CHAPTER 1

Product Overview

This chapter describes the Catalyst 6500 series switches and contains these sections:

Note The Catalyst 6000 series switches (Catalyst 6006 switch and Catalyst 6009 switch) are described in a separate publication, the *Catalyst 6000 Series Switches Installation Guide*.

Note Throughout this publication, except where noted, the term *supervisor engine* is used to refer to Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720.

Catalyst 6503 Switch

The Catalyst 6503 switch is a 3-slot horizontal chassis. Table 1-1 lists the features of the Catalyst 6503 switch chassis. Table 1-2 lists the specifications of the Catalyst 6503 switch chassis. Figure 1-1 shows the front view and Figure 1-2 shows the rear view of the Catalyst 6503 switch.

Table 1-1 Catalyst 6503 Switch Features

Feature	Description
Chassis	• Three horizontal slots. Slots are numbered from 1 (top) to 3 (bottom).
Supervisor engine	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor engines are installed in slot 1 and slot 2. – Using a Supervisor Engine 32 or a Supervisor Engine 720 requires that you install the optional high-speed fan tray. • The uplink ports are fully functional on the redundant supervisor engine in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to two Catalyst 6500 series modules. • Does not support the WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules. • Does not support the WS-X67xx modules. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 720 GBps switch fabric.
Clock and VTT modules	• One replaceable clock module (CLK-7600=) provides clocking signals to the EOBC channel and the switching bus. • Non-replaceable voltage termination (VTT) module provides reference voltage for bus signals.

Table 1-1 Catalyst 6503 Switch Features (continued)

Feature	Description
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – FAN-MOD-3 (Standard fan tray—170 CFM). Supports Supervisor Engine 1 and Supervisor Engine 2 only; does not support Supervisor Engine 32 or Supervisor Engine 720. – FAN-MOD-3HS (Optional high-speed fan tray—270 CFM). Required for Supervisor Engine 32 and Supervisor Engine 720. Supports Supervisor Engine 1 and Supervisor Engine 2. **Note** Both fan tray models contain four individual fans. The individual fans are not field replaceable; you must replace the fan tray. **Note** The WS-C6503-E-FAN tray is not supported in the Catalyst 6503 chassis. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power Entry Module (PEM)[1]	• A PEM is required for each installed power supply. – PEM-15A-AC (PEM for 950 W AC-input power supplies). – PEM-DC/3 (PEM for 950 W DC-input power supplies). – PEM-20A-AC+ (PEM for 1400 W AC-input power supplies).
Power supplies	• Supports one or two power supplies. The following power supplies are supported: – PWR-950-AC (950 W AC-input power supply). – PWR-950-DC (950 W DC-input power supply). – PWR-1400-AC (1400 W AC-input power supply). • Installed power supplies can be of different wattage ratings. Installed power supplies can be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. **Note** For Catalyst 6503 and Catalyst 6503-E chassis that are equipped with DC-input power supplies, the system (NEBS) ground serves as the primary safety ground and must be installed. The DC-input power supplies for these chassis do not have a separate ground. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the lower power supply bay. The second power supply is installed in the upper power supply bay.

1. PEMs are required for Catalyst 6503 and Catalyst 6503-E switches only.

Table 1-2 Catalyst 6503 Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 40°C (104°F) generating a minor alarm and at 55°C (131°F) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	Operating: 5% to 90% Nonoperating and storage: 5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch was complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	64 to 76 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-2 Catalyst 6503 Switch Specifications (continued)

Item	Specification
Physical Characteristics	
Dimensions (H x W x D)	• 7 x 17.37 x 21.75 in. (17.78 x 44.12 x 55.25 cm). • Chassis requires 4 RU[1]. • The Catalyst 6503 switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	• Chassis only: 27 lb (12.25 kg). • Chassis fully configured with 1 supervisor engine, 2 modules, 2 AC-input PEMs, and 2 AC-input power supplies: 85.4 lb (38.7 kg).
Airflow	• FAN-MOD-3 (Standard fan tray)—170 CFM • FAN-MOD-3HS (Optional high-speed fan tray)—270 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-1 Catalyst 6503 Switch—Front View

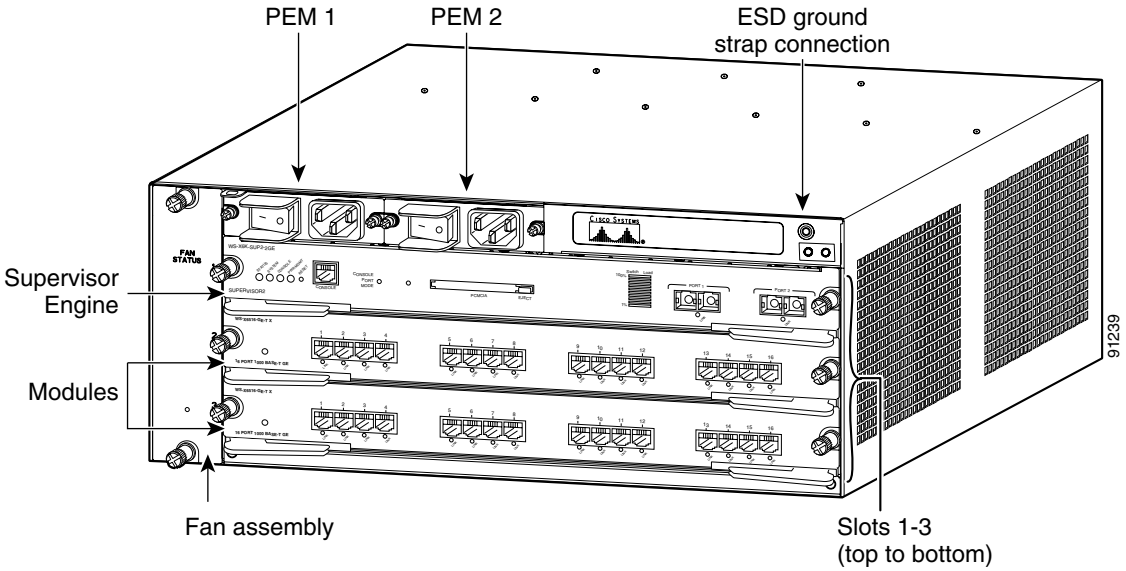
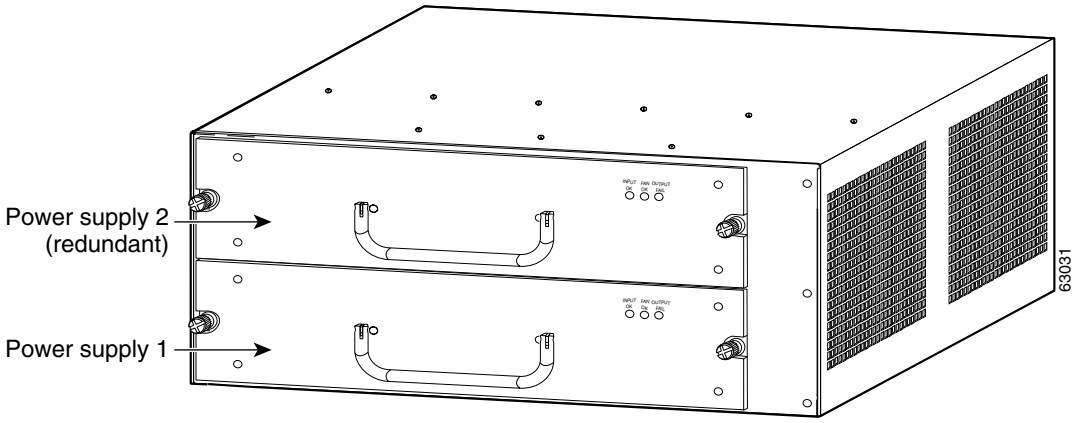


Figure 1-2 Catalyst 6503 Switch—Rear View



Catalyst 6503-E Switch

The Catalyst 6503-E switch is a 3-slot horizontal chassis. Table 1-3 lists the features of the Catalyst 6503-E switch chassis. Table 1-4 lists the specifications of the Catalyst 6503-E switch chassis. Figure 1-3 shows the front view and Figure 1-4 shows the rear view of the Catalyst 6503-E switch.

Table 1-3 Catalyst 6503-E Switch Features

Feature	Description
Chassis	• Three horizontal slots. Slots are numbered from 1 (top) to 3 (bottom).
Supervisor engine	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor engines are installed in slot 1 and slot 2. • The uplink ports are fully functional on the redundant supervisor engine in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to two Catalyst 6500 series modules. • Does not support the WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 720 GBps switch fabric.
Clock and VTT module	• One replaceable clock module (CLK-7600=) provides clocking signals to the EOBC channel and the switching bus. • Non-replaceable voltage termination (VTT) module provides reference voltage for bus signals.

Table 1-3 Catalyst 6503-E Switch Features (continued)

Feature	Description
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6503-E-FAN—282 CFM **Note** The fan tray contains four individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power Entry Module (PEM)[1]	• A PEM is required for each installed power supply. – PEM-15A-AC (PEM for 950 W AC-input power supplies). – PEM-DC/3 (PEM for 950 W DC-input power supplies). – PEM-20A-AC+ (PEM for 1400 W AC-input power supplies).
Power supplies	• Supports one or two power supplies. The following power supplies are supported: – PWR-950-AC (950 W AC-input power supply). – PWR-950-DC (950 W DC-input power supply). – PWR-1400-AC (1400 W AC-input power supply). • Installed power supplies can be of different wattage ratings. Installed power supplies can be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the lower power supply bay. The second power supply is installed in the upper power supply bay.

1. PEMs are required for Catalyst 6503 and Catalyst 6503-E switches only.

Table 1-4 Catalyst 6503-E Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet Designed and tested for operation: –200 to 10000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	64 to 76 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-4 Catalyst 6503-E Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 7 x 17.37 x 21.75 in. (17.78 x 44.12 x 55.25 cm). • Chassis requires 4 RU[1]. • The Catalyst 6503-E switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	• Chassis only: 33 lb (15 kg). • Chassis fully configured with 1 supervisor engine, 2 modules, 2 AC-input PEMs, and 2 AC-input power supplies: 85.4 lb (38.7 kg).
Airflow	• WS-C6503-E-FAN—282 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-3 Catalyst 6503-E Switch—Front View

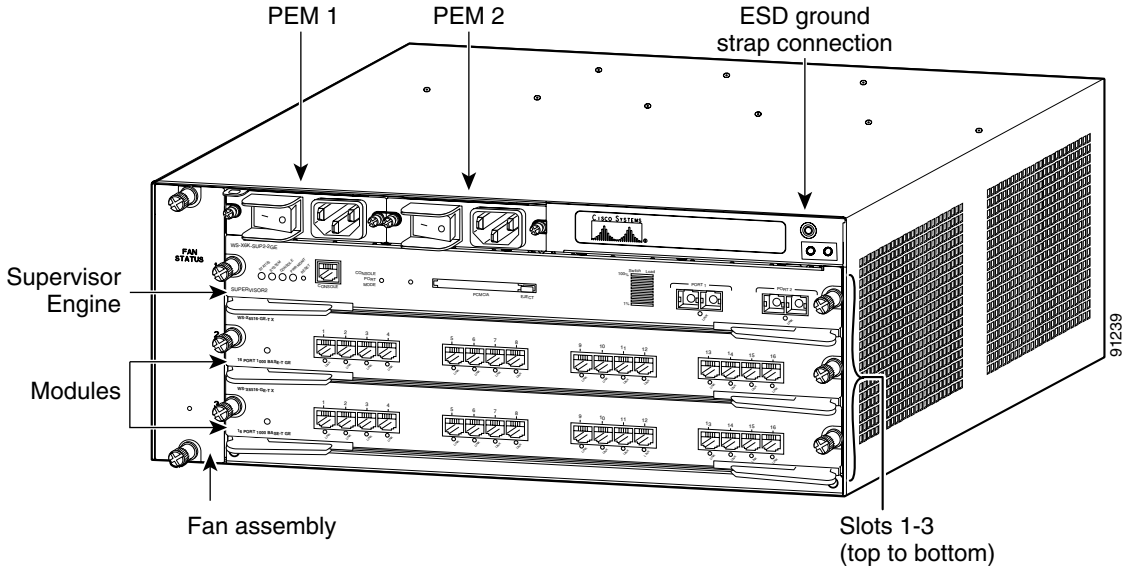
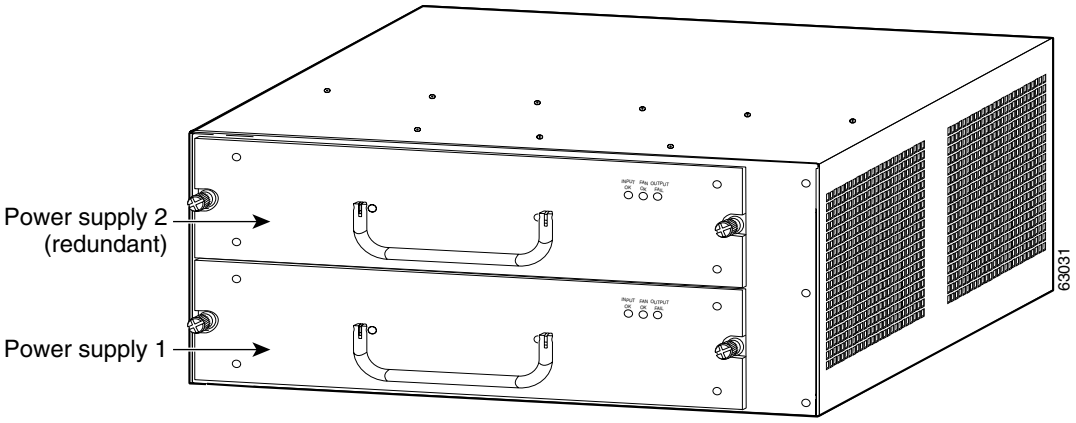


Figure 1-4 Catalyst 6503-E Switch—Rear View



Catalyst 6504-E Switch

The Catalyst 6504-E switch is a 4-slot horizontal chassis. Table 1-5 lists the features of the Catalyst 6504-E switch chassis. Table 1-6 lists the specifications of the Catalyst 6504-E switch chassis. Figure 1-5 shows the front view and Figure 1-6 shows the rear view of the Catalyst 6504-E switch.

Table 1-5 Catalyst 6504-E Switch Features

Feature	Description
Chassis	• Four horizontal slots. Slots are numbered from 1 (top) to 4 (bottom).
Supervisor engine	• Supports Supervisor Engine 32 and Supervisor Engine 720. – Supervisor engines are installed in slot 1 and slot 2. • The uplink ports are fully functional on the redundant supervisor engine in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to three Catalyst 6500 series modules. • Does not support the WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 720 GBps switch fabric.
Clock and VTT module	• One replaceable clock module (CLK-7600=) provides clocking signals to the EOBC channel and the switching bus. • Non-replaceable voltage termination (VTT) module provides reference voltage for bus signals.

Table 1-5 Catalyst 6504-E Switch Features (continued)

Feature	Description
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – FAN-MOD-4HS—300 CFM **Note** The fan tray contains eight individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power supplies	• Supports one or two power supplies. The following power supplies are supported: – PWR-2700-AC/4 (2700 W AC-input power supply). – PWR-2700-DC/4 (2700 W DC-input power supply). • Installed power supplies can be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the lower power supply bay. The second power supply is installed in the upper power supply bay.

Table 1-6 Catalyst 6504-E Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)

Table 1-6 Catalyst 6504-E Switch Specifications (continued)

Item	Specification
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	64 to 76 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).
Physical characteristics	
Dimensions (H x W x D)	• 8.7 x 17.5 x 21.6 in. (22.09 x 44.45 x 54.86 cm). • Chassis requires 5 RU[1]. • The Catalyst 6504-E switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	• Chassis only: 27 lb (12.25 kg). • Chassis fully configured with 2 supervisor engines, 2 modules, and 2 AC-input power supplies: 97 lb (43.99 kg).
Airflow	• FAN-MOD-4HS—300 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-5 Catalyst 6504-E Switch—Front View

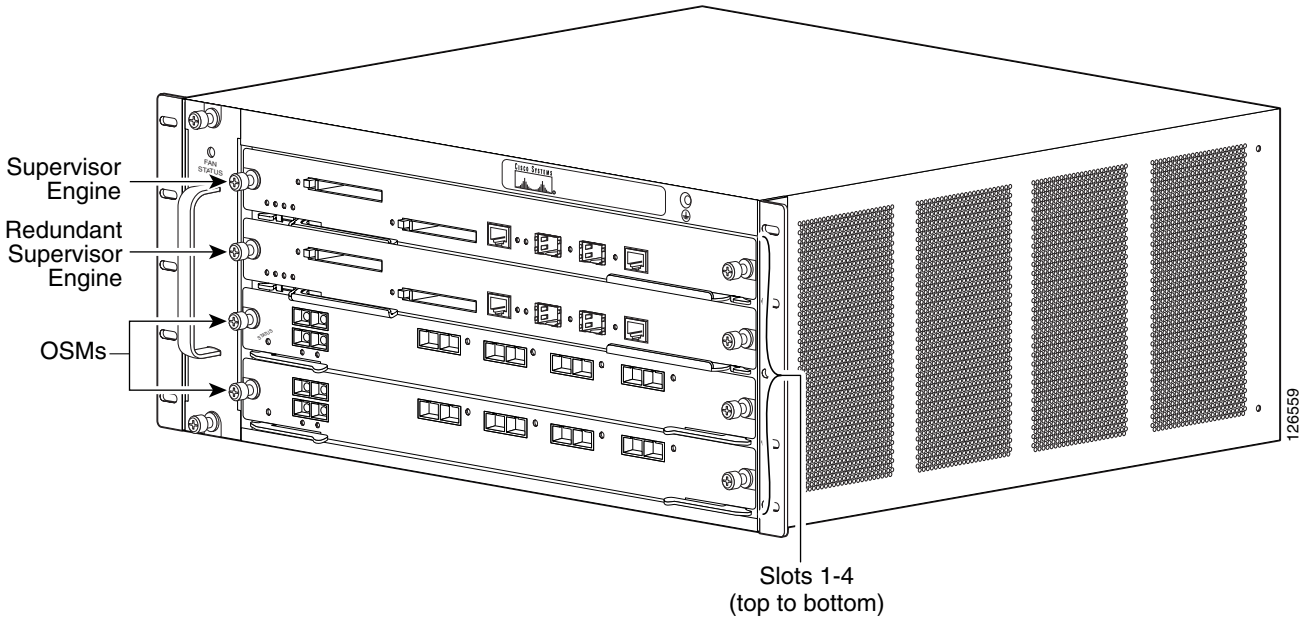
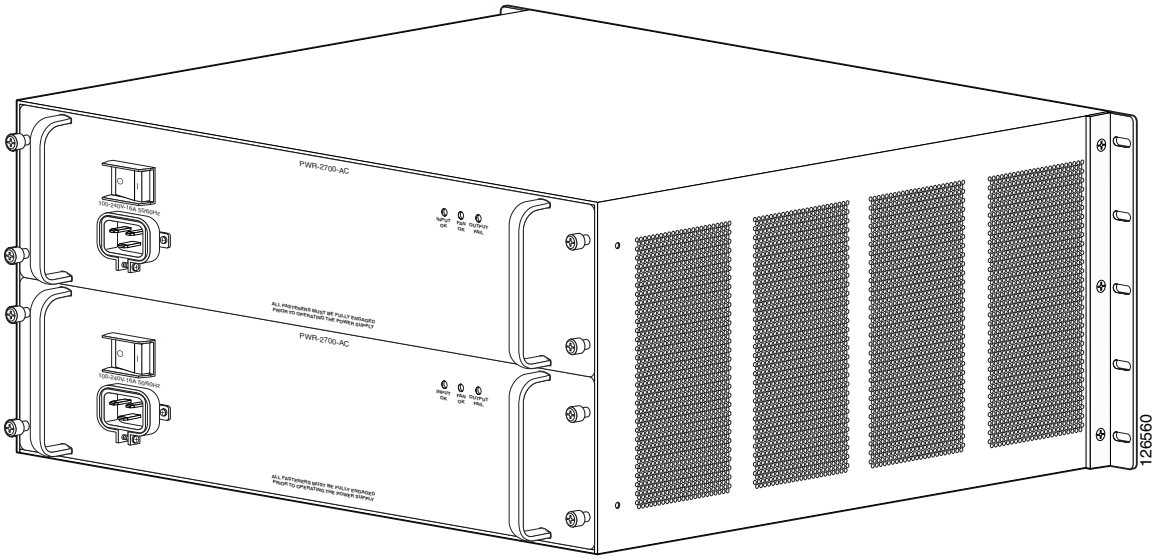


Figure 1-6 Catalyst 6504-E Switch—Rear View



Catalyst 6506 Switch

The Catalyst 6506 switch is a 6-slot horizontal chassis. Table 1-7 lists the features of the Catalyst 6506 switch chassis. Table 1-8 lists the specifications of the Catalyst 6506 switch chassis. Figure 1-7 shows the Catalyst 6506 switch.

Table 1-7 Catalyst 6506 Switch Features

Feature	Descriptions
Chassis	• Six horizontal slots. Slots are numbered from 1 (top) to 6 (bottom).
Supervisor engines	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 or slot 2. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 or slot 6. – Supervisor Engine 32 and Supervisor Engine 720 require that you install the high-speed fan tray. You must also install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. **Note** The 2500 W power supply, when supporting the high-speed fan tray, can be powered from either 120 VAC or 220 VAC. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on the redundant supervisor engine in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to five Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.

Table 1-7 Catalyst 6506 Switch Features (continued)

Feature	Descriptions
Clock and VTT modules	• Two replaceable clock modules (WS-C6K-CL=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT=) provide reference voltage for bus signals.
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6K-6SLOT-FAN (Standard fan tray—227 CFM). Supports Supervisor Engine 1 and Supervisor Engine 2 only; does not support Supervisor Engine 32 or Supervisor Engine 720. – WS-C6K-6SLOT-FAN2 (Optional high-speed fan tray—420 CFM. Required for Supervisor Engine 32 and Supervisor Engine 720. Supports Supervisor Engine 1 and Supervisor Engine 2.) **Note** You must install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. The 2500 W power supply can be powered from either 120 VAC or 220 VAC. **Note** The fan trays contains six individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.

Table 1-7 Catalyst 6506 Switch Features (continued)

Feature	Descriptions
Power supply	• Supports one or two power supplies. The following power supplies are supported: – WS-CAC-1000W (1000 W AC-input power supply). – WS-CAC-1300W (1300 W AC-input power supply). – WS-CDC-1300W (1300 W DC-input power supply). – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W (8700 W AC-input power supply). **Note** The 6000 W and the 8700 W AC-input power supplies are limited to 4000 W maximum output when installed in the Catalyst 6506 chassis. • Installed power supplies can be of different wattage ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the left power supply bay. The second power supply is installed in the right power supply bay. • You must install a 2500 W or higher capacity power supply when using the Supervisor Engine 32 or the Supervisor Engine 720 and the high-speed fan tray.

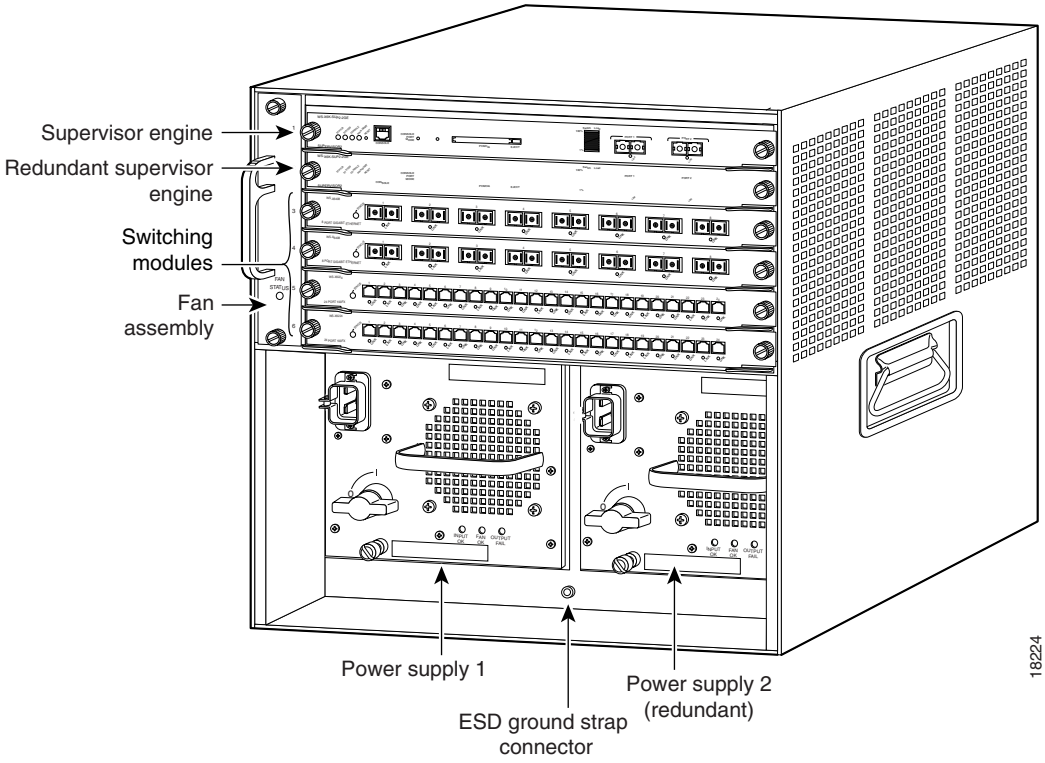
Table 1-8 Catalyst 6506 Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	53 to 61 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-8 Catalyst 6506 Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 20.1 x 17.2 x 18.1 in. (51.1 x 43.7 x 46.0 cm). • Chassis depth including cable guide is 21.64 in. (55.0 cm). • Chassis requires 12 RU. • The Catalyst 6506 switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	• Chassis only: 45 lb (20.4 kg). • Chassis fully configured with 1 supervisor engine, 5 switching modules, and 2 power supplies: 156.6 lb (71.0 kg).
Airflow	WS-C6K-6SLOT-FAN (Standard fan tray)—227 CFM. WS-C6K-6SLOT-FAN2 (Optional high-speed fan tray)—420 CFM. **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

Figure 1-7 Catalyst 6506 Switch



Catalyst 6506-E Switch

The Catalyst 6506-E switch is a 6-slot horizontal chassis. Table 1-9 lists the features of the Catalyst 6506-E switch chassis. Table 1-10 lists the specifications of the Catalyst 6506-E switch chassis. Figure 1-8 shows the Catalyst 6506-E switch.

Table 1-9 Catalyst 6506-E Switch Features

Feature	Descriptions
Chassis	• Six horizontal slots. Slots are numbered from 1 (top) to 6 (bottom).
Supervisor engines	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 and slot 2. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 and slot 6. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on the redundant supervisor engine in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to five Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.
Clock and VTT modules	• Two replaceable clock modules (CLK-7600=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT-E=) provide reference voltage for bus signals.

Table 1-9 Catalyst 6506-E Switch Features (continued)

Feature	Descriptions
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6506-E-FAN—564 CFM **Note** You must install a 2500 W or higher capacity power supply in the chassis to power the fan tray. The 2500 W power supply can be powered from either 120 VAC or 220 VAC. **Note** The fan tray contains six individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power supply	• Supports one or two power supplies. The following power supplies are supported: – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). • Installed power supplies can be of different wattage ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the left power supply bay. The second power supply is installed in the right power supply bay.

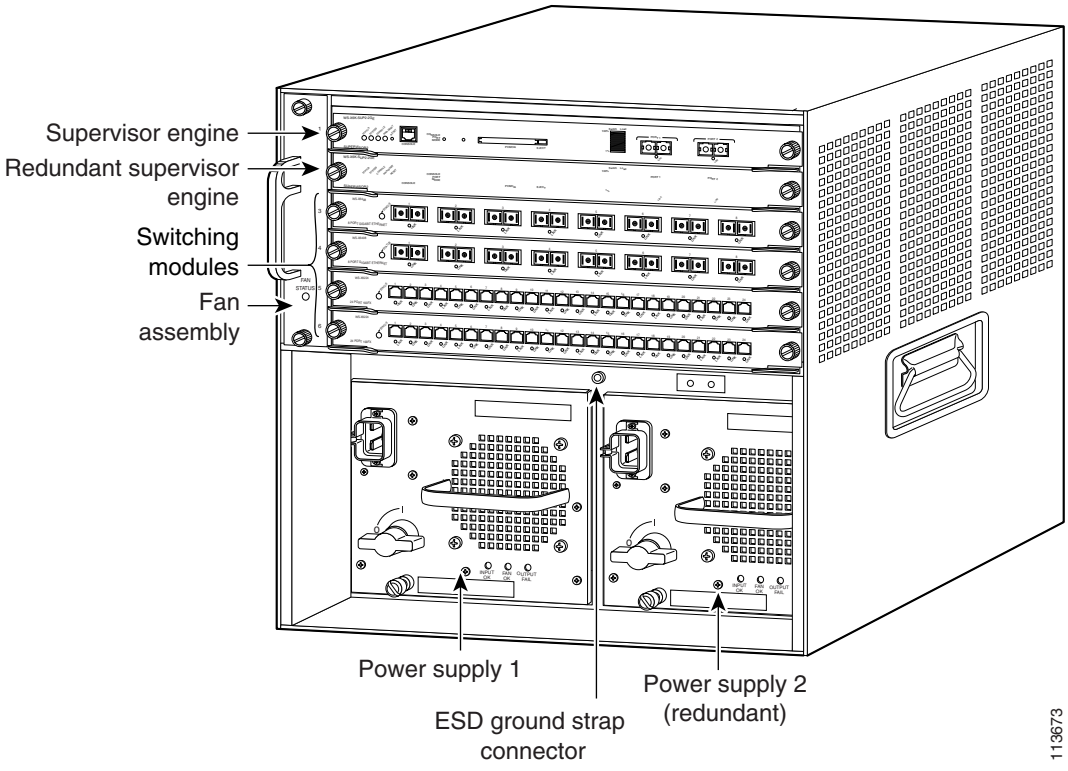
Table 1-10 Catalyst 6506-E Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	53 to 61 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-10 Catalyst 6506-E Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 19.2 x 17.5 x 18.2 in. (48.8 x 44.5 x 46.0 cm). • Chassis depth including cable guide is 21.64 in. (55.0 cm). • Chassis requires 12 RU. • The Catalyst 6506-E switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis only: 50 lb (22.7 kg). Chassis fully configured with 1 supervisor engine, 5 switching modules, and 2 power supplies: 159 lb (72.3 kg).
Airflow	WS-C6506-E-FAN—564 CFM. **Note** We recommend that you maintain a minimum air space of 6 inches (16 cm) between walls and the chassis air vents and a minimum horizontal separation of 12 inches (30.5 cm) between two chassis to prevent overheating.

Figure 1-8 Catalyst 6506-E Switch



Catalyst 6509 Switch

The Catalyst 6509 switch is a 9-slot horizontal chassis. Table 1-11 lists the features of the Catalyst 6509 switch chassis. Table 1-12 lists the specifications of the Catalyst 6509 switch chassis. Figure 1-9 shows the Catalyst 6509 switch.

Table 1-11 Catalyst 6509 Switch Features

Feature	Description
Chassis	• Nine horizontal slots. Slots are numbered from 1 (top) to 9 (bottom).
Supervisor engines	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 and slot 2. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 and slot 6. – Supervisor Engine 32 and Supervisor Engine 720 require that you install the high-speed fan tray. You must also install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. **Note** The 2500 W power supply, when supporting the high-speed fan tray, can be powered from either 120 VAC or 220 VAC. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on all redundant supervisor engine models when they are in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to eight Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.

Table 1-11 Catalyst 6509 Switch Features (continued)

Feature	Description
Clock and VTT modules	• Two replaceable clock modules (WS-C6K-CL=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT=) provide reference voltage for bus signals.
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6K-9SLOT-FAN (Standard fan tray—340 CFM). Supports Supervisor Engine 1 and Supervisor Engine 2 only; does not support Supervisor Engine 32 or Supervisor Engine 720. – WS-C6K-9SLOT-FAN2 (Optional high-speed fan tray—630 CFM). Required for Supervisor Engine 32 and Supervisor Engine 720. Supports Supervisor Engine 1 and Supervisor Engine 2. **Note** You must install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. The 2500 W power supply can be powered from either 120 VAC or 220 VAC. **Note** The fan tray contains nine individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.

Table 1-11 Catalyst 6509 Switch Features (continued)

Feature	Description
Power supply	• Supports one or two power supplies. The following power supply models are supported: – WS-CAC-1000W (1000 W AC-input power supply). – WS-CAC-1300W (1300 W AC-input power supply). – WS-CDC-1300W (1300 W DC-input power supply). – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). **Note** The 6000 W and the 8700 W AC-input power supplies are limited to 4000 W maximum output when installed in the Catalyst 6509 chassis. • Installed power supplies can be of different wattage ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the left power supply bay. The second (redundant) power supply is installed in the right power supply bay. • You must install a 2500 W or higher capacity power supply when using the Supervisor Engine 32 or the Supervisor Engine 720 and the high-speed fan tray.

Table 1-12 Catalyst 6509 Switch Specifications

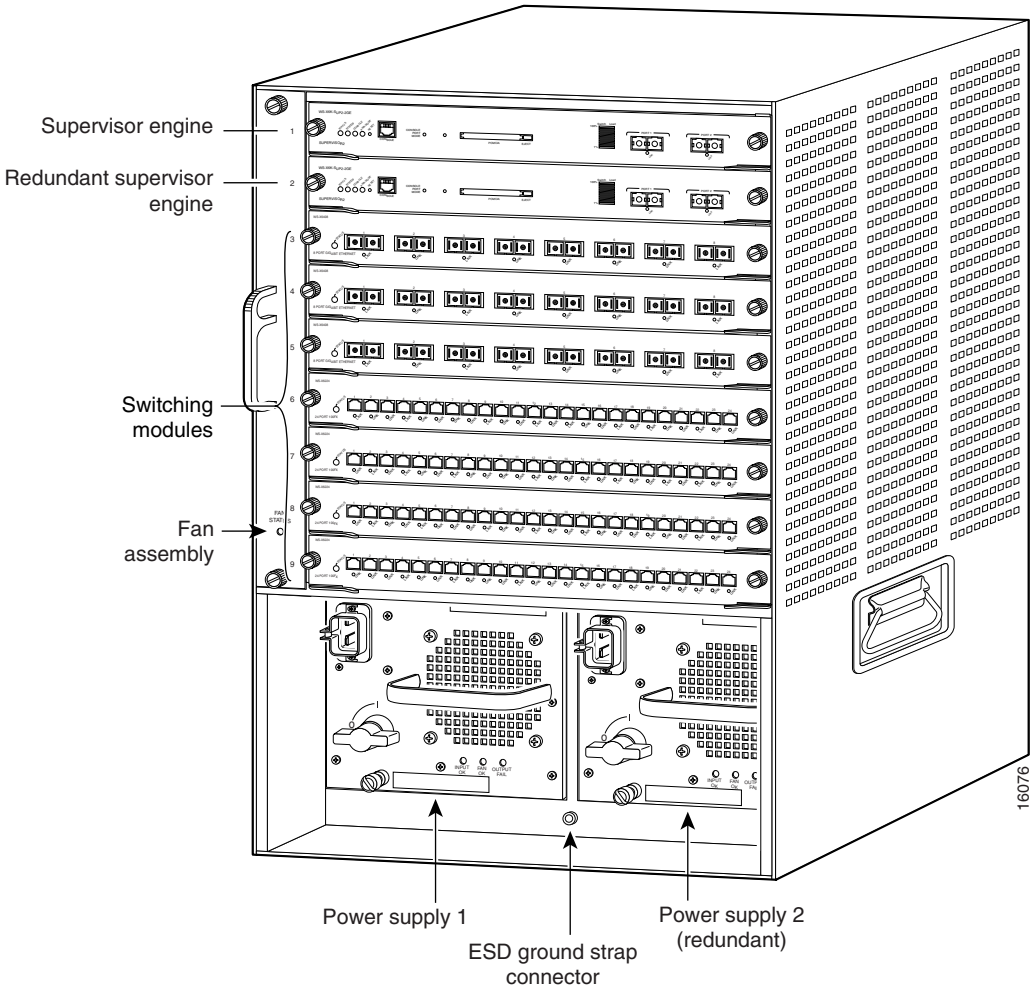
Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	53.6 to 68 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-12 Catalyst 6509 Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 25.2 x 17.2 x 18.4 in. (64.0 x 43.7 x 46.7 cm). • Chassis depth including cable guide is 21.64 in. (55.0 cm). • Chassis requires 15 RU[1]. • The Catalyst 6509 switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis only: 55 lb (24.9 kg). Chassis fully configured with 1 supervisor engine, 8 switching modules, and 2 power supplies: 194.5 lb (88.2 kg).
Airflow	WS-C6K-9SLOT-FAN (Standard fan tray)—340 CFM WS-C6K-9SLOT-FAN2 (Optional high-speed fan tray)—630 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-9 Catalyst 6509 Switch



Catalyst 6509-E Switch

The Catalyst 6509-E switch is a 9-slot horizontal chassis. Table 1-13 lists the features of the Catalyst 6509-E switch chassis. Table 1-14 lists the specifications of the Catalyst 6509-E switch chassis. Figure 1-10 shows the Catalyst 6509-E switch.

Table 1-13 Catalyst 6509-E Switch Features

Feature	Description
Chassis	• Nine horizontal slots. Slots are numbered from (1) top to (9) bottom.
Supervisor engines	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 and slot 2. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 and slot 6. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on all redundant supervisor engine models when they are in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to eight Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.
Clock and VTT modules	• Two replaceable clock modules (CLK-7600=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT-E=) provide reference voltage for bus signals.

Table 1-13 Catalyst 6509-E Switch Features (continued)

Feature	Description
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6509-E-FAN—846 CFM **Note** You must install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. The 2500 W power supply can be powered from either 120 VAC or 220 VAC. **Note** The fan tray contains nine individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power supply	• Supports one or two power supplies. The following models are supported: – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). • Installed power supplies can be of different wattage ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated.

Table 1-14 Catalyst 6509-E Switch Specifications

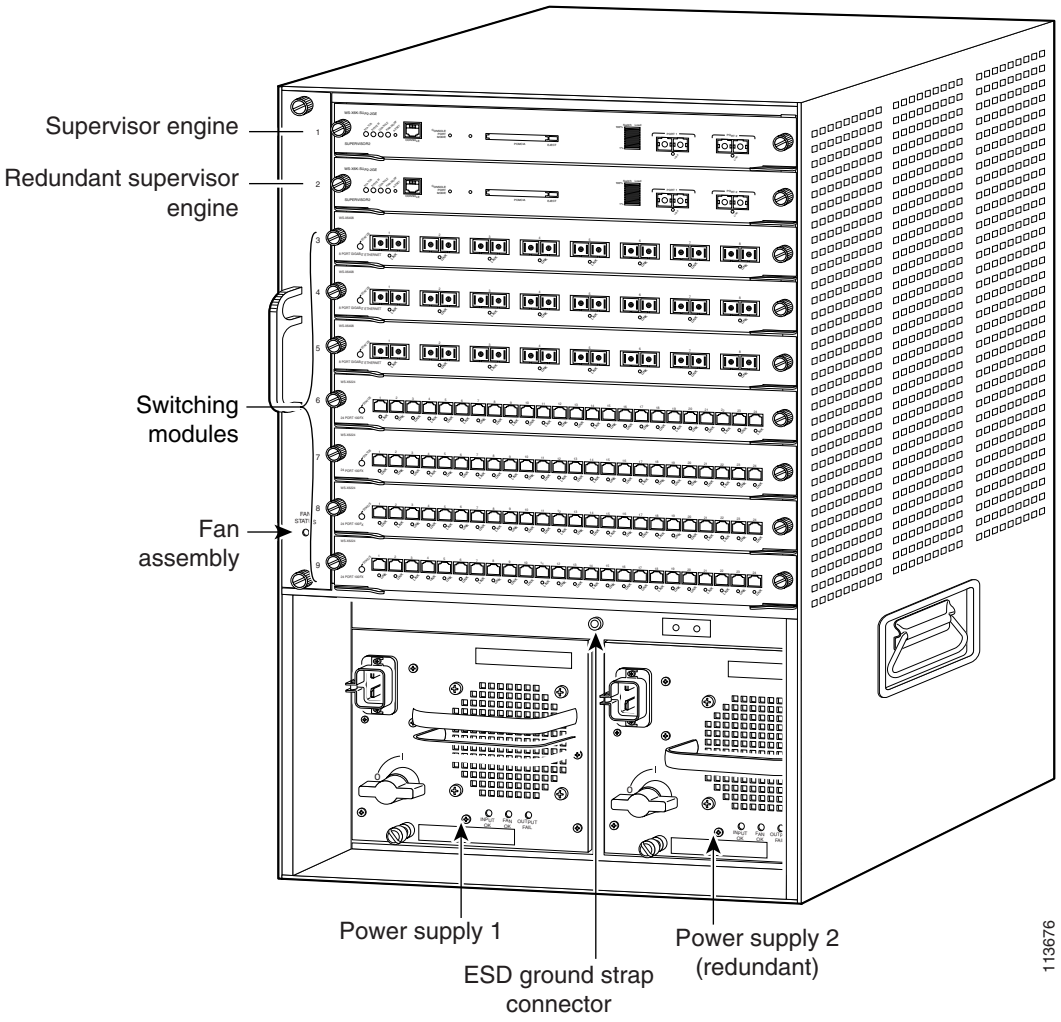
Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	67 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-14 Catalyst 6509-E Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 24.5 x 17.5 x 18.2 in. (62.2 x 44.5 x 46.0 cm). • Chassis depth including cable guide is 21.64 in. (55.0 cm). • Chassis requires 15 RU[1]. • The Catalyst 6509-E switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis only: 60 lb (27.3 kg). Chassis fully configured with 1 supervisor engine, 8 switching modules, and 2 power supplies: 190 lb (86.4 kg).
Airflow	WS-C6509-E-FAN—846 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-10 Catalyst 6509-E Switch



Catalyst 6509-NEB Switch

The Catalyst 6509-NEB switch is a 9-slot vertical chassis. Table 1-15 lists the features of the Catalyst 6509-NEB switch chassis. Table 1-16 lists the specifications of the Catalyst 6509-NEB switch chassis. Figure 1-11 shows the Catalyst 6509-NEB switch chassis.

Table 1-15 Catalyst 6509-NEB Switch Features

Feature	Features
Chassis	• Nine vertical slots. Slots are numbered from 1 (right) to 9 (left).
Supervisor engines	• Supports Supervisor Engine 1 and Supervisor Engine 2. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 or slot 2. – Supervisor Engine 32 is installed in slot 5 or slot 6. • Supervisor Engine 32 and Supervisor Engine 720 are supported if the WS-6509-NEB-UPGRD kit is installed. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 or slot 6. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on all redundant supervisor engine models when they are in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to eight Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.
Clock and VTT modules	• Two replaceable clock modules (WS-C6K-CL=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT=) provide reference voltage for bus signals.

Table 1-15 Catalyst 6509-NEB Switch Features (continued)

Feature	Features
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6509-NEB-FAN (Standard fan tray—294 CFM). Supports Supervisor Engine 1 and Supervisor Engine 2 only; does not support Supervisor Engine 32 or Supervisor Engine 720. – WS-6509-NEB-UPGRD[1]—630 CFM (The fan tray is a part of the upgrade kit). This kit must be installed if you are installing a Supervisor Engine 32 or a Supervisor Engine 720 in the Catalyst 6509-NEB switch. The kit contains a high-speed fan tray, back panel, and power harness. If you are operating the chassis from an AC source, you will also need to order a 3000 W AC-input power supply which has a front panel DC power connector. The upgrade kit fan tray receives 42 VDC power from this front panel DC power connector through a power harness also provided in the upgrade kit. If you are operating the chassis from a DC source, you can power the system with either the 2500 W or 4000 W DC-input power supplies and power the upgrade fan tray from the site source DC. **Note** Both fan tray models contain nine individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.

Table 1-15 Catalyst 6509-NEB Switch Features (continued)

Feature	Features
Power supply	• Supports one or two power supplies. The following models are supported: – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). **Note** The 6000 W and the 8700 W AC-input power supplies are limited to 4000 W maximum output when installed in the Catalyst 6509-NEB chassis. • Installed power supplies can be of different wattage ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • Single power supplies are installed in the left power supply bay. The second power supply is installed in the right power supply bay.

1. Refer to the *Catalyst 6509-NEB Switch and Cisco OSR-7609 Router Upgrade Note* for kit installation instructions.

Table 1-16 Catalyst 6509-NEB Switch Specifications

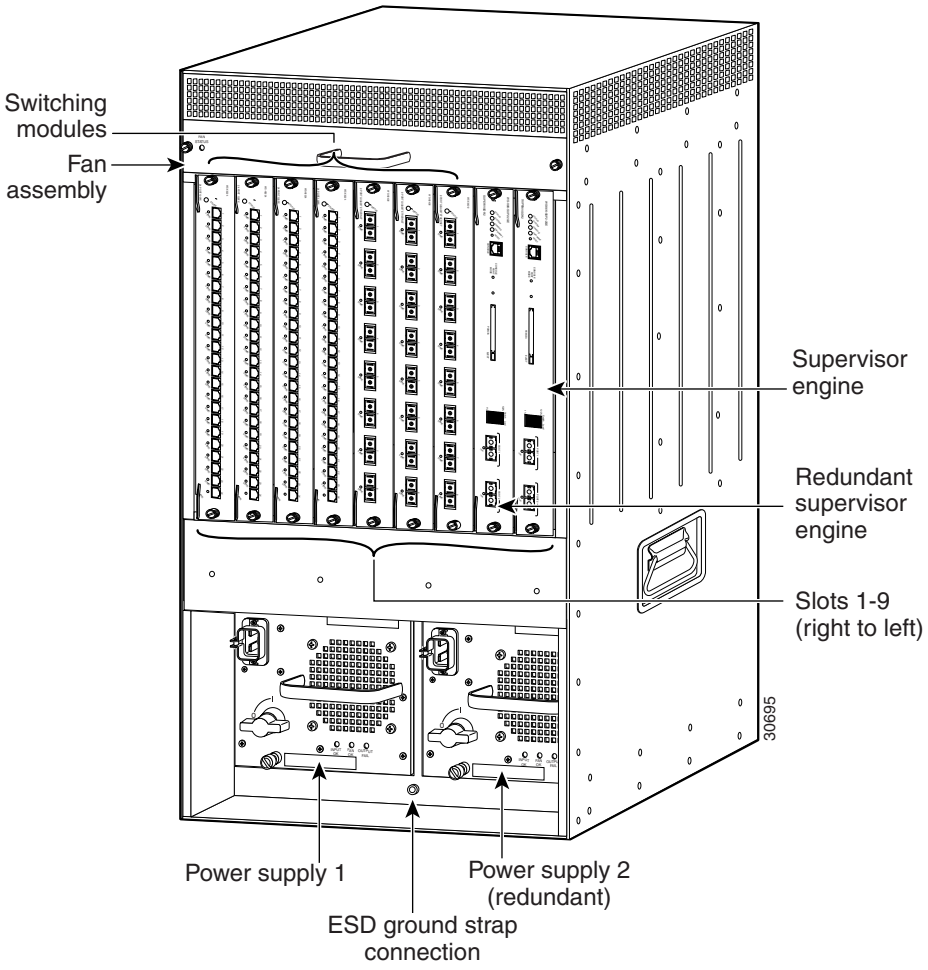
Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	56.4 to 75 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-16 Catalyst 6509-NEB Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 33.3 x 17.2 x 18.1 in. (84.6 x 43.7 x 46.0 cm). • Chassis requires 20 RU[1]. • The Catalyst 6509-NEB switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis only: 55 lb (24.9 kg). Chassis fully configured with 1 supervisor engine, 8 switching modules, and 2 power supplies: 135 lb (61.2 kg).
Airflow	• WS-C6509-NEB-FAN (Standard fan tray)—294 CFM • Optional high-speed fan tray[2]—630 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units.
2. Part of the WS-6509-NEB-UPGRD kit.

Figure 1-11 Catalyst 6509-NEB Switch



Catalyst 6509-NEB-A Switch

Table 1-17 lists the features of the Catalyst 6509-NEB-A switch chassis. Table 1-18 lists the specifications of the Catalyst 6509-NEB-A switch chassis. Figure 1-12 shows the Catalyst 6509-NEB-A switch chassis.

Table 1-17 Catalyst 6509-NEB-A Switch Features

Feature	Description
Chassis	• Nine vertical slots. Slots are numbered from 1 (right) to 9 (left).
Supervisor engines	• Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 1 and Supervisor Engine 2 are installed in slot 1 and slot 2. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 5 and slot 6. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on all redundant supervisor engine models when they are in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to eight Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 5 or slot 6. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.
Clock and VTT modules	• Two replaceable clock modules (CLK-7600=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT=) provide reference voltage for bus signals.

Table 1-17 Catalyst 6509-NEB-A Switch Features (continued)

Feature	Description
Fan tray	• Supports two hot-swappable fan trays. These fan tray models are supported: – FAN-MOD-09 (High-speed fan tray—760 CFM). Supports Supervisor Engine 1, Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. **Note** The fan tray contains four individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.
Power supply	• Supports one or two power supplies. The following models are supported: – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). **Note** The 6000 W and the 8700 W AC-input power supplies are limited to 4500 W maximum output when installed in the Catalyst 6509-NEB-A chassis. • Installed power supplies can be of different ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated.

Table 1-18 Catalyst 6509-NEB-A Switch Specifications

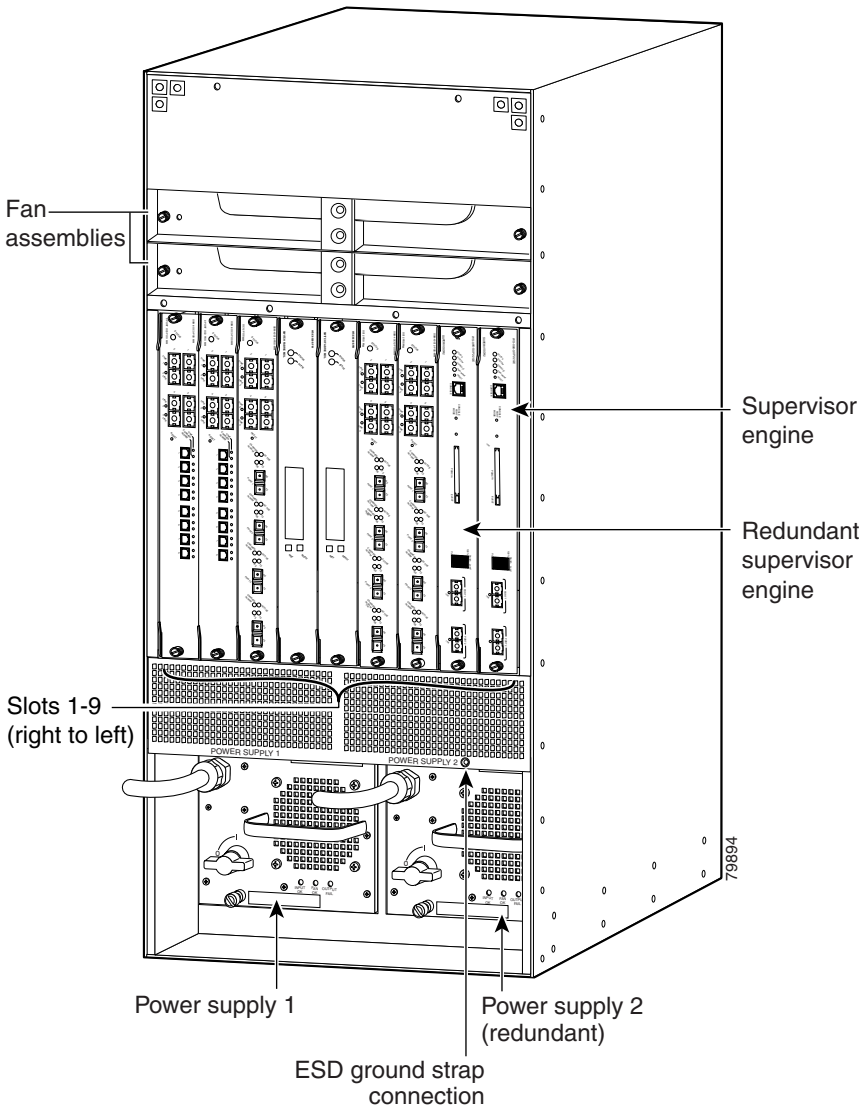
Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	67 to 77 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-18 Catalyst 6509-NEB-A Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 36.7 x 17.2 x 20.3 in. (93.1 x 43.7 x 51.6 cm). • Chassis requires 21 RU[1]. • The Catalyst 6509-NEB-A switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis only: 121 lb (54.9 kg). Chassis fully configured with 1 supervisor engine, 8 modules, 2 AC-input power supplies: 270 lb (122.47 kg).
Airflow	FAN-MOD-09 (High-speed fan tray)—760 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-12 Catalyst 6509-NEB-A Switch Chassis



Catalyst 6513 Switch

Table 1-19 lists the features of the Catalyst 6513 switch chassis. Table 1-20 lists the specifications of the Catalyst 6513 switch chassis. Figure 1-13 shows a view of the Catalyst 6513 switch chassis.

Table 1-19 Catalyst 6513 Switch Features

Feature	Description
Chassis	• Thirteen horizontal slots. Slots are numbered from (1) top to (13) bottom.
Supervisor engines	• Supports Supervisor Engine 2, Supervisor Engine 32, and Supervisor Engine 720. – Supervisor Engine 2 is installed in slot 1 and slot 2. – Supervisor Engine 1A is not supported. – Supervisor Engine 32 and Supervisor Engine 720 are installed in slot 7 and slot 8. – Supervisor Engine 32 and Supervisor Engine 720 require that you install the high-speed fan tray. You must also install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. – Supervisor Engine 32 does not support the Switch Fabric Modules. – Supervisor Engine 720 has built-in switching fabric. Switch Fabric Modules are not supported by Supervisor Engine 720 and cannot be installed in the same chassis. • The uplink ports are fully functional on all redundant supervisor engine models when they are in standby mode. **Note** Redundant supervisor engines must be configured identically.
Modules	• Supports up to 12 Catalyst 6500 series modules. • WS-C6500-SFM and WS-X6500-SFM2 Switch Fabric Modules must be installed in slot 7 or slot 8. • WS-X6748-SFP, WS-X6748-GE-TX, and WS-X6704-10GE modules are not supported in slots 2–8; they are supported in slots 9–13. – Slots 1–8 support a single fabric channel; slots 9–13 support dual fabric channels. • Some Catalyst 6500 series modules may: – Not be supported – Require that you install a Supervisor Engine 720 – Have chassis slot restrictions – Require a specific software release level Check your software release notes for specific information.
Backplane bandwidth	• 32 GBps shared bus. • 256 GBps switch fabric. • 720 GBps switch fabric.

Table 1-19 Catalyst 6513 Switch Features (continued)

Feature	Description
Clock and VTT module	• Two replaceable clock modules (WS-C6513-CL=) provide clocking signals to the EOBC channel and the switching bus. • Three replaceable voltage termination (VTT) modules (WS-C6K-VTT=) provide reference voltage for bus signals.
Fan tray	• Supports one hot-swappable fan tray. These fan tray models are supported: – WS-C6K-13SLOT-FAN (Standard fan tray—641 CFM). Supports Supervisor Engine 2 only; does not support the Supervisor Engine 32 or the Supervisor Engine 720. – WS-C6K-13SLT-FAN2 (Optional high-speed fan tray—1090 CFM). Required for Supervisor Engine 32 and Supervisor Engine 720. Supports Supervisor Engine 2. **Note** You must install a high-speed fan tray when using a Supervisor Engine 32 or a Supervisor Engine 720. You must install a 2500 W or higher capacity power supply in the chassis to power the high-speed fan tray. The 2500 W power supply can be powered from either 120 VAC or 220 VAC. **Note** Both fan tray models contain 15 individual fans. The individual fans are not field replaceable; you must replace the fan tray. • Fan tray STATUS LED – Red—One or more individual fans have failed. – Green—Fan tray is operating normally.

Table 1-19 Catalyst 6513 Switch Features (continued)

Feature	Description
Power supply	• Supports one or two power supplies. The following models are supported: – WS-CAC-2500W (2500 W AC-input power supply). – WS-CDC-2500W (2500 W DC-input power supply). – WS-CAC-3000W (3000 W AC-input power supply). – WS-CAC-4000W-US (4000 W AC-input power supply). – WS-CAC-4000W-INT (4000 W AC-input power supply). – PWR-4000-DC (4000 W DC-input power supply). – WS-CAC-6000W (6000 W AC-input power supply). – WS-CAC-8700W-E (8700 W AC-input power supply). **Note** The 8700 W power supply is limited to 6000 W maximum output when installed in the Catalyst 6513 switch chassis. • Installed power supplies can be of different ratings. Installed power supplies can also be both AC-input, both DC-input, or one AC-input and one DC-input. Power supplies can be configured in either redundant or non-redundant mode. • All Catalyst 6500 series AC-input power supplies require single-phase source AC. Source AC can be out of phase between multiple power supplies or multiple AC-power plugs on the same power supply because all AC power supply inputs are isolated. • You must install a 2500 W or higher capacity power supply when using the Supervisor Engine 32 or the Supervisor Engine 720 and the high-speed fan tray.

Table 1-20 Catalyst 6513 Switch Specifications

Item	Specification
Environmental	
Temperature, operating	Certified for operation: 32° to 104°F (0° to 40°C) Designed and tested for operation: 32° to 130°F (0° to 55°C) **Note** The Catalyst 6500 series switches are equipped with internal air temperature sensors that are triggered at 104°F (40°C) generating a minor alarm and at 131°F (55°C) generating a major alarm.
Temperature, nonoperating and storage	Chassis unpackaged: –4° to 149°F (–20° to 65°C) Chassis in protective shipping package: –40° to 158°F (–40° to 70°C)
Thermal transition	0.5°C per minute (hot to cold) 0.33°C per minute (cold to hot)
Humidity (RH), ambient (noncondensing) operating	5% to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5% to 95%
Altitude, operating	Certified for operation: 0 to 6500 feet (0 to 2000 m) Designed and tested for operation: –200 to 10,000 feet (–60 to 3000 m)
Shock and vibration	This switch complies with Network Equipment Building Systems (NEBS) (Zone 4 per GR-63-Core) in the following areas: • Earthquake environment and criteria • Office vibration and criteria • Transportation vibration and criteria **Shock** • Operational—5 G 30 ms, half-sine (IEC 68-2-27) • Non-operational—20 G, 7.5 ms, trapezoidal **Vibration** Operational—3 Hz to 500 Hz, Power Spectral Density (PSD)-0.0005 G^2/Hz at 10 Hz and 200 Hz. 5 dB/octave roll off at each end. 0.5 hours per axis (1.12 Grms).
Acoustic noise	61.4 to 77 dB. International Organization for Standardization (ISO) 7779: Bystander position operating to an ambient temperature of 86°F (30°C).

Table 1-20 Catalyst 6513 Switch Specifications (continued)

Item	Specification
Physical characteristics	
Dimensions (H x W x D)	• 33.3 x 17.2 x 18.1 in. (84.6 x 43.7 x 46.0 cm). • Chassis requires 20 RU[1]. • The Catalyst 6513 switch chassis is designed to install in standard 19-inch equipment racks that meet ANSI/EIA 310-D, IEC 60297, and ETS 300-119 standards.
Weight	Chassis fully configured with 2 supervisor engines, 11 switching modules, and 2 power supplies: 280 lb (127 kg).
Airflow	• WS-C6K-13SLOT-FAN (Standard fan tray)—641 CFM • WS-C6K-13SLT-FAN2 (Optional high-speed fan tray)—1090 CFM **Note** To maintain proper air circulation through the Catalyst switch chassis, we recommend that you maintain a minimum 6-inch (15 cm) separation between a wall and the chassis air intake or a wall and the chassis air exhaust. You should also allow a minimum separation of 12 inches (30.5 cm) between the hot air exhaust on one chassis and the air intake on another chassis. Failure to maintain adequate air space can cause the chassis to overheat and the system to fail. On Catalyst chassis in which the airflow is from front to back, the chassis may be placed side-by-side.

1. RU = rack units

Figure 1-13 Catalyst 6513 Switch