CHAPTER 2

Switch Description

This chapter describes the features and the hardware components of the Catalyst 2926 and Catalyst 2926G series switches and includes the following sections:

- System Features on page 2-1
- Switch Components on page 2-6

System Features

This section describes the hardware features for both the Catalyst 2926 and Catalyst 2926G series switches. For software feature descriptions, refer to the *Software Configuration Guide* for your switch.

Switch Backplane

The Catalyst 2926 and Catalyst 2926G series switches use a 1.2-Gbps, media-independent backplane. The backplane provides the connection between the supervisor engine, the 10/100-Mbps Fast Ethernet autosensing switched ports, the supervisor engine uplink ports, and the power supplies. The switching fabric supports Fast Ethernet and Gigabit Ethernet switched interfaces.

Supervisor Engine Features

The Catalyst 2926 and Catalyst 2926G series switches have different supervisor engines. Each model's supervisor engine is described in the following sections.

Catalyst 2926 Series Switch

The supervisor engine for the Catalyst 2926 series switch has the following features:

- Bridge-address table for up to 16,000 active Media Access Control (MAC) addresses and associated virtual LANS (VLANs), dynamically allocated between active ports
- 25-MHz Motorola MC68EC040 Network Management Processor (NMP)
- Switch fabric interface with the capability of over one million packets per second (pps)
- Data path and control for all network interfaces, including two integrated Fast Ethernet interfaces, which, when used with VLANs, can support redundancy using either the spanning-tree algorithm or load sharing
- Fast Ethernet interfaces using RJ-45 and media-independent interface (MII) connectors or Fast Ethernet multimode fiber (MMF)
- Hardware support for up to 1024 VLANs
- Network management functions, which include monitoring the interface and environmental status and providing Simple Network Management Protocol (SNMP) management and the console/Telnet interface
- Three types of onboard memory: dynamic random-access memory (DRAM) for the default system software, Flash memory for downloading the system software, and nonvolatile random-access memory (NVRAM) for the configuration file
  - DRAM–16 MB (supervisor engine)
  - Flash–8 MB
  - NVRAM–256 KB

Catalyst 2926G Series Switch

The supervisor engine for the Catalyst 2926G series switch has the following features:

- Bridge address table for up to 16,000 active MAC addresses and associated VLANs allocated dynamically between active ports
- Switching engine that provides data path and control for all network interfaces including two integrated Gigabit Ethernet interfaces that can support redundancy using the spanning-tree algorithm or load sharing when used with VLANs
- Management functions that include monitoring the interface and environmental status and providing SNMP management and the console/Telnet interface
- 150-MHz IDT R4700 Reduced Instruction Set Computer (RISC) processor
- Hardware support for up to 1024 VLANs
- Two Flash PC card slots for memory or to serve as I/O devices
- Dual 1000BaseSX or 1000BaseLX/LH Gigabit Ethernet interfaces with SC connectors
- NetFlow Feature Card (NFFC) that provides Multilayer Switching (MLS) capability

Architecture and Switching Bus

Switch architecture for the Catalyst 2926 and Catalyst 2926G series switches is based on high-speed switching network principles, using a queuing model for input. Each switch port maintains its own frame buffer memory. Each frame is stored in a frame buffer before it is forwarded to the next port.

Bus arbitration and hardware-based switching are shared among all ports. Together, they control the destination of packet transfers and access to the data switching bus. The switch uses central bus arbitration and address recognition logic. Multiple copies are not required for high-speed broadcast and multicast frame forwarding because all ports simultaneously receive the same copy of the frame when it is sent on the backplane.

The media-independent backplane for the Catalyst 2926 and Catalyst 2926G series switches supports a three-level priority request scheme. Two priorities are user-selected, and the third is backplane-based. The buses allow each port to perform a local flush and maintain a packet retry mechanism for outbound port congestion.

Hardware-Based Switching

Hardware-based switching in the Catalyst 2926 and Catalyst 2926G series switches is similar to the learning bridge or content-addressable memory (CAM) of other types of network switches and routers. Hardware-based switching automatically learns source MAC addresses and VLAN and port information and saves them in a RAM address table. Hardware-based switching uses learned entries to forward packets to their destination addresses. The supervisor engine has the NFFC, which accommodates all the core switching logic.

Environmental Monitoring

Environmental monitoring functions constantly monitor the internal temperature of the chassis. Each power supply monitors its own voltage and temperature and shuts itself down if it detects a critical condition.

The reporting functions enable you to retrieve and display the present values of measured parameters, and the reporting functions display alarms on the console if any of the monitored parameters exceed defined thresholds.

The processor monitors the temperature inside the chassis, and the power supplies use the normal and critical levels to monitor power supply voltages. If the temperature exceeds a defined threshold within a power supply, the power supply turns off. If both power supplies turn off, the switch shuts down. See the “Power Supplies” section on page 2-16 for temperature and voltage thresholds for the processor-monitored levels.

The environmental monitoring functions use these three status levels to monitor the system:

- Normal—All monitored parameters are within normal tolerances.
- Alarm—An out-of-tolerance temperature or voltage condition exists. The system might not continue operation. If the power supply reaches an overvoltage measurement level, the power supply can shut down the system. Immediate action is required.

- Critical—The power supply detects an out-of-tolerance voltage, current, or temperature condition within the power supply and shuts down. The PS1 and PS2 LEDs on the supervisor engine stay on as the power ramps down and, if a second power supply is still providing power, the LEDs remain red after shutdown. This status condition is typically caused by one of the following conditions:
  - Loss of input power. (You turned off the power supply, or the input power source failed.)
  - Power supply detects an overvoltage, overcurrent, undervoltage, or overtemperature condition within the power supply.

The processor uses two status levels (normal and alarm) to monitor the air temperature in the chassis. Sensors on the supervisor engine monitor the temperature of the cooling air that flows through the chassis. If the air temperature exceeds a defined threshold, the system processor indicates an alarm condition using the supervisor engine status LED, SNMP traps, and command-line interface (CLI) displays. The processor stores the present alarm configuration in NVRAM. Information about these alarms can be retrieved later as a report of the last shutdown parameters.

Note For complete environmental and power specifications, see Appendix A, "Technical Specifications."

Flash Memory

Embedded Flash memory in the Catalyst 2926 and Catalyst 2926G series switches allows you to load and store system software images remotely. You can download a new software image over the network or from a local Trivial File Transfer Protocol (TFTP) server and add the new image to Flash memory or replace an existing file.

The Catalyst 2926G series Flash memory has a file system. You can use a variety of commands to manage the file system (such as **cd**, **pwd**, **dir**, **delete**, and **copy**). The file system includes the following devices:

- bootflash: onboard Flash memory
- slot0: first Flash PC card slot
- slot1: second Flash PC card slot

For detailed information on the Flash memory PC cards and configuring the supervisor engine to boot from the Flash memory PC card, refer to the *Software Configuration Guide* for your switch.

EEPROM

An electronically erasable programmable read-only memory (EEPROM) component on the Catalyst 2926 and Catalyst 2926G series switch supervisor engines stores interface-specific information, such as the 10/100-Mbps Fast Ethernet interface board serial number, part number, controller type, hardware revision, configuration information, and other details unique to the interface board. The EEPROM also contains an address allocator, which is a bank of 1024 hardware or MAC-level addresses, one for each possible VLAN in the system.

Switch Components

This section describes the hardware components.

Supervisor Engine Models

The supervisor engine model depends on the switch type, Catalyst 2926 series switch or Catalyst 2926G series switch.

Catalyst 2926 Series Switches

Two versions of the Catalyst 2926 series supervisor engine are available, as follows:

- Dual Fast Ethernet RJ-45 and media-independent interface (MII) connector interfaces, Catalyst 2926T switch (see Figure 2-1)
- Dual Fast Ethernet MMF SC connector interfaces, Catalyst 2926F switch (see Figure 2-2)

Figure 2-1 Supervisor Engine Dual RJ-45 and Media-Independent Connectors

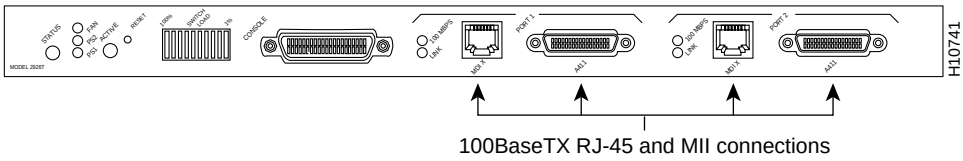
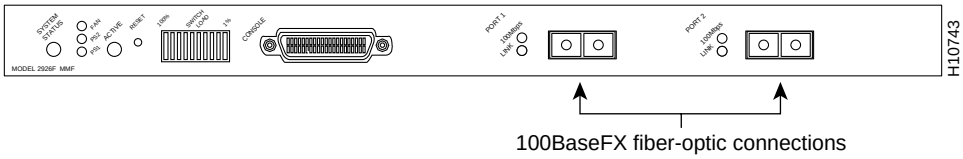
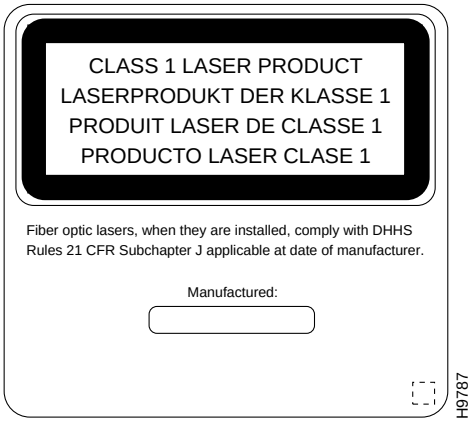


Figure 2-2 Supervisor Engine Dual-Multimode Connectors



Warning Class 1 laser product.

Warning Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Following is an example of the warning label that appears on the product:



Catalyst 2926G Series Switches

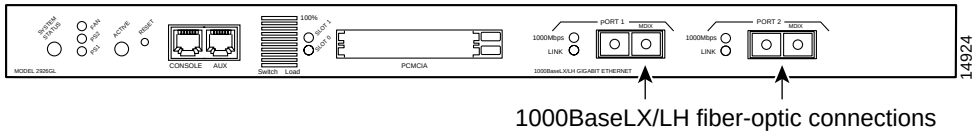
Two versions of the Catalyst 2926G series supervisor engine are available, as follows:

- Dual 1000BaseSX interfaces, Catalyst 2926GS switch
- Dual 1000BaseLX/LH interfaces, Catalyst 2926GL switch

Figure 2-3 shows the appearance of the Catalyst 2926G series supervisor engine panel.

Note Only the 1000BaseLX/LH interface is shown. The 1000BaseSX interface is essentially similar.

Figure 2-3 1000BaseLX/LH Gigabit Ethernet Uplink Configuration



Both supervisor engines have the following features:

- SC connectors
- Two Flash PC card slots
- Console and auxiliary ports using RJ-45 connectors

Note The auxiliary (AUX) port is currently not supported.

- NFFC supporting MLS

LEDs

The LEDs on the front panel of the supervisor engine indicate the status of the system, which includes the supervisor engine, the power supplies, and the fan assembly.

Figure 2-4 shows the LEDs on the Catalyst 2926 series switch.

Figure 2-4 Catalyst 2926 Series Supervisor Engine LEDs

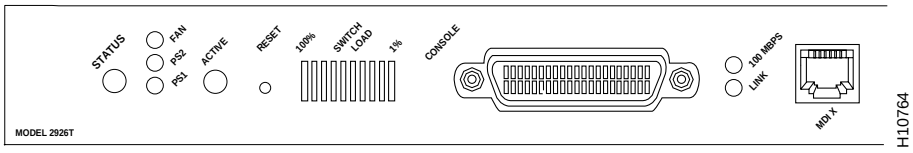


Figure 2-5 shows the LEDs on the Catalyst 2926G series switch.

Figure 2-5 Catalyst 2926G Series Supervisor Engine LEDs

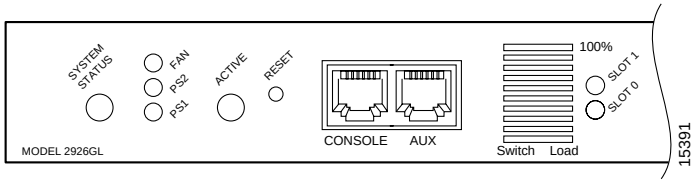


Table 2-1 describes the supervisor engine LEDs on both the Catalyst 2926 series switch and the Catalyst 2926G series switch.

Table 2-1 Supervisor Engine LED Descriptions

LED	State	Description
SYSTEM STATUS		Indicates the results of a series of self-tests and diagnostic tests.
	Green	All the tests pass.
	Red	Any test fails.
	Red	During system boot or if the module is disabled.
	Red	The redundant power supply is installed but not turned on or receiving input.
	Orange	The fan module fails.
FAN		Indicates whether or not the fan is operational.
	Green	The fan is operational.
	Red	The fan is not operational.
PS1		Indicates whether or not the power supply in the PS1 AC receptacle is operational.
	Green	If the power supply associated with the PS1 AC receptacle is operational, the LED is green.
	Red	If the power supply associated with the PS1 AC receptacle is not receiving input power, the LED is red.

Table 2-1 Supervisor Engine LED Descriptions (continued)

LED	State	Description
PS2		Indicates whether or not the power supply in the PS2 AC receptacle is operational.
	Green	If the power supply associated with the PS2 AC receptacle is operational, the LED is green.
	Red	If the power supply associated with the PS2 AC receptacle is not receiving input power, the LED is red.
ACTIVE	Green	The supervisor engine is operational and active.
	Orange	The supervisor engine module is in standby mode.
SLOT 1 and SLOT 0		Catalyst 2926G series switches only: The Flash PC card SLOT 1 and SLOT 0 LEDs light when their respective slot 1 and slot 0 Flash PC card devices are accessed by the switch.
SWITCH LOAD	1–100%	If the switch is operational, the switch load display indicates (as an approximate percentage) the current traffic load over the backplane (see Figure 2-5).
100 Mbps	Green	The port is operating at 100 Mbps (Catalyst 2926 series switches only).
1000 Mbps	Green	The port is operating at 1000 Mbps (Catalyst 2926G series switches only).
LINK	Green	The port is operational.
	Orange	The link has been disabled by software.
	Flashing orange	The link is bad and has been disabled due to a hardware failure.
	Off	No signal is detected.

Reset Button

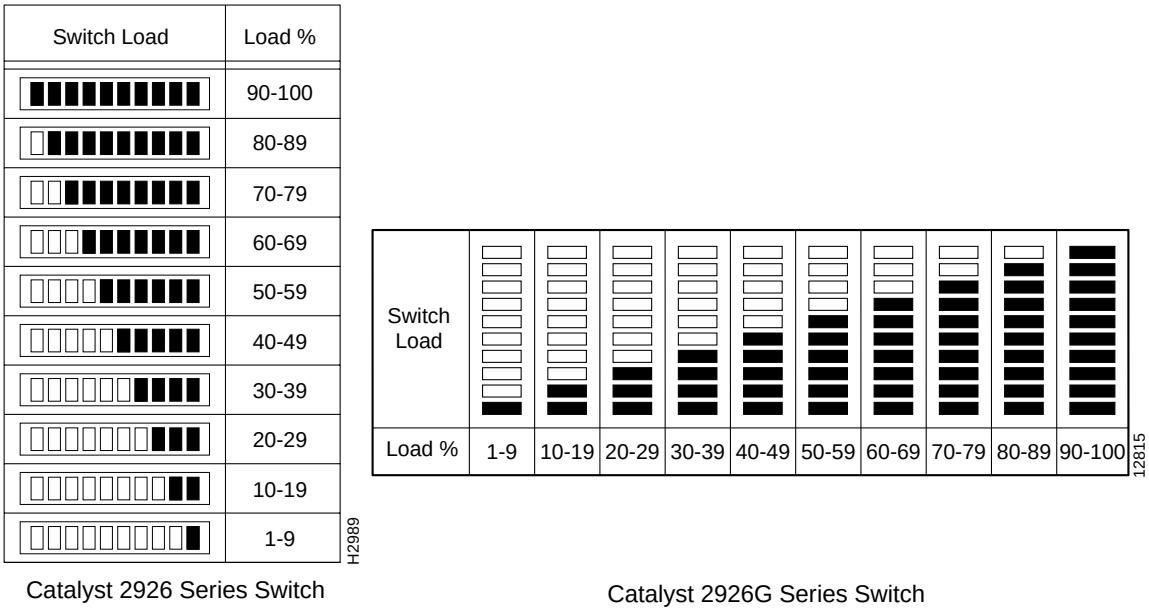
The Reset button on both the Catalyst 2926 and Catalyst 2926G series switches (see Figure 2-4) allows you to restart the switches.

Note Use a paper clip or other small, pointed object to access the Reset button.

Switch Load Display

The Switch Load display on both the Catalyst 2926 and Catalyst 2926G series switches (see Figure 2-6) provides a visual approximation of the current traffic load across the backplane.

Figure 2-6 Supervisor Engine Switch Load Display



Catalyst 2926 Series Switch

Catalyst 2926G Series Switch

Console Port

The console port on the Catalyst 2926 and Catalyst 2926G series switches allows you to perform the following functions:

- Configure the switch from the CLI
- Monitor network statistics and errors

- Configure SNMP agent parameters
- Download software updates to the switch or distribute software images residing in Flash memory to attached devices

For more information, see the "Using Flash PC Cards (Catalyst 2926G Series Switch Only)" section on page 4-10.

The console port on the Catalyst 2926 series switch, shown in Figure 2-4, is a data communications equipment (DCE) DB-25 receptacle, which supports a DCE EIA/TIA-232 interface.

Note The auxiliary (AUX) port is currently not supported on the Catalyst 2926G series switch.

The console port on the Catalyst 2926G series switch (see Figure 2-5) is an EIA/TIA-232 asynchronous, serial, full-featured data terminal equipment (DTE) connection with hardware flow control and an RJ-45 connector. A console port accessory kit with the necessary cabling and adapters is provided for making your terminal connection.

For detailed information on using this port, see the "Using Flash PC Cards (Catalyst 2926G Series Switch Only)" section on page 4-10.

Flash PC Card Slots (Catalyst 2926G Series Switch Only)

The Flash PC card slots on the front panel of the Catalyst 2926G series switch provide additional Flash PC card-based Flash memory. You can use Flash memory to store and run switch software or system configuration files, or to serve as an I/O device.

For more information, see the "Using Flash PC Cards (Catalyst 2926G Series Switch Only)" section on page 4-10. For more information on configuring the supervisor engine to boot from PC card Flash memory, refer to the *Software Configuration Guide* for your switch.

Supervisor Engine Fast Ethernet Ports (Catalyst 2926 Series Switch Only)

The supervisor engine Fast Ethernet ports (see Figure 2-1 and Figure 2-2) on the Catalyst 2926 series switch operate in full- or half-duplex mode. These ports support the following connectivity:

- RJ-45 and MII connectors with 100BaseTX Category 5 UTP cabling
- Fast Ethernet MMF interfaces, using SC connectors with multimode fiber-optic cable

For more information, see the “Supervisor Engine Uplink Ports” section on page 4-14.

Gigabit Ethernet Uplink Ports (Catalyst 2926G Series Switch Only)

The Gigabit Ethernet uplink ports on the Catalyst 2926G series switch operate in full-duplex mode only. These ports support the 1000BaseSX and 1000BaseLX/LH interfaces, using SC connectors.

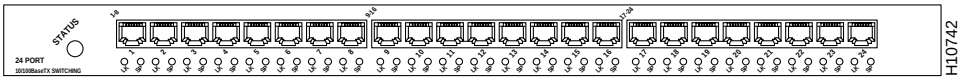
For more information, see the “Supervisor Engine Uplink Ports” section on page 4-14.

10/100-Mbps Fast Ethernet Autosensing Switched Ports

The Catalyst 2926 and Catalyst 2926G series switches have 24 autosensing, 10/100-Mbps Fast Ethernet switched ports (10/100BaseTX) that can operate in full- or half-duplex mode using Category 5 unshielded twisted-pair (UTP) cabling with RJ-45 connectors.

Figure 2-7 shows the 10/100-Mbps Fast Ethernet autosensing switched ports available with the Catalyst 2926 and Catalyst 2926G series switches.

Figure 2-7 10/100-Mbps Fast Ethernet Autosensing Switched Ports



The Catalyst 2926 and Catalyst 2926G series switch faceplates contain a STATUS LED for overall status of the 10/100-Mbps autosensing switched ports and an LK (link) and SP (speed) LED for each autosensing switched port. The LEDs are shown in Figure 2-8 and are described in Table 2-2.

Figure 2-8 10/100-Mbps Fast Ethernet Autosensing Switched Port LEDs

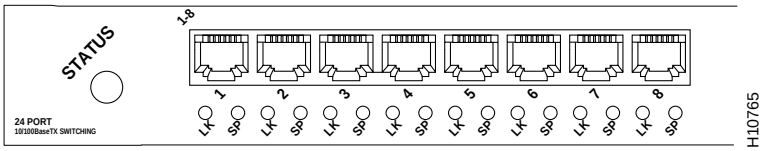


Table 2-2 10/100-Mbps Fast Ethernet Autosensing Switched Port LED Descriptions

LED	State	Description
STATUS		Indicates the results of a series of self-tests and diagnostic tests.
	Green	All the tests pass.
	Red	A test other than an individual port test fails.
	Orange	During system boot, self-test diagnostics, or if the board containing the 10/100-Mbps ports is disabled.
LK	Green	If the port is operational (a signal is detected), the LED is green.
	Orange	The link has been disabled by software.
	Flashing Orange	The link is bad and has been disabled due to a hardware failure.
	Off	No signal is detected.
SP	Green	The port is operating at 100 Mbps.
	Off	The port is operating at 10 Mbps.

For specifications on the 10/100-Mbps Fast Ethernet autosensing switched ports, see Appendix A, “Technical Specifications.”

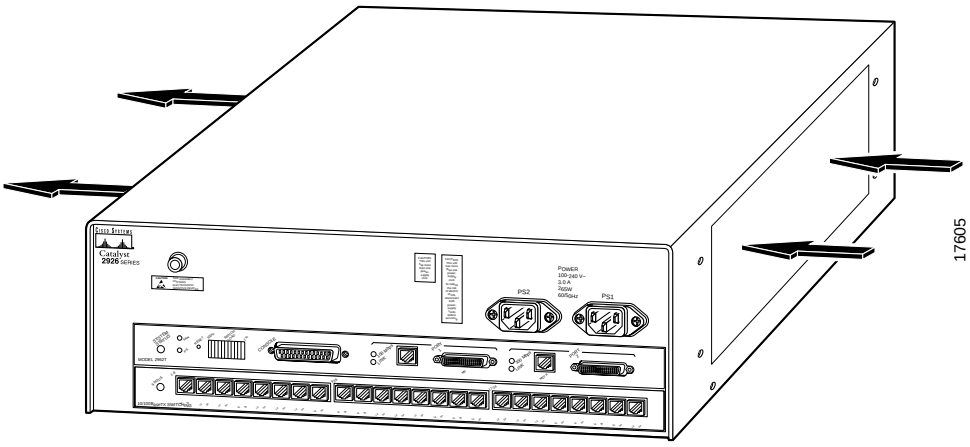
Fan Assembly

Note For complete environmental specifications, including airflow requirements, see Appendix A, “Technical Specifications.”

The system fan assembly provides cooling air for the supervisor engine, the 10/100-Mbps Fast Ethernet autosensing switched ports, and the backplane. The fan assembly is located in the chassis.

Figure 2-9 shows the direction of airflow into and out of the switch.

Figure 2-9 Internal Airflow



If an individual fan within the assembly fails, the fan LED on the supervisor engine turns red. The supervisor engine fan LED is described in Table 2-1.

Sensors on the supervisor engine monitor the internal air temperatures. If the air temperature exceeds a desired threshold, the environmental monitor displays warning messages on the console. For specific threshold and status level descriptions, see the “Environmental Monitoring” section on page 2-4.

Note The switch fan assembly is not a field-replaceable unit (FRU).

Power Supplies

For maximum network performance, the Catalyst 2926 and Catalyst 2926G series switches have dual internal AC-input power supplies. Each power supply has a status LED on the supervisor engine.

Note For complete power specifications, see Appendix A, “Technical Specifications.”

The dual AC-input power supplies normally operate in a load-sharing mode. In normal operation, each power supply concurrently provides approximately half of the required power to the system. If one power supply fails, the second power supply immediately assumes full power to maintain uninterrupted system operation. Load sharing and fault tolerance are enabled automatically.

The front panel of the supervisor engine has two LEDs (PS1 and PS2) that indicate the status of the power supplies. These LEDs are described in Table 2-1.

Note The switch power supplies are not FRUs.