

HP Comware-Based Devices

Transceiver Modules User Guide

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Overview

This guide describes transceiver modules available on the following HP Comware-based devices:

- HP FlexFabric 12900 Switch Series
- HP 12500 Switch Series
- HP FlexFabric 12500E Switch Series
- HP FlexFabric 11900 Switch Series
- HP 10500 Switch Series
- HP 9500 Switch Series
- HP FlexFabric 7900 Switch Series
- HP 7500 Switch Series
- HP 6125 Blade Switch Series
- HP FlexFabric 5930 Switch Series
- HP 5920 Switch Series
- HP 5900 Switch Series
- HP 5830 Switch Series
- HP 5820 Switch Series
- HP 5800 Switch Series
- HP 5700 Switch Series
- HP 5500 HI Switch Series
- HP 5500 EI Switch Series
- HP 5500 SI Switch Series
- HP 5130 EI Switch Series
- HP 5120 EI Switch Series
- HP 5120 SI Switch Series
- HP 3600 v2 Switch Series
- HP 3100-48 v2 Switch
- HP 3100 v2 Switch Series
- HP 1920 Gigabit Ethernet Switch Series
- HP 1910 Gigabit Ethernet Switch Series
- HP 1910 Fast Ethernet Switch Series
- HP 8800 Router Series
- HP 6600 Router Series
- HP HSR6600 Router Series
- HP HSR6800 Router Series
- HP MSR1002-4 Router
- HP MSR2004-24 Router

- HP MSR3000 Router Series
- HP MSR4000 Router Series (with SPU-200 / SPU-300)
- HP MSR30-40 / MSR30-60 Routers
- HP MSR50 Router Series
- HP F5000 Firewall
- HP F5000-S VPN Firewall Appliance
- HP F5000-C VPN Firewall Appliance
- HP F1000-E VPN Firewall Appliance
- HP F1000-S-EI VPN Firewall Appliance
- HP F1000-A-EI VPN Firewall Appliance
- HP U200-A Unified Threat Management Appliance
- HP 7500 VPN Firewall Module
- HP 9500 VPN Firewall Module
- HP 12500 VPN Firewall Module
- HP 6600 VPN Firewall Module
- HP 8800 VPN Firewall Module
- HP 10500/11900/7500 20Gbps VPN FW Module
- HP 12500 20Gbps VPN Firewall Module
- HP 12900 40Gbps VPN Firewall Module
- HP 7500 NetStream Monitoring Module
- HP 9500 NetStream Monitoring Module
- HP 12500 NetStream Monitoring Module
- HP 7500 Load Balancing Module
- HP 9500 Load Balancing Module
- HP 12500 Load Balancing Module
- HP 8800 Load Balancing Module
- HP 830 8-Port PoE+ Unified Wired-WLAN Switch
- HP 830 24-Port PoE+ Unified Wired-WLAN Switch
- HP 850 Unified Wired-WLAN Appliance
- HP 870 Unified Wired-WLAN Appliance

Types of transceiver modules

Table 1 Types of transceiver modules

Transceiver module type	Connector type
Small form-factor pluggable (SFP) module (transceiver)	100-Megabit SFP fiber transceiver module
	622-Megabit SFP fiber transceiver module
	Gigabit SFP fiber transceiver module
	2.5-Gigabit SFP fiber transceiver module

Transceiver module type		Connector type
	100-Megabit bi-direction (BIDI) fiber transceiver module	LC
	Gigabit BIDI fiber transceiver module	
	Gigabit coarse wavelength division multiplexing (CWDM) fiber transceiver module	LC
	Gigabit SFP copper transceiver module	RJ-45
	Gigabit SFP cable (for interconnecting devices)	N/A
SFP+ module (transceiver)	10-Gigabit SFP+ fiber transceiver module	LC
	10-Gigabit SFP+ cable (for interconnecting devices)	N/A
10-Gigabit small form-factor pluggable (XFP) module (transceiver)		LC
10-Gigabit CX4 cable (for interconnecting devices)		N/A
QSFP+ module (transceiver)	40-Gigabit QSFP+ fiber transceiver module	MPO/LC
	40-Gigabit QSFP+ cable (for interconnecting QSFP+ ports)	N/A
	QSFP+ to SFP+ cable (for connecting one 40-Gigabit QSFP+ port to four 10-Gigabit SFP+ ports)	N/A
CFP module (transceiver)	40-Gigabit/100-Gigabit CFP fiber transceiver module	LC
CXP module (transceiver)	100-Gigabit CXP fiber transceiver module	MPO
	100-Gigabit CXP AOC	N/A

NOTE:

- The available transceiver modules vary by HP Comware-based device models and are subject to change over time. For the most up-to-date list of transceiver modules, contact your HP sales representative or technical support engineer.
- For information about the transceiver modules available for each HP Comware-based device model, see the installation guides.

Fiber transceiver modules

Fiber modules transmit signals over optical fibers. Optical transmission features low loss and is fit for long distance transmission.

The HP Comware-based devices support fiber transceiver module models of different specifications. You can choose fiber transceiver modules as needed for data transmission over optical fibers.

The fiber transceiver modules include optical transmitters, optical receivers, transceivers, and transponders.

The HP Comware-based devices support transceivers. Transceivers are mainly used for optical-to-electrical and electrical-to-optical conversions and provide the following functions: optical

power control, modulation transmission, signal probe, IV conversion, and limiting amplifier and decision regeneration. In addition, transceivers provide some other functions, such as counterfeit-prevention query and TX-disable. Common transceivers include XFP, SFP, SFP+, and QSFP+.

Data rate

Data rate is the number of bits transmitted per second. The unit of measure for data rate is Megabits per second (Mbps) or Gigabits per second (Gbps). Fiber transceiver modules available for HP Comware-based devices mainly provide the following levels of data rates: 100 Mbps, 155 Mbps, 622 Mbps, 1000 Mbps, 2.5 Gbps, 10 Gbps, 40 Gbps, and 100 Gbps.

Transmission distance

The transmission distance of fiber transceiver modules is divided into short and long-range types. A distance of 2 km (1.24 miles) and below is generally considered as short-range type. 10 km (6.21 miles) is considered as long-range type.

Transmission distances provided by fiber transceiver modules are mainly limited by certain loss and dispersion suffered during the transmission of fiber signals over fibers.

- Loss is the optical energy loss due to the absorption, dispersion and leakage over the media when light travels through optical fibers. This loss increases in direct ratio to transmission distance.
- Dispersion happens mainly because electromagnetic waves of different wavelengths travel at different rates over the same medium, causing different wave components of optical signals to reach the receiving end early or late as the transmission distance increases, which in turn causes impulse broadening, making the signal values indistinguishable.

To meet different transmission distance requirements, choose suitable fiber transceiver modules according to actual networking conditions.

Central wavelength

Central wavelength represents the wave band used for optical signal transmission. The following central wavelengths are available for common fiber transceiver modules: 850 nm, 1310 nm, and 1550 nm, respectively representing three wavebands.

- The 850 nm wave band is used for short-reach transmission.
- The 1310 nm and 1550 nm wave bands are used for middle-reach and long-haul transmissions.

Fiber

Fiber types

Fibers are classified as multimode fibers and single-mode fibers.

- Multimode fibers

Multimode fibers (MMFs) have thicker fiber cores and can transport light in multiple modes. However, the intermodal dispersion is greater and worsens as the transmission distance increases.

Multimode fibers can be classified into multiple grades according to their diameters and modal bandwidth. For more information, see [Table 2](#). The modal bandwidth of a multimode fiber is determined by the expression *the modulation frequency of the maximum modulation frequency*

pulse that can pass a fiber \times the fiber length. The modal bandwidth is a comprehensive index reflecting the optical characteristics of a multimode fiber.

International Telecommunication Union (ITU) defines multimode fiber types in its G series standards. The commonly-used multimode fiber is defined in the ITU G.651 standard. The G.651-compliant fiber transmits light at the wavelength range 800 nm to 900 nm or 1200 nm to 1350 nm.

Table 2 Multimode fiber grades

Fiber mode	Fiber grade	Fiber diameter (μm)	Modal bandwidth at 850 nm (MHz*km)
Multimode fiber	OM1	62.5/125	200
	OM2	50/125	500
	OM3	50/125	2000

Other factors that influence the transmission distance of multimode fibers include interface type, central wavelength, and fiber grade. For more information, see [Table 3](#).

Table 3 Multimode fiber specifications

Interface type	Central wavelength (nm)	Fiber grade	Transmission distance
1000BASE-SX	850	OM1	< 275 m (902.23 ft)
		OM2	< 550 m (1804.46 ft)
10GBASE-SR	850	OM1	< 33 m (108.27 ft)
		OM2	< 82 m (269.03 ft)
		OM3	< 300 m (984.25 ft)
10GBASE-LRM	1310	OM1	< 220 m (721.78 ft)
		OM2	< 220 m (721.78 ft)
		OM3	< 220 m (721.78 ft)

- Single-mode fibers

Single-mode fibers (SMFs) have a small core size, typically 9 μm or 10 μm , and can transmit light in only one mode. Single-mode fibers suffer little intermodal dispersion and are suitable for long-haul communication. Single-mode fibers transmit light at the central wavelength of 1310 nm or 1550 nm.

Telecommunication Industries Alliance (TIA)/Electronic Industries Alliance (EIA) defines that single-mode fibers use yellow outer jackets with the mark "SM".

ITU defines single-mode fiber types in its G series standards. The mostly-commonly used single-mode fibers are defined in ITU G.652 and G.655 standards. [Table 4](#) describes features of the G.652 and G.655-compliant fibers.

Table 4 Features of G.652 and G.655-compliant fibers

Single-mode fiber type	Wavelength (nm)	Features	Applications
G.652-compliant fiber (standard single-mode fiber)	<ul style="list-style-type: none">• 1260 to 1360• 1530 to 1565	Zero dispersion at 1310 nm.	Connecting transceiver modules with a central wavelength of 1310 nm or 1550 nm.
G.655-compliant fiber (non-zero dispersion shifted fiber)	1530 to 1565	Near-zero dispersion around 1550 nm.	For 1550-nm wavelength-division multiplexing (WDM) transmissions.

Fiber diameter

Fiber diameter is expressed as core diameter/cladding diameter, in μm . For example, 9/125 μm means the fiber core diameter is 9 μm and the fiber cladding diameter is 125 μm .

For the HP Comware-based devices, the following fiber diameters are recommended:

- **G.652 standard single-mode fiber**—9/125 μm .
- **G.655 single-mode fiber**—9/125 μm .
- **G.651 standard multimode fiber**—50/125 μm or 62.5/125 μm .

Connector

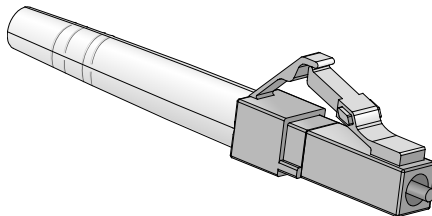
CAUTION:

Cover the connector with a dust cap when it is not connected to any optical fibers.

Connectors connect transceiver modules to the corresponding transmission media. The transceiver modules available for the HP Comware-based devices use the following types of connectors:

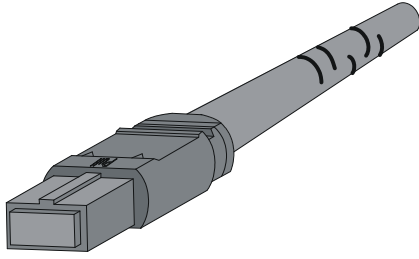
- Lucent connector or local connector (LC).

Figure 1 LC connector



- Multi-fiber Push On connector (MPO).

Figure 2 MPO connector



HP transceiver modules use only female MPO connectors, which have guide holes in the end face.

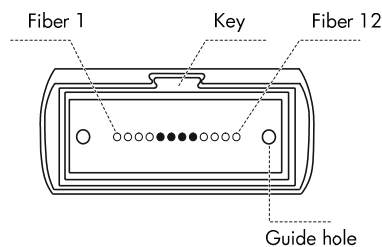
MPO connectors are classified as the following types based on the polish type:

- **Physical contact (PC)**—End face polished flat.
- **Angle-polished contact (APC)**—End face polished with an angle, typically 8°.

MPO connectors are available with 12 fibers or 24 fibers:

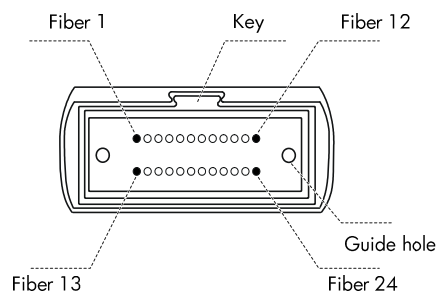
- 12-fiber MPO connector

Figure 3 End face of a 12-fiber connector



- 24-fiber MPO connector

Figure 4 End face of a 24-fiber connector



Optical parameters

This guide provides average transmit and receive power ranges for transceiver modules.

Transmit power

Transmit power is the power at which the transmitter of a fiber transceiver module transmits optical signals, in dBm.

Receive power

Receive power is the power at which the receiver of a fiber transceiver module receives optical signals, in dBm.

Copper transceiver modules

Copper transceiver modules transmit signals over Category-5 unshielded twisted pair (UTP). UTP transmission cover shorter distances than fiber transmission and can be used in small-sized networks only.

The HP Comware-based devices support the HP X120 1G SFP RJ45 T Transceiver (JD089B) copper transceiver modules.

Transmission distance

Through UTP cables, signals can be transmitted over a distance of 100 m (328.08 ft.) only. This is because signals attenuate during transmission through the UTP cables.

Attenuation refers to the dissipation of the power of a transmitted signal as it travels over a cable. Attenuation occurs because signal transmission suffers certain resistance from the cable, which weakens the signals as they travel over the cable. When signals are transmitted over a very long distance, signal strength decreases significantly, causing the signal-to-noise ratio to drop below the accepted level. This makes it impossible to distinguish between signals and noise, resulting in decision errors.

When signals are to be transmitted over a short distance, use copper transceiver modules only.

Connector

Registered Jack-45 (RJ-45) twisted pair connectors are used as connectors for copper transceiver modules.

Figure 5 RJ-45 connector

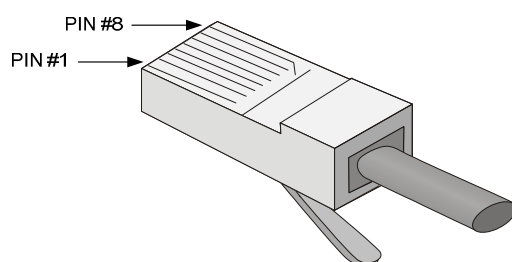


Table 5 RJ-45 GE connector pin assignment

Pin	Signal	Function
1	MX_0+	Data transmit/receive
2	MX_0-	Data transmit/receive
3	MX_1+	Data transmit/receive
4	MX_2+	Data transmit/receive

Pin	Signal	Function
5	MX_2-	Data transmit/receive
6	MX_1-	Data transmit/receive
7	MX_3+	Data transmit/receive
8	MX_3-	Data transmit/receive

SFP modules

100-Megabit SFP fiber transceiver module

Figure 6 100-Megabit/622-Megabit/Gigabit/2.5-Gigabit SFP fiber transceiver module



Models and specifications

100-Megabit SFP fiber transceiver modules use LC connectors.

Table 6 Specifications for 100-Megabit SFP fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)	Data rate (Mbps)	Fiber mode	Fiber diameter (μm)	Transmission distance
JD102B	HP X115 100M SFP LC FX Transceiver	1310	155	MMF	50/125 62.5/125	2 km (1.24 miles)
JF833A	HP X110 100M SFP LC FX Transceiver	1310	125	MMF	50/125 62.5/125	2 km (1.24 miles)
JF832A	HP X120 100M/1G SFP LC LX Transceiver	1310	125	SMF	9/125	10 km (6.21 miles)
JD120B	HP X110 100M SFP LC LX Transceiver	1310	155	SMF	9/125	15 km (9.32 miles)
JD090A	HP X110 100M SFP LC LH40 Transceiver	1310	155	SMF	9/125	40 km (24.86 miles)
JD091A	HP X110 100M SFP LC LH80 Transceiver	1550	155	SMF	9/125	80 km (49.71 miles)

Table 7 Specifications for 100-Megabit SFP fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD102B	HP X115 100M SFP LC FX Transceiver	-19 to -14	-30 to -14

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JF833A	HP X110 100M SFP LC FX Transceiver	-20 to -14	-31.5 to -8
JF832A	HP X120 100M/1G SFP LC LX Transceiver	-15 to -8	-28 to -8
JD120B	HP X110 100M SFP LC LX Transceiver	-15 to -8	-28 to -7
JD090A	HP X110 100M SFP LC LH40 Transceiver	-5 to 0	-34 to -9
JD091A	HP X110 100M SFP LC LH80 Transceiver	-5 to 0	-34 to -10

622-Megabit SFP fiber transceiver module

See [Figure 6](#) for a view of the 622-Megabit SFP fiber transceiver module.

Models and specifications

622-Megabit SFP fiber transceiver modules use LC connectors.

Table 8 Specifications for 622-Megabit SFP fiber transceiver modules (1)

Product code	Name	Central wavelen gth (nm)	Fiber mode	Fiber diameter (μm)	Transmission distance
JF829A	HP X120 622M SFP LC LX 15km Transceiver	1310	SMF	9/125	15 km (9.32 miles)
JF830A	HP X120 622M SFP LC LH 40km 1310 Transceiver	1310	SMF	9/125	40 km (24.86 miles)
JF831A	HP X120 622M SFP LC LH 80km 1550 Transceiver	1550	SMF	9/125	80 km (49.71 miles)

Table 9 Specifications for 622-Megabit SFP fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JF829A	HP X120 622M SFP LC LX 15km Transceiver	-15 to -8	-28 to -8
JF830A	HP X120 622M SFP LC LH 40km 1310 Transceiver	-3 to +2	-28 to -8

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JF831A	HP X120 622M SFP LC LH 80km 1550 Transceiver	-3 to +2	-28 to -8

Gigabit SFP fiber transceiver module

See [Figure 6](#) for a view of the Gigabit SFP fiber transceiver module.

Models and specifications

Gigabit SFP fiber transceiver modules provide a transmission rate of 1250 Mbps and use LC connectors.

Table 10 Specifications for Gigabit SFP fiber transceiver modules (1)

Product code	Name	Central wavelen gth (nm)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Transmission distance
JD118B	HP X120 1G SFP LC SX Transceiver	850	MMF	50/125	500	550 m (1804.46 ft)
					400	500 m (1640.42 ft)
				62.5/125	200	275 m (902.23 ft)
					160	220 m (721.78 ft)
JD119B	HP X120 1G SFP LC LX Transceiver	1310	SMF	9/125	N/A	10 km (6.21 miles)
			MMF	50/125	500 or 400	550 m (1804.46 ft)
			MMF	62.5/125	500	550 m (1804.46 ft)
JF832A	HP X120 100M/1G SFP LC LX Transceiver	1310	SMF	9/125	N/A	10 km (6.21 miles)
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	1310	SMF	9/125	N/A	40 km (24.86 miles)
JD062A	HP X120 1G SFP LC LH40 1550nm Transceiver	1550	SMF	9/125	N/A	40 km (24.86 miles)
JD063B	HP X125 1G SFP LC LH70 Transceiver	1550	SMF	9/125	N/A	70 km (43.5 miles)
JD103A	HP X120 1G SFP LC LH100 Transceiver	1550	SMF	9/125	N/A	100 km (62.14 miles)

Table 11 Specifications for Gigabit SFP fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD118B	HP X120 1G SFP LC SX Transceiver	-9.5 to 0	-17 to 0

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD119B	HP X120 1G SFP LC LX Transceiver	−9.5 to −3	−20 to −3
JF832A	HP X120 100M/1G SFP LC LX Transceiver	−9.5 to −3	−22 to −3
JD061A	HP X125 1G SFP LC LH40 1310nm Transceiver	−5 to +5	−22 to −3
JD062A	HP X120 1G SFP LC LH40 1550nm Transceiver	−4 to +1	−21 to −3
JD063B	HP X125 1G SFP LC LH70 Transceiver	−4 to +5	−22 to −3
JD103A	HP X120 1G SFP LC LH100 Transceiver	0 to +5	−30 to −9

2.5-Gigabit SFP fiber transceiver module

See [Figure 6](#) for a view of the 2.5-Gigabit SFP fiber transceiver module.

Models and specifications

2.5-Gigabit SFP fiber transceiver modules use LC connectors.

Table 12 Specifications for 2.5-Gigabit SFP fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)	Fiber mode	Fiber diameter (μm)	Transmission distance
JD084A	HP X160 2.5G SFP LC 2km Transceiver	1310	SMF	9/125	2 km (1.24 miles)
JD085A	HP X160 2.5G SFP LC 15km Transceiver	1310	SMF	9/125	15 km (9.32 miles)
JD086A	HP X160 2.5G SFP LC 40km Transceiver	1310	SMF	9/125	40 km (24.86 miles)
JD087A	HP X160 2.5G SFP LC 80km Transceiver	1550	SMF	9/125	80 km (49.71 miles)

Table 13 Specifications for 2.5-Gigabit SFP fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD084A	HP X160 2.5G SFP LC 2km Transceiver	−10 to −3	−18 to −3
JD085A	HP X160 2.5G SFP LC 15km Transceiver	−5 to 0	−18 to 0

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD086A	HP X160 2.5G SFP LC 40km Transceiver	-2 to +3	-27 to -9
JD087A	HP X160 2.5G SFP LC 80km Transceiver	-20 to -14	-31 to -12

100-Megabit BIDI fiber transceiver module

Figure 7 100-Megabit/Gigabit BIDI fiber transceiver module



Models and specifications

100-Megabit BIDI fiber transceiver modules provide a transmission rate of 155 Mbps and use LC connectors.

Table 14 Specifications for 100-Megabit BIDI fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)		Fiber mode	Fiber diameter (μm)	Transmission distance
		Transmitting end (TX)	Receiving end (RX)			
JD100A	HP X110 100M SFP LC BX 10-U Transceiver	1310	1550	SMF	9/125	15 km (9.32 miles)
JD101A	HP X110 100M SFP LC BX 10-D Transceiver	1550	1310			

Table 15 Specifications for 100-Megabit BIDI transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD100A	HP X110 100M SFP LC BX 10-U Transceiver	-15 to -8	-31 to -3
JD101A	HP X110 100M SFP LC BX 10-D Transceiver		

NOTE:

- BIDI fiber transceiver modules use different central wavelengths in transmit and receive directions to implement bidirectional transmission of fiber signals over the same fiber.
- You must use the HP X115 100M SFP LC BX 10-U Transceiver (JD100A) and HP X115 100M SFP LC BX 10-D Transceiver (JD101A) in pairs.

Gigabit BIDI fiber transceiver module

See [Figure 7](#) for a view of the Gigabit BIDI fiber transceiver module.

Models and specifications

Gigabit BIDI fiber transceiver modules provide a transmission rate of 1250 Mbps and use LC connectors.

Table 16 Specifications for Gigabit BIDI fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)		Fiber mode	Fiber diameter (μm)	Transmission distance
		Transmitting end (TX)	Receiving end (RX)			
JD098B	HP X120 1G SFP LC BX 10-U Transceiver	1310	1490	SMF	9/125	10 km (6.21 miles)
JD099B	HP X120 1G SFP LC BX 10-D Transceiver	1490	1310			

Table 17 Specifications for Gigabit BIDI transceiver modules (2)

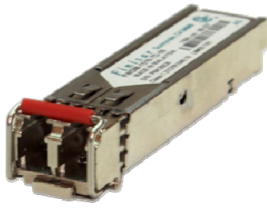
Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD098B	HP X120 1G SFP LC BX 10-U Transceiver	-9 to -3	-18.7 to -3
JD099B	HP X120 1G SFP LC BX 10-D Transceiver		

NOTE:

- BIDI fiber transceiver modules use different central wavelengths in transmit and receive directions, in order to implement bidirectional transmission of fiber signals over the same fiber.
- You must use the HP X120 1G SFP LC BX 10-U Transceiver (JD098B) and HP X120 1G SFP LC BX 10-D Transceiver (JD099B) in pairs.

Gigabit CWDM fiber transceiver module

Figure 8 Gigabit CWDM fiber transceiver module



Models and specifications

Gigabit CWDM fiber transceiver modules provide a transmission rate of 1250 Mbps and use LC connectors.

Table 18 Specifications for Gigabit CWDM fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)	Fiber mode	Fiber diameter (μm)	Transmission distance
JD113A	HP X170 1G SFP LC LH70 1470 Transceiver	1470	SMF	9/125	70 km (43.5 miles)
JD114A	HP X170 1G SFP LC LH70 1490 Transceiver	1490			
JD115A	HP X170 1G SFP LC LH70 1510 Transceiver	1510			
JD116A	HP X170 1G SFP LC LH70 1530 Transceiver	1530			
JD109A	HP X170 1G SFP LC LH70 1550 Transceiver	1550			
JD110A	HP X170 1G SFP LC LH70 1570 Transceiver	1570			
JD111A	HP X170 1G SFP LC LH70 1590 Transceiver	1590			
JD112A	HP X170 1G SFP LC LH70 1610 Transceiver	1610			

Table 19 Specifications for Gigabit CWDM fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD113A	HP X170 1G SFP LC LH70 1470 Transceiver	0 to +5	-23 to -3
JD114A	HP X170 1G SFP LC LH70 1490 Transceiver		
JD115A	HP X170 1G SFP LC LH70 1510 Transceiver		
JD116A	HP X170 1G SFP LC LH70 1530 Transceiver		
JD109A	HP X170 1G SFP LC LH70 1550 Transceiver		

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD110A	HP X170 1G SFP LC LH70 1570 Transceiver		
JD111A	HP X170 1G SFP LC LH70 1590 Transceiver		
JD112A	HP X170 1G SFP LC LH70 1610 Transceiver		

NOTE:

Gigabit CWDM fiber transceiver modules adopt the CWDM technology that uses wavelength division multiplexers to multiplex optical signals with different wavelengths for transmission over a single optical fiber, thereby saving optical fiber resources. The receiving end uses a wavelength division demultiplexer to demultiplex the multiplexed optical signals.

Gigabit SFP copper transceiver module

Figure 9 Gigabit SFP copper transceiver module



Models and specifications

Table 20 Specifications for SFP copper transceiver modules

Product code	Name	Transmission distance	Data rate	Cable type	Connector type
JD089B	HP X120 1G SFP RJ45 T Transceiver	100 m (328.08 ft)	1250 Mbps	UTP/STP	RJ-45

Gigabit SFP cable

Figure 10 Gigabit SFP cable



Models and specifications

Table 21 Specifications for Gigabit SFP cables

Product code	Name	Cable length	Data rate	Cable type
JD324B	HP A3600 Switch SFP Stacking Kit	1.5 m (4.92 ft)	1250 Mbps	UTP/STP

SFP+ modules

10-Gigabit SFP+ fiber transceiver module

Figure 11 10-Gigabit SFP+ fiber transceiver module



Models and specifications

10-Gigabit SFP+ fiber transceiver modules provide a transmission rate of 10.31 Gbps and use LC connectors.

Table 22 Specifications for 10-Gigabit SFP+ fiber transceiver modules (1)

Product code	Name	Central wavelen gth (nm)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Transmission distance
JD092B	HP X130 10G SFP+ LC SR Transceiver	850	MMF	50/125	2000	300 m (984.25 ft)
					500	82 m (269.03 ft)
					400	66 m (216.54 ft)
				62.5/125	200	33 m (108.27 ft)
					160	26 m (85.30 ft)
					1500	220 m (721.78 ft)
JD093B	HP X130 10G SFP+ LC LRM Transceiver	1310	MMF	50/125	500	220 m (721.78 ft)
					400	100 m (328.08 ft)
					200	220 m (721.78 ft)
				62.5/125	160	220 m (721.78 ft)
					1500	220 m (721.78 ft)
JD094B	HP X130 10G SFP+ LC LR Transceiver	1310	SMF	9/125	N/A	10 km (6.21 miles)
JG234A	HP X130 10G SFP+ LC ER 40km Transceiver	1550	SMF	9/125	N/A	40 km (24.86 miles)
JG915A	HP X130 10G SFP+ LC LH 80km Transceiver	1550	SMF	9/125	N/A	80 km (49.71 miles)

Product code	Name	Central wavelen gth (nm)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Transmission distance
JG879A	HP X190 8G/4G/2G SFP+ LC Short Wave Transceiver	850	MMF	62.5/125	200	150m (492.13 ft)
				50/125	500	380m (1246.72 ft)
					2000	500m (1640.42 ft)
JG880A	HP X190 8G/4G/2G SFP+ LC Long Wave Transceiver	1310	SMF	9/125	N/A	10km (6.21 miles)
JG990A	HP X180 10G SFP+ LC LH 80km 1538.19nm DWDM Transceiver	1538.19	SMF	9/125	N/A	80 km (49.71 miles)
JG991A	HP X180 10G SFP+ LC LH 80km 1537.40nm DWDM Transceiver	1537.40	SMF	9/125	N/A	80 km (49.71 miles)
JG992A	HP X180 10G SFP+ LC LH 80km 1539.77nm DWDM Transceiver	1539.77	SMF	9/125	N/A	80 km (49.71 miles)

Table 23 Specifications for 10-Gigabit SFP+ fiber transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD092B	HP X130 10G SFP+ LC SR Transceiver	-7.3 to -1	-9.9 to +0.5
JD093B	HP X130 10G SFP+ LC LRM Transceiver	-6.5 to +0.5	-6.5 to +1.5
JD094B	HP X130 10G SFP+ LC LR Transceiver	-8.2 to +0.5	-14.4 to +0.5
JG234A	HP X130 10G SFP+ LC ER 40km Transceiver	-4.7 to +4	-15.8 to -1
JG915A	HP X130 10G SFP+ LC LH 80km Transceiver	0 to +4	-24 to -7
JG879A	HP X190 8G/4G/2G SFP+ LC Short Wave Transceiver	-10 to 0 (2.125Gbps)	-13.1 to 0 (2.125Gbps)
		-9 to 0 (4.25Gbps)	-12.1 to 0 (4.25Gbps)
		-8.2 to 0 (8.5Gbps)	-11.2 to 0 (8.5Gbps)
JG880A	HP X190 8G/4G/2G SFP+ LC Long Wave Transceiver	-9.5 to -3 (2.125Gbps)	-18.2 to -3 (2.125Gbps)
		-8.4 to -1 (4.25Gbps)	-15.4 to -1 (4.25Gbps)
		-8.4 to +0.5 (8.5Gbps)	-13.8 to +0.5 (8.5Gbps)

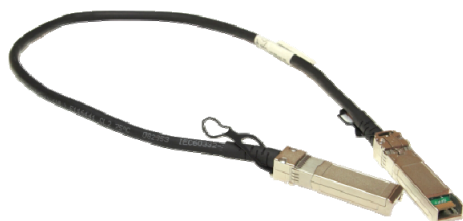
Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JG990A	HP X180 10G SFP+ LC LH 80km 1538.19nm DWDM Transceiver	0 to +4	–23 to –1
JG991A	HP X180 10G SFP+ LC LH 80km 1537.40nm DWDM Transceiver	0 to +4	–23 to –1
JG992A	HP X180 10G SFP+ LC LH 80km 1539.77nm DWDM Transceiver	0 to +4	–23 to –1

NOTE:

A mode conditioning patch cord is required when you use OM1 or OM2 fiber types on an HP X130 10G SFP+ LC LRM Transceiver (JD093B). Never use mode conditioning patch cords for OM3 fiber types. For more information about mode conditioning patch cords, see related parts in the IEEE 802.3 standard.

10-Gigabit SFP+ cable

Figure 12 10-Gigabit SFP+ cable



Models and specifications

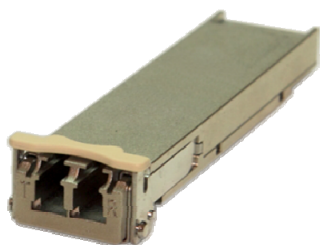
Table 24 Specifications for 10-Gigabit SFP+ cables

Product code	Name	Cable length	Data rate	Type
JD095C	HP X240 10G SFP+ SFP+ 0.65m DA Cable	0.65 m (2.13 ft)		
JD096B	HP X240 10G SFP+ SFP+ 1.2m DA Cable	1.2 m (3.94 ft)		
JD096C	HP X240 10G SFP+ SFP+ 1.2m DA Cable	1.2 m (3.94 ft)	10.31 Gbps	SFP+ cable
JD097B	HP X240 10G SFP+ SFP+ 3m DA Cable	3 m (9.84 ft)		
JD097C	HP X240 10G SFP+ SFP+ 3m DA Cable	3 m (9.84 ft)		

Product code	Name	Cable length	Data rate	Type
JG081C	HP X240 10G SFP+ SFP+ 5m DA Cable	5 m (16.40 ft)		
JC784C	HP X240 10G SFP+ SFP+ 7m Direct Attach Copper Cable	7 m (22.97 ft)		

XFP transceiver modules

Figure 13 XFP transceiver module



Models and specifications

10-Gigabit XFP fiber transceiver modules use LC connectors.

Table 25 Specifications for XFP transceiver modules (1)

Product code	Name	Central wavelength (nm)	Data rate (Gbps)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Maximum transmission distance
JD117B	HP X130 10G XFP LC SR Transceiver	850	10.31	MMF	50/125	2000	300 m (984.25 ft)
						500	82 m (269.03 ft)
						400	66 m (216.54 ft)
					62.5/125	200	33 m (108.27 ft)
						160	26 m (85.30 ft)
JD108B	HP X130 10G XFP LC LR 1310nm Transceiver	1310	10.31	SMF	9/125	N/A	10 km (6.21 miles)
JD088A	HP X130 10G POS XFP LC LR Transceiver	1310	9.95 to 11.3	SMF	9/125	N/A	10 km (6.21 miles)
JD121A	HP X135 10G XFP LC ER Transceiver	1550	9.95 to 10.7	SMF	9/125	N/A	40 km (24.86 miles)
JD107A	HP X130 10G XFP LC ZR 1550nm Transceiver	1550	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG226A	HP X180 10G XFP LC LH 80km 1538.98nm DWDM Transceiver	1538.98	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)

Product code	Name	Central wavelen gth (nm)	Data rate (Gbps)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Maximum transmission distance
JG227A	HP X180 10G XFP LC LH 80km 1539.77nm DWDM Transceiver	1539.77	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG228A	HP X180 10G XFP LC LH 80km 1540.56nm DWDM Transceiver	1540.56	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG229A	HP X180 10G XFP LC LH 80km 1542.14nm DWDM Transceiver	1542.14	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG230A	HP X180 10G XFP LC LH 80km 1542.94nm DWDM Transceiver	1542.94	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG231A	HP X180 10G XFP LC LH 80km 1558.98nm DWDM Transceiver	1558.98	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG232A	HP X180 10G XFP LC LH 80km 1559.79nm DWDM Transceiver	1559.79	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)
JG233A	HP X180 10G XFP LC LH 80km 1560.61nm DWDM Transceiver	1560.61	9.95 to 10.31	SMF	9/125	N/A	80 km (49.71 miles)

Table 26 Specifications for XFP transceiver modules (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JD117B	HP X130 10G XFP LC SR Transceiver	-7.3 to -1.08	-9.9 to -1
JD108B	HP X130 10G XFP LC LR 1310nm Transceiver	-8.2 to +0.5	-14.4 to +0.5
JD088A	HP X130 10G POS XFP LC LR Transceiver	-6 to -1	-10.3 to +0.5
JD121A	HP X135 10G XFP LC ER Transceiver	-1 to +2	-14.1 to -1
JD107A	HP X130 10G XFP LC ZR 1550nm Transceiver	0 to +4	-24 to -7
JG226A	HP X180 10G XFP LC LH 80km 1538.98nm DWDM Transceiver	-1 to +3	-24 to -7

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JG227A	HP X180 10G XFP LC LH 80km 1539.77nm DWDM Transceiver	-1 to +3	-24 to -7
JG228A	HP X180 10G XFP LC LH 80km 1540.56nm DWDM Transceiver	-1 to +3	-24 to -7
JG229A	HP X180 10G XFP LC LH 80km 1542.14nm DWDM Transceiver	-1 to +3	-24 to -7
JG230A	HP X180 10G XFP LC LH 80km 1542.94nm DWDM Transceiver	-1 to +3	-24 to -7
JG231A	HP X180 10G XFP LC LH 80km 1558.98nm DWDM Transceiver	-1 to +3	-24 to -7
JG232A	HP X180 10G XFP LC LH 80km 1559.79nm DWDM Transceiver	-1 to +3	-24 to -7
JG233A	HP X180 10G XFP LC LH 80km 1560.61nm DWDM Transceiver	-1 to +3	-24 to -7

NOTE:

The 9/125 μ m single-mode fibers used by transceiver modules JG226A through JG233A should conform to ITU-T G.655, and those used by other transceiver modules should conform to ITU-T G.652.

CX4 cables

Figure 14 CX4 cable



Models and specifications

Table 27 Specifications for CX4 cables

Product code	Name	Cable length	Data rate	Description
JD363B	HP X230 Local Connect 50cm CX4 Cable	0.5 m (1.64 ft)	12 Gbps	Used for interconnecting deices, and supports IRF
JD364B	HP X230 Local Connect 100cm CX4 Cable	1 m (3.28 ft)		
JD365A	HP X230 CX4 to CX4 3m Cable	3 m (9.84 ft)		

QSFP+ modules

QSFP+ modules provide a transmission rate of 40 Gbps.

QSFP+ fiber transceiver modules that use MPO connectors

Figure 15 QSFP+ fiber transceiver module that use MPO connectors



Models and specifications

Table 28 Specifications for QSFP+ fiber transceiver modules that use MPO connectors (1)

Product code	HP description	Central wavelength (nm)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Transmission distance
JG325B	HP X140 40G QSFP+ MPO SR4 Transceiver	850	MMF	50/125	2000	100 m (328.08 ft)
					4700	150 m (492.12 ft)
JG709A	HP X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	850	MMF	50/125	2000	300 m (984.25 ft)
					4700	400 m (1312.33 ft)

Table 29 Specifications for QSFP+ fiber transceiver modules that use MPO connectors (2)

Product code	Name	Connector	Optical parameters (dBm)	
			Transmit power	Receive power
JG325B	HP X140 40G QSFP+ MPO SR4 Transceiver	MPO (PC polished, 12-fiber)	-7.6 to 0	-9.5 to +2.4

Product code	Name	Connector	Optical parameters (dBm)	
			Transmit power	Receive power
JG709A	HP X140 40G QSFP+ MPO MM 850nm CSR4 300m Transceiver	MPO (PC polished, 12-fiber)	-7.6 to 0	-9.9 to +2.4

NOTE:

The 40G QSFP+ ports of the JG325B and JG709A fiber transceiver modules can be split into four channels. You can connect a 40G QSFP+ port to four 10G SFP+ ports. The QSFP+ fiber transceiver module and SFP+ fiber transceiver modules to be connected must be the same in specifications, including central wavelength and fiber type.

QSFP+ fiber transceiver modules that use LC connectors

Figure 16 QSFP+fiber transceiver module that use LC connectors



Models and specifications

Table 30 Specifications for QSFP+ transceiver modules that use LC connectors (1)

Product code	Name	Central wavelength (nm)	Fiber mode	Fiber diameter (μm)	Modal bandwidth (MHz*km)	Transmission distance
JG661A	HP X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver Module	Four lanes: <ul style="list-style-type: none"> • 1271 • 1291 • 1311 • 1331 	SMF	9/125	N/A	10 km (6.21 miles)

Table 31 Specifications for QSFP+ transceiver modules that use LC connectors (2)

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JG661A	HP X140 40G QSFP+ LC LR4 SM 10km 1310nm Transceiver Module	-7 to +2.3	-13.7 to +2.3

40-Gigabit QSFP+ cable

Figure 17 40-Gigabit QSFP+ cable



Models and specifications

Table 32 Specifications for 40-Gigabit QSFP+ cables

Product code	Name	Cable length	Data rate	Description
JG326A	HP X240 40G QSFP+ QSFP+ 1m Direct Attach Copper Cable	1 m (3.28 ft)	40 Gbps	Used for interconnecting 40-Gigabit QSFP ports
JG327A	HP X240 40G QSFP+ QSFP+ 3m Direct Attach Copper Cable	3 m (9.84 ft)		
JG328A	HP X240 40G QSFP+ QSFP+ 5m Direct Attach Copper Cable	5 m (16.40 ft)		

QSFP+ to SFP+ cable

One end of a QSFP+ to SFP+ cable provides a 40-Gigabit QSFP+ module, and the other end provides four 10-Gigabit SFP+ modules.

Figure 18 QSFP+ to SFP+ cable



Models and specifications

Table 33 Specifications for QSFP+ to SFP+ cables

Product code	Name	Cable length	Data rate	Description
JG329A	HP X240 40G QSFP+ to 4x10G SFP+ 1m Direct Attach Copper Splitter Cable	1 m (3.28 ft)	40 Gbps	Used for connecting a 40-Gigabit QSFP+ port to four 10-Gigabit SFP+ ports
JG330A	HP X240 40G QSFP+ to 4x10G SFP+ 3m Direct Attach Copper Splitter Cable	3 m (9.84 ft)		
JG331A	HP X240 40G QSFP+ to 4x10G SFP+ 5m Direct Attach Copper Splitter Cable	5 m (16.40 ft)		

CFP transceiver modules

Figure 19 CFP transceiver module



Models and specifications

CFP transceiver modules use LC connectors.

Table 34 Specifications for CFP transceiver modules (1)

Product code	Name	Central wavelength (nm)	Data rate	Fiber mode	Fiber diameter (μm)	Maximum transmission distance
JC857A	HP X140 40G CFP LC LR4 10km SM Transceiver	Four lanes: <ul style="list-style-type: none"> • 1271 • 1291 • 1311 • 1331 	40 Gbps	SMF	9/125	10 km (6.21 miles)
JG829A (end of sale)	HP X150 100G CFP LC LR4 10km SM Transceiver	Four lanes: <ul style="list-style-type: none"> • 1295.56 • 1300.05 • 1304.58 • 1309.14 	100 Gbps	SMF	9/125	10 km (6.21 miles)
JG829B	HP X150 100G CFP LC LR4 10km SM Transceiver	Four lanes: <ul style="list-style-type: none"> • 1295.56 • 1300.05 • 1304.58 • 1309.14 	100 Gbps	SMF	9/125	10 km (6.21 miles)

Table 35 Specifications for CFP transceiver modules (2)

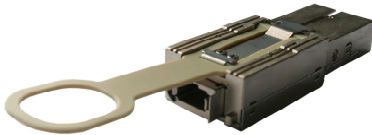
Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JC857A	HP X140 40G CFP LC LR4 10km SM Transceiver	-4 to +3 per lane	-11.5 to +3 per lane

Product code	Name	Optical parameters (dBm)	
		Transmit power	Receive power
JG829A (end of sale)	HP X150 100G CFP LC LR4 10km SM Transceiver	-4.3 to +4.5 per lane	-10.6 to +4.5 per lane
JG829B	HP X150 100G CFP LC LR4 10km SM Transceiver	-4.3 to +4.5 per lane	-10.6 to +4.5 per lane

CXP modules

CXP fiber transceiver modules

Figure 20 CXP fiber transceiver module



Models and specifications

CXP fiber transceiver modules provide a transmission rate of 100 Gbps and use MPO connectors.

Table 36 Specifications for CXP fiber transceiver modules (1)

Product code	Name	Central wavelength (nm)	Fiber mode	Fiber diameter (μm)	Maximum transmission distance
JG881A	HP X150 100G CXP MPO SR 100m Multimode Transceiver	850	MMF	50/125	100 m (328.08 ft)

Table 37 Specifications for CXP fiber transceiver modules (2)

Product code	Name	Connector	Optical parameters (dBm)	
			Transmit power	Receive power
JG881A	HP X150 100G CXP MPO SR 100m Multimode Transceiver	MPO (PC polished, 24-fiber)	-7.6 to +2.4	-9.5 to +2.4

CXP AOC

Figure 21 CXP AOC



Models and specifications

Table 38 Specifications for CXP AOCs

Product code	Name	Cable length	Data rate
JG883A	HP X2A0 100G CXP to CXP 30m Active Optical Cable	30 m (98.43 ft)	100 Gbps
JG882A	HP X2A0 100G CXP to CXP 10m Active Optical Cable	10 m (32.81 ft)	100 Gbps

Support and other resources

Contacting HP

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/wwalerts>

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

Related information

Documents

To find related documents, browse to the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

- For related documentation, navigate to the Networking section, and select a networking category.
- For a complete list of acronyms and their definitions, see *HP FlexNetwork Technology Acronyms*.

Websites

- HP.com <http://www.hp.com>
- HP Networking <http://www.hp.com/go/networking>
- HP manuals <http://www.hp.com/support/manuals>
- HP download drivers and software <http://www.hp.com/support/downloads>
- HP software depot <http://www.software.hp.com>
- HP Education <http://www.hp.com/learn>

Conventions

This section describes the conventions used in this documentation set.





Command conventions

Convention	Description
Boldface	Bold text represents commands and keywords that you enter literally as shown.
<i>Italic</i>	<i>Italic</i> text represents arguments that you replace with actual values.
[]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x y ... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[x y ...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x y ... } *	Asterisk-marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[x y ...] *	Asterisk-marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.











GUI conventions

Convention	Description
Boldface	Window names, button names, field names, and menu items are in bold text. For example, the New User window appears; click OK .
>	Multi-level menus are separated by angle brackets. For example, File > Create > Folder .

Symbols

Convention	Description
 WARNING	An alert that calls attention to important information that if not understood or followed can result in personal injury.
 CAUTION	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
 IMPORTANT	An alert that calls attention to essential information.
NOTE	An alert that contains additional or supplementary information.
 TIP	An alert that provides helpful information.

Network topology icons

	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
	Represents an access controller, a unified wired-WLAN module, or the switching engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a mesh access point.
	Represents omnidirectional signals.
	Represents directional signals.
	Represents a security product, such as a firewall, UTM, multiservice security gateway, or load-balancing device.
	Represents a security card, such as a firewall, load-balancing, NetStream, SSL VPN, IPS, or ACG card.

Port numbering in examples

The port numbers in this document are for illustration only and might be unavailable on your device.

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