Doc. No. 78-1753-02

Catalyst 5000 Series Fast Ethernet Switching Module (100BaseTX 12 Port) Configuration Note

Product Number: WS-X5113

This document contains instructions for installing and configuring the Catalyst 5000 series Fast Ethernet switching module (100BaseTX 12 port). 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 the Cisco Connection Documentation, Enterprise Series CD, or in print.

Sections in this document include the following:

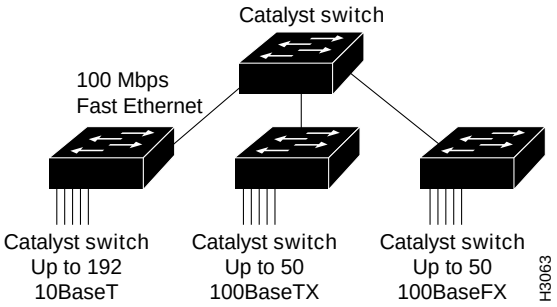
- What is the Catalyst 5000 Series Switch?
- Fast Ethernet Switching Module (100BaseTX 12 Port)
- Specifications
- Fast Ethernet Switching Module (100BaseTX 12-Port) LEDs
- Preparing Network Connections
- Safety Recommendations
- Installing and Configuring Switching Modules
- Configuring the Interfaces

Warning Only trained and qualified personnel should be allowed to install or replace this equipment.

What is the Catalyst 5000 Series Switch?

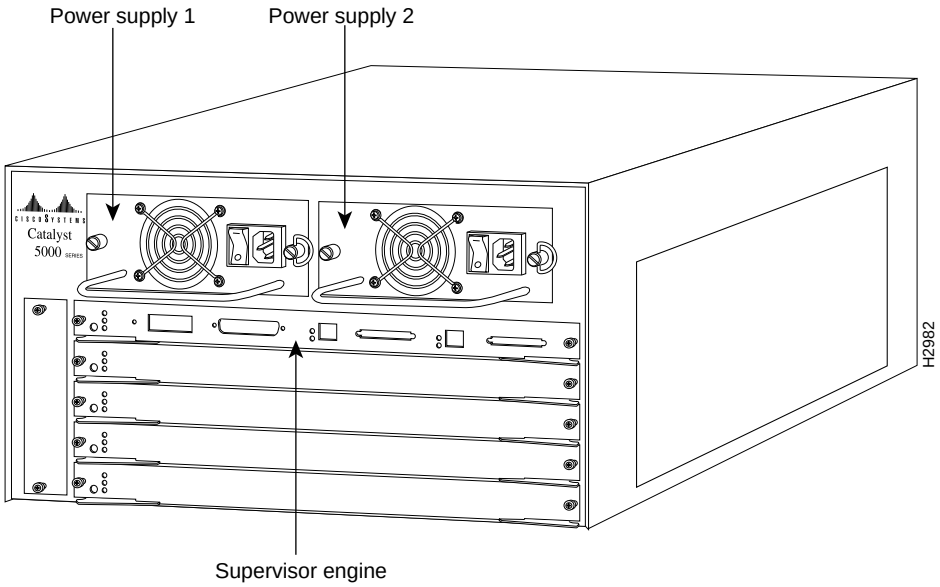
The Catalyst 5000 series switch provides high-density switched Ethernet and Fast Ethernet for both wiring closet and data center applications. The switch includes a single, integrated 1.2-Gbps switching backplane that supports switched 10-Mbps Ethernet with repeater connections, and 100-Mbps Fast Ethernet with backbone connections, Fiber Distributed Data Interface (FDDI), Copper Distributed Data Interface (CDDI), and Asynchronous Transfer Mode (ATM). The Catalyst 5000 provides switched connections to individual workstations, servers, LAN segments, backbones, or other Catalyst 5000 switches using shielded twisted-pair (STP), unshielded twisted-pair (UTP), and fiber-optic cable. Figure 1 is an example of a configuration using the Catalyst 5000 series switch.

Figure 1 Cascaded Switches Using Fast Ethernet Interfaces



The Catalyst 5000 series switch chassis has five slots. Slot 1 is reserved for the supervisor engine, which provides Layer 2 switching, local and remote management, and dual Fast Ethernet interfaces. The remaining four slots are used for any combination of modules for additional Ethernet, Fast Ethernet, CDDI/FDDI, and ATM connections. Figure 2 shows the rear view of the Catalyst 5000 series switch, which provides access to the supervisor engine, all switching modules, power supplies, and fan assembly.

Figure 2 Catalyst 5000 Series Switch Chassis Rear View

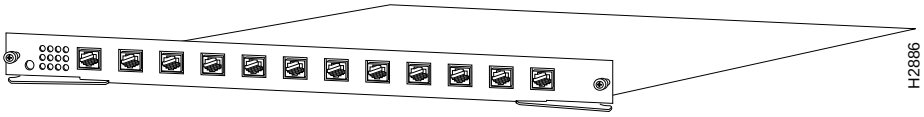


Fast Ethernet Switching Module (100BaseTX 12 Port)

The Fast Ethernet switching module (100BaseTX 12 port), shown in Figure 3, provides connection to twelve, full- or half-duplex Fast Ethernet interfaces using RJ-45 female connectors.

Note This module requires NMP software version 1.4 or later.

Figure 3 Fast Ethernet Switching Module (100BaseTX 12 Port)



LEDs provide status information for the module and individual Fast Ethernet interface connections. The LEDs are described in the section "Fast Ethernet Switching Module (100BaseTX 12-Port) LEDs."

Specifications

Following are the Fast Ethernet switching module (100BaseTX 12 port) specifications:

Table 1 Fast Ethernet Switching Module (100BaseTX 12 Port) Specifications

Description	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in (3 x 35.6 x 40.6 cm)
Weight	3 lb (1.36 kg)
Environmental Conditions:	
Operating temperature	32 to 104 F (0 to 40 C)
Nonoperating temperature	-40 to 167 F (-40 to 75 C)
Humidity	10 to 90%, noncondensing
Connectors	12 RJ-45 IEEE 802.3 Fast Ethernet 100BaseTX
RAM buffer memory	192 KB per interface
Maximum station-to-station cabling distance	Category 5 UTP[1]: 328' (100 meters) 100-Ohm shielded UTP: 328 feet (100 meters)
Frame processing	Transparent bridging (802.1d)
Network management	SNMP[2] agent
Agency approvals:	
Safety	UL[4] 1950, CSA[5]-C22.2 No. 950-93, and EN60950
EMI[3]	FCC Class A (47 CFR, Part 15), CE Mark, EN55022 Class B and VCCI Class 2 with shielded UTP cables

1. UTP = unshielded twisted pair
2. SNMP = Simple Network Management Protocol
3. EMI = electromagnetic interference
4. UL = Underwriters Laboratory
5. CSA = Canadian Standards Association

Maximum Configuration

The five available interface slots on the Catalyst 5000 series switch support the supervisor engine and switching modules, providing a maximum port density of up to 50 switched Fast Ethernet interfaces. Slot 1 is reserved for the supervisor engine; slots 2 through 5 are used for any combination of Catalyst 5000 series switching modules.

Fast Ethernet Switching Module (100BaseTX 12-Port) LEDs

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

The LEDs on the faceplate of the Fast Ethernet switching module provide status information for the module and individual Fast Ethernet interface connections. The LEDs are described in Table 2.

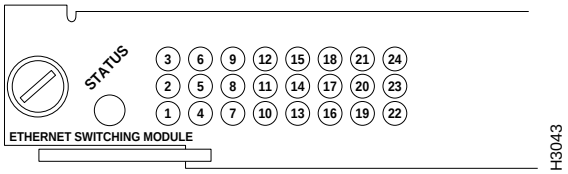
Fast Ethernet Switching Module (100BaseTX 12 Port) LEDs

The LEDs on the faceplate of the Fast Ethernet switching module, shown in Figure 4, are described in Table 2.

Table 2 Fast Ethernet Switching Module (100BaseTX 12 Port) LED Descriptions

LED	Description
Status	The switch performs a series of self-tests and diagnostics. If all the tests pass, the status LED will be green. If any test fails, it will be red (or orange for a minor fault).
100-Mbps (top LED)	If the port is operating at 100 Mbps, the LED is green.
Link (bottom LED)	If the port is operational (a signal is detected), 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 due to a hardware failure, the LED flashes orange. If no signal is detected, the LED is off.

Figure 4 Fast Ethernet Switching Module (100BaseTX 12 Port) LEDs



Preparing Network Connections

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

- Type of cabling required (fiber, thin, 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 and converters

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 "Cabling Specifications" appendix in the *Catalyst 5000 Series Installation Guide* publication. For ordering information, contact a customer service representative.

Distance Limitations

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

Ethernet and Fast Ethernet Connections

The maximum distances for Ethernet and Fast Ethernet network segments and connections depend on the type of transmission cable used, for example, unshielded twisted-pair.

The IEEE 100BaseTX standard recommends a maximum distance of 328 feet (100 meters) between station (connection) and hub for Fast Ethernet connections using category 5 UTP. See Table 3 for maximum cable distances.

Table 3 Ethernet and Fast Ethernet Maximum Transmission Distances

Transceiver Speed	Cable Type	Duplex Mode	Maximum Distance Between Stations
10 Mbps	Category 3 UTP	Full & half	328 feet (100 meters)
10 Mbps	Multimode fiber	Full & half	1.2 miles (2 km)
100 Mbps	Category 5 UTP	Full & half	328 feet (100 meters)
100 Mbp	Multimode fiber	Full	1.2 miles (2 km)
100 Mbp	Multimode fiber	Half	1,312 feet (400 meters)

Fast Ethernet Connection Equipment

Use RJ-45 male connectors to connect to the Fast Ethernet network. (See Figure 5.)

Figure 5 Fast Ethernet RJ-45 Interface Cable Connectors

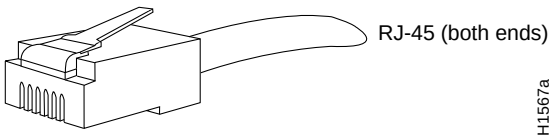


Table 4 lists the signals for the Fast Ethernet switching module's port RJ-45 connector cable.

Table 4 Fast Ethernet Switching Module 100BaseT RJ-45 Port Signals

Pin	Signal	Direction	Description
1	RxD+	<—	Receive data +
2	RxD–	<—	Receive data –
3	TxD+	—>	Transmit data +
4	NC		No connection
5	NC		No connection
6	TxD–	—>	Transmit data –
7	NC		No connection
8	NC		No connection

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 when installing the switch, so *be alert*.

- Never try to lift the chassis by yourself; *two people are required* to lift the switch.
- Always turn off all power supplies and unplug all power cords before removing the chassis front panel.
- Always unplug all power cords before installing or removing a chassis.
- Keep the chassis area clear and dust free during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis. Fasten your tie or scarf and 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 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 primary 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 following guidelines when working with any equipment that is disconnected from a power source but still connected to telephone wiring or other network cabling.

- 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.

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

Preventing Electrostatic Discharge Damage

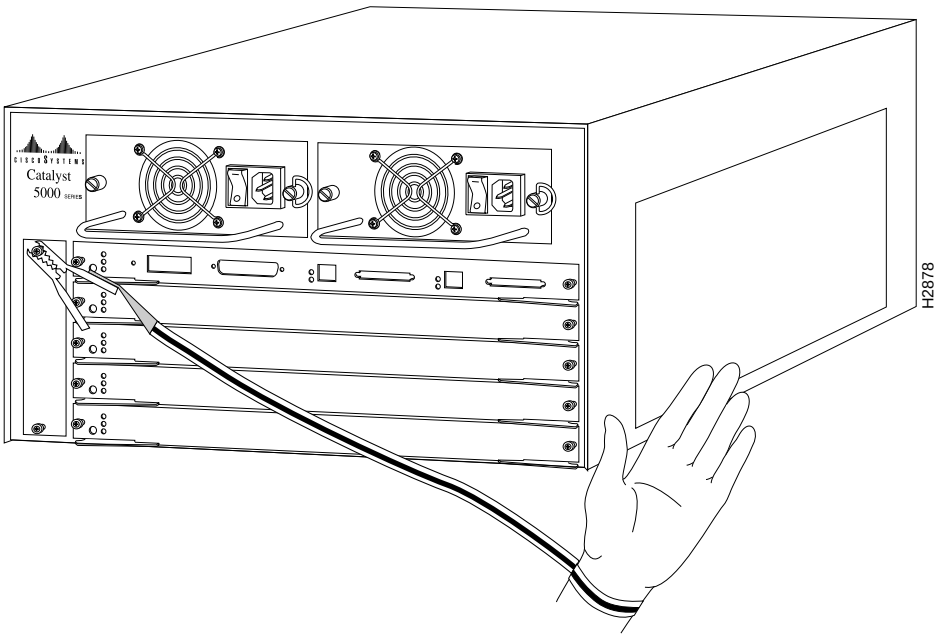
Electrostatic Discharge (ESD) damage occurs when electronic or components are improperly handled, resulting in complete or intermittent failures. The supervisor engine and switching modules each consist of a printed circuit board (PCB) fixed in a metal carrier. Electromagnetic interference (EMI) shielding,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

Caution Always tighten the captive installation screws on the supervisor engine and switching modules when you install them. These screws prevent accidental removal, provide proper grounding for the system, and 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 the supervisor engine or switching modules, connect the equipment end of the strap to one of the captive installation screws on an installed switching module, power supply, or fan assembly. (See Figure 6.) When replacing internal components, such as the supervisor engine, that are accessible from the rear of the chassis, connect the strap to an unpainted inner surface of the chassis, such as the inner frame that is exposed when a module is removed.
- When installing a supervisor engine or switching module, use the ejector levers to properly seat the bus connectors in the backplane, then tighten both 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 or switching module, use the ejectors 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 module or any connector pins.
- When removing a supervisor engine or switching module, place the PCB side up on an antistatic surface or in a static shielding bag. When returning a component to the factory, immediately place it in a static shielding bag.
- Handle bare boards by the edges only.
- Avoid contact between the module and clothing. The wrist strap protects only the board 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, letting you install, remove, replace, and rearrange them 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 module, and resumes system operation without any operator intervention.

Overview of Hot Swapping

The hot-swap feature lets you 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.

The switching module contains a bus-type connector that connects to the backplane. Each 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. The system assesses the signals it receives and the order in which it receives them to determine what event is occurring and what task it needs to perform, such as reinitializing new interfaces or shutting down removed ones.

For example, when inserting the switching module, the longest pins make contact with the backplane first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them. The system expects to receive signals from individual pins in this logical sequence.

When you remove or insert a switching module, the backplane pins send signals to notify the system, and 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 the administratively shut-down state.
3. Brings all previously configured interfaces on the supervisor engine and switching modules back to the state they were in before the module was removed. Any newly inserted interfaces are put in the administratively shut-down state, as if they were present, but unconfigured, at boot time. If a switching module has been reinserted into a slot, then its ports are configured and brought on line up to the port count of the original switching module.

Note If the switching module is different from the original, the default configuration is used to bring it on line.

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, indicating that the system is operating normally and a 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 supervisor engine or a switching module 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.

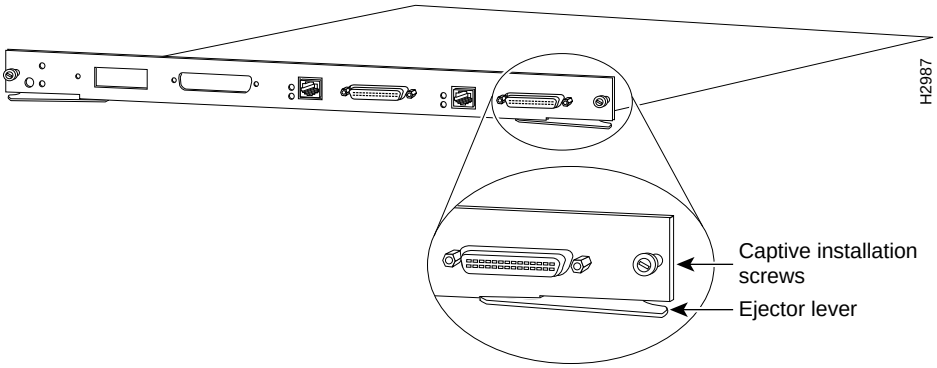
Incorrect Practices When Inserting and Removing Switching Modules

The function of the ejector levers (see Figure 7) on the switching module is to align and seat the board connectors in the backplane. Failure to use the ejector levers and insert the switching module properly can disrupt the order in which the pins make contact with the backplane. 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 try to use the ejector levers to seat the switching module, the first layer of pins making contact with the backplane can disconnect and make contact with the backplane. The system interprets this as a failure.
- Using the faceplate to force or slam the switching module all the way into the slot can damage the pins on the module 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 making contact with and disconnecting from the backplane will cause the system to interpret a failure. Using the ejector levers ensures that the module connector makes contact 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, but not all, of the connector pins making contact with the backplane—a state that will suspend the system. Using the ejector levers and making sure they are properly seated into position, ensures that all three layers of pins are making contact with the backplane.

It is also important to use the ejector levers when removing a switching module, ensuring that its connector pins disconnect from the backplane in the logical sequence expected by the system. A switching module partially connected to the backplane can hang the bus. Detailed steps for correctly performing a hot swap are included in the following procedures for installing and removing a switching module.

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



Tools Required

You need a 1/4-inch flat-blade screwdriver to remove the switching module, and to tighten the captive installation screws that secure the engine in its slot. Whenever you handle the switching module, 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 after removing it, disconnect any network interface cables attached to the switching module ports.

Step 2 Use a screwdriver to loosen the switching module's captive installation screws.

Step 3 Place your thumbs on the left and right ejector levers and simultaneously push the levers outward to release the 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 it out of the slot. Avoid touching the module.

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 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 modules.

Installing Switching Modules

You can install switching modules in any of the four switching module slots, numbered 2 through 5. (See Figure 8.) Slot 1 contains the supervisor engine—a required system component. Switching module fillers, blank switching module carriers, are installed in slots without switching modules to maintain consistent airflow through the switching module compartment.

Figure 8 Module Slot Numbers

Following is the procedure for installing a switching module.

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

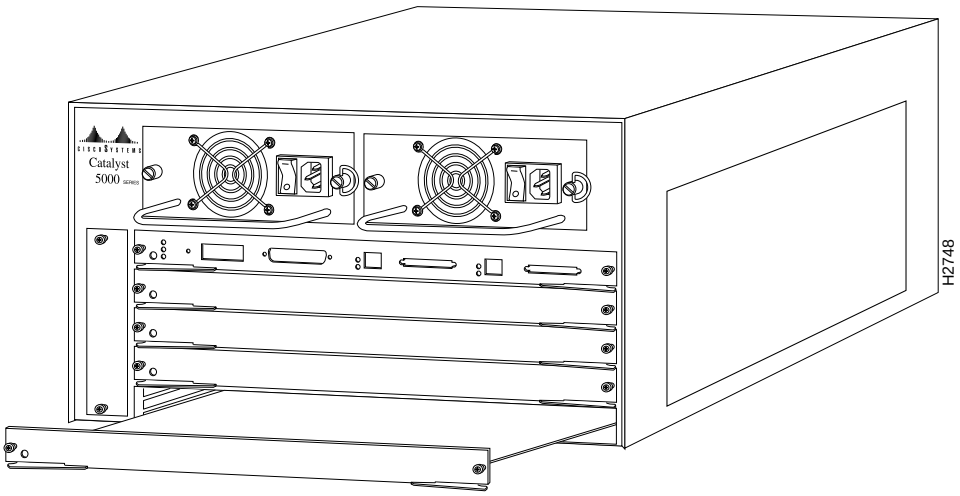
Step 1 Choose a slot for the new switching module, ensuring that there is enough clearance to accommodate any interface equipment that you will connect directly to the switching module ports. If possible, place switching modules between empty slots that contain only switching module filler plates.

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 existing switching module or filler 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 board.

Step 4 Place the back of the switching module in the slot, aligning 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 Keeping the switching module oriented horizontally, carefully slide the switching module into the slot until its faceplate makes contact with the ejector levers.

Step 6 Using your thumbs and forefingers, simultaneously push the levers in to fully seat the switching module in the backplane connector.

Note Always use the ejector levers when installing or removing switching modules. A module partially seated in the backplane will cause the system to halt.

Step 7 Use a screwdriver to tighten the switching module's captive installation screws.

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 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 *Catalyst 5000 Series Configuration Guide and Command Reference* publication 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 a switching module is removed from slot 2. When the **show port** command is used to query the module, the system reports *notconnect*.When the module is reinserted, the system marks the module as *ok*.

```
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         0,00:21:41     none

PS1-Type   PS2-Type   Modem   Baud  Traffic Peak Peak-Time
---------- ---------- ------- ----- ------- ---- -------------------------
WS-C5008   none       disable  9600   0%      0% Tue May 14 1996, 14:37:31

System Name              System Location          System Contact
------------------------ ------------------------ ------------------------
Console> (enable)

Console> (enable) show module
Mod Module-Name          Ports Module-Type           Model   Serial-Num Status
--- -------------------- ----- --------------------- -------- ---------- -------
1                        2     100BaseTX Supervisor  WS-X5009 002650014 ok
2                        10    100BaseTX Fast Eth    WS-X5113 002475046 ok
4                        48    4 Segment 10BaseT Eth WS-X5020 001336146 ok

Mod MAC-Address(es)                           Hw     Fw     Sw
--- ----------------------------------------  ------ ------ ----------------
1   00-40-0b-ac-80-00 thru 00-40-0b-ac-83-ff  1.81   1.5    2.1
2   00-40-0b-4c-92-58 thru 00-40-0b-4c-92-6f  1.0    1.4    2.1
4   00-40-0b-ff-00-00 thru 00-40-0b-ff-00-03  0.2    2.1(1) 2.1
Console> (enable)

Console> (enable) show port 2/10
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
2/10                      connected  1          normal   half    10 10BaseT

Port Align-Err  FCS-Err    Xmit-Err   Rcv-Err
---- ---------- ---------- ---------- ----------
2/10          0          0          0          0

Port Single-Col Multi-Coll Late-Coll  Excess-Col Carri-Sens Runts     Giants
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
2/10          0          0          0          0          0         0         0

Last-Time-Cleared
--------------------------
Tue May 14 1996, 14:37:31
Console> (enable)
```

Configuring the Interfaces

After you install the switching module, use the following information to configure the individual interfaces on the module. The section “Port Addresses” contains an overview of the module and port numbering scheme used to configure the Catalyst 5000 series switching modules. The section

"Configuring the Fast Ethernet Ports" describes how to configure the ports on the switching module The section "Checking the Configuration" describes the procedures you should use to confirm that the module is configured correctly.

Port Addresses

Each interface 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* or *hardware* address—a standard data link layer address required for every port or device connected 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 addresses of its interfaces.

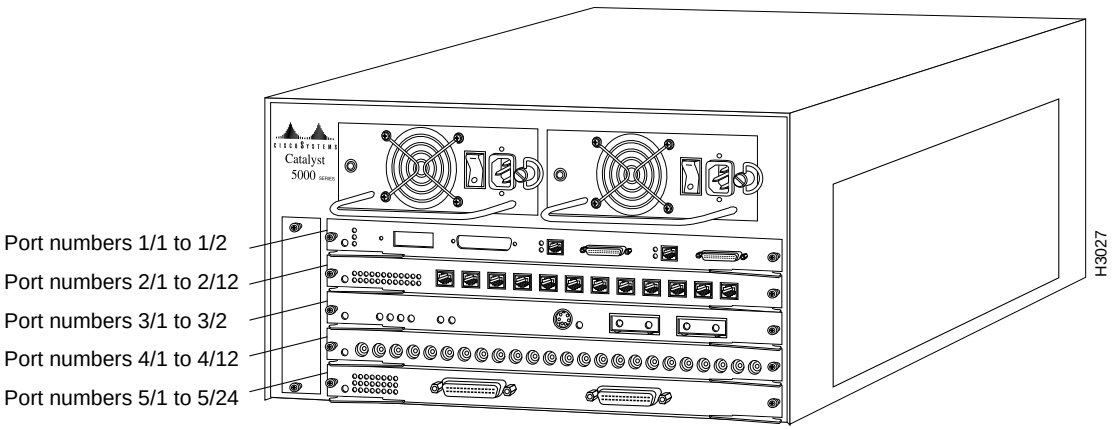
The following sections describe how the Catalyst 5000 series switch assigns and controls both the physical (slot/port) and MAC addresses for interfaces within the chassis.

Physical Interface Addresses

In the Catalyst 5000 series switch, physical port addresses specify the actual physical location of each 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 supervisor engine or 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 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 10/100BaseTX 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 10/100Base TX switching module from slot 2 and install it in slot 4, the addresses of those same ports become 4/1 and 4/12.

Figure 10 Interface Port Address Examples



The Fast Ethernet switching module supports up to 12 interfaces—*n*/1 through *n*/12. Switching modules are always *n*/1 to *n*/12 because each switching module supports at least twelve interfaces. (Switching modules with more than 12 interfaces are addressed /1 through /*n*.)

You can identify module interfaces by physically checking the slot/port location on the back of the switch. Software commands are used to display information about a specific interface 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 without parameters displays status information (including the physical slot and port address) for each interface in the switch.

```
Console> (enable) show port
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
1/1  Management Port      connected  1          normal   half   100  100BaseTX
1/2  InterSwitch Link     connected  trunk      normal   half   100  100BaseTX
2/1  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/2  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/3  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/4  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/5  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX.
.
.
.
4/45                      notconnect 1          normal   half    10  10BaseT
4/46                      notconnect 1          normal   half    10  10BaseT
4/47                      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
.
.
.
2/18          0          0          0          0
2/19          0          0          0          0
```

```
2/20          0          0          0          0
2/21          0          0          0          0
2/22          0          0          0          0
2/23          0          0          0          0
2/24          0          0          0          0TT

Port Auto-Parts Giants     Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                           Mismatch                                     Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
4/1           0          0          0          0          0          0        0
4/2           0          0          0          0          0          0        0
4/3           0          0          0          0          0          0        0
4/4           0          0          0          0          0          0        0
4/5           0          0          0          0          0          0        0
4/6           0          0          0          0          0          0        0
.
.
.
4/43          0          0          0          0          0          0        0
4/44          0          0          0          0          0          0        0
4/45          0          0          0          0          0          0        0
4/46          0          0          0          0          0          0        0
4/47          0          0          0          0          0          0        0
4/48          0          0          0          0          0          0        0

Port Rcv-Multi  Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
4/1           0          0          0          0          0         0         0
4/2           0          0          0          0          0         0         0
4/3           0          0          0          0          0         0         0
4/4           0          0          0          0          0         0         0
.
.
.
4/42          0          0          0          0          0         0         0
4/43          0          0          0          0          0         0         0
4/44          0          0          0          0          0         0         0
4/45          0          0          0          0          0         0         0
4/46          0          0          0          0          0         0         0
4/47          0          0          0          0          0         0         0
4/48          0          0          0          0          0         0         0

Last-Time-Cleared
--------------------------
Tue May 14 1996, 14:37:31
Console> (enable)
```

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

MAC Address Allocation

All network interface connections require a unique MAC address. The switch uses a MAC address allocator, stored in the supervisor engine's nonvolatile memory which identifies all system interface addresses. Each switch interface, configured or not, is allocated a MAC address. For instance, interface 2/10 is allocated a MAC address as a Fast Ethernet connection configured in slot 2, port 10; interface 2/11 is not configured but is also allocated an address. This addressing scheme is important, especially when hot-swapping modules, because it gives the switch the intelligence to identify the state—*connected* or *notconnect*—of each interface on the switch.

Configuring the Fast Ethernet Ports

This section describes how to use the administrative interface to configure the interfaces on the Fast 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 Fast Ethernet ports, complete the tasks in the following sections:

- Enable Administrative Mode
- Set Port Names
- Set Port Priority Levels
- Set Port Transmission Type
- Set Virtual LANs

Enable Administrative Mode

Use the **enable** command to activate the switch's administrative mode. Administrative mode lets you invoke privileged commands that set the switching module's interface features, such as enabling an interface and showing the current configuration. The designation (enable) indicates that the system is in administrative mode and privileged commands can be invoked.

Example

The following example shows how to enter administrative 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 administrative mode:

Task	Command
Configure a name for a port. Figure 11 shows an example **set port name** command.	**set port name** *mod_num/port_num [name_string]*
Verify that the port name is correct. Figure 12 shows an example **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 1/1 Management Port
Port 1/1 name set.
Console> (enable) set port name 1/2 InterSwitch Link
Port 1/2 name set.
Console> (enable)
```

Figure 12 Sample show port Command Display

```
Console> (enable) show port
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
1/1  Management Port      connected  1          normal   half   100  100BaseTX
1/2  InterSwitch Link     connected  trunk      normal   half   100  100BaseTX
2/1  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/2  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/3  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/4  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX
2/5  100BaseTX Fast Eth   connected  1          normal   half   100 100BaseTX.
.
.
4/45                      notconnect 1          normal   half    10  10BaseT
4/46                      notconnect 1          normal   half    10  10BaseT
4/47                      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
.
.
.
2/18          0          0          0          0
2/19          0          0          0          0
2/20          0          0          0          0
2/21          0          0          0          0
2/22          0          0          0          0
2/23          0          0          0          0
2/24          0          0          0          0TT

Port Auto-Parts Giants     Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                           Mismatch                                     Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
4/1           0          0          0          0          0          0        0
4/2           0          0          0          0          0          0        0
4/3           0          0          0          0          0          0        0
4/4           0          0          0          0          0          0        0
4/5           0          0          0          0          0          0        0
4/6           0          0          0          0          0          0        0
.
.
.
4/43          0          0          0          0          0          0        0
4/44          0          0          0          0          0          0        0
4/45          0          0          0          0          0          0        0
4/46          0          0          0          0          0          0        0
4/47          0          0          0          0          0          0        0
4/48          0          0          0          0          0          0        0

Port Rcv-Multi  Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
4/1           0          0          0          0          0         0         0
4/2           0          0          0          0          0         0         0
4/3           0          0          0          0          0         0         0
4/4           0          0          0          0          0         0         0
.
.
.
4/42          0          0          0          0          0         0         0
4/43          0          0          0          0          0         0         0
4/44          0          0          0          0          0         0         0
4/45          0          0          0          0          0         0         0
4/46          0          0          0          0          0         0         0
4/47          0          0          0          0          0         0         0
4/48          0          0          0          0          0         0         0

Last-Time-Cleared
--------------------------
Tue May 14 1996, 14:37:31
Console> (enable)
```

Set Port Priority Levels

Configure the priority level of each port. When ports request simultaneous access to the switching bus, the switch uses the port priority level to determine the order in which ports access the bus. To set the priority level, perform the following tasks in administrative mode:

Task	Command
Configure the priority level for each port. Figure 13 shows an example **set port level** command.	**set port level** *mod_num/port_num* **normal** | **high**
Verify that the port priority level is correct. Figure 12 shows an example **show port** command. 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 1/1-2 high
Ports 1/1-2 port level set to high.
Console> (enable)
```

Set Port Transmission Type

Set the transmission type to full- or half-duplex for the ports to be used. To set the transmission type, perform the following tasks in administrative mode:

Task	Command
Enter the module number, port number, and transmission type of each port to be used. Figure 14 shows an example **set port duplex** command.	**set port duplex** *mod num/port num* **[full** | **half]**
Verify that the transmission type is set correctly. Figure 12 shows an example **show port** command. The transmission type is listed in the Duplex column.	**show port** *mod_num/port_num*

Figure 14 set port duplex Command Example

```
Console> (enable) set port duplex 1/1 half
Port 1/1 set to half-duplex.
Console> (enable) set port duplex 1/2 half
Port 1/2 set to half-duplex.
Console> (enable)
```

Set Virtual LANs

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 unicast, broadcast, and multicast traffic (flooding) to ports included in the same VLAN.

The **set vlan** command groups ports. The default configuration has all switched Ethernet ports and Ethernet repeater ports in VLAN 1. You can enter groups of ports as individual entries, such as 2/1,3/3,3/4,3/5. You can also use a hyphenated format to indicate a range of ports, such as 2/1, 3/3-5.

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

Task	Command
Define the VLAN and indicate the ports to be included. Figure 15 shows an example of the **set vlan** command. Figure 16 shows a diagram of the established VLANs. VLAN 10, in the engineering department, includes module 2, ports 1 through 4. VLAN 20, in the accounting department, includes module 2, ports 5 through 24. The accounting and engineering departments are isolated from each other in this configuration.	**set vlan** *vlan mod/port*s
Verify that the VLAN configuration is correct. Figure 17 shows an example **show vlan** command.	**show vlan**

Figure 15 set vlan Command Example

```
Console> (enable) set vlan 10 2/1-4
VLAN 10 modified.
VLAN 1 modified.
VLAN    Mod/Ports
10      2/1-4
Console> (enable) set vlan 20 2/5-24
VLAN 20 modified.
VLAN 1 modified.
VLAN    Mod/Ports
20      2/5-24
Console> (enable)
```

Figure 16 VLAN Configuration

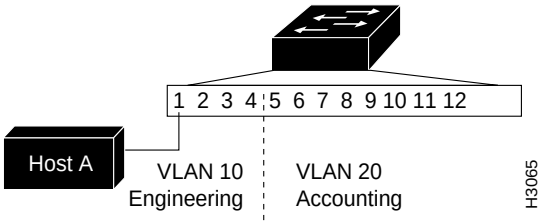


Figure 17 Sample show vlan Command Display

```
Console> (enable) show vlan
VLAN    Mod/Ports
----    ---------------------------------------------------
1       1/1-2
10      2/1-4
20      2/5-24
Console> (enable)
```

Checking the Configuration

This section describes procedures uses to confirm that your Fast Ethernet switching module (100BaseTX 12 port) 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. Enter **Ctrl-C** to stop pinging.

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 2000 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

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, a host with the 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> (enable) 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> (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.

Example

In the following example, the system status and other information is 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         1,20:53:07     none

PS1-Type   PS2-Type   Modem   Baud  Traffic Peak Peak-Time
---------- ---------- ------- ----- ------- ---- -------------------------
WS-C5008   none       disable  9600   0%      1% Thu May 16 1996, 10:06:22

System Name              System Location          System Contact
------------------------ ------------------------ ------------------------
Console> (enable)
```

Displaying the System Configuration

Use the **show config** command to display the current port configuration:

```
Console> (enable) show config
begin
set password $1$FMFQ$HfZR5DUszVHIRhrz4h6V70
set enablepass $1$FMFQ$HfZR5DUszVHIRhrz4h6V70
set prompt Console>
set length 100 default
set logout 0
!
#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 1 172.20.25.130 255.255.0.0 172.20.255.255

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 route 0.0.0.0         172.20.1.201    1
set ip alias default         0.0.0.0
set ip alias max             171.69.193.165
set ip alias atlas           172.20.1.201
set ip alias cat7-lnf        172.20.25.130
set ip alias cat9-lnf        172.20.25.132
set ip alias da_bears        172.20.22.7
set ip alias lnf             172.20.0.0
!
!
#vlan
set vlan 1    1/2,2/1-24,4/1,4/13,4/25,4/37
!
#trunks
set trunk 1/1  desirable 1-1000
set trunk 1/2  off 1-1000
.
.
.
#vlan 2
set spantree enable         2
set spantree fwddelay 15    2
set spantree hello    2     2
set spantree maxage   20    2
set spantree priority 32768 2end
!
```

```
#trunk
set spantree portcost     1/1  10
set spantree portpri      1/1  32
set spantree portvlanpri  1/1  0 100-102
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
!
#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 Management Port
set port name      1/2 InterSwitch Link
!
#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 empty
!
#module 4
set module name    4
set module enable  4
set port enable    4/1-48
set port level     4/1,4/13,4/25,4/37  normal
set port trap      4/1-48  disable
set port name      4/1-48
!
#module 5 empty
!
#switch port analyzer
set span 1 1/1  both
set span disable
end
Console> (enable)
```

Displaying the Port Configuration

Use the **show port** command to display the current system configuration:

```
Console> (enable) show port
Port Name                 Status     Vlan       Level  Duplex Speed Type
---- -------------------- ---------- ---------- ------ ------ ----- -----------
1/1  Management Port      connected  1          normal   half   100  100BaseTX
1/2  InterSwitch Link     connected  trunk      normal   half   100  100BaseTX
2/1  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/2  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/3  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/4  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX
2/5  100BaseTX Fast Eth   connected  1          normal   half   100  100BaseTX.
.
.
4/45                      notconnect 1          normal   half    10  10BaseT
4/46                      notconnect 1          normal   half    10  10BaseT
4/47                      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
.
.
.
2/18          0          0          0          0
2/19          0          0          0          0
2/20          0          0          0          0
2/21          0          0          0          0
2/22          0          0          0          0
2/23          0          0          0          0
2/24          0          0          0          0TT

Port Auto-Parts Giants     Data-Rate  FCS-Err    Runts      Rcv-frms   Src-Addr
                           Mismatch                                     Changes
---- ---------- ---------- ---------- ---------- ---------- ---------- --------
4/1           0          0          0          0          0          0        0
4/2           0          0          0          0          0          0        0
4/3           0          0          0          0          0          0        0
4/4           0          0          0          0          0          0        0
4/5           0          0          0          0          0          0        0
4/6           0          0          0          0          0          0        0
.
.
.
4/43          0          0          0          0          0          0        0
4/44          0          0          0          0          0          0        0
4/45          0          0          0          0          0          0        0
4/46          0          0          0          0          0          0        0
4/47          0          0          0          0          0          0        0
4/48          0          0          0          0          0          0        0

Port Rcv-Multi  Rcv-Broad  Good-Bytes Align-Err  Short-Evnt Late-Coll Collision
---- ---------- ---------- ---------- ---------- ---------- --------- ---------
4/1           0          0          0          0          0         0         0
4/2           0          0          0          0          0         0         0
4/3           0          0          0          0          0         0         0
4/4           0          0          0          0          0         0         0
.
```

```
.
.
4/42          0          0          0          0          0          0          0
4/43          0          0          0          0          0          0          0
4/44          0          0          0          0          0          0          0
4/45          0          0          0          0          0          0          0
4/46          0          0          0          0          0          0          0
4/47          0          0          0          0          0          0          0
4/48          0          0          0          0          0          0          0

Last-Time-Cleared
--------------------------
Tue May 14 1996, 14:37:31
Console> (enable)
```

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This document is to be used in conjunction with the *Catalyst 5000 Series Switch Installation Guide* publication.