Catalyst 5000 Series Group Switching Ethernet Module Configuration Note

Product Number: WS-X5020

This document contains instructions for installing the Catalyst 5000 Series Group Switching Ethernet Module (10BaseT 48 port). This document also contains procedures for configuring the module once it is installed. Configuration examples are also provided. For a complete description of commands used to configure and maintain the Catalyst 5000 series switch, refer to the *Catalyst 5000 Series Configuration Guide and Command Reference* publication. For complete hardware configuration and maintenance procedures, refer to the *Catalyst 5000 Series Installation Guide* publication. These documents are available on UniverCD or in printed form.

Sections in this document include the following:

- What is the Catalyst 5000 Series Switch?

- Group Switching Ethernet Module (10BaseT 48 port) Description

- Switching Module LEDs

- Preparing Network Connections

- Ethernet Connection Equipment

- Safety Recommendations

- Installing and Configuring Switching Modules

- Configuring the Interfaces

Warning   Only trained and qualified personnel should be allowed to install or replace the Catalyst 5000 series switch, chassis, power supplies, fan assembly, or switching modules.

Note   Refer to the *Catalyst 5000 Series Installation Guide* for translated versions of all warnings in this document.

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What is the Catalyst 5000 Series Switch?

The Catalyst 5000 series switch provides high-density switched Ethernet for both wiring closet and data-center applications. The switch includes a single integrated 1.2 gigabit-per-second (Gbps) multiple-LAN-switching backplane, called the switching backplane, that supports switched 10-megabits-per-second (Mbps) and 100-Mbps Fast Ethernet with backbone connections to Fast Ethernet. Figure 1 is an example of a configuration using the Catalyst 5000 series switch.

Figure 1   Cascaded Switches Using Fast Ethernet Interfaces on the Supervisor Engine Module
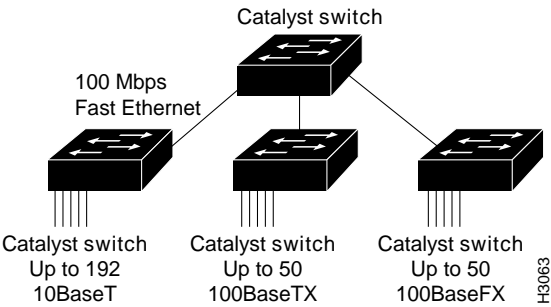
The Catalyst 5000 series switch chassis has five slots. The first slot is used for the supervisor engine module, which provides Layer 2 switching, local and remote management, and dual Fast Ethernet interfaces. The remaining four slots can be used for any combination of modules for additional 10- and 100-Mbps Ethernet. Figure 2 shows the rear view of the Catalyst 5000 series switch, which provides access to the supervisor engine and switching modules, power supply, and fan assembly. The LEDs on the supervisor engine module indicate normal system operation, switch load, and the currently active power supplies. The status LED turns green to indicate that the system is in a normal operating state.

**Figure 2   Catalyst 5000 Series Switch Chassis Rear View**
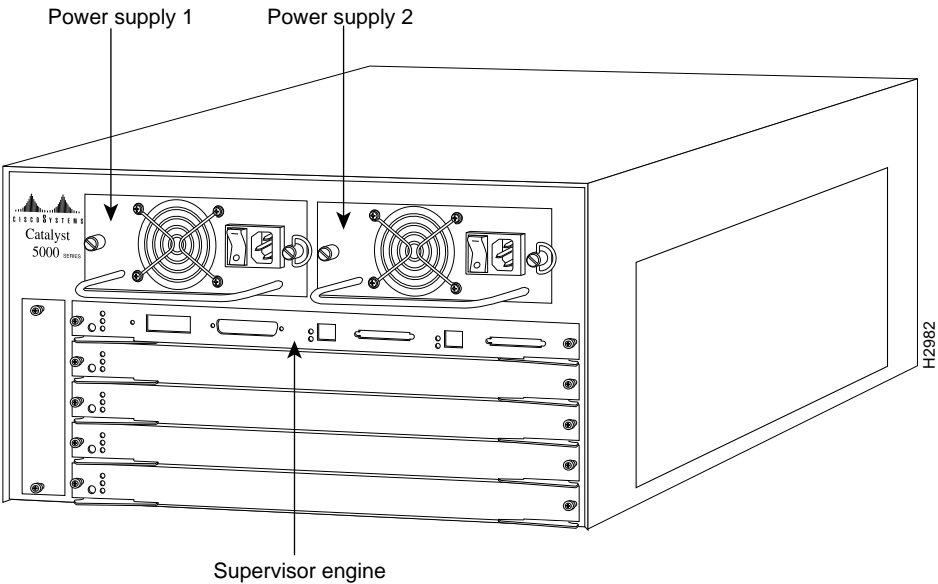
Group Switching Ethernet Module (10BaseT 48 port) Description

The Group Switching Ethernet Module (10BaseT 48 port) provides a method to divide users into managed switch groups. Group switching combines hub costing and network management on one module; it is an alternative to shared-media hubs. Each module has four 10BaseT Ethernet segments with groups of 12 users per segment (48 interfaces per module).

The Group Switching Ethernet Module, shown in Figure 3, provides connection to 48 10-Mbps (10BaseT) full- or half-duplex Ethernet interfaces using four RJ-21 Telco female ports (12 interfaces per port). You can switch each group of 12 ports to any Catalyst 5000 VLAN.

Figure 3   Group Switching Ethernet Module (10BaseT 48 port)
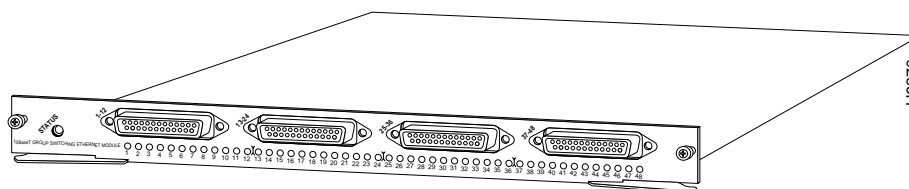
Specifications

Following are the Group Switching Ethernet Module (10BaseT 48 port) specifications:

Table 1   Group Switching Ethernet Module (10BaseT 48 port) Specifications

Description	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 inches (3 x 35.6 x 40.6 cm)
Weight	5.7 lb (2.53 kg)

Environmental Conditions:
   Operating temperature
   Nonoperating temperature
   Humidity
	
	 32 to 104 F (0 to 40 C)
	 -40 to 167 F (-40 to 75 C)
	 10 to 90%, noncondensing

Connectors	4 RJ-21 IEEE 802.3 Ethernet 10BaseT
RAM buffer memory	192 KB per group
Maximum station-to-station cabling distance	10BaseT Ethernet: Category 3-5 UTP[1]: 328' (100 m) 100-Ohm STP: 328' (100m)
Frame processing	Transparent bridging (802.1d)
Network management	Ethernet MIB (RFC 1398) Bridge MIB (RFC 1493) Ethernet Repeater MIB (RFC 1516) Interface Table (RFC 1573) RMON MIB (RFC 1757) Cisco Discovery Protocol Cisco VLAN Trunk Protocol (VTP) Cisco Workgroup MIB

Agency approvals
   Safety:
   EMI[2]:
	
	 UL[3] 1950, CSA[4]-C22.2 No. 950-93, and EN60950
	 FCC[5] Class A (Part 15), EN 55022 Class B on shielded UTP, CE Mark, VCCI Class 2, CISPR 22 Class B on shielded UTP

1. UTP = unshielded twisted pair
2. EMI = electromagnetic interface
3. UL = Underwriters Laboratory
4. CSA = Canadian Standards Association
5. FCC = Federal Communications Commission

Maximum Configuration

The five available interface slots on the Catalyst 5000 series switch support any combination of network interface switching modules, or any of the same type switching modules providing the maximum port densities up to 192 grouped switched Ethernet interfaces and two 100-Mbps switched interfaces.

Switching Module LEDs

Each switching module contains a status LED. When on, this LED indicates that the switching module is powered up. It does not necessarily mean that the interface ports are functional or enabled.

The LEDs on the faceplate of the Group Switching Ethernet Module (10BaseT 48 port) are described in Table 2 and shown in Figure 4.

Table 2   Group Switching Ethernet Module (10BaseT 48 port) LED Descriptions

LED	Description
Status	The switch performs a series of self-tests and diagnostic tests.
	If the module is not receiving power, the status LED is off.
	If all the tests pass, the status LED is green.
	If a test other than an individual port test fails, the status LED is red.
	During system boot or if the module is disabled, the LED is orange.
	During self-test diagnostics, the LED is orange.
	If the module is disabled, the LED is orange.
LEDs 1 through 48	If the port is operational, the LED is green.
	If the link has been disabled by software, the LED is orange.
	If the link is bad and has been disabled, the LED is flashing orange.
	If no signal is detected, the LED is off.

Figure 4   Group Switching Ethernet Module (10BaseT 48 port) LEDs
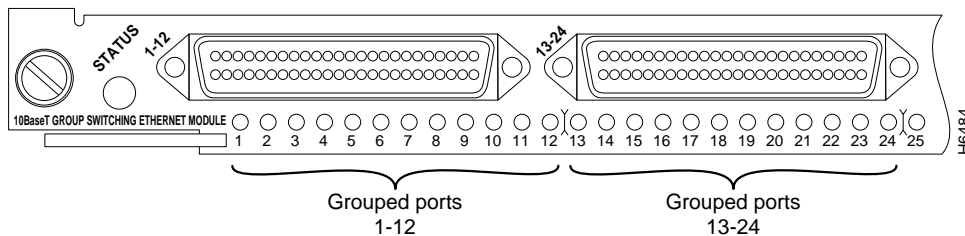
Preparing Network Connections

When preparing your site for network connections to the switch, you need to consider several factors related to each type of interface:

- Type of cabling required for each type (fiber, thick, or twisted-pair cabling).

- Distance limitations for each signal type.

- Specific cables you need to connect each interface.

- Any additional interface equipment you need, such as transceivers, modems, channel service units (CSUs), or data service units (DSUs).

Before installing the switch, have all additional external equipment and cables on hand. If you intend to build your own cables, refer to the cable pinouts in the appendix "Cabling Specifications" in the *Catalyst 5000 Series Installation Guide* publication. For ordering information, contact a customer service representative.

Distance Limitations

The distance and rate limits discussed in this section are the IEEE recommended maximum speeds and distances for signaling; however, if you understand the electrical problems that might arise and can compensate for them, you should get good results with rates and distances greater than those described here. But, you do so at your own risk. The following distance limits are provided as guidelines for planning your network connections before installation.

The maximum distances for Ethernet network segments and connections depend on the type of transmission cable used, for example, unshielded twisted pair (10BaseT).

The IEEE recommends a maximum distance of 328 feet (100 meters) between station (connection) and hub for 10BaseT connections using Category 3 UTP.

Ethernet Connection Equipment

You can use RJ-21 Telco male connectors to connect twelve 10-Mbps Ethernet to a punch-down block or patch panel. The Group Switching Ethernet module requires a 180 degree hood on the RJ-21 connector. Refer to Figure 5 for an example of an Ethernet RJ-25 Telco Interface 180° Cable connector.

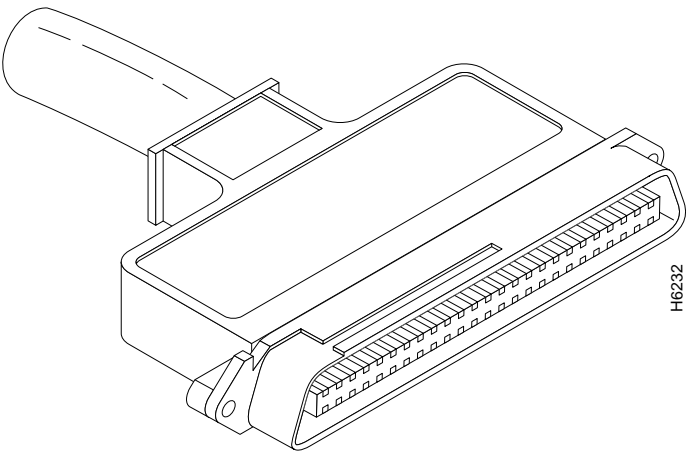**Figure 5   Ethernet RJ-25 Telco Interface 180° Cable Connectors**

Table 3 lists the signals for the Group Switching Ethernet Module (10BaseT 48 port) RJ-21 Telco Ethernet connector.

Table 3   Ethernet Switching Module RJ-21 Telco Ethernet Port Signals

Pin	Signal	Direction	Description	Ethernet Port No.
1	RxD –	<—	Receive Data	1
2	TxD –	—>	Transmit Data	1
26	RxD +	<—	Receive Data	1
27	TxD +	—>	Transmit Data	1
3	RxD –	<—	Receive Data	2
4	TxD –	—>	Transmit Data	2
28	RxD +	<—	Receive Data	2
29	TxD +	—>	Transmit Data	2
5	RxD –	<—	Receive Data	3
6	TxD –	—>	Transmit Data	3
30	RxD +	<—	Receive Data	3
31	TxD +	—>	Transmit Data	3
7	RxD –	<—	Receive Data	4
8	TxD –	—>	Transmit Data	4
32	RxD +	<—	Receive Data	4
33	TxD +	—>	Transmit Data	4
9	RxD –	<—	Receive Data	5
10	TxD –	—>	Transmit Data	5
34	RxD +	<—	Receive Data	5
35	TxD +	—>	Transmit Data	5
11	RxD –	<—	Receive Data	6
12	TxD –	—>	Transmit Data	6
36	RxD +	<—	Receive Data	6
37	TxD +	—>	Transmit Data	6
13	RxD –	<—	Receive Data	7
14	TxD –	—>	Transmit Data	7
38	RxD +	<—	Receive Data	7
39	TxD +	—>	Transmit Data	7
15	RxD –	<—	Receive Data	8
16	TxD –	—>	Transmit Data	8
40	RxD +	<—	Receive Data	8
41	TxD +	—>	Transmit Data	8
17	RxD –	<—	Receive Data	9
18	TxD –	—>	Transmit Data	9
42	RxD +	<—	Receive Data	9
43	TxD +	—>	Transmit Data	9
19	RxD –	<—	Receive Data	10

Pin	Signal	Direction	Description	Ethernet Port No.
20	TxD –	—>	Transmit Data	10
44	RxD +	<—	Receive Data	10
45	TxD +	—>	Transmit Data	10
21	RxD –	<—	Receive Data	11
22	TxD –	—>	Transmit Data	11
46	RxD +	<—	Receive Data	11
47	TxD +	—>	Transmit Data	11
23	RxD –	<—	Receive Data	12
24	TxD –	—>	Transmit Data	12
48	RxD +	<—	Receive Data	12
49	TxD +	—>	Transmit Data	12
25			(Not Used)	
50			(Not Used)	

Safety Recommendations

The following guidelines will help to ensure your safety and protect the equipment. This list is not inclusive of all potentially hazardous situations that you may be exposed to as you install the switch, so *be alert*.

- Never try to lift the Catalyst 5000 chassis by yourself; *two people are required* to lift the switch.

- Always turn all power supplies off (the position marker zero) and unplug all power cords before installing or removing a chassis, or removing the chassis front panel.

- Keep the chassis area clear and free of dust during and after installation.

- Keep tools and chassis components off the floor and away from foot traffic.

- Avoid wearing, jewelry (including rings and chains), or other items that could get caught in the chassis. Avoid wearing or securely fasten any loose clothing, such as a tie, scarf, or sleeves.

Warning Metal objects heat up when connected to power and ground, and can cause serious burns.

Safety with Electricity

The supervisor engine, switching modules, and redundant (second) power supplies are designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system. Before removing a redundant power supply, ensure that the first supply is powered on. However, you must shut down the system before removing or replacing any of the replaceable components inside the front panel; for example, the backplane. Never install equipment that appears damaged.

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.

- Disconnect all power and external cables before installing or removing a chassis.

- Do not work alone when potentially hazardous conditions exist.

- Never assume that power has been disconnected from a circuit; always check.

- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

In addition, use the guidelines that follow when working with any equipment that is disconnected from a power source but still connected to telephone wiring or other network cabling.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity.

- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

ESD damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent failures. The supervisor engine module and switching modules each consist of a printed circuit card that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the metal carrier helps to protect the cards from ESD, use a preventive antistatic strap whenever you handle the supervisor engine module or switching modules. Handle the carriers by the handles and the carrier edges only; never touch the cards or connector pins.

Caution Always tighten the captive installation screws on the supervisor engine module and switching modules when you are installing them. These screws prevent accidental removal, provide proper grounding for the system, and help to ensure that the bus connectors are properly seated in the backplane.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap and ensure that it makes good skin contact.

- When removing switching modules, connect the equipment end of the strap to one of the captive installation screws on an installed switching module or power supply. (See Figure 6.) When replacing internal components that are accessible from the rear of the chassis (for example, the supervisor engine module), connect the strap to an unpainted inner surface of the chassis such as the inner frame, which is exposed when the panels are removed.

- When installing a supervisor engine module or switching module, use the ejector levers to properly seat the bus connectors in the backplane, then tighten both (left and right) captive installation screws. These screws prevent accidental removal, provide proper grounding for the system, and help to ensure that the bus connectors are seated in the backplane.

Figure 6   Placement of ESD Wrist Strap
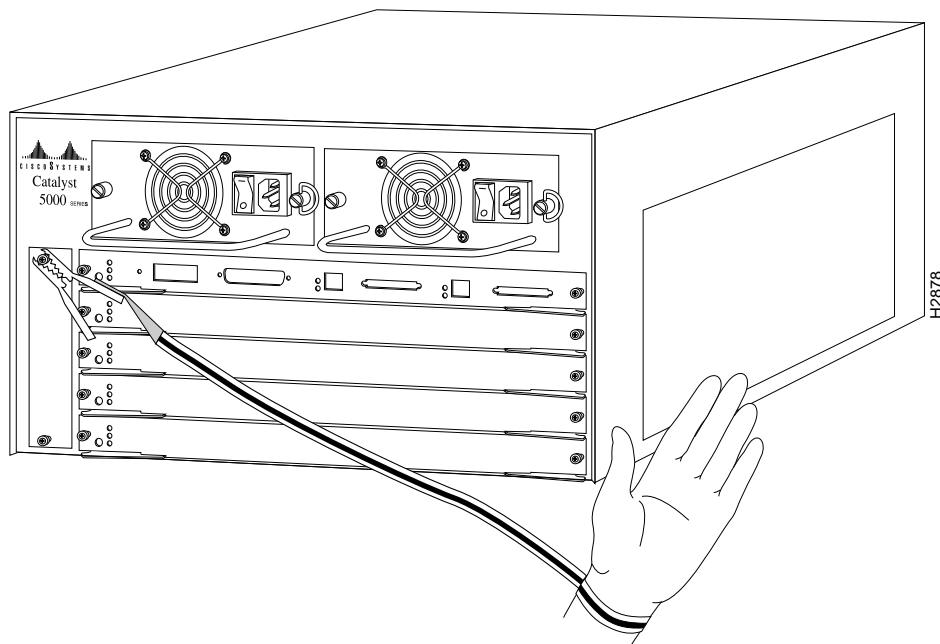
- When removing a supervisor engine module or switching module, use the ejector levers to release the bus connectors from the backplane. Grasp the captive screws and pull the carrier out slowly, using your hand along the bottom of the carrier to guide it straight out of the slot.

- Handle carriers by the handles and carrier edges only; avoid touching the card or any connector pins.

- When removing a supervisor engine module or switching module, place the removed card component side up on an antistatic surface or in a static shielding bag. If the component will be returned to the factory, immediately place it in a static shielding bag.

- Handle bare cards by the edges only.

- Avoid contact between the switching module and clothing. The wrist strap protects only the card from ESD voltages on the body; ESD voltages on clothing can still cause damage.

⚠ **Caution**   For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 Mohms.

Installing and Configuring Switching Modules

All switching modules support hot-swapping, which allows you to install, remove, replace, and rearrange the switching modules without turning off the system power. When the system detects that a switching module has been installed or removed, it automatically runs diagnostic and discovery routines, acknowledges the presence or absence of the switching module, and resumes system operation without any operator intervention.

Overview of Hot-Swapping

The hot-swapping feature allows you to remove and replace switching modules while the system is operating; you do not need to notify the software or shut down the system power. All switching modules support hot-swapping.

Caution   The supervisor engine module is a required system component. Do not remove the supervisor module while the system is operating. Doing so will cause the system to halt.

Each supervisor engine module and switching module contains a bus-type connector that mates with the system backplane. Each card connector consists of a set of tiered pins, in three lengths. The pins send specific signals to the system as they make contact with the backplane. When you remove or insert a switching module, the backplane, the system performs as follows:

1   Rapidly scans the backplane for configuration changes.

2   Initializes all newly inserted switching modules, noting any removed interfaces and placing them in administrative shutdown.

3   Brings all previously configured interfaces on the switching module back to the state they were in when they were removed. Any newly inserted interfaces are put in administrative shutdown, as if they were present (but unconfigured) at boot time. If a similar switching module type has been reinserted into a slot, then its ports are configured and brought online up to the port count of the original switching module.

When you insert a new switching module, the system runs a diagnostic test on the new interfaces and compares them to the existing configuration. If this initial diagnostic fails, the system remains off line for another 15 seconds while it performs a second set of diagnostic tests to determine whether or not the switching module is faulty and if normal system operation is possible.

If the second diagnostic test passes, which indicates that the system is operating normally and the new switching module is faulty, the system resumes normal operation but leaves the new interfaces disabled.

If the second diagnostic test fails, the system crashes, which usually indicates that the new switching module has created a problem in the bus and should be removed.

Caution   To avoid erroneous failure messages, allow at least 15 seconds for the system to reinitialize and note the current configuration of all interfaces before you remove or insert another switching module.

Incorrect Practices When Inserting and Removing Switching Modules

The function of the ejector levers (see Figure 7) on the supervisor and switching modules is to align and seat the card connectors in the backplane. Failure to use the ejector levers and insert the switching module properly can disrupt network activity. Follow the installation and removal instructions carefully, and review the following examples of *incorrect* insertion practices and results:

- Using the faceplate to force a switching module all the way into the slot can pop the ejector levers out of their springs. If you then try to use the ejector levers to seat the switching module, the first layer of pins (which are already mated to the backplane) can disconnect and then remate with the backplane, which the system interprets as a card failure.

- Using the faceplate to force or slam the switching module all the way into the slot can also damage the pins on the card connectors if they are not aligned properly with the backplane.

- When using the faceplate (rather than the ejector levers) to seat the switching module in the backplane, you may need to pull the switching module back out and push it in again to align it properly. Even if the connector pins are not damaged, the pins mating with and disconnecting from the backplane will cause the system to interpret a card failure. Using the ejector levers ensures that the card connector mates with the backplane in one continuous movement.

- Using the faceplate to insert or remove a switching module, or failing to push the ejector levers to the full 90-degree position, can leave some (not all) of the connector pins mated to the backplane, a state that will suspend the system and bring down the network. Using the ejector levers and making sure that they are pushed fully into position ensures that all three layers of pins are mated with (or free from) the backplane.

It is also important to use the ejector levers when removing a switching module to ensure that the card connector pins disconnect from the backplane in the logical sequence expected by the system. Any supervisor engine module or switching module that is only partially connected to the backplane can hang the bus. Detailed steps for correctly performing hot-swapping are included with the following procedures for installing and removing switching modules.

⚠️ **Caution**   Do not use the faceplate to insert or remove a switching module. Be sure to push the ejector levers to the full 90-degree position to make sure **all** of the connector pins are mated to the backplane. Always use the ejector levers when removing a switching module.

Figure 7   Ejector Levers and Captive Installation Screws (Supervisor Engine Module Shown)

Captive installation screws

Ejector lever
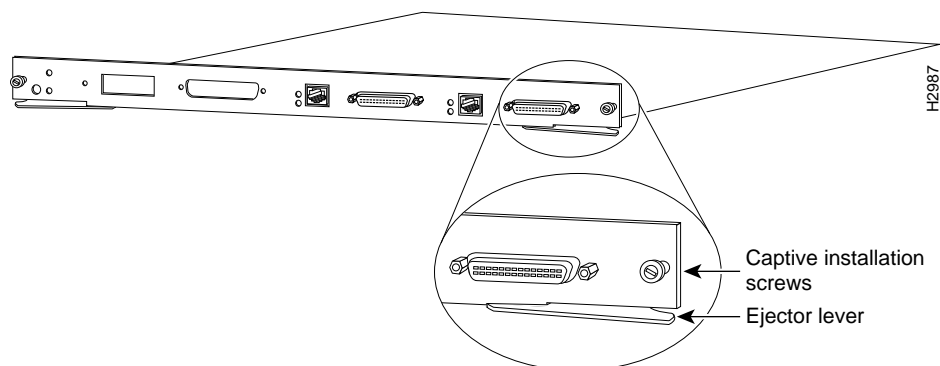
Tools Required

You need a 1/4-inch flat-blade screwdriver to remove any filler (blank) switching modules and to tighten the captive installation screws that secure the switching modules in their slots. Whenever you handle switching modules, you should use a wrist strap or other grounding device to prevent ESD damage. See the section "Preventing Electrostatic Discharge Damage."

Removing Switching Modules

Take the following steps to remove a switching module:

Step 1 If you do not plan to immediately reinstall the switching module you are removing, disconnect any network interface cables attached to the switching module ports.

Step 2 Use a screwdriver to loosen the captive installation screws at the left and right sides of the switching module.

Step 3 Place your thumbs on the left and right ejector levers and simultaneously push the levers outward to release the switching module from the backplane connector.

Step 4 Grasp the switching module handle with one hand and place your other hand under the carrier to support and guide the switching module out of the slot. Avoid touching the card.

Step 5 Carefully pull the switching module straight out of the slot, keeping your other hand under the carrier to guide it. Keep the switching module oriented horizontally.

Step 6 Place the removed switching module on an antistatic mat or antistatic foam, or immediately install it in another slot.

Step 7 If the slot is to remain empty, install a switching module filler plate (part number 800-00292-01) to keep dust out of the chassis and to maintain proper airflow through the switching module compartment.

Caution   Always install the switching module filler plate in empty switching module slots to maintain the proper flow of cooling air across the cards.

Installing Switching Modules

You can install switching modules in any of the four switching module slots, numbered 2 through 5 from top to bottom, when viewing the chassis from the rear. (See Figure 8.) The top slot contains the supervisor engine module, which is a required system component. Switching module fillers, which are blank switching module carriers, are installed in slots without switching modules to maintain consistent airflow through the switching module compartment.

Figure 8   Slot Numbers
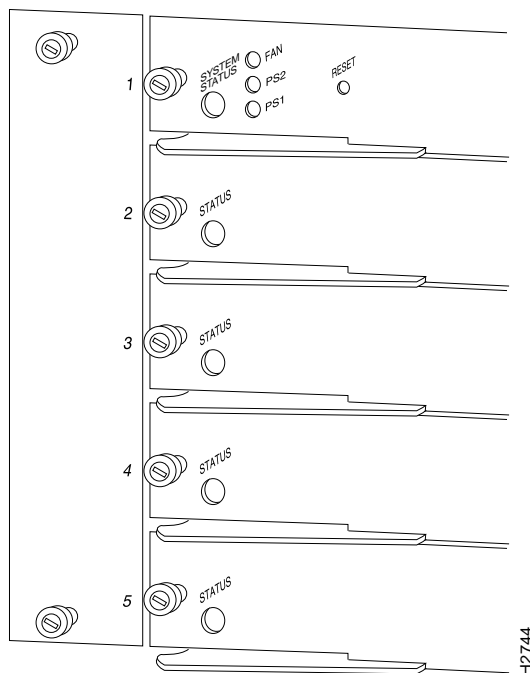
Following is the procedure for installing a switching module.

⚠️ **Caution**   Handle switching modules only by the carrier edges to prevent ESD damage.

Step 1   Choose a slot for the new switching module and ensure that there is enough clearance to accommodate any interface equipment that you will connect directly to the switching module ports. If possible, place switching modules between empty slots that contain only switching module filler plates.

Step 2   Switching modules are secured with two captive installation screws. Use a 1/4-inch flat-blade screwdriver to loosen the captive installation screws and remove the switching module filler (or the existing switching module) from the slot you want to use.

Step 3   Hold the switching module handle with one hand, and place your other hand under the carrier to support the switching module and guide it into the slot. Avoid touching the card.

Step 4   Place the back of the switching module in the slot and align the notch on the sides of the switching module carrier with the groove in the slot. (See Figure 9.)

Figure 9   Module Installation
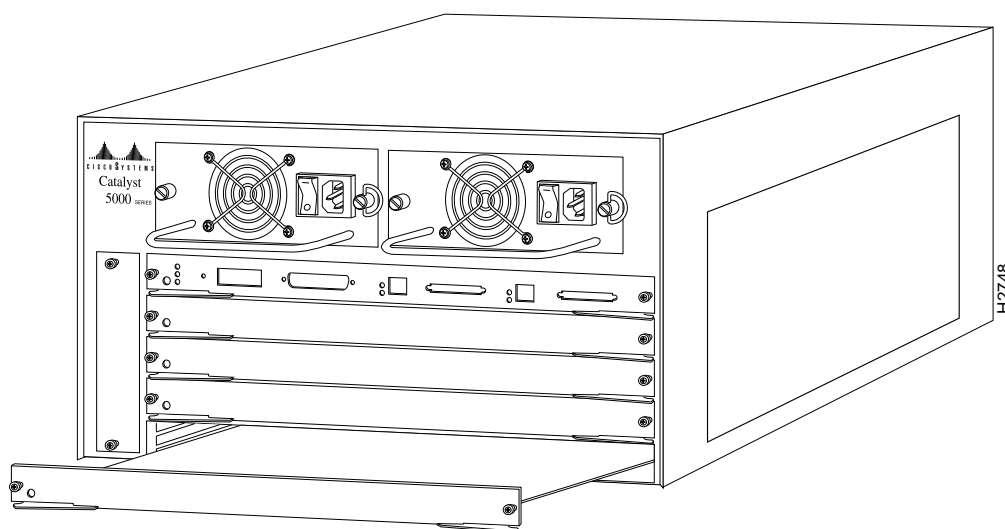
Step 5   While keeping the switching module oriented horizontally, carefully slide the switching module into the slot until the switching module faceplate makes contact with the ejector levers.

Step 6   Using the thumb and forefinger of each hand, simultaneously push the left and right levers in to fully seat the switching module in the backplane connector.

⚠ **Caution**   Always use the ejector levers when installing or removing switching modules. A module that is partially seated in the backplane will cause the system to halt and subsequently crash.

Step 7   Use a screwdriver to tighten the captive installation screws on the left and right ends of the switching module.

Step 8   Attach network interface cables or other devices to the interface ports.

Step 9   Check the status of the interfaces as follows:

- If this installation is a replacement switching module, use the **show module** or **show port** [*mod_num/port_num*] command to verify that the system has acknowledged the new interfaces and brought them up.

- If the interfaces are new, use the **set module** command and the **set module name** command facility to configure the new interface(s). This does not have to be done immediately, but the interfaces will not be available until you configure them. See the publication *Catalyst 5000 Series Configuration Guide and Command Reference* for information on how to configure new interfaces.

Sample Screen Display for Hot-Swapping Procedure

When you remove and replace switching modules, the system provides status messages on the console screen. The messages are for information only. In the following sample display, using the **show system** and **show module** commands, you can follow the events logged by the system when an Ethernet switching module is removed from slot 2. If you then use the **show ports** command to query the module, the system responds, "Module 2 is not installed." When the Ethernet switching module is reinserted, the system marks the module as *ready* again.

```
Console> (enable) show system
PS1-Status PS2-Status Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s Logout
---------- ---------- ---------- ---------- ---------- -------------- ---------
ok         none       ok         off        ok            0,00:10:14    20 min

PS1-Type   PS2-Type   Modem   Baud   Traffic Peak Peak-Time
---------- ---------- ------- ----- ------- ---- ------------------------
WS-C5008   none       disable 9600   0%       0% Mon Apr 29 1996, 16:38:39

System Name              System Location         System Contact
----------------------- ----------------------- -----------------------

Console> (enable)
```

Configuring the Interfaces

After you install the switching module, use the following information to configure the module and the individual interfaces on the Ethernet switching port module. The section "Port Addresses" contains an overview of the port and module numbering scheme used to configure the Catalyst 5000 switching modules. The section "Configuring the Ethernet Ports" describes how to configure the ports on the Ethernet switching module. And the section "Checking the Configuration" describes the procedures you should use to confirm that the Ethernet switching module is configured correctly.

Port Addresses

Each interface (or port) in the Catalyst 5000 series switch is designated by several different types of addresses. The *physical* interface address is the actual physical location (slot/port) of the interface connector within the chassis. The system software uses the physical addresses to control activity within the switch and to display status information. These physical slot/port addresses are not used by other devices in the network; they are specific to the individual switch and its internal components and software.

A second type of address is the *MAC-layer* or *hardware* address, which is a standardized data link layer address that is required for every port or device that connects to a network. Other devices in the network use these addresses to locate specific ports in the network and to create and update routing tables and data structures. The Catalyst 5000 series switch uses a unique method to assign and control the MAC-layer addresses of its interfaces.

The following sections describe how the Catalyst 5000 series switch assigns and controls both the physical (slot/port) and MAC-layer addresses for interfaces within the chassis.

Physical Interface Addresses

In the Catalyst 5000 series switch, physical port addresses specify the actual physical location of each module port on the rear of the switch. (See Figure 10.) The address is composed of a two-part number in the format *slot number/port number*. The first number identifies the slot in which the switching module is installed. Module slots are numbered 1 to 5, from top to bottom. The second number identifies the physical port number on the switching module. The port numbers always begin

at 1 and are numbered from the left port to the right port, when facing the rear of the switch. The number of additional ports (/1, /2, and so on) depends on the number of ports available on the module.

Interface ports maintain the same address regardless of whether other switching modules are installed or removed. However, when you move a switching module to a different slot, the first number in the address changes to reflect the new slot number. For example, on a 12-port 100BaseTX switching module in slot 2, the address of the left port is 2/1 and the address of the right port is 2/12. If you remove the 12-port 100Base TX switching module from slot 2 and install it in slot 4, the addresses of those same ports become 4/1 and 4/12.

Note   The 10BaseT 48-port Group Switching Ethernet module's telco connectors are numbered left to right. The first set of telco connector ports, starting on the left, are numbers 1 through 12, the second set of connector ports are numbers 13 through 24, the third set of connector ports are numbers 25 through 36, and the forth set of connector ports are numbers 37 through 48.

Figure 10   Interface Port Address Examples
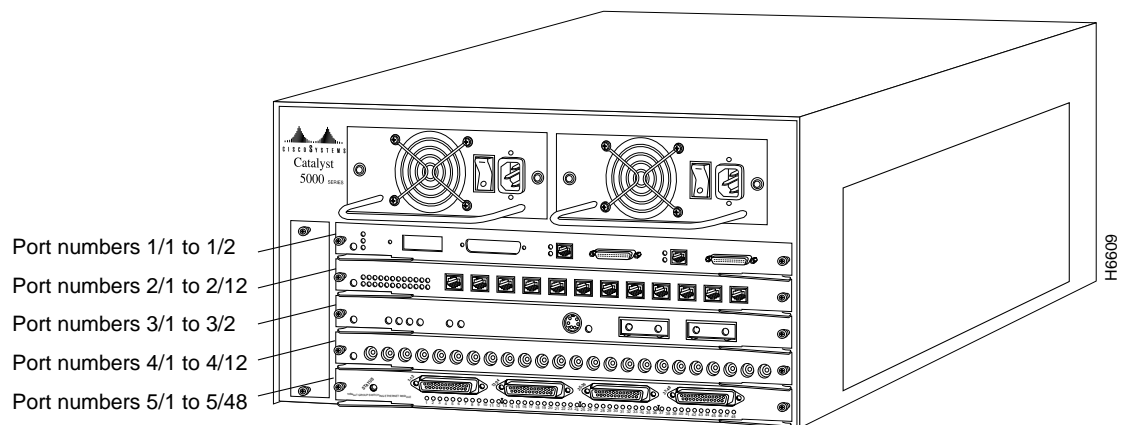
Switching modules are always *n*/1, because each switching module supports at least one interface. (The multiple connectors on the switching modules are numbered /1 through /*n*, and so on.)

You can identify module ports by physically checking the slot/port location on the back of the switch. You can also use software commands to display information about a specific interface, or all interfaces, in the switch. To display information about every interface, use the **show port** command without parameters. To display information about a specific interface, use the **show port** command with the interface type and port address in the format **show port** [*mod_num/port_num*]. If you abbreviate the command (**sho po**) and do not include parameters, the system interprets the command as **show port** and displays the status of all interfaces.

Following is an example of how the **show port** command displays status information (including the physical slot and port address) for a Catalyst 5000 series switch. In this example, most of the status information is omitted.

```
Console> show port
Console> (enable) show port
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
1/1                       notconnect 1          normal half    100 100BaseTX
1/2                       notconnect 1          normal half    100 100BaseTX
2/1                       connected  1          normal half     10 10BaseT
2/2                       notconnect 1          normal half     10 10BaseT
.                                    .                                  .
.                                    .                                  .
.                                    .                                  .
5/44                      notconnect 1          normal half     10 10BaseT
5/45                      notconnect 1          normal half     10 10BaseT
5/46                      notconnect 1          normal half     10 10BaseT
5/47                      notconnect 1          normal half     10 10BaseT
5/48                      notconnect 1          normal half     10 10BaseT

Port Align-Err  FCS-Err    Xmit-Err   Rcv-Err
---- ---------- ---------- ---------- ----------
1/1           0          0          0          0
1/2           0          0          0          0
2/1           0          0          0          0
2/2           0          0          0          0
2/3           0          0          0          0
2/4           0          0          0          0
.                                   .
.                                   .
.                                   .
3/8           0          0          0          0
3/9           0          0          0          0
3/10          0          0          0          0
3/11          0          0          0          0
3/12          0          0          0          0

Port Single-Col Multi-Coll Late-Coll  Excess-Col Carri-Sens Runts     Giants
---- ---------- ---------- ---------- ---------- ---------- --------- --------- ---------
1/1           0          0          0          0          0         0         -
1/2           0          0          0          0          0         0         -
2/1           0          0          0          0          0         0         0
2/2           0          0          0          0          0         0         0
.                                   .                               .
.                                   .                               .
.                                   .                               .
3/9           0          0          0          0          0         0         -
3/10          0          0          0          0          0         0         -
3/11          0          0          0          0          0         0         -
3/12          0          0          0          0          0         0         -

Port Auto-Parts Giants     Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                           Mismatch                                    Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
5/1           0          0          0          0          0          0        0
5/2           0          0          0          0          0          0        0
5/3           0          0          0          0          0          0        0
5/4           0          0          0          0          0          0        0
.                                   .                                 .
.                                   .                                 .
.                                   .                                 .
5/44          0          0          0          0          0          0        0
5/45          0          0          0          0          0          0        0
```

```
5/46           0           0           0           0           0           0           0
5/47           0           0           0           0           0           0           0
5/48           0           0           0           0           0           0           0

Port Rcv-Multi  Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
5/1            0           0           0           0           0           0           0
5/2            0           0           0           0           0           0           0
5/3            0           0           0           0           0           0           0
5/4            0           0           0           0           0           0           0
.                                      .                                  .
.                                      .                                  .
.                                      .                                  .
5/45           0           0           0           0           0           0           0
5/46           0           0           0           0           0           0           0
5/47           0           0           0           0           0           0           0
5/48           0           0           0           0           0           0           0

Last-Time-Cleared
-------------------------
Tue Apr 30 1996, 18:06:00
Console> (enable)
```

For complete descriptions of the commands to configure and maintain the Catalyst 5000, refer to the *Catalyst 5000 Series Configuration Guide and Command Reference*.

MAC Address Allocation

All network interface connections (ports) require a unique MAC-layer address. Typically, the MAC address of an interface is stored on a component that resides directly on the interface circuitry. Every interface on the switch contains an electrically erasable programmable read-only memory (EEPROM) component with a unique MAC address for that interface. The switch system code reads the EEPROM for each interface in the system, learns the MAC addresses, and can then initialize appropriate hardware and data structures.

However, hot-swapping makes it necessary to use a different method of handling the MAC addresses in the Catalyst 5000 series switch. Hot-swapping allows you to remove a switching module and replace it with another identically configured switching module. If the new interfaces match the current configuration (of the interfaces you removed), the system immediately brings them online. In order to allow hot-swapping, an address allocator with numerous unique MAC addresses (four switching module slots times numerous possible ports on each) is stored in an EEPROM on the supervisor engine module. Each address is assigned to a specific slot/port in the switch regardless of whether or not an interface resides in that port. This address scheme allows you to remove switching modules and insert them into other switches without causing the MAC addresses to move around the network or be assigned to multiple devices.

Note If the MAC addresses were stored on each switching module, hot-swapping would not function because you could never replace one interface with an identically configured one; the MAC addresses would always be different.

Configuring the Ethernet Ports

This section describes how to use the administrative interface and the procedure used to configure the Ethernet ports on the Ethernet switching module.

Note   For definitions of all commands discussed in this section, refer to the "Command Reference" chapter of the *Catalyst 5000 Series Configuration Guide and Command Reference* publication.

To configure Ethernet ports, complete the tasks in the following sections:

- Enable Administrative Mode
- Set Port Names
- Set Port Priority Levels
- Enable Modules
- Enable Ports
- Set Virtual LANs (VLANs)
- Set Up and Display the CAM Table
- Set Up Spanning-Tree Parameters
- Set Up Cisco Discovery Protocol (CDP)

Enable Administrative Mode

Use the **enable** command to activate privileged mode. In privileged mode, certain commands are available, and certain displays have extra information.

> **enable**

The designation (enable) indicates that the system is in privileged mode and that privileged commands can be entered.

Example

The following example shows how to enter privileged mode:

```
Console>
Console> enable
Enter password:
Console> (enable)
```

Set Port Names

Assign a name to each port. To set a port name, perform the following tasks in privileged mode:

Task	Command
Configure a name for a port. Figure 11 shows an example of the **set port name** command.	**set port name** *mod_num/port_num* *[name_string]*
Verify that the port name is correct. Figure 12 shows a sample display of the **show port** command. Port names are listed in the Name column.	**show port** *mod_num/port_num*

Figure 11   set port name Command Example

```
Console> (enable) set port name 5/1 Router Connection
Port 5/1 name set.
Console> (enable) set port name 5/2 Server 1
Port 5/2 name set.
```

Figure 12   Sample show port Command Display

```
Console> (enable) show port 5/23
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
5/23                      notconnect 1                 normal half     10 10BaseT

Port Auto-Parts Giants      Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                            Mismatch                                     Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
5/23          0          0          0          0          0          0        0

Port Rcv-Multi  Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
5/23          0          0          0          0          0         0         0

Last-Time-Cleared
-------------------------
Mon Apr 29 1996, 16:38:39

Console> (enable)
```

Set Port Priority Levels

Configure the priority level of each port. When ports request simultaneous access to the switching bus, the Catalyst 5000 series switch assesses the port priority level to determine the order in which ports have access to the switching bus. Changing the port level for a single port modifies the port level for all the ports in a segment. To set the priority level, perform the following tasks in privileged mode:

Task	Command
Configure the priority level for each port. Figure 13 shows an example of the **set port level** command.	**set port level** *mod_num/port_num* **normal	high**
Verify that the port priority level is correct. Figure 12 shows a sample display of the **show port** command, which shows the ports on a per-port basis. Port priority levels are listed in the Level column.	**show port** *mod_num/port_num*

Figure 13   set port level Command Example

```
Console> (enable) set port level 5/1 high
Port 5/1-12 level set to high.
Console> (enable) set port level 5/2 high
Port 5/1-12 level set to high.
```

Enable Modules

Enable the modules that will be used. To enable a module, perform the following tasks in privileged mode:

Task	Command
Enter the module number of each module you want to enable. Figure 14 shows an example of the **set module enable** command.	**set module enable** *mod_num*
Verify that the module has been enabled. Figure 15 shows a sample display of the **show module** command. The Status column lists whether the module is enabled (ok) or disabled.	**show module**

Figure 14   set module enable Command Example

```
Console> (enable) set module enable 1
Module 1 enabled.
Console> (enable) set module enable 5
Module 5 enabled.
```

Figure 15   Sample show module Command Display

```
Console> (enable) show module
Mod Module-Name          Ports Module-Type          Model    Serial-Num Status
--- -------------------- ----- -------------------- -------- --------- -------
1                        2     100BaseTX Supervisor WS-X5009 002650292 ok
2                        24    10BaseT Ethernet     WS-X5010 000139910 ok
3                        12    100BaseF Ethernet    WS-X5111 002712121 ok
5                        48    4 Segment 10BaseT Eth WS-X5020 002532386 ok

Mod MAC-Address(es)                        Hw     Fw     Sw
--- --------------------------------------- ------ ------ ----------------
1   00-40-0b-ff-00-00 thru 00-40-0b-ff-03-ff 1.81   1.5    2.132
2   00-40-0b-30-0a-38 thru 00-40-0b-30-0a-4f 0.405  1.4    2.132
3   00-40-0b-d5-02-f4 thru 00-40-0b-d5-02-ff 1.0    1.3    2.132
5   00-40-0b-14-00-6c thru 00-40-0b-14-00-6f 0.2    1.4369 2.132
Console> (enable)
```

Enable Ports

Enable the ports that will be used. To enable a port, perform the following tasks in privileged mode:

Task	Command
Enter the module number of each module you want to enable. Figure 16 shows an example of the **set port enable** command.	**set port enable** *mod_num/port_num*
Verify that the port has been enabled. Figure 12 shows a sample display of the **show port** command. The Status column lists whether the module is enabled (indicated by the ready or connect status) or disabled.	**show port** *mod_num/port_num*

Figure 16   set port enable Command Example

```
Console> (enable) set port enable 1/1
Port 1/1 enabled.
Console> (enable) set port enable 1/2
Port 1/2 enabled.
Console> (enable) set port enable 5/1
Port 5/1 enabled.
```

Set Virtual LANs (VLANs)

VLANs allow ports on the same or different switches to be grouped so that traffic is confined to members of that group only. This feature restricts broadcast, unicast, and multicast traffic (flooding) to only ports included in a certain VLAN. You can set up VLANs for an entire management domain from a single Catalyst 5000 series switch.

Setting up VLANs for a management domain requires two tasks, as follows:

- Create VLANs in a Management Domain
- Grouping Switch Ports to VLANs

Create VLANs in a Management Domain

The **set vtp** and **set vlan** commands use Virtual Trunk Protocol (VTP) to set up VLANs across an entire management domain. The default configuration has all switched Ethernet ports and Ethernet repeater ports grouped as VLAN 1.

By default, Catalyst 5000 switches have all of their interfaces in the no-management- domain state. They remain in this state until they are configured with a management domain or receive an advertisement for a domain. If a switch receives an advertisement, it inherits the management domain name and configuration revision number; it ignores advertisements with a different management domain or a smaller configuration revision number and checks all received advertisements with the same domain for consistency. While a Catalyst 5000 series switch is in the no-management domain state, it is a VTP client, that is, it learns from received advertisements but does not generate advertisements.

The **set vtp** command sets up the management domain. It establishes a management domain name, VLAN trunk protocol mode of operation (server or client), interval between VLAN advertisements, and password value. There is no default domain name (the value is set to null). The default advertisement interval is five minutes. The default VLAN trunk protocol mode of operation is set to **server**.

By default, VLANs are set to nonsecure mode, without a password. Adding a password sets the VLAN to secure mode. A password must be set at each Catalyst 5000 series switch in the management domain for each VLAN in secure mode.

Caution   A VLAN that is assigned with a password does not function properly if the password is not assigned from each Catalyst 5000 series switch in the domain.

The **set vlan** command uses the following parameters to create a VLAN in the management domain:

- The VLAN number
- A VLAN name
- The VLAN type (Ethernet, FDDI, Token Ring, FDDI NET, or TR NET)
- The maximum transmission unit (packet size, in bytes) that the VLAN can use
- A security association identifier (SAID)
- The state of the VLAN (active or suspended)
- The ring number for FDDI and Token Ring VLANs
- A bridge identification number
- A parent VLAN number
- A Spanning Tree Protocol (STP) type
- The VLAN number to use for translation when translating from one VLAN type to another

The Catalyst 5000 uses the security association identifier (SAID) parameter of the **set vlan** command to identify each VLAN. The default SAID for VLAN 1 is **1**, for VLAN 2 is **2**, for VLAN 3 is **3**, and so on. The default maximum transmission unit (**mtu**) is 1,500 bytes. The default state is active.

When translating from one VLAN type (Ethernet, FDDI, Token Ring, FDDI NET, or TR NET) to another, the Catalyst 5000 series switch requires the VLAN number of the VLAN with a different type.

To create a VLAN across a networking domain, perform the following tasks in privileged mode:

Task	Command
Define the VLAN management domain, indicating the domain name, VLAN trunk protocol mode of operation, interval between VLAN advertisements, and password value. Figure 17 shows an example of the **set vtp** command.	**set vtp [domain** *name***] [mode** *mode***] [interval** *interval***] [passwd** *passwd***]**
Verify that the VLAN management domain configuration is correct. Figure 18 shows a sample display of the **show vtp domain** command.	show vtp domain
Define the VLAN, indicating the parameters described above: VLAN number, name, type, maximum transmission unit, SAID, state, ring number, bridge identification number, and number to indicate whether source routing should be set to transparent or bridging. Figure 19 shows an example of the **set vlan** command. Figure 20 shows a diagram of the established VLANs, illustrating how VTP can traverse trunk connections using the ISL and 802.10 protocols and ATM LAN emulation (LANE). In Figure 20, Ethernet VLAN 1 is translated to FDDI VLAN 4 on the FDDI module, Ethernet VLAN 2 is translated to FDDI VLAN 5, and so on.	**set vlan** *vlan_num* **[name** *name***] [type** *type***] [mtu** *mtu***] [said** *said***] [state** *state***] [ring** *ring_number***] [bridge** *bridge_number***] [parent** *vlan_num***] [stp** *stp_type***] [translation** *vlan_num***]**
Verify that the VLAN configuration is correct. Figure 21 shows a sample display of the **show vlan** command.	**show vlan**

Figure 17   set vtp Command Example

```
Console (enable) set vtp
Usage:
set vtp [domain <name>][mode <mode>][interval <interval>]
[passwd <passwd>]
(name: 1-32 characters, mode = (client, server, transparent),
interval = 120-600 sec, passwd : 0-64 characters)
Console> (enable) set vtp domain engineering mode client interval 160
VTP: domain engineering modified
Console> (enable)
```

Figure 18   show vtp domain Command Example

```
Console> show vtp domain
Domain Name                     Domain Index VTP Version Local Mode
------------------------------- ------------ ----------- -----------
engineering                     1            1           client

Last Updater    Vlan-count Max-vlan-storage Config Revision Notifications
--------------- ---------- ---------------- --------------- -------------
172.20.25.130   12         256              0               disabled
```

Figure 19   set vlan Command Example

```
Console> (enable) set vlan
Usage:
set vlan <vlan_num> <mod/ports...>
set vlan <vlan_num> [name <name>][type <type>][mtu <mtu>][said <said>]
         [state <state>] [ring <ring_number>]
         [bridge <bridge_number>] [parent <vlan_num>]
         [stp <stp_type>] [translation <vlan_num>]
         (An example of mod/ports is 1/1,2/1-12,3/1-2,4/1-12
          type = (ethernet, fddi, token_ring, fddi_net, tr_net)
          name = 1..32 characters, status = (active, suspend)
          vlan_num = 1..1005)
```

```
Console> (enable) set vlan 3 name engineering type ethernet mtu 1500 said 3
VTP: vlan addition successful
Console> (enable)
```

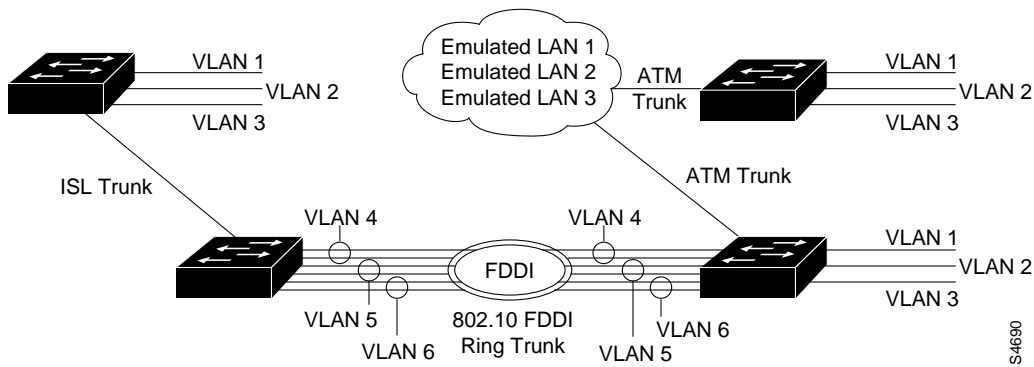**Figure 20   VLAN Configuration Across a Management Domain**

Figure 21   show vlan Command Display Sample

```
Console> (enable) show vlan
VLAN Name                         Type   Status    Mod/Ports
---- ------------------------- ----- --------- ----------------
3    default                   enet   active    1/1-2
                                                2/1-24
                                                3/1-12
                                                5/1-48
1002 fddi-default              fddi   active
1003 token-ring-default        tring  active
1004 fddinet-default           fdnet  active
1005 trnet-default             trnet  active


VLAN SAID       MTU   RingNo BridgeNo StpNo Parent Trans1 Trans2
---- ---------- ----- ------ -------- ----- ------ ------ ------
3    3          1500  0      0        0     0      0      0
1002 1002       1500  0      0        0     0      0      0
1003 1003       1500  0      0        0     0      0      0
1004 1004       1500  0      0        0     0      0      0
1005 1005       1500  0      0        0     0      0      0
```

Grouping Switch Ports to VLANs

A VLAN that is created in a management domain remains inactive until it is mapped to Catalyst 5000 switch ports. The **set vlan** command maps VLANs to ports.

The default configuration has all switched Ethernet ports. However, you can enter groups of ports as individual entries, for example, 2/1,3/3,3/4,3/5. You can also use a hyphenated format, for example, 2/1,3/3-5.

To create a VLAN, perform the following tasks in privileged mode:

Task	Command
Define the VLAN and indicate the included ports. Figure 22 shows an example of the **set vlan** command. Figure 23 show a diagram of the established VLANs. In the example in Figure 22, VLAN 10, the engineering department, includes module 2, Ethernet ports 1 through 4. VLAN 20, the accounting department, includes module 2, Ethernet ports 5 through 24. The accounting and engineering departments are totally isolated from each other in this configuration.	**set vlan** *vlan_num mod/port*s
Verify that the VLAN configuration is correct. Figure 24 shows a sample display of the **show vlan** command.	**show vlan**

Figure 22   Example of the set vlan Command

```
Console> (enable) set vlan 10 5/1-4
VLAN 10 modified.
VLAN 1 modified.
VLAN  Mod/Ports
---- ----------------------
10    5/1-12

Console> (enable) set vlan 20 5/13-16
VLAN 20 modified.
VLAN 1 modified.
VLAN  Mod/Ports
---- ----------------------
20    5/13-24
```

Figure 23   Local VLAN Configuration

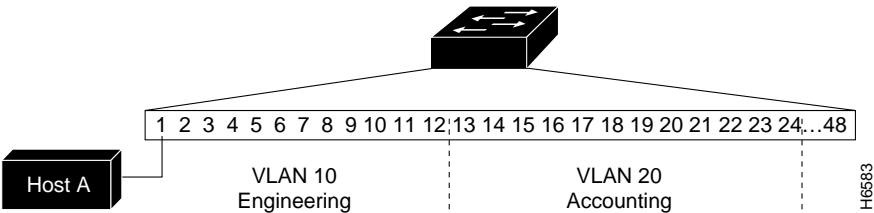**Figure 24   Sample show vlan Command Display**

```
Console> (enable) show vlan
VLAN Name                      Type  Status    Mod/Ports
---- ------------------------- ----- --------- ---------------
1    default                   enet  active    1/1-2
                                               2/1-24
                                               3/1-12
                                               5/25-48
10   enet-default              enet  active    5/1-12
20   enet-default              enet  active    5/13-24
1002 fddi-default              fddi  active
1003 token-ring-default        tring active
1004 fddinet-default           fdnet active
1005 trnet-default             trnet active
```

```
VLAN SAID        MTU   RingNo BridgeNo StpNo Parent Trans1 Trans2
---- ----------- ----- ------ -------- ----- ------ ------ ------
1    1           1500  0      0        0     0      0      0
10   1           1500  0      0        0     0      0      0
20   1           1500  0      0        0     0      0      0
1002 1002        1500  0      0        0     0      0      0
1003 1003        1500  0      0        0     0      0      0
1004 1004        1500  0      0        0     0      0      0
1005 1005        1500  0      0        0     0      0      0
system1> (enable)
```

Set Up and Display the CAM Table

The following example shows how to add and display entries for the Content Addressable Memory (CAM) table. An entry for a single port affects an entire segment on the Group Switching Ethernet module. For details, refer to the *Catalyst 5000 Series Configuration Guide and Command Reference* publication.

```
Console> (enable) set cam dynamic 2:3:4:5:6:7 5/47 1
Dynamic unicast entry added to CAM table.
Console> (enable) show cam dynamic
* = Static Entry. + = Permanent Entry. # = System Entry.

VLAN  Destination MAC     Destination Ports or VCs
----  -----------------   ----------------------------------------------------
1     00-40-0b-60-cd-98   2/1
1     00-40-0b-60-cd-96   2/1
1     00-40-0b-a0-04-32   2/1
1     00-40-0b-a0-04-29   2/1
1     00-40-0b-a0-02-b7   2/1
1     00-80-8c-01-02-6b   2/1
1     00-00-0c-35-7f-42   2/1
1     00-40-0b-4c-92-58   2/1
1     00-40-0b-ac-83-ff   2/1
1     00-40-0b-a0-6f-00   2/1
1     02-03-04-05-06-07   5/37-48
1     00-02-d0-05-40-ed   2/1
1     00-40-0b-80-50-24   2/1

Total Matching CAM Entries = 13

Console> (enable)
```

Set Up Spanning-Tree Parameters

The following sections provide examples of spanning-tree commands, which are segment-based for the Group Switching Ethernet module:

- Set Up the Port Cost

- Enable a Fast Start Connection

- Set the Spanning-Tree Port Priority

- Display the Spanning Tree

Set Up the Port Cost

The following example shows how to set up the spanning-tree port cost for the Catalyst 5000 Series Group Switching Ethernet module. Setting up the spanning tree port cost for a single port affects an entire segment.

```
Console> (enable) set spantree portcost
Usage: set spantree portcost <mod_num/port_num> <cost>
       (cost = 1..65535)
Console> (enable) set spantree portcost 5/47 10
set spantree portcost 5/47 10
Spantree port 5/37-48 path cost set to 10.
```

Enable a Fast Start Connection

The following example shows how to use the **spantree portfast** command to allow a port that is connected to a Group Switching Ethernet module and single workstation or PC to start faster. Enabling the **spantree portfast** command for a single port affects an entire segment.

```
Console> (enable) set spantree portfast 5/47 enable
set spantree portfast 5/47 enable

Warning: Spantree port fast start should only be enabled on ports connected
to a single host. Connecting hubs, concentrators, switches, bridges, etc. to
a fast start port can cause temporary spanning tree loops. Use with caution.

Spantree port 5/37-48 fast start enabled.
Console> (enable)
```

Set the Spanning-Tree Port Priority

The following example shows how to set up the spanning-tree port priority for the Group Switching Ethernet module. Changes made to the spanning-tree port priority of a single port affect an entire segment.

```
Console> (enable) set spantree portpri  5/47 62
Bridge port 5/37-48 port priority set to 62.
Console> (enable)
```

Display the Spanning Tree

The following example shows how to display spanning-tree information for the Catalyst 5000, including information about the Group Switching Ethernet module.

```
Console> (enable) show spantree
VLAN 1
Spanning tree enabled

Designated Root          00-40-0b-60-cd-96
Designated Root Priority   32768
Designated Root Cost       100
Designated Root Port       2/1
Root Max Age   20 sec    Hello Time 2  sec   Forward Delay 15 sec

Bridge ID MAC ADDR          00-40-0b-ff-00-00
Bridge ID Priority        32768
Bridge Max Age 20 sec     Hello Time 2  sec   Forward Delay 15 sec

Port      Vlan  Port-State     Cost   Priority  Fast-Start
--------  ----  -------------  -----  --------  ----------
1/1       1     not-connected   10         32   disabled
1/2       1     not-connected   10         32   disabled
```

```
2/1       1     forwarding     100      32   disabled
2/2       1     not-connected  100      32   disabled
.                              .                          .
.                              .                          .
.                              .                          .
3/10      1     not-connected  100      32   disabled
3/11      1     not-connected  100      32   disabled
3/12      1     not-connected  100      32   disabled
5/25-36   1     not-connected  100      32   disabled
5/37-48   1     not-connected   10      62   enabled
Console> (enable)
```

Set Up Cisco Discovery Protocol (CDP)

Use the examples in the following sections to set up Cisco Discovery Protocol (CDP). These commands are segment-based for the Group Switching Ethernet module:

- Enable CDP

- Set the CDP Interval

- Display CDP Information

- Display Network Neighbors Using CDP

Enable CDP

The following example shows how to enable the Cisco Discovery Protocol (CDP) for a segment of the Group Switching Ethernet module. Enabling CDP for a single port in a segment enables CDP for all the ports in the segment.

```
Console> (enable) set cdp enable 5/47
CDP enabled on port 5/37-48.
Console> (enable)
```

Set the CDP Interval

The following example shows how to set the Cisco Discovery Protocol (CDP) interval for a segment of the Group Switching Ethernet module. The CDP interval for all ports of a segment are modified when you change the CDP interval for a single port in the segment.

```
Console> (enable) set cdp interval 5/46 100
CDP message interval set to 100 seconds for port 5/37-48.
Console> (enable)
```

Display CDP Information

The following examples show how to display Cisco Discovery Protocol (CDP) port information using the **show cd**p command with a module number. All the ports for each segment of the Group Switching Ethernet module are displayed if you do not specify a port number.

```
Console> (enable) show cdp port 5
Port     CDP Status  Message-Interval
-------  ----------  ----------------
5/1-12   enabled     60
5/13-24  enabled     60
5/25-36  enabled     60
5/37-48  enabled     100
```

```
Console> (enable) show cdp port 5/46
Port     CDP Status  Message-Interval
-------  ----------  ----------------
5/37-48  enabled     100
Console> (enable)
```

Display Network Neighbors Using CDP

The following example shows how to display the network neighbors of the Group Switching
Ethernet module. Network neighbors for all the ports of each segment are displayed.

```
Console> (enable) show cdp neighbors 5
Port     Device-ID              Port-ID           Platform            Capability
-------  ---------------------  ----------------  ------------------  ----------
5/1-12   000100808              1                 WS-C1201            S
5/1-12   002650014              2/1               WS-C5000            T
5/37-48  000041770              1                 WS-C1201            S
5/37-48  000100808              1                 WS-C1201            S
5/37-48  002650014              2/1               WS-C5000            T
5/37-48  atlas-gw.cisco.com     Ethernet0/2       cisco 7000          R
Console> (enable)
```

Accessing MIBs

To access the information that certain MIB variables support, you must enter either an Interface
Index (IF-INDEX) or Bridge Identifier (BridgeID) value as an instance identifier. The following
sections describe how to access these types of values for use with specific MIBs:

- Finding the Module Port Number from the Interface Extension MIB (RFC 1573) and Accessing
  the CDP MIB

- Using RMON (RFC 1757) and SNMP MIBs with the Group Switching Ethernet Module

- Accessing the Bridge MIB (RFC 1493)

- Accessing the SNMP-REPEATER-MIB (RFC 1516)

Cisco-specific MIBs are available through ftp.cisco.com in the following locations:

- Cisco Systems private MIBs for switches: */ftp/wgp/mibs/cisco-stack.my*

- Cisco Systems private CDP MIB: */ftp/pub/mibs/v2/CISCO-CDP-MIB.m*y

- Cisco Systems private RFC1573 MIB: */ftp/pub/mibs/v2/IF-MIB.my*

Finding the Module Port Number from the Interface Extension MIB (RFC 1573) and Accessing the CDP MIB

To find the module number and port number to which an IF-INDEX is mapped, read the **IfName** in
the MIB object of the Interface Extension MIB (RFC 1573). Use this method to find the IF-INDEX
when you are accessing any of the variables in the CDP MIB that require an IF-INDEX for a variable
instance identifier (such as "CDP neighbors").

The Catalyst 5000 Series Group Switching Ethernet module has 12 ports in each of its four switched,
repeated segments. To gather statistical information about one of these segments using the Interface
Extension MIB (RFC 1573) or CDP MIB, use the IF-INDEX of the first port of the segment (port 1,
13, 25 or 37) as the variable instance identifier.

Using RMON (RFC 1757) and SNMP MIBs with the Group Switching Ethernet Module

Standard remote monitoring (RMON, RFC 1757) supports nine types of monitoring groups. The Catalyst 5000 supports four of these groups: statistics, history, alarms, and events. Any RMON-compliant manager can obtain and display information from these groups. For example, the Cisco TrafficDirector application provides a simple, point-and-click method of obtaining the information. Refer to the *TrafficDirector Windows User Guide* or *TrafficDirector UNIX User Guide* for details about TrafficDirector.

Collecting remote monitoring (RMON) information requires you to create TrafficDirector software agents. These agents consist of a Catalyst 5000 IP address and an Interface Index (IF-INDEX) for the port about which information is to be collected. For instructions about how to display the IF-INDEX and the port number to which it is mapped, refer to the sections in this document "Displaying the IF-INDEX Using SunNet Manager" and "Displaying the IF-INDEX Using HP Openview." To gather statistical information using the Interface Extension MIB (RFC 1573) or CDP MIB, use the IF-INDEX of the first port of the segment (port 1, 13, 25 or 37) as the variable instance identifier.

Accessing the Bridge MIB (RFC 1493)

The Bridge MIB (RFC 1493) contains a bridge port number for each Catalyst 5000 Series Group Switching Ethernet module segment. Query the **portCrossIndex.***mod_num.port_num* MIB object in the CISCO-STACK-MIB to find the BridgeID. The *mod_num* is the module number in the Catalyst 5000, and the *port_num* is the first port in each Group Switching Ethernet module segment (that is, port 1, 13, 25 or 37).

To display Bridge MIB information for different VLANs, change the SNMP community string to append **@***vlan_num* to the configured SNMP community string. The *vlan_num* is the VLAN number.

Accessing the SNMP-REPEATER-MIB (RFC 1516)

To access the different segments of the Group Switching Ethernet module using the SNMP-REPEATER-MIB (RFC 1516), change the SNMP community string to add the following syntax:

```
community_string@mod_num/port_num
```

The community_string represents the name of the SNMP community (the defaults are Public for Read-Only permission, private for Read-Write permission, and secret for Read-Write-All permission). The *mod_num* is the module number in the Catalyst 5000 and the *port_num* is the first port of each segment; for segment one use port 1, for segment two use port 13, for segment three use port 25, and for segment four use port 37.

Displaying the IF-INDEX Using SunNet Manager

To display the IF-INDEX and port number of a Catalyst 5000 using SunNet Manager, perform the following steps:

Step 1 Download the following files from *ftp.cisco.com*

```
/pub/mibs/schema/IF-MIB.schema
/pub/mibs/oid/IF-MIB.oid.
```

Step 2 Copy these files to your SNMP agents directory, which is typically located in *$SNMHOME/agents*.

Step 3 Re-initialize SunNet Manager using the following command:

```
$SNMHOME/bin/snm -i
```

Step 4 If an icon of the Catalyst 5000 you are interested in monitoring is present in your network application topology map, highlight it and select **IF-MIB** from the properties sheet list. If the Catalyst 5000 icon is not present, create a new object to represent the switch in your network, before highlighting its icon and selecting **IF-MIB** from the properties sheet list.

Step 5 On the device-specific menu, select the following commands: **Quick Dump**, **IF-MIB**, and **ifXTable**.

Output similar to the following will be displayed. The IF-INDEX is listed under the column heading "KEY" in the first column of the output.

```
Apr 12 13:48:39 1996 [ 172.20.24.188 ] : Quick Dump: IF-MIB.ifXTable

KEY       ifName    ifInMulticastPkts      ifInBroadcastPkts...

1         sc0       0                      0
2         sl0       0                      0
3         1/1       0                      0
4         1/2       0                      0
5         2/1       0                      0
6         2/2       0                      0
7         2/3       0                      0
8         2/4       0                      0
9         2/5       0                      0
10        2/6       0                      0
11        2/7       0                      0
12        2/8       0                      0
13        2/9       0                      0
14        2/10      0                      0
15        2/11      0                      0
16        2/12      0                      0
```

Step 6 Choose the key that corresponds to the module or port to monitor.

Displaying the IF-INDEX Using HP Openview

To display the IF-INDEX and port number of the Catalyst 5000 using HP Openview, perform the following steps:

Step 1 Download the following file from ftp.cisco.com

```
/ftp/pub/mibs/V2/IF-MIB.my
```

Step 2 Copy this MIB file to your OpenView MIBs directory, which is typically located in the directory path: `/usr/OV/snmp_mibs`

Step 3 Rename the file *rfc1573.mib* to *rfc1573-INTERFACES*.

Step 4 From the HP Openview main menu, select the following commands: **Options**, **Load/Unload MIBs:SNMP**. Click on **Load**. Choose the file name *rfc1573-INTERFACES*, and then click **OK**.

Step 5 From the HP Openview main menu, select the following commands: **Monitor**, **MIB Values**, **Browse MIB:SNMP**. Type a device name or IP address into the form and then click **MIB Object ID**.

Checking the Configuration

This section describes procedures to confirm that your Ethernet (10BaseT 24 port) switching module is installed and configured correctly.

Checking the Connection

Use the **ping** command to send Internet Control Message Protocol (ICMP) echo request packets to another node on the network.

>   **ping -s** *host [packet_size] [packet_count]*

Syntax Description

-s	Causes **ping** to send one datagram per second, printing one line of output for every response received. The **ping** command does not return any output when no response is received.
host	The IP address or IP alias of the host.
packet_size	(Optional) The number of bytes in a packet, from 1 to 2,000 bytes, with a default of 56 bytes. The actual packet size is eight bytes larger because the switch adds header information.
packet_count	(Optional) The number of packets to send

Usage Guidelines

Ctrl-C	Stop pinging.

Following are sample results of the **ping** command:

- Normal response—The normal response occurs in one to ten seconds, depending on network traffic.

- Destination does not respond—If the host does not respond, a no answer message appears in ten seconds.

- Destination unreachable—The gateway given in the route table for this destination indicates that the destination is unreachable.

- Network or host unreachable—The switch found no corresponding entry in the route table.

Example

In the following example, host with IP alias elvis is pinged a single time, then pinged once per second until you enter **Ctrl C** to stop pinging:

```
Console> ping elvis
elvis is alive
Console> ping -s elvis
ping elvis: 56 data bytes
64 bytes from elvis: icmp_seq=0. time=11 ms
64 bytes from elvis: icmp_seq=1. time=8 ms
64 bytes from elvis: icmp_seq=2. time=8 ms
64 bytes from elvis: icmp_seq=3. time=7 ms
64 bytes from elvis: icmp_seq=4. time=11 ms
```

```
64 bytes from elvis: icmp_seq=5. time=7 ms
64 bytes from elvis: icmp_seq=6. time=7 ms
^C

----elvis PING Statistics----
7 packets transmitted, 7 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 7/8/11
Console>
```

Displaying the Segment Status

Use the **show mac** command to show the cumulative statistics for a group of 12 ports on a per-segment basis. The following command examples illustrate the **show mac** command with the module number, both with and without the port number.

```
Console> (enable) show mac 5
MAC       Rcv-Frms   Xmit-Frms  Rcv-Multi  Xmit-Multi Rcv-Broad  Xmit-Broad
-------   ---------- ---------- ---------- ---------- ---------- ----------
5/1-12             0          0          0          0          0          0
5/13-24            0          0          0          0          0          0
5/25-36            0          0          0          0          0          0
5/37-48            0          0          0          0          0          0

MAC       Dely-Exced MTU-Exced  In-Discard Lrn-Discrd In-Lost    Out-Lost
-------   ---------- ---------- ---------- ---------- ---------- ----------
5/1-12             0          0          0          0          0          0
5/13-24            0          0          0          0          0          0
5/25-36            0          0          0          0          0          0
5/37-48            0          0          0          0          0          0

MAC       Cols-count Pkt-frag-ct Jabbers   Bytes-Trns
--------  ---------- ----------- ---------- ----------
5/1-12             0           0          0          0
5/13-24            0           0          0          0
5/25-36            0           0          0          0
5/37-48            0           0          0          0

Last-Time-Cleared
-------------------------
Mon Apr 29 1996, 16:38:39
Console> (enable) show mac 5/1
MAC       Rcv-Frms   Xmit-Frms  Rcv-Multi  Xmit-Multi Rcv-Broad  Xmit-Broad
-------   ---------- ---------- ---------- ---------- ---------- ----------
5/1-12             0          0          0          0          0          0

MAC       Dely-Exced MTU-Exced  In-Discard Lrn-Discrd In-Lost    Out-Lost
-------   ---------- ---------- ---------- ---------- ---------- ----------
5/1-12             0          0          0          0          0          0

MAC       Cols-count Pkt-frag-ct Jabbers   Bytes-Trns
--------  ---------- ----------- ---------- ----------
5/1-12             0           0          0          0

Last-Time-Cleared
-------------------------
Mon Apr 29 1996, 16:38:39
Console> (enable)
```

Displaying the System Status

Use the **show system** command to display the power supply, fan, temperature alarm, system, and modem status; the number of days, hours, minutes, and seconds since the last system restart; the baud rate; the MAC address range; and the system name, location, and contact.

In the following example, the system status and other information are displayed:

```
Console> (enable) show system
PS1-Status PS2-Status Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s Logout
---------- ---------- ---------- ---------- ---------- -------------- ---------
ok         none       ok         off        ok           0,00:10:14    20 min

PS1-Type   PS2-Type   Modem   Baud   Traffic Peak Peak-Time
---------- ---------- ------- ----- ------- ---- ------------------------
WS-C5008   none       disable 9600   0%       0% Mon Apr 29 1996, 16:38:39

System Name             System Location         System Contact
----------------------- ----------------------- -----------------------

Console> (enable)
```

Displaying the System Configuration

Use the **show config** command as follows to display the current system configuration:

```
Console> show config
Console> (enable) show config
....................
begin
set password $1$FMFQ$HfZR5DUszVHIRhrz4h6V70
set enablepass $1$FMFQ$HfZR5DUszVHIRhrz4h6V70
set prompt Console>
set length 100 default
set logout 20
!
#system
set system baud  9600
set system modem disable
set system name
set system location
set system contact
!
#snmp
set snmp community read-only      public
set snmp community read-write     private
set snmp community read-write-all secret
set snmp rmon enable
set snmp trap disable module
set snmp trap disable chassis
set snmp trap disable bridge
set snmp trap disable repeater
set snmp trap disable vtp
set snmp trap disable auth
!
#ip
set interface sc0 1 172.20.25.127 255.255.0.0 172.20.255.255

set interface sl0 0.0.0.0 0.0.0.0
set arp agingtime 1200
set ip redirect    enable
set ip unreachable    disable
set ip fragmentation enable
set ip alias default        0.0.0.0
!
```

```
#Command alias
!
#bridge
set bridge ipx snaptoether   8023raw
set bridge ipx 8022toether   8023
set bridge ipx 8023rawtofddi snap
!
#vtp
!
#vlan
set vlan 1    2/1-24,5/1,5/13,5/25,5/37
!
#trunks
set trunk 1/1  auto 1-1000
set trunk 1/2  auto 1-1000
set trunk 3/1  auto 1-1000
set trunk 3/2  auto 1-1000
set trunk 3/3  auto 1-1000
set trunk 3/4  auto 1-1000
set trunk 3/5  auto 1-1000
set trunk 3/6  auto 1-1000
set trunk 3/7  auto 1-1000
set trunk 3/8  auto 1-1000
set trunk 3/9  auto 1-1000
set trunk 3/10 auto 1-1000
set trunk 3/11 auto 1-1000
set trunk 3/12 auto 1-1000
!
#cam
set cam agingtime 1    300
!
#cdp
set cdp enable   1/1-2,2/1-24,3/1-12,5/1,5/13,5/25,5/37
set cdp interval 1/1-2,2/1-24,3/1-12,5/1,5/13,5/25,5/37 60
!
#spantree
#vlan 1
set spantree enable        1
set spantree fwddelay 15    1
set spantree hello    2     1
set spantree maxage   20    1
set spantree priority 32768 1
set spantree portcost 2/1-24 100
set spantree portpri  2/1-24 32
set spantree portfast 2/1-24 disable
set spantree portcost 5/1,5/13,5/25,5/37 100
set spantree portpri  5/1,5/13,5/25,5/37 32
set spantree portfast 5/1,5/13,5/25,5/37 disable
!
#trunk
set spantree portcost     1/1  10
set spantree portpri      1/1  32
set spantree portvlanpri  1/1  0
set spantree portfast     1/1  disable
set spantree portcost     1/2  10
set spantree portpri      1/2  32
set spantree portvlanpri  1/2  0
set spantree portfast     1/2  disable
set spantree portcost     3/1  10
set spantree portpri      3/1  32
set spantree portvlanpri  3/1  0
set spantree portfast     3/1  disable
set spantree portcost     3/2  10
set spantree portpri      3/2  32
set spantree portvlanpri  3/2  0
```

```
set spantree portfast     3/2  disable
set spantree portcost     3/3  10
set spantree portpri      3/3  32
set spantree portvlanpri  3/3  0
set spantree portfast     3/3  disable
set spantree portcost     3/4  10
set spantree portpri      3/4  32
set spantree portvlanpri  3/4  0
set spantree portfast     3/4  disable
set spantree portcost     3/5  10
set spantree portpri      3/5  32
set spantree portvlanpri  3/5  0
set spantree portfast     3/5  disable
set spantree portcost     3/6  10
set spantree portpri      3/6  32
set spantree portvlanpri  3/6  0
set spantree portfast     3/6  disable
set spantree portcost     3/7  10
set spantree portpri      3/7  32
set spantree portvlanpri  3/7  0
set spantree portfast     3/7  disable
set spantree portcost     3/8  10
set spantree portpri      3/8  32
set spantree portvlanpri  3/8  0
set spantree portfast     3/8  disable
set spantree portcost     3/9  10
set spantree portpri      3/9  32
set spantree portvlanpri  3/9  0
set spantree portfast     3/9  disable
set spantree portcost     3/10 10
set spantree portpri      3/10 32
set spantree portvlanpri  3/10 0
set spantree portfast     3/10 disable
set spantree portcost     3/11 10
set spantree portpri      3/11 32
set spantree portvlanpri  3/11 0
set spantree portfast     3/11 disable
set spantree portcost     3/12 10
set spantree portpri      3/12 32
set spantree portvlanpri  3/12 0
set spantree portfast     3/12 disable
!
#module 1
set module name   1
set port enable   1/1-2
set port level    1/1-2  normal
set port duplex   1/1-2  half
set port trap     1/1-2  disable
set port name     1/1-2
!
#module 2
set module name   2
set module enable 2
set port enable   2/1-24
set port level    2/1-24  normal
set port duplex   2/1-24  half
set port trap     2/1-24  disable
set port name     2/1-24
!
#module 3
set module name   3
set module enable 3
set port enable   3/1-12
set port level    3/1-12  normal
set port duplex   3/1-12  half
```

```
set port trap       3/1-12  disable
set port name       3/1-12
!
#module 4 empty
!
#module 5
set module name     5
set module enable   5
set port enable     5/1-48
set port level      5/1,5/13,5/25,5/37  normal
set port trap       5/1-48  disable
set port name       5/1-48
!
#switch port analyzer
set span 1 1/1  both
set span disable
end
Console> (enable)
```

Displaying the Port Configuration

Use the **show port** command as follows to display the current port configuration on a per-port basis:

```
Console> (enable) show port 5
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- ----------
5/1                       notconnect 1          normal half     10 10BaseT
5/2                       notconnect 1          normal half     10 10BaseT
5/3                       notconnect 1          normal half     10 10BaseT
.                                    .                              .
.                                    .                              .
.                                    .                              .
5/45                      notconnect 1          other  half     10 10BaseT
5/46                      notconnect 1          other  half     10 10BaseT
5/47                      notconnect 1          other  half     10 10BaseT
5/48                      notconnect 1          other  half     10 10BaseT

Port Auto-Parts Giants     Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                           Mismatch                                    Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
5/1           0          0          0          0          0          0        0
5/2           0          0          0          0          0          0        0
5/3           0          0          0          0          0          0        0
.                        .                                 .
.                        .                                 .
.                        .                                 .
5/45          0          0          0          0          0          0        0
5/46          0          0          0          0          0          0        0
5/47          0          0          0          0          0          0        0
5/48          0          0          0          0          0          0        0

Port Rcv-Multi Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
5/1           0          0          0          0          0         0         0
5/2           0          0          0          0          0         0         0
5/3           0          0          0          0          0         0         0
.                        .                                 .
.                        .                                 .
.                        .                                 .
5/45          0          0          0          0          0         0         0
5/46          0          0          0          0          0         0         0
5/47          0          0          0          0          0         0         0
5/48          0          0          0          0          0         0         0
```

```
Last-Time-Cleared
-------------------------
Mon Apr 29 1996, 16:38:39

Console>
```

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- WWW: `http://www.cisco.com`.

- Telnet: `cco.cisco.com`.

- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

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