Configuring Switch Alarms

Finding Feature Information

Your software release may not support all the features documented in this chapter. For the latest feature information and caveats, see the release notes for your platform and software release.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About Switch Alarms

The switch software monitors switch conditions on a per-port or a switch basis. If the conditions present on the switch or a port do not match the set parameters, the switch software triggers an alarm or a system message. By default, the switch software sends the system messages to a system message logging facility, or a *syslog* facility. You can also configure the switch to send Simple Network Management Protocol (SNMP) traps to an SNMP server. You can configure the switch to trigger an external alarm device by using the alarm relay.

Global Status Monitoring Alarms

The switch processes alarms related to temperature and power supply conditions, referred to as global or facility alarms.

Table 3-1   Global Status Monitoring Alarms

Alarm	Description
Power supply alarm	By default, the switch monitors a single power supply. If you configure a dual power supply, an alarm triggers if one power supply fails. You can configure the power supply alarm to be connected to the hardware relays. For more information, see the "Configuring the Power Supply Alarms" section on page 3-6.
Temperature alarms	The switch contains one temperature sensor with a primary and secondary temperature setting. The sensor monitors the environmental conditions inside the switch.
	The primary and secondary temperature alarms can be set as follows:
	• The primary alarm is enabled automatically to trigger both at a low temperature, –4°F (–20°C) and a high temperature, 203°F (95°C). It cannot be disabled. By default, the primary temperature alarm is associated with the major relay.
	• The secondary alarm triggers when the system temperature is higher or lower than the configured high and low temperature thresholds. The secondary alarm is disabled by default.
	For more information, see the "Configuring the Switch Temperature Alarms" section on page 3-6.
SD-Card	By default the alarm is disabled.

FCS Error Hysteresis Threshold

The Ethernet standard calls for a maximum bit-error rate of 10^{-8}. The bit error-rate range is from 10^{-6} to 10^{-11}. The bit error-rate input to the switch is a positive exponent. If you want to configure the bit error-rate of 10^{-9}, enter the value 9 for the exponent. By default, the FCS bit error-rate is 10^{-8}.

You can set the FCS error hysteresis threshold to prevent the toggle of the alarm when the actual bit-error rate fluctuates near the configured rate. The hysteresis threshold is defined as the ratio between the alarm clear threshold to the alarm set threshold, expressed as a percentage value.

For example, if the FCS bit error-rate alarm value is configured to 10^{-8}, that value is the alarm set threshold. To set the alarm clear threshold at $5*10^{-10}$, the hysteresis, value h, is determined as follows:

h = alarm clear threshold / alarm set threshold

$h = 5*10^{-10} / 10^{-8} = 5*10^{-2} = 0.05 = 5$ percent

The FCS hysteresis threshold is applied to all ports on the switch. The allowable range is from 1 to 10 percent. The default value is 10 percent. See the "Configuring the FCS Bit Error Rate Alarm" section on page 3-7 for more information.

Port Status Monitoring Alarms

The switch can also monitor the status of the Ethernet ports and generate alarm messages based on the alarms listed in Table 3-2. To save user time and effort, it supports changeable alarm configurations by using alarm profiles. You can create a number of profiles and assign one of these profiles to each Ethernet port.

Alarm profiles provide a mechanism for you to enable or disable alarm conditions for a port and associate the alarm conditions with one or both alarm relays. You can also use alarm profiles to set alarm conditions to send alarm traps to an SNMP server and system messages to a syslog server. The alarm profile *defaultPort* is applied to all interfaces in the factory configuration (by default).

> **Note** You can associate multiple alarms to one relay or one alarm to both relays.

Table 3-2 lists the port status monitoring alarms and their descriptions and functions. Each fault condition is assigned a severity level based on the Cisco IOS System Error Message Severity Level.

Table 3-2   Port Status Monitoring Alarms

Alarm List ID	Alarm	Description
1	Link Fault alarm	The switch generates a link fault alarm when problems with a port physical layer cause unreliable data transmission. A typical link fault condition is loss of signal or clock. The link fault alarm is cleared automatically when the link fault condition is cleared. The severity for this alarm is *error condition*, level 3.
2	Port not Forwarding alarm	The switch generates a port not-forwarding alarm when a port is not forwarding packets. This alarm is cleared automatically when the port begins to forward packets. The severity for this alarm is *warning*, level 4.
3	Port not Operating alarm	The switch generates a port not-operating alarm when a port fails during the startup self-test. When triggered, the port not-operating alarm is only cleared when the switch is restarted and the port is operational. The severity for this alarm is *error condition*, level 3.
4	FCS Bit Error Rate alarm	The switch generates an FCS bit error-rate alarm when the actual FCS bit error-rate is close to the configured rate. You can set the FCS bit error-rate by using the interface configuration CLI for each of the ports. See the "Configuring the FCS Bit Error Rate Alarm" section on page 3-7 for more information. The severity for this alarm is *error condition*, level 3.

Triggering Alarm Options

The switch supports these methods for triggering alarms:

- Configurable Relay

  The switch is equipped with one independent alarm relay that can be triggered by alarms for global, port status and SD flash card conditions. You can configure the relay to send a fault signal to an external alarm device, such as a bell, light, or other signaling device. You can associate any alarm condition with the alarm relay. Each fault condition is assigned a severity level based on the Cisco IOS System Error Message Severity Level.

  See the "Configuring the Power Supply Alarms" section on page 3-6 for more information on configuring the relay.

- SNMP Traps

  SNMP is an application-layer protocol that provides a message format for communication between managers and agents. The SNMP system consists of an SNMP manager, an SNMP agent, and a management information base (MIB).

The **snmp-server enable traps** command can be changed so that the user can send alarm traps to an SNMP server. You can use alarm profiles to set environmental or port status alarm conditions to send SNMP alarm traps. See the "Enabling SNMP Traps" section on page 3-9 for more information.

- Syslog Messages

  You can use alarm profiles to send system messages to a syslog server. See the "Configuring the Power Supply Alarms" section on page 3-6 for more information.

External Alarms

The switch supports two alarm inputs and one alarm output. The alarm input circuit is designed to sense if a dry contact is open or closed relative to the Alarm-In reference pin. The Alarm_Out is a relay with Normally Open and Normally Closed contacts. The switch software is configured to detect faults which are used to energize the relay coil and change the state on both of the relay contacts. Normally open contacts close and normally closed contacts open.

- **Open** means that the normal condition has current flowing through the contact (normally closed contact). The alarm is generated when the current stops flowing.

- **Closed** means that no current flows through the contact (normally open contact). The alarm is generated when current does flow.

Note   Software can program the Alarm_In to trigger an alarm with either Open or Closed setting.

The alarm connector is a 6-pin screw terminal. This table lists pinouts for the alarm ports.

Pin #	Signal Name	Description
6	Alarm_Out_NO	Alarm output relay normally open contact
5	Alarm_Out_Com	Alarm output relay common contact
4	Alarm_Out-NC	Alarm output relay normally closed contact
3	Alarm_In2	Alarm input #2
2	Alarm_In_Ref	Alarm input reference
1	Alarm_In1	Alarm input #1

You can set the alarm severity to major, minor, or none. The severity is included in the alarm message and also sets the LED color when the alarm is triggered. The LED is red for a minor alarm and blinking red for a major alarm. If not set, the default alarm severity is minor.

For detailed information about the alarm connector, LEDs, alarm circuit and wiring installation, alarm ratings and ports, see the *Hardware Installation Guide*.

Default Switch Alarm Settings

Table 3-3   Default Switch Alarm Settings

	Alarm	Default Setting
Global	Power supply alarm	Enabled in switch single power mode. No alarm.
		In dual-power supply mode, the default alarm notification is a system message to the console.
	Primary temperature alarm	Enabled for switch temperature range of 203ºF (95ºC) maximum to –4°F (–20ºC) minimum.
		The primary switch temperature alarm is associated with the major relay.
	Secondary temperature alarm	Disabled.
	Output relay mode alarm	Normally deenergized. The alarm output has switched off or is in an off state.
Port	Link fault alarm	Disabled on all interfaces.
	Port not forwarding alarm	Disabled on all interfaces.
	Port not operating alarm	Enabled on all interfaces.
	FCS bit error rate alarm	Disabled on all interfaces.

How to Configure Switch Alarms

Configuring External Alarms

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**alarm contact** *contact-number* **description** *string*	(Optional) Configures a description for the alarm contact number. • The *contact-number* value is from 1 to 4. • The description string is up to 80 alphanumeric characters in length and is included in any generated system messages.
Step 3	**alarm contact** {*contact-number* | **all**} {**severity** { **major** | **minor** | **none**} | **trigger** {**closed** | **open**}}	Configures the trigger and severity for an alarm contact number or for all contact numbers. • Enter a contact number (1 to 4) or specify that you are configuring **all** alarms. • For **severity**, enter **major**, **minor** or **none**. If you do not configure a severity, the default is **minor**. • For **trigger**, enter **open** or **closed**. If you do not configure a trigger, the alarm is triggered when the circuit is **closed**.
Step 4	**alarm relay-mode energized**	(Optional) Configures the output relay mode to energized.
Step 5	**end**	Returns to privileged EXEC mode.

	Command	Purpose
Step 6	show env alarm-contact	Shows the configured alarm contacts.
Step 7	copy running-config startup-config	(Optional) Saves your entries in the configuration file.

Configuring the Power Supply Alarms

	Command	Purpose
Step 1	configure terminal	Enters global configuration mode.
Step 2	power-supply dual	Configures dual power supplies.
Step 3	alarm facility power-supply disable	Disables the power supply alarm.
Step 4	alarm facility power-supply relay major	Associates the power supply alarm to the relay.
Step 5	alarm facility power-supply notifies	Sends power supply alarm traps to an SNMP server.
Step 6	alarm facility power-supply syslog	Sends power supply alarm traps to a syslog server.
Step 7	end	Returns to privileged EXEC mode.
Step 8	show env power	Displays the switch power status.
Step 9	show facility-alarm status	Displays all generated alarms for the switch.
Step 10	show alarm settings	Verifies the configuration.
Step 11	copy running-config startup-config	(Optional) Saves your entries in the configuration file.

Configuring the Switch Temperature Alarms

	Command	Purpose
Step 1	configure terminal	Enters global configuration mode.
Step 2	alarm facility temperature {primary	secondary} high threshold	Sets the high temperature threshold value. Set the threshold from –238°F (–150°C) to 572°F (300°C).
Step 3	alarm facility temperature primary low threshold	Sets the low temperature threshold value. Set the threshold from –328°F (–200°C) to 482°F (250°C).
Step 4	end	Returns to privileged EXEC mode.
Step 5	show alarm settings	Verifies the configuration.
Step 6	copy running-config startup-config	(Optional) Saves your entries in the configuration file.

Associating the Temperature Alarms to a Relay

By default, the primary temperature alarm is associated to the relay. You can use the **alarm facility temperature** global configuration command to associate the primary temperature alarm to an SNMP trap, or a syslog message, or to associate the secondary temperature alarm to the relay, an SNMP trap, or a syslog message.

Note   The single relay on the switch is called the major relay.

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**alarm facility temperature {primary	secondary} relay major**	Associates the primary or secondary temperature alarm to the relay.
Step 3	**alarm facility temperature {primary	secondary} notifies**	Sends primary or secondary temperature alarm traps to an SNMP server.
Step 4	**alarm facility temperature {primary	secondary} syslog**	Sends primary or secondary temperature alarm traps to a syslog server. Uses the **no alarm facility temperature secondary** command to disable the secondary temperature alarm.
Step 5	**end**	Returns to privileged EXEC mode.
Step 6	**show alarm settings**	Verifies the configuration.
Step 7	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Configuring the FCS Bit Error Rate Alarm

Setting the FCS Error Threshold

The switch generates an FCS bit error-rate alarm when the actual rate is close to the configured rate.

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**interface** *interface-id*	Enters the interface to be configured, and enters interface configuration mode.
Step 3	**fcs-threshold** *value*	Sets the FCS error rate. For *value*, the range is 6 to 11 to set a maximum bit error rate of 10^{-6} to 10^{-11}. By default, the FCS bit error rate is 10^{-8}.
Step 4	**end**	Returns to privileged EXEC mode.
Step 5	**show fcs-threshold**	Verifies the setting.
Step 6	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Setting the FCS Error Hysteresis Threshold

The hysteresis setting prevents the toggle of an alarm when the actual bit error-rate fluctuates near the configured rate. The FCS hysteresis threshold is applied to all ports of a switch.

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**alarm facility fcs-hysteresis** *percentage*	Sets the hysteresis percentage for the switch. For *percentage*, the range is 1 to 10. The default value is 10 percent.
Step 3	**end**	Returns to privileged EXEC mode.
Step 4	**show running config**	Verifies the configuration.
Step 5	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Configuring Alarm Profiles

Creating an Alarm Profile

You can use the **alarm profile** global configuration command to create an alarm profile or to modify an existing profile. When you create a new alarm profile, none of the alarms are enabled.

Note   The only alarm enabled in the *defaultPort* profile is the Port not operating alarm.

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**alarm profile** *name*	Creates the new profile or identifies an existing profile, and enters alarm profile configuration mode.
Step 3	**end**	Returns to privileged EXEC mode.
Step 4	**show alarm profile** *name*	Verifies the configuration.
Step 5	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Modifying an Alarm Profile

You can modify an alarm profile from alarm profile configuration mode.

You can enter more than one alarm type separated by a space.

Command	Purpose
**alarm {fcs-error	link-fault	not-forwarding	not-operating}**	(Optional) Adds or modifies alarm parameters for a specific alarm.
**notifies {fcs-error	link-fault	not-forwarding	not-operating}**	(Optional) Configures the alarm to send an SNMP trap to an SNMP server.

Command	Purpose
**relay-major {fcs-error	link-fault	not-forwarding	not-operating}**	(Optional) Configures the alarm to send an alarm trap to the relay.
**syslog {fcs-error	link-fault	not-forwarding	not-operating}**	(Optional) Configures the alarm to send an alarm trap to a syslog server.

Attaching an Alarm Profile to a Specific Port

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**interface** *port interface*	Enters interface configuration mode.
Step 3	**alarm-profile** *name*	Attaches the specified profile to the interface.
Step 4	**end**	Returns to privileged EXEC mode.
Step 5	**show alarm profile**	Verifies the configuration.
Step 6	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Enabling SNMP Traps

	Command	Purpose
Step 1	**configure terminal**	Enters global configuration mode.
Step 2	**snmp-server enable traps alarms**	Enables the switch to send SNMP traps.
Step 3	**end**	Returns to privileged EXEC mode.
Step 4	**show alarm settings**	Verifies the configuration.
Step 5	**copy running-config startup-config**	(Optional) Saves your entries in the configuration file.

Monitoring and Maintaining Switch Alarms Status

Table 3-4   Commands for Displaying Global and Port Alarm Status

Command	Purpose
show alarm description ports	Displays an alarm number and its text description.
show alarm profile [*name*]	Displays all alarm profiles in the system or a specified profile.
show alarm settings	Displays all global alarm settings on the switch.
**show env {alarm-contact	all	power	temperature}**	Displays the status of environmental facilities on the switch.
show facility-alarm status [**critical	info	major	minor**]	Displays generated alarms on the switch.

Configuration Examples for Switch Alarms

Configuring External Alarms: Example

This example configures alarm input 1 named *door sensor* to assert a major alarm when the door circuit is closed and then displays the status and configuration for all alarms:

```
Switch(config)# alarm contact 1 description door sensor
Switch(config)# alarm contact 1 severity major
Switch(config)# alarm contact 1 trigger closed
Switch(config)# end
Switch(config)# show env alarm-contact
Switch# show env alarm-contact

ALARM CONTACT 1
   Status:      not asserted
   Description: door sensor
   Severity:    major
   Trigger:     closed
ALARM CONTACT 2
   Status:      not asserted
   Description: external alarm contact 2
   Severity:    minor
   Trigger:     closed
```

Associating Temperature Alarms to a Relay: Examples

This example sets the secondary temperature alarm to the major relay, with a high temperature threshold value of 113ºF (45ºC). All alarms and traps associated with this alarm are sent to a syslog server and an SNMP server.

```
Switch(config) # alarm facility temperature secondary high 45
Switch(config) # alarm facility temperature secondary relay major
Switch(config) # alarm facility temperature secondary syslog
Switch(config) # alarm facility temperature secondary notifies
```

This example sets the first (primary) temperature alarm to the major relay. All alarms and traps associated with this alarm are sent to a syslog server.

```
Switch(config) # alarm facility temperature primary syslog
Switch(config) # alarm facility temperature primary relay major
```

Creating or Modifying an Alarm Profile: Example

This example creates or modifies the alarm profile *fastE* for the Fast Ethernet port with link-down (*alarmList* ID 3) alarm enabled. The link-down alarm is connected to the major relay. This alarm also send notifications to an SNMP server and sends system messages to a syslog server.

```
Switch(config)# alarm profile fastE
Switch(config-alarm-profile)# alarm fcs-error
Switch(config-alarm-profile)# relay major link-fault
Switch(config-alarm-profile)# notifies not-forwarding
Switch(config-alarm-profile)# syslog not-forwarding
```

Setting the FCS Error Hysteresis Threshold: Example

This example shows how to set the FCS bit error rate for a port to 10^{-10}:

```
Switch# configure terminal
Switch(config)# interface fastethernet1/1
Switch(config-if) # fcs-threshold 10
```

Configuring a Dual Power Supply: Examples

This example shows how to configure two power supplies:

```
Switch# configure terminal
Switch(config)# power-supply dual
```

These examples show how to display information when two power supplies are not present which results in a triggered alarm.

```
Switch# show facility-alarm status
Source Severity Description Relay Time
Switch MAJOR 5 Redundant Pwr missing or failed NONE Mar 01
1993 00:23:52

Switch# show env power
POWER SUPPLY A is DC OK
POWER SUPPLY B is DC FAULTY <--

Switch# show hard led
SWITCH: 1
SYSTEM: GREEN
ALARM : ALT_RED_BLACK <--
```

Displaying Alarm Settings: Example

```
Switch# show alarm settings
Alarm relay mode: De-energized
Power Supply
        Alarm                 Enabled
        Relay
        Notifies              Disabled
        Syslog                Enabled
Temperature-Primary
        Alarm                 Enabled
        Thresholds            MAX: 95C              MIN:  -20C
        Relay                 MAJ
        Notifies              Enabled
        Syslog                Enabled
Temperature-Secondary
        Alarm                 Disabled
        Threshold
        Relay
        Notifies              Disabled
        Syslog                Disabled
SD-Card
        Alarm                 Disabled
        Relay
        Notifies              Disabled
        Syslog                Enabled
```

```
Input-Alarm 1
        Alarm                 Enabled
        Relay
        Notifies              Disabled
        Syslog                Enabled
Input-Alarm 2
        Alarm                 Enabled
        Relay
        Notifies              Disabled
        Syslog                Enabled
```

Additional References

The following sections provide references related to switch administration:

Related Documents

Related Topic	Document Title
Cisco IE 2000 commands	*Cisco IE 2000 Switch Command Reference*, Release 15.0(1)EY
Cisco IOS basic commands	*Cisco IOS Configuration Fundamentals Command Reference*
Alarm input and output ports.	*Hardware Installation Guide*

Standards

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

MIBs

MIBs	MIBs Link
—	To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

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
The Cisco Technical Support website contains thousands of 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.	http://www.cisco.com/techsupport