Modules
Configuring T1 or E1 module connections

Typical UNI configuration

This example illustrates the configuration used to establish a connection on a Stinger MRT-2 between ADSL port 5, and a UNI port on DS1 interface 4 of a T1 or E1 trunk module. The T1 or E1 module is identified as occupying slot 18 of the Stinger MRT-2 unit. The ds1-atm profile has a default nailed group number of 854, and the ADSL port has a nailed group number of 5. The following example shows how to create a connection with a VPI of 0, and a VCI of 36. Figure 8-3 shows the type of linkage that the UNI configuration creates.

Figure 8-3. Sample UNI configuration links

UNI configuration

<table>
<thead>
<tr>
<th>Step</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configure the ds1-atm profile for the physical link. A nailed group must be assigned to each ds1-atm profile. Physical lines that are part of the same IMA group must have the same nailed group number assigned in their respective ds1-atm profiles. Physical lines that are used to support UNI ports must each have a unique nailed group number.</td>
</tr>
<tr>
<td>2</td>
<td>Create and configure an imagroup profile. When you are using the IMA mode, ds1-atm profiles are bound to the imagroup profile by the nailed group number. The same nailed group number used in the ds1-atm profiles must also be assigned to the ima-group profile. This step is unnecessary for DS1 lines that support UNI ports.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
</tbody>
</table>
To configure the connection between the ADSL port and the UNI port of a T1 or E1 trunk module, the administrator in this example proceeds as follows:

1. Verify the presence of the DS1 interfaces.

   ```
   admin> dir ds1-atm
   102 01/24/2002 10:34:23  { shelf-1 trunk-module-2 1 } 1:18:1
   108 01/23/2002 17:04:47  { shelf-1 trunk-module-2 2 } 1:18:2
   108 01/24/2002 10:34:23  { shelf-1 trunk-module-2 3 } 1:18:3
   108 01/24/2002 10:34:23  { shelf-1 trunk-module-2 4 } 1:18:4
   108 01/24/2002 10:34:24  { shelf-1 trunk-module-2 5 } 1:18:5
   108 01/24/2002 10:34:24  { shelf-1 trunk-module-2 7 } 1:18:7
   108 01/24/2002 10:34:24  { shelf-1 trunk-module-2 8 } 1:18:8
   ```

   **Note** The dual-slot interfaces (numbered 5 through 8) are displayed if the dual-slot software license has been installed.

2. Configure the ds1-atm profiles.

   The administrator enables ds1-atm interface 4. Because the interface has a default nailed group number of 854, this value does not need to be set.

   ```
   admin> read ds1-atm { 1 18 4}
   DS1-ATM/{ shelf-1 trunk-module-2 4 } read
   admin> set enabled = yes
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 4 } written
   ```

3. Configure the ADSL port. (See Chapter 7, “Configuring the ADSL Line Interfaces,” for additional information.)

   ```
   admin> read al-dmt { 1 1 5}
   AL-DMT/{ shelf-1 slot-1 5 } read
   admin> set enabled = yes
   admin> write
   AL-DMT/{ shelf-1 slot-1 5 } written
   ```

4. Create a connection profile.

   The administrator creates a connection profile named uni-conn to associate the DS1-ATM interface (nailed group 854) with the ADSL port (nailed group 5). The default encapsulation method, atm-circuit, is used.

   ```
   admin> new connection uni-conn
   CONNECTION/uni-conn read
   admin> set active = yes
   admin> set atm-options nailed-group = 5
   admin> set atm-options vpi = 0
   admin> set atm-options vci = 36
   admin> set atm-connect-options nailed-group = 854
   admin> set atm-connect-options vpi = 0
   admin> set atm-connect-options vci = 36
   admin> write
   CONNECTION/uni-conn written
   ```

   **Note** If necessary, different VPI-VCI settings can be used in the connection profile. To modify the VPI-VCI values for the ADSL port, change the settings of the
atm-options vpi and vci parameters. To modify the VPI-VCI values for the T1 or E1 interface, change the settings of the atm-connect vpi and vci parameters. For additional information, see the Stinger ATM Configuration Guide.

**Typical IMA configuration**

This example illustrates how to create a group of interfaces using the first three DS1 links. The interfaces are assigned the IMA group name ima1, and nailed group number 851. A connection to a subscriber link on port 9 is set up. The subscriber link has the nailed group number 9.

Figure 8-4 shows the type of linkage that the IMA configuration creates.

*Figure 8-4. Sample IMA configuration links*

**IMA configuration**

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

1. Verify the presence of the DS1 interfaces.
   
   ```
   admin> dir ds1-atm
   102 01/24/2002 10:34:23 { shelf-1 trunk-module-2 1 } 1:18:1
   108 01/24/2002 17:04:47 { shelf-1 trunk-module-2 2 } 1:18:2
   108 01/24/2002 10:34:23 { shelf-1 trunk-module-2 3 } 1:18:3
   108 01/24/2002 10:34:23 { shelf-1 trunk-module-2 4 } 1:18:4
   108 01/24/2002 10:34:24 { shelf-1 trunk-module-2 5 } 1:18:5
   108 01/24/2002 10:34:24 { shelf-1 trunk-module-2 7 } 1:18:7
   108 01/24/2002 10:34:24 { shelf-1 trunk-module-2 8 } 1:18:8
   ```

2. Configure the ds1-atm interfaces.
   
   The administrator enables the interfaces for the first three lines and assigns the group number 851. All three links are initially in UNI mode, and can be configured individually for connections to separate ATM streams.
   
   ```
   admin> read ds1-atm { 1 18 1}
   DS1-ATM/{ shelf-1 trunk-module-2 1 } read
   ```

**Note** An IMA group can consist of up to eight line interfaces (ds1-atm profiles).
admin> set line-config nailed-group = 851
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 trunk-module-2 1 } written
admin> read ds1-atm { 1 18 2}
DS1-ATM/{ shelf-1 trunk-module-2 2 } read
admin> set line-config nailed-group = 851
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 trunk-module-2 2 } written
admin> read ds1-atm { 1 18 3}
DS1-ATM/{ shelf-1 trunk-module-2 3 } read
admin> set line-config nailed-group = 851
admin> set enabled = yes
admin> write
DS1-ATM/{ shelf-1 trunk-module-2 3 } written

3 Create an IMA group.

The administrator creates an imagroup profile named ima. When the profile is written, the system inactivates the UNI 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-group= 851
admin> write
IMAGROUP/ima1 written

4 Create a connection profile.

The administrator creates a connection profile to link the ADSL port (nailed group 9) with the IMA group (nailed group 851). A VPI of 0, a VCI of 40, and the default encapsulation method atm-circuit are used.

admin> new connection ima-conn
CONNECTION/ima-conn read
admin> set active = yes
admin> set atm-options nailed-group = 9
admin> set atm-options vpi = 0
admin> set atm-options vci = 40
admin> set atm-connect-options nailed-group = 851
admin> set atm-connect-options vpi = 0
admin> set atm-connect-options vci = 40
admin> write
CONNECTION/ima-conn written

Note If necessary, different VIP-VCI settings can be used in the connection profile. To modify the VIP-VCI values for the ADSL port, change the settings of the atm-options vpi and vci parameters. To modify the VPI-VCI values for the T1 or E1 interface, change the settings of the atm-connect vpi and vci parameters. For additional information, see the Stinger ATM Configuration Guide.
Typical return to UNI configuration from IMA

To return to a UNI configuration after an IMA configuration has been in use, you must take the following actions:

- Disable or delete the IMA group.
- Assign unique nailed group numbers to the DS1-ATM profiles.
- Disable and re-enable the DS1 lines, so that the new settings will take effect.

The following example illustrates how an IMA group, named ima1, with three DS1 lines is dismantled:

1. Disable the IMA group.

   ```
   admin> read imagroup ima1
   IMAGROUP/ima1 read
   admin> set active = no
   admin> write
   IMAGROUP/ima1 written
   ```

2. Assign unique nailed group numbers to each of the DS1 lines.

   ```
   admin> read ds1-atm {1 18 1}
   DS1-ATM/{ shelf-1 trunk-module-2 1 } read
   admin> set line-config nailed-group = 851
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 1 } written
   
   admin> read ds1-atm {1 18 2}
   DS1-ATM/{ shelf-1 trunk-module-2 2 } read
   admin> set line-config nailed-group = 852
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 2 } written
   
   admin> read ds1-atm {1 18 3}
   DS1-ATM/{ shelf-1 trunk-module-2 3 } read
   admin> set line-config nailed-group = 853
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 3 } written
   ```

3. Disable and re-enable the individual DS1 lines.

   ```
   admin> read ds1-atm {1 18 1}
   DS1-ATM/{ shelf-1 trunk-module-2 1 } read
   admin> set enable = no
   admin> write
   admin> set enable = yes
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 1 } written
   
   admin> read ds1-atm {1 18 2}
   DS1-ATM/{ shelf-1 trunk-module-2 2 } read
   admin> set enable = no
   admin> write
   admin> set enable = yes
   admin> write
   DS1-ATM/{ shelf-1 trunk-module-2 2 } written
   ```
Considerations for assigning a nailed group number to a DS1-ATM profile

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

- When you configure physical lines as UNI 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 UNI mode. All these links have the same nailed group number, which is an invalid configuration for UNI mode. If you want the links to operate in UNI mode, you must assign unique nailed group numbers to the different links by configuring the ds1-atm profiles. After you do so, the UNI ports on the different links are reactivated.
- If a UNI port is active and another UNI port is configured on a second link with the same nailed group, the second port is not activated. The following message is logged:
  Line <#> not activated: multiple ds1-atm lines with same nailed group on this slot

Commands for checking T1 or E1 IMA performance

Use the imalines, imagroups, and ima-tpp commands from the TAOS command-line interface to provide information about IMA performance. Table 8-2 contains descriptions of the output from these commands.

<table>
<thead>
<tr>
<th>Output column heading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dvOp</td>
<td>Device operational state. The current operational state of the device, either UP or DOWN.</td>
</tr>
<tr>
<td>dvUpSt</td>
<td>Device up status. The status of the device, when it is UP.</td>
</tr>
<tr>
<td>dvRq</td>
<td>Device required state. The state in which the device is required to be.</td>
</tr>
<tr>
<td>sAdm</td>
<td>Administrative state of the device, either UP or DOWN.</td>
</tr>
<tr>
<td>lMode</td>
<td>Link mode, either UNI or IMA.</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules
Commands for checking T1 or E1 IMA performance

Checking line status with the IMAlines command

The imalines command displays the status of T1 or E1 lines configured for IMA in a Stinger MRT-2 unit. This command has the following options:

imalines -[ a | d | f | u ]

Syntax element Description
No argument Displays the options for this command.
-a Shows all IMA lines.
-d Shows disabled lines.
-f Shows all free lines.
-u Shows lines that are in use.

The following example displays information about all IMA lines:

admin> imalines -a
All IMA lines:

<table>
<thead>
<tr>
<th>Line</th>
<th>{ 1 18 1 }</th>
<th>(Down Idle DOWN DOWN UNI 00051)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>{ 1 18 2 }</td>
<td>(Up Assigned UP UP IMA 00100)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 3 }</td>
<td>(Down Idle DOWN DOWN IMA 00100)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 4 }</td>
<td>(Down Idle DOWN DOWN UNI 00054)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 5 }</td>
<td>(Down Idle DOWN DOWN UNI 00054)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 6 }</td>
<td>(Down Idle DOWN DOWN UNI 00054)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 7 }</td>
<td>(Down Idle DOWN DOWN UNI 00054)</td>
</tr>
<tr>
<td>Line</td>
<td>{ 1 18 8 }</td>
<td>(Down Idle DOWN DOWN UNI 00054)</td>
</tr>
</tbody>
</table>

Checking group status with the IMAgroups command

The imagroups command displays the status of IMA groups created on a T1 or E1 module in a Stinger MRT-2 unit. This command has the following options:

imagroups -[ a | d | f | u ]

Syntax element Description
No argument Displays the options for this command.
-a Shows all IMA groups.
-d Shows disabled groups.
-f Shows all free groups.
-u Shows groups that are in use.

Table 8-2. Descriptions of IMA command output (continued)
The following example displays the status of all IMA groups:

```
admin> imagroups -a
All IMA groups:
   (dvOp  dvUpSt  dvRq   sAdm    nailg)
ima-co {  1  18 4 } (Down  Idle  UP  UP  100)
```

### Testing connectivity with the IMA-TPP command

The `ima-tpp` debug-level command initiates a test pattern procedure that can detect misconfigured IMA connections. The procedure complies with ATM Forum specifications AF-PHY-0086.000 and AF-PHY-0086.001 and optional specification O-31. This command has the following syntax:

```
ima-tpp group-name test-link [test-pattern] yes | no [yes | no]
```

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>group-name</td>
<td>Name of the IMA group profile.</td>
</tr>
<tr>
<td>test-link</td>
<td>Test link to be used to perform the inband test pattern procedure, a value, in the range 1 through 8 on an eight-port IMA module, that corresponds to one of the links in the IMA group.</td>
</tr>
<tr>
<td>test-pattern</td>
<td>Test pattern to run on the link. Specify a value in the range 0 through 255 (the default) to manually select a pattern.</td>
</tr>
<tr>
<td>yes</td>
<td>Enables or disables the test pattern procedure.</td>
</tr>
<tr>
<td>no</td>
<td>Enables or disables a report of the results of the test pattern procedure.</td>
</tr>
</tbody>
</table>

The following command runs test pattern 200 on port 7 in IMA group profile `ima3_4`, and requests a report of the results:

```
admin> ima-tpp ima3_4 7 200 yes yes
IMA TPP request sent, please wait for response ...  
admin> TPP test result: 
ImaGroupName=ima3_4, ImaTppTestResult=TPP_PASSED  
2 links configured in IMA group ima3_4, all passed TPP test !
```

### T1 and E1 module specifications

Stinger MRT-2 modules for T1 and E1 connections share common specifications and also have their own unique specifications. Stinger MRT-2 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 T1 and E1 line modules**

Table 8-3 lists the specifications that are applicable to all Stinger MRT-2 T1 and E1 modules.

*Table 8-3. T1 and E1 line module specifications*

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission convergence sublayer</td>
<td>ITU-T G.704</td>
</tr>
<tr>
<td>Clocking options</td>
<td>The reference clock source can be derived from one of the following inputs for the Stinger MRT-2:</td>
</tr>
<tr>
<td></td>
<td>- BITS input to the Stinger MRT-2</td>
</tr>
<tr>
<td></td>
<td>- Trunk module line input</td>
</tr>
<tr>
<td></td>
<td>- Local oscillator in the unit</td>
</tr>
<tr>
<td>Loopback options</td>
<td>Local—digital</td>
</tr>
<tr>
<td></td>
<td>Local—analog (full local loopback)</td>
</tr>
<tr>
<td></td>
<td>Remote</td>
</tr>
<tr>
<td>Physical dimensions</td>
<td>Height: 0.875 inches (2.2cm)</td>
</tr>
<tr>
<td></td>
<td>Width: 5.85 inches (14.86cm)</td>
</tr>
<tr>
<td></td>
<td>Depth: 6.95 inches (17.65cm)</td>
</tr>
<tr>
<td></td>
<td>Weight: 8.8 ounces (0.249kg)</td>
</tr>
<tr>
<td>Power requirements</td>
<td>6 watts (maximum)</td>
</tr>
<tr>
<td>Operating humidity</td>
<td>10% to 90%, noncondensing</td>
</tr>
<tr>
<td>Storage humidity</td>
<td>10% to 90%, noncondensing</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>-40°F to 149°F (-40°C to 65°C)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°F to 176°F (-40°C to 80°C)</td>
</tr>
<tr>
<td>Maximum rate of temperature change</td>
<td>54°F/hour (30°C/hour)</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>0 to 13,123 feet (0 to 4000 meters)</td>
</tr>
<tr>
<td>Alarms detected</td>
<td>Loss of signal (LOS)</td>
</tr>
<tr>
<td></td>
<td>Out of frame (OOF)</td>
</tr>
<tr>
<td></td>
<td>Remote alarm indication (RAI)</td>
</tr>
<tr>
<td></td>
<td>Alarm indication signal (AIS)</td>
</tr>
<tr>
<td></td>
<td>Loss of cell delineation (LOCD)</td>
</tr>
</tbody>
</table>
Configuring T1 and E1 Trunk Modules

Table 8-3. T1 and E1 line module specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DS1 MIB supported</td>
<td>RFC 1406</td>
</tr>
<tr>
<td>IMA compliance</td>
<td>Compliant with ATM Forum IMA specifications v1.0 (AF-PHY-0086.000) and v1.1 (AF-PHY-0086.001)</td>
</tr>
<tr>
<td>Maximum number of physical lines per IMA group</td>
<td>Eight</td>
</tr>
<tr>
<td>QoS types supported</td>
<td>Constant bit rate (CBR), variable bit rate (VBR)-real time, VBR-nonreal time, and unspecified bit rate (UBR)</td>
</tr>
<tr>
<td>Discard policies</td>
<td>Early packet discard (EPD), partial packet discard (PPD), and queue length exceed</td>
</tr>
</tbody>
</table>

Specifications unique to T1 line modules

Table 8-4 lists the specifications that apply only on T1 modules.

Table 8-4. T1-specific specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line code</td>
<td>G.703 bipolar 8-zero substitution (B8ZS) or alternate mark inversion (AMI)</td>
</tr>
<tr>
<td>Frame format</td>
<td>Extended superframe (ESF) (ANSI T1.408) or D4</td>
</tr>
<tr>
<td>Line rate</td>
<td>1.544Mbps (± 50bps)</td>
</tr>
<tr>
<td>Impedance</td>
<td>100 ohms</td>
</tr>
</tbody>
</table>
| Line buildout options (short-haul) | < 133 feet (≤40.5M) = 0.6dB  
134 to 266 feet (40.8m to 81.2m) = 1.2dB  
267 to 399 feet (81.3m to 121.7m) = 1.8dB  
400 to 533 feet (121.8m to 162.6m) = 2.4dB  
534 to 655 feet (162.7m to 199.6m) = 3.0dB |
| Line buildout options (long-haul) | 0dB  
7.5dB  
15dB  
22.5dB |
| Cell rate                     | 3622 cells/second (UNI mode) |
| IMA differential delay        | Up to 281ms among IMA group constituents |
Specifications unique to E1 line modules

Table 8-5 lists specifications that apply only to E1 models.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line code</td>
<td>High-density bipolar 3 (HDB3)</td>
</tr>
<tr>
<td>Frame format</td>
<td>ITU-T G.704</td>
</tr>
<tr>
<td>Line rate</td>
<td>2.048Mbps (± 50bps)</td>
</tr>
<tr>
<td>Impedance</td>
<td>120 ohms or 75 ohms</td>
</tr>
<tr>
<td>Cell rate</td>
<td>4528 cells/second (UNI mode)</td>
</tr>
<tr>
<td>IMA differential delay</td>
<td>Up to 225ms among IMA group constituents</td>
</tr>
</tbody>
</table>

Compliance with IMA specifications

Table 8-6 details how the T1 and E1 modules conform to the IMA requirements of the ATM Forum.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Specifications</td>
<td>Compliant with all mandatory specifications of v1.0 and v1.1 ATM Forum IMA specifications.</td>
</tr>
<tr>
<td>Optional Specification O-1</td>
<td>Uniform distribution of IMA Control Protocol (ICP) cells within an IMA frame.</td>
</tr>
<tr>
<td>Optional Specifications O-2 and O-3</td>
<td>User can configure IMA frame sizes of 32, 64, 128 (the default), or 256.</td>
</tr>
<tr>
<td>Optional Specification O-4</td>
<td>User can configure the IMA-ID and LID.</td>
</tr>
<tr>
<td>Optional Specifications O-9 and O-10</td>
<td>Supports Independent Transmit Clock (ITC) and Common Transmit Clock (CTC) modes.</td>
</tr>
<tr>
<td>Optional Specification O-11</td>
<td>Indicates an incoming stuff event in the 4th, 3rd, and 2nd ICP cells preceding the event.</td>
</tr>
<tr>
<td>Optional Specification O-12</td>
<td>At least one ICP cell with correct cyclic redundancy check (CRC) required to process the incoming stuff event code.</td>
</tr>
<tr>
<td>Optional Specification O-13</td>
<td>User can configure maximum differential delay among IMA group constituents.</td>
</tr>
</tbody>
</table>
Table 8-6. IMA specifications  (continued)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional Specification O-14</td>
<td>Supports inhibited, failed, fault, or misconnected report causes for unusable links.</td>
</tr>
<tr>
<td>Optional Specification O-15</td>
<td>User can increase the minimum number of links in a group to keep it from entering an alarm (nonoperational) state if constituent links fail.</td>
</tr>
<tr>
<td>Optional Specification O-16</td>
<td>User can configure the values of alpha (), beta (), and gamma () per link set (links 1 through 8, 9 through 16, or 17 through 24) to control the IMA Frame Sync procedure.</td>
</tr>
<tr>
<td>Optional Specification O-17</td>
<td>Transitions from any state to HUNT state when cells are no longer being received from the physical layer.</td>
</tr>
<tr>
<td>Optional Specification O-18</td>
<td>Maintains IMA frame synchronization when one of the two stuff ICP cells has a header error control (HEC) or CRC error.</td>
</tr>
<tr>
<td>Optional Specification O-21</td>
<td>Far-end transmit failure count maintained.</td>
</tr>
<tr>
<td>Optional Specification O-22</td>
<td>Far-end receive failure count maintained.</td>
</tr>
<tr>
<td>Optional Specifications O-23 and O-24</td>
<td>Count stuff events inserted in transmit or receive directions.</td>
</tr>
<tr>
<td>Optional Specification O-25</td>
<td>Far-end group failure count maintained.</td>
</tr>
<tr>
<td>Optional Specifications O-26 and O-27</td>
<td>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.)</td>
</tr>
<tr>
<td>Optional Specifications O-28 and O-29</td>
<td>Implementation-specific transmit fault or receive fault conditions are declared at the near end.</td>
</tr>
</tbody>
</table>
Table 8-6. IMA specifications (continued)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional Specification O-30</td>
<td>For loss of IMA frame (LIF), link out-of-delay 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.</td>
</tr>
<tr>
<td>Optional Specification O-31</td>
<td>Conforms with the test pattern procedure for testing connectivity.</td>
</tr>
<tr>
<td>Optional Specifications O-32 and O-33</td>
<td>Supports the IMA MIB and SNMP-based management.</td>
</tr>
</tbody>
</table>

Compliance with ATM specifications

Table 8-7 details ATM specifications supported by the T1 and E1 modules.

Table 8-7. ATM specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNI support</td>
<td>Compliant with ATM Forum specifications for UNI 3.0 and 3.1.</td>
</tr>
<tr>
<td>Virtual path (VP) and virtual channel (VC) connections</td>
<td>Supports up to 384 permanent virtual channels (PVCs) per port and up to 384 PVCs per IMA module. Supports 255 permanent virtual paths (PVP) per port. Up to 16 VPI's for VC switching can be specified in the DS1-ATM profile or in the IMA-Group profile.</td>
</tr>
<tr>
<td>QoS types</td>
<td>Constant bit rate (CBR), variable bit rate (VBR)-real time, VBR-nonreal time, and unspecified bit rate (UBR)</td>
</tr>
<tr>
<td>Discard policies</td>
<td>Early packet discard (EPD), partial packet discard (PPD), queue length exceeded.</td>
</tr>
<tr>
<td>HEC</td>
<td>Supports ITU I.432. Users have the option of omitting the coset polynomial while calculating HEC.</td>
</tr>
<tr>
<td>Payload scrambling</td>
<td>Can be configured by the user.</td>
</tr>
</tbody>
</table>
Configuring an OC3-ATM Trunk Module

Installing an OC3-ATM trunk module ........................................... 9-1
Connecting an OC3-ATM trunk module ........................................ 9-1
Interpreting OC3-ATM status lights ............................................. 9-2
Configuring an OC3-ATM trunk module ................................. 9-2
Call control ................................................................. 9-5
Example of OC3-ATM configuration ....................................... 9-6
Checking OC3-ATM trunk interface status ............................ 9-6
OC3-ATM trunk module specifications ................................. 9-13

The OC3-ATM trunk module provides fiber optic interfaces between the Stinger MRT-2 unit and the carrier ATM core network. The OC3-ATM trunk module provides one or two 155.52Mbps interfaces for connecting to an ATM switch.

After installing the OC3-ATM trunk module and connecting it to an ATM switch, you verify connections by checking the status lights. You then configure the physical link. Use a status profile to display the state of the OC3 line and any error conditions.

Note The TAOS software addresses the single trunk module slot of the Stinger MRT-2 as slot 18. This is consistent with number of the second trunk module slot in larger Stinger models.

Installing an OC3-ATM trunk module

An OC3-ATM trunk module is installed in the same manner as any trunk module. (For details, see “Installing a trunk module” on page 3-10.) After installation, the module must be connected and configured according to the instructions in this guide.

Connecting an OC3-ATM trunk module

An OC3-ATM trunk module requires duplex subscriber connector (SC) fiber optic cable.
**Caution**  Bind excess cable lengths in a figure-eight pattern. Do not wind excess cable into circular coils.

**Note**  Clean any fiber optic cables prior to connecting them.

To connect the cables to an OC3-ATM trunk module, align the small rectangular key on the head of the cable with the slot in the trunk module connector and carefully insert the head of each cable into the proper connector on the trunk module, as shown in Figure 9-1.

*Figure 9-1. Connecting an OC3-ATM trunk module for an MRT-2*

Inform your service provider that the equipment is connected so the provider can activate the line.

**Interpreting OC3-ATM status lights**

Each port of the OC3-ATM trunk module for the MRT-2 has two status lights, as shown in Figure 9-2 and described in Table 9-1.

*Figure 9-2. OC3-ATM trunk module*

<table>
<thead>
<tr>
<th>Status light</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>Green</td>
<td>ON</td>
<td>A DS3 signal is detected on the interface.</td>
</tr>
<tr>
<td>LOS</td>
<td>Yellow</td>
<td>ON</td>
<td>The DS3 signal on the interface has been lost.</td>
</tr>
</tbody>
</table>

**Configuring an OC3-ATM trunk module**

Each OC3-ATM trunk module supports two 155.52Mbps-interfaces, and each OC3-ATM interface connects to one ATM switch.
The Stinger unit creates an OC3-ATM profile for each OC3 interface detected in the system. The OC3-ATM profiles provide an interface to the physical ATM framer associated with each interface, which supports the standard Universal Test and Operations Interface for ATM (UTOPIA).

Overview of OC3-ATM settings

Following are the parameters for configuring an OC3-ATM interface. The parameters are shown with default settings.

```
in OC3-ATM/{ shelf-1 trunk-module-2 1 }
  name = 1:18:1
  physical-address* = { shelf-1 trunk-module-2 1 }
  enabled = no
  spare-physical-address = { any-shelf any-slot 0 }
  sparing-mode = inactive
[in OC3-ATM/{ any-shelf any-slot 0 }:line-config]
  trunk-group = 0
  nailed-group = 851
  call-route-info = { any-shelf any-slot 0 }
  loopback = no-loopback
  framer-rate = STS-3c
  framer-mode = sonet
  tx-scramble-disabled = no
  tx-cell-payload-scramble-disabled = no
  loop-timing = no
  vpi-vci-range = vpi-0-255-vci-32-8191
  vc-switching-vpi = [ 0 0 0 0 0 0 0 0 ]
  clock-source = not-eligible
  clock-priority = middle-priority
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Name of the interface. The default value is the interface address in shelf:slot:item format (for example, 1:18:2), but you can assign a text string of up to 16 characters.</td>
</tr>
<tr>
<td>physical-address</td>
<td>Physical address of the trunk port in the Stinger unit.</td>
</tr>
<tr>
<td>enabled</td>
<td>Enable/disable the OC3-ATM interface, which is disabled by default. When the interface is disabled, it transmits the OC3 idle signal to the far end.</td>
</tr>
<tr>
<td>spare-physical-address</td>
<td>Physical address of the trunk port to be used as a spare.</td>
</tr>
<tr>
<td>sparing-mode</td>
<td>Redundancy mode for the port.</td>
</tr>
<tr>
<td>line-config:trunk-group</td>
<td>Not currently used. Leave the default value (zero).</td>
</tr>
</tbody>
</table>
Parameter | Setting
---|---
line-config:nailed-group | Nailed-group number for the OC3-ATM physical interface. A Connection or RADIUS profile specifies this number to use 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 to 1024 that is unique within the system. See “Displaying OC3-ATM status and nailed groups” on page 9-5 for related information.

line-config:call-route-info | Not currently used. Leave the default value (the zero address).

line-config:loopback | Enable/disable loopback for diagnosing connectivity or possible equipment problems. Loopback is disabled by default, which is required for normal operations.

line-config:framer-rate | Framing operations. Only the default STS-3C setting is used, which represents both the 155.52Mbps interface in the U.S. and the equivalent European 155.52Mbps interface (STM-1). For more information, see “Changing physical-layer interface settings” on page 9-5.

line-config:framer-mode | Specify sonet or sdh. Synchronous optical network (SONET) and synchronous digital hierarchy (SDH) are American National Standards Institute (ANSI) optical digital transmission standards. SONET supports data transmission rates from 51.84Mbps (STS-1) to 13.2192 Gbps (STS-48). SDH is the corresponding international standard, supporting rates from 155.52Mbps (STM-1) to 4.976Gbps (STM-32). SONET is the default.

line-config:tx-scramble-disabled | Enable/disable scrambling and descrambling of the entire transmit and receive stream. This function is enabled by default. Disable it only if the far-end switch has disabled the corresponding functions.

line-config:tx-cell-payload-scramble-disabled | Enable/disable scrambling and descrambling of the 48-byte ATM cell payload in transmitted and received cells. This function is enabled by default. Disable it only if the far-end switch has disabled the corresponding functions.

line-config:loop-timing | Enable/disable derivation of transmission (TX) timing from receiver inputs. Yes causes the TAOS unit to derive TX timing for all trunk ports from the receiver inputs of the ports. Loop timing is disabled by default. With the default setting, transmission timing is derived from the reference clock.

line-config:vpi-vci-range | Valid range of virtual channel identifier (VCI) numbers to be used with specified virtual path identifiers (VPIs) for virtual channel connections (VCCs).

line-config:vc-switching-vpi | Array of up to seven VPIs to use for VC switching.

line-config:clock-source | Enable/disable obtaining the system clock signal from the port.
Configuring an OC3-ATM Trunk Module

Call control

Displaying OC3-ATM status and nailed groups

To see the nailed-group numbers for trunk ports, use the `atmtrunks` command. For example, the command output that follows shows the nailed-group numbers for all OC3-ATM trunks.

```
admin> atmtrunks -a
All OC3 ATM trunks:
  OC3 Lines                     (dvOp  dvUpSt  dvRq    sAdm    nailg)
  Line {  1 18 1 }       (Up    Idle    UP      UP     00851)
  Line {  1 18 2 }       (Up    Idle    UP      UP     00852)
All DS3 ATM trunks:
  DS3 Lines                     (dvOp  dvUpSt  dvRq    sAdm    nailg)
```

Table 9-2 explains the output of the `atmtrunks` command.

<table>
<thead>
<tr>
<th>Output column heading</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dvOp</td>
<td>Device operational state. The current operational state of the device, either UP or DOWN.</td>
</tr>
<tr>
<td>dvUpSt</td>
<td>Device up status. The status of the device, when it is UP.</td>
</tr>
<tr>
<td>dvRq</td>
<td>Device required state. The state in which the device is required to be.</td>
</tr>
<tr>
<td>sAdm</td>
<td>Administrative state of the device, either UP or DOWN.</td>
</tr>
<tr>
<td>Nailg</td>
<td>Number of the nailed group to which a line is assigned.</td>
</tr>
</tbody>
</table>

Changing physical-layer interface settings

The ATM framer multiplexes ATM cells into the SONET payload and extracts cells from the SONET payload for reassembly into packets. It uses the STS-3C frame format. The default STS-3C setting indicates a 155.52Mbps interface in the U.S. as well as the equivalent European 155.52Mbps interface (STM-1).

The interface provides a SONET-level scrambler and one at the cell payload level. Typically, these functions are enabled. Disable them only if the far-end switch requires it.

Call control

Using the call-control procedures, you can configure the Stinger MRT-2 to allow connections to be established even when the line is not fully operational. You can
configure the unit to use these procedures systemwide or on a per-port basis on the DS3-ATM and OC3-ATM trunk modules and on the ADSL lines. For details, see “Configuring call control” on page 7-11.

Example of OC3-ATM configuration

The OC3-ATM module can have one active OC3-ATM interface and one spare port that remains inactive until other trunk port becomes inactive.

The following command lists the trunk port profiles:

```
admin> dir oc3-atm
40  08/03/1999 15:33:35  { shelf-1 trunk-module-2 2 }  1:18:2
40  08/04/1999 10:18:22  { shelf-1 trunk-module-2 1 }  1:18:1
```

The following commands enables both ports:

```
admin> read oc3-atm {1 trunk-module-2 1}
OC3-ATM/{ shelf-1 trunk-module-2 1 } read
admin> set enabled = yes
admin> write
OC3-ATM/{ shelf-1 trunk-module-2 1 } written

admin> read oc3-atm {1 trunk-module-2 2}
OC3-ATM/{ shelf-1 trunk-module-2 2 } read
admin> set enabled = yes
admin> write
OC3-ATM/{ shelf-1 trunk-module-2 2 } written
```

Checking OC3-ATM trunk interface status

The Stinger MRT-2 unit creates an OC3-ATM-Stat profile for each of its OC3 interfaces. The profiles provide information about the state of the physical interfaces, error counters, and ATM framer status information. The Performance-Monitoring and Interval-Performance-Monitoring subprofiles provide counters for the SONET payload.

Monitoring the OC3 interface

The following display shows OC3-ATM-Stat parameters for the physical interface, with sample settings for an active line:

```
[ in OC3-ATM-STAT/{ shelf-1 trunk-module-2 1 }]
physical-address* = { shelf-1 trunk-module-2 1 }
line-state = active
spare-physical-address = { any-shelf any-slot 0 }
sparing-state = sparing-none
vpi-vci-range = vpi-0-255-vci-32-8191
vc-switching-vpi = 0
vcc-vpi = [ 0 0 0 0 0 0 0 0 ]
loss-of-signal = False
loss-of-frame = False
out-of-frame = False
section-state = sonet-section-active-no-defect
```
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical-address</td>
<td>Physical location of the OC3-ATM line within the Stinger MRT-2 system.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> Two OC3-ATM modules appear when an OC3-ATM trunk module is installed in the Stinger MRT-2. The profile for the module indicated as trunk-module-1 is for the built-in STS-3 interfaces on the chassis. The profile for the module indicated as trunk-module-2 is for the OC3-ATM trunk module in the unit’s trunk module slot.</td>
</tr>
<tr>
<td>line-state</td>
<td>Overall state of the OC3 line, which can be any of the following states:</td>
</tr>
<tr>
<td></td>
<td>- active—Line is enabled and a multipoint connection is established.</td>
</tr>
<tr>
<td></td>
<td>- does-not-exist—Link is not physically on the trunk module.</td>
</tr>
<tr>
<td></td>
<td>- disabled—Line is disabled.</td>
</tr>
<tr>
<td></td>
<td>- loss-of-signal—Near end has lost the signal.</td>
</tr>
<tr>
<td></td>
<td>- loss-of-frame—Near end has lost framing (also known as a Red Alarm).</td>
</tr>
<tr>
<td></td>
<td>- yellow-alarm—Near end is receiving a Yellow Alarm from the far end, indicating a loss of framing.</td>
</tr>
<tr>
<td></td>
<td>- ais-receive—Near end is receiving an Alarm Indication signal (AIS).</td>
</tr>
</tbody>
</table>
### Configuring an OC3-ATM Trunk Module

#### Checking OC3-ATM trunk interface status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>spare-physical-address</td>
<td>Redundant 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.</td>
</tr>
<tr>
<td>sparing-state</td>
<td>State of the redundancy function. The sparing-none value indicates that redundancy is not enabled. If redundancy is enabled and the current port is the primary trunk port, the value can be primary-active or primary-inactive. If redundancy is enabled and the current port is the secondary trunk port, the value can be secondary-active or secondary-inactive.</td>
</tr>
<tr>
<td>vpi-vci-range</td>
<td>Current valid VCI range configured for the port.</td>
</tr>
<tr>
<td>vc-switching-vpi</td>
<td>Array of VPIs used for virtual circuit switching.</td>
</tr>
<tr>
<td>vcc-vpi</td>
<td><em>For internal use only.</em></td>
</tr>
<tr>
<td>loss-of-signal</td>
<td>Loss of signal on the line. <em>False</em> indicates that the carrier is maintaining a connection.</td>
</tr>
<tr>
<td>loss-of-frame</td>
<td>Loss of frame on the line (also known as a Red Alarm). <em>False</em> indicates that the line is enabled and in frame.</td>
</tr>
<tr>
<td>out-of-frame</td>
<td>Near end is out of frame. <em>False</em> indicates that the line is enabled and in frame.</td>
</tr>
<tr>
<td>section-state</td>
<td>State of the SONET section.</td>
</tr>
<tr>
<td>path-state</td>
<td>State of the SONET path.</td>
</tr>
<tr>
<td>ais-receive</td>
<td>Far end is sending an Alarm Indication signal (AIS). <em>False</em> indicates that the local device has not received an AIS.</td>
</tr>
<tr>
<td>yellow-receive</td>
<td>Far-end loss-of-frame (Yellow Alarm) occurred on the line. <em>False</em> indicates that a Yellow Alarm was not received.</td>
</tr>
<tr>
<td>loss-of-cell-delineation</td>
<td>Loss of cell delineation.</td>
</tr>
<tr>
<td>APS-Receive</td>
<td><em>Not currently used.</em></td>
</tr>
<tr>
<td>rsop-bip-error-count</td>
<td>Number of Receive Section Overhead Processor (RSOP) bit-interleaved parity (BIP)-8 errors. The RSOP synchronizes and descrambles frames and provides section-level alarms and performance monitoring.</td>
</tr>
<tr>
<td>rlop-bip-error-count</td>
<td>Number of Receive Line Overhead Processor (RLOP) BIP-8 errors. The RLOP is responsible for line-level alarms and for monitoring performance.</td>
</tr>
<tr>
<td>rlop-febe-error-count</td>
<td>Number of RLOP far-end block errors (FEBE).</td>
</tr>
</tbody>
</table>
Monitoring errors and performance of the SONET payload

The Performance-Monitoring and Interval-Performance-Monitoring subprofiles include counters for SONET performance and error conditions.

The Performance-Monitoring values and the cumulative performance counters, which are reset at the end of every 15-minute interval. The information in the Performance-Monitoring counters is used to update the values in the Interval-Performance-Monitoring subprofile.

The Interval-Performance-Monitoring values represent performance for the preceding four 15-minute intervals, thereby providing performance data about the past hour.

Events that constitute errors (such as severely errored frames, loss of signal, Alarm Indication signal, or STS-path loss of pointer events) are defined in “SONET performance and error counters” and detailed in RFC 1595, Definitions of Managed Objects for the SONET/SDH Interface Type.

SONET performance and error counters

Performance and error counters are maintained at the section, line, and path SONET layers (see Figure 9-3).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>rpop-bip-error-count</td>
<td>Number of Receive Path Overhead Processor (RPOP) BIP-8 errors. The RSOP interprets pointers and extracts path overhead and the synchronous payload envelope. It is also responsible for path-level alarms and for monitoring performance.</td>
</tr>
<tr>
<td>rpop-febe-error-count</td>
<td>Number of RPOP far-end block errors (FEBE).</td>
</tr>
<tr>
<td>racp-chcs-error-count</td>
<td>Number of Receive ATM Cell Processor (RACP) correctable header check sequence (CHCS) errors. The RACP delineates ATM cells and filters cells on the basis of their idle or unassigned status or HCS errors. It also descrambles the cell payload.</td>
</tr>
<tr>
<td>racp-uchcs-error-count</td>
<td>Number of RACP uncorrectable header check sequence (UCHCS) errors.</td>
</tr>
<tr>
<td>racp-rx-cell-count</td>
<td>Receive ATM Cell Processor (RACP) receive cell count.</td>
</tr>
<tr>
<td>tacp-tx-cell-count</td>
<td>Transmit ATM Cell Processor (TACP) transmit cell count.</td>
</tr>
<tr>
<td>frequency-justification-count</td>
<td>Number of frequency justification operations.</td>
</tr>
<tr>
<td>hec-cell-drop-counter</td>
<td>Number of cells dropped by HEC processing.</td>
</tr>
<tr>
<td>fifo-overflow-counter</td>
<td>Number of cells dropped because of first in, first out (FIFO) overflow.</td>
</tr>
<tr>
<td>idle-cell-counter</td>
<td>Total number of idle cells received.</td>
</tr>
<tr>
<td>valid-cell-counter</td>
<td>Total number of valid cells received.</td>
</tr>
</tbody>
</table>
As shown in Figure 9-3, a SONET section is a single run of cable. Section-terminating equipment is any adjacent pair of switches. A line is one or more sections. A path is an end-to-end circuit. SONET performance and error counters monitor the following events on a Stinger MRT-2 OC3-ATM trunk interface for SONET sections, lines, and paths:

- **Coding violations.** Coding violations are bit-interleaved parity errors detected in the incoming signal.
- **Errored seconds.** An errored second is a second in which one or more coding violations or incoming errors have occurred at the specified layer.
- **Severely errored seconds.** A severely errored second is a second in which more than a certain number of coding violations or incoming errors have occurred, with the number based on line rate and bit error rate (BER).
- **Severely errored framing seconds.** A severely errored framing second is a second in which one or more severely errored frame defects occur at the section layer. A severely errored frame defect begins when four contiguous words are detected with an error in frame alignment, and ends when two contiguous words occur with error-free frame alignment.
- **Unavailable seconds.** An unavailable second is a second in which the interface is unavailable at the specified layer. An interface is considered unavailable after 10 consecutive severely errored seconds.
Performance-Monitoring and Interval-Performance-Monitoring subprofiles

Following are the two levels of performance-monitoring counters, shown with no errors (zero counts):

```
[in OC3-ATM-STAT/{ shelf-1 trunk-module-2 1 }:performance-monitoring]
sonet-section-errored-seconds = 0
sonet-section-severely-errored-seconds = 0
sonet-section-severely-errored-framing-seconds = 0
sonet-section-coding-violations = 0
sonet-line-errored-seconds = 0
sonet-line-severely-errored-seconds = 0
sonet-line-coding-violations = 0
sonet-line-unavailable-seconds = 0
sonet-far-end-line-errored-seconds = 0
sonet-far-end-line-severely-errored-seconds = 0
sonet-far-end-line-coding-violations = 0
sonet-far-end-line-unavailable-seconds = 0
sonet-path-errored-seconds = 0
sonet-path-severely-errored-seconds = 0
sonet-path-coding-violations = 0
sonet-path-unavailable-seconds = 0
sonet-far-end-path-errored-seconds = 0
sonet-far-end-path-severely-errored-seconds = 0
sonet-far-end-path-coding-violations = 0
sonet-far-end-path-unavailable-seconds = 0
```

```
[in OC3-ATM-STAT/{ shelf-1 trunk-module-2 1 }:interval-performance-monitoring[1]]
sonet-section-errored-seconds = 0
sonet-section-severely-errored-seconds = 0
sonet-section-severely-errored-framing-seconds = 0
sonet-section-coding-violations = 0
sonet-line-errored-seconds = 0
sonet-line-severely-errored-seconds = 0
sonet-line-coding-violations = 0
sonet-line-unavailable-seconds = 0
sonet-far-end-line-errored-seconds = 0
sonet-far-end-line-severely-errored-seconds = 0
sonet-far-end-line-coding-violations = 0
sonet-far-end-line-unavailable-seconds = 0
sonet-path-errored-seconds = 0
sonet-path-severely-errored-seconds = 0
sonet-path-coding-violations = 0
sonet-path-unavailable-seconds = 0
sonet-far-end-path-errored-seconds = 0
sonet-far-end-path-severely-errored-seconds = 0
sonet-far-end-path-coding-violations = 0
sonet-far-end-path-unavailable-seconds = 0
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>sonet-section-errored-seconds</td>
<td>Number of errored seconds at the section layer.</td>
</tr>
</tbody>
</table>
### Configuring an OC3-ATM Trunk Module

#### Checking OC3-ATM trunk interface status

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sonet-section-severely-errored-seconds</code></td>
<td>Number of severely errored seconds at the section layer.</td>
</tr>
<tr>
<td><code>sonet-section-severely-errored-framing-seconds</code></td>
<td>Number of severely errored framing seconds at the section layer.</td>
</tr>
<tr>
<td><code>sonet-section-coding-violations</code></td>
<td>Number of bit-interleaved parity errors at the Section layer.</td>
</tr>
<tr>
<td><code>sonet-Line-errored-seconds</code></td>
<td>Number of errored seconds at the line layer.</td>
</tr>
<tr>
<td><code>sonet-line-severely-errored-seconds</code></td>
<td>Number of severely errored seconds at the line layer.</td>
</tr>
<tr>
<td><code>sonet-line-coding-violations</code></td>
<td>Number of bit-interleaved parity errors at the line layer.</td>
</tr>
<tr>
<td><code>sonet-line-unavailable-seconds</code></td>
<td>Number of unavailable seconds at the line layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-line-errored-seconds</code></td>
<td>Number of errored seconds at the far-end device's line layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-line-severely-errored-seconds</code></td>
<td>Number of severely errored seconds at the far-end device's line layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-line-coding-violations</code></td>
<td>Number of bit-interleaved parity errors at the far-end device's line layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-line-unavailable-seconds</code></td>
<td>Number of unavailable seconds at the line layer.</td>
</tr>
<tr>
<td><code>sonet-path-errored-seconds</code></td>
<td>Number of errored seconds at the path layer.</td>
</tr>
<tr>
<td><code>sonet-path-severely-errored-seconds</code></td>
<td>Number of severely errored seconds at the path layer.</td>
</tr>
<tr>
<td><code>sonet-path-coding-violations</code></td>
<td>Number of bit-interleaved parity errors at the path layer.</td>
</tr>
<tr>
<td><code>sonet-path-unavailable-seconds</code></td>
<td>Number of unavailable seconds at the path layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-path-errored-seconds</code></td>
<td>Number of errored seconds at the far-end device's path layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-path-severely-errored-seconds</code></td>
<td>Number of severely errored seconds at the far-end device’s path layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-path-coding-violations</code></td>
<td>Number of bit-interleaved parity errors at the far-end device’s path layer.</td>
</tr>
<tr>
<td><code>sonet-far-end-path-unavailable-seconds</code></td>
<td>Number of unavailable seconds at the far-end device’s path layer.</td>
</tr>
</tbody>
</table>
OC3-ATM trunk module specifications

The OC3-ATM trunk module provides up to two 155.52Mbps ports for optical connections. Each port supports the OC3 and the STM-1 interface standards and comes with 64KB cell buffers per port, enabling you to customize your network for specific traffic needs.

You can configure each port as one of the following:
- User-to-Network Interface (UNI)
- Interim Interswitch Signaling Protocol (IISP) connection
- Direct trunk

Module specifications

Table 9-3 lists OC3-ATM module specifications.

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical dimensions</td>
<td>Height: 0.875 inches (2.2cm)</td>
</tr>
<tr>
<td></td>
<td>Width: 5.85 inches (14.86cm)</td>
</tr>
<tr>
<td></td>
<td>Depth: 6.95 inches (17.65cm)</td>
</tr>
<tr>
<td></td>
<td>Weight: 6.8 ounces (0.193kg)</td>
</tr>
<tr>
<td>Power requirements</td>
<td>4.2 watts (maximum)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40°F to 149°F (-40°C to 65°C).</td>
</tr>
<tr>
<td>Operating humidity</td>
<td>0% to 90%, noncondensing.</td>
</tr>
<tr>
<td>Agency approvals</td>
<td>Electromagnetic Emissions Certifications: FCC Part 15 Class A, and CISPR Class A.</td>
</tr>
<tr>
<td>Interface standards (OC-3c)</td>
<td>ANSI T1.105.</td>
</tr>
<tr>
<td></td>
<td>ANSI T1.106.</td>
</tr>
<tr>
<td>Interface standards (STM-1)</td>
<td>ITU G.957 (optical).</td>
</tr>
<tr>
<td></td>
<td>ITU G.709 (optical).</td>
</tr>
<tr>
<td>Physical connectors</td>
<td>Subscriber connector (SC).</td>
</tr>
<tr>
<td>Physical interfaces</td>
<td>Two UNI 3.0/3.1 cell-bearing OC-3c/STM-1 155.52Mbps ports (optical).</td>
</tr>
</tbody>
</table>
Table 9-3. OC3-ATM module specifications (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal distance/levels (single-mode laser optics)</td>
<td>Medium-Reach:</td>
</tr>
<tr>
<td></td>
<td>• Up to 15 kilometers (9.3 miles).</td>
</tr>
<tr>
<td></td>
<td>• TX power: -15 decibels relative to 1 milliwatt (dBm) to -8dBm.</td>
</tr>
<tr>
<td></td>
<td>• RX sensitivity: -31dBm.</td>
</tr>
<tr>
<td></td>
<td>• Nominal wavelength: 1310 nanometers.</td>
</tr>
<tr>
<td>Minimum bend radius</td>
<td>3 inches (7.62cm).</td>
</tr>
<tr>
<td>Other OC-3c standards</td>
<td>ATM Forum UNI 3.0/3.1.</td>
</tr>
<tr>
<td></td>
<td>ANSI T1M1.3/92-005R1.</td>
</tr>
<tr>
<td></td>
<td>Bellcore TR-NWT-00112.</td>
</tr>
<tr>
<td></td>
<td>Bellcore GR-253-CORE.</td>
</tr>
<tr>
<td></td>
<td>RFC 1595.</td>
</tr>
<tr>
<td>Other STM-1 standards</td>
<td>ATM Forum UNI 3.0/3.1.</td>
</tr>
<tr>
<td></td>
<td>ANSI T1M1.3/92-005R1.</td>
</tr>
<tr>
<td></td>
<td>Bellcore GR-253-CORE.</td>
</tr>
<tr>
<td></td>
<td>RFC 1595.</td>
</tr>
</tbody>
</table>

**Cable specifications**

Table 9-4 provides cable specifications.

Table 9-4. OC3-ATM cable specifications

<table>
<thead>
<tr>
<th>Interface type</th>
<th>dc resistance</th>
<th>Nominal impedance</th>
<th>Nominal capacitance</th>
<th>Shield</th>
<th>Maximum length</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.703—75-ohm</td>
<td>49.2ohms per kilometer</td>
<td>75ohms</td>
<td>66.7 picofarads per meter</td>
<td>95%</td>
<td>120m (393.7 feet)</td>
</tr>
</tbody>
</table>

Stinger® MRT-2 Getting Started Guide
Configuring a DS3-ATM Trunk Module

Installing a DS3-ATM trunk module .............................................. 10-1
Connecting a DS3-ATM trunk module ................................. 10-1
Interpreting DS3-ATM status lights ............................... 10-2
Configuring a DS3-ATM trunk module ...................... 10-3
Call control .......................................................... 10-6
Example of DS3-ATM configuration ............................. 10-6
Checking DS3-ATM trunk interface status ....................... 10-7
Traffic aggregation with the DS3-ATM module .................. 10-9
DS3-ATM trunk module specifications ......................... 10-10

The DS3-ATM trunk module provides a coaxial copper interface between the Stinger unit and the carrier ATM core network. The DS3-ATM trunk module supports two 44.736Mbps interfaces and connects each interface to an ATM switch.

After installing a DS3-ATM trunk module and connecting it to an ATM switch, you verify connections by checking the status lights. You then configure the physical link. Use a status profile to display the state of the DS3 line and any error conditions.

Note The TAOS software addresses the single trunk module slot of the Stinger MRT-2 as slot 18. This is consistent with number of the second trunk module slot in larger Stinger models.

Installing a DS3-ATM trunk module

A DS3-ATM trunk module is installed in the same manner as any trunk module. (For details, see “Installing a trunk module” on page 3-10.) After installation, the module must be connected and configured according to the instructions in this guide.

Connecting a DS3-ATM trunk module

Connect the DS3 line to the RX LN and TX LN connectors on a DS3-ATM trunk module, using two 75-ohm coaxial cables (RG 59/U).

To configure a DS3-ATM connection, connect the receive and transmit cables to the trunk module as shown in Figure 10-1.
Inform your service provider that the equipment is connected, so the provider can activate the line.

**Interpreting DS3-ATM status lights**

Several status lights on the front panel of the DS3-ATM trunk module indicate the status of the module and its ports. Figure 10-2 shows the front panel and status lights of the DS3-ATM trunk module.

All status lights except line active (LA) are lit upon startup or restart and remain lit until the trunk module passes power-on self test (POST).

Table 10-1 explains the DS3-ATM trunk module status lights.

<table>
<thead>
<tr>
<th>Status light</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF</td>
<td>Yellow</td>
<td>ON</td>
<td>Framing for the DS3 signal has been lost.</td>
</tr>
</tbody>
</table>
Configuring a DS3-ATM trunk module

The Stinger unit creates a DS3-ATM profile containing the following parameters for each DS3-ATM interface detected in the system.

The following parameters are shown with their default settings:

```
[ in DS3-ATM/{ shelf-1 trunk-module-2 1 } ]
name = 1:18:1
physical-address* = { shelf-1 trunk-module-2 1 }
enabled = no
spare-physical-address = { any-shelf any-slot 0 }
sparing-mode = inactive

[ in DS3-ATM/{ shelf-1 trunk-module-2 1 }:line-config ]
trunk-group = 9
nailed-group = 851
activation = static
call-route-info = { any-shelf any-slot 0 }
loopback = no-loopback
high-tx-output = no
framer-mode = C-BIT-PLCP
receive-equalization = no
vpi-vci-range = vpi-0-255-vci-32-8191
vc-switching-vpi = [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ]
clock-source = not-eligible
clock-priority = middle-priority
```

### Configuring a DS3-ATM trunk module

The Stinger unit creates a DS3-ATM profile containing the following parameters for each DS3-ATM interface detected in the system.

The following parameters are shown with their default settings:

```
[ in DS3-ATM/{ shelf-1 trunk-module-2 1 } ]
name = 1:18:1
physical-address* = { shelf-1 trunk-module-2 1 }
enabled = no
spare-physical-address = { any-shelf any-slot 0 }
sparing-mode = inactive

[ in DS3-ATM/{ shelf-1 trunk-module-2 1 }:line-config ]
trunk-group = 9
nailed-group = 851
activation = static
call-route-info = { any-shelf any-slot 0 }
loopback = no-loopback
high-tx-output = no
framer-mode = C-BIT-PLCP
receive-equalization = no
vpi-vci-range = vpi-0-255-vci-32-8191
vc-switching-vpi = [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ]
clock-source = not-eligible
clock-priority = middle-priority
```

#### Table 10-1. DS3-ATM trunk module status lights

<table>
<thead>
<tr>
<th>Status light</th>
<th>Color</th>
<th>Condition</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>Yellow</td>
<td>ON</td>
<td>The DS3 signal has been lost.</td>
</tr>
<tr>
<td>AD</td>
<td>Yellow</td>
<td>ON</td>
<td>An ATM Alarm Indication signal (AIS) is detected.</td>
</tr>
<tr>
<td>YEL</td>
<td>Yellow</td>
<td>ON</td>
<td>The DS3 interface has detected Far End Receive Failure indication transmitted from the other side.</td>
</tr>
<tr>
<td>LA</td>
<td>Green</td>
<td>ON</td>
<td>The DS3 interface is enabled and has not detected any error conditions.</td>
</tr>
<tr>
<td>BYP</td>
<td>Green</td>
<td>ON</td>
<td>The line is in bypass mode. This is the default mode for the interface with the card boots, and when the line is disabled in the DS3-ATM profile.</td>
</tr>
<tr>
<td>ALARM</td>
<td>Yellow</td>
<td>ON</td>
<td>A problem with the trunk module or one of its ports has been detected.</td>
</tr>
<tr>
<td>ACT</td>
<td>Green</td>
<td>ON</td>
<td>The module is active and functioning normally.</td>
</tr>
</tbody>
</table>
### Configuring a DS3-ATM Trunk Module

Configuring a DS3-ATM trunk module

**Parameter** | **Setting**
---|---
`cell-payload-scramble = yes` |  
`status-change-trap-enable = no` |  

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Name of the interface. The default value is the interface address in <code>shelf:slot:item</code> format (for example, <code>1:18:2</code>), but you can assign a text string of up to 16 characters.</td>
</tr>
<tr>
<td>physical-address</td>
<td>Physical address of the trunk port in the Stinger unit.</td>
</tr>
<tr>
<td>enabled</td>
<td>Enable/disable the DS3-ATM interface, which is disabled by default.</td>
</tr>
<tr>
<td>spare-physical-address</td>
<td>Physical address of the trunk port to be used as a spare.</td>
</tr>
<tr>
<td>sparing-mode</td>
<td>Redundancy mode for the port.</td>
</tr>
<tr>
<td><code>line-config:trunk-group</code></td>
<td>Not currently used. Leave the default value (zero).</td>
</tr>
<tr>
<td><code>line-config:nailed-group</code></td>
<td>Nailed-group number for the DS3-ATM 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 to 1024 that is unique within the system. See “Displaying DS3-ATM port status and nailed groups” on page 10-5 for related information.</td>
</tr>
<tr>
<td><code>line-config:activation</code></td>
<td>Line activation mode. Only the static setting is currently supported.</td>
</tr>
<tr>
<td><code>line-config:call-route-info</code></td>
<td>Not currently used. Leave the default value (the zero address).</td>
</tr>
<tr>
<td><code>line-config:loopback</code></td>
<td>Enable/disable loopback for diagnosing connectivity or possible equipment problems. Loopback is disabled by default, which is required for normal operations.</td>
</tr>
<tr>
<td><code>line-config:high-tx-output</code></td>
<td>Enable/disable high transmit output. The default is no, which is correct for DS3 cables that are less than 255 feet (78m) long. For cables longer than 255 feet, set this parameter to yes.</td>
</tr>
</tbody>
</table>
| `line-config:framer-mode` | DS3-ATM framer mode. Following are valid values:  
- c-bit-adm  
- c-bit-plcp  
- c-bit-adm-loop-timed  
- c-bit-plcp-loop-timed  
- c-bit-adm-frame-locked  
- c-bit-plcp-frame-locked  
For more information, see “Setting DS3 framing formats” on page 10-5. |
Configuring a DS3-ATM Trunk Module

Configuring a DS3-ATM trunk module

Displaying DS3-ATM port status and nailed groups

To see the nailed-group numbers for trunk ports, use the `atmtrunks` command. For example, the command output that follows shows the nailed-group numbers for DS3-ATM trunks. In this example, the system has one DS3-ATM trunk module installed in slot 18.

```
admin> atmtrunks -a
All DS3 ATM trunks:
 DS3 Lines                    (dvOp   dvUpSt  dvRq    sAdm    nailg)
 Line {    1 18 1 }       (Up      Idle    UP      UP     00851)
 Line {    1 18 2 }       (Up      Idle    UP      UP     00852)
```

For explanations of command output, see Table 9-2 on page 9-5.

Setting DS3 framing formats

You can specify C-bit Physical Layer Convergence Protocol (PLCP) or C-bit ATM direct mapping (ADM) framing format for a DS3-ATM interface. Both sides of a DS3-ATM link must agree about the framing format.

The PLCP format incurs some overhead for framing. ADM format does not. When ADM framing is used, the entire DS3 payload is used for ATM cells. Within each format, the framer can operate in the following modes:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free-running and fixed-stuffing</td>
<td>The DS3 transmit clock signal and the PLCP frame are derived from an onboard oscillator. This mode is typically used when the line is neither providing the clock signal (frame-locked) nor synchronizing to an incoming clock (loop-timed).</td>
</tr>
</tbody>
</table>
Configure the Stinger MRT-2 to allow connections to be established even when the line is not fully operational. You can configure the unit to use these procedures systemwide or on a per-port basis on the DS3-ATM, and OC3-ATM trunk modules and on the ADSL lines. For details, see “Configuring call control” on page 7-11.

Example of DS3-ATM configuration

In this example, the administrator enables the two DS3-ATM ports and adds two VPIs to double the number of the virtual channel connections (VCCs) that they can handle.

The following command lists the trunk port profiles:

```
admin> dir ds3-atm
91 10/18/2001 18:53:39 { shelf-1 trunk-module-2 1 } 1:18:1
91 10/18/2001 18:53:55 { shelf-1 trunk-module-2 2 } 1:18:2
```

The following commands enable both ports:

```
admin> read ds3-atm {1 trunk-module-2 1}
DS3-ATM/{ shelf-1 trunk-module-2 1 } read
admin> set enabled = yes
admin> write
DS3-ATM/{ shelf-1 trunk-module-2 1 } written
admin> read ds3-atm {1 trunk-module-2 2}
DS3-ATM/{ shelf-1 trunk-module-2 2 } read
admin> set enabled = yes
admin> write
DS3-ATM/{ shelf-1 trunk-module-2 2 } written
```

The following commands add VPI 10 and VPI 20 as valid VPI, for virtual channel switching on the first and second active ports, respectively. The addition of these VPIs doubles the number of VCCs the ports can handle from 8K to 16K:

```
admin> read ds3-atm {1 trunk-module-2 1}
DS3-ATM/{ shelf-1 trunk-module-2 1 } read
admin> set line-config vc-switching-vpi 2 = 10
admin> write
DS3-ATM/{ shelf-1 trunk-module-2 1 } written
admin> read ds3-atm {1 trunk-module-2 2}
DS3-ATM/{ shelf-1 trunk-module-2 2 } read
admin> set line-config vc-switching-vpi 2 = 20
admin> write
DS3-ATM/{ shelf-1 trunk-module-2 2 } written
```
Checking DS3-ATM trunk interface status

The Stinger MRT-2 unit creates a DS3-ATM-Stat profile for each of its DS3-ATM interfaces. The profiles provide information about the state of the physical interfaces, error counters, and other status information. The error counters in the DS3-ATM-Stat profile are cleared when the DS3 physical interface becomes active (synchronized). The counts accumulate every second if an error occurs.

Following are the DS3-ATM-Stat parameters, shown with sample settings for an active line:

```
[in DS3-ATM-STAT/ { shelf-1 trunk-module-2 1 }]
physical-address** = { shelf-1 trunk-module-2 1 }  
line-state = active
spare-physical-address = { any-shelf any-slot 0 }  
sparing-state = sparing-none
vpi-vci-range = vpi-0-255-vci-32-8191
vc-switching-vpi = 0
vcc-vpi = [ 0 0 0 0 0 0 0 0 ]  
f-bit-error-count = 0
p-bit-error-count = 0
cp-bit-error-count = 0
feb-error-count = 0
bpv-error-count = 0
loss-of-signal = False
loss-of-frame = False
yellow-receive = False
ais-receive = False
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical-address</td>
<td>Physical location of the DS3-ATM line within the Stinger MRT-2 system.</td>
</tr>
<tr>
<td>line-state</td>
<td>Overall state of the DS3 line, which can be any of the following states:</td>
</tr>
<tr>
<td></td>
<td>■ active—Line is enabled and a multipoint connection is established.</td>
</tr>
<tr>
<td></td>
<td>■ does-not-exist—Link is not physically on the trunk module.</td>
</tr>
<tr>
<td></td>
<td>■ disabled—Line is disabled.</td>
</tr>
<tr>
<td></td>
<td>■ loss-of-signal—Near end has loss of signal.</td>
</tr>
<tr>
<td></td>
<td>■ loss-of-frame—Near end has loss of frame (also known as a Red Alarm).</td>
</tr>
<tr>
<td></td>
<td>■ yellow-alarm—Near end is receiving a Yellow Alarm from the far end, indicating a loss of framing.</td>
</tr>
<tr>
<td></td>
<td>■ ais-receive—Near end is receiving an Alarm Indication signal (AIS).</td>
</tr>
</tbody>
</table>
### Configuring a DS3-ATM Trunk Module

**Checking DS3-ATM trunk interface status**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>spare-physical-address</td>
<td>Redundant 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.</td>
</tr>
<tr>
<td>sparing-state</td>
<td>State of the redundancy function. The sparing-none value indicates that redundancy is not enabled. If redundancy is enabled and the current port is the primary trunk port, the value can be primary-active or primary-inactive. If redundancy is enabled and the current port is the secondary trunk port, the value can be secondary-active or secondary-inactive.</td>
</tr>
<tr>
<td>vpi-vci-range</td>
<td>Current valid VCI range configured for the port.</td>
</tr>
<tr>
<td>vc-switching-vpi</td>
<td>Array of VPIs used for virtual channel switching.</td>
</tr>
<tr>
<td>vcc-vpi</td>
<td>For internal use only.</td>
</tr>
<tr>
<td>f-bit-error-count</td>
<td>Number of F-bit errors. If three or more errors occur in up to 16 consecutive F-bits in a DS3 M-frame, a DS3 out-of-frame defect is detected. If an out-of-frame defect is consistent for up to 10 seconds, a DS3 loss-of-frame defect is detected.</td>
</tr>
<tr>
<td>p-bit-error-count</td>
<td>Number of P-bit parity errors. These errors occur when the system receives P-bit code on a DS3 M-frame that is not identical to the corresponding P-bit code that was calculated locally.</td>
</tr>
<tr>
<td>cp-bit-error-count</td>
<td>Number of CP-bit parity errors.</td>
</tr>
<tr>
<td>feb-error-count</td>
<td>Number of far-end C-bit coding violations reported through the far-end block error count.</td>
</tr>
<tr>
<td>bpv-error-count</td>
<td>Number of bipolar violation (BPV) errors. BPV errors can indicate that the line sent consecutive one bits with the same polarity. It could also mean that three or more consecutive zeroes were sent.</td>
</tr>
<tr>
<td>loss-of-signal</td>
<td>Loss of signal on the line. False indicates that the carrier is maintaining a connection.</td>
</tr>
<tr>
<td>loss-of-frame</td>
<td>Loss of frame on the line (also known as a Red Alarm.) False indicates that the line is enabled and in frame.</td>
</tr>
<tr>
<td>yellow-receive</td>
<td>Far end loss-of-frame (Yellow Alarm) occurred on the line. False indicates that a Yellow Alarm was not received.</td>
</tr>
<tr>
<td>ais-receive</td>
<td>Far end is sending an Alarm Indication signal (AIS). False indicates that the local device has not received an AIS.</td>
</tr>
</tbody>
</table>

For details about DS3 line errors, see RFC 1407, *Definitions of Managed Objects for the DS3/E3 Interface Type*.
Traffic aggregation with the DS3-ATM module

The ports of the DS3-ATM trunk module can be used to aggregate the traffic of several Stinger MRT-2 units. DS3 traffic passes into and out from the ATM switch through only one unit. Figure 10-3 shows this type of connection.

Figure 10-3. DS3-ATM traffic aggregation connection

DS3-ATM traffic aggregation connection

For DS3-ATM traffic aggregation, the units must be connected as follows (see Figure 10-3):

- The receive connector of port 2 on the DS3-ATM trunk module in the top unit is connected directly to the transmit connector of port 1 on the module in the second (bottom) unit.

- The transmit connector of port 1 on DS3-ATM module in the second (bottom) unit is connected directly to the receive connector of port 2 on the module in the top unit.

- The transmit and receive connectors of port 2 on the second (bottom) unit are connected to an ATM switch.

When PVCs are properly configured, traffic from the first (top) Stinger MRT-2 is switched through the second (bottom) unit so that the traffic of both units can use the uplink connection of the second unit.

Aggregation failure protection with the DS3-ATM bypass feature

The bypass feature of the DS3-ATM trunk module for the Stinger MRT-2 unit allows traffic from one unit to pass through (bypass) the DS3-ATM module in a second Stinger MRT-2. Bypass occurs if the second unit fails or becomes inactive.
For bypass to work, the units must be connected for DS3-ATM traffic aggregation. (For details, see “DS3-ATM traffic aggregation connection” on page 10-9.) The connections allow DS3-ATM traffic from the first unit to reach the ATM switch, so that end-to-end continuity to the final uplink connection is not interrupted.

Neither connector on the second (bypassed) unit has continuity to the internal ATM switch of the unit when its DS3-ATM module is in bypass mode.

**DS3-ATM trunk module specifications**

The two-port DS3-ATM trunk module provides two active and two standby trunk connections at data rates of 44.736 Mbps at each port. You can configure each port as one of the following:

- User-to-Network Interface (UNI)
- Interim Interswitch Signaling Protocol (IISP) connection
- Direct trunk

Table 10-2 provides DS3-ATM trunk module specifications.

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
</table>
| Physical dimensions | Height: 0.875 inches (2.2cm)  
                      | Width: 5.85 inches (14.86cm)  
                      | Depth: 6.95 inches (17.65cm)  
                      | Weight: 8.6 ounces (0.244kg)  |
| Power requirements  | 6 watts (maximum)                                                             |
| Temperature range   | -40°F to 149°F (-40°C to 65°C)                                                |
| Operating humidity  | 0% to 90%, noncondensing.                                                      |
| Agency approvals    | Electromagnetic Emissions Certifications: FCC Part 15 Class A, CISPR Class A.|
| Interlace standards | ITU G.703.  
                      | ANSI T1.102.                                                                   |
Other standards supported

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI T1E1.1/94-002R1.</td>
<td></td>
</tr>
<tr>
<td>ANSI T1.107.</td>
<td></td>
</tr>
<tr>
<td>ANSI T1.107a.</td>
<td></td>
</tr>
<tr>
<td>ANSI T1.403.</td>
<td></td>
</tr>
<tr>
<td>ATM Forum UNI 3.0/3.1.</td>
<td></td>
</tr>
<tr>
<td>Bellcore TR-NWT 001112.</td>
<td></td>
</tr>
<tr>
<td>Bellcore TR-TSY-000499.</td>
<td></td>
</tr>
<tr>
<td>Bellcore TR-NWT-000820.</td>
<td></td>
</tr>
<tr>
<td>ITU G.804.</td>
<td></td>
</tr>
<tr>
<td>RFC 1407.</td>
<td></td>
</tr>
<tr>
<td>TR54014 (AT&amp;T ACCUNET T45 and T45R).</td>
<td></td>
</tr>
<tr>
<td>Telcordia TR/NWT-000821.</td>
<td></td>
</tr>
</tbody>
</table>

Physical interfaces

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two ATM UNI 3.0/3.1 cell-bearing DS3 ports supporting C-bit/M-framing, PLCP according to TR-TSY-000773, and direct cell mapping according to G.804.</td>
<td></td>
</tr>
<tr>
<td>BNC connector according to ANSI T1.404.</td>
<td></td>
</tr>
</tbody>
</table>
Stinger MRT-2 Intended Use

User line interfaces

Users can connect to the Stinger MRT-2 over ADSL lines. Internal splitters also allow lines from a POTS switch to be connected to the unit. Both the subscriber DSL lines and lines to the POTS switch connect to the Stinger with USOC RJ-21X 50-pin telephone company connectors. Information about connecting and disconnecting the 50-pin connectors is provided in “Connecting cables to a Stinger MRT-2 unit” on page 3-12. For detailed pinout information, see “50-pin telephone company connector cable specifications” on page C-4.

Network interfaces

The Stinger MRT-2 unit extracts data from the digital subscriber line and switches it to remote ATM switches depending on the configuration of virtual circuit and path information. Stinger modules are available that support ATM connections to ATM network switches over the following types of digital lines:

- T1 (individual lines or aggregated bandwidth)
- E1 (individual lines or aggregated bandwidth)
- DS3
- OC3

For an explanation of installation and configuration options, see the chapter for a specific module.
Administrative interfaces

The Stinger MRT-2 is equipped with the following interfaces for configuration and administration. For an explanation of basic configuration options, see Chapter 6, “Configuring Administrative Access, System Timing, and Startup Settings.”

- A DB-9 female connector for an RS-232 serial connection, with the following default settings:
  - 9600bps
  - Direct connection
  - 8 data bits
  - No parity
  - 1 stop bit
  - No flow control

- A DB-9 female connector for alarm monitoring connections.

- An RJ-45 connector for a 10BaseT Ethernet connection.

- An RJ-11 connector for the internal modem.

For additional details about these connectors, including pin-out information, see Appendix C, “Cables and Connectors.”
Hosted Operation of Cascaded Stinger MRT units

Beginning with TAOS version 9.6.0, you can provision and manage up to five cascaded Stinger MRT or MRT-2 units as a single hosted system, with a single management interface. This Appendix explains the details of this type of operation. Throughout the remainder of this section the term Stinger MRT is used to refer to capabilities that are available on all Stinger MRT 19, Stinger MRT 23, and Stinger MRT-2 units.

Hosted operation of multiple Stinger MRT units is accomplished by connecting the STS-3 ports of the units together. The units must be cabled together in daisy chain fashion via their cascade ports (labeled EXP1 and EXP2), and each unit must be assigned a unique shelf ID via the back panel rotary switch labeled SHELF ID.

Only one of the Stinger MRT units supports ATM trunk interfaces, and that unit must be the controlling unit (the host) for the hosted system. You configure the host's controller to operate in master mode, and assign it shelf ID 1. All provisioning and management of the hosted system is performed on the host.

The other cascaded units (remote shelves) are included in the hosted system topology by enabling the remote shelf through a profile for that shelf ID. This action causes a control link to be established between the host and that shelf. You configure the controller of each of the remote shelves to operate in slave mode and assign each shelf a unique shelf ID from 2 to 7. All upstream traffic from a remote shelf is carried through the MRT cascade ports to the host trunk interfaces.

Note For performance reasons, the recommended maximum number of shelves in a Stinger MRT hosted system is five (one master and four remote shelves). However, the software can support up to seven shelves, so valid shelf IDs range from 2 to 7.

Introduction to the host management interface

All provisioning and management of the hosted system is performed on the host. You can telnet to the host's command-line through an Ethernet port, or via the ATM management connection over the host system's trunk interface.

The look and feel of the host management interface is very similar to that of a standalone system, except that some commands now require that you specify a shelf
Hosted Operation of Cascaded Stinger MRT units

Configuring hosted MRT system operations

ID in the physical address of a slot or port, and the shelf ID is also now displayed in the output of commands that previously showed only slot and port information. In addition, some commands are new, or have been extended for hosted system management. For details, see “Monitoring the status of remote shelves” on page B-16.

For example, the `show` command has been extended to include information about all shelves with an active control link to the host. The following command output shows that in addition to the host shelf (shelf ID 1), shelves 3, 4, 5, and 6 have an active link to the host. The shelf ID of a remote shelf is set by the SHELF ID switch on that shelf.

```
HOST> show
Shelf 1 ( master ):
  Reqd  Oper  Slot Type
 { shelf-1 slot-1 0 }         UP    UP     mrt-36-adsl-card
 { shelf-1 trunk-module-1 0 } UP    UP     oc3-atm-trunk-daughter-card
 { shelf-1 trunk-module-2 0 } UP    UP     ds3-atm-trunk-daughter-card
 { shelf-3 slot-1 0 }         UP    UP     mrt-36-adsl-card
 { shelf-3 first-control-mod+ UP    UP     mrt-cm
 { shelf-4 slot-1 0 }         UP    UP     mrt-36-shdsl-card
 { shelf-4 first-control-mod+ UP    UP     mrt-cm
 { shelf-5 slot-1 0 }         UP    UP     mrt-36-adsl-card
 { shelf-5 first-control-mod+ UP    UP     mrt-cm
 { shelf-6 slot-1 0 }         UP    UP     mrt-36-adsl-card
 { shelf-6 first-control-mod+ UP    UP     mrt-cm
```

**Note** All configuration profiles reside on and are accessible only on the host system.

You can also use the `open` command to access the controllers and LIMs of remote shelves directly from the host, or to access the host from a remote shelf. For example, the following command opens a session with the LIM in slot 1 of remote shelf 3:

```
HOST> open 3 1
mrtdmt-3/1>
```

Opening a session to the resources of a remote shelf is useful for diagnosing error conditions, checking configurations, or performing certain maintenance functions, but it cannot be used to provision the remote shelf.

The `open` command can also be used on a remote shelf to open a session to the host. For example, a repair or maintenance technician can open a session to the host to inspect or change the configuration, run diagnostics, or perform certain maintenance functions. In addition, once a session is open to the host, an additional session can be opened from the host back to a remote shelf.

**Configuring hosted MRT system operations**

In a hosted system, the host controller is configured as the *master* controller and the remote shelf controllers operate as *slaves*. The master controller uses some of the bandwidth of the cascade port for control messages to remote system resources—for example, to set up virtual circuits, update or create profiles, and manage the remote DSL interfaces. When a slave controller receives control messages from the master controller, it acts as proxy for the master controller and forwards the messages to the proper resource.
To enable up to five Stinger MRT systems to operate as a hosted system, complete the following steps:

1. Cable the units together via the cascade ports.
2. Configure each remote shelf to operate in slave mode, then reset.
3. Configure the host unit to operate in master mode, then reset.
4. On the host system, enable each remote shelf.
5. Verify that the hosted system topology is correct.
6. Provision virtual circuits from remote LIMs.

**Cabling Stinger MRT units together**

As shown in Figure B-1, each Stinger MRT unit has a pair of STS-3 connectors, labeled EXP1 and EXP2, used to cascade units. For details about cabling these ports, see the appropriate section of the unit’s Getting Started Guide.

Figure B-1 also shows that remote shelves do not have trunk interfaces. Only the host Stinger MRT provides connection and access to the network through its trunk interfaces.

![Figure B-1. Hosted MRT system](image)

**Caution** Path redundancy is not supported with this software version. There must be a single path from a remote shelf to the host. Do not connect both cascade ports on a remote shelf toward the host.

A hosted system can contain a mix of Stinger MRT model types. A remote shelf with any valid shelf ID (from 2 to 7) can be connected in any order to either of the host’s cascade ports.

If a remote shelf is configured with an invalid shelf ID or a shelf ID that has been assigned to another shelf, the remote shelf is not accepted into the hosted system topology.

With a single path from a remote shelf to the host, failure of a single unit can cause inaccessibility of downstream remote shelves. The host detects and reports remote shelves that become unreachable due to failures.

**Configuring the remote shelves**

A console connection to the serial port of the remote shelf is required to complete the initial setup of the unit. For details about connecting a terminal to the unit and logging in, see the appropriate section of the unit’s Getting Started Guide.
Note Most configuration changes are not allowed from a remote shelf. Currently, only the system profile is user-writable on remote shelves, as shown in step 3 below. After a system has been upgraded to the current software and configured to operate in slave mode, the other profiles that are needed for its operation are provided with appropriate default settings automatically by the system.

To configure a remote shelf, follow these steps:

1. If the unit previously operated in standalone mode and does not already have a multishelf-capable boot loader (mrtcmb.bin), you must first perform an upgrade by using the load command from the console connection. Follow the upgrade instructions for this software version.

2. If the unit previously operated in standalone mode and has profile configurations, clear NVRAM to bring the system configuration back to a factory-default state.

3. Through the serial port console connection, enable slave mode in the system profile. Following are the required commands:
   ```
   admin> read system
   admin> set shelf-controller-type = slave
   admin> write -f
   ```

4. Turn the SHELF ID rotary switch to a value between 2 and 7. This value must be unique within the hosted system.

   Figure B-2 shows a close-up of the SHELF ID rotary switch on an MRT-2 chassis. The switch is in a different location on a Stinger MRT 23 or MRT 19 chassis, but is otherwise identical.

   **Figure B-2. SHELF ID switch on a Stinger MRT back panel**

   Note Typically, you set the SHELF ID switch once and do not change it after the shelf has been added to a hosted system topology. If you change a system’s shelf ID and reset the system, profiles configured for the previous shelf ID no longer apply.

5. Reset the system.

   After a unit’s shelf-controller-type has been changed, it must be reset for the change to become effective.

   When shelf-controller-type is set to slave, if the rotary switch is not set to a number from 2 to 7, the unit does not complete its initialization. In that case, the system software remains in a holding state and issues repeated log emergency messages to the console.
Configuring the host system to operate in master mode

To configure the host to operate as the master controller, follow these steps:

1. If the unit previously operated in standalone mode and does not already have a multishelf-capable boot loader (`mrtcmb.bin`), you must first perform an upgrade by using the `load` command from the console connection. Follow the upgrade instructions for this software version.

2. Enable master mode in the `system` profile. Following are the required commands:
   ```
   admin> read system
   admin> set shelf-controller-type = master
   admin> write -f
   ```

3. Make sure that the rotary switch is set to 1.

4. Reset the system.
   
   After a unit's `shelf-controller-type` has been changed, it must be reset for the change to become effective.

   When `shelf-controller-type` is set to `master`, if the rotary switch is set to a number other than 1, a log message is displayed, but the system continues initialization and becomes operational with a shelf ID of 1.

Enabling the remote shelves in the hosted system

For each shelf you want to put into service, you need to create and enable a `remote-shelf-config` profile on the host system. The profiles are indexed by shelf ID, and are also accessible via SNMP. Following are the profile's parameters, shown with default values for the remote shelf with shelf-ID 3:

```
[in REMOTE-SHELF-CONFIG/shelf-3]
remote-shelf-id* = shelf-3
enabled = no
name = ""
location = ""
remote-shelf-type = stngr-cascaded-mrt
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote-shelf-id</td>
<td>The shelf ID of the remote shelf. This value is set by the system when it detects the remote shelf across the cascade port.</td>
</tr>
<tr>
<td>enabled</td>
<td>Enables/disables the remote shelf. Enabling a remote shelf causes a control link to be established between the host and that shelf. By default, remote shelves are initially disabled.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the remote shelf, up to 23 characters, to uniquely identify each remote shelf in a hosted system.</td>
</tr>
<tr>
<td>location</td>
<td>Location of the remote shelf, up to 83 characters. This field is used to specify the physical location of the remote shelf equipment.</td>
</tr>
</tbody>
</table>
Configuring hosted MRT system operations

For example, the following steps show how to add shelves 2 through 5:

HOST> new remote-shelf-config shelf-2
HOST> set enabled = yes
HOST> write -f
HOST> new remote-shelf-config shelf-3
HOST> set enabled = yes
HOST> write -f
HOST> new remote-shelf-config shelf-4
HOST> set enabled = yes
HOST> write -f
HOST> new remote-shelf-config shelf-5
HOST> set enabled = yes
HOST> write -f

Checking the hosted system topology

To display a picture of the remote shelf topology recognized by the host, use the `topology -p` command. The topology command is described in more detail in “Displaying hosted MRT system topology and statistics” on page B-22.

For example, the following output shows a topology of 4 remote shelves:

HOST> topol -p

```
-------------------
| MASTER: 1         |
EXP1---------------------------EXP2
|                           |
| Slave     : 5 |             | Slave     : 2 |
-------EXP1-------             -------EXP2-------
|                           |
|                           |
-------EXP1-------             -------EXP1-------
| Slave     : 4 |             | Slave     : 3 |
-------EXP2-------             -------EXP2-------
```

For more information about checking the status of a remote shelf, see “Displaying hosted MRT system topology and statistics” on page B-22.
Provisioning virtual circuits in the hosted system

You use the same profiles and procedure for provisioning virtual circuits in a hosted system as you do on standalone Stinger MRT. For background information about provisioning virtual circuits, see the Stinger ATM Configuration Guide.

DSL interfaces on each shelf are assigned nailed group numbers using the default ranges shown in Table B-1.

<table>
<thead>
<tr>
<th>Shelf number</th>
<th>Default nailed-group range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (the host)</td>
<td>1..4000</td>
</tr>
<tr>
<td>2</td>
<td>4001..6000</td>
</tr>
<tr>
<td>3</td>
<td>6001..8000</td>
</tr>
<tr>
<td>4</td>
<td>8001..10000</td>
</tr>
<tr>
<td>5</td>
<td>10001..12000</td>
</tr>
<tr>
<td>6</td>
<td>12001..14000</td>
</tr>
<tr>
<td>7</td>
<td>14001..16000</td>
</tr>
</tbody>
</table>

These default nailed-group numbers can be obtained for any specific interface in the hosted system by using the which command. For example, the following command displays the nailed-group number of the DSL interface on shelf 3, slot 2, port 1:

```
admin> which -n { 3 2 1 }
```

Nailed group corresponding to port { shelf-3 slot-2 1 } is 6101

Figure B-3 shows a sample LIM-trunk virtual circuit configuration from a LIM interface on shelf #3 to a host trunk port.

```
admin> which -n { 3 2 1 }
```

Nailed group corresponding to port { shelf-3 slot-2 1 } is 6101

Figure B-3. Sample hosted virtual circuit configuration

The following commands provision an ATM circuit from the DSL interface on shelf 3 to a host OC3 interface:

```
HOST> new connection
HOST> set station = pvc-3-2-1
HOST> set atm-options nailed-group = 6101
HOST> set atm-options vci = 55
HOST> set atm-connect-options nailed-group = 801
HOST> set atm-connect-options vci = 55
```
**HOST> write -f**

You can use standard ATM-related commands, such as `atmvcx` or `atmvcl`, to display connection information in hosted systems. For example, the following command displays information about virtual circuits on shelf 3:

```
HOST> atmvcx -sh 3
```

<table>
<thead>
<tr>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>Kind</td>
</tr>
<tr>
<td>Permanent</td>
<td>VC</td>
</tr>
<tr>
<td>pvc-3-2-1</td>
<td>pvc</td>
</tr>
</tbody>
</table>

**Restoring a remote shelf to standalone operations**

After a unit's `shelf-controller-type` has been set to `slave`, you cannot restore the system to standalone operations by simply changing the `shelf-controller-type` setting to `standalone`. To restore a slave controller to standalone mode, you must clear the system’s NVRAM. For example:

```
admin> nvram -f
```

When the system comes up again following the `nvram` command, its `shelf-controller-type` is set to `standalone` by default.

**Traffic management in hosted MRT systems**

With earlier software versions, upstream bandwidth was not configurable for Stinger MRT platforms. Guaranteed upstream LIM bandwidth is now configurable for MRT platforms as for other Stinger platforms. For details about this type of configuration, see the *Stinger ATM Configuration Guide*.

**Deprecated `atm-config` profile**

In a hosted Stinger MRT system, the total amount of LIM bandwidth varies when remote shelves are added or removed. To accommodate this environment, ATM parameters previously located in the `atm-config` profile have been relocated in the system or `slot-static-config` profiles, and the `atm-config` profile has been deprecated.

The system creates a `slot-static-config` profile for a remote LIM dynamically, when the associated `remote-shelf-config` profile is created (written).

**Note** The system provides a seamless upgrade from earlier releases by relocating existing configurations from the deprecated `atm-config` profile to their new locations, as shown in Table B-2. The parameters still work as described in the *Stinger ATM Configuration Guide* and *Stinger Reference Guide*.

**Table B-2. New locations for traffic management settings**

<table>
<thead>
<tr>
<th>Deprecated configuration settings</th>
<th>Replacement configuration settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>[in ATM-CONFIG:slot-vpi-vci-range] slot-vpi-vci-range[N]</code></td>
<td><code>[in SLOT-STATIC-CONFIG/\{ shelf-M slot-N \} vpi-vci-range</code></td>
</tr>
</tbody>
</table>
LIM slot CAC support

Because upstream data in a hosted system converges at the master, all shelves in the hosted system now perform CAC calculations by default at connection time. LIMs in the remote shelves guarantee bandwidth by performing LIM slot CAC, and the host itself performs calculations on both the bandwidth of its trunk interfaces and its cascade ports.

Hosted MRT system bandwidth and CAC calculations

For a general description of CAC and how the system uses guaranteed bandwidth values for CAC purposes, see the Stinger ATM Configuration Guide. For details about each CAC setting, see the Stinger Reference Guide.

Following are the LIM and trunk CAC parameters, shown with default settings:

```
[in SLOT-STATIC-CONFIG/{shelf-M slot-N 0}]
allow-guaranteed-up-stream-bandwidth = 42500
port-cac-enable = no
port-over-subscription = 10
slot-cac-enable = yes
slot-over-subscription = 10
```

```
[in HIGH-SPEED-SLOT-STATIC-CONFIG/{shelf-1 trunk-N 1}]:trunk-cac-config[1]
enable = yes
over-subscription = 10
```
With the default CAC configuration, for a PVC connection request from a remote LIM to a host trunk, the system performs bandwidth calculations in the sequence shown in Figure B-4:

1. Remote shelf LIM slot bandwidth
2. Host trunk port bandwidth
3. Host cascade port bandwidth

Figure B-4. Slot-level CAC bandwidth calculations performed with default settings

LIM port CAC is disabled by default. To enable it, you must set cac-preference to provisioning-time system-wide. For details, see the Stinger ATM Configuration Guide.

In addition, you must configure the LIM's slot-static-config profile by setting port-cac-enable to yes, with a nonzero value for port-over-subscription.
When port-level CAC is enabled, the system performs two additional CAC calculations before allowing a connection to be provisioned. The port-level CAC sequence is shown in Figure B-5. If sufficient bandwidth is not available at any one of the calculation points, the connection profile cannot be written.

Figure B-5. Port-level CAC sequence (performed only at provisioning time)

**Upstream traffic shaping in a hosted system**

The system shapes traffic in the transmit output direction at the maximum line rate of a host trunk port and of every slave cascade port in the system. The line rate is not configurable for these interfaces. Virtual path shaping, which enables traffic shaping control on a per-VPI basis, can be configured and applied only at the host trunk ports.

For LIM interfaces on the host and on remote shelves, the `allow-max-up-stream-bandwidth` setting provides a configurable maximum line rate for upstream traffic from the LIM.

**Hosted MRT system management**

This section describes some common administrative tasks and the procedures, commands, and profiles specifically related to hosted systems. For general system management procedures, see the Stinger Administration Guide. For details about specific commands and profiles, see the Stinger Reference Guide.

**Upgrading hosted MRT system software**

To upgrade a hosted Stinger MRT system, you must first upgrade the host’s software by following the upgrade instructions for the new software version. This section explains related issues.

If you are upgrading a Stinger MRT system from an earlier software version, the system preserves the existing configuration and operation of a standalone MRT or a set of subtended units. However, to convert the system to hosted operation, you would need to modify the subtending configuration.
Normally, you do not need to clear the system’s NVRAM for an upgrade. However, if the upgrade requires this step, you must follow the instructions in “Required steps before initializing NVRAM in the host” on page B-12.

A typical upgrade is described in “Automatic upgrade procedure” on page B-12.

A manual upgrade, in which you explicitly load new software to each remote shelf, is described in “Manual upgrade via loadslave (optional procedure)” on page B-13.

**Note** Always check the specific upgrade instructions for a new software version. This section describes general procedure and requirements.

### Required steps before initializing NVRAM in the host

Before you initialize nonvolatile random-access memory in the host, you must save basic configuration settings to the default.cfg file in the system’s flash memory, to enable the system to restore a minimal configuration. For background information about default.cfg, see the *Stinger Administration Guide*.

**Caution** For a hosted system, it’s very important to save enough profile information in default.cfg to allow the master controller to restore the hosted system framework and recognize the remote shelves. Otherwise, when you load the saved configuration file after clearing NVRAM, the host will drop connection profiles with nailed groups that do not yet exist in the system.

To ensure that the system reestablishes all remote shelves and connections after its NVRAM has been initialized, follow these steps:

1. On the host, create a default.cfg file with minimal required profiles. For example:
   ```bash
   HOST> save flash 1/default.cfg -p remote-shelf-config system
   ip-interface ip-route user
   ```

2. Back up the system configuration that contains connection data for remote LIMs. For example:
   ```bash
   HOST> save -a network 10.5.63.145 hostmrt-config-0930
   ```

3. Initialize NVRAM on the host.
   ```bash
   HOST> nvram -f
   ```

4. After the host has reinitialized and reset, wait until it has recreated its remote-shelf-config and slot-static-config profiles.

   The slot-static-config profiles for remote LIMs are created dynamically when the corresponding remote-shelf-config profile is written.

5. Restore the system configuration containing remote LIM connection data. For example:
   ```bash
   HOST> load config network 10.5.63.145 hostmrt-config-0930
   ```

### Automatic upgrade procedure

A typical software upgrade modifies only the system’s operational code. For this type of upgrade, following is the general procedure for upgrading a host Stinger and up to 5 remote shelves from a TFTP server on the network:

1. Load the new software to host flash:
HOST> load tar network 10.5.63.145 mrtrel.tar

2 Reset the host.
   HOST> reset

Or, if the software version specifically requires an upgrade of the bootloader code as well, follow this general procedure:

1 Load the new bootloader code to host flash:
   HOST> load boot-mrt network 10.5.63.145 mrtcmb.bin

2 Load the new software to host flash:
   HOST> load tar network 10.5.63.145 mrtrel.tar

3 Reset the host.
   HOST> reset

When you reset the host system following the upgrade, the boot code forces the cascade ports to come up in an enabled state. The boot code then communicates the version and size of the host’s runtime image to the slave controllers. If the slave controller detects a difference from its runtime image, it initiates a download from the host.

The remote shelf controller runtime code is loaded to the shelf’s local flash memory, but the LIM code is loaded from the host directly to the remote shelf’s RAM.

You do not need to reset each remote shelf separately. The system resets slave controllers automatically when you use the automatic upgrade procedure.

Manual upgrade via loadslave (optional procedure)

You can choose to upgrade each shell manually, to slightly reduce the service outage of an upgrade procedure. The loadslave command loads software to a remote shelf from the host’s flash memory. To upgrade the shelves manually, the loadslave command must be entered before resetting the host. (After the reset, system automatically upgrades remote shelves with older software.)

The loadslave command uses the following syntax:

loadslave shelf [image (1=cmb.bin 2=cmb.bin 3=cm.fss)]

For example, the following command loads the operational software from the host to remote shelf 2:

HOST> loadslave 2 3

The first argument specifies the remote shelf ID, and the second argument represents the file to load, as shown in the following list:

<table>
<thead>
<tr>
<th>Number</th>
<th>File name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 or 2</td>
<td>mrtcmb.bin</td>
<td>Bootloader image 1 or 2, which are currently identical.</td>
</tr>
<tr>
<td>3</td>
<td>mrtcm.fss</td>
<td>Operational (runtime) software</td>
</tr>
</tbody>
</table>

For a manual upgrade of the operational code only, following is the general procedure for upgrading a host Stinger and 3 remote shelves from a TFTP server on the network:

1 Load the new operational code to host flash:
HOST> load tar network 10.5.63.145 mrtrel.tar

2 Before resetting the host, use the loadslave command to transfer the upgraded operational code to each remote shelf. For example, the following commands load the boot code to shelves 2, 3, and 4:

   HOST> loadslave 2 3
   HOST> loadslave 3 3
   HOST> loadslave 4 3

3 Reset the host.

   HOST> reset

For a manual upgrade that includes a bootloader upgrade, following is the general procedure for upgrading a host Stinger and up to 3 remote shelves from a TFTP server on the network:

1 Load the new host boot software to host flash:

   HOST> load boot-mrt network 10.5.63.145 mrtcmb.bin

2 Load the new operational code to host flash:

   HOST> load tar network 10.5.63.145 mrtrel.tar

3 Before resetting the host, use the loadslave command to transfer the upgraded software. For example, the following commands load the boot code to shelves 2, 3, and 4:

   HOST> loadslave 2
   HOST> loadslave 3
   HOST> loadslave 4

   The following commands load the upgraded software to shelves 2, 3, and 4:

   HOST> loadslave 2 3
   HOST> loadslave 3 3
   HOST> loadslave 4 3

4 Reset the host.

   HOST> reset

Resetting a hosted system

From the host, you can reset the host system only, a specific remote shelf, or the entire hosted system. If you use the reset command with no options, the default action is to reset all controllers in the hosted system. For example:

   HOST> reset

To reset only the master controller (the controller in the host system), use the -m option:

   HOST> reset -m

To reset a specific remote shelf, use the -s option and specify the shelf’s ID. For example, the following command resets shelf 3:

   HOST> reset -s 3

In an open session to a remote shelf, the -m and -s options are not supported. Executing a reset on a remote shelf resets only that shelf.
Monitoring remote LIMs and connections

Some Stinger administrative commands have been modified to support a shelf-specific option, to allow you to focus on a particular remote shelf rather than obtain a large output for all interfaces or connections in the hosted system. Where appropriate, output of these commands now shows the shelf number, along with slot and port.

Displaying status of remote DSL lines

The following new options have been added to Stinger commands for monitoring LIMs, to specify a shelf, or a shelf and slot combination on the command line:

- `sh shelf`
- `sl shelf slot`

These options are not order-dependent, they can appear before or after other options when entering the following commands:

- `dsllines`
- `dmtaldsllines`
- `hdsllines`
- `sdsllines`
- `shdsllines`
- `vdsllines`

Displaying shelf-specific ATM connection and signaling information

The following new option has been added to Stinger commands for displaying ATM connection and signaling details:

- `sh shelf`

This option applies to the following commands:

- `atmvcl`
- `atmypl`
- `atmvcx`
- `atmvpx`
- `spvcc`
- `spvpc`
- `spvcshow`
- `atmsig`

You can also specify a shelf number with the existing `-s (slot)`, `-p (port)`, or `-d (details) options to these commands. If no shelf number is specified, shelf 1 is assumed. For example, the following command shows PVC cross-connects on shelf 2, slot 1:

`HOST> atmvcx -s 2 1`

<table>
<thead>
<tr>
<th>Profile</th>
<th>Kind</th>
<th>Intf</th>
<th>Sh</th>
<th>Sl</th>
<th>Port</th>
<th>VPI</th>
<th>VCI</th>
<th>Oper</th>
<th>Intf</th>
<th>Sh</th>
<th>Sl</th>
<th>Port</th>
<th>VPI</th>
<th>VCI</th>
<th>Oper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent VC X-Connects:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Monitoring the status of remote shelves

The remote-shelf-stat profile resides on the host for monitoring remote shelves. The remoteshelf command displays information about enabled remote shelves in the hosted system.

You can also set alarms and traps to notify an SNMP management station when certain conditions occur on a remote shelf.

Using the remote-shelf-stat profile

When the host detects an enabled remote shelf, the system creates a remote-shelf-stat profile for the shelf. For example:

HOST> dir remote-shelf-stat
  0 08/27/2003 16:11:22 shelf-2
  0 08/27/2003 16:17:39 shelf-3
  0 08/27/2003 16:13:33 shelf-4

As with other stat profiles, the remote-shelf-stat profile is read-only, and maintains dynamic state information regarding the remote shelf. It is accessible by SNMP managers. Following are the read-only fields in a profile for shelf 3:

```
[remote-shelf-stat/shelf-3]
remote-shelf-id* = shelf-3
host-port = { { any-shelf any-slot 0 } 0 }
remote-shelf-oper-state = remote-shelf-oper-state-up
name = MyShelfName
location = MyShelfLocation
internal-fan-unit-failed = no
external-fan-unit-failed = no
door-open = no
over-temperature = no
contact-closure = [ no no no no no no no ]
topology = { remote-shelf-cascade-port-none any-shelf any-shelf }

[remote-shelf-stat/shelf-2:host-port]
physical-address = { any-shelf any-slot 0 }
logical-item = 0

[remote-shelf-stat/shelf-2:contact-closure]
contact-closure[1] = no
contact-closure[2] = no
contact-closure[3] = no
contact-closure[4] = no
contact-closure[5] = no
contact-closure[6] = no
contact-closure[7] = no
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote-shelf-id</td>
<td>Shelf ID of the remote shelf represented in this profile.</td>
</tr>
</tbody>
</table>
Using the remoteshelf command

A new remoteshelf command displays information about enabled remote shelves. It uses the following syntax on a hosted system:

`HOST> help remoteshelf`

`usage: remoteshelf -[s|o] <param>`

- `remoteshelf with no options`, show all configured remote shelves
- `remoteshelf -s <shelf>`, show detailed information for a single remote shelf

For example, the following command shows details about remote shelf 3:

`HOST> remoteshelf -s 3`

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote-shelf-oper-state</td>
<td>The operational state of the remote shelf. Values can indicate that the remote shelf is up or down, if the link between the host and remote shelf failed to come up, or that the host-to-shelf autodiscovery process is currently in progress or has established the link to the operational remote shelf.</td>
</tr>
<tr>
<td>internal-fan-unit-failed</td>
<td>Not meaningful for Stinger MRT units.</td>
</tr>
<tr>
<td>external-fan-unit-failed</td>
<td>Not meaningful for Stinger MRT units.</td>
</tr>
<tr>
<td>door-open</td>
<td>Not meaningful for Stinger MRT units.</td>
</tr>
<tr>
<td>over-temperature</td>
<td>Whether the cabinet temperature exceeds the threshold (yes or no).</td>
</tr>
<tr>
<td>contact-closure[n]</td>
<td>An array of indexed parameters that indicate the contact closure state (yes if contact closure is detected) on the corresponding remote shelf. <strong>Only the first two contact closure values are meaningful for Stinger MRT units.</strong></td>
</tr>
<tr>
<td>host-port:physical-address</td>
<td>The physical address of the remote shelf. The address specifies a shelf ID, followed by a slot number, followed by the item number of an addressable entity within the context of shelf and slot.</td>
</tr>
<tr>
<td>host-port:logical-item</td>
<td>A number that specifies an addressable logical entity within the context of a physical address.</td>
</tr>
<tr>
<td>topology:port-towards-host-shelf</td>
<td>The port on the remote shelf used for the link to the host.</td>
</tr>
<tr>
<td>topology:port-1-shelf</td>
<td>The shelf ID of the remote shelf directly connected to the first cascade port on the host.</td>
</tr>
<tr>
<td>topology:port-2-shelf</td>
<td>The shelf ID of the remote shelf directly connected to the second cascade port on the host.</td>
</tr>
</tbody>
</table>
Hosted Operation of Cascaded Stinger MRT units
Hosted MRT system management

Oper State: OPER_UP
Up Count: 2
Last Up Time: Wed Sep 17 15:45:25 2003
Last down Time: Wed Sep 17 15:45:21 2003

Without any options, the command displays all configured remote shelves:

HOST> remoteshelf
Shelf Name AdminState OperState host-port up-count
2 MyShelfName Enabled OPER_Down {{ 0 0 0} 0} 0

Setting alarms for events on remote shelves

Alarms triggered by events on remote shelves operate within the existing profile-based alarm infrastructure, which is described in the Stinger Administration Guide. If you configure an alarm to be active by setting its value to yes, an action is triggered and volatile profiles are updated. An emergency level log message is generated whenever the alarm is raised or cleared.

The following parameter, shown with its default setting, determines the scope of an alarm event in a hosted system:

[in ALARM/*]
physical-address = { any-shelf any-slot 0 }

The default setting represents all remote shelves in the hosted system. To specify an alarm event that will be triggered only when it occurs on the host itself, specify shelf 1. For example:

HOST> set physical-address shelf = shelf-1

To configure an alarm for a specific remote shelf, specify the ID of that shelf. For example, to configure an alarm for shelf 2:

HOST> set physical-address shelf = shelf-2

An alarm profile specific to a remote shelf is deleted if the remote-shelf-config profile for that shelf is deleted, and the corresponding alarms are cleared.

Remote shelf alarm events

Following are alarm events related to MRT remote shelves:

Table B-3. Hosted MRT alarm events

<table>
<thead>
<tr>
<th>event setting</th>
<th>Event on remote shelf that triggers alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote-shelf-state-change</td>
<td>The remote shelf changes state. The new status is shown in the remote-shelf-oper-state setting of the remote-shelf-stat profile.</td>
</tr>
<tr>
<td>input-relay-closed</td>
<td>Contact-closure sensors on the remote shelf indicate closure. The status is shown in the contact-closure[N] setting of the remote-shelf-stat profile.</td>
</tr>
<tr>
<td>input-relay-open</td>
<td>Contact-closure sensors on the remote shelf indicate loss of contact closure. The status is shown in the contact-closure[N] setting of the remote-shelf-stat profile.</td>
</tr>
</tbody>
</table>
**Sample alarm for remote shelf 3 state change**

The following commands set an alarm for a change in status of shelf 3:

```
HOST> new alarm shelf-3
HOST> set enabled = yes
HOST> set event = remote-shelf-state-change
HOST> set physical-address shelf = shelf-3
HOST> write -f
```

If the alarm is triggered (for example, if shelf 3 becomes unavailable), an emergency log message is displayed. For example:

```
LOG emergency, Shelf 1, Controller-1, Time: 14:26:35--
   Wed Sep 17 14:26:35 2000 - ALARM: Remote Shelf { 3 } Alarm is: Active
```

The following alarm command shows that an alarm has been set and the remote shelf is down:

```
HOST> alarm -s
Type            Address       State
Remote Shelf Down      {  3 }        Active
```

When the shelf changes state again, for example, when it comes up or is disabled in the remote-shelf-config profile, the alarm is cleared. For example:

```
LOG emergency, Shelf 1, Controller-1, Time: 14:28:16--
   Wed Sep 17 14:28:16 2000 - ALARM: Remote Shelf { 3 } Alarm is: Cleared
```

```
HOST> alarm -s
Type            Address       State
```

**Sample alarm for input-relay closure status on any remote shelf**

The following commands configure an alarm for input-relay closure on any remote shelf in a hosted system:

```
HOST> new alarm closed
HOST> set enabled = yes
HOST> set event = input-relay-closed
HOST> write -f
HOST> new alarm open
HOST> set enabled = yes
HOST> set event = input-relay-open
HOST> write -f
```

If one of the alarms is triggered, the alarm action takes effect, and the remote-shelf-stat profile is updated. In addition, the status is accessible in the output of the `alarm -s` command. For example, the following output shows contact closure on shelf 2:

```
HOST> alarm -s
Type            Address           State
Input Relay Closed     {  2  0  1 }       Active
```
Enabling traps for events on remote shelves

When you have configured a trap profile to generate a trap protocol data unit (PDU) on detection of a certain event, if the event occurs, the system sends a PDU to a specified SNMP station. For hosted systems, the host sends trap PDUs generated by any shelf in the system. For background information about traps, see the Stinger Administration Guide.

**Trap optimization**

To streamline the number of traps generated by remote shelves, you can enable trap optimization. Trap optimization behavior depends on the settings of the following parameters, shown with default values:

```
[ in TRAP/* ]
trap-optimization-enabled = no
slot-enabled = no
linkdown-enabled = yes
linkup-enabled = yes
ascend-link-down-trap-enabled = no
ascend-link-up-trap-enabled = no
```

To fully enable trap optimization, set all these fields to yes. For example:

```
HOST> read trap dsl-snmp
HOST> set trap-optimization-enabled = yes
HOST> set slot-enabled = yes
HOST> set ascend-link-down-trap-enabled = yes
HOST> set ascend-link-up-trap-enabled = yes
HOST> write -f
```

The following trap optimizations are made:

- LinkUp and LinkDown traps are not generated unless `ascend-link-down-trap-enabled` and `ascend-link-up-trap-enabled` are set to no.
- AscendLinkUp traps are not generated in the case of slots coming up and system reset. In these cases, the ascendLinkUp trap will not be sent for 120 seconds after the slot comes up.
- AscendLinkDown traps are not generated in the case of slots going down.
- The sysSlotStateChange trap is generated only for the slot status changes to `operStateDown` or `operStateUp`. The trap is not sent for other intermediate states such as `operStateLoading` and `operStatePost`.
- If `trap-optimization-enabled` is set to yes but `slot-enabled` is set to no, the system generates ascendLinkDown and ascendLinkUp traps for each line when a slot changes state, and does not generate the sysSlotStateChange trap.

**Note** If `trap-optimization-enabled` is set to yes but `ascend-link-down-trap-enabled` and `ascend-link-up-trap-enabled` are set to no, the system generates linkDown and linkUp traps in all scenarios.
Modified traps to include shelf numbers

Several traps have been modified to include the value of the shelf number along with the slot index for events such as a card reset, slot state change, system clock change, flash state change, CAC failure, or ATM OAM loopback timeout. In addition, new traps have been introduced for events and state changes on remote shelves.

Enabling remote shelf watchdog warning traps

To enable the system to send traps related to sensors on remote shelves, the following parameters must be set to yes (their default value):

```
[ in TRAP/**]
remote-shelf-enabled = yes
watchdog-warning-enabled = yes
```

Remote shelf watchdog profiles are created and deleted on the host depending on the operational state of the remote-shelf-stat profile for that shelf. These profiles are indexed using the `shelf-number` x 1000 + the unit value on the remote shelf. For example,

$$4001 = 4 \times 1000 + 1$$

For example:

```
HOST> dir watchdog
  68  11/06/2003 11:59:46  { thermal shelf-controller 1 }
  41  11/06/2003 11:59:53  { relay cm-input-relay 1 }
  41  11/06/2003 11:59:53  { relay cm-input-relay 2 }
  41  11/06/2003 11:59:53  { relay cm-input-relay 3 }
  68  11/06/2003 11:59:46  { thermal shelf-controller 4001 }
  33  11/06/2003 00:24:08  { relay cm-input-relay 4001 }
  33  11/06/2003 00:22:27  { relay cm-input-relay 4002 }
  33  11/06/2003 00:22:27  { relay cm-input-relay 4003 }
```

The next commands configure a trap profile to support these watchdog warnings on a remote shelf, to be sent to an SNMP station at IP address 10.10.10.1:

```
HOST> new trap 10.10.10.1
HOST> set host-address = 10.10.10.1
HOST> set alarm-enabled = yes
HOST> set remote-shelf-enabled = yes
HOST> set watchdog-warning-enabled = yes
HOST> write -f
```

You can disable a specific remote shelf watchdog by modifying the watchdog profile. For example:

```
HOST> read watchdog { relay cm-input-relay 4003 }
HOST> set watchdog-trap-enable = no
HOST> write -f
```

For more details about traps and watchdogs, see the Stinger Administration Guide.
Displaying hosted MRT system topology and statistics

To display the topology of a hosted system, use the topology command. The command uses the following syntax:

```
HOST> ? topology
```

```
topologyDetails Display the topology details
Usage: topology -[p|d|s|r] <options>
topology with no options, displays entire topology
topology -p pictorial display of topology
topology -d <shelfId> displays details of shelf
topology -s <shelfId> displays the statistics
topology -r <shelfId> on master, sends Init to Slave
```

You can also execute the topology command in an open session on a remote shelf. In that case, the command displays the details of that shelf.

Displaying the entire topology

With no options, the topology command displays details about each shelf in the hosted system. In the following example, remote shelf 3 is connected to EXP1, and no remote shelves are connected after it. On EXP2 remote shelf 2 is connected, followed by remote shelf 5.

```
HOST> topol
Slaves connected to EXP1 of Master
==================================
ShelfId : 3
Operational State : UP
Admin State : UP
Position : 1
MrtType : STINGER_MRT_23INCH_PLATFORM
MRT Connected to Exp1 : 1
MRT Connected to Exp2 : 16
Port connected to - On Master : 0
Port connected to - On Slave : 0

Slaves connected to EXP2 of Master
==================================
ShelfId : 2
Operational State : UP
Admin State : UP
Position : 1
MrtType : STINGER_MRT_23INCH_PLATFORM
MRT Connected to Exp1 : 1
MRT Connected to Exp2 : 5
Port connected to - On Master : 1
Port connected to - On Slave : 0

ShelfId : 5
Operational State : UP
Admin State : UP
Position : 2
MrtType : STINGER_MRT_23INCH_PLATFORM
MRT Connected to Exp1 : 2
```
MRT Connected to Exp2 : 16
Port connected to - On Master : 1
Port connected to - On Slave : 0

Table B-4 shows details displayed by this command:

Table B-4. Details displayed for each shelf in the topology

<table>
<thead>
<tr>
<th>Output field</th>
<th>Description of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShelfId</td>
<td>ID of the remote shelf.</td>
</tr>
<tr>
<td>Operational State</td>
<td>Operational state of the remote shelf.</td>
</tr>
<tr>
<td>Admin State</td>
<td>State set by the administrator, either in a profile or by using a command.</td>
</tr>
<tr>
<td>Position</td>
<td>Position of the remote shelf relative to the host.</td>
</tr>
<tr>
<td>MrtType</td>
<td>Description of the Stinger MRT platform.</td>
</tr>
<tr>
<td>MRT Connected to Exp1</td>
<td>ID of shelf connected to that EXP1 port. The string ANY-SHELF indicates an invalid shelf ID. The number 16 indicates that no remote shelf is connected to the port.</td>
</tr>
<tr>
<td>MRT Connected to Exp2</td>
<td>ID of shelf connected to that EXP2 port. The string ANY-SHELF indicates an invalid shelf ID. The number 16 indicates that no remote shelf is connected to the port.</td>
</tr>
<tr>
<td>Port connected to - On Master</td>
<td>The cascade port used by the host to connect to the remote shelf. The string ANY-PORT indicates an invalid port number.</td>
</tr>
<tr>
<td>Port connected to - On Slave</td>
<td>The cascade port used by the remote shelf to connect to host. The string ANY-PORT indicates an invalid port number.</td>
</tr>
</tbody>
</table>

Displaying a picture of the topology

For a picture of the topology, use the topology -p command. For example:

HOST> topol -p

------------------------
| MASTER: 1 |
EXP1------------------EXP2
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Hosted Operation of Cascaded Stinger MRT units

Displaying the details for a specific shelf

You can also display the details about a particular shelf by using the `topology -d` command and specifying the remote shelf ID. For example:

```
HOST> topol -d 5
ShelfId : 5
Operational State : UP
Admin State : UP
Position : 2
MrtType : STINGER_MRT_23INCH_PLATFORM
MRT Connected to Exp1 : 2
MRT Connected to Exp2 : 16
Port connected to - On Master : 1
Port connected to - On Slave : 0
```

These are the same details described in Table B-4 on page B-23, but represent a single shelf only.

Displaying statistics for a specific shelf

To display statistics about the types of packets received and sent to a particular shelf, use the `topology -s` command with the remote shelf ID. For example:

```
HOST> topol -s 3
Statistics of Shelf: 3
discovery restart : 0
Number of requests received
Valid : 1
Duplicate ShelfId : 0
Admin State not UP: 0
Invalid : 0
Discarded : 0
Number of Ack Sent : 1
Number of Nack Sent : 0
Number of Reset Sent : 0
Number of Init Sent : 0
```

Table B-5 shows details displayed by this command:

<table>
<thead>
<tr>
<th>Output field</th>
<th>Description of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>discovery restart</td>
<td>Number of times autodiscovery has been restarted.</td>
</tr>
<tr>
<td>Number of requests received</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>Duplicate ShelfId</td>
</tr>
<tr>
<td></td>
<td>Admin State not UP</td>
</tr>
</tbody>
</table>
When you specify shelf ID 1, indicating the host, the topology -s command displays the number of erroneous packets received. For example:

```bash
HOST> topol -s 1
Discarded packets   : 0
Request Rcvd with Invalid ShelfID   : 0
```

Table B-6 shows details displayed by this command:

<table>
<thead>
<tr>
<th>Output field</th>
<th>Description of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discarded packets</td>
<td>Packets discarded due to header errors, intermediate shelves being down. No action had been taken on these packets, they were silently discarded.</td>
</tr>
<tr>
<td>Request Rcvd with Invalid ShelfID</td>
<td>Autodiscovery received from with invalid shelf ID (a shelf ID outside the range from 2 to 7).</td>
</tr>
</tbody>
</table>

If you execute this command on the remote shelf, statistics are displayed for that shelf only. For example:

```bash
HOST> open 3 8
SLAVE3/8>> topol -s
Statistics of Shelf: 3
Discarded packets   : 0
Discovery restart   : 0
Number of Req Sent  : 126
Number of Ack Rcvd  : 0
Number of Nack Rcvd : 0
Number of PassThruReq : 0
Number of PassThruRep : 0
Number of Init Rcvd  : 0
Number of Reset Rcvd : 0
```

Table B-7 shows details displayed by this command:
Hosted Operation of Cascaded Stinger MRT units
Hosted MRT system management

Table B-7. Statistics displayed in an open session on the remote shelf

<table>
<thead>
<tr>
<th>Output field</th>
<th>Description of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discarded packets</td>
<td>Packet discarded due to header errors.</td>
</tr>
<tr>
<td>Discovery restart</td>
<td>Number of times Auto Discovery has been restarted.</td>
</tr>
<tr>
<td>Number of Req Sent</td>
<td>Number of Auto Discovery Request sent.</td>
</tr>
<tr>
<td>Number of Ack Rcvd</td>
<td>Number of Acks received from the host.</td>
</tr>
<tr>
<td>Number of Nack Rcvd</td>
<td>Number of Nacks received from the host.</td>
</tr>
<tr>
<td>Number of PassThruReq</td>
<td>Number of pass through request forwarded.</td>
</tr>
<tr>
<td>Number of PassThruRep</td>
<td>Number of pass through replies forwarded.</td>
</tr>
<tr>
<td>Number of Init Rcvd</td>
<td>Number of Inits received from the host.</td>
</tr>
<tr>
<td>Number of Reset Rcvd</td>
<td>Number of Resets received from the host.</td>
</tr>
</tbody>
</table>

Sending an init packet to a remote shelf

Usually, the host sends an init packet to a remote shelf only if its administrative state is UP and its operational state is DOWN. To restart autodiscovery between the host and a remote shelf without resetting the shelf, use the topology -r command and specify the shelf’s ID. For example:

HOST> topo1 -r 2
Cables and Connectors

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Alarm connector pinouts ............................................................... C-2
Ethernet interface specifications .................................................... C-3
STS-3 (synchronous transport signals-3) connector specifications ........ C-3
50-pin telephone company connector cable specifications ............... C-4
T1 and E1 connector and cable specifications ................................. C-11

CONSOLE port and cable pinouts

The CONSOLE serial port uses a standard DB-9 female connector that conforms to the EIA RS-232 standard for serial interfaces. Table C-1 shows the pinouts and their functions.

Table C-1. CONSOLE serial port and cable pinouts

<table>
<thead>
<tr>
<th>DB-9 pin number</th>
<th>RS-232 signal name</th>
<th>Function</th>
<th>I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Data Carrier Detect</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>RD</td>
<td>Serial Receive Data</td>
<td>O</td>
</tr>
<tr>
<td>3</td>
<td>SD</td>
<td>Serial Transmit Data</td>
<td>I</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>Data Terminal Ready</td>
<td>I</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal Ground</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>Data Set Ready</td>
<td>O</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>Request to Send</td>
<td>I</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>Clear to Send</td>
<td>O</td>
</tr>
<tr>
<td>9*</td>
<td>RI*</td>
<td>Ring Indicator*</td>
<td>O*</td>
</tr>
</tbody>
</table>

*Pin 9 is not active. (A ring indication signal is not supplied.)
Cables and Connectors

Alarm connector pinouts

The ALARM RELAY connector consists of a DB-15 female connector. This connector provides access to two alarm relays within the unit. These relays can be connected to remote alarms or monitoring devices to report the status of the Stinger MRT-2.

The ALARM RELAY connector also provides access to four status relays within the unit that have the ability to monitor the alarm status of up to four remote devices.

Table C-2 shows the pins of the ALARM RELAY connector and their function.

Table C-2. Alarm input pinouts

<table>
<thead>
<tr>
<th>ALARM RELAY connector pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Alarm relay 1: normally closed</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Alarm relay 1: common</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Alarm relay 1: normally open</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Alarm relay 2: normally closed</td>
</tr>
<tr>
<td>Pin 5</td>
<td>Alarm relay 2: common</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Alarm relay 2: normally open</td>
</tr>
<tr>
<td>Pin 7</td>
<td>Status relay 3</td>
</tr>
<tr>
<td>Pin 8</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 9</td>
<td>Not used</td>
</tr>
<tr>
<td>Pin 10</td>
<td>Status relay 4</td>
</tr>
<tr>
<td>Pin 11</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 12</td>
<td>Status relay 5</td>
</tr>
<tr>
<td>Pin 13</td>
<td>Ground</td>
</tr>
<tr>
<td>Pin 14</td>
<td>Status relay 6</td>
</tr>
<tr>
<td>Pin 15</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Operation or nonoperation of the status relays is detected by the TAOS software, based on continuity or lack of continuity between the pair of pins to which it is connected.

The status relay connections apply 3.3Vdc at less than 10mA through the closed contacts of the remote relay. The cable associated with this connector must consist of 24-gauge-to-28-gauge conductors.
Ethernet interface specifications

The base Stinger unit has an Ethernet interface that supports the physical specifications of IEEE 802.3 and IEEE 802.14 with Ethernet 2 (Ethernet/DIX) framing. The unit provides a single Ethernet interface, labeled ETNERNET 10BT, that supports a 10BaseT unshielded twisted pair (UTP) cable with an RJ-45 connector.

The Ethernet address used to identify the Ethernet interface resides in the Stinger MRT unit's motherboard.

STS-3 (synchronous transport signals-3) connector specifications

Connection from the STS-3 connector on one Stinger MRT-2 unit to an STS-3 connector on another unit requires a Category 5 crossover cable with RJ-45 connectors. The pin arrangement and wiring for both ends of a crossover cable are described in Table C-3 and Table C-4.

Table C-3. RJ-45 connector (normal end)

<table>
<thead>
<tr>
<th>RJ-45 pin number</th>
<th>Function</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Transmit (positive)</td>
<td>Orange/White</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Transmit (negative)</td>
<td>Orange</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Receive (positive)</td>
<td>Green/White</td>
</tr>
<tr>
<td>Pin 4</td>
<td>No connection (NC)</td>
<td>Blue</td>
</tr>
<tr>
<td>Pin 5</td>
<td>NC</td>
<td>Blue/White</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Receive (negative)</td>
<td>Green</td>
</tr>
<tr>
<td>Pin 7</td>
<td>NC</td>
<td>Brown/White</td>
</tr>
<tr>
<td>Pin 8</td>
<td>NC</td>
<td>Brown</td>
</tr>
</tbody>
</table>

Table C-4. RJ-45 connector (crossover end)

<table>
<thead>
<tr>
<th>RJ-45 pin number</th>
<th>Function</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Transmit (positive)</td>
<td>Green/White</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Transmit (negative)</td>
<td>Green</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Receive (positive)</td>
<td>Orange/White</td>
</tr>
<tr>
<td>Pin 4</td>
<td>NC</td>
<td>Blue</td>
</tr>
<tr>
<td>Pin 5</td>
<td>NC</td>
<td>Blue/White</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Receive (negative)</td>
<td>Orange</td>
</tr>
</tbody>
</table>
Cables and Connectors
50-pin telephone company connector cable specifications

Table C-4. RJ-45 connector (crossover end) (continued)

<table>
<thead>
<tr>
<th>RJ-45 pin number</th>
<th>Function</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 7</td>
<td>NC</td>
<td>Brown/White</td>
</tr>
<tr>
<td>Pin 8</td>
<td>NC</td>
<td>Brown</td>
</tr>
</tbody>
</table>

50-pin telephone company connector cable specifications

Subscriber line DSL connections and voice connections, on some models, to the telephone switch use USOC RJ-21X 50-pin telephone company connectors on the Stinger MRT-2 chassis, as shown in Figure C-1.

Figure C-1. USOC RJ-21X 50-pin connector

The MRT-2 chassis provides three LINE connectors for subscriber voice-over-DSL connections, and three POTS connectors for connection to a voice switch. The Stinger MRT-2 supports a total of 72 subscriber connections.

Pinouts for subscriber line DSL connections

Three 50-pin connectors on the left, labeled LINE 1-24, LINE 25-48, and LINE 49-72, provide up to 72 DSL connections to individual subscribers. Three similar connectors on the right, labeled POTS 1-24, POTS 25-48, and POTS 49-72 provide up to 72 connections to a POTS switch providing analog voice service. Internal splitters combine the analog POTS service from the switch with the Stinger DSL service for delivery to subscribers over the same pair of LINE wires. Table C-5, Table C-6, and Table C-7 provide the cable pinouts for the LINE connectors on the Stinger MRT-2 chassis.
### Table C-5. Cable pinouts for the 1-24 LINE connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line 1 ring</td>
<td>Blue/white 26</td>
<td>26</td>
<td>Line 1 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>Line 2 ring</td>
<td>Orange/white 27</td>
<td>27</td>
<td>Line 2 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>Line 3 ring</td>
<td>Green/white 28</td>
<td>28</td>
<td>Line 3 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>Line 4 ring</td>
<td>Brown/white 29</td>
<td>29</td>
<td>Line 4 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>Line 5 ring</td>
<td>Slate/white 30</td>
<td>30</td>
<td>Line 5 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>Line 6 ring</td>
<td>Blue/red 31</td>
<td>31</td>
<td>Line 6 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>Line 7 ring</td>
<td>Orange/red 32</td>
<td>32</td>
<td>Line 7 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>Line 8 ring</td>
<td>Green/red 33</td>
<td>33</td>
<td>Line 8 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>Line 9 ring</td>
<td>Brown/red 34</td>
<td>34</td>
<td>Line 9 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>Line 10 ring</td>
<td>Slate/red 35</td>
<td>35</td>
<td>Line 10 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>Line 11 ring</td>
<td>Blue/black 36</td>
<td>36</td>
<td>Line 11 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>Line 12 ring</td>
<td>Orange/black 37</td>
<td>37</td>
<td>Line 12 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>Line 13 ring</td>
<td>Green/black 38</td>
<td>38</td>
<td>Line 13 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>Line 14 ring</td>
<td>Brown/black 39</td>
<td>39</td>
<td>Line 14 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>Line 15 ring</td>
<td>Slate/black 40</td>
<td>40</td>
<td>Line 15 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>Line 16 ring</td>
<td>Blue/yellow 41</td>
<td>41</td>
<td>Line 16 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>Line 17 ring</td>
<td>Orange/yellow 42</td>
<td>42</td>
<td>Line 17 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>Line 18 ring</td>
<td>Green/yellow 43</td>
<td>43</td>
<td>Line 18 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>Line 19 ring</td>
<td>Brown/yellow 44</td>
<td>44</td>
<td>Line 19 tip</td>
<td>Yellow/brown</td>
</tr>
<tr>
<td>20</td>
<td>Line 20 ring</td>
<td>Slate/yellow 45</td>
<td>45</td>
<td>Line 20 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>Line 21 ring</td>
<td>Blue/violet 46</td>
<td>46</td>
<td>Line 21 tip</td>
<td>Violet/blue</td>
</tr>
<tr>
<td>22</td>
<td>Line 22 ring</td>
<td>Orange/violet 47</td>
<td>47</td>
<td>Line 22 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>Line 23 ring</td>
<td>Green/violet 48</td>
<td>48</td>
<td>Line 23 tip</td>
<td>Violet/green</td>
</tr>
<tr>
<td>24</td>
<td>Line 24 ring</td>
<td>Brown/violet 49</td>
<td>49</td>
<td>Line 24 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A 50</td>
<td>NC</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
# Cables and Connectors

50-pin telephone company connector cable specifications

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**Table C-6. Cable pinouts for the 25-48 LINE connector**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line 25 ring</td>
<td>Blue/white</td>
<td>26</td>
<td>Line 25 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>Line 26 ring</td>
<td>Orange/white</td>
<td>27</td>
<td>Line 26 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>Line 27 ring</td>
<td>Green/white</td>
<td>28</td>
<td>Line 27 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>Line 28 ring</td>
<td>Brown/white</td>
<td>29</td>
<td>Line 28 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>Line 29 ring</td>
<td>Slate/white</td>
<td>30</td>
<td>Line 29 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>Line 30 ring</td>
<td>Blue/red</td>
<td>31</td>
<td>Line 30 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>Line 31 ring</td>
<td>Orange/red</td>
<td>32</td>
<td>Line 31 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>Line 32 ring</td>
<td>Green/red</td>
<td>33</td>
<td>Line 32 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>Line 33 ring</td>
<td>Brown/red</td>
<td>34</td>
<td>Line 33 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>Line 34 ring</td>
<td>Slate/red</td>
<td>35</td>
<td>Line 34 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>Line 35 ring</td>
<td>Blue/black</td>
<td>36</td>
<td>Line 35 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>Line 36 ring</td>
<td>Orange/black</td>
<td>37</td>
<td>Line 36 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>Line 37 ring</td>
<td>Green/black</td>
<td>38</td>
<td>Line 37 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>Line 38 ring</td>
<td>Brown/black</td>
<td>39</td>
<td>Line 38 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>Line 39 ring</td>
<td>Slate/black</td>
<td>40</td>
<td>Line 39 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>Line 40 ring</td>
<td>Blue/yellow</td>
<td>41</td>
<td>Line 40 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>Line 41 ring</td>
<td>Orange/yellow</td>
<td>42</td>
<td>Line 41 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>Line 42 ring</td>
<td>Green/yellow</td>
<td>43</td>
<td>Line 42 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>Line 43 ring</td>
<td>Brown/yellow</td>
<td>44</td>
<td>Line 43 tip</td>
<td>Yellow/brown</td>
</tr>
<tr>
<td>20</td>
<td>Line 44 ring</td>
<td>Slate/yellow</td>
<td>45</td>
<td>Line 44 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>Line 45 ring</td>
<td>Blue/violet</td>
<td>46</td>
<td>Line 45 tip</td>
<td>Violet/blue</td>
</tr>
<tr>
<td>22</td>
<td>Line 46 ring</td>
<td>Orange/violet</td>
<td>47</td>
<td>Line 46 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>Line 47 ring</td>
<td>Green/violet</td>
<td>48</td>
<td>Line 47 tip</td>
<td>Violet/green</td>
</tr>
<tr>
<td>24</td>
<td>Line 48 ring</td>
<td>Brown/violet</td>
<td>49</td>
<td>Line 48 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A</td>
<td>50</td>
<td>NC</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Table C-7. Cable pinouts for the 49-72 LINE connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line 49 ring</td>
<td>Blue/white</td>
<td>26</td>
<td>Line 49 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>Line 50 ring</td>
<td>Orange/white</td>
<td>27</td>
<td>Line 50 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>Line 51 ring</td>
<td>Green/white</td>
<td>28</td>
<td>Line 51 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>Line 52 ring</td>
<td>Brown/white</td>
<td>29</td>
<td>Line 52 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>Line 53 ring</td>
<td>Slate/white</td>
<td>30</td>
<td>Line 53 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>Line 54 ring</td>
<td>Blue/red</td>
<td>31</td>
<td>Line 54 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>Line 55 ring</td>
<td>Orange/red</td>
<td>32</td>
<td>Line 55 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>Line 56 ring</td>
<td>Green/red</td>
<td>33</td>
<td>Line 56 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>Line 57 ring</td>
<td>Brown/red</td>
<td>34</td>
<td>Line 57 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>Line 58 ring</td>
<td>Slate/red</td>
<td>35</td>
<td>Line 58 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>Line 59 ring</td>
<td>Blue/black</td>
<td>36</td>
<td>Line 59 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>Line 60 ring</td>
<td>Orange/black</td>
<td>37</td>
<td>Line 60 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>Line 61 ring</td>
<td>Green/black</td>
<td>38</td>
<td>Line 61 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>Line 62 ring</td>
<td>Brown/black</td>
<td>39</td>
<td>Line 62 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>Line 63 ring</td>
<td>Slate/black</td>
<td>40</td>
<td>Line 63 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>Line 64 ring</td>
<td>Blue/yellow</td>
<td>41</td>
<td>Line 64 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>Line 65 ring</td>
<td>Orange/yellow</td>
<td>42</td>
<td>Line 65 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>Line 66 ring</td>
<td>Green/yellow</td>
<td>43</td>
<td>Line 66 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>Line 67 ring</td>
<td>Brown/yellow</td>
<td>44</td>
<td>Line 67 tip</td>
<td>Yellow/brown</td>
</tr>
<tr>
<td>20</td>
<td>Line 68 ring</td>
<td>Slate/yellow</td>
<td>45</td>
<td>Line 68 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>Line 69 ring</td>
<td>Blue/violet</td>
<td>46</td>
<td>Line 69 tip</td>
<td>Violet/blue</td>
</tr>
<tr>
<td>22</td>
<td>Line 70 ring</td>
<td>Orange/violet</td>
<td>47</td>
<td>Line 70 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>Line 71 ring</td>
<td>Green/violet</td>
<td>48</td>
<td>Line 71 tip</td>
<td>Violet/green</td>
</tr>
<tr>
<td>24</td>
<td>Line 72 ring</td>
<td>Brown/violet</td>
<td>49</td>
<td>Line 72 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A</td>
<td>50</td>
<td>NC</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Cables and Connectors
50-pin telephone company connector cable specifications

Pinouts for POTS connections to a voice switch

Voice connections to a POTS switch use the three 50-pin connectors on the right side of the Stinger MRT-2 chassis, labeled POTS 1-24, POTS 25-48, and POTS 49-72. Table C-8, Table C-9, and Table C-10 provide the cable pinouts for the POTS connectors on the Stinger MRT-2 chassis.

Table C-8. Cable pinouts for the 1-24 POTS connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POTS 1 ring</td>
<td>Blue/white</td>
<td>26</td>
<td>POTS 1 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>POTS 2 ring</td>
<td>Orange/white</td>
<td>27</td>
<td>POTS 2 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>POTS 3 ring</td>
<td>Green/white</td>
<td>28</td>
<td>POTS 3 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>POTS 4 ring</td>
<td>Brown/white</td>
<td>29</td>
<td>POTS 4 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>POTS 5 ring</td>
<td>Slate/white</td>
<td>30</td>
<td>POTS 5 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>POTS 6 ring</td>
<td>Blue/red</td>
<td>31</td>
<td>POTS 6 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>POTS 7 ring</td>
<td>Orange/red</td>
<td>32</td>
<td>POTS 7 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>POTS 8 ring</td>
<td>Green/red</td>
<td>33</td>
<td>POTS 8 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>POTS 9 ring</td>
<td>Brown/red</td>
<td>34</td>
<td>POTS 9 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>POTS 10 ring</td>
<td>Slate/red</td>
<td>35</td>
<td>POTS 10 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>POTS 11 ring</td>
<td>Blue/black</td>
<td>36</td>
<td>POTS 11 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>POTS 12 ring</td>
<td>Orange/black</td>
<td>37</td>
<td>POTS 12 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>POTS 13 ring</td>
<td>Green/black</td>
<td>38</td>
<td>POTS 13 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>POTS 14 ring</td>
<td>Brown/black</td>
<td>39</td>
<td>POTS 14 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>POTS 15 ring</td>
<td>Slate/black</td>
<td>40</td>
<td>POTS 15 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>POTS 16 ring</td>
<td>Blue/yellow</td>
<td>41</td>
<td>POTS 16 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>POTS 17 ring</td>
<td>Orange/yellow</td>
<td>42</td>
<td>POTS 17 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>POTS 18 ring</td>
<td>Green/yellow</td>
<td>43</td>
<td>POTS 18 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>POTS 19 ring</td>
<td>Brown/yellow</td>
<td>44</td>
<td>POTS 19 tip</td>
<td>Yellow/brown</td>
</tr>
<tr>
<td>20</td>
<td>POTS 20 ring</td>
<td>Slate/yellow</td>
<td>45</td>
<td>POTS 20 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>POTS 21 ring</td>
<td>Blue/violet</td>
<td>46</td>
<td>POTS 21 tip</td>
<td>Violet/blue</td>
</tr>
<tr>
<td>22</td>
<td>POTS 22 ring</td>
<td>Orange/violet</td>
<td>47</td>
<td>POTS 22 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>POTS 23 ring</td>
<td>Green/violet</td>
<td>48</td>
<td>POTS 23 tip</td>
<td>Violet/green</td>
</tr>
</tbody>
</table>
### Table C-8. Cable pinouts for the 1-24 POTS connector (continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>POTS 24 ring</td>
<td>Brown/violet</td>
<td>49</td>
<td>POTS 24 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A</td>
<td>50</td>
<td>NC</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table C-9. Cable pinouts for the 25-48 POTS connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POTS 25 ring</td>
<td>Blue/white</td>
<td>26</td>
<td>POTS 25 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>POTS 26 ring</td>
<td>Orange/white</td>
<td>27</td>
<td>POTS 26 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>POTS 27 ring</td>
<td>Green/white</td>
<td>28</td>
<td>POTS 27 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>POTS 28 ring</td>
<td>Brown/white</td>
<td>29</td>
<td>POTS 28 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>POTS 29 ring</td>
<td>Slate/white</td>
<td>30</td>
<td>POTS 29 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>POTS 30 ring</td>
<td>Blue/red</td>
<td>31</td>
<td>POTS 30 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>POTS 31 ring</td>
<td>Orange/red</td>
<td>32</td>
<td>POTS 31 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>POTS 32 ring</td>
<td>Green/red</td>
<td>33</td>
<td>POTS 32 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>POTS 33 ring</td>
<td>Brown/red</td>
<td>34</td>
<td>POTS 33 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>POTS 34 ring</td>
<td>Slate/red</td>
<td>35</td>
<td>POTS 34 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>POTS 35 ring</td>
<td>Blue/black</td>
<td>36</td>
<td>POTS 35 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>POTS 36 ring</td>
<td>Orange/black</td>
<td>37</td>
<td>POTS 36 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>POTS 37 ring</td>
<td>Green/black</td>
<td>38</td>
<td>POTS 37 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>POTS 38 ring</td>
<td>Brown/black</td>
<td>39</td>
<td>POTS 38 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>POTS 39 ring</td>
<td>Slate/black</td>
<td>40</td>
<td>POTS 39 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>POTS 40 ring</td>
<td>Blue/yellow</td>
<td>41</td>
<td>POTS 40 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>POTS 41 ring</td>
<td>Orange/yellow</td>
<td>42</td>
<td>POTS 41 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>POTS 42 ring</td>
<td>Green/yellow</td>
<td>43</td>
<td>POTS 42 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>POTS 43 ring</td>
<td>Brown/yellow</td>
<td>44</td>
<td>POTS 43 tip</td>
<td>Yellow/brown</td>
</tr>
<tr>
<td>20</td>
<td>POTS 44 ring</td>
<td>Slate/yellow</td>
<td>45</td>
<td>POTS 44 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>POTS 45 ring</td>
<td>Blue/violet</td>
<td>46</td>
<td>POTS 45 tip</td>
<td>Violet/blue</td>
</tr>
</tbody>
</table>
### Cables and Connectors

50-pin telephone company connector cable specifications

#### Table C-9. Cable pinouts for the 25-48 POTS connector (continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>POTS 46 ring</td>
<td>Orange/violet</td>
<td>47</td>
<td>POTS 46 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>POTS 47 ring</td>
<td>Green/violet</td>
<td>48</td>
<td>POTS 47 tip</td>
<td>Violet/green</td>
</tr>
<tr>
<td>24</td>
<td>POTS 48 ring</td>
<td>Brown/violet</td>
<td>49</td>
<td>POTS 48 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A</td>
<td>50</td>
<td>NC</td>
<td>N/A</td>
</tr>
</tbody>
</table>

#### Table C-10. Cable pinouts for the 49-72 POTS connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POTS 49 ring</td>
<td>Blue/white</td>
<td>26</td>
<td>POTS 49 tip</td>
<td>White/blue</td>
</tr>
<tr>
<td>2</td>
<td>POTS 50 ring</td>
<td>Orange/white</td>
<td>27</td>
<td>POTS 50 tip</td>
<td>White/orange</td>
</tr>
<tr>
<td>3</td>
<td>POTS 51 ring</td>
<td>Green/white</td>
<td>28</td>
<td>POTS 51 tip</td>
<td>White/green</td>
</tr>
<tr>
<td>4</td>
<td>POTS 52 ring</td>
<td>Brown/white</td>
<td>29</td>
<td>POTS 52 tip</td>
<td>White/brown</td>
</tr>
<tr>
<td>5</td>
<td>POTS 53 ring</td>
<td>Slate/white</td>
<td>30</td>
<td>POTS 53 tip</td>
<td>White/slate</td>
</tr>
<tr>
<td>6</td>
<td>POTS 54 ring</td>
<td>Blue/red</td>
<td>31</td>
<td>POTS 54 tip</td>
<td>Red/blue</td>
</tr>
<tr>
<td>7</td>
<td>POTS 55 ring</td>
<td>Orange/red</td>
<td>32</td>
<td>POTS 55 tip</td>
<td>Red/orange</td>
</tr>
<tr>
<td>8</td>
<td>POTS 56 ring</td>
<td>Green/red</td>
<td>33</td>
<td>POTS 56 tip</td>
<td>Red/green</td>
</tr>
<tr>
<td>9</td>
<td>POTS 57 ring</td>
<td>Brown/red</td>
<td>34</td>
<td>POTS 57 tip</td>
<td>Red/brown</td>
</tr>
<tr>
<td>10</td>
<td>POTS 58 ring</td>
<td>Slate/red</td>
<td>35</td>
<td>POTS 58 tip</td>
<td>Red/slate</td>
</tr>
<tr>
<td>11</td>
<td>POTS 59 ring</td>
<td>Blue/black</td>
<td>36</td>
<td>POTS 59 tip</td>
<td>Black/blue</td>
</tr>
<tr>
<td>12</td>
<td>POTS 60 ring</td>
<td>Orange/black</td>
<td>37</td>
<td>POTS 60 tip</td>
<td>Black/orange</td>
</tr>
<tr>
<td>13</td>
<td>POTS 61 ring</td>
<td>Green/black</td>
<td>38</td>
<td>POTS 61 tip</td>
<td>Black/green</td>
</tr>
<tr>
<td>14</td>
<td>POTS 62 ring</td>
<td>Brown/black</td>
<td>39</td>
<td>POTS 62 tip</td>
<td>Black/brown</td>
</tr>
<tr>
<td>15</td>
<td>POTS 63 ring</td>
<td>Slate/black</td>
<td>40</td>
<td>POTS 63 tip</td>
<td>Black/slate</td>
</tr>
<tr>
<td>16</td>
<td>POTS 64 ring</td>
<td>Blue/yellow</td>
<td>41</td>
<td>POTS 64 tip</td>
<td>Yellow/blue</td>
</tr>
<tr>
<td>17</td>
<td>POTS 65 ring</td>
<td>Orange/yellow</td>
<td>42</td>
<td>POTS 65 tip</td>
<td>Yellow/orange</td>
</tr>
<tr>
<td>18</td>
<td>POTS 66 ring</td>
<td>Green/yellow</td>
<td>43</td>
<td>POTS 66 tip</td>
<td>Yellow/green</td>
</tr>
<tr>
<td>19</td>
<td>POTS 67 ring</td>
<td>Brown/yellow</td>
<td>44</td>
<td>POTS 67 tip</td>
<td>Yellow/brown</td>
</tr>
</tbody>
</table>
T1 and E1 connector and cable specifications

T1 and E1 connectors on a Stinger MRT-2 have RJ-48 female connectors that accept RJ-48 male plugs. Several type of T1 and E1 cables and connectors can connect the unit to WAN hardware.

T1 and E1 connector specifications

T1 and E1 WAN interfaces for the Stinger MRT-2 are supported by the female RJ-48 connectors on the T1 and E1 trunk modules. Table C-11 lists the pins assignments for the active pins on these connectors. The remaining pins are not connected.

Table C-11. Transmit and receive pins assignments for T1 and E1 trunk module connectors

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
<th>Pin</th>
<th>Signal</th>
<th>Color code</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>POTS 68 ring</td>
<td>Slate/yellow</td>
<td>45</td>
<td>POTS 68 tip</td>
<td>Yellow/slate</td>
</tr>
<tr>
<td>21</td>
<td>POTS 69 ring</td>
<td>Blue/violet</td>
<td>46</td>
<td>POTS 69 tip</td>
<td>Violet/blue</td>
</tr>
<tr>
<td>22</td>
<td>POTS 70 ring</td>
<td>Orange/violet</td>
<td>47</td>
<td>POTS 70 tip</td>
<td>Violet/orange</td>
</tr>
<tr>
<td>23</td>
<td>POTS 71 ring</td>
<td>Green/violet</td>
<td>48</td>
<td>POTS 71 tip</td>
<td>Violet/green</td>
</tr>
<tr>
<td>24</td>
<td>POTS 72 ring</td>
<td>Brown/violet</td>
<td>49</td>
<td>POTS 72 tip</td>
<td>Violet/brown</td>
</tr>
<tr>
<td>25</td>
<td>NC</td>
<td>N/A</td>
<td>50</td>
<td>NC</td>
<td>N/A</td>
</tr>
</tbody>
</table>

T1 and E1 cable specifications

Use only cables specifically constructed for transmission of T1 or E1 signals. The cables must meet standard T1 or E1 attenuation and transmission requirements. The following specifications are recommended:

- 100ohm (T1) or 120ohm (E1) resistance
- Two twisted pairs, Category 3 or better

The WAN interface cables and plugs described in the following sections are supported for the Stinger MRT-2 T1 and E1 WAN interfaces.
T1 or E1 crossover cable: RJ-48C/RJ-48C

Install the RJ-48C/RJ-48C cable when the WAN transmits on pins 5 and 4 and receives on pins 2 and 1. Figure C-2 and Table C-12 show the pinouts.

Figure C-2. RJ-48C/RJ-48C crossover cable.

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male RJ-48C</th>
<th>Male RJ-48C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
T1 or E1 straight-through cable: RJ-48C/RJ-48C

Before installing the RJ-48C/RJ-48C straight-through cable, verify that the WAN transmits on pins 2 and 1 and receives on pins 5 and 4. Figure C-3 and Table C-13 show the pinouts.

*Figure C-3. RJ-48C/RJ-48C straight-through cable specifications*

![RJ-48C/RJ-48C straight-through cable specifications](image)

*Table C-13. RJ-48C/RJ-48C straight-through cable specifications*

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male RJ-48C</th>
<th>Male RJ-48C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Cables and Connectors
T1 and E1 connector and cable specifications

T1 or E1 straight-through cable: RJ-48C/DB-15

Before installing the RJ-48C/DB-15 straight-through cable, verify that the WAN transmits on pins 3 and 11 and receives on pins 1 and 9. Figure C-4 and Table C-14 shows the pinouts.

Figure C-4. RJ-48C/DB-15 straight-through cable

Table C-14. RJ-48C/DB-15 straight-through cable specifications

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male RJ-48C</th>
<th>Male DB-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>
T1 or E1 crossover cable: RJ-48C/DB-15

Before installing the RJ-48C/DB-15 cable, verify that the WAN transmits on pins 1 and 9 and receives on pins 3 and 11. Figure C-5 and Table C-15 show the pinouts.

*Figure C-5. RJ-48C/DB-15 crossover cable*

![RJ-48C/DB-15 crossover cable](image)

*Table C-15. RJ-48C/DB-15 crossover cable specifications*

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male RJ-48C</th>
<th>Male DB-15P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>
Cables and Connectors

T1 and E1 connector and cable specifications

T1 or E1 straight-through cable: RJ-48C/Bantam

The WAN side of the RJ-48C/Bantam straight-through cable connects to dual bantam jacks. Figure C-6 and Table C-16 show the pinouts.

Figure C-6. RJ-48C/Bantam straight-through cable

Table C-16. RJ-48C/Bantam straight-through cable specifications

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male Dual 310-P</th>
<th>Male RJ-48</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>Tip 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ring 1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>Tip 2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ring 2</td>
<td>4</td>
</tr>
</tbody>
</table>

T1 or E1 RJ-48C-Loopback plug

The RJ-48C-Loopback plug loops the transmit signal back to the Stinger MRT-2. Table C-17 shows the pinouts.

Table C-17. RJ-48C-Loopback plug specifications

<table>
<thead>
<tr>
<th>Pair #</th>
<th>Signal</th>
<th>Male RJ-48C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receive</td>
<td>1 (connects to 4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 (connects to 5)</td>
</tr>
<tr>
<td>2</td>
<td>Transmit</td>
<td>4 (connects to 1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 (connects to 2)</td>
</tr>
</tbody>
</table>
Safety-Related Electrical, Physical, and Environmental Information

Electrical and electronic information information provides specifications, universal service order code (USOC) information, ground wire size, and electromagnetic interference (EMI) class.

Electronic and electrical specifications

The Stinger MRT-2 is nominally powered from a -48Vdc source. This source is wired to a power filter on the left side at the front of the chassis.

Caution The -48Vdc power source must include a double pole circuit breaker to provide a method of disconnecting the unit from power, as required by national and international safety standards UL 1950 and IEC/EN60950.

Table D-1 describes Stinger MRT-2 electronic and electrical specifications.

Table D-1. Stinger MRT-2 electronic and electrical specifications

<table>
<thead>
<tr>
<th>Application</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>-48Vdc</td>
<td>180 watts maximum</td>
</tr>
<tr>
<td>Input voltage</td>
<td>-42dc to -57.6dc</td>
</tr>
<tr>
<td>Inrush current</td>
<td>Minimal because all modules have inrush-limiting circuits</td>
</tr>
</tbody>
</table>
Table D-1. Stinger MRT-2 electronic and electrical specifications (continued)

<table>
<thead>
<tr>
<th>Application</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit breaker</td>
<td>5 amps</td>
</tr>
<tr>
<td>Power cable</td>
<td>In accordance with national standards and specifications as described in IEC 60950 (minimum wire size of 0.75mm² or 18 AWG for up to 6amps)</td>
</tr>
<tr>
<td>Connectors</td>
<td>Number 10 terminal lugs</td>
</tr>
<tr>
<td>Standards</td>
<td>Bellcore GR-1089-CORE, classified A2</td>
</tr>
</tbody>
</table>

USOC jack and code information

Stinger MRT-2 equipment complies with Part 68 of the U.S. Federal Communications Commission (FCC) Rules and uses the universal service order code (USOC) jack type and code shown in Table D-2. For information about FCC Part 68, see the Edge Access and Broadband Access Networks Safety and Compliance Guide.

Table D-2. Stinger MRT-2 T1 and E1 module USOC jacks and codes

<table>
<thead>
<tr>
<th>Model name</th>
<th>Facility interface code</th>
<th>Service order code</th>
<th>Jack type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRT19-TM-T1-4</td>
<td>04DU9-BN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-4</td>
<td>04DU9-DN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-4</td>
<td>04DU9-1KN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-4</td>
<td>04DU9-1SN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-4</td>
<td>04DU9-1ZN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-8</td>
<td>04DU9-BN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-8</td>
<td>04DU9-DN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-8</td>
<td>04DU9-1KN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-8</td>
<td>04DU9-1SN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-T1-8</td>
<td>04DU9-1ZN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-4</td>
<td>04DU9-BN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-4</td>
<td>04DU9-DN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-4</td>
<td>04DU9-1KN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-4</td>
<td>04DU9-1SN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-4</td>
<td>04DU9-1ZN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
</tbody>
</table>
**Table D-2. Stinger MRT-2 T1 and E1 module USOC jacks and codes (continued)**

<table>
<thead>
<tr>
<th>Model name</th>
<th>Facility interface code</th>
<th>Service order code</th>
<th>Jack type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRT19-TM-E1-8</td>
<td>04DU9-BN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-8</td>
<td>04DU9-DN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-8</td>
<td>04DU9-1KN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-8</td>
<td>04DU9-1SN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
<tr>
<td>MRT19-TM-E1-8</td>
<td>04DU9-1ZN</td>
<td>6.0N</td>
<td>RJ-48C</td>
</tr>
</tbody>
</table>

**ADSL line ringer equivalence number (REN)**

Stinger units have the following ringer equivalence number ratings:

**Table D-3. Ringer equivalence number ratings**

<table>
<thead>
<tr>
<th>Stinger model</th>
<th>ADSL+POTS lines</th>
<th>Analog Modem</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRT-AD-36S- (all non SR models)*</td>
<td>REN 0.9B (U.S. rating)</td>
<td>REN 0.8B</td>
</tr>
<tr>
<td></td>
<td>REN 1.0B (Information Canada rating)</td>
<td></td>
</tr>
<tr>
<td>MRT-AD-36S-SR- (all SR models)*</td>
<td>REN 1.0B (U.S. rating)</td>
<td>REN 0.8B</td>
</tr>
<tr>
<td></td>
<td>REN 1.0B (Information Canada rating)</td>
<td></td>
</tr>
<tr>
<td>MRT19-AD-48*</td>
<td>REN 0.4B (U.S. rating)</td>
<td>NA</td>
</tr>
<tr>
<td>MRT-2</td>
<td>REN 0.4B (U.S. rating)</td>
<td>REN 0.9B (U.S. rating)</td>
</tr>
<tr>
<td></td>
<td>REN 0.2B (Information Canada rating)</td>
<td>REN 0.3B (Information Canada rating)</td>
</tr>
</tbody>
</table>

* See the *Stinger MRT Getting Started Guide*.

**EMI compatibility**

The Stinger MRT-2 product is compliant with the following specifications:

- FCC Part 15 Class A
- EN55022 Class A
- AS/NZS3548 Class A
- VCCI Class A
- CISPR 22 Class A
- EN 300338-2
Safety-Related Electrical, Physical, and Environmental Information

Physical specifications

Certifications
The Stinger MRT-2 meets the following certifications:
- NEBS 1-3
- Telcordia GR-63-CORE
- Telcordia GR-1089-CORE

Minimum ground wire size
The DSL lines coming into the Stinger MRT-2 can be subject to lightning surges. These must be discharged to ground through an adequate ground wire. An adequate ground wire presents a resistance of approximately 0.02 ohms to a surge of 500 amps. The gauges shown in Table D-4 are appropriate for the wire lengths indicated:

<table>
<thead>
<tr>
<th>Length</th>
<th>Wire gauge</th>
<th>Wire size (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 10 feet</td>
<td>12 AWG</td>
<td>3.31</td>
</tr>
<tr>
<td>10 to 25 feet</td>
<td>9 AWG</td>
<td>6.63</td>
</tr>
<tr>
<td>25 to 50 feet</td>
<td>6 AWG</td>
<td>13.3</td>
</tr>
<tr>
<td>50 to 100 feet</td>
<td>3 AWG</td>
<td>26.7</td>
</tr>
</tbody>
</table>

Lucent Technologies does not recommend a ground wire greater than 100 feet long.

Physical specifications
Table D-5 describes the Stinger MRT-2 physical specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM standards</td>
<td>ATM Forum UNI (Version 3.0 and Version 3.1), ATM Forum Interim Interswitch Signaling Protocol (IISP)</td>
</tr>
<tr>
<td>WAN interfaces</td>
<td>DS3 and E3 (cell-based), OC3c/STM-1 (optical and electrical), T1, E1, and Ethernet</td>
</tr>
<tr>
<td>Management interfaces</td>
<td>Ethernet and RS-232</td>
</tr>
<tr>
<td>Physical characteristics</td>
<td>Basic unit includes integrated dc power filters and cooling fans.</td>
</tr>
</tbody>
</table>
| Overall MRT-2 chassis size | Height: 3.48 inches (8.839cm)  
  Depth: 9.43 inches (23.963cm)  
  Width: 17.4 inches (44.196cm) |
Safety certifications

The Stinger MRT-2 meets the following safety guidelines and standards:

- UL 1950
- CSA 22.2-950
- EN/IEC 60950
- CB-Scheme

Site specifications

Stinger MRT-2 units require a particular operating environment and minimum clearance for proper operation.

Operating environment

Table D-6 describes the environmental requirements for selecting an installation site for the Stinger MRT-2 hardware. The site requirements are based on Network Equipment Building System (NEBS) GR-63-CORE and GR-1089-CORE.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient operating temperature</td>
<td>-40°C to 70°C (-40°F to 158°F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>10% to 95% (noncondensing)</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>To 13,123 feet (4000 m)</td>
</tr>
<tr>
<td>Ambient storage temperature and humidity</td>
<td>-40°C to +85°C (-40°F to +185°F), 95% relative humidity</td>
</tr>
<tr>
<td>Storage altitude</td>
<td>-1,000 feet to +30,000 feet (-305m to 9150m)</td>
</tr>
</tbody>
</table>

Space requirements

The Stinger MRT-2 hardware requires the following minimum clearances for the chassis:

- 6 inches (15.2cm) at the front panel for cable routing
- 10.5 inches (26.7cm) at the front panel for module replacement
- 1 inch (2.5cm) at the right and left sides of the unit for air flow
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