

Cisco Catalyst 4500 Series Line Cards for Delivering Ethernet in the First Mile



Figure 1. 48-port 100BASE-LX10 Fast Ethernet and 48-port 1000BASE-LX10 Gigabit Ethernet line cards

Cisco® Catalyst® 4500 Series line cards for delivering Ethernet in the First Mile (EFM) fulfill the high-density, high-bandwidth, and long-reach requirements that network operators have to build the next generation of metropolitan-area access networks. Cisco Catalyst 4500 Series EFM line cards (Figure 1) let service providers deliver any combination of data, voice, and video services over a single optical connection to residential homes, business parks, and multitenant units.

Cisco Catalyst 4500 Series EFM line cards are also appropriate for manufacturing facilities, transportation monitoring, and fiber-to-the-desktop applications. Ethernet over fiber enables operation in noisy electromagnetic environments, providing physical security and longer reaches with the same well-understood Ethernet transport.

Cisco Catalyst 4500 Series EFM line cards are the industry's highest-density line cards for optical Fast Ethernet and Gigabit Ethernet with full support of IEEE 802.3 standards for Ethernet over fiber. The Cisco Catalyst 4500 Series line cards are designed with functional transparency that allows full integration with the supervisor engine's capabilities to increase deployment lifetime. New capabilities are delivered to each line card port simply by swapping the supervisor engine. Cisco Catalyst 4500 Series switches deployed with the Cisco Catalyst 4000/4500 Supervisor Engine 4 offer quality of service, sophisticated traffic management, and comprehensive security.



These Cisco Catalyst 4500 Series line cards are particularly suited for this environment:

- **48-Port 1000BASE-LX Gigabit Ethernet Line Card**—Optimized for service aggregation and business customer connectivity, this line card has 48 Gigabit Ethernet ports, including 48 1000BASE-LX small form-factor pluggable (SFP) optics preloaded at the factory. The line card ports support the standard IEEE 802.3x flow-control (pause-frame) mechanism to control Gigabit Ethernet host traffic. Bandwidth is allocated across six 8-port groups, providing 1 Gbps of sustained bandwidth per port-group to maximize the use of the switching fabric for under-subscribed Gigabit Ethernet ports. The 1000BASE-LX ports support single-mode fiber (SMF) for reaches up to 6.2 miles (10 kilometers).
- **6-Port Gigabit Ethernet Line Card**—This line card provides six ports of dedicated 1000BASE-X Gigabit Ethernet uplinks for high-speed backbone, switch-to-switch applications, or small server-farm applications. It uses versatile gigabit interface converter (GBIC) technology, so that, if needed, intrabuilding multimode connections can be intermixed with long-reach, single-mode connections. All ports can use Cisco Gigabit EtherChannel® or IEEE 802.3ad link aggregation for high-speed interconnection applications.
- **48-Port 100BASE-LX10 Fast Ethernet Line Card**—The 48 100BASE-LX10 Fast Ethernet ports for single-mode fiber provide high-density connectivity for both residential and small-business customers over distances up to 6.2 miles (10 km). Fast Ethernet over single-mode fiber offers an attractive choice of cost and future performance; the same access fiber infrastructure can be enabled for gigabit technology by upgrading the switching equipment.
- **48-Port 100BASE-FX Fast Ethernet Line Card**—The forty-eight 100BASE-FX Fast Ethernet ports for multimode fiber (MMF) enable affordable high-density connectivity for fiber-to-the-desktop applications and residential customers located within a 1.2-mile (2-km) radius.

Technical Specifications

48-Port 1000BASE-LX Gigabit Ethernet Line Card

48-port IEEE 802.3 1000BASE-LX small form-factor pluggables (SFPs)

Connectors: LCs for the 1000BASE-LX SFP

Distance: 5.9 miles (9.5 km) over single-mode fiber

Status: green (operational), red (faulty)

Link: green (operational), red (faulty)

Standards: IEEE 802.3, IEEE 802.3x

6-Port Gigabit Ethernet Line Card

6-port IEEE 802.3 1000BASE-X GBICs

Connectors: SCs for the GBICs

Distance: dependent on optic

Status: green (operational), red (faulty)

Link: green (operational), red (faulty)

Standards: IEEE 802.3, IEEE 802.3ad

48-Port 100BASE-LX10 Fast Ethernet Line Card



48-port 100BASE-LX10 Fast Ethernet

Connectors: MT-RJ

Distance: 6.2 miles (10 km) over single-mode fiber

Status: green (operational), red (faulty)

Link: green (operational), red (faulty)

Standards: compatible with IEEE 802.3ah Draft 1.3

48-Port 100BASE-FX Fast Ethernet Line Card

48-port IEEE 802.3 100BASE-FX Fast Ethernet

Connectors: MT-RJ

Distance: 1.2 miles (2 km) over multimode fiber

Status: green (operational), red (faulty)

Link: green (operational), red (faulty)

Standards: IEEE 802.3

Tables 1–4 provide technical specifications for the Fast Ethernet interfaces. The 1000BASE-LX specifications can be found in the Cisco Small Form-Factor Pluggable Data Sheet. The Cisco Gigabit Interface Converter Data Sheet covers the available GBIC choices as well as optical specifications.

Table 1 Fast Ethernet Port Cabling Specifications

Port Type	Fiber Type	Core Size (Micron)	Modal Bandwidth (MHz/km)	Cable Distance
Cisco 100BASE-FX	MMF	62.5	500	6562 ft (2 km)
Cisco 100BASE-LX10	SMF	50.0	500	1804 ft (550 m)
		9/10	–	32,810 ft (10 km)

Table 2 Fast Ethernet Optical Transmission Characteristics

Port Type	Bit Error Rate	Nominal Wavelength (nm)	Launch Power	
			Maximum (dBm)	Minimum (dBm)
100BASE-FX	2.5×10^{-10}	1270–1380	–14	–20
100BASE-LX10 (Draft 1.3)	1×10^{-12}	1260–1360	–8	–15



Table 3 Fast Ethernet Optical Reception Characteristics

Port Type	Bit Error Rate	Nominal Wavelength (nm)	Reception Sensitivity	
			Maximum (dBm)	Minimum (dBm)
100BASE-FX	2.5×10^{-10}	1270–1380	-14	-31
100BASE-LX10 (Draft 1.3)	1×10^{-12}	1260–1360	-8	-25

Table 4 Gigabit Ethernet Port Cabling Specifications

Port Type	Wavelength (Nanometer)	Fiber Type	Core Size (Micron)	Modal Bandwidth (MHz/km)	Cable Distance
Cisco 1000BASE-SX	850	MMF	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
Cisco 1000BASE-LX	1300	MMF ¹	62.5	500	1804 ft (550 m)
		SMF	50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	–	32,810 ft (10 km)
Cisco 1000BASE-ZX	1550	SMF	9/10	–	44–62 miles (70–100 km) ²

1. Mode-conditioning patch cord is required. Using an ordinary patch cord with MMF, 1000BASE-LX/LH and 100BASE-LX10 ports, and a short link distance (tens of meters) can cause transceiver saturation, resulting in an elevated bit error rate (BER). In addition, when using the LX/LH port with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the port and the MMF cable on both the transmission and receiving ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 feet (300 m).

2. 1000BASE-ZX can reach up to 62 miles (100 km) by using dispersion-shifted SMF or low-attenuation SMF; the distance depends on fiber quality, number of splices, and connectors.

For all other specifications, including Management Information Bases (MIBs), standards, environmental compliance and conditions, safety, and electromagnetic compliance, see the Cisco Catalyst 4500 Series Data Sheet.

Ordering Information

Table 5 provides product numbers and descriptions for Cisco Catalyst 4500 Series EFM line cards.

Table 5 Ordering Information for Cisco Catalyst 4500 Series Line Cards

Model Number	Description
WS-X4448-GB-LX	Cisco Catalyst 4500 Series 48-Port 1000BASE-LX Gigabit Ethernet Line Card prepopulated with 48 1000BASE-LX optics (SFP)
WS-X4306-GB	Cisco Catalyst 4000/4500 Gigabit Ethernet Line Card, 6 ports (GBIC)
WS-X4148-FX-MT	Cisco Catalyst 4500 Series 48-Port 100BASE-FX Fast Ethernet Line Card (MT-RJ) for multimode fiber
WS-X4148-FE-LX-MT	Cisco Catalyst 4500 Series 48-Port 100BASE-LX10 Fast Ethernet Line Card (MT-RJ) for single-mode fiber

For More Information

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