Preparing the Site

This chapter includes the following sections:

Humidity Requirements

High humidity can cause moisture to seep into the switch. Moisture can cause corrosion of internal components and degradation of properties such as electrical resistance, thermal conductivity, physical strength, and size. The switch is rated to operate at 8 to 80 percent relative humidity, with a humidity gradation of 10 percent per hour.

The switch can withstand from 5 to 90 percent relative humidity. Buildings in which the climate is controlled by air-conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for the switch equipment. However, if the switch is located in an unusually humid location, you should use a dehumidifier to maintain the humidity within an acceptable range.

Altitude Requirements

If you operate a switch at a high altitude (low pressure), the efficiency of forced and convection cooling is reduced and can result in electrical problems that are related to arcing and corona effects. This condition can also cause sealed components with internal pressure, such as electrolytic capacitors, to fail or to perform at a reduced efficiency. This switch is rated to operate at altitudes from –500 to 13,123 feet (–152 to 4,000 meters). You can store the switch at altitudes of –1,000 to 30,000 feet (–305 to 9,144 meters).

Dust and Particulate Requirements

Exhaust fans cool power supplies and system fan trays cool switches by drawing in air and exhausting air out through various openings in the chassis. However, fans also ingest dust and other particles, causing contaminant buildup in the switch and increased internal chassis temperature. A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the mechanical components in the switch.

Note If you are using this switch in a nonclean environment, you can order and install an optional air filter. This air filter requires that you also order the optional front door for the chassis.

In addition to regular cleaning, follow these precautions to avoid contamination of your switch:

- Do not permit smoking near the switch.
- Do not permit food or drink near the switch.

Minimizing Electromagnetic and Radio Frequency Interference

Electromagnetic interference (EMI) and radio frequency interference (RFI) from the switch can adversely affect other devices such as radio and television (TV) receivers operating near the switch. Radio frequencies that emanate from the switch can also interfere with cordless and low-power telephones. Conversely, RFI from high-power telephones can cause spurious characters to appear on the switch monitor.

RFI is defined as any EMI with a frequency above 10 kHz. This type of interference can travel from the switch to other devices through the power cable and power source or through the air like transmitted radio waves. The Federal Communications Commission (FCC) publishes specific regulations to limit the amount of EMI and RFI that can be emitted by computing equipment. Each switch meets these FCC regulations.

To reduce the possibility of EMI and RFI, follow these guidelines:

- Cover all open expansion slots with a metal filler.
- Always use shielded cables with metal connector shells for attaching peripherals to the switch.

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires and cause the following implications:

- Bad wiring can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in the chassis and even create an electrical hazard by conducting power surges through lines into equipment.

Note To predict and prevent strong EMI, you might need to consult experts in radio frequency interference (RFI).

The wiring is unlikely to emit radio interference if you use twisted-pair cable with a good distribution of grounding conductors. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.

If the wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic switches. You may want to consult experts in electrical surge suppression and shielding if you had similar problems in the past.

Shock and Vibration Requirements

The switch has been shock- and vibration-tested for operating ranges, handling, and earthquake standards to Network Equipment Building Standards (NEBS) Zone 4 per GR-63-Core.

Grounding Requirements

The switch is sensitive to variations in voltage supplied by the power sources. Overvoltage, undervoltage, and transients (or spikes) can erase data from the memory or cause components to fail. To protect against these types of problems, ensure that there is an earth-ground connection for the switch. You can connect the grounding pad on the switch either directly to the earth-ground connection or to a fully bonded and grounded rack.

You must provide the grounding cable to make this connection but you can connect the grounding wire to the switch using a grounding lug that ships with the switch. Size the grounding wire to meet local and national installation requirements. Depending on the power supply and system, a 12 AWG to 6 AWG copper conductor is required for U.S. installations (for those installations, we recommend that you use commercially available 6 AWG wire). The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.

Note You automatically ground the AC power supplies when you connect them to a power source, but you cannot ground a 3-kW DC power supply. You must connect the chassis to the facility earth ground.

Planning for Power Requirements

To plan for the power requirements of a switch, you must determine each of the following:

- Power requirements of the switch
- Minimum number of power supplies required to power the switch and its components
- Power mode to use and the number of additional power supplies required for that mode

You must also ensure that the circuit used for the switch is dedicated to the switch to minimize the possibility of circuit failure.

When you know the amount of power that is required for operations (available power) and redundancy (reserve power), you can plan for the required number of input power receptacles with reach of the switch location.

Step 1 Determine the power requirement for the switch by summing the maximum wattage for each installed module (see the following table).

Component		Quantity	Maximum Power	Typical Power
Supervisor Modules		1	—	—
	Supervisor 2 Enhanced (N77-SUP2E)		265 W	137 W
	Supervisor 3 Enhanced (N77-SUP3E)		150 W	110 W
F3 I/O Modules		1	—	—
	48-port 1- and 10-Gigabit Ethernet I/O module (N77-F348XP-23)		480 W	450 W
	24-port 40-Gigabit Ethernet I/O module (N77-F324FQ-25)		740 W	650 W
	12-port 100-Gigabit Ethernet I/O module (N77-F312CK-26)		730 W	640 W
F4 I/O Module			—	—
	30-port 100-Gigabit Ethernet I/O module (N77-F430CQ-36)		1000 W	730 W
M3 I/O Modules			—	—
	48-port 1- and 10-Gigabit Ethernet I/O module (N77-M348XP-23L)		560 W	500 W
	24-port 40-Gigabit Ethernet I/O module (N77-M324FQ-25L)		750 W	700 W
	12-port 100-Gigabit Ethernet I/O module (N77-M312CQ-26L)		1095 W	800 W
Fan Tray		1	—	—
	Fan Tray (N77-C7702-FAN)		300 W	50 W

Note Maximum power values are used for calculating the power requirements.

Step 2 Determine the number of power supplies needed for the available power requirement by dividing the power requirement amount (see Step 1) by the output wattage of the power supplies installed in the switch.

Step 3 Select one of the following power modes to determine the number of additional power supplies required for reserve power:

- Combined power—Do not add any power supplies to the number of power supplies calculated for the available power in Step 2. This power mode does not provide power redundancy, so no extra power supplies are needed.
- Power supply redundancy (*n*+1 redundancy)—Add one power supply (reserve power supply). This form of power redundancy provides a reserve power supply that can replace any active power supply that goes offline.
- Input source redundancy (grid redundancy)—Add enough power supplies (reserve power supplies) to at least equal the total output of the active power supplies (number of power supplies calculated in Step 2). Typically, you would double the number of power supplies. You must plan for a second power source for the reserve power supplies.

- Full redundancy (*n*+1 and grid redundancy)—Add enough power supplies (reserve power supplies) to at least equal the output of the active power supplies (number of power supplies calculated in Step 2). For power supply (*n*+1) redundancy, ensure that . For input-source (grid) redundancy, you will probably double the number of power supplies. You must plan for a second power source with at least the same amount of input power for the reserve power supplies. Either one of the reserve power supplies can replace any of the active power supplies.

Step 4 Be sure that the power source circuits are dedicated to the switch and not to other electrical equipment.

For combined power mode (no power redundancy) or power supply (*n*+1) redundancy, you need only one dedicated circuit. The requirements for each circuit are listed in the following table.

Table 1: Circuit Requirements for 3-kW Power Supplies

Power Supply			Number of Circuits	Requirement for Each Circuit
AC Power Supplies				
	3-kW power supply	(N77-AC-3.0KW)	1	20 A at 110 VAC or 220 VAC
DC Power Supplies				
	3-kW power supply	(N77-DC-3.0KW)	1	20A

Table 2: Circuit Requirements for 3.5-kW HVAC/HVDC Power Supplies

Power Supply			Number of Circuits	Requirement for Each Circuit
	3.5-kW HVAC/HVDC power supply	(N77-HV-3.5KW)	1	20 A at 110 VAC, 210 VAC, 220/230 VAC and 277 VAC or 20 A at 210 VDC, 220/240 VDC and 380 VDC

Step 5 Plan the placement of the input power receptacles within reach of the power cables used for each power supply (see the following table for the maximum distances).

Typically, power receptacles are placed on the rack with the switch. If the DC power source is further than allowed by the DC power cables, you can install a power interface unit (PIU) in the rack with the switch and connect that to the power source with other cabling.

Power Supply	Maximum Distance Between Receptacle and Power Supply
All AC power supplies	12 feet (3.6 m)
HVAC/HVDC 3.5-kW power supplies	14 feet (4.26 m)
DC 3-kW power supplies	Determined by the length of the power cord that you supply.

Rack and Cabinet Requirements

You can install the following types of racks or cabinets for your switch:

- Standard perforated cabinets
- Solid-walled cabinets with a roof fan tray (bottom to top cooling)

Note Installation clearance requirements for solid-wall cabinets are not in the scope of this guide. Such installations have to be custom-engineered by a cooling professional. The customised configuration should satisfy the requirements mentioned in the Preparing the Site and the Switch Specifications sections.

- Standard open four-post Telco racks
- Standard open two-post Telco racks

To correctly install the switch in a cabinet that is located in a hot-aisle/cold-aisle environment, you should fit the cabinet with baffles to prevent exhaust air from recirculating into the chassis air intake.

Work with your cabinet vendors to determine which of their cabinets meet the following requirements or see the Cisco Technical Assistance Center (TAC) for recommendations:

- Use a standard 19-inch, four-post Electronic Industries Alliance (EIA) cabinet or rack with mounting rails that conform to English universal hole spacing per section 1 of the ANSI/EIA-310-D-1992 standard.
- The height of the rack or cabinet must accommodate the 3-RU (5.25 inches or 13.3 cm) height of the switch.
- The depth of a four-post rack must be 24 to 32 inches (61.0 to 81.3 cm) between the front and rear mounting brackets.
- Required clearances between the chassis and the edges of its rack or the interior of its cabinet are as follows:
    - 7.5 inches (19.1 cm) between the front of the chassis and the front of the rack or interior of the cabinet (required for cabling).
    - 3.0 inches (7.6 cm) between the rear of the chassis and the perforated rear door of the cabinet (required for airflow in the cabinet if used).

Note This requirement does not apply to enclosures which have a solid rear door or wall with other exhaust configurations.

    - No clearance is required between the chassis and the sides of the rack or cabinet (no side airflow).

Additionally, you must consider the following site requirements for the rack:

- Power receptacles must be located within reach of the power cords used with the switch.
    - AC power supplies

    - Power cords for 3-kW AC power supplies are 8 to 12 feet (2.5 to 3.6 m) long.

  - DC power supplies
    - Power cords for 3.0-kW DC power supplies are supplied and dimensioned by the customer.

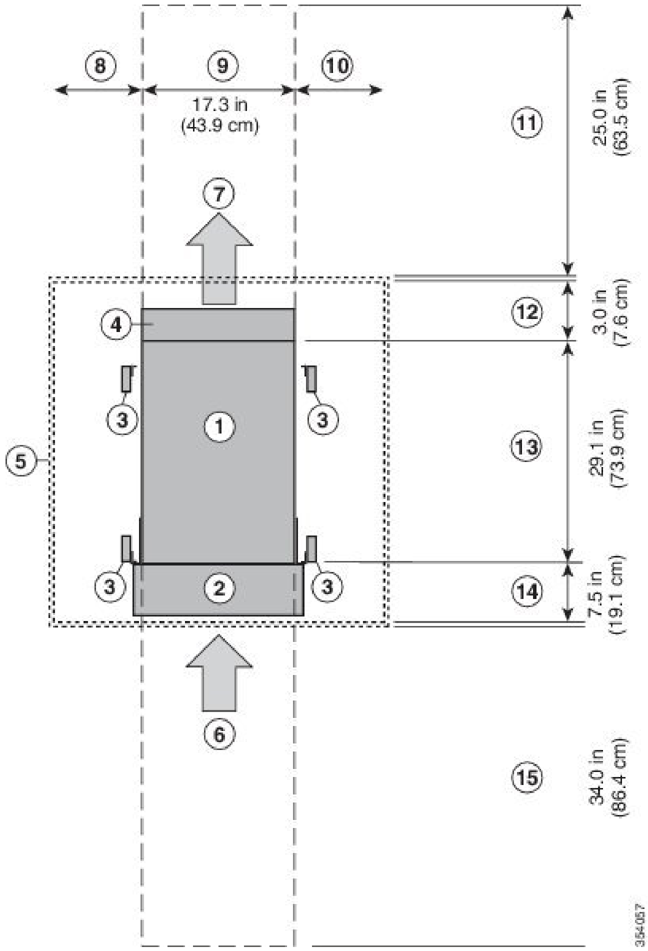
  - HVAC/HVDC power supplies
    - Power cords for 3.5-kW HVAC/HVDC power supplies are 14 feet (4.26 m) long.

- Clearance required for cables that connect to as many as 200 ports (in addition to the cabling required for other devices in the same rack). These cables must not block access to any removable chassis modules or block airflow into or out of the chassis. Route the cables through the cable management frames on the left and right sides of the chassis.
- Where necessary, have a seismic rating of Network Equipment Building Standards (NEBS) Zone 3 or Zone 4, per GR-63-CORE if required.
- Minimum gross load rating of 2000 lb (907.2 kg) (static load rating) if supporting two switches.

Clearance Requirements

You must provide the chassis with adequate clearance between the chassis and any other rack, device, or structure so that you can properly install the chassis, route cables, provide airflow, and maintain the switch. For the clearances required for an installation of this chassis, see the following figure.

Figure 1: Clearances Required Around the Chassis



1	Chassis	9	Chassis width
2	Cable management frames	10	No right side clearance required (no airflow on right side)
3	Vertical rack-mount posts and rails	11	Rear service clearance required to replace fan trays and fabric modules
4	Area used for fan tray handles at the rear of the chassis (allow 2 inches [5 cm])	12	Airflow clearance area required at the rear of the chassis within the cabinet (if a cabinet is used)
5	Nearest object or inside of cabinet (no side clearance required)	13	Chassis depth
6	Air intake from the cold aisle for all modules and power supplies	14	Clearance required between the front of the chassis and the inside of the cabinet (if used) or the edge of the cold aisle (if no cabinet) for the cable management frames and the optional front doors

7	Air exhaust to the hot aisle for all modules and power supplies	15	Front service clearance required for installing the chassis and replacing the modules on the front of the chassis
8	No left side clearance required (no airflow on left side)		

Note Figure 1: Clearances Required Around the Chassis, on page 8 shows the clearance requirements for conventional cold-aisle to hot-aisle systems which include rack enclosures with perforated front and rear doors. The information given above does not apply to enclosures which have a solid rear or front door or wall with other inlet or exhaust configurations. We recommend consulting a cooling professional if a solid rear or front door is used.