CHAPTER 3

Site Planning

This chapter describes how to prepare your site for installation of the Catalyst 2926 and Catalyst 2926G series switches. This chapter contains the following sections:

- Site Environmental Requirements on page 3-1
- Site Power Requirements on page 3-2
- Cabling Requirements on page 3-8
- Site Planning Checklist on page 3-16

Note A site planning checklist has been provided at the end of this chapter to help ensure that all site planning activities are completed prior to switch installation.

Site Environmental Requirements

You should install your switch in an enclosed, secure area, ensuring that only qualified personnel have access to the switch and control of the environment. Equipment placed too close together or inadequately ventilated can cause system overtemperature conditions. In addition, poor equipment placement can make chassis panels inaccessible and difficult to maintain.

The switch operates as a standalone system mounted in a rack in a secure wiring closet. It requires a dry, clean, well-ventilated, and air-conditioned environment. The flow of ambient air must be maintained to ensure normal operation. If the airflow is blocked or restricted, or intake air is too warm, an overtemperature condition can occur. The switch's environmental monitor can then shut down the system to protect the system components.

To ensure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure the site maintains an ambient temperature of 0 to 40°C (32 to 104°F). It is essential to keep the area around the chassis as free from dust and foreign conductive material (such as metal flakes from nearby construction activity) as is possible. For a description of the environmental monitor and status levels, see the "Environmental Monitoring" section on page 2-4.

Multiple switches can be rack-mounted with little or no clearance above and below the chassis. However, when mounting a switch in a rack with other equipment, or when placing it on the floor near other equipment, ensure that the exhaust from other equipment does not blow into the intake vent of the chassis.

Cooling air is drawn in through the right side of the chassis. Keep the right side clear of obstructions, including dust and foreign conductive material, and away from the exhaust ports of other equipment.

Appendix A, "Technical Specifications," lists the operating and nonoperating environmental site requirements for the switches. To maintain normal operation and ensure high system availability, maintain an ambient temperature and clean power at your site. The environmental ranges listed in Appendix A are within the ranges that the switch will continue to operate; however, a measurement that approaches the minimum or maximum of a range indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they exceed the maximum operating range.

Warning This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

Site Power Requirements

This section provides site power requirements. Verify your site power before you install the switch. This section consists of the following sections:

- General Requirements
- Warnings and Cautions

- EMI Recommendations
- Power requirements and heat dissipation

General Requirements

Follow these general requirements when preparing your site for the switch installation:

- Connect each power supply to separate wiring on a dedicated circuit; provide each power supply with its own branch circuit connection with sufficient overcurrent protection and direct grounding to the branch circuit.
- Connect each of the two power supplies to a separate input power source. Failure to do so makes the system susceptible to total power failure due to a fault in the external wiring or a tripped circuit breaker.
- Provide each power supply with an AC-input power source, since redundant power supply input sources must be the same type.
- To prevent a loss of input power, be sure the total maximum load on each AC circuit supplying the power supplies is within the current ratings of the wiring and breakers.
- Use care when connecting the switch to the supply circuit so that wiring is not overloaded.
- In some systems, you should use a redundant power source (UPS) to protect against power failures. If a UPS is used, avoid types that use ferroresonant technology. A UPS that uses ferroresonant technology can become unstable when used on systems such as the Catalyst 2926 and Catalyst 2926G series switches, which can have substantial current draw fluctuations due to bursty data-traffic patterns. UPS devices such as the APC Smart-UPS series products have been used successfully with the Catalyst 2926 and Catalyst 2926G series switches.
- Connect the redundant power supplies to separate input power lines to provide uninterrupted power in case one power supply or input power line fails.

Warnings and Cautions

Follow these precautions when preparing your site for the switch installation:

Warning Ultimate disposal of this product should be handled according to all national laws and regulations.

Warning Unplug the power cord before you work on a system that does not have an on/off switch.

Warning Read the installation instructions before you connect the system to its power source.

Warning This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.

Warning This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 15A U.S. (240 VAC, 10A international) is used on the phase conductors (all current-carrying conductors).

Note In Germany only—the electrical rating is 240 VAC and 16A.

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

EMI Recommendations

When setting up the plant wiring, consider the following factors:

- When planning the location of the new system, consider electromagnetic interference (EMI), the distance limitations for signaling, and connector compatibility.
- When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires.
- Bad plant wiring can result in radio frequency interference (RFI).
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the switch and can create an electrical hazard by conducting power surges through lines and into equipment.

Note To predict and remedy strong EMI, you might need to consult experts in RFI.

Power Requirements and Heat Dissipation

This section provides estimates of the power requirements and heat dissipation for the Catalyst 2926 series switch (Catalyst 2926T switch and Catalyst 2926F switch) and Catalyst 2926G series switch (Catalyst 2926GS switch and Catalyst 2926GL switch). The power requirements might be useful for planning the power distribution system needed to support the switch. Heat dissipation is an important consideration for sizing the air conditioning requirements for an installation. The power and heat associated with a Catalyst 2926 series switch and Catalyst 2926G series switch varies upon the average switching traffic levels.

Unless otherwise noted, the information assumes worst-case conditions. Typical numbers are approximately 30 percent below the numbers listed here.

Table 3-1 lists the power requirements and heat dissipation estimates for the Catalyst 2926T switch, which is configured as follows:

- WS-X2926T supervisor engine (dual Fast Ethernet RJ-45 and media-independent interface [MII] connectors)
- 24 10/100-Mbps Fast Ethernet interfaces
- Dual AC-input power supplies

Table 3-1 Catalyst 2926T Power Requirements and Heat Dissipation

Model Number/ Card Type	AC Input Power (Watts)	Heat Diss. (BTU/HR)	Input Current at 90 VAC (Amps)	Input Current at 120 VAC (Amps)	Input Current at 180 VAC (Amps)	Input Current at 240 VAC (Amps)
Catalyst 2926T chassis (with frame)	42	144	0.47	0.35	0.23	0.18
Supervisor, UTP[1]	71	243	0.79	0.59	0.39	0.30
10/100-Mbps board	101	344	1.12	0.84	0.56	0.42
Total	**214**	**731**	**2.38**	**1.78**	**1.18**	**0.90**

1 UTP = unshielded twisted-pair

Table 3-2 lists the power requirements and heat dissipation estimates for the Catalyst 2926F switch, which is configured as follows:

- WS-X2926F supervisor engine (dual Fast Ethernet multimode fiber-optic SC connectors)
- 24 10/100-Mbps Fast Ethernet interfaces
- Dual AC-input power supplies

Table 3-2 Catalyst 2926F Power Requirements and Heat Dissipation

Model Number/ Card Type	AC Input Power (Watts)	Heat Diss. (BTU/HR)	Input Current at 90 VAC (Amps)	Input Current at 120 VAC (Amps)	Input Current at 180 VAC (Amps)	Input Current at 240 VAC (Amps)
Catalyst 2926F chassis (with fans)	42	144	0.47	0.35	0.23	0.18
Supervisor, MMF[1]	62	212	0.69	0.52	0.34	0.26
10/100-Mbps board	101	344	1.12	0.84	0.56	0.42
Total	**205**	**700**	**2.28**	**1.71**	**1.13**	**0.86**

1 MMF = multimode fiber

Table 3-3 lists the power requirements and heat dissipation estimates for the Catalyst 2926G series switch, which is configured as follows:

- WS-X2926GS supervisor engine (dual 1000BaseSX fiber-optic SC connectors) or WS-X2926GL supervisor engine (dual 1000BaseLX/LH multimode fiber-optic SC connectors)
- 24 10/100-Mbps Fast Ethernet interfaces
- Dual AC-input power supplies with PFC

Table 3-3 Catalyst 2926G Power Requirements and Heat Dissipation

Model Number	AC Input Power (Watts)	Heat Diss. (BTU/HR)	Input Current at 90 VAC (Amps)	Input Current at 120 VAC (Amps)	Input Current at 180 VAC (Amps)	Input Current at 240 VAC (Amps)
Catalyst 2926G	260	888	2.89	2.17	1.44	1.09

Cabling Requirements

This section provides cabling guidelines for your networks using the Catalyst 2926 and Catalyst 2926G series switches. This section also describes connection equipment you will need to connect to network devices.

When preparing your site for cabling to the switch, you need to consider several factors for each switch interface type. Use the following sections to determine your cabling requirements:

- Network Cabling Overview, page 3-8
- Determining Cable Distances, page 3-10
- Connecting Interface Equipment, page 3-14

Before installing the switch, have all cables and any additional interface equipment on hand. If you intend to build your own cables, refer to the cable pinouts in Appendix B, “Cabling Specifications.”

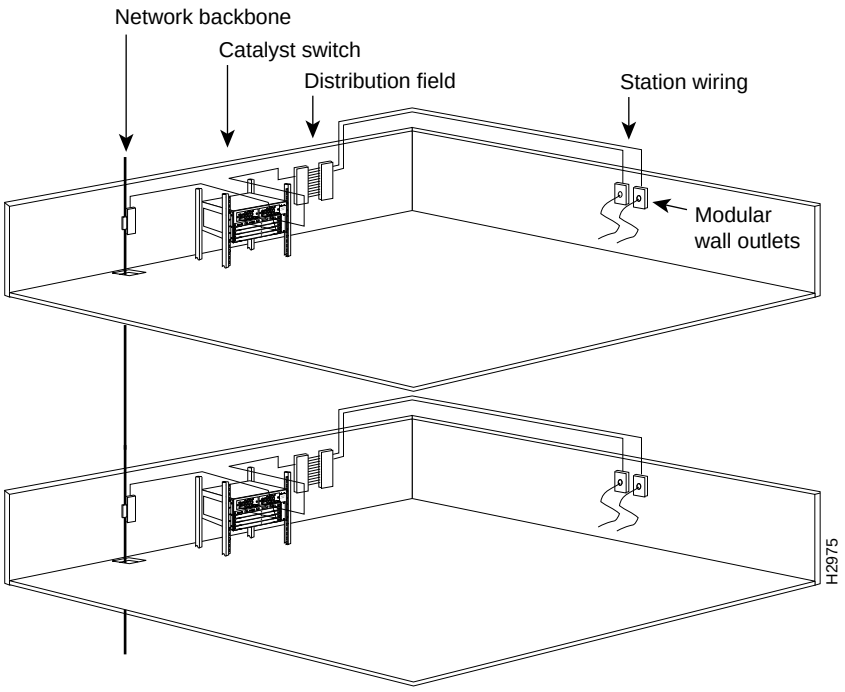
Network Cabling Overview

The network cabling components shown in Figure 3-1 consist of the following:

- Network backbone—Supplies a vertical or horizontal connection between floors of the building or between buildings in a campus environment
- Distribution field—Provides the cross-connection between the Fast Ethernet port connections and the individual station wiring

- Station wiring—Provides the connection from the wiring closet to the modular wall outlets
- Modular wall outlets—Provides connection to the network

Figure 3-1 Network Cabling Components



Determining Cable Distances

The length of your networks and the distances between connections depend on the type of signal, the signal speed, and the transmission media (the type of cabling used to transmit the signals). The distance and rate limits in the following sections are the IEEE-recommended maximum speeds and distances for signaling.

The distance limits in the following sections are provided as guidelines for planning your network connections *before* installation.

Setting Up Fast Ethernet Cabling

The maximum distances for Fast Ethernet network segments and connections (shown in Table 3-4) depend on the type of transmission cable used. The term *10BaseT* is an abbreviation for *10* Mbps transmission, *Base*band medium, and *T* for twisted pair.

Table 3-4 Fast Ethernet Maximum Transmission Distances

Transceiver Speed	Cable Type	Duplex Mode	Maximum Distance between Stations
10/100 Mbps	Category 5 UTP	Full and half	328 ft (100 m)
100 Mbps	Multimode fiber	Full	1.2 miles (2 km)
100 Mbps	Multimode fiber	Half	1312 ft (400 m)

Setting Up Gigabit Ethernet Cabling (Catalyst 2926G Series Switch Only)

Table 3-5 provides cabling specifications for the Gigabit Ethernet uplink ports on Catalyst 2926G series switches. All Gigabit Ethernet uplink ports have SC-type connectors, and the minimum cable distance for both types listed (MMF and SMF) is 6.5 feet (2 meters).

Table 3-5 Gigabit Ethernet Cabling Specifications

Gigabit Ethernet Uplink	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz.km)	Cable Distance
SX[1]	850	MMF	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
LX/LH	1300	MMF[2]	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
		SMF (LX/LH)	9/10	-	32,810 feet (10 km)

1 MMF only.
2 Patch cord recommended. See the “Connecting the Patch Cord (Catalyst 2926GL Switch Only)” section for details.

Connecting the Patch Cord (Catalyst 2926GL Switch Only)

When connecting the 1000BaseLX/LH uplink port with 62.5-micron diameter multimode fiber (MMF), we recommend you install a mode-conditioning patch cord (Cisco product number CAB-GELX-625 or equivalent) between the uplink port and the MMF cable on both the transmit and receive ends of the link. The patch cord is required for link distances greater than 984 feet (300 meters). Otherwise, an effect called Differential Mode Delay might degrade link performance. For more information, refer to Appendix E, “Differential Mode Delay.”

Note We do not recommend using the Catalyst 2926GL switch with MMF and no patch cord for very short link distances (tens of meters). The result could be an elevated bit error rate (BER).

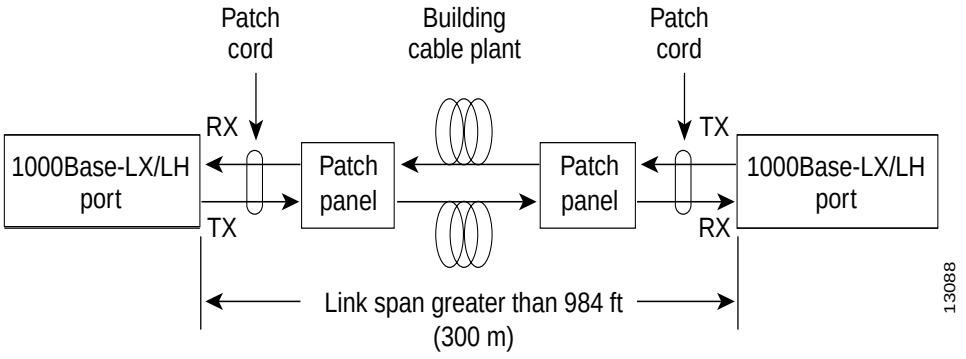
Note The patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable due to a problem in the center of some fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center by using the patch cord. At the output of the patch cord, the 1000BaseLX/LH uplink port is compliant with the IEEE 802.3z standard for 1000BaseLX. For more information, see the "Setting Up Fiber-Optic Cabling" section on page 3-13.

Note Cisco Gigabit Ethernet products have been tested and evaluated to comply with the standards listed in Appendix A, "Technical Specifications." Equivalent cables should also meet these standards.

Patch Cord Configuration Example

Figure 3-2 shows a typical configuration using the patch cord.

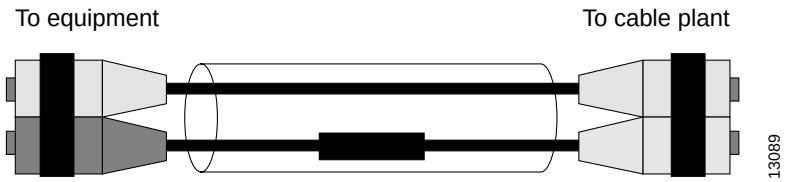
Figure 3-2 Patch Cord Configuration



Patch Cord Installation

Plug the end of the patch cord labeled "To Equipment" into the uplink port (see Figure 3-3). Plug the end labeled "To Cable Plant" into the patch panel.

Figure 3-3 Patch Cord Installation



Setting Up Fiber-Optic Cabling

The maximum distances for fiber-optic network connections are determined by the transmitter output power, receiver sensitivity, and type of optical source, as shown in Table 3-6.

Table 3-6 Multimode Fiber-Optic Distance Specifications

Item	Description
Transmitter Output Power	–19 to –14 dBm
Receiver Sensitivity	–32.5 to –14 dBm
Wavelength	1270 to 1380 nm
Optical Source	LED
Maximum Span	1.2 miles (2 km)

Setting Up Serial Cabling

As with all signaling systems, serial signals can travel a limited distance at any given bit rate; generally, the slower the baud rate, the greater the distance. Table 3-7 shows the standard relationship between baud rate and distance for EIA/TIA-232 signals.

Table 3-7 EIA/TIA-232 Transmission Speed Versus Distance

Rate (bps)	Distance (Feet)	Distance (Meters)
2400	200	60
4800	100	30
9600	50	15
19,200	25	7.6
38,400	12	3.7
56,000	8.6	2.6

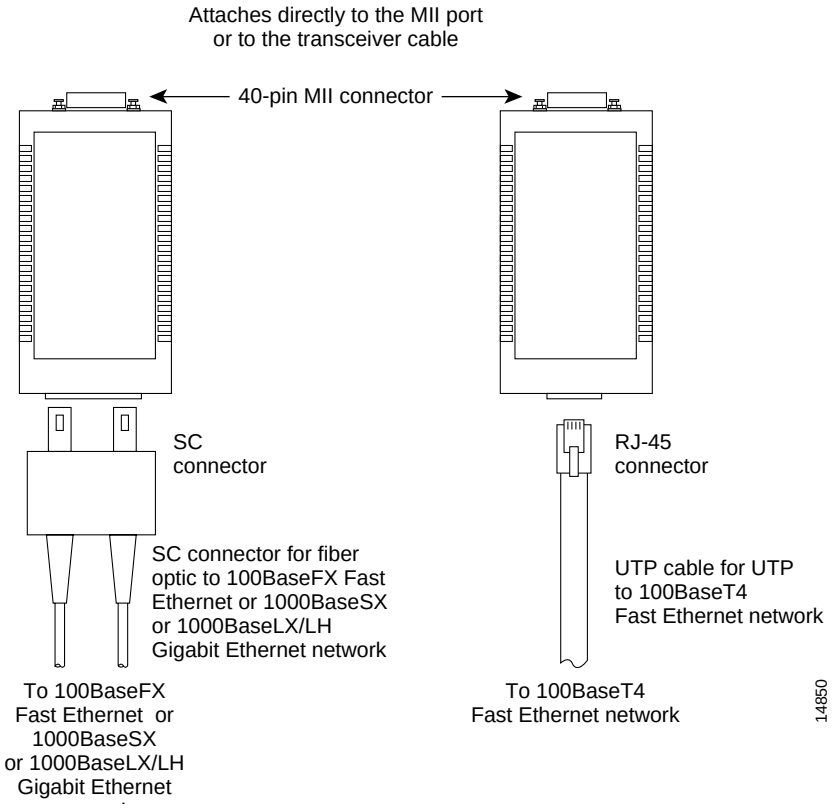
Connecting Interface Equipment

Ethernet transceivers are available from a variety of sources for Virtual Terminal Protocol (VTP) and multimode fiber-optic cabling. Figure 3-4 shows an example of Fast Ethernet and Gigabit Ethernet transceivers and connection equipment.

You might need additional data communications equipment to complete your installation.

When planning your connections, consider the types and locations of connectors on adjacent switching ports to avoid overlapping the transceiver and impairing access to other connections.

Figure 3-4 Fast Ethernet and Gigabit Ethernet Fiber and UTP Transceivers and Connection Equipment



Site Planning Checklist

Table 3-8 lists the site planning activities that you should perform before you install the switch. Completing each activity helps ensure a successful switch installation.

Table 3-8 Site Planning Checklist

Task No.	Planning Activity	Verified By	Time	Date
1	**Space Evaluation:** Space and layout Floor covering Impact and vibration Lighting Maintenance access			
2	**Environmental Evaluation:** Ambient temperature Humidity Altitude Atmospheric contamination Airflow			
3	**Power Evaluation:** Input power type Power receptacles Receptacle proximity to the equipment Dedicated (separate) circuits for redundant power supplies UPS for power failures			
4	**Grounding Evaluation:** Circuit breaker size			

Table 3-8 Site Planning Checklist (continued)

Task No.	Planning Activity	Verified By	Time	Date
5	**Cable and Interface Equipment Evaluation:** Cable type Connector type Cable distance limitations Interface equipment (transceivers)			
6	**EMI Evaluation:** Distance limitations for signaling Site wiring RFI levels			