



# APS Support on Cisco AS5850 STM-1 Interfaces

This feature provides SONET automatic protection switching (APS) on Cisco AS5850 STM-1 interfaces. SONET APS—also referred to as SDH multiplex section protection (MSP)—refers to the mechanism of providing fault tolerance through fiber cable redundancy in SONET/SDH networks. When the working fiber fails, the protect fiber quickly assumes its traffic load. Some command-line interface (CLI) commands are available to provide a measure of manual intervention in the APS switching process.

## Feature History for the APS Support on Cisco AS5850 STM-1 Interfaces Feature

Release	Modification
12.3(11)T	This feature was introduced on the Cisco AS5850.

## Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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# Prerequisites for APS Support on Cisco AS5850 STM-1 Interfaces

This feature assumes familiarity with the ITU-T G.841 *Types and characteristics of SDH network protection architectures* standard.

## Information About APS Support on Cisco AS5850 STM-1 Interfaces

To configure SONET APS on the STM-1 card, you should understand the following concepts.

- [SONET APS Using an STM-1 Card, page 2](#)
- [Benefits of SONET APS Using an STM-1 Card, page 3](#)

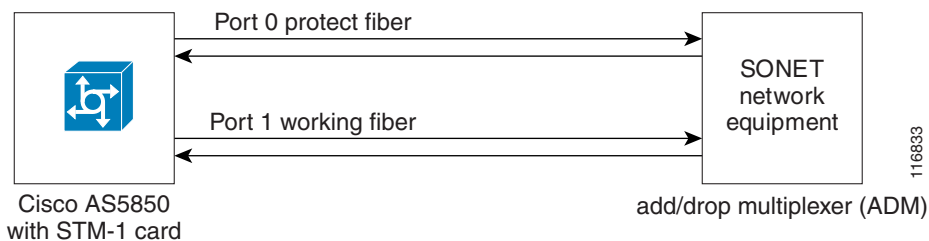
## SONET APS Using an STM-1 Card

SONET APS provides the ability to switch fiber cable interfaces—referred to in this feature as ports—on an STM-1 card in a Cisco AS5850. The ability to switch from one SONET port to another SONET port in response to a fiber cut or module failure, signal failure, signal degradation, or manual intervention provides redundancy.

The protection mechanism used for this feature has a linear 1+1 architecture as described in the ITU-T G.841 standard and the Bellcore publication *GR-253-CORE, SONET Transport Systems; Common Generic Criteria, Section 5.3*. The connection may be bidirectional or unidirectional.

In the 1+1 architecture, a protect port is paired with each working port. Normally, the protect and working ports are connected to a SONET ADM (add/drop multiplexer), which sends the same signal payload to the working and protect ports. [Figure 1](#) shows an APS configuration with the working and protect fibers terminating in SONET ports on the STM-1 card in a Cisco AS5850.

**Figure 1** APS Configuration



When SONET APS is configured and a failure is detected on the working fiber, or when switch commands are entered through the command-line interface (CLI), the software switches the traffic to the protect fiber. The software also monitors the health of the protect fiber when APS is enabled and informs the user of any problems. When the protect fiber problem is resolved, normal APS operation is resumed.

## Benefits of SONET APS Using an STM-1 Card

The STM-1 card is generally deployed by medium to large service providers who have a need for a larger DS0 capacity. The main benefits of using the STM-1 card over E1 interfaces are an initial lower cost of deployment compared to deploying 63 E1 interfaces, a lower recurring monthly charge, and lower maintenance cost because only one cable is required between the Main Distribution Facility (MDF) and the Cisco AS5850 instead of 63 cables. Service providers who carry voice data do expect to have more protection on an STM-1 port than on an E1 port because the STM-1 port supports a high density of DS0s (1953). Network reliability could be severely impacted if 1953 connections are lost at the same time. SONET APS can provide the fiber protection and network resiliency expected by the service providers. The existing media gateways that support STM-1 already provide APS protection.

## How to Configure APS Support on Cisco AS5850 STM-1 Interfaces

This section contains the following tasks:

- [Configuring APS Support on the Cisco AS5850, page 3](#) (required)
- [Issuing APS Switch Commands Using CLI, page 5](#) (optional)

## Configuring APS Support on the Cisco AS5850

Perform this task to enable and configure APS on SONET ports on an STM-1 trunk card.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller sonet *slot/port***
4. **main-fiber port {0 | 1}**
5. **aps protect**
6. **b2 sd-ber *rate***
7. **b2 sf-ber *rate***
8. **aps unidirectional**
9. **end**
10. **show controllers sonet *slot/port***

**DETAILED STEPS**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<p><code>enable</code></p> <p><b>Example:</b>  <pre>Router&gt; enable</pre></p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<p><code>configure terminal</code></p> <p><b>Example:</b>  <pre>Router# configure terminal</pre></p>	<p>Enters global configuration mode.</p>
<b>Step 3</b>	<p><code>controller sonet slot/port</code></p> <p><b>Example:</b>  <pre>Router(config)# controller sonet 1/0</pre></p>	<p>Configures a SONET controller and enters controller configuration mode.</p> <ul style="list-style-type: none"> <li>Use the <i>slot</i> argument to specify the slot number in which the STM-1 card resides.</li> <li>The <i>port</i> argument is always 0 because only one port on the STM-1 card can be configured.</li> </ul>
<b>Step 4</b>	<p><code>main-fiber port {0   1}</code></p> <p><b>Example:</b>  <pre>Router(config-controller)# main-fiber port 1</pre></p>	<p>(Optional) Specifies the working port to use for the optical link connection on the SDH/STM-1 trunk card on a Cisco AS5850. The default is port 0.</p> <ul style="list-style-type: none"> <li>We recommend that port 1 be configured as the working port.</li> <li>The other port on the STM-1 card is configured automatically as the protect port when APS is enabled.</li> <li>After APS is enabled, you cannot change the main-fiber (working) port until you disable APS.</li> </ul>
<b>Step 5</b>	<p><code>aps protect</code></p> <p><b>Example:</b>  <pre>Router(config-controller)# aps protect</pre></p>	<p>Enables APS on the current working SONET port.</p> <ul style="list-style-type: none"> <li>By default, the bidirectional mode is enabled.</li> </ul>
<b>Step 6</b>	<p><code>b2 sd-ber rate</code></p> <p><b>Example:</b>  <pre>Router(config-controller)# b2 sd-ber 7</pre></p>	<p>Sets the signal degrade bit error rate (BER) threshold values.</p> <ul style="list-style-type: none"> <li>Use this command to configure the threshold for degradation of quality of signal with b2 errors.</li> <li>The rate value can be in the range from 3 to 9. A higher number represents better quality, and a value of 3 represents lower quality.</li> </ul>
<b>Step 7</b>	<p><code>b2 sf-ber rate</code></p> <p><b>Example:</b>  <pre>Router(config-controller)# b2 sf-ber 4</pre></p>	<p>Sets the signal failure BER threshold values.</p> <ul style="list-style-type: none"> <li>Use this command to configure the threshold for failure of quality of signal with b2 errors.</li> <li>The rate value can be in the range from 3 to 9. A higher number represents better quality, and a value of 3 represents lower quality.</li> </ul>

	Command or Action	Purpose
Step 8	<b>aps unidirectional</b>  <b>Example:</b> Router(config-controller)# <b>aps unidirectional</b>	Configures APS to operate in unidirectional mode. <ul style="list-style-type: none"> <li>To return to bidirectional mode, use the <b>no</b> form of this command.</li> </ul>
Step 9	<b>end</b>  <b>Example:</b> Router(config-controller)# <b>end</b>	Exits controller configuration mode and returns to privileged EXEC mode.
Step 10	<b>show controllers sonet slot/port</b>  <b>Example:</b> Router# <b>show controllers sonet 1/0</b>	Displays information about SONET controllers. <ul style="list-style-type: none"> <li>Only partial syntax is displayed here. For more details, see the <b>show controllers sonet</b> command in the <i>Cisco IOS Interface and Hardware Component Command Reference</i>, Release 12.3 T.</li> </ul>

## Examples

The following example shows partial output from the **show controllers sonet** command.

```
Router# show controllers sonet 1/0

SONET 1/0 is up.
  Applique type is Channelized Sonet/SDH
  Clock Source is Line, AUG mapping is AU4.
  MSP 1+1 bi-directional enabled
  Protection fiber (Port 0), No Alarm, traffic in-use
  Working fiber (Port 1), No Alarm, traffic not in-use
  Local request: No Request
  Remote request: No Request

Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM
  .
  .
  .
```

## Troubleshooting Tips

- Use the **show controllers sonet** command and look for any alarms or local and remote request information.
- Check that the ADM is sourcing the SONET clocking.

## Issuing APS Switch Commands Using CLI

Perform this task to issue one or more of the optional APS switch commands when the working fiber is active but you want to switch to the protect fiber. The APS switch commands allow a measure of manual intervention in the APS process.

## APS Switching Priority Levels

Each APS switch command has a priority level compared to the other APS switch commands and the signal status of the working and protect fibers. Table 1 shows the priority requests from the highest (lockout) to the lowest (manual). The actual decision-based activity performed by the software is quite complex; details are provided in the ITU-T G.841 *Types and characteristics of SDH network protection architectures* standard.

**Table 1 APS Priority Request**

Priority	Priority Request
1	Lockout of protect port
2	Forced switch
3	Signal failure—low priority
4	Signal degradation—low priority
5	Manual switch

### SUMMARY STEPS

1. **enable**
2. **aps manual sonet slot/port from {protection | working}**
3. **aps force sonet slot/port from {protection | working}**
4. **aps lockout sonet slot/port**
5. **aps clear sonet slot/port**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>aps manual sonet slot/port from {protection   working}</b>  <b>Example:</b> Router# aps manual sonet 1/0 from working	(Optional) Issues an APS manual request to switch from one port to the alternate port. <ul style="list-style-type: none"> <li>• Use the <b>from protection</b> keywords to switch from the active protect fiber to the working fiber unless an equal or higher switching priority exists.</li> <li>• Use the <b>from working</b> keywords to switch from the active working fiber to the protect fiber unless an equal or higher switching priority exists.</li> </ul>

	Command or Action	Purpose
Step 3	<pre>aps force sonet slot/port from {protection   working}</pre> <p><b>Example:</b> Router# <code>aps force sonet 1/0 from working</code></p>	<p>(Optional) Issues an APS force request to switch from one port to the alternate port.</p> <ul style="list-style-type: none"> <li>Use the <b>from protection</b> keywords to switch from the active protect fiber to the working fiber unless an equal or higher switching priority exists.</li> <li>Use the <b>from working</b> keywords to switch from the active working fiber to the protect fiber unless an equal or higher switching priority exists.</li> </ul>
Step 4	<pre>aps lockout sonet slot/port</pre> <p><b>Example:</b> Router# <code>aps lockout sonet 1/0</code></p>	<p>(Optional) Issues an APS lockout of protection request.</p> <ul style="list-style-type: none"> <li>Use this command to deny the working fiber access to the protect fiber unless an equal switching priority exists.</li> <li>Lockout is defined as the highest APS request priority level.</li> <li>If the protect fiber is active, this command switches the traffic to the working fiber.</li> </ul>
Step 5	<pre>aps clear sonet slot/port</pre> <p><b>Example:</b> Router# <code>aps clear sonet 1/0</code></p>	<p>(Optional) Removes any APS priority requests configured for the specified port using the <b>aps lockout sonet</b>, <b>aps force sonet</b>, or <b>aps manual sonet</b> commands.</p>

## Configuration Examples for APS Support on Cisco AS5850 STM-1 Interfaces

This section contains the following configuration example:

- [Configuring APS Support and APS Switch Commands on the Cisco AS5850: Example, page 7](#)

### Configuring APS Support and APS Switch Commands on the Cisco AS5850: Example

In the following example, SONET APS parameters are configured, and APS is enabled on port 1 of an STM-1 card in a Cisco AS5850. A manual APS switching request is configured, and partial output for the **show controllers sonet** command is displayed.

```
Router# configure terminal
Router (config)# controller sonet 1/0
Router (config-controller)# main-fiber port 1
Router (config-controller)# aps protect
Router (config-controller)# b2 sd-ber 7
Router (config-controller)# b2 sf-ber 4
Router (config-controller)# aps unidirectional
Router (config-controller)# end
Router# aps manual sonet 1/0 from working
```

```
Router# show controllers sonet

SONET 1/0 is up.
  Applique type is Channelized Sonet/SDH
  Clock Source is Line, AUG mapping is AU4.
  MSP 1+1 bi-directional enabled
  Protection fiber (Port 0), No Alarm, traffic in-use
  Working fiber (Port 1), No Alarm, traffic not in-use
  Local request: Manual Switch/Working
  Remote request: No request
.
.
.
```

## Where to Go Next

For more details about the Cisco AS5850, visit the [Cisco AS5850 Universal Gateway Introduction](#) page under the Products and Service section on [www.cisco.com](http://www.cisco.com).

## Additional References

The following sections provide references related to the APS Support on Cisco AS5850 STM-1 Interfaces feature.

## Related Documents

Related Topic	Document Title
Hardware and configuration information for the SDH/STM-1 trunk card	The “ <a href="#">SDH/STM-1 Trunk Card</a> ” chapter of the <i>Cisco AS5850 Universal Gateway Card Guide</i>
APS and SONET commands: complete command syntax, command mode, defaults, usage guidelines, and examples	<a href="#">Cisco IOS Interface and Hardware Component Command Reference</a> , Release 12.3 T
APS and SONET configuration	<a href="#">Cisco IOS Interface and Hardware Component Configuration Guide</a> , Release 12.3

## Standards

Standards	Title
Bellcore SONET linear 1+1 architecture	<i>GR-253-CORE, SONET Transport Systems; Common Generic Criteria, Section 5.3</i>
ITU-T G.841	<i>Types and characteristics of SDH network protection architectures</i>

## MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## Command Reference

This section documents new and modified commands.

- [aps clear sonet](#)
- [aps force sonet](#)
- [aps lockout sonet](#)
- [aps manual sonet](#)
- [aps protect \(SONET\)](#)
- [aps unidirectional](#)
- [show controllers sonet](#)

# aps clear sonet

To remove all externally initiated SONET automatic protection switching (APS) commands configured on a Cisco AS5850, use the **aps clear sonet** command in privileged EXEC mode.

**aps clear sonet** *slot/port*

## Syntax Description

<i>slot</i>	Slot number on an STM-1 trunk card.
<i>/port</i>	SONET port number on an STM-1 trunk card. The slash mark is required between the <i>slot</i> argument and the <i>port</i> argument.

## Defaults

No APS switch commands are removed.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.3(11)T	This command was introduced on the Cisco AS5850.

## Usage Guidelines

Use the **aps clear sonet** command to remove any SONET APS commands, such as the **aps force sonet** command, that could switch the working fiber to the protect fiber on an STM-1 trunk card.

This command applies to the Cisco AS5850 universal gateway only.

## Examples

The following example shows how to remove all externally initiated SONET APS switch commands:

```
Router# aps clear sonet 1/0
```

## Related Commands

Command	Description
<b>aps force sonet</b>	Requests an APS forced switch of a specified port to the alternate port unless a request of equal or higher priority is in effect.
<b>aps lockout sonet</b>	Prevents a working SONET port from switching to a protect SONET port unless a request of equal or higher priority is in effect.
<b>aps manual sonet</b>	Requests a manual APS switch on a SONET port.
<b>aps protect (SONET)</b>	Enables SONET APS.

# aps force sonet

To force a specified port to switch to the alternate port within a redundant pair unless a request of equal or higher priority is in effect, use the **aps force sonet** command in privileged EXEC mode.

```
aps force sonet slot/port from {protection | working}
```

Syntax Description	slot	Slot number on an STM-1 trunk card.
	/port	SONET port number on an STM-1 trunk card. The slash mark is required between the <i>slot</i> argument and the <i>port</i> argument.
	from protection	Specifies that you want to switch from the protect port to the working port.
	from working	Specifies that you want to switch from the working port to the protect port.

**Defaults** No port is switched.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.3(11)T	This command was introduced on the Cisco AS5850.

**Usage Guidelines** Forced is a defined APS request priority level. The request succeeds if no higher priority request (lockout is the only higher priority request) is posted. The **aps force sonet** command does not persist after a system restart. The *slot* and *port* arguments indicate the SONET interface on which you want to issue the **aps force sonet** command. The **aps force sonet** command has a higher priority than any of the signal failures or the **aps manual sonet** command.

For more information about APS priority requests, see the ITU-T G.841 standard.

This command applies to the Cisco AS5850 universal gateway only.

**Examples** The following example shows how to force the protect port in the SONET controller to become an active port:

```
Router# configure terminal
Router(config)# controller sonet 1/0
Router(config-controller)# aps protect
Router(config-controller)# end
Router# aps force sonet 1/0 from working
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>aps clear sonet</b>	Removes any APS switch commands configured using CLI.
	<b>aps lockout sonet</b>	Prevents a working SONET port from switching to a protect SONET port unless a request of equal or higher priority is in effect.
	<b>aps manual sonet</b>	Requests a manual APS switch on a SONET port.
	<b>aps protect (SONET)</b>	Enables SONET APS.

# aps lockout sonet

To prevent a working port from switching to a protect port unless a request of equal or higher priority is in effect, use the **aps lockout sonet** command in privileged EXEC mode.

**aps lockout sonet** *slot*/*port*

Syntax Description	<i>slot</i>	Slot number on an STM-1 trunk card.
	<i>port</i>	SONET port number on an STM-1 trunk card. The slash mark is required between the <i>slot</i> argument and the <i>port</i> argument.

**Defaults** No lockout exists; that is, a working port is not prevented from switching to a protect port.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.3(11)T	This command was introduced on the Cisco AS5850.

**Usage Guidelines** Lockout is defined as the highest APS request priority level.

The **aps lockout sonet** command does not persist after a system restart. The *slot* and *port* arguments indicate the SONET interface from which the protect port is to be locked out. When the specified port is locked out, SONET APS switching from the working port is not allowed.

For more information about APS priority requests, see the ITU-T G.841 standard.

This command applies to the Cisco AS5850 universal gateway only.

**Examples** The following example shows how to lock out SONET port 1/0 (prevents SONET APS switching to a protect interface if the working circuit becomes unavailable):

```
Router# configure terminal
Router(config)# controller sonet 1/0
Router(config-controller)# aps protect
Router(config-controller)# end
Router# aps lockout sonet 1/0
```

Related Commands	Command	Description
	<b>aps clear sonet</b>	Removes any APS switch commands configured using CLI.
	<b>aps force sonet</b>	Requests an APS forced switch of a specified port to the alternate port unless a request of equal or higher priority is in effect.
	<b>aps manual sonet</b>	Requests a manual APS switch on a SONET port.
	<b>aps protect (SONET)</b>	Enables SONET APS.

# aps manual sonet

To manually switch to the alternate port within a redundant pair unless a request of equal or higher priority is in effect, use the **aps manual sonet** command in privileged EXEC mode.

**aps manual sonet** *slot*/*port* **from** {**protection** | **working**}

Syntax Description		
<i>slot</i>		Slot number on an STM-1 trunk card.
<i>port</i>		SONET port number on an STM-1 trunk card. The slash mark is required between the <i>slot</i> argument and the <i>port</i> argument.
<b>from protection</b>		Specifies that you want to switch from the protect port to the working port.
<b>from working</b>		Specifies that you want to switch from the working port to the protect port.

**Defaults** No port is switched.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.3(11)T	This command was introduced on the Cisco AS5850.

**Usage Guidelines** Use the **aps manual sonet** command to manually switch the active port to the alternate port. For example, you can use this command when you need to perform maintenance on the working port.

Manual is a defined APS request priority level. The request succeeds if no higher priority request is posted. The **aps manual sonet** command does not persist after a system restart. The *slot* and *port* arguments indicate the SONET interface on which you want to issue the **aps manual sonet** command. The **aps manual sonet** command has a lower priority than any of the signal failures or the **aps force sonet** command.

For more information about APS priority requests, see the ITU-T G.841 standard.

This command applies to the Cisco AS5850 universal gateway only.

**Examples** The following example shows how to manually switch the working port, SONET port 1/0, to the protect port:

```
Router# configure terminal
Router(config)# controller sonet 1/0
Router(config-controller)# aps protect
Router(config-controller)# end
Router# aps manual sonet 1/0 from working
```

Related Commands	Command	Description
	<b>aps clear sonet</b>	Removes any APS switch commands configured using CLI.
	<b>aps force sonet</b>	Requests an APS forced switch of a specified port to the alternate port unless a request of equal or higher priority is in effect.
	<b>aps lockout sonet</b>	Prevents a working SONET port from switching to a protect SONET port unless a request of equal or higher priority is in effect.
	<b>aps protect (SONET)</b>	Enables SONET APS.

## aps protect (SONET)

To enable automatic protection switching (APS) on a SONET port in an STM-1 trunk card, use the **aps protect** command in controller configuration mode. To disable APS on the SONET port, use the **no** form of this command.

**aps protect**

**no aps protect**

**Syntax Description** This command has no arguments or keywords.

**Defaults** APS is disabled.

**Command Modes** Controller configuration

Command History	Release	Modification
	12.3(11)T	This command was introduced on the Cisco AS5850.

**Usage Guidelines** Use the **aps protect** command to enable APS on a protect SONET port as a working port if the working port becomes unavailable because of a fiber failure, degradation or loss of channel signal, or manual intervention.

**Examples** The following example shows how to enable APS on SONET port 0/1 in an STM-1 trunk card.

```
Router# configure terminal
Router(config)# controller sonet 1/0
Router(config-controller)# aps protect
Router(config-controller)# end
```

Related Commands	Command	Description
	<b>aps unidirectional</b>	Configures a protect SONET port for unidirectional mode.
	<b>show controllers sonet</b>	Displays information about SONET controllers.

# aps unidirectional

To configure a protect interface for unidirectional mode, use the **aps unidirectional** command in controller configuration or interface configuration mode. To return to the default, bidirectional mode, use the **no** form of this command.

**aps unidirectional**

**no aps unidirectional**

**Syntax Description** This command has no arguments or keywords.

**Defaults** Bidirectional mode

**Command Modes** Controller configuration  
Interface configuration

Command History	Release	Modification
	11.1 CC	This command was introduced.
	12.3(11)T	Support for SONET APS using an STM-1 card was added on the Cisco AS5850.

**Usage Guidelines** The **aps unidirectional** command is configured only on protect interfaces.

Use the **aps unidirectional** command when you must interoperate with SONET network equipment, add/drop multiplexors (ADMs) that supports unidirectional mode.



**Note**

We recommend bidirectional mode when it is supported by the interconnecting SONET equipment. When the protect interface is configured as bidirectional, the working and protect interfaces must cooperate to switch the transmit and receive SONET channel in a bidirectional fashion. This happens automatically when the SONET network equipment is in bidirectional mode.

**Examples** The following example shows how to configure POS interface 3/0/0 for unidirectional mode on a Cisco 12000 series router:

```
Router# configure terminal
Router(config)# interface pos 3/0/0
Router(config-if)# aps unidirectional
Router(config-if)# aps protect 1 10.7.7.7
Router(config-if)# end
```

The following example shows how to configure SONET port 0/0 for unidirectional mode on a Cisco AS5850 universal gateway using an STM-1 trunk card:

```
Router# configure terminal  
Router(config)# controller sonet 0/0  
Router(config-controller)# aps protect  
Router(config-controller)# aps unidirectional  
Router(config-controller)# end
```

# show controllers sonet

To display information about SONET controllers, use the **show controllers sonet** command in user EXEC or privileged EXEC mode with the appropriate parameters for the operating mode of the channelized line.

```
show controllers sonet [slot/port | slot/port.sts1-number/t1-number | slot/port.vtg1-number/
sts1-number/t1-number | slot/port.au-3-number/tug-2-number/t1-number |
slot/port.au-4-number/tug-3-number/tug-2-number/e1-line-number |
slot/port.au-4-number/vc3-number | slot/port:interface-number |
t3 slot/port:t1-line-number] [bert | brief | tabular]
```

Syntax Description	Description
<i>slot/port</i>	(Optional) Slot and port number. The slash mark is required between the <i>slot</i> argument and the <i>port</i> argument.  <b>Note</b> This form of the syntax is used only for the STM-1 trunk card on a Cisco AS5850 universal gateway.
<i>slot/port.sts1-number/</i> <i>t1-number</i>	(Optional) Slot and port number of a T1 line under SONET framing in CT3 mode.
<i>slot/port.vtg1-number/</i> <i>sts1-number/t1-number</i>	(Optional) Slot and port number of a T1 line under SONET framing in VT-15 mode.
<i>slot/port.au-3-number/</i> <i>tug-2-number/t1-number</i>	(Optional) Slot and port number of a T1 line under SDH framing with AU-3 AUG mapping.
<i>slot/port.au-4-number/</i> <i>tug-3-number/tug-2-number/</i> <i>e1-line-number</i>	(Optional) Slot and port number of an E1 line under SDH framing with AU-4 AUG mapping.
<i>slot/port.au-4-number/</i> <i>vc3-number</i>	(Optional) Slot and port number of a DS3/E3 interface under SDH framing with AU-4 mapping.
<i>slot/port:interface-number</i>	(Optional) Slot and port number of a DS3/E3 interface under SONET framing or SDH framing with AU-3 mapping.
<b>t3</b> <i>slot/port:t1-line-number</i>	(Optional) Displays information for a T1 line under SF or ESF format framing.
<b>bert</b>	(Optional) Displays bit error rate test (BERT) information.
<b>brief</b>	(Optional) Displays summary information.
<b>tabular</b>	(Optional) Displays information in a tabular format.

Command Modes	Modes
	User EXEC Privileged EXEC

Command History	Release	Modification
	12.0(21)S	This command was introduced on Cisco 12000 series Internet routers.
	12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T, and support was added for the STM-1 trunk card on the Cisco AS5850 platform.
	12.3(11)T	Output was modified to support SONET APS on the Cisco AS5850 platform.

**Usage Guidelines**

You can enter the **show controllers sonet** command at any time during a BER test.

**Examples**

The following is sample output from the **show controllers sonet** command on a T1 line under SONET framing in VT-15 mode. (Table 2 describes the lines in the BER test portion of the output.)

```
Router# show controllers sonet 4/0.1/1/1 brief

OC3.STS1 4/0.1 is up. Hardware is GSR 2 port STM1/OC3 (channelized)
  Applique type is VT1.5 in STS-1

STS-1 1, VTG 1, T1 1 (VT1.5 1/1/1) is up
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Clock Source is Internal
  BERT test result (running)
    Test Pattern : 2^20-QRSS, Status : Sync, Sync Detected : 1
    Interval : 5 minute(s), Time Remain : 4 minute(s)
    Bit Errors (since BERT started): 0 bits,
    Bits Received (since BERT started): 112 Mbits
    Bit Errors (since last sync): 0 bits
    Bits Received (since last sync): 112 Mbits
```

**Table 2** *show controllers sonet Line Descriptions*

Output Line	Description
BERT test result (running)	Indicates the current state of the test. In this case, “running” indicates that the test is still active. If the test is complete, “done” is displayed.
Test Pattern : 2^20-QRSS, Status : Sync, Sync Detected : 1	Indicates the test pattern that you selected for the test (2^20-QRSS), the current synchronization state (Sync), and the number of times that synchronization was detected during this test (1).
Interval : 5 minute(s), Time Remain : 4 minute(s)	Indicates the time allocated for the test to run and the time remaining for the test to run.  For a BER test that you terminate before the time expires, this line indicates the time the test would have taken to run and the time remaining for the test to run had you not terminated it. “unable to complete” is displayed to indicate that you interrupted the test.
Bit Errors (since BERT started): 0 bits Bits Received (since BERT started): 112 Mbits Bit Errors (since last sync): 0 bits Bits Received (since last sync): 112 Mbits	Shows the bit errors that were detected versus the total number of test bits that were received since the test started and since the last synchronization was detected.

The following is sample output from the **show controllers sonet** command for an E1 line under SDH framing with AU-4 AUG mapping.

```
Router# show controllers sonet 3/0.1/1/3/5

SONET 3/0 is up. (Configured for Locally Looped) Hardware is GSR 2 port
STM1/OC3 (channelized)
  Applique type is Channelized OCx interface
  Clock Source is Line, AUG mapping is AU4.
Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM
Regenerator Section:
LOF = 0          LOS = 0          BIP(B1) = 0
Multiplex Section:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Active Alarms: None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA B3-TCA
BER thresholds: SF = 10e-3 SD = 10e-6
TCA thresholds: B1 = 10e-6 B2 = 10e-6 B3 = 10e-6
High Order Path:

PATH 1:
  AIS = 0          RDI = 0          REI = 15          BIP(B3) = 11
  LOP = 0          PSE = 4          NSE = 0          NEWPTR = 1
  LOM = 0          PLM = 0          UNEQ = 0
Active Defects: None

S1S0 = 02, C2 = 02

PATH TRACE BUFFER : STABLE
CRC-7: 0xF2 OK
  52 6F 75 74 65 72 33 2F 30 2F 31 00 00 00 00 Router3/0/1....

STM1.AU4 3/0.1 is up. Hardware is GSR 2 port STM1/OC3 (channelized)
  Applique type is C12 in TUG-3 in AU-4

AU-4 1, TUG-3 1, TUG-2 1, E1 1 (C-12 1/1/1/1) is up
timeslots: 1-31
No alarms detected.
Framing is crc4, Clock Source is Internal
BERT test result (running)
  Test Pattern : 2^15, Status : Sync, Sync Detected : 1
  Interval : 5 minute(s), Time Remain : 5 minute(s)
  Bit Errors (since BERT started): 0 bits,
  Bits Received (since BERT started): 95 Mbits
  Bit Errors (since last sync): 0 bits
  Bits Received (since last sync): 95 Mbits
Data in current interval (708 seconds elapsed):
  0 Line Code Violations, 1 Path Code Violations
  0 Slip Secs, 1 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
Data in Interval 1:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
Data in Interval 2:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
```

```
Data in Interval 3:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 1 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
Total Data (last 3 15 minute intervals):
  0 Line Code Violations,0 Path Code Violations,
  0 Slip Secs, 1 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
```

The following is sample output from the **show controllers sonet** command when AUG mapping is AU-3 and the **tabular** keyword is specified.

Router# **show controllers sonet 2/0.1/1/1 tabular**

```
SONET 2/0/0 is up.
Channelized OC-3/STM-1 SMI PA
H/W Version : 0.2.3, ROM Version : 1.2
FREEDM version : 2, F/W Version : 0.14.0
SONET 2/0/0 E1 1/1/1 is down
Transmitter is sending LOF Indication (RAI).
Receiver has loss of frame.
Framing is crc4, Clock Source is internal, National bits are 0x1F.
INTERVAL      LCV  PCV  CSS  SEFS  LES  DM  ES  BES  SES  UAS  SS
17:26-17:29   0    0    0    0    0    0  0  0    0    173  0
17:11-17:26   0    0    0    0    0    0  0  0    0    471  0
16:56-17:11   0    0    0    0    0    0  0  0    0    0    0
16:41-16:56   0    0    0    0    0    0  0  0    0    0    0
16:26-16:41   0    0    0    0    0    0  0  0    0    216  0
16:11-16:26   0    0    0    0    0    0  0  0    0    225  0
Total         0    0    0    0    0    0  0  0    0    912  0
```

The following is partial sample output from the **show controllers sonet** command using an STM-1 card in the Cisco AS5850.

Router# **show controllers sonet 3/0**

```
SONET 3/0 is down.
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU4.

Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM

Regenerator Section Status:
  LOS

Multiplex Section Status:

Higher Order Path Status:
  Path# 1 has no defects

Lower Order Path Status:
  VC-12 1/1/1/1 has no defects
  VC-12 1/1/1/2 has no defects
  VC-12 1/1/1/3 has no defects
  VC-12 1/1/2/1 has no defects
  VC-12 1/1/2/2 has no defects
  VC-12 1/1/2/3 has no defects
  VC-12 1/1/3/1 has no defects
  VC-12 1/1/3/2 has no defects
  VC-12 1/1/3/3 has no defects
  VC-12 1/1/4/1 has no defects
```

show controllers sonet

```

VC-12 1/1/4/2 has no defects
VC-12 1/1/4/3 has no defects
VC-12 1/1/5/1 has no defects
VC-12 1/1/5/2 has no defects
VC-12 1/1/5/3 has no defects
VC-12 1/1/6/1 has no defects
VC-12 1/1/6/2 has no defects
.
.
.
VC-12 1/3/5/3 has no defects
VC-12 1/3/6/1 has no defects
VC-12 1/3/6/2 has no defects
VC-12 1/3/6/3 has no defects
VC-12 1/3/7/1 has no defects
VC-12 1/3/7/2 has no defects
VC-12 1/3/7/3 has no defects
Data in current interval (20 seconds elapsed):
  Regenerator Section:
    0 CVs, 20 ESs, 20 SESs, 0 SEFSs
  Multiplex Section:
    0 CVs, 0 ESs, 0 SESs, 0 UASs
  Higher Order Path:
    Path# 1: 0 CVs, 0 ESs, 0 SESs, 20 UASs
  Lower Order Path:
    VC-12 1/1/1/1: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/1/1/2: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/1/1/3: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/1/2/1: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/1/2/2: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/1/2/3: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    .
    .
    .
    VC-12 1/3/5/3: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/6/1: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/6/2: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/6/3: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/7/1: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/7/2: 0 CVs, 0 ESs, 0 SESs, 20 UASs
    VC-12 1/3/7/3: 0 CVs, 0 ESs, 0 SESs, 20 UASs

```

Table 3 describes the significant fields shown in the display.

**Table 3** show controllers sonet STM-1 Field Descriptions

Field	Description
SONET 3/0	The SONET controller in slot 3 shows the state in which it is operating. The controller's state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).
Applique type	Controller type.
Clock Source	User-specified clock source (Line or Internal).
AUG mapping	Indicates type of administrative unit group (AUG) mapping.
Line Coding	Shows the current line encoding type, either return to zero (RZ) or nonreturn to zero (NRZ).

**Table 3** show controllers sonet STM-1 Field Descriptions (continued)

Field	Description
Line Type	Line type for this interface. Optical line types can be either long range (LONG) or short range (SHORT), and either single mode (SM) or multimode (MM).
VC-12	Indicates the number of the virtual circuit (VC) and whether the VC has reported any defects.
CVs	Number of coding violation (CV) error events.
ESs	An errored second (ES) is a second in which one of the following is detected: <ul style="list-style-type: none"> <li>• One or more path code violations.</li> <li>• One or more out of frame defects.</li> <li>• One or more controlled slip events.</li> <li>• A detected alarm indication signal (AIS) defect.</li> </ul>
SESSs	Severely errored seconds (SESSs) are seconds with one or more out-of-frame defects or a detected incoming AIS. This gauge is not incremented when UASs are counted.
SEFSs	Severely errored framing seconds (SEFSs) are seconds with one or more out-of-frame defects or a detected incoming AIS.
UASs	Unavailable seconds (UASs) are calculated by counting the number of seconds for which the interface is unavailable.

The following is partial output from the **show controllers sonet** command using an STM-1 card in the Cisco AS5850 with SONET APS configured.

```
Router# show controllers sonet 1/0

SONET 1/0 is up.
  Applique type is Channelized Sonet/SDH
  Clock Source is Line, AUG mapping is AU4.
  MSP 1+1 bi-directional enabled
  Protection fiber (Port 0), No Alarm, traffic in-use
  Working fiber (Port 1), No Alarm, traffic not in-use
  Local request: No Request
  Remote request: No Request

Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:

  No alarms detected.
  No BER failure/degrade detected
  B2 BER_SF threshold power : 3
  B2 BER_SD threshold power : 6

Higher Order Path Status:
  Path# 1 has no defects
```

show controllers sonet

```
Lower Order Path Status:
VC-12 1/1/1/1 has no defects
VC-12 1/1/1/2 has no defects
VC-12 1/1/1/3 has no defects
.
.
.
```

Table 4 describes the significant fields shown in the display that are different from the fields described in Table 3.

**Table 4** show controllers sonet STM-1 APS Field Descriptions

Field	Description
MSP 1+1	Indicates whether the SDH multiplex section protection (MSP) is bidirectional or unidirectional.
Protection fiber	Indicates the port location of the protect fiber, whether an alarm has been detected, and whether traffic is flowing through the port.
Working fiber	Indicates the port location of the working fiber, whether an alarm has been detected, and whether traffic is flowing through the port.
Local request	Indicates whether a local request to switch fibers has been received. If a request has been received, the type of request (forced, lockout, or manual) is indicated.
Remote request	Indicates whether a remote request to switch fibers has been received. If a request has been received, the type of request (forced, lockout, or manual) is indicated.
No alarms detected	Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending alarm indication signal (AIS).</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul>
No BER failure/degrade detected	No bit error rate (BER) failures or degrades detected.
B2 BER_SF threshold power	BER signal failure (SF) threshold configured with the <b>b2 sf-ber</b> controller command.
B2 BER_SD threshold power	BER signal degrade (SD) threshold configured with the <b>b2 sd-ber</b> controller command.

**Related Commands**

Command	Description
<b>aps protect (SONET)</b>	Enables SONET APS.
<b>show version</b>	Displays information about the hardware and software on a router.

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■ show controllers sonet