CHAPTER 2-

Ethernet Switching Modules

Revised: February 2016

This chapter describes the 10BASE, 10/100BASE, 10/100/1000BASE, 1-Gigabit, 10-Gigabit, and 40-Gigabit Ethernet modules and contains these sections:

Note Service modules are not covered in this document. They have their own separate documentation sets.

10 and 10/100 Fiber-Based Ethernet Modules

This section describes the following 10 and 10/100 fiber-based Ethernet modules:

Note All 10 and 10/100 Fiber-based Ethernet modules are hot-swappable.

WS-X6024-10FL-MT Ethernet Module

The WS-X6024-10FL-MT Ethernet module (Figure 2-1) provides 24 10-Mbps full- or half-duplex ports. Table 2-1 lists the module features, and Table 2-2 lists the module physical and environmental specifications.

Figure 2-1 WS-X6024-10FL-MT Ethernet Module Front Panel

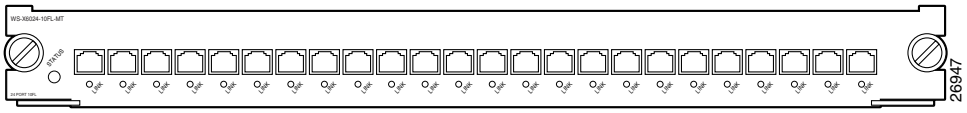


Table 2-1 WS-X6024-10FL-MT Ethernet Module Features

Feature	Description
Ports per module	• 24 ports. Ports are numbered from 1 (left) to 24 (right). • 2 port groups • Port ranges per port group: 1–12, 13–24
Port connector type	MT-RJ
Cabling distance	1.24 mi (2 km) full- or half-duplex over 62.5- and 125-micron MMF
Buffer size	64 KB per port
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720
Software support	• With Supervisor Engine 2—12.2(17d)SXB • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • Catalyst OS support—6.4(11)
Queues per port	• Tx—2q2t • Rx—1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.

Table 2-1 WS-X6024-10FL-MT Ethernet Module Features (continued)

Feature	Description
Bus connection	Single connection into the 32-Gbps shared bus
Module upgrades available	
PoE support	Not available.
Distributed forwarding support	Not available.
Pluggable transceivers support	Not supported.
Digital Optical Monitoring (DOM) support	Not supported
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

WS-X6148-FE-SFP Ethernet Module

The WS-X6148-FE-SFP Ethernet module (Figure 2-2) provides 48 100-Mbps full- or half-duplex ports. Table 2-3 lists the module features, and Table 2-4 lists the module physical and environmental specifications.

Figure 2-2 WS-X6148-FE-SP Ethernet Module Front Panel

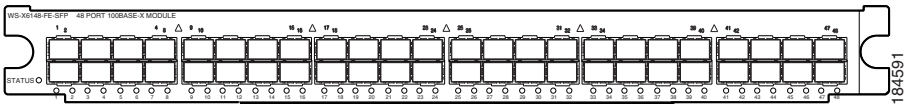


Table 2-3 WS-X6148-FE-SFP Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right). – Top row, odd numbered ports 1–47. – Bottom row, even numbered ports 2–48. • 3 port groups • Port ranges per port group: 1–16, 17–32, 33–48
Port connector type	LC or RJ-45 (depending on the type of 100-Mbps Fast Ethernet SFP transceiver installed in the module port)

Table 2-3 WS-X6148-FE-SFP Features (continued)

Feature	Description
Cabling distance	Depends on the 100BASE-X Fast Ethernet SFP transceiver installed in the module port. Refer to the transceiver installation guides located at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_installation_guides_list.html Refer to Appendix B for descriptions of the Fast Ethernet SFP transceiver types and supported cabling distances.
Buffer size	256 MB shared between 48 ports (5.4 MB per port)
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 8 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 • Supervisor Engine 720 • Supervisor Engine 720-10GE • Supervisor Engine 2T
Software support	• With Supervisor Engine 2—12.2(18)SXF2 • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(18)SXF • With Supervisor Engine 720-10GE—12.2(33)SXH • Supervisor Engine 2T—12.2(50)SY • Catalyst OS—8.4(1)
Queues per port	• Tx—1p3q8t (per port) • Rx—1p1q2t (per group of 8 ports)
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	Single connection into the 32-Gbps shared bus
Module upgrades available	
PoE support	Not available.
Distributed forwarding support	Not available.

Table 2-3 WS-X6148-FE-SFP Features (continued)

Feature	Description
Pluggable transceivers support	The module supports 100BASE-X Fast Ethernet SFP transceivers. Refer to your software release notes to determine which Fast Ethernet SFP transceivers are supported. See the "100-MB Transceivers" section on page B-1 in Appendix B for additional information on the Fast Ethernet SFP transceivers.
Digital Optical Monitoring (DOM) support	Not supported
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-4 WS-X6148-FE-SFP Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	6.6 lb (3 kg)
Power and heat numbers	• Module current—2.3 A • Module power—96.60 W • AC-input power—120.75 W • AC heat dissipation—412.36 BTU/hour • DC-input power—129.84 W • DC heat dissipation—443.40 BTU/hour

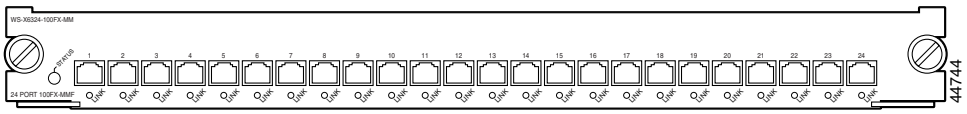
Table 2-4 WS-X6148-FE-SFP Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Modules

The WS-X6324-100FX-MM and the WS-X6324-100FX-SM Ethernet modules (Figure 2-3) provide 24 100-Mbps full- or half-duplex ports. The WS-X6324-100FX-MM Ethernet module operates over multimode fiber-optic (MMF) cable and the WS-X6324-100FX-SM Ethernet module operates over G.652 single-mode fiber-optic (SMF) cable. Table 2-5 lists both modules features, and Table 2-6 lists both modules physical and environmental specifications.

Figure 2-3 WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Modules Front Panel



Note The WS-X6324-100FX-SM Ethernet module front panel is identical to the WS-X6324-100FX-MM Ethernet module front panel with the exception of the product part number.

Table 2-5 WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Module Features

Feature	Description
Ports per module	• 24 ports. Ports are numbered 1 (left) to 24 (right). • 2 port groups • Port ranges per port group: 1–12, 13–24
Port connector type	MT-RJ (both modules)
Cabling distance	• WS-X6324-100FX-MM—1.24 mi (2 km) full-duplex over MMF • WS-X6324-100FX-MM—1312 ft (400 m) half-duplex over MMF • WS-X6324-100FX-SM—6.2 mi (10 km) full- or half-duplex over G.652 SMF
Buffer size	128 KB per port

Table 2-5 WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Module Features (continued)

Feature	Description
QoS	• Number of egress queues: 2 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(2)E • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS—6.4(11)
Queues per port	Both modules: • Tx—2q2t • Rx—1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the modules can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	Single connection into the 32-Gbps shared bus
Module upgrades available	
PoE support	Not available.
Distributed forwarding support	Not available.
Pluggable transceivers support	Not supported.

Table 2-5 WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-6 WS-X6324-100FX-MM and WS-X6324-100FX-SM Ethernet Modules Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	7.0 lb (3.18 kg)
Power and heat numbers	• Module current—1.52 A • Module power—63.84 W • AC-input power—79.8 W • AC heat dissipation—272.52 BTU/hour • DC-input power—85.81 W • DC heat dissipation—293.03 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6524-100FX-MM Ethernet Module

The WS-X6524-100FX-MM Ethernet module (Figure 2-4) provides 24 100-Mbps full- or half-duplex ports. Table 2-7 lists the module features, and Table 2-8 lists the module physical and environmental specifications.

Figure 2-4 WS-X6524-100FX-MM Switching Modules Front Panel

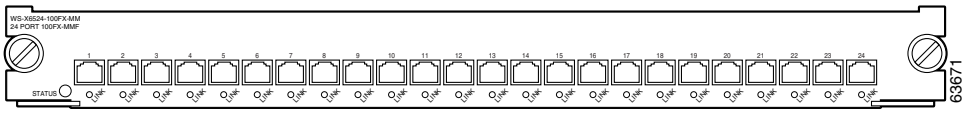


Table 2-7 WS-X6524-100FX-MM Features

Feature	Description
Ports per module	• 24 ports. Ports are numbered 1 (left) to 24 (right). • 1 port group • Port ranges per port group: 1–24
Port connector type	MT-RJ
Cabling distance	1.24 mi (2 km) full-duplex; 1312 ft (400 m) half-duplex over MMF
Buffer size	1.2 MB per port
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 1 • Number of thresholds per ingress queue: 0
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(8a)EX • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS—7.6(9)

Table 2-7 WS-X6524-100FX-MM Features (continued)

Feature	Description
Queues per port	• Tx—1p3q1t • Rx—1p1q0t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	Single connection into the 32-Gbps shared bus
Module upgrades available	
PoE support	Not available
Distributed forwarding support	Field upgradeable to support distributed forwarding with the following daughter cards: • WS-F6K-DFC • WS-F6K-DFC3A • WS-F6K-DFC3B • WS-F6K-DFC3BXL See Appendix A for further information on the DFC daughter cards. See the *Catalyst 6500 Series DFC, DFC3A, DFC3B, and DFC3BXL Installation Note* for field installation procedures.
Pluggable transceivers support	Not supported
Digital Optical Monitoring (DOM) support	Not supported
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-8 WS-X6524-100FX-MM Physical and Environmental Specifications

Item	Specification
Dimensions	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	Base module—7.0 lb (3.18 kg)
Power and heat numbers	• Base module – Module current—1.90 A – Module power—79.8 W – AC-input power—99.75 W – AC heat dissipation—340.65 BTU/hour – DC-input power—107.30 W – DC heat dissipation—366.30 BTU/hour • Base module + DFC3 daughter card – Module current—4.00 A – Module power—168.00 W – AC-input power—210.00 W – AC heat dissipation—717.15 BTU/hour – DC-input power—225.81 W – DC heat dissipation—771.13 BTU/hour • Base module + DFC3A daughter card – Module current—4.47 A – Module power—187.74 W – AC-input power—234.68 W – AC heat dissipation—801.42 BTU/hour – DC-input power—252.34 W – DC heat dissipation—861.74 BTU/hour

Table 2-8 WS-X6524-100FX-MM Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• Base module + DFC3B daughter card – Module current—3.57 A – Module power—149.94 W – AC-input power—187.43 W – AC heat dissipation—640.06 BTU/hour – DC-input power—201.53 W – DC heat dissipation—688.23 BTU/hour • Base module + DFC3BXL daughter card – Module current—3.37 A – Module power—141.54 W – AC-input power—176.93 W – AC heat dissipation—604.20 BTU/hour – DC-input power—190.24 W – DC heat dissipation—649.68 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

10/100 and 10/100/1000 Ethernet Modules

This section describes the following 10/100 and 10/100/1000BASE Ethernet modules:

- WS-X6516-GE-TX Ethernet Module, page 2-47
- WS-X6548-GE-TX, WS-X6548-GE-45AF, and WS-X6548V-GE-TX Ethernet Modules, page 2-50
- WS-X6548-RJ-21 Ethernet Module, page 2-54
- WS-X6548-RJ-45 Ethernet Module, page 2-57
- WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Modules, page 2-61

Note All 10/100 and 10/100/1000 Ethernet modules are hot-swappable.

WS-X6148-GE-TX and WS-X6148A-GE-TX Ethernet Modules

The base WS-X6148-GE-TX and the base WS-X6148A-GE-TX Ethernet modules and their variants (See Table 2-9) provide 48 10/100/1000-Mbps full- or half-duplex ports. (See Table 2-9.). Figure 2-5 shows the module front panel.

Table 2-9 WS-X6148-GE-TX and WS-X6148A-GE-TX Ethernet Module Variants

Module	Description
WS-X6148-GE-TX	Base module without daughter cards installed.
WS-X6148-GE-45AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).
WS-X6148V-GE-TX	Base module equipped with a factory-installed Cisco prestandard PoE daughter card (WS-F6K-VPWR-GE).
WS-X6148A-GE-TX	Base module (with enhanced port buffer size) without daughter cards installed.
WS-X6148A-GE-45AF	Base module (with enhanced port buffer size) equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).

Figure 2-5 WS-X6148-GE-TX Ethernet Module Front Panel

Note The WS-X6148-GE-TX and the WS-X6148A-GE-TX Ethernet modules share the same front panel. The product numbers located in the upper-left corner will differ.

Table 2-10 lists the features and descriptions for the base modules and their variants, and Table 2-11 lists the physical and environmental specifications for the base modules and their variants.

Table 2-10 WS-X6148-GE-TX and WS-X6148A-GE-TX Features

Feature	Description
Ports per module	• 48 ports (all variants). Ports are numbered (left to right) – Top row, odd numbered ports 1–47. – Bottom row, even numbered ports 2–48. • Port groups – WS-X6148-GE-TX—2 – WS-X6148A-GE-TX—6 • Port ranges per port group – WS-X6148-GE-TX: 1–24, 25–48 – WS-X6148A-GE-TX: 1–8, 9–16, 17–24, 25–32, 33–40, 41–48
Port connector type	RJ-45 (all variants)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (all variants)
Buffer size	• WS-X6148-GE-TX, WS-X6148V-GE-TX, and WS-X6148-GE-45AF—1.4 MB per 8 ports • WS-X6148A-GE-TX and WS-X6148A-GE-45AF—5.5 MB per port
QoS	• Number of egress queues: 3 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 2
Maximum frame size	• WS-X6148-GE-TX, WS-X6148V-GE-TX, and WS-X6148-GE-45AF—Up to 1518 bytes per frame • WS-X6148A-GE-TX and WS-X6148A-GE-45AF—Up to 9216 bytes per frame
Module oversubscription rate	8:1
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE • Supervisor Engine 2T (only supported with the WS-X6148A-GE-TX and the WS-X6148A-GE-45AF Ethernet modules)

Table 2-10 WS-X6148-GE-TX and WS-X6148A-GE-TX Features (continued)

Feature	Description
Software support	• With Supervisor Engine 2—12.2(18)SXF2 • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(18)SXF • With Supervisor Engine 720 and WS-F6K-GE48-AF or WS-F6K48-AF PoE daughter cards—12.2(17d)SXB (WS-X6148-GE-TX only) • With Supervisor Engine 720-10GE—12.2(33)SXH • With Supervisor Engine 2T—12.2(50)SY • Catalyst OS – WS-X6148-GE-TX—7.6(9) – WS-X6148A-GE-TX—8.4(1)
Queues per port	WS-X6148-GE-TX, WS-X6148V-GE-TX, and WS-X6148-GE-45AF • Tx—1p2q2t (per 8 ports) • Rx—1p2t (per port) WS-X6148A-GE-TX and WS-X6148A-GE-45AF • Tx—1p3q8t • Rx—1q2t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis (all variants)
Bus connection	Single connection into the 32-Gbps shared bus (all variants).
Module upgrades available	
PoE support	WS-X6148-GE-TX and WS-X6148A-GE-TX: • The WS-X6148-GE-TX is field upgradeable with the WS-F6K-VPWR-GE= daughter card that supports only the Cisco prestandard. • Both the WS-X6148-GE-TX and the WS-X6148A-GE-TX are field upgradeable with the WS-F6K-GE48-AF= daughter card that supports both the Cisco prestandard and the IEEE 802.3af standard. Refer to the *Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. Refer to Appendix A for additional information on the PoE daughter cards.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.
TDR support	All variants are supported.

Table 2-10 WS-X6148-GE-TX and WS-X6148A-GE-TX Features (continued)

Feature	Description
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

Table 2-11 WS-X6148-GE-TX and Variants Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	• WS-X6148-GE-TX (base module only)—7.6 lb (3.4 kg) • WS-X6148A-GE-TX (base module only)—6.6 lb (3 kg)

Table 2-11 WS-X6148-GE-TX and Variants Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• Base module (WS-X6148-GE-TX) – Module current—2.47 A – Module power—104.00 W – AC-input power— 130.00W – AC heat dissipation—443.00 BTU/hour – DC-input power—139.00 W – DC heat dissipation—476.00 BTU/hour • WS-X6148-GE-45AF (base module + PoE daughter card) – Module current—2.65 A – Module power—111.30 W – AC-input power—139.13 W – AC heat dissipation—475.11 BTU/hour – DC-input power—149.60 W – DC heat dissipation—510.87 BTU/hour • WS-X6148V-GE-TX (base module + PoE daughter card) – Module current—2.89 A – Module power—121.38 W – AC-input power—151.72 W – AC heat dissipation—518.14 BTU/hour – DC-input power—163.15 W – DC heat dissipation—557.14 BTU/hour • WS-X6148A-GE-TX (enhanced base module) – Module current— 2.50A – Module power—105.00 W – AC-input power—131.25 W – AC heat dissipation—448.22 BTU/hour – DC-input power—141.13 W – DC heat dissipation—481.96 BTU/hour • WS-X6148A-GE-45AF (enhanced base module + PoE daughter card) – Module current—2.68 A – Module power—112.56 W – AC-input power—140.70 W – AC heat dissipation—480.49 BTU/hour – DC-input power—151.29 W – DC heat dissipation—516.66 BTU/hour

Table 2-11 WS-X6148-GE-TX and Variants Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6148-RJ21 Ethernet Modules

The WS-X6148-RJ21 Ethernet module and its two variants provide 48 10/100-Mbps full- or half-duplex ports. (See Table 2-12.) Figure 2-6 shows the module front panel.

Table 2-12 WS-X6148-RJ21 Ethernet Module Variants

Module	Description
WS-X6148-RJ21	Base module without daughter cards installed.
WS-X6148-21AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).
WS-X6148-RJ21V	Base module equipped with a factory-installed Cisco prestandard PoE daughter card (WS-F6K-VPWR-GE).

Figure 2-6 WS-X6148-RJ-21 Ethernet Module Front Panel

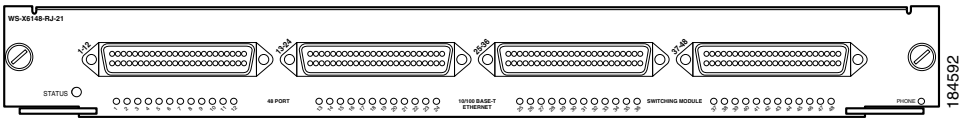


Table 2-13 lists the features and descriptions for the modules, and Table 2-14 lists the physical and environmental specifications for the modules.

Table 2-13 WS-X6148-RJ-21 Ethernet Modules Features

Feature	Description
Ports per module	• 48 ports (all variants). Ports are numbered from left to right. First connector, ports 1–12; second connector, ports 13–24; third connector, ports 25–32; fourth connector, ports 33–48. • 4 port groups • Port ranges per port group: 1–12, 13–24, 25–36, 37–48
Port connector type	RJ-21 (all variants)

Table 2-13 WS-X6148-RJ-21 Ethernet Modules Features (continued)

Feature	Description
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (all variants)
Buffer size	128 KB per port (all variants)
QoS	• Number of egress queues: 2 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 8092 bytes per frame (all variants)
Module oversubscription rate	1.2:1
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(12c)E1 • With Supervisor Engine 2 and WS-F6K-VPWR PoE daughter card—12.1(13)E • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720 except with WS-F6K-48-AF PoE daughter card—12.2(14)SX • With Supervisor Engine 720 and WS-F6K-48-AF PoE daughter card—12.2(17d)SXB • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS—6.4(11) (for software release 6.x); 7.6(9) (for software release 7.x)
Queues per port	All variants: • Tx—2q2t • Rx—1q4t

Table 2-13 WS-X6148-RJ-21 Ethernet Modules Features (continued)

Feature	Description
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis (all variants).
Bus connection	Single connection into the 32-Gbps shared bus (all variants)
Daughter card support	
PoE support	WS-X6148-RJ-21—Field upgradeable to Cisco Prestandard only by installing the WS-F6K-VPWR= daughter card. Refer to the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. **Note** An IEEE 802.3af standard PoE daughter card is available through factory advance replacement only; the IEEE 802.3af standard PoE daughter card is not field upgradeable.
Distributed forwarding support	Not available.
Pluggable transceivers support	Not supported.
TDR support	All variants supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

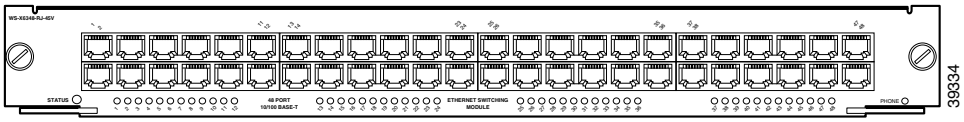
WS-X6148-RJ-45 and WS-X6148A-RJ-45 Ethernet Modules

The WS-X6148-RJ-45 and the WS-X6148A-RJ-45 Ethernet modules provide 48 10/100-Mbps full- or half-duplex ports. Table 2-15 lists the two base modules and their variants. Figure 2-7 shows the module front panel.

Table 2-15 WS-X6148-RJ-45 and WS-X61248A-RJ-45 Ethernet Modules and Variants

Module	Description
WS-X6148-RJ-45	Base module without daughter cards installed.
WS-X6148-45AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).
WS-X6148-RJ45V	Base module equipped with a factory-installed Cisco prestandard PoE daughter card (WS-F6K-VPWR-GE).
WS-X6148A-RJ-45	Base module (with enhanced port buffer size) without daughter cards installed.
WS-X6148A-45AF	Base module (with enhanced port buffer size) equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).

Figure 2-7 WS-X6148-RJ-45 Ethernet Module Front Panel



Note The WS-X6148-RJ-45 and the WS-X6148A-RJ-45 Ethernet modules share the same front panel. The product numbers in the upper-left corner will differ.

Table 2-16 lists the features and descriptions for the modules, and Table 2-17 lists the physical and environmental specifications for the modules.

Table 2-16 WS-X6148-RJ-45 and WS-X6148A-RJ-45 Ethernet Modules Features

Feature	Description
Ports per module	• 48 ports (all variants). Ports are numbered (left to right): – Top row, odd numbered ports 1–47. – Bottom row, even numbered ports 2–48. • Port groups: – WS-X6148-RJ-45—2 – WS-X6148A-RJ-45—6 • Port ranges per port group: – WS-X6148-RJ-45: 1–24, 25–48 – WS-X6148A-RJ-45: 1–8, 9–16, 17–24, 25–32, 33–40, 41–48
Port connector type	RJ-45 (all variants)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (all variants)
Buffer size	• WS-X6148-RJ-45, WS-X6148-45AF, and WS-X6148-RJ45V—1 MB per 8 ports • WS-X6148A-RJ-45 and WS-X6148A-45AF—5.3 MB per 8 ports
QoS	• Number of egress queues: 2 (6148), 4 (6148A) • Number of ingress queues: 1 (6148), 2 (6148A) • Number of thresholds per egress queue: 2 (6148), 8 (6148A) • Number of thresholds per ingress queue: 4 (6148), 4 (6148A)
Maximum frame size	• WS-X6148-RJ-45, WS-X6148-45AF, and WS-X6148-RJ45V—Up to 8092 bytes per frame • WS-X6148A-RJ-45 and WS-X6148A-45AF—Up to 9216 bytes per frame
Module oversubscription rate	1.2:1
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE • Supervisor Engine 2T (only supported with the WS-X6148A-RJ-45 and the WS-X6148A-45AF Ethernet modules)

Table 2-16 WS-X6148-RJ-45 and WS-X6148A-RJ-45 Ethernet Modules Features (continued)

Feature	Description
Software support	• With Supervisor Engine 2—12.1(12c)E1 • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(18)SXF (6148A) • With Supervisor Engine 720 except with WS-F6K-48-AF PoE daughter card—12.2(14)SX (6148) • With Supervisor Engine 720 and WS-F6K-48-AF PoE daughter card—12.2(17d)SXB (6148) • With Supervisor Engine 720-10GE—12.2(33)SXH • With Supervisor Engine 2T—12.2(50)SY • Catalyst OS (6148A)—8.4(1) • Catalyst OS (6148)—6.4(11) (for software release 6.x); 7.6(9) (for software release 7.x)
Queues per port	• WS-X6148-RJ-45, WS-X6148-45AF, and WS-X6148-RJ45V – Tx—1p2q2t per 8 ports – Rx—1p2t per port • WS-X6148A-RJ-45 and WS-X6148A-45AF – Tx—1p3q8t – Rx—1q2t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis (all variants).
Bus connection	Single connection into the 32-Gbps shared bus (all variants)
Module upgrades available	
PoE support	• WS-X6148-RJ-45—Field upgradeable to the Cisco prestandard only with the WS-F6K-VPWR-GE= daughter card or both the Cisco prestandard and the IEEE 802.3af standard by installing the WS-F6K-GE48-AF= daughter card. • WS-X6148A-RJ-45—Field upgradeable to the Cisco prestandard and the IEEE 802.3af standard by installing the WS-F6K-GE48-AF= daughter card. See the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. See Appendix A for further information on the PoE daughter cards.
Distributed forwarding support	Not supported.

Table 2-16 WS-X6148-RJ-45 and WS-X6148A-RJ-45 Ethernet Modules Features (continued)

Feature	Description
Pluggable transceivers support	Not supported.
TDR support	Yes
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

Table 2-17 WS-X6148-RJ-45 Ethernet Modules Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	• WS-X6148-RJ-45 (Base module)—6.8 lb (3.08 kg) • WS-X6148A-RJ-45 (Enhanced base module)—7.2 lb (3.27 kg)
Power and heat numbers	• WS-X6148-RJ-45 – Module current—2.39 A – Module power—100.38 W – AC-input power—125.48 W – AC heat dissipation—428.50 BTU/hour – DC-input power—134.92 W – DC heat dissipation—460.75 BTU/hour • WS-X6148-45AF (base module + PoE daughter card) – Module current—2.57 A – Module power—107.94 W – AC-input power—134.33 W – AC heat dissipation—460.77 BTU/hour – DC-input power—145.08 W – DC heat dissipation—495.45 BTU/hour • WS-X6148-RJ45V (base module + PoE daughter card) – Module current—2.81 A – Module power—118.02 W – AC-input power—147.53 W – AC heat dissipation—503.80 BTU/hour – DC-input power—158.63 W – DC heat dissipation—541.72 BTU/hour

Table 2-17 WS-X6148-RJ-45 Ethernet Modules Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• WS-X6148A-RJ-45 – Module current—1.00 A – Module power—42.00 W – AC-input power—52.50 W – AC heat dissipation—179.29 BTU/hour – DC-input power—55.45 W – DC heat dissipation—192.78 BTU/hour • WS-X6148A-RJ45AF (enhanced base module + PoE daughter card) – Module current—1.42 A – Module power—59.64 W – AC-input power—74.55 W – AC heat dissipation—254.59 BTU/hour – DC-input power—80.16 W – DC heat dissipation—273.75 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6148E-GE-45AT Ethernet Module

The WS-X6148E-GE-45AT Ethernet module provides 48 10/100/1000-Mbps full- or half-duplex ports. Figure 2-8 shows the module front panel. The module provides 48 ports of enhanced PoE support.

Figure 2-8 WS-X6148E-GE-45AT Ethernet Module Front Panel

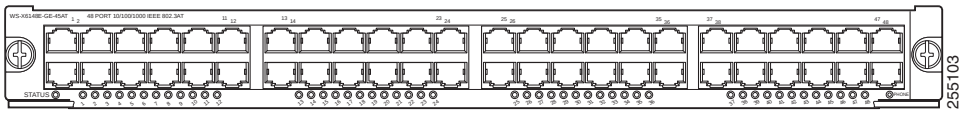


Table 2-18 lists the features and descriptions for the module, and Table 2-19 lists the physical and environmental specifications for the modules.

Table 2-18 WS-X6148E-GE-45AT Ethernet Module Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1–47 – Bottom row, even numbered ports 2–48 • Port groups: 6 • Port ranges per port group: 1–8, 9–16, 17–24, 25–32, 33–40, 41–48
Port connector type	RJ-45
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	5.3 MB per 8 ports
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 8 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	8:1
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 32 • Supervisor Engine 720 • Supervisor Engine 720-10GE • Supervisor Engine 2T
Software support	12.2(33)SXI4 Supervisor Engine 2T support requires 12.2(50)SY
Queues per port	• Tx—1p3q8t • Rx—1q2t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.

Table 2-18 WS-X6148E-GE-45AT Ethernet Module Features (continued)

Feature	Description
Bus connection	Single connection into the 32-Gbps shared bus
Module upgrades available	
PoE support	Comes equipped with the WS-F6K-48-AT PoE daughter card. The WS-F6K-48-AT PoE daughter card can not be used on any other Ethernet module. See Appendix A for further information on the PoE daughter cards.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.
TDR support	Yes
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6148X2-RJ-45 and WS-X6148X2-45AF Ethernet Modules

The WS-X6148X2-RJ-45 and the WS-X6148X2-45AF Ethernet modules, listed in Table 2-20, provide 96 10/100-Mbps full- or half-duplex ports. (See Figure 2-9.) The WS-X6148X2-RJ-45 and the WS-X6148X2-RJ-45AF modules are shipped with a 96-port splitter panel (WS-F6K-48X2-SPLTR). (See Figure 2-10.)

Table 2-20 WS-X6148X2-RJ-45 and the WS-X6148X2-45AF Ethernet Modules

Module	Description
WS-X6148X2-RJ-45	Base module without daughter cards installed.
WS-X6148X2-45AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-FE48X2-AF=).

Figure 2-9 WS-X6148X2-RJ-45 Ethernet Module Front Panel

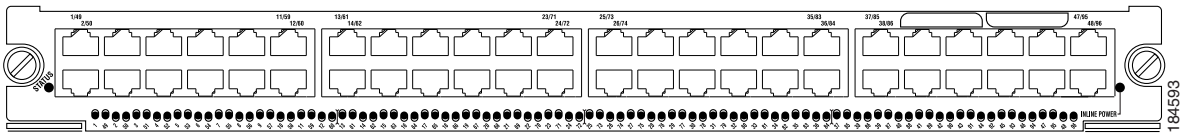


Figure 2-10 WS-F6K-48X2-SPLTR Splitter Panel

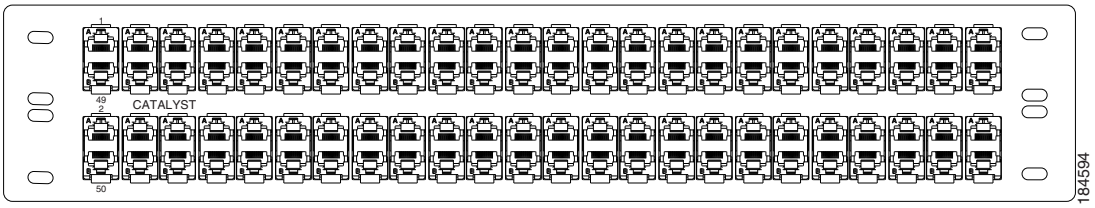


Table 2-21 lists the features for the modules, and Table 2-22 lists the physical and environmental specifications for the module.

Note With the IEEE 802.3af PoE daughter card installed, the WS-X6148X2-RJ-45 module can support up to 48 Class 3 (15.4 W) devices per module when operating as a 48-port module or up to 96 Class 2 (7 W) devices per module when operating as a 96-port module.

Table 2-21 WS-X6148X2-RJ-45 and WS-X6148X2-45AF Ethernet Modules Features

Feature	Description
Ports per module	48 ports, but scalable to 96 ports with the use of the supplied splitter panel (both modules) • Each connector supports two ports. Ports are numbered (left to right): – Top row, odd numbered ports 1/49 through 47/95. – Bottom row, even numbered ports 2/50 through 48/96.
Port connector type	• RJ-45 (both modules) • RJ-45 (splitter panel)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (both modules)
Buffer size	1.116 MB per port (both modules)
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 1 • Number of thresholds per ingress queue: 0
Maximum frame size	Up to 9216 bytes per frame (both modules)
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—Not supported with the 12.1E Release • With Supervisor Engine 32—12.2(18)SXF3 • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(18)SXF3 • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS—8.3(3)
Queues per port	Both modules: • Tx—1p3q1t • Rx—1p1q0t

Table 2-21 WS-X6148X2-RJ-45 and WS-X6148X2-45AF Ethernet Modules Features (continued)

Feature	Description
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	Single connection into the 32-Gbps shared bus (both modules)
Module upgrades available	
PoE support	• WS-X6148X2-RJ-45—Field upgradeable to both Cisco prestandard and IEEE 802.3af with the WS-F6K-FE48X2-AF= PoE daughter card. **Note** With the IEEE 802.3af PoE daughter card installed, the WS-X6148X2-RJ-45 module can support up to 48 Class 3 (15.4 W) devices per module when operating as a 48-port module or up to 96 Class 2 (7 W) devices per module when operating as a 96-port module. See the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. See Appendix A for further information on the PoE daughter cards.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.

Table 2-21 WS-X6148X2-RJ-45 and WS-X6148X2-45AF Ethernet Modules Features (continued)

Feature	Description
TDR support	Not supported
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6196-RJ-21 and WS-X6196-21AF Ethernet Modules

The WS-X6196-RJ-21 and the WS-X6196-21AF Ethernet modules, provide 96 10/100-Mbps full- or half-duplex ports. (See Table 2-23.) Figure 2-11 shows the module front panel.

Table 2-23 WS-X6196-RJ-21 Modules

Module	Description
WS-X6196-RJ-21	Base module without daughter cards installed.
WS-X6196-21AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).

Figure 2-11 WS-X6196-RJ-21 Switching Module Front Panel

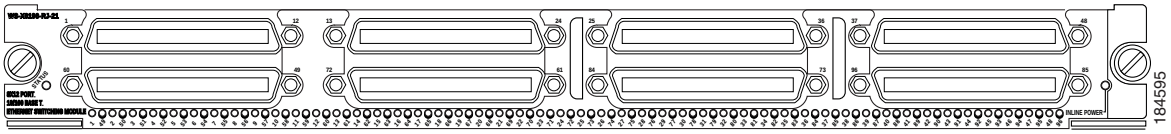


Table 2-24 lists the module features, and Table 2-25 lists the module physical and environmental specifications.

Note With the PoE daughter card installed, the WS-X6196-RJ-21 module can support 96 Class 2 (7 W) devices or 62 Class 3 (15.4 W) devices per module.

Table 2-24 WS-X6196-RJ-21 and WS-X6196-21AF Ethernet Modules Features

Feature	Description
Ports per module	• 96 ports (both modules). Ports are numbered (left to right) – Top row of connectors—First connector, ports 1–12; second connector, ports 13–24; third connector, ports 25–36; fourth connector, ports 37–48. – Bottom row of connectors—First connector, ports 60–49; second connector, ports 72–61; third connector, ports 73–84; fourth connector, ports 85–96. **Note** The bottom row of four RJ-21 connectors are inverted. The highest port number for a bottom row connector appears on the left side of the connector and the connector's lowest port number appears on the right side.
Port connector type	RJ-21 (both modules)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (both modules)
Buffer size	1.116 MB per port (both modules)

Table 2-24 WS-X6196-RJ-21 and WS-X6196-21AF Ethernet Modules Features (continued)

Feature	Description
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 1 • Number of thresholds per ingress queue: 0
Maximum frame size	Up to 9216 bytes (both modules)
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—Not supported with Release 12.1E • With Supervisor Engine 32—12.2(18)SXF3 • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(18)SXF3 • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS Release—8.2.1
Queues per port	Both modules: • Tx—1p3q1t • Rx—1p1q0t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus (both modules)
Module upgrades available	
PoE support	WS-X6196-RJ-21—Field upgradeable to both Cisco prestandard and IEEE 802.3af with the WS-F6K-FE48X2-AF= PoE daughter card. **Note** With the PoE daughter card installed, the WS-X6196-RJ-21 module can support 96 Class 2 (7 W) devices or 62 Class 3 (15.4 W) devices per module. WS-X6196-21AF—Shipped with a WS-F6K-FE48X2-AF PoE daughter card installed. See the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. See Appendix A for further information on the PoE daughter cards.
Distributed forwarding support	Not supported.

Table 2-24 WS-X6196-RJ-21 and WS-X6196-21AF Ethernet Modules Features (continued)

Feature	Description
Pluggable transceivers support	Not supported.
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6348-RJ21V Ethernet Module

The WS-X6348-RJ21V Ethernet module provides 48 10/100-Mbps full- or half-duplex ports. (See (Figure 2-12.) Table 2-26 lists the features and description for the module, and Table 2-27 lists the physical and environmental specifications for the module.

Figure 2-12 WS-X6348-RJ21V Switching Module Front Panel

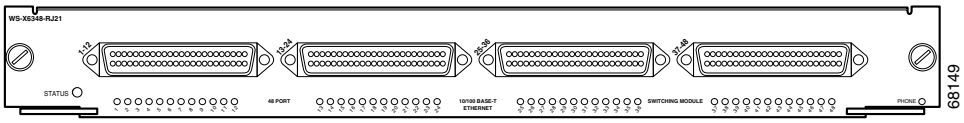


Table 2-26 WS-X6348-RJ21V Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – First connector, ports 1 to 12; second connector, ports 13–24; third connector, ports 25–32; fourth connector, 33–48. • 4 port groups • Port ranges per port group: 1–12, 13–24, 25–36, 37–48
Port connector type	RJ-21 (12 ports per connector)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	128 KB
QoS	• Number of egress queues: 2 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 8092 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine720-10GE
Software support	• With Supervisor Engine 2—12.1(8a)EX • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine720-10GE—12.2(33)SXH

Table 2-26 WS-X6348-RJ21V Features (continued)

Feature	Description
Queues per port	• Tx—2q2t • Rx—1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus
Module upgrades available	
PoE support	Cisco prestandard only. The WS-F6K-VPWR= PoE daughter card is factory installed on the module. No PoE field upgrades are available.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6348-RJ45 and WS-X6348-RJ45V Ethernet Modules

The WS-X6348-RJ45 and the WS-X6348-RJ45V Ethernet modules, provide 48 10/100-Mbps full- or half-duplex ports. (See Table 2-28.) Figure 2-13 shows the module front panel.

Table 2-28 WS-X6348-RJ45 Modules

Module	Description
WS-X6348-RJ45	Base module without daughter cards installed.
WS-X6348-RJ45V	Base module equipped with a factory-installed Cisco prestandard PoE daughter card (WS-F6K-VPWR-GE).

Figure 2-13 WS-X6348-RJ45 and WS-X6348-RJ45V Ethernet Modules Front Panel

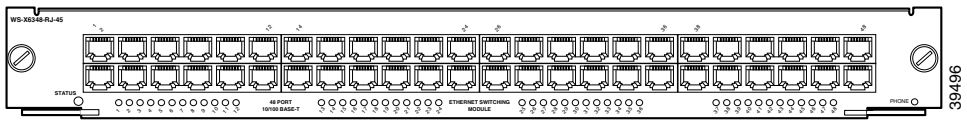


Table 2-29 lists the module features, and Table 2-30 lists the module physical and environmental specifications.

Table 2-29 WS-X6348-RJ45 and WS-X6348-RJ45V Ethernet Modules Features

Feature	Description
Ports per module	• 48 ports (both modules). Ports are numbered (left to right): – Top row, odd numbered ports 1 through 47. – Bottom row, even numbered ports 2 through 48. • 4 port groups • Port ranges per port group: 1–12, 13–24, 25–36, 37–48
Port connector type	RJ-45 (both modules)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (both modules)
Buffer size	128 KB per port (both modules)
QoS	• Number of egress queues: 2 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 8092 bytes per frame (both modules)
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine720-10GE
Software support	• With Supervisor Engine 2—12.1(2)E • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine720-10GE—12.2(33)SXH
Queues per port	Both modules: • Tx—2q2t • Rx—1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the modules can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.

Table 2-29 WS-X6348-RJ45 and WS-X6348-RJ45V Ethernet Modules Features (continued)

Feature	Description
Bus connection	32-Gbps shared bus (both modules)
Module upgrades available	
PoE support	• WS-X6348-RJ45—Field upgradeable to Cisco prestandard with the WS-F6K-VPWR= PoE daughter card. • WS-X6348-RJ-45V—Comes equipped with the WS-F6K-VPWR daughter card. See the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures. See Appendix A for further information on the PoE daughter cards.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6516-GE-TX Ethernet Module

The WS-X6516-GE-TX Ethernet module provides 16 10/100/1000-Mbps full- or half-duplex ports. (See (Figure 2-14).) Table 2-31 lists the features and description for the module, and Table 2-32 lists the physical and environmental specifications for the module.

Figure 2-14 WS-X6516-GE-TX Ethernet Module Front Panel

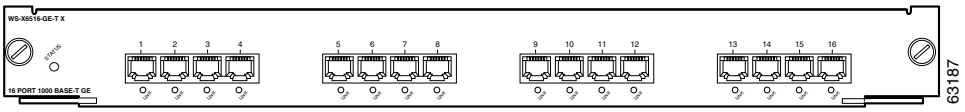


Table 2-31 WS-X6516-GE-TX Ethernet Module Features

Feature	Description
Ports per module	• 16 ports. Ports are numbered from 1 (left) to 16 (right). • 2 port groups • Port ranges per port group: 1–8, 9–16
Port connector type	RJ-45
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	512 KB per port
QoS	• Number of egress queues: 3 • Number of ingress queues: 2 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(8a)EX • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine720-10GE—12.2(33)SXH
Queues per port	• Tx—1p2q2t • Rx—1p1q4t

Table 2-31 WS-X6516-GE-TX Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing[1]. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

1. Verify that all LINK LEDs are functioning.

WS-X6548-GE-TX, WS-X6548-GE-45AF, and WS-X6548V-GE-TX Ethernet Modules

The WS-X6548-GE-TX Ethernet module and its variants, listed in Table 2-33, provide 48 10/100/1000-Mbps full- or half-duplex ports. Figure 2-15 shows the module front panel.

Table 2-33 WS-X6548-GE-TX Ethernet Module Variants

Module	Description
WS-X6548-GE-TX	Base module without daughter cards installed.
WS-X6548-GE-45AF	Base module equipped with a factory-installed IEEE 802.3af PoE daughter card (WS-F6K-GE48-AF).
WS-X6548V-GE-TX	Base module equipped with a factory-installed Cisco prestandard PoE daughter card (WS-F6K-VPWR-GE).

Figure 2-15 WS-X6548-GE-TX Ethernet Module Front Panel

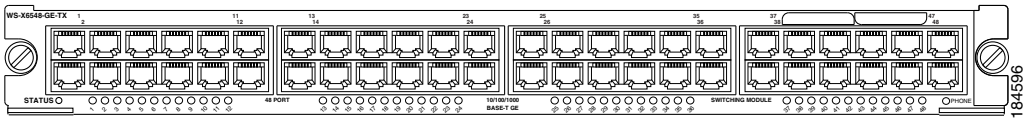


Table 2-34 lists the features and descriptions for the modules, and Table 2-35 lists the physical and environmental specifications for the modules.

Table 2-34 WS-X6548-GE-TX Modules Features

Feature	Description
Ports per module	• 48 (all variants). Ports are numbered (left to right): – Top row, odd-numbered ports 1–47. – Bottom row, even-numbered ports 2–48. • 2 port groups • Port ranges per port group: 1–24, 25–48
Port connector type	RJ-45 (all variants)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable (all variants)
Buffer size	1.4 MB per 8 ports
QoS	• Number of egress queues: 3 • Number of ingress queues: 1 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 2
Maximum frame size	Up to 1518 bytes per frame
Module oversubscription rate	N/A

Table 2-34 WS-X6548-GE-TX Modules Features (continued)

Feature	Description
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(19)E1 • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720 (without either the WS-F6K-GE48-AF or the WS-F6K-48-AF daughter cards)—12.2(17a)SX • With Supervisor Engine 720 (with either the WS-F6K-GE48-AF or the WS-F6K-48-AF daughter cards)—12.2(17d)SXB • With Supervisor Engine720-10GE—12.2(33)SXH
Queues per port	• Tx—1p2q2t (per 8 ports) • Rx—1p2t (per 8 ports)
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis (all variants).
Bus connection	32-Gbps shared bus (all variants)
Module upgrades available	
PoE support	WS-X6548-GE-TX—Field-upgradeable to Cisco prestandard only by installing the WS-F6K-VPWR-GE= daughter card or both Cisco prestandard and IEEE 802.3af by installing the WS-F6K-GE48-AF= daughter card. **Note** Refer to the *Cisco Catalyst 6500 Series Power over Ethernet Daughter Cards Field-Upgrade Installation Note* for field upgrade procedures.
Distributed forwarding support	Not supported.
Pluggable transceivers support	Not supported.

Table 2-34 WS-X6548-GE-TX Modules Features (continued)

Feature	Description
TDR support	All module variants support TDR.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

WS-X6548-RJ-21 Ethernet Module

The WS-X6548-RJ-21 Ethernet module provides 48 10/100-Mbps full- or half-duplex ports. (See Figure 2-16.) Table 2-36 lists the features and description of the module, and Table 2-37 lists the physical and environmental specifications for the module.

Figure 2-16 WS-X6548-RJ-21 Ethernet Module Front Panel

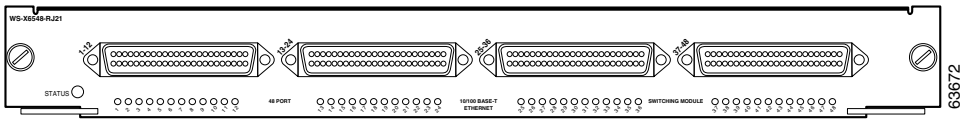


Table 2-36 WS-X6548-RJ-21 Ethernet Module Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – First connector, ports 1–12; second connector, ports 13–24; third connector, ports 25–32; fourth connector, 33–48. • Bottom row, even numbers 2 through 48. • 1 port group • Port ranges per port group: 1–48
Port connector type	RJ-21 (12 ports per connector)
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	1.116 MB per port
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 1 • Number of thresholds per ingress queue: 0
Maximum frame size	Up to 1518 bytes per frame.
Module oversubscription rate	N/A
Supervisor engine support	• Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.1(8a)E • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH

Table 2-36 WS-X6548-RJ-21 Ethernet Module Features (continued)

Feature	Description
Queues per port	• Tx—1p3q1t • Rx—1p1q0t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus
Module upgrades available	
PoE support	Not available.
Distributed forwarding support	Can be field-upgraded with either the WS-F6K-DFC, WS-F6K-DFC3B, or WS-F6K-DFC3BXL daughter cards. See the *Catalyst 6500 Series DFC, DFC3A, DFC3B, and DFC3BXL Installation Note* for additional information and field upgrade procedures. See Appendix A for additional information on the DFC daughter cards.
Pluggable transceivers support	Not supported.
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing[1]. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

1. Verify that all LINK LEDs are functioning.

Table 2-37 WS-X6548-RJ-21 Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	7.6 lb (3.45 kg)
Power and heat numbers	• Base module – Module current—2.90 A – Module power—121.80 W – AC-input power—152.25 W – AC heat dissipation—519.93 BTU/hour – DC-input power—163.71 W – DC heat dissipation—559.07 BTU/hour • Base module + DFC3A daughter card – Module current—5.47 A – Module power—229.74 W – AC-input power—287.18 W – AC heat dissipation—980.70 BTU/hour – DC-input power—308.79 W – DC heat dissipation—1054.52 BTU/hour • Base module + DFC3B daughter card – Module current—4.57 A – Module power—191.94 W – AC-input power—239.93 W – AC heat dissipation—819.34 BTU/hour – DC-input power—257.98 W – DC heat dissipation—881.01 BTU/hour • Base module + DFC3BXL daughter card – Module current—4.37 A – Module power—183.54 W – AC-input power—229.43 W – AC heat dissipation—783.49 BTU/hour – DC-input power—246.69 W – DC heat dissipation—842.46 BTU/hour

Table 2-37 WS-X6548-RJ-21 Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6548-RJ-45 Ethernet Module

The WS-X6548-RJ-45 Ethernet module provides 48 10/100-Mbps full- or half-duplex ports. (See Figure 2-17.) Table 2-38 lists the features and descriptions of the module, and Table 2-39 lists the physical and environmental specifications for the module.

Figure 2-17 WS-X6548-RJ-45 Switching Module Front Panel

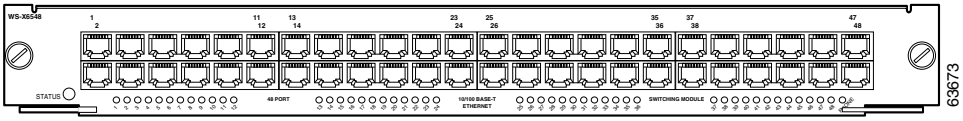


Table 2-38 WS-X6548-RJ-45 Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1–47. – Bottom row, even numbered ports 2–48. • 1 port group • Port ranges per port group: 1–48
Port connector type	RJ-45
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	1.116 MB per port
QoS	• Number of egress queues: 4 • Number of ingress queues: 2 • Number of thresholds per egress queue: 1 • Number of thresholds per ingress queue: 0
Maximum frame size	Up to 1518 bytes per frame
Module oversubscription rate	N/A

Table 2-38 WS-X6548-RJ-45 Features (continued)

Feature	Description
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE **Note** Check your release notes for specific information on the software release required to support the supervisor engines.
Software support	• With Supervisor Engine 2—12.1(8a)E • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH
Queues per port	• Tx—1p3q1t • Rx—1p1q
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	One 8-Gbps fabric connection and 32-Gbps shared bus
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Can be field-upgraded with either the WS-F6K-DFC, WS-F6K-DFC3B, or WS-F6K-DFC3BXL daughter cards. See the *Catalyst 6500 Series DFC, DFC3A, DFC3B, and DFC3BXL Installation Note* for additional information and field upgrade procedures. See Appendix A for additional information on the DFC daughter cards.
Pluggable transceivers support	Not supported.

Table 2-38 WS-X6548-RJ-45 Features (continued)

Feature	Description
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** • Green—The port is active (the link is connected and operational). • Orange—The module or port is disabled through the CLI command or the module is initializing[1]. • Flashing orange—The port is faulty and has been disabled. • Off—The port is not active or the link is not connected. **PHONE** • Green—The PoE daughter card is installed and detected. • Off—The PoE daughter card is not detected or is not installed.

1. Verify that all LINK LEDs are functioning.

Table 2-39 WS-X6548-RJ-45 Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	7.6 lb (3.45 kg)

Table 2-39 WS-X6548-RJ-45 Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• Base module – Module current—2.90 A – Module power—121.80 W – AC-input power—152.25 W – AC heat dissipation—519.93 BTU/hour – DC-input power—163.71 W – DC heat dissipation—559.07 BTU/hour • Base module + DFC3A daughter card – Module current—5.47 A – Module power—229.74 W – AC-input power—287.18 W – AC heat dissipation—980.70 BTU/hour – DC-input power—308.79 W – DC heat dissipation—1054.52 BTU/hour • Base module + DFC3B daughter card – Module current—4.57 A – Module power—191.94 W – AC-input power—239.93 W – AC heat dissipation—819.34 BTU/hour – DC-input power—257.98 W – DC heat dissipation—881.01 BTU/hour • Base module + DFC3BXL daughter card – Module current—4.37 A – Module power—183.54 W – AC-input power—229.43 W – AC heat dissipation—783.49 BTU/hour – DC-input power—246.69 W – DC heat dissipation—842.46 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Modules

The WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet modules provide 48 10/100/1000-Mbps full- or half-duplex ports. (See Figure 2-18.) Table 2-40 lists the modules features, and Table 2-41 lists the modules physical and environmental specifications.

Figure 2-18 WS-X6748-GE-TX and WS-X6848-TX-2T Ethernet Modules Front Panel

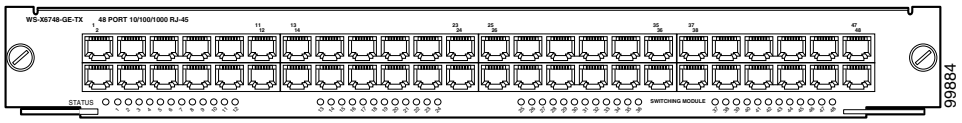


Table 2-40 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Module Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1 through 47. – Bottom row, even numbered ports 2 through 48. • 4 port groups • Port ranges per port group: 1–12, 13–24, 25–36, 37–48
Port connector type	RJ-45
Cabling distance	328 ft (100 m) over Category 5, 5e, and 6 UTP/STP cable
Buffer size	1.3 MB per port
QoS	• Number of egress queues: 4 • Number of ingress queues: 1 (2 if DFC3x is present) • Number of thresholds per egress queue: 1 or 2 • Number of thresholds per ingress queue: 8
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	1.2:1

Table 2-40 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Supervisor engine support	• WS-X6748-GE-TX – Supervisor Engine 720 – Supervisor Engine 720-10GE – Supervisor Engine 2T-10GE • WS-X6848-TX-2T/-2TXL – Supervisor Engine 2T-10GE • WS-X6748-GE-TX (with DFC4A/AXL) or WS-X6848-TX-2T/-2TXL – Supervisor Engine 6T **Note** WS-X6748-GE-TX modules that have a CFC daughter card or are upgraded with DFC4-A or DFC4-AXL daughter cards are supported only on the Supervisor Engine 2T. WS-X6748-GE-TX modules that are upgraded with DFC4-A or DFC4-AXL daughter cards are only supported on the Supervisor Engine 6T.
Software support	• WS-X6748-GE-TX – With Supervisor Engine 720—12.2(17a)SX – With Supervisor Engine 720-10GE—12.2(33)SXH • WS-6848-TX-2T/-2TXL – With Supervisor Engine 2T-10GE—12.2(50)SY • WS-X6748-GE-TX (with DFC4A/AXL) or WS-6848-TX-2T/-2TXL – With Supervisor Engine 6T—15.3(1)SY or higher
Queues per port	• With CFC daughter card: – Tx—1p3q8t – Rx—1q8t • With DFC daughter card: – Tx—1p3q8t – Rx—2q8t

Table 2-40 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	• The WS-X6748-GE-TX is not supported in the Catalyst 6503 switch chassis. The WS-X6748-GE-TX module can occupy any slot in any other Catalyst 6500 or Catalyst 6500-E chassis except the Catalyst 6513 chassis where the module must be installed in slots 9–13. The module does not power up when it is installed in slots 1–8. • The WS-X6748-GE-TX when equipped with either a CFC, or DFC4 daughter card is supported by the Supervisor Engine 2T. • The WS-X6748-GE-TX when equipped with DFC4 daughter card is supported by the Supervisor Engine 6T. • Module operation—The WS-X6848-TX-2T/-2TXL operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1: Ports 25–48 – Fabric channel 2: Ports 1–24
Fabric channel speed	20 Gb/sec
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• WS-X6748-GE-TX ships with the WS-F6700-CFC daughter card factory-installed. The module can be upgraded in the field to support the WS-F6700-DFC3A, WS-F6700-DFC3B, WS-F6700-DFC3BXL, WS-F6700-DFC3C, WS-F6700-DFC3CXL, WS-F6K-DFC4-A, or the WS-F6K-DFC4-AXL daughter cards. • WS-X6848-TX-2T/-2TXL supports either the DFC4-A or the DFC4-AXL daughter card. **Note** Refer to the *Catalyst 6500 Series CFC, DFC3A, DFC3B, and DFC3BXL Installation Note* or the *Catalyst 6500 Series Distributed Forwarding Card 4 for WS-X68xx Modules Installation Note* for additional information and field upgrade procedures. See Appendix A for additional information on the DFC daughter cards.

Table 2-40 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Pluggable transceivers support	Not supported.
TDR support	Supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics. An overtemperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.) • Red—The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization sequence. An overtemperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.) If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. **LINK** Green—The port is active (the link is connected and operational). Orange—The module or port is disabled through the CLI command or the module is initializing[1]. Flashing orange—The port is faulty and has been disabled. Off—The port is not active or the link is not connected. **PHONE** Green—The PoE daughter card is installed and detected. Off—The PoE daughter card is not detected or is not installed.

1. Verify that all LINK LEDs are functioning.

Table 2-41 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	Base module + CFC daughter card (WS-F6700-CFC)—10.2 lb (4.63 kg)
Power and heat numbers	• Base module + WS-F6700-CFC daughter card – Module current—7.75 A – Module power—325.50 W – AC-input power—406.88 W – AC heat dissipation—1389.48 BTU/hour – DC-input power—437.50 W – DC heat dissipation—1494.06 BTU/hour • Base module + WS-F6700-DFC3A daughter card – Module current—10.00 A – Module power—420.00 W – AC-input power—525.00 W – AC heat dissipation—1792.88 BTU/hour – DC-input power—564.52 W – DC heat dissipation—1927.82 BTU/hour • Base module + WS-F6700-DFC3B daughter card – Module current—9.70 A – Module power—407.40 W – AC-input power—509.25 W – AC heat dissipation—1739.09 BTU/hour – DC-input power—547.58 W – DC heat dissipation—1869.99 BTU/hour

Table 2-41 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• Base module + WS-F6700-DFC3BXL daughter card – Module current—10.30 A – Module power—363.30 W – AC-input power—454.13 W – AC heat dissipation—1550.84 BTU/hour – DC-input power—488.31 W – DC heat dissipation—1667.57 BTU/hour • Base module + WS-F6700-DFC3C daughter card – Module current—8.65 A – Module power—363.30 W – AC-input power—454.13 W – AC heat dissipation—1550.84 BTU/hour – DC-input power—488.31 W – DC heat dissipation—1667.57 BTU/hour • Base module + WS-F6700-DFC3CXL daughter card – Module current—9.35 A – Module power—392.70 W – AC-input power—490.88 W – AC heat dissipation—1676.34 BTU/hour – DC-input power—527.82 W – DC heat dissipation—1802.51 BTU/hour • WS-X6848-TX-2T + WS-F6K-DFC4-A daughter card – Module current—9.64 A – Module power—404.88 W – AC-input power—506.10 W – AC heat dissipation—1728.33 BTU/hour – DC-input power—544.19 W – DC heat dissipation—1858.42 BTU/hour • WS-X6848-TX-2TXL + WS-F6K-DFC4-AXL daughter card – Module current—9.76 A – Module power—409.92 W – AC-input power—512.40 W – AC heat dissipation—1749.85 BTU/hour – DC-input power—550.97 W – DC heat dissipation—1881.55 BTU/hour

Table 2-41 WS-X6748-GE-TX and WS-X6848-TX-2T/-2TXL Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

1-Gigabit Ethernet Modules

This section describes the following 1-Gigabit Ethernet modules:

Note 1-Gigabit Ethernet modules are hot swappable.

WS-X6408A-GBIC

The WS-X6408A-GBIC Ethernet module provides 8 1-Gbps full- or half-duplex ports. (See Figure 2-19.) Table 2-42 lists the features and descriptions for the module, and Table 2-43 lists the physical and environmental specifications for the module.

Figure 2-19 WS-X6408A-GBIC Ethernet Module Front Panel

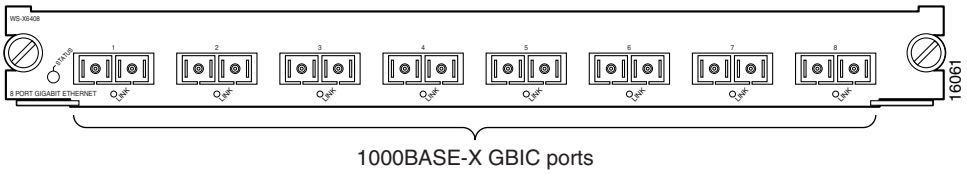


Table 2-42 WS-X6408A-GBIC Ethernet Module Features

Feature	Description
Ports per module	• 8 ports. Ports are numbered from 1 (left) to 8 (right). • 1 port group • Port ranges per port group: 1–8
Port connector type	SC or RJ-45 depending on the GBIC transceiver installed in the module port
Cabling distance	Depends on the GBIC transceiver installed in the module port. Refer to Appendix B for descriptions of the GBIC transceiver types and supported cabling distances.
Buffer size	512 KB per port
QoS	• Number of egress queues: 3 • Number of ingress queues: 2 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4

Table 2-42 WS-X6408A-GBIC Ethernet Module Features (continued)

Feature	Description
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE
Software support	• With Supervisor Engine 2—12.2(17d)SXB • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH • Catalyst OS support—6.4(11)
Queues per port	• Tx—1p2q2t • Rx—1p1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32 Gbps shared bus
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Not supported.
Pluggable transceivers support	GBIC transceivers are supported. Refer to your software release notes to determine which GBIC transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the GBIC transceivers.

Table 2-42 WS-X6408A-GBIC Ethernet Module Features (continued)

Feature	Description
TDR support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-43 WS-X6408A-GBIC Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	6.4 lb (2.9 kg)
Power and heat numbers	• Module current—2.00 A • Module power—84.00 W • AC-input power—105.00 W • AC heat dissipation—358.58 BTU/hour • DC-input power—112.90 W • DC heat dissipation—385.56 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6416-GBIC

The WS-X6416-GBIC Ethernet module provides 16 1-Gbps full- or half-duplex ports. (See Figure 2-20.) Table 2-44 lists the module features, and Table 2-45 lists the module physical and environmental specifications.

Figure 2-20 WS-X6416-GBIC Ethernet Module Front Panel

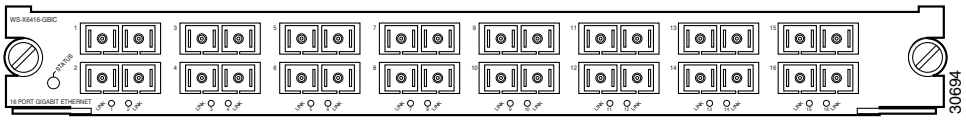


Table 2-44 WS-X6416-GBIC Features

Feature	Description
Ports per module	• 16 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1–15. – Bottom row, even numbered ports 2–16. • 2 port groups • Port ranges per port group: 1–8, 9–16
Port connector type	SC or RJ-45 depending on the type of GBIC transceiver installed
Cabling distance	Depends on the GBIC transceiver installed in the module port. Refer to Appendix B for descriptions of the GBIC transceiver types and supported cabling distances.
Speed	1 Gbps
Buffer size	512 KB per port
QoS	• Number of egress queues: 3 • Number of ingress queues: 2 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	N/A
Supervisor engine support	• Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE

Table 2-44 WS-X6416-GBIC Features (continued)

Feature	Description
Software support	• With Supervisor Engine 2—12.1(2)E • With CWDM-GBIC and WS-G5483 GBIC transceiver support—12.1(13)E • With DWDM-GBIC transceiver support—12.1(20)E2 • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH
Queues per port	• Tx—1p2q2t • Rx—1p1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus
Forwarding architecture	Cisco Express Forwarding (CEF)
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Not supported.
Pluggable transceivers support	GBIC transceivers are supported. Refer to your software release notes to determine which GBIC transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the GBIC transceivers.

Table 2-44 WS-X6416-GBIC Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Supported on some GBIC transceivers **Note** Refer to your software release notes for specific information on which GBIC transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-45 WS-X6416-GBIC Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	7.0 lb (3.17 kg)
Power and heat numbers	• Module current—2.81 A • Module power—118.02 W • AC-input power—147.53 W • AC heat dissipation—503.80 BTU/hour • DC-input power—158.63 W • DC heat dissipation—541.72 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6516-GBIC and WS-X6516A-GBIC

The WS-X6516-GBIC and the WS-X6516A-GBIC Ethernet modules (Figure 2-21) provide 16 1-Gbps full- or half-duplex ports. Table 2-46 lists the module features, and Table 2-47 lists the module physical and environmental specifications.

Figure 2-21 WS-X6516-GBIC and WS-X6516A-GBIC Ethernet Modules Front Panel

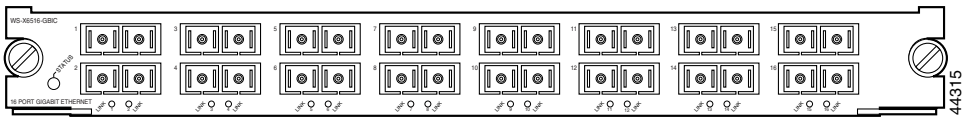


Table 2-46 WS-X6516-GBIC and WS-X6516A-GBIC Features

Feature	Description
Ports per module	• 16 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1–15. – Bottom row, even numbered ports 2–16. • 2 port groups • Port ranges per port group: 1–8, 9–16
Port connector type	SC or RJ-45 depending on the type of GBIC transceiver installed in the module port
Cabling distance	Depends on the GBIC transceiver installed in the module port. Refer to Appendix B for descriptions of the GBIC transceiver types and supported cabling distances.
Speed	1 Gbps
Buffer size	• 512 KB per port—WS-X6516-GBIC • 1 MB per port—WS-X6516A-GBIC
QoS	• Number of egress queues: 3 • Number of ingress queues: 2 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes per frame (both modules)
Module oversubscription rate	2:1
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 2 • Supervisor Engine 32 • Supervisor Engine 32 PISA • Supervisor Engine 720 • Supervisor Engine 720-10GE

Table 2-46 WS-X6516-GBIC and WS-X6516A-GBIC Features (continued)

Feature	Description
Software support	• With Supervisor Engine 2—12.1(18a)E, WS-X6516-GBIC; 12.1(19)E1, WS-X6516A-GBIC • With Supervisor Engine 32—12.2(18)SXF • With Supervisor Engine 32 PISA—12.2(18)ZY • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 720-10GE—12.2(33)SXH
Queues per port	Both modules: • Tx—1p2q2t • Rx—1p1q4t
Chassis/slot restrictions	No chassis or slot restrictions; the module can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis.
Bus connection	32-Gbps shared bus
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Can be field-upgraded with either the WS-F6K-DFC, WS-F6K-DFC3B, or WS-F6K-DFC3BXL daughter cards. Refer to the *Catalyst 6500 Series DFC, DFC3A, DFC3B, and DFC3BXL Installation Note* for additional information and field upgrade procedures.
Pluggable transceivers support	GBIC transceivers are supported. Refer to your software release notes to determine which GBIC transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the GBIC transceivers.

Table 2-46 WS-X6516-GBIC and WS-X6516A-GBIC Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Supported on some GBIC transceivers. **Note** Refer to your software release notes for specific information on which GBIC transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-47 WS-X6516-GBIC and WS-X6516A-GBIC Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	8.6 lb (3.9 kg)

Table 2-47 WS-X6516-GBIC and WS-X6516A-GBIC Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• WS-X6516-GBIC (base module) – Module current—3.40 A – Module power—142.80 W – AC-input power—178.50 W – AC heat dissipation—609.58 BTU/hour – DC-input power—191.94 W – DC heat dissipation—655.46 BTU/hour • Base module + DFC3A daughter card (WS-F6K-DFC3A) – Module current—5.97 A – Module power—250.74 W – AC-input power—313.43 W – AC heat dissipation—1070.35 BTU/hour – DC-input power—337.02 W – DC heat dissipation—1150.91 BTU/hour • Base module + DFC3B daughter card (WS-F6K-DFC3B) – Module current—5.07 A – Module power—212.94 W – AC-input power—266.18 W – AC heat dissipation—908.99 BTU/hour – DC-input power—286.21 W – DC heat dissipation—977.41 BTU/hour • Base module + DFC3BXL daughter card (WS-F6K-DFC3BXL) – Module current—4.87 A – Module power—204.54 W – AC-input power—255.68 W – AC heat dissipation—873.13 BTU/hour – DC-input power—274.92 W – DC heat dissipation—938.85 BTU/hour

Table 2-47 WS-X6516-GBIC and WS-X6516A-GBIC Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• WS-X6516A-GBIC (enhanced base module) – Module current—3.62 A – Module power—152.04 W – AC-input power—190.05 W – AC heat dissipation—649.02 BTU/hour – DC-input power—204.35 W – DC heat dissipation—697.87 BTU/hour • Base module + DFC3A daughter card (WS-F6K-DFC3A) – Module current—6.19 A – Module power—259.98 W – AC-input power—324.98 W – AC heat dissipation—1109.79 BTU/hour – DC-input power—349.44 W – DC heat dissipation—1193.32 BTU/hour • Base module + DFC3B daughter card (WS-F6K-DFC3B) – Module current—5.29 A – Module power—222.18 W – AC-input power—277.73 W – AC heat dissipation—948.43 BTU/hour – DC-input power—298.63 W – DC heat dissipation—1019.82 BTU/hour • Base module + DFC3BXL daughter card (WS-F6K-DFC3BXL) – Module current—5.09 A – Module power—213.78 W – AC-input power—267.23 W – AC heat dissipation—912.57 BTU/hour – DC-input power—287.34 W – DC heat dissipation—981.26 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL

The WS-X6724-SFP and the WS-X6824-SFP-2T/-2TXL Ethernet modules (Figure 2-22) provide 24 1-Gbps full- or half-duplex ports. Table 2-48 lists the module features, and Table 2-49 lists the module physical and environmental specifications.

Note A sticker is placed on the module faceplate identifying it as either a WS-X6824-SFP-2T or WS-X6824-SFP-2TXL depending on whether a WS-F6K-DFC4-A or WS-F6K-DFC4-AXL daughter card is installed on the module.

Figure 2-22 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Module Front Panel

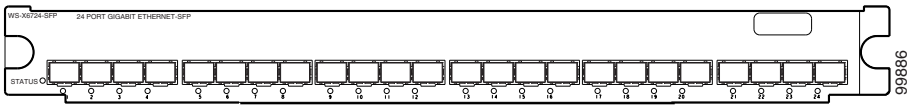


Table 2-48 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Module Features

Feature	Description
Ports per module	• 24 ports. Ports are numbered 1 (left) to 24 (right). • 2 port groups • Port ranges per port group: 1–12, 13–24
Port connector type	LC (optical) or RJ-45 (copper) depending on the SFP transceiver installed.
Cabling distance	Depends on the SFP transceiver installed in the module port. Refer to the transceiver installation notes at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_installation_guides_list.html
Buffer size	• Rx—166 kB per port • Tx—1.17 MB per port
QoS	• Number of egress queues: 4 • Number of ingress queues: 1 (2 if DFC3x daughter card is present.) • Number of thresholds per egress queue: 1 or 2 • Number of thresholds per ingress queue: 8
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	1.2:1

Table 2-48 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Supervisor engine support	• WS-X6724-SFP – Supervisor Engine 720 – Supervisor Engine 720-10GE – Supervisor Engine 2T (The WS-X6724-SFP must be equipped with either a CFC, DFC4 or DFC4XL daughter card) • WS-X6824-SFP-2T/-2TXL – Supervisor Engine 2T-10GE • WS-X6724-SFP (with DFC4A/AXL) or WS-X6824-SFP-2T/-2TXL – Supervisor Engine 6T **Note** WS-X6724-SFP modules that are equipped with a CFC daughter card are supported on the Supervisor Engine 2T. WS-X6724-SFP modules that are upgraded with DFC4-A or DFC4-AXL daughter cards are supported only on the Supervisor Engine 2T-10GE. WS-X6724-SFP modules that are upgraded with DFC4-A or DFC4-AXL daughter cards are only supported on the Supervisor Engine 6T.
Software support	• WS-X6724-SFP – With Supervisor Engine 720—12.2(17a)SX – With Supervisor Engine 720 and DFC3C or DFC3CXL—12.2(33)SXH – With Supervisor Engine 720-10GE—12.2(33)SXH – With Supervisor Engine 2T (module equipped with either CFC or DFC4—12.2(50)SY • WS-X6824-SFP-2T/-2TXL – With Supervisor Engine 2T-10GE—12.2(50)SY • WS-X6724-SFP (with DFC4A/AXL) or WS-X6824-SFP-2T/-2TXL – With Supervisor Engine 6T—15.3(1)SY or higher
Queues per port	• With CFC daughter card: – Tx—1p3q8t – Rx—1q8t • With DFC daughter card: – Tx—1p3q8t – Rx—2q8t

Table 2-48 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	• The WS-X6724-SFP module is not supported in the Catalyst 6503 chassis. • The WS-X6724-SFP when equipped with either a CFC, or DFC4 daughter card is supported by the Supervisor Engine 2T. • Requires that modules be installed in adjacent slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • Module operation—The WS-X6824-SFP-2T/-2TXL operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	Single fabric channel.
Fabric channel speed	20 Gb/sec
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• WS-X6724-SFP ships with the WS-F6700-CFC daughter card factory-installed. The module can be upgraded in the field to support the WS-F6700-DFC3A, WS-F6700-DFC3B, WS-F6700-DFC3BXL, WS-F6700-DFC3C, WS-F6700-DFC3CXL, WS-F6K-DFC4-A, or the WS-F6K-DFC4-AXL daughter cards. • WS-X6824-SFP-2T ships with the DFC4-A installed and the WS-X6824-SFP-2TXL ships with the DFC4-AXL daughter card installed. **Note** Refer to the *Catalyst 6500 Series CFC, DFC3A, DFC3B, and DFC3BXL Installation Note* or the *Catalyst 6500 Series Distributed Forwarding Card 4 for WS-X68xx Modules Installation Note* for additional information and field upgrade procedures.
Pluggable transceivers support	SFP transceivers are supported. Refer to your software release notes to determine which SFP transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the SFP transceivers.

Table 2-48 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) supported	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-49 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Modules Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	Base module—8.8 lb (4.0 kg) Base module + DFC daughter card—9.4 lb (4.3 kg)
Power and heat numbers	• Base module + CFC daughter card (WS-F6700-CFC) – Module current—2.98 A – Module power—125.16 W – AC-input power—156.45 W – AC heat dissipation—534.28 BTU/hour – DC-input power—168.23 W – DC heat dissipation—574.49 BTU/hour • Base module + DFC3A daughter card (WS-F6700-DFC3A) – Module current—5.23 A – Module power—219.66 W – AC-input power—274.58 W – AC heat dissipation—937.67 BTU/hour – DC-input power—295.24 W – DC heat dissipation—1008.25 BTU/hour • Base module + DFC3B daughter card (WS-F6700-DFC3B) – Module current—4.93 A – Module power—207.06 W – AC-input power—258.83 W – AC heat dissipation—883.89 BTU/hour – DC-input power—278.31 W – DC heat dissipation—950.42 BTU/hour

Table 2-49 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Modules Physical and Environmental Specifications

Item	Specification
Power and heat numbers (continued)	• Base module + DFC3BXL daughter card (WS-F6700-DFC3BXL) – Module current—5.53 A – Module power—232.26 W – AC-input power—290.33 W – AC heat dissipation—991.46 BTU/hour – DC-input power—312.18 W – DC heat dissipation—1066.09 BTU/hour • Base module + DFC3C daughter card (WS-F6700-DFC3C) – Module current—3.88 A – Module power—162.96 W – AC-input power—203.70 W – AC heat dissipation—695.64 BTU/hour – DC-input power—219.03 W – DC heat dissipation—748.00 BTU/hour • Base module + DFC3CXL daughter card (WS-F6700-DFC3CXL) – Module current—4.58 A – Module power—192.36 W – AC-input power—240.45 W – AC heat dissipation—821.14 BTU/hour – DC-input power—258.55 W – DC heat dissipation—882.94 BTU/hour • WS-X6824-SFP-2T + DFC4-A daughter card – Module current—4.87 A – Module power—204.66 W – AC-input power—255.68 W – AC heat dissipation—873.13 BTU/hour – DC-input power—274.92 W – DC heat dissipation—938.85 BTU/hour • WS-X6824-SFP-2TXL + DFC4-AXL daughter card – Module current—4.99 A – Module power—209.66 W – AC-input power—261.98 W – AC heat dissipation— 894.64BTU/hour – DC-input power—281.69 W – DC heat dissipation—961.98 BTU/hour

Table 2-49 WS-X6724-SFP and WS-X6824-SFP-2T/-2TXL Ethernet Modules Physical and Environmental Specifications

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL

The WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Ethernet modules (Figure 2-23) provide 48 1-Gbps full- or half-duplex ports. Table 2-50 lists the module features, and Table 2-50 lists the module physical and environmental specifications.

Note A sticker is placed on the module faceplate identifying it as either a WS-X6848-SFP-2T or WS-X6848-SFP-2TXL depending on whether a WS-F6K-DFC4-A or WS-F6K-DFC4-AXL daughter card is installed on the module.

Figure 2-23 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Switching Module Front Panel

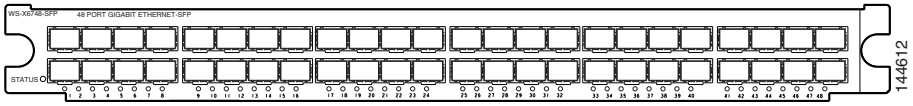


Table 2-50 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Features

Feature	Description
Ports per module	• 48 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1–47. – Bottom row, even numbered ports 2–48. • 4 port groups • Port ranges per port group: – 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 – 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 – 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47 – 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48
Port connector type	LC (optical) or RJ-45 (copper) depending on the type of SFP transceiver installed in the port.

Table 2-50 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Features (continued)

Feature	Description
Cabling distance	Depends on the SFP transceiver installed in the module port. For SFP transceivers currently supported, refer to the compatibility matrices at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html For cabling distance information, refer to the transceiver installation guides at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_installation_guides_list.html
Buffer size	Rx—166 kB per port Tx—1.17 MB per port
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	1.2:1
Supervisor engine support	• WS-X6748-SFP – Supervisor Engine 720 – Supervisor Engine 720-10GE – Supervisor Engine 2T (the module must be equipped with either a CFC daughter card, or a DFC4-A or DFC4-AXL daughter card. • WS-X6848-SFP-2T/-2TXL – Supervisor Engine 2T-10GE • WS-X6748-SFP (with DFC4A/AXL) or WS-X6848-SFP-2T/-2TXL – Supervisor Engine 6T **Note** WS-X6748-SFP modules that are upgraded with DFC4-A or DFC4-AXL daughter cards are supported only on the Supervisor Engine 2T-10GE WS-X6748-SFP modules that are upgraded with DFC4-A or DFC4-AXL daughter cards are only supported on the Supervisor Engine 6T.
Software support	• WS-X6748-SFP – With Supervisor Engine 720—12.2(17d)SXB – With Supervisor Engine 720 and DFC3C or DFC3CXL—12.2(33)SXH – With Supervisor Engine 720-10GE—12.2(33)SXH • WS-X6848-SFP-2T/-2TXL – With Supervisor Engine 2T-10GE—12.2(50)SY • WS-X6748-SFP (with DFC4A/AXL) or WS-X6848-SFP-2T/-2TXL – With Supervisor Engine 6T—15.3(1)SY or higher

Table 2-50 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Features (continued)

Feature	Description
Queues per port	• With CFC daughter card: – Tx—1p3q8t – Rx—1q8t • With DFC daughter card: – Tx—1p3q8t – Rx—2q8t
Chassis/slot restrictions	• The module is not supported in the Catalyst 6503 switch chassis. • The WS-X6748-SFP module can occupy any slot in any other Catalyst 6500 or Catalyst 6500-E chassis with the exception of the Catalyst 6513 chassis where the module must be installed only in slots 9–13. The module will not power up if it is installed in slots 1–8. • Requires that modules be installed in adjacent slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • The WS-X6748-SFP when equipped with either a CFC, or DFC4 daughter card is supported by the Supervisor Engine 2T. • The WS-X6748-SFP when equipped with DFC4 daughter card is supported by the Supervisor Engine 6T. • Module operation—The WS-X6848-SFP-2T/-2TXL operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1—Ports 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48 – Fabric channel 2—Ports 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47

Table 2-50 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Features (continued)

Feature	Description
Fabric channel speed	20 Gb/sec (dual channel, 40 Gb/sec total)
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• The WS-X6748-SFP module ships with the WS-F6700-CFC daughter card factory-installed. The module can be upgraded in the field to support dCEF with the installation of a WS-F6700-DFC3A, WS-F6700-DFC3B, WS-F6700-DFC3BXL, WS-F6700-DFC3C, WS-F6700-DFC3CXL, WS-F6K-DFC4-A, or the WS-F6K-DFC4-AXL daughter card. • The WS-X6848-SFP-2T module ships with the DFC4-A installed; the WS-X6848-TX-2TXL ships with the DFC-4AXL daughter card installed. **Note** Refer to the *Catalyst 6500 Series DFC3A, DFC3B, and DFC3BXL Installation Note* or the *Catalyst 6500 Series Distributed Forwarding Card 4 for WS-X68xx Modules Installation Note* for additional information and field upgrade procedures.
Pluggable transceivers support	SFP transceivers are supported. Refer to your software release notes to determine which SFP transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the SFP transceivers.
Digital Optical Monitoring (DOM) support	Not supported.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-51 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Physical and Environmental Specifications

Item	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	• Base module with CFC daughter card (WS-F6700-CFC) installed—9.0 lb (4.1 kg) • Base module with DFC daughter card WS-F6700-DFC installed—10.8 lb (4.5 kg) • Base module with DFC4-A or DFC4-AXL installed—10.8 lb (4.5 kg)
Power requirement (at 42 VDC)	• WS-X6748-SFP + CFC daughter card WS-X6700-CFC) – Module current—6.07 A – Module power—254.94 W – AC-input power—318.68 W – AC heat dissipation—1088.28 BTU/hour – DC-input power—342.66 W – DC heat dissipation—1170.19 BTU/hour • WS-X6748-SFP + DFC3A daughter card (WS-F6700-DFCA) – Module current—8.32 A – Module power—349.44 W – AC-input power—436.80 W – AC heat dissipation—1491.67 BTU/hour – DC-input power—469.68 W – DC heat dissipation—1603.95 BTU/hour • WS-X6748-SFP + DFC3B daughter card (WS-F6700-DFC3B) – Module current—8.02 A – Module power—336.84 W – AC-input power—421.05 W – AC heat dissipation—1437.89 BTU/hour – DC-input power—452.74 W – DC heat dissipation—1546.11 BTU/hour

Table 2-51 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• WS-X6748-SFP + DFC3BXL daughter card (WS-F6700-DFC3BXL) – Module current—8.62 A – Module power—362.04 W – AC-input power—452.55 W – AC heat dissipation—1545.46 BTU/hour – DC-input power—486.61 W – DC heat dissipation—1661.78 BTU/hour • WS-X6748-SFP + DFC3C daughter card (WS-F6700-DFC3C) – Module current—6.97 A – Module power—292.74 W – AC-input power—365.93 W – AC heat dissipation—1249.63 BTU/hour – DC-input power—393.47 W – DC heat dissipation—1343.69 BTU/hour • WS-X6748-SFP + DFC3CXL daughter card (WS-F6700-DFC3CXL) – Module current—7.67 A – Module power—322.14 W – AC-input power—402.68 W – AC heat dissipation—1375.14 BTU/hour – DC-input power—432.98 W – DC heat dissipation—1478.64 BTU/hour • WS-X6848-SFP-2T + DFC4-A daughter card – Module current—7.96 A – Module power—334.44 W – AC-input power—417.90 W – AC heat dissipation—1427.13 BTU/hour – DC-input power—449.35 W – DC heat dissipation—1534.55 BTU/hour • WS-X6848-SFP-2TXL + DFC4-AXL daughter card – Module current—8.08 A – Module power—339.44 W – AC-input power—424.20 W – AC heat dissipation—1448.64 BTU/hour – DC-input power—456.13 W – DC heat dissipation—1557.68 BTU/hour

Table 2-51 WS-X6748-SFP and WS-X6848-SFP-2T/-2TXL Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6816-GBIC

The WS-X6816-GBIC Ethernet module (Figure 2-24) provides 16 1-Gbps full- or half-duplex ports. Table 2-52 lists the module features, and Table 2-53 lists the module physical and environmental specifications.

Figure 2-24 WS-X6816-GBIC Switching Module Front Panel

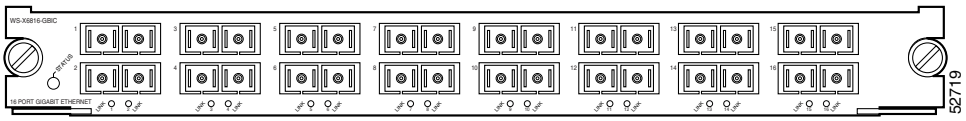


Table 2-52 WS-X6816-GBIC Ethernet Module Features

Feature	Description
Ports per module	• 16 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1 through 15. – Bottom row, even numbered ports 2 through 16. • 2 port groups • Port ranges per port group: 1–8, 9–16
Port connector type	SC (optical) or RJ-45 (copper) depending on the type of GBIC transceiver installed in the module port.
Cabling distance	Depends on the GBIC transceiver installed in the module port. Refer to Appendix B for supported GBIC transceiver types and supported cabling distances.
Buffer size	• Tx—1.17 MB per port • Rx—166 kB per port
QoS	• Number of egress queues: 3 • Number of ingress queues: 2 • Number of thresholds per egress queue: 2 • Number of thresholds per ingress queue: 4

Table 2-52 WS-X6816-GBIC Ethernet Module Features (continued)

Feature	Description
Maximum frame size	Up to 9216 bytes per frame
Module oversubscription rate	Approximately 1:1
Supervisor engine support	Supported by the following supervisor engines: • Supervisor Engine 2 (requires a Switch Fabric Module or SFM2 be installed in the switch chassis and a DFC3 daughter card installed on the WS-X6816-GBIC) • Supervisor Engine 720 (requires a DFC3A, DFC3B, or DFC3BXL daughter card be installed on the module) • Supervisor Engine 720-10GE (requires a DFC3A, DFC3B, or DFC3BXL daughter card be installed on the module)
Software support	• With Supervisor Engine 720-10GE—12.2(33)SXH • With Supervisor Engine 720—12.2(14)SX • With Supervisor Engine 2—12.2(17d)SXB • With Supervisor Engine 2—12.1(8a)E **Note** With CWDM GBIC and WS-G5483 GBIC support—12.1(13)E. With DWDM GBIC support—12.1(20)E2
Queues per port	• Tx—1p2q2t • Rx—1p1q4t **Note** Rx is 2q8t when using dCEF.
Chassis/slot restrictions	• Can occupy any slot in any Catalyst 6500 or Catalyst 6500-E chassis except for the Catalyst 6513 switch chassis. • In the Catalyst 6513 chassis, the module can occupy only slots 9–13. The module does not power up if it is installed in slots 1–8.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1—Ports 1–8 – Fabric channel 2—Ports 9–16
Fabric channel speed	8 Gb/sec
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Can be upgraded in the field to support dCEF with the installation of a DFC daughter card (WS-F6K-DFC3A, WS-F6K-DFC3B, or the WS-F6K-DFC3BXL). **Note** Refer to the *Catalyst 6500 Series DFC3A, DFC3B, and DFC3BXL Installation Note* for additional information and field upgrade procedures.
Pluggable transceivers support	GBIC transceivers are supported. Refer to your software release notes to determine which GBIC transceivers are supported. See the "1-GB Transceivers" section on page B-3 in Appendix B for additional information on the GBIC transceivers.

Table 2-52 WS-X6816-GBIC Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Supported on some GBIC transceivers. **Note** Refer to your software release notes for specific information on which GBIC transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

10-Gigabit Ethernet Modules

This section describes the following 10-Gigabit Ethernet modules:

Note All of the 10-Gigabit Ethernet modules are hot swappable.

WS-X6704-10GE Ethernet Module

The WS-X6704-10GE Ethernet module (Figure 2-25) provides 4 10-Gbps full- or half-duplex ports. Table 2-54 lists the module features, and Table 2-55 lists the module physical and environmental specifications.

Figure 2-25 WS-X6704-10GE Ethernet Module Front Panel

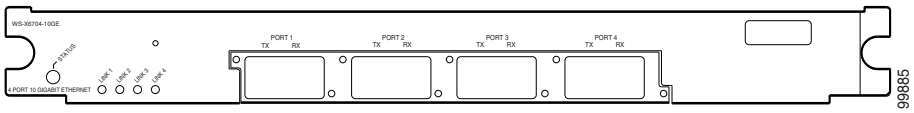


Table 2-54 WS-X6704-10GE Ethernet Module Features

Feature	Description
Ports per module	• 4 ports. Ports are numbered from 1 (left) to 4 (right). • 4 port groups • Port ranges per port group: 1 port in each group
Port connector type	SC or InfiniBand 4X depending on the type of XENPAK transceiver installed in the module.
Cabling distance	Depends on the XENPAK transceiver installed in the module port. Refer to Appendix B for supported XENPAK transceiver types and cabling distances.
Buffer size	16 MB
QoS	• Number of egress queues: 8 • Number of ingress queues: 1 (8 if DFC3x is present) • Number of thresholds per egress queue: 8 Number of thresholds per ingress queue: 8
Maximum frame size	Up to 9216 bytes
Module oversubscription rate	Approximately 1:1

Table 2-54 WS-X6704-10GE Ethernet Module Features (continued)

Feature	Description
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 720 • Supervisor Engine 720-10GE • Supervisor Engine 2T (module must be equipped with a CFC daughter card or either a DFC4-A or DFC4-AXL daughter card) • Supervisor Engine 6T (module must be equipped with either a DFC4-A or DFC4-AXL daughter card & 1G RAM)
Software support	• With Supervisor Engine 720—12.2(17a)SX • With Supervisor Engine 720 and DFC3C or DFC3CXL—12.2(33)SXH • With Supervisor Engine 720-10GE—12.2(33)SXH • With Supervisor Engine 2T (module equipped with either CFC, DFC4-A, or DFC4-AXL daughter card)—12.2(50)SY • With Supervisor Engine 6T (module equipped with either DFC4-A, or DFC4-AXL daughter card)—15.3(1)SY or higher
Queues per port	• With CFC daughter card: – Tx—1p7q8t – Rx—1q8t • With DFC daughter card: – Tx—1p7q8t – Rx—8q8t
Chassis/slot restrictions	• Not supported in the Catalyst 6503 chassis. • Supported only in slots 9–13 in the Catalyst 6513 chassis. The module does not power up if it is installed in slots 1–8. • Module operation—The WS-X6704-10GE operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Switch fabric connection	• Dual switch-fabric connections: – Fabric channel 1—Ports 3 and 4 – Fabric channel 2—Ports 1 and 2
Fabric channel speed	20 Gb/sec

Table 2-54 WS-X6704-10GE Ethernet Module Features (continued)

Feature	Description
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	Ships with the WS-F6700-CFC daughter card factory-installed. Can be upgraded in the field with a DFC daughter card (WS-F6700-DFC3A, WS-F6700-DFC3B, WS-F6700-DFC3B, WS-F6700-DFC3C, WS-F6700-DFC3CXL, WS-)F6K-DFC4-A, or WS-F6K-DFC4-AXL.
Pluggable transceivers support	XENPAK transceivers are supported. Refer to your software release notes to determine which XENPAK transceivers are supported. See the "10-GB Transceivers" section on page B-8 in Appendix B for additional information on the XENPAK transceivers.
Digital Optical Monitoring (DOM) support	Supported on some XENPAK transceivers. **Note** Refer to your software release notes for specific information on which XENPAK transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-55 WS-X6704-10GE Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	Base module + CFC daughter card (WS-F6700-CFC)—9.0 lb (4.08 kg)
Power and heat numbers	• WS-X6704-10GE (base module + CFC daughter card) – Module current—7.03 A – Module power—295.26 W – AC-input power—369.08 W – AC heat dissipation—1260.39 BTU/hour – DC-input power—396.85 W – DC heat dissipation—1355.26 BTU/hour • WS-X6704-10GE (base module + DFC3A daughter card) – Module current—9.28 A – Module power—389.76 W – AC-input power—487.20 W – AC heat dissipation—1663.79 BTU/hour – DC-input power—523.87 W – DC heat dissipation—1789.02 BTU/hour • WS-X6704-10GE (base module + DFC3B daughter card) – Module current—8.98 A – Module power—377.16 W – AC-input power—471.45 W – AC heat dissipation—1610.00 BTU/hour – DC-input power—506.94 W – DC heat dissipation—1731.18 BTU/hour • WS-X6704-10GE (base module + DFC3BXL daughter card) – Module current—9.58 A – Module power—402.36 W – AC-input power—502.95 W – AC heat dissipation—1717.57 BTU/hour – DC-input power—540.81 W – DC heat dissipation—1846.85 BTU/hour

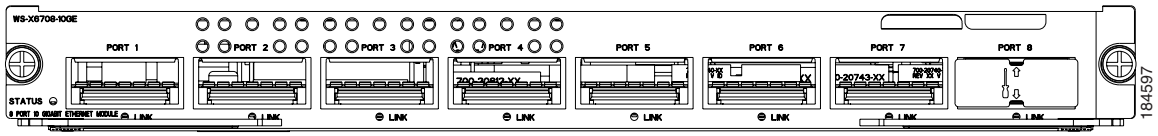
Table 2-55 WS-X6704-10GE Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers (continued)	• WS-X6704-10GE (base module + DFC3C daughter card) – Module current—7.93 A – Module power—333.06 W – AC-input power—416.33 W – AC heat dissipation—1421.75 BTU/hour – DC-input power—447.66 W – DC heat dissipation—1528.76 BTU/hour • WS-X6704-10GE (base module + DFC3CXL daughter card) – Module current—8.63 A – Module power—362.46 W – AC-input power—453.08 W – AC heat dissipation—1547.25 BTU/hour – DC-input power—487.18 W – DC heat dissipation—1663.71 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet Modules

The WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet module (Figure 2-26) provides 8 10-Gbps full- or half-duplex ports. Table 2-54 lists the module features, and Table 2-55 lists the module physical and environmental specifications.

Figure 2-26 WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet Module Front Panel



Note Both of the modules (WS-X6708-10G-3C and WS-X6708-10G-3CXL) are identified on the faceplate as WS-X6708-10GE.

Table 2-56 WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet Module Features

Feature	Description
Ports per module	• 8 ports. Ports are numbered from 1 (left) to 8 (right). • 1 port group • Port ranges per port group: 1–8
Port connector type	SC or CX4 depending on the type of X2 transceiver installed in the module port.
Cabling distance	Depends on the X2 transceiver installed in the module port. Refer to Appendix B for supported X2 transceiver types and cabling distances.
Buffer size	200 MB per port
QoS	• Number of egress queues: 8 • Number of ingress queues: 8 • Number of thresholds per egress queue: 4 • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes
Module oversubscription rate	2:1
Supervisor engine support	Supported on the following supervisor engines: • Supervisor Engine 720 • Supervisor Engine 720-10GE **Note** Check your release notes for specific information on the software release versions required to support the supervisor engines.
Software support	• With Supervisor Engine 720—12.2(18)SXF5 • With Supervisor Engine 720-10GE—12.2(33)SXH

Table 2-56 WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet Module Features (continued)

Feature	Description
Queues per port	• Tx—1p7q4t • Rx—8q4t
Chassis/slot restrictions	• Not supported in the Catalyst 6503 chassis. • Supported only in slots 9–13 in the Catalyst 6513 chassis. The module does not power up if it is installed in slots 1–8. • When the WS-X6708-10G module is installed in a Catalyst 6500-E series chassis or a Catalyst 6509-NEB-A chassis, the configuration is NEBS 3 compliant (chassis supports operating temperatures up to 55°C). • When the WS-X6708-10G module is installed in a Catalyst 6500 non-E series chassis that is equipped with a fan tray 2 and a 2500 W or larger power supply, the configuration is not NEBS 3 compliant (chassis supports operating temperatures up to 40°C only). • Support for the Catalyst 6509-NEB-A chassis requires two FAN-MOD-09 fan trays.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1: Ports 2, 3, 6, 8 – Fabric channel 2: Ports 1, 4, 5, 7
Fabric channel speed	20 Gb/sec
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• WS-X6708-10G-3C comes factory-equipped with a DFC3C daughter card. • WS-X6708-10G-3CXL comes factory-equipped with a DFC3CXL daughter card.
Pluggable transceivers support	X2 transceivers are supported. Not all types of X2 transceivers may be supported. Refer to your software release notes to determine which X2 transceivers are currently supported. See the "10-GB Transceivers" section on page B-8 in Appendix B for additional information on the X2 transceivers. **Note** The WS-6708-10GE does not support X2 transceivers shipped prior to the release of the WS-X6708-10GE with Cisco IOS Release 12.2(18)SXF5. The unsupported X2 transceivers are labeled with a number that ends with -01. This restriction does not apply to the X2-10GB-LRM transceiver.

Table 2-56 WS-X6708-10G-3C and WS-X6708-10G-3CXL Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Supported on some X2 transceivers. **Note** Refer to your software release notes for specific information on which X2 transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Modules

The WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet modules (Figure 2-27) provide 16 10-Gbps full- or half-duplex ports. Table 2-58 lists the module features, and Table 2-59 lists the module physical and environmental specifications.

Note A sticker is placed on the module faceplate identifying it as either a WS-X6816-10G-2T or WS-X6816-10G-2TXL depending on whether a WS-F6K-DFC4-E or WS-F6K-DFC4-EXL daughter card is installed on the module.

Figure 2-27 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Front Panel

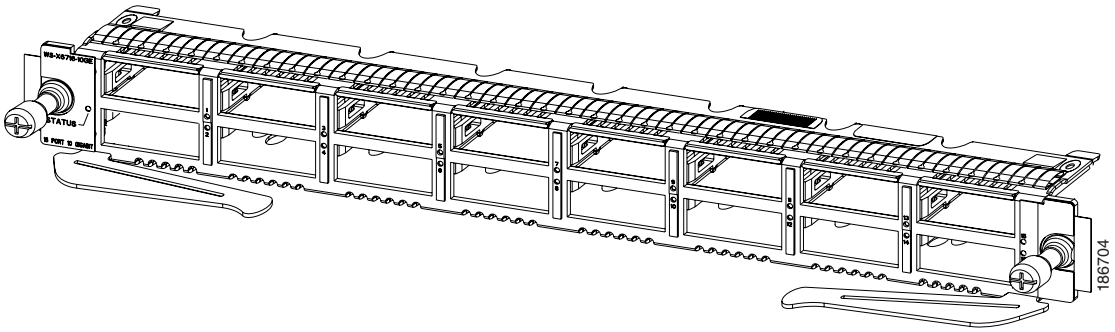


Table 2-58 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Features

Feature	Description
Ports per module	• 16 ports. Ports are numbered (left to right): – Top row, odd numbered ports 1 through 15. – Bottom row, even numbered ports 2 through 16. • 4 port groups • Port ranges per port group: 1–4, 5–8, 9–12, 13–16
Port connector type	SC or CX4 depending on the type of X2 transceiver installed in the module port.
Cabling distance	Depends on the X2 transceiver installed in the module port. For X2 transceivers currently supported, refer to the compatibility matrices at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html For cabling distance information, refer to the transceiver installation guides at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_installation_guides_list.html
Buffer size	• Oversubscription mode—90 MB per port group • Performance mode—200 MB per port

Table 2-58 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
QoS	• Number of egress queues: 8 • Number of ingress queues: 8 • Number of thresholds per egress queue: 2 per queue in oversubscription mode or 4 per queue in performance mode • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes
Module oversubscription rate	4:1
Supervisor engine support	• WS-X6716-10GE supported on the following supervisor engines: – Supervisor Engine 720 – Supervisor Engine 720-10GE – Supervisor Engine 2T (module must be upgraded with either a DFC4-E or DFC4-EXL daughter card) • WS-X6816-10G-2T/-2TXL supported on the following supervisor engines: – Supervisor Engine 2T-10GE • WS-X6716-10GE (with DFC4E/EXL) or WS-X6816-10G-2T/-2TXL – Supervisor Engine 6T
Software support	• WS-X6716-10GE – With Supervisor Engine 720—12.2(33)SXH2 – With Supervisor Engine 720-10GE—12.2(33)SXH2 – With Supervisor Engine 2T (module upgraded with DFC4-E or DFC4-EXL)—12.2(50)SY • WS-X6816-10G-2T/-2TXL – With Supervisor Engine 2T-10GE—12.2(50)SY • WS-X6716-10GE (with DFC4E/EXL) or WS-X6816-10G-2T/-2TXL – Supervisor Engine 6T – 15.3(1)SY or higher
Queues per port	• Oversubscription mode: – Tx—1p7q4t per port group – Rx—1p7q2t per port • Performance mode: – Tx—1p7q4t per port – Rx—8q4t per port

Table 2-58 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	• Not supported in the Catalyst 6503 chassis. • Supported only in slots 9–13 in the Catalyst 6513 chassis and does not power up in slots 1–8. • When the WS-X6716-10G module is installed in a Catalyst 6500 E-series chassis or a Catalyst 6509-NEB-A chassis, the configuration is NEBS 3 compliant (chassis supports operating temperatures up to 55°C). • When the WS-X6716-10G module is installed in a Catalyst 6500 non-E series chassis that is equipped with a fan tray 2 and a 2500 W or larger power supply, the configuration is not NEBS 3 compliant (chassis supports operating temperatures up to 40°C only). • Support in the Catalyst 6509-NEB-A chassis requires two FAN-MOD-09 fan trays. • Requires that modules be installed in adjacent slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • Module operation—The WS-X6816-10G-2T/-2TXL operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1: Ports 1–8 – Fabric channel 2: Ports 9–16
Fabric channel speed	20 Gb/sec (dual channel, 40 Gb/sec total)

Table 2-58 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• WS-X6716-10G-3C comes factory-equipped with a DFC3C daughter card. • WS-X6716-10G-3CXL comes factory-equipped with a DFC3CXL daughter card. • WS-X6816-10G-2T comes factory-equipped with a DFC4-E daughter card. • WS-X6816-10G-2TXL comes factory-equipped with a DFC4-EXL daughter card.
Pluggable transceivers support	X2 transceivers are supported. Not all types of X2 transceivers may be supported. For an up-to-date list of supported transceivers, refer to your transceiver compatibility matrices at the following URL. http://www.cisco.com/en/US/products/hw/modules/ps5455/products_device_support_tables_list.html See the "10-GB Transceivers" section on page B-8 in Appendix B for additional information on the X2 transceivers. **Note** WS-6716-10GE does not support X2 transceivers shipped prior to the release of the WS-X6708-10GE with Cisco IOS Release 12.2(18)SXF5. The unsupported X2 transceivers are labeled with a number that ends with -01. This restriction does not apply to the X2-10GB-LRM transceiver. **Note** Some X2 transceivers shipped prior to the WS-X6716-10GE becoming available might not provide EMI compliance with the WS-X6716-10GE. All X2 transceivers shipped since the WS-X6716-10GE became available provide EMI compliance with the WS-X6716-10GE. See the "10-GB Transceivers" section on page B-8 in Appendix B for additional information.

Table 2-58 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	Supported on some X2 transceivers. **Note** Refer to your software release notes for specific information on which X2 transceivers support DOM and the software release required for support.
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-59 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	13.6 lb (6.16 kg) (Excludes weight of X2 transceivers)
Power and heat numbers	• WS-X6716-10G-3C (base module + the DFC3C daughter card)—10.9 A – Module power—457.80 W – AC-input power—572.25 W – AC heat dissipation—1954.23 BTU/hour – DC-input power—615.32 W – DC heat dissipation—2101.33 BTU/hour • WS-X6716-10G-3CXL (base module + the DFC3CXL daughter card)—11.6 A – Module power—487.20 W – AC-input power—609.00 W – AC heat dissipation—2079.74 BTU/hour – DC-input power—654.84 W – DC heat dissipation—2236.27 BTU/hour • WS-X6816-10G-2T (base module + the DFC4-E daughter card)—11.63 A – Module power—488.46 W – AC-input power—610.58 W – AC heat dissipation—2085.11 BTU/hour – DC-input power—656.53 W – DC heat dissipation—2242.06 BTU/hour • WS-X6816-10G-2TXL (base module + the DFC4-EXL daughter card)—11.99 A – Module power—503.58 W – AC-input power—629.48 W – AC heat dissipation—2149.66 BTU/hour – DC-input power—676.85 W – DC heat dissipation—2311.46 BTU/hour

Table 2-59 WS-X6716-10GE and WS-X6816-10G-2T/-2TXL Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Modules

The WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet modules (Figure 2-28) provide 16 10-Gbps full- or half-duplex copper ports. Table 2-60 lists the module features, and Table 2-61 lists the module physical and environmental specifications.

Note A sticker is placed on the module faceplate identifying it as either a WS-X6816-10T-2T or WS-X6816-10T-2TXL depending on whether a WS-F6K-DFC4-E or WS-F6K-DFC4-EXL daughter card is installed on the module.

Figure 2-28 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Front Panel

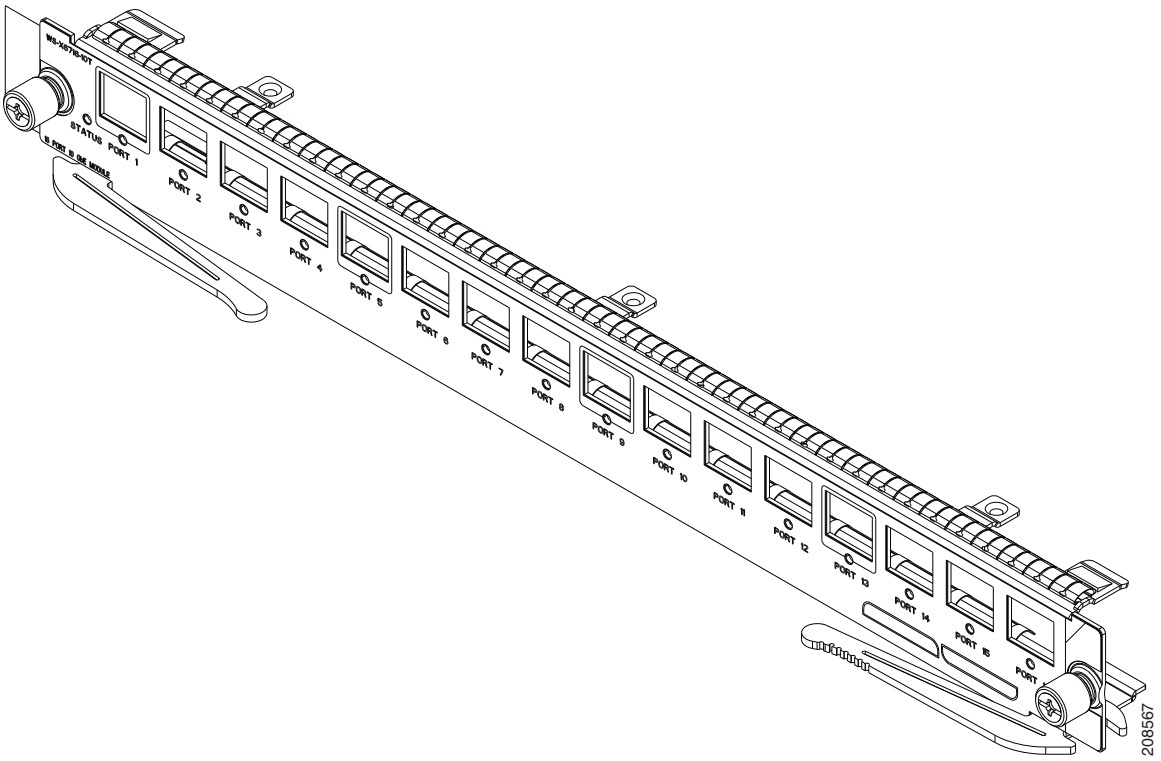


Table 2-60 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Features

Feature	Description
Ports per module	• 4 ports (Transparent mode): – Only port numbers 1, 5, 9, and 13 are used. • 16 ports (MUX mode, 4:1 oversubscription). Ports are numbered (left to right) • 4 port groups • Port ranges per port group: 1–4, 5–8, 9–12, 13–16
Port connector type	RJ-45
Cabling distance	Cat 7 cable—Up to 330 ft (100 m) Cat 6A cable—Up to 330 ft (100 m) Cat 6 cable—Up to 179 ft (55 m) Cat 5 cable—Up to 98 ft (30 m)
Buffer size	• Oversubscription mode—90 MB per port group • Performance mode—200 MB per port

Table 2-60 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
QoS	• Number of egress queues: 8 • Number of ingress queues: 8 • Number of thresholds per egress queue: 2 per queue in oversubscription mode or 4 per queue in performance mode • Number of thresholds per ingress queue: 4
Maximum frame size	Up to 9216 bytes
Module oversubscription rate	4:1
Supervisor engine support	• The WS-X6716-10T is supported on the following supervisor engines: – Supervisor Engine 720 – Supervisor Engine 720-10GE – Supervisor Engine 2T (module must be upgraded with either a DFC4-E or DFC4-EXL daughter card) • The WS-X6816-10T-2T/-2TXL is supported on the following supervisor engines – Supervisor Engine 2T • WS-X6716-10T (with DFC4E/EXL) or WS-X6816-10T-2T/-2TXL – Supervisor Engine 6T
Software support	• WS-X6716-10T – With Supervisor Engine 720—12.2(33)SXI4a or later – With Supervisor Engine 720-10GE—12.2(33)SXI4 – With Supervisor Engine 2T (module upgraded with either a DFC4-E or DFC4-EXL daughter card)—12.2(50)SY • WS-X6816-10T-2T/-2TXL – With Supervisor Engine 2T—12.2(50)SY • WS-X6716-10T (with DFC4E/EXL) or WS-X6816-10T-2T/-2TXL – Supervisor Engine 6T – 15.3(1)SY or higher
Queues per port	• Oversubscription mode: – Tx—1p7q4t per port group – Rx—1p7q2t per port • Performance mode: – Tx—1p7q4t per port – Rx—8q4t per port

Table 2-60 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	• Not supported in the Catalyst 6503 chassis or the Catalyst 6509-NEB chassis • Supported only in slots 9–13 in the Catalyst 6513 chassis and does not power up in slots 1–8. • When the WS-X6716-10T module is installed in a Catalyst 6500-E series chassis or a Catalyst 6509-NEB-A chassis, the configuration is NEBS 3 compliant (chassis supports operating temperatures up to 55°C). • When the WS-X6716-10T module is installed in a Catalyst 6500 non-E series chassis that is equipped with a fan tray 2 and a 2500 W or larger power supply, the configuration is not NEBS 3 compliant (chassis supports operating temperatures up to 40°C only). • Support in the Catalyst 6509-NEB-A chassis requires two FAN-MOD-09 fan trays be installed. • Requires that modules be installed in adjacent slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • Module operation—The WS-X6816-10T-2T/-2TXL operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	• Dual switch-fabric connections: – Fabric channel 1: Ports 1–8 – Fabric channel 2: Ports 9–16
Fabric channel speed	20 Gb/sec (40Gb/sec total)

Table 2-60 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Features (continued)

Feature	Description
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• WS-X6716-10T-3C comes factory-equipped with a DFC3C daughter card. • WS-X6716-10T-3CXL comes factory-equipped with a DFC3CXL daughter card. **Note** The WS-X6716-10T can be upgraded with the DFC4-E or DFC4-EXL daughter card to operate with the Supervisor Engine 2T. • WS-X6816 -10T-2T comes factory-equipped with a DFC4-E daughter card. • WS-X6816-10T-2TXL comes factory-equipped with a DFC4-EXL
Pluggable transceivers support	No
Digital Optical Monitoring (DOM) support	No
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected.

Table 2-61 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions	1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	17.71 lb (8.03 kg)

Table 2-61 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• WS-X6716-10T-3C (base module + the DFC3C daughter card)—11.53 A – Module power—484.26 W – AC-input power—605.33 W – AC heat dissipation—2067.18 BTU/hour – DC-input power—650.89 W – DC heat dissipation—2222.78 BTU/hour • WS-X6716-10T-3CXL (base module + the DFC3CXL daughter card)—12.23 A – Module power—513.66 W – AC-input power—642.08 W – AC heat dissipation—2192.69 BTU/hour – DC-input power—690.40 W – DC heat dissipation—2357.73 BTU/hour • WS-X6816-10T-2T (base module + the DFC4-E daughter card)—12.26 A – Module power—514.96 W – AC-input power—643.65 W – AC heat dissipation—2198.06 BTU/hour – DC-input power—692.10 W – DC heat dissipation—2363.51 BTU/hour • WS-X6816-10T-2TXL (base module + the DFC4-EXL daughter card)—12.62 A – Module power—529.96 W – AC-input power—662.55 W – AC heat dissipation—2262.61 BTU/hour – DC-input power—712.42 W – DC heat dissipation—2432.91 BTU/hour

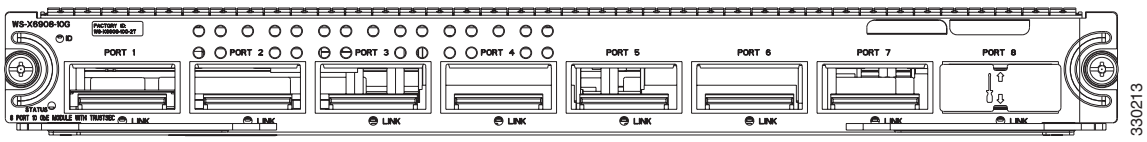
Table 2-61 WS-X6716-10T and WS-X6816-10T-2T/-2TXL Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

WS-X6908-10G Ethernet Module

The WS-X6908-10G Ethernet module (Figure 2-29) provides 8 10-Gbps full- or half-duplex copper ports. Table 2-62 lists the module features, and Table 2-63 lists the module physical and environmental specifications.

Figure 2-29 WS-X6908-10GEthernet Module Front Panel



Note The WS-X6908-10G is the product identifier on the module front panel. The two orderable product IDs for the module are WS-X6908-10G-2T (equipped with a WS-F6K-DFC4-E daughter card) and WS-X6908-10G-2TXL (equipped with WS-F6K-DFC4-EXL daughter card).

Table 2-62 WS-X6908-10G Ethernet Module Features

Feature	Description
Ports per module	• 8 ports • 1 port group • Port ranges per port group: 1–8
Port connector type	Either SC, RJ45, or InfiniBand depending on the type of X2 transceiver installed in the module port.
Cabling distance	Dependent on the type of X2 transceiver installed in the module port. For cabling distances, refer to the transceiver installation guides at the following url: http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_installation_guides_list.html
Maximum frame size	Up to 9216 bytes

Table 2-62 WS-X6908-10G Ethernet Module Features (continued)

Feature	Description
Module oversubscription rate	1:1
Supervisor engine support	• Supervisor Engine 2T-10GE • Supervisor Engine 6T
Software support	• With Supervisor Engine 2T-10GE – 12.2(50)SY or higher • With Supervisor Engine 6T – 15.3(1)SY or higher
Queues per port	• Tx—1p7q4t per port • Rx—8q4t per port
Chassis/slot restrictions	• Not supported in non E-series Catalyst 6500 switches • Requires that modules be installed in adjacent slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • Module operation—The WS-X6908-10G operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.
Fabric connection	Dual 40 Gbps switch-fabric connections • Fabric Channel 1: Ports 2, 3, 6, 8 • Fabric Channel 2: Ports 1, 4, 5, 7
Fabric channel speed	80 Gb/sec full duplex
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• Supports either the WS-F6K-DFC4-E or WS-F6K-DFC4-EXL
Pluggable transceivers support	10GBASE-X X2 transceivers

Table 2-62 WS-X6908-10G Ethernet Module Features (continued)

Feature	Description
Digital Optical Monitoring (DOM) support	No
Module front panel LEDs	**STATUS** • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. **LINK** • Green—The port is active (the link is connected and operational). • Flashing orange—The port failed diagnostics and is disabled. • Orange—The port is disabled. • Red—The module is resetting; an overtemperature condition has occurred. **Note** If the module fails to download code and configuration information successfully during the initial reset, the LED stays red; the module does not come online. • Off—The port is not active or the link is not connected. **ID** • Blinking blue—The module is being identified for attention. The LED is turned on by the user to aid servicing personnel in identifying the module. • Off—The module is not being identified.

Table 2-63 WS-X6908-10G Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions	1.73 x 14.4 x 16 in. (4.4 x 36.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	12.6 lb (5.72 kg)

Table 2-63 WS-X6908-10G Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• WS-X6908-10G-2T (base module + the DFC4-E daughter card)—14.00 A – Module power—488.0 W – AC-input power—610.05 W – AC heat dissipation—2083.32 BTU/hour – DC-input power—655.97 W – DC heat dissipation—2240.13 BTU/hour • WS-X6908-10G-2TXL (base module + the DFC4-EXL daughter card)—14.36 A – Module power—603.0 W – AC-input power—753.90 W – AC heat dissipation—2574.57 BTU/hour – DC-input power—810.65 W – DC heat dissipation—2768.35 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

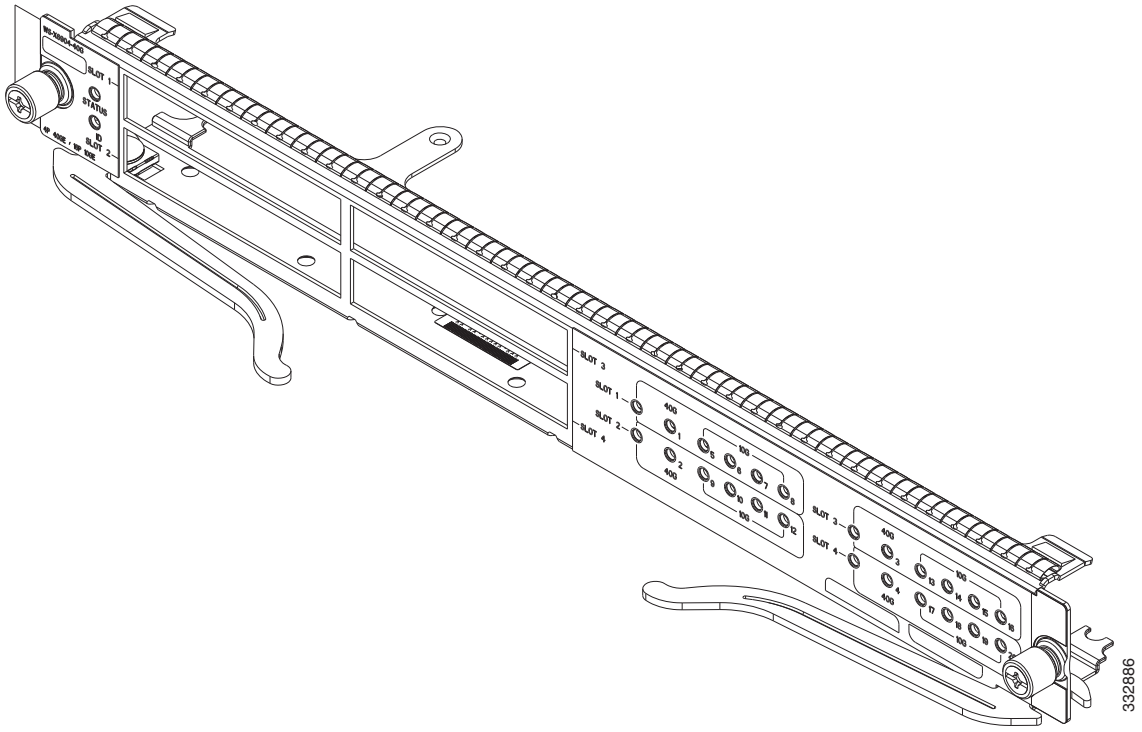
40-Gigabit Ethernet Modules

This section describes the following 40-Gigabit Ethernet modules:

WS-X6904-40G Ethernet Module

The WS-X6904-40G Ethernet module (Figure 2-30) has four optics bays that can accept four 40-Gigabit Ethernet CFP optics modules or four FourX adapters each providing four 10-Gigabit ports (using SFP+ transceivers). The ports can also be mixed between 40-Gigabit and 10-Gigabit transceivers. Table 2-64 lists the module features, and Table 2-65 lists the module physical and environmental specifications.

Figure 2-30 WS-X6904-40GEthernet Module Front Panel



Note The WS-X6904-40G is the product identifier on the module front panel. The two orderable product IDs for the module are WS-X6904-40G-2T (equipped with a WS-F6K-DFC4-E daughter card) and WS-X6904-40G-2TXL (equipped with WS-F6K-DFC4-EXL daughter card).

Table 2-64 WS-X6904-40G Ethernet Module Features

Feature	Description
Ports per module	• 4 ports—four 40-Gigabit CFP optics modules (ports 1 through 4) • 16 ports—four 10-Gigabit FourX adapters (ports 5 through 20) **Note** Each of the four optics bays on the module front panel can accept either one CFP transceiver module (one 40-Gigabit port) or a FourX converter and up to four SFP+ transceivers (four 10-Gigabit ports). The module can also support a mix of both 40-Gigabit CFP optics modules and 10-Gigabit SFP+ transceivers (two 40-Gigabit ports and 16 10-Gigabit ports).
Port connector type	• MPO/MTP connector for the 40-Gigabit CFP transceiver module. • LC connector for the 10- Gigabit SFP+ transceiver.
Cabling distance	Dependent on the type of transceiver installed. See the transceiver data sheets or the transceiver installation notes for specific information on cabling distances with the each transceiver type.
Maximum frame size	Up to 9216 bytes
Supervisor engine support	• Supervisor Engine 2T-10GE • Supervisor Engine 6T
Software support	• With Supervisor Engine 2T – 15.0(1)SY1 or higher • With Supervisor Engine 6T – 15.3(1)SY or higher
Queues per port	• 40-Gigabit Ethernet ports: – Tx—1p7q4t – Rx—1p7q4t • 10-Gigabit Ethernet ports: – Tx—1p7q4t – Rx—8q4t

Table 2-64 WS-X6904-40G Ethernet Module Features (continued)

Feature	Description
Chassis/slot restrictions	• Not supported in non E-series Catalyst 6500 switches • Supported in a WS-C6503-E chassis with a hardware revision 1.3 or higher • Requires that modules be installed in adjacent chassis slots or, if either adjacent slot is unused, you must install a switching-module filler plate (Cisco part numbers WS-X6K-SLOT-CVR-E or SLOTBLANK-09) rather than a blank slot cover (WS-X6K-SLOT-CVR) to maintain an adequate air flow through the chassis. • Module operation—The WS-X6904-40G operates only in a Cisco Catalyst 6807-XL and a Cisco Catalyst 6500 E-series chassis equipped with a Supervisor Engine 2T-10GE or Supervisor Engine 6T. • Slot restrictions—In the following switch chassis, you cannot install Ethernet modules in slots meant for supervisor engines: – In a Cisco Catalyst 6807-XL, the supervisor engine slots are 3 and 4. – In a Cisco Catalyst 6513 E-series chassis, the supervisor engine slots are 7 and 8. This restriction does not apply to any other 6500 E-series chassis.

Table 2-64 WS-X6904-40G Ethernet Module Features (continued)

Feature	Description
Fabric connection	Dual 40 Gbps switch-fabric connections • Fabric Channel 1: Ports 1 and 2 (40-Gigabit ports) or 5 through 12 (10-Gigabit ports) • Fabric Channel 2: Ports 3 and 4 (40-Gigabit ports) or 13 through 20 (10-Gigabit ports)
Fabric channel speed	80 Gb/sec full duplex
Module upgrades available	
PoE support	Not supported.
Distributed forwarding support	• Supports only the WS-F6K-DFC4-E or the WS-F6K-DFC4-EXL
Pluggable transceivers support	• Supports 40-Gigabit CFP optical modules • Supports 10-Gigabit SFP+ transceivers using FourX converters **Note** Not all 40-Gigabit CFP optical modules or SFP+ transceivers may be supported. For an up-to-date list of supported CFP optical modules and SFP+ transceivers along with software requirements, refer to either the 40-Gigabit Ethernet Transceivers Compatibility Matrix or the 10-Gigabit Ethernet Transceivers Compatibility Matrix both available on cisco.com.

Table 2-64 WS-X6904-40G Ethernet Module Features (continued)

Feature	Description
Module front panel LEDs	**STATUS** Indicates the status of the module. • Green—All diagnostics pass; the module is operational. • Orange—The module is booting or running diagnostics; an overtemperature condition has occurred. • Red—A fault has been detected in the module. • Off—The module is not powered up. **ID** • Blinking blue—The module is being identified for attention. The LED is turned on by a CLI command to aid servicing personnel in identifying the module. **SLOT 1, 2, 3, 4** Indicates the operational status of the CFP slot. • Green—Slot is occupied and operational. • Alternate flashing green and yellow—Slot is identified for customer attention. The alternate color flashing operates in conjunction with the flashing blue ID LED. • Off—Slot is empty. **LINK** Indicates the link status of each port. When operating with 40-Gigabit CFP transceiver modules, the first LINK LED under each CFP slot indicates the status of the 40-Gigabit port. When operating with 10-Gigabit SFP+ transceivers, the four grouped LEDs associated with each optical bay indicate the port status of the four SFP+ transceivers in the FourX converter. • Green—The port is active (the link is connected and operational). • Yellow—The port is disabled. • Alternate flashing green and yellow—Port is identified for customer attention. The alternate color flashing operates in conjunction with the flashing blue ID LED. • Off—The port is not active or the link is not connected.

Table 2-65 WS-X6904-40G Ethernet Module Physical and Environmental Specifications

Item	Specification
Dimensions	1.73 x 14.4 x 16 in. (4.4 x 35.6 x 40.6 cm). Occupies one slot in the chassis.
Weight	12 lb (5.4 kg) Excludes CFP optical modules. Each CFP optical module weighs 0.25 lb (0.11 kg)

Table 2-65 WS-X6904-40G Ethernet Module Physical and Environmental Specifications (continued)

Item	Specification
Power and heat numbers	• WS-X6904-40G-2T (base module + the DFC4-E daughter card)—16.67 A – Module power—700.14 W – AC-input power—875.18 W – AC heat dissipation—2988.72 BTU/hour – DC-input power—941.05 W – DC heat dissipation—3213.68 BTU/hour • WS-X6908-10G-2TXL (base module + the DFC4-EXL daughter card)—17.03 A – Module power—715.26 W – AC-input power—894.08 W – AC heat dissipation—3053.27 BTU/hour – DC-input power—961.37 W – DC heat dissipation—3283.08 BTU/hour
Environment	
Operating temperature	• Certified for operation: 32° to 104°F (0° to 40°C) • Designed and tested for operation: 32° to 130°F (0° to 55°C)
Humidity (RH) ambient (noncondensing)	10 to 90%
Operating altitude	• Certified for operation: 0 to 6500 ft (0 to 2000 m) • Designed and tested for operation: –200 to 10,000 ft (–60 to 3000 m)

For more information about the WS-X6904-40G Ethernet module, see these publications:

- 40 Gigabit Ethernet on Cisco Catalyst 6500 Series Switches: How It Works

Note Some features described in the whitepaper will be supported in future releases.

- Cisco Catalyst 6900 Series 40 Gigabit Ethernet Interface Module for Cisco Catalyst 6500 Series Switches Data Sheet