



Configuring the Switch Alarms

This chapter describes how to configure alarms on the Cisco Industrial Ethernet 2000U Series (IE 2000U) and Connected Grid Switches, hereafter referred to as *switch*. This chapter includes the following sections:

- [Information About Switch Alarms, page 5-1](#)
- [Prerequisites, page 5-4](#)
- [Guidelines and Limitations, page 5-4](#)
- [Default Settings, page 5-4](#)
- [Configuring External Alarms, page 5-4](#)
- [Configuring Switch Alarms, page 5-7](#)
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- [Feature History, page 5-14](#)



Note

For complete syntax and usage information for the commands used in this chapter, see the switch command reference listed in the [“Related Documents” section on page 5-14](#).



Note

For information about the alarm input and output ports, see the [Cisco IE 2000U Switch Hardware Installation Guide](#).

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. For more information on how to configure the alarms, see the [“Configuring Switch Alarms” section on page 5-7](#).

This section includes the following topics:

- [Global Status Monitoring Alarms, page 5-2](#)
- [FCS Error Hysteresis Threshold, page 5-2](#)
- [Port Status Monitoring Alarms, page 5-2](#)
- [Triggering Alarm Options, page 5-3](#)

Global Status Monitoring Alarms

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

Table 5-1 Switch Global Status Monitoring Alarms

Alarm	Description
Power supply alarm	The switch monitors dual power supply levels. If there are two power supplies installed in the switch, an alarm triggers if a power supply fails. The alarm is automatically cleared when both power supplies are working. 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 5-7 .

FCS Error Hysteresis Threshold

The Ethernet standard calls for a maximum bit error rate of 10^{-8} . On the switch, 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:

$$h = \text{alarm clear threshold} / \text{alarm set threshold}$$

$$h = 5 \times 10^{-10} / 10^{-8} = 5 \times 10^{-2} = 0.05 = 5 \text{ percent}$$

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 5-8](#) 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 5-2](#). 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 5-2 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 5-2 Switch Port Status Monitoring Alarms

Alarm	Description
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 <i>error condition</i> , level 3.
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 <i>warning</i> , level 4.
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 <i>error condition</i> , level 3.
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 5-8 for more information. The severity for this alarm is <i>error condition</i> , 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 and port status 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 Switch Alarms” section on page 5-7](#) 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 5-12](#) for more information.

- Syslog Messages

You can use alarm profiles to send system messages to a syslog server. See the [“Configuring Switch Alarms” section on page 5-7](#) for more information.

Prerequisites

Review the [“Information About Switch Alarms” section on page 5-1](#).

Guidelines and Limitations

The `snmp-server enable traps alarms` command is used in conjunction with the `snmp-server host` command. Use the `snmp-server host` command to specify which host or hosts receive SNMP notifications. To send notifications, you must configure at least one `snmp-server host` command. See [Chapter 14, “Configuring SNMP”](#).

Default 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.
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.

Configuring External Alarms

You can connect up to four alarm inputs from external devices in your environment, such as a door, a temperature gauge, or a fire alarm, to the alarm input port on the switch front panel.

Figure 5-1 Alarm Port Pinouts

Pin	Alarm connection	1	2	3	4	5	6	7	8
1	Alarm 1 input								
2	Alarm 2 input								
3	Normally closed								
4	Alarm 3 input								
5	Alarm 4 input								
6	Normally open								
7	Alarm output common								
8	Alarm input common								

For each alarm input, you can configure an open or closed circuit to trigger an alarm and configure the severity of the alarm. A triggered alarm generates a system message. If you enter a descriptive name for the alarm, that name is included in the system message. A triggered alarm also turns on the LED display (the LED is normally off, meaning no alarm). See the [Cisco IE 2000U Switch Hardware Installation Guide](#) for information about the LEDs.

The alarm trigger setting is **open** or **closed**. If not set, the alarm is triggered when the circuit closes.

- 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.

You can set the alarm severity to **minor**, **major**, or **critical**. The severity is included in the alarm message and also sets the LED color when the alarm is triggered. The LED is amber for a minor alarm, red for a major alarm, and blinking red for a critical alarm. If not set, the default alarm severity is **minor**.

BEFORE YOU BEGIN

Review the “[Global Status Monitoring Alarms](#)” section on page 5-2.

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	alarm contact <i>contact-number</i> description <i>string</i>	(Optional) Configure a description for the alarm contact number. <ul style="list-style-type: none"> • The <i>contact-number</i> is from 1 to 4. • The description string is up to 80 alphanumeric characters in length and is included in any generated system messages.

	Command	Purpose
Step 3	alarm contact { <i>contact-number</i> all } { severity { critical major minor } trigger { closed open }}	Configure the trigger and severity for an alarm contact number or for all contact numbers. <ul style="list-style-type: none"> Enter a contact number (1 to 4) or specify that you are configuring all alarms. See Figure 5-1 for the alarm contact pinouts. For severity, enter critical, major, or minor. 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	end	Return to privileged EXEC mode.
Step 5	show env alarm-contact	Show the configured alarm contacts.
Step 6	copy running-config startup-config	(Optional) Save your entries in the configuration file.

To delete the alarm description, enter the **no alarm contact** *contact-number* **description** privileged EXEC command. To set the alarm severity to **minor** (the default), enter the **no alarm contact** {*contact-number* | **all**} **severity**. To set the alarm contact trigger to **closed** (the default), enter the **no alarm contact** {*contact-number* | **all**} **trigger**.

To see the alarm configuration and status, enter the **show env alarm-contact** privileged EXEC command.

For more detailed information about the alarm commands, see the command reference listed in the [“Related Documents”](#) section on page 5-14.

**Note**

The switch supports the CISCO-ENTITY-ALARM-MIB for these alarms.

EXAMPLE

This example configures alarm input 2 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 2 description door sensor
Switch(config)# alarm contact 2 severity major
Switch(config)# alarm contact 2 trigger closed
Switch(config)# end
Switch(config)# show env alarm-contact
Switch# show env alarm-contact
ALARM CONTACT 1
  Status:      not asserted
  Description: test_1
  Severity:    critical
  Trigger:     open
ALARM CONTACT 2
  Status:      not asserted
  Description: door sensor
  Severity:    major
  Trigger:     closed
ALARM CONTACT 3
  Status:      not asserted
  Description: flood sensor
  Severity:    critical
  Trigger:     closed
```

```
ALARM CONTACT 4
  Status:      not asserted
  Description:
  Severity:    critical
  Trigger:     closed
```

Configuring Switch Alarms

This section includes the following topics:

- [Configuring the Power Supply Alarms, page 5-7](#)
- [Configuring the FCS Bit Error Rate Alarm, page 5-8](#)
- [Configuring Alarm Profiles, page 5-9](#)
- [Enabling SNMP Traps, page 5-12](#)

Configuring the Power Supply Alarms

The presence of power supplies is dynamically detected. Use the **show env power** command in privileged EXEC or user EXEC mode to display power information for the switch.

Use the **alarm facility power-supply rps** global configuration command to associate the switch redundant power supply (RPS) alarm to the relay. You can also configure all alarms and traps associated with the RPS to be sent to syslog and the SNMP server.

BEFORE YOU BEGIN

Before you can use the **notifies** command to send alarm traps to an SNMP server, you must first set up the SNMP server by using the **snmp-server enable traps alarms** global configuration command. See the “[Enabling SNMP Traps](#)” section on page 5-12.

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	alarm facility power-supply rps relay major	Associate the RPS alarm to the relay.
Step 3	alarm facility power-supply rps notifies	Send RPS alarm traps to an SNMP server.
Step 4	alarm facility power-supply rps syslog	Send RPS alarm traps to a syslog server.
Step 5	end	Return to privileged EXEC mode.
Step 6	show alarm settings	Verify the configuration.
Step 7	copy running-config startup-config	(Optional) Save your entries in the configuration file.

To disable sending the alarm to a relay, to syslog, or to an SNMP server, use the **no alarm facility power-supply rps relay**, **no alarm facility power-supply rps notifies**, or **no alarm facility power-supply rps syslog** global configuration commands.

EXAMPLE

This example sets the RPS monitoring alarm to the major relay:

```
Switch(config) # alarm facility power-supply rps relay major
```

Configuring the FCS Bit Error Rate Alarm

- [Setting the FCS Error Threshold, page 5-8](#)
- [Setting the FCS Error Hysteresis Threshold, page 5-9](#)

Setting the FCS Error Threshold

The switch generates an FCS bit error rate alarm when the actual rate is close to the configured rate. Use the **fcs-threshold** interface configuration command to set the FCS error threshold.

BEFORE YOU BEGIN

Review the “[FCS Error Hysteresis Threshold](#)” section on [page 5-2](#).

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	interface <i>interface-id</i>	Enter the interface to be configured, and enter interface configuration mode.
Step 3	fcs-threshold <i>value</i>	Set the FCS bit error rate. For <i>value</i> , 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	Return to privileged EXEC mode.
Step 5	show fcs-threshold	Verify the setting.
Step 6	copy running-config startup-config	(Optional) Save your entries in the configuration file.

Use the **no fcs-threshold** interface configuration command to return to the default FCS threshold value.

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
```


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. Use the **alarm facility fcs-hysteresis** global configuration command to set the FCS error hysteresis threshold.



Note

The FCS hysteresis threshold is applied to all ports of a switch.

BEFORE YOU BEGIN

Review the “[FCS Error Hysteresis Threshold](#)” section on page 5-2.

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	alarm facility fcs-hysteresis percentage	Set the hysteresis percentage for the switch. For <i>percentage</i> , the range is 1 to 10. The default value is 10 percent.
Step 3	end	Return to privileged EXEC mode.
Step 4	show running config	Verify the configuration.
Step 5	copy running-config startup-config	(Optional) Save your entries in the configuration file.

Use the **no alarm facility fcs-hysteresis** command to set the FCS error hysteresis threshold to its default value.



Note

The **show running config** command displays any FCS error hysteresis that is not the default value.

EXAMPLE

This example shows how to set the FCS error hysteresis at 5 percent:

```
Switch(config)# alarm facility fcs-hysteresis 5
```

Configuring Alarm Profiles

- [Creating or Modifying an Alarm Profile, page 5-9](#)
- [Attaching an Alarm Profile to a Specific Port, page 5-11](#)

Creating or Modifying 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.

BEFORE YOU BEGIN

Before you use the **notifies** command to send alarm traps to an SNMP server, you must first set up the SNMP server by using the **snmp-server enable traps alarms** global configuration command. See the “Enabling SNMP Traps” section on page 5-12.

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	alarm profile name	Create the new profile or identify an existing profile, and enter alarm profile configuration mode.
Step 3	alarm alarm-id	Add or modify alarm parameters for a specific alarm (see Table 5-3). The values are 1 to 4. You can enter more than one alarm ID separated by a space.
Step 4	notifies alarm-id	(Optional) Configure the alarm to send an SNMP trap to an SNMP server.
Step 5	relay-major alarm-id	(Optional) Configure the alarm to send an alarm trap to the relay.
Step 6	syslog alarm-id	(Optional) Configure the alarm to send an alarm trap to a syslog server.
Step 7	end	Return to privileged EXEC mode.
Step 8	show alarm profile name	Verify the configuration.
Step 9	copy running-config startup-config	(Optional) Save your entries in the configuration file.

To delete an alarm profile, use the **no alarm profile name** global configuration command.

[Table 5-3](#) lists the *alarmList* IDs and their corresponding alarm definitions. For a description of these alarms, see the “Port Status Monitoring Alarms” section on page 5-2.

Table 5-3 AlarmList ID Number Alarm Descriptions

AlarmList ID	Alarm Description
1	Link fault
2	Port not forwarding
3	Port not operating
4	FCS bit error rate exceeds threshold

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-prof)# alarm 3
Switch(config-alarm-prof)# relay major 3
Switch(config-alarm-prof)# notifies 3
Switch(config-alarm-prof)# syslog 3
```

Attaching an Alarm Profile to a Specific Port

In interface configuration mode, you can use the **alarm-profile** command to attach an alarm profile to a specific port.

BEFORE YOU BEGIN

Review the [“Port Status Monitoring Alarms”](#) section on page 5-2.

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal	Enter global configuration mode.
Step 2	interface <i>port interface</i>	Enter the number of the switch port to be configured, and the switch enters interface configuration mode.
Step 3	alarm-profile <i>name</i>	Attach the specified profile to the interface.
Step 4	end	Return to privileged EXEC mode.
Step 5	show alarm profile	Verify the configuration.
Step 6	copy running-config startup-config	(Optional) Save your entries in the configuration file.

To detach an alarm profile from a specific port, use the **no alarm-profile** *name* interface configuration command.

EXAMPLE

This example attaches an alarm profile named *fastE* to a port:

```
Switch(config)# interface fastethernet 1/2
Switch(config-if)# alarm profile fastE
```

This example detaches an alarm profile named *fastE* from a port:

```
Switch(config)# interface fastethernet 1/2
Switch(config-if)# no alarm profile fastE
```

Enabling SNMP Traps

Use the `snmp-server enable traps alarms` global configuration command to enable the switch to send *alarm* traps.

BEFORE YOU BEGIN

The `snmp-server enable traps alarms` command is used in conjunction with the `snmp-server host` command. Use the `snmp-server host` command to specify which host or hosts receive SNMP notifications. To send notifications, you must configure at least one `snmp-server host` command.

DETAILED STEPS

	Command	Purpose
Step 1	<code>configure terminal</code>	Enter global configuration mode.
Step 2	<code>snmp-server enable traps alarms</code>	Enable the switch to send SNMP traps.
Step 3	<code>end</code>	Return to privileged EXEC mode.
Step 4	<code>show alarm settings</code>	Verify the configuration.
Step 5	<code>copy running-config startup-config</code>	(Optional) Save your entries in the configuration file.

EXAMPLE

```
Switch(config)# snmp-server enable traps alarms
```

Verifying Configuration

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

Configuration Example

This example configures alarm input 2 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 2 description door sensor
Switch(config)# alarm contact 2 severity major
Switch(config)# alarm contact 2 trigger closed
```

```

Switch(config)# end
Switch(config)# show env alarm-contact
Switch# show env alarm-contact
ALARM CONTACT 1
  Status:      not asserted
  Description: test_1
  Severity:    critical
  Trigger:     open
ALARM CONTACT 2
  Status:      not asserted
  Description: door sensor
  Severity:    major
  Trigger:     closed
ALARM CONTACT 3
  Status:      not asserted
  Description: flood sensor
  Severity:    critical
  Trigger:     closed
ALARM CONTACT 4
  Status:      not asserted
  Description:
  Severity:    critical
  Trigger:     closed

```

This example sets the RPS monitoring alarm to the major relay:

```
Switch(config) # alarm facility power-supply rps relay major
```

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

```

This example shows how to set the FCS error hysteresis at 5 percent:

```
Switch(config)# alarm facility fcs-hysteresis 5
```

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-prof)# alarm 3
Switch(config-alarm-prof)# relay major 3
Switch(config-alarm-prof)# notifies 3
Switch(config-alarm-prof)# syslog 3

```

This example attaches an alarm profile named *fastE* to a port:

```

Switch(config)# interface fastethernet 1/2
Switch(config-if)# alarm profile fastE

```

This example detaches an alarm profile named *fastE* from a port:

```

Switch(config)# interface fastethernet 1/2
Switch(config-if)# no alarm profile fastE

```

Related Documents

- [Cisco IOS Master Command List, All Releases](#)
- [Cisco IE 2000U Switch Hardware Installation Guide](#)

Feature History

Platform	First Supported Release
IE 2000U	Cisco IOS Release 15.0(2)EH
CGS 2520	Cisco IOS Release 12.2(53)EX