CHAPTER 2

Overview: Cisco 7600 Series Ethernet Services Plus Line Cards

This chapter describes the Cisco 7600 Series Ethernet Services + line cards that are supported on the Cisco 7600 series routers and contains the following sections:

Cisco 7600 Series Ethernet Services Plus Line Card Summary

Summary descriptions of the Cisco 7600 Cisco 7600 Series ES+ line cards that are supported on the Cisco 7600 series routers are shown in Table 2-1.

Table 2-1 Cisco 7600 ES+ Line Card Summary

Product Numbers	Description	Maximum Number of SFPs or XFPs	Minimum Cisco IOS Release
7600-ES+20G3C, 7600-ES+20G3CXL	7600 ES+ Line Card, 20xGE SFP with DFC 3C 7600 ES+ Line Card, 20xGE SFP with DFC 3CXL	20 SFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+2TG3C, 7600-ES+2TG3CXL	7600 ES+ Line Card, 2x10GE XFP with DFC 3C 7600 ES+ Line Card, 2x10GE XFP with DFC 3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+40G3C, 7600-ES+40G3CXL	7600 ES+ Line Card, 40xGE SFP with DFC 3C 7600 ES+ Line Card, 40xGE SFP with DFC 3CXL	40 SFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+4TG3C, 7600-ES+4TG3CXL	7600 ES+ Line Card, 4x10GE XFP with DFC 3C 7600 ES+ Line Card, 4x10GE XFP with DFC 3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD
76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL	7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3C 7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD1
76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL	7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3C 7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD1
76-ES+T-20G	7600 ES+T Line Card, 20xGE SFP with DFC 3CXL	20 SFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+T-40G	7600 ES+T Line Card, 40xGE SFP with DFC 3CX	40 SFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+T-2TG	7600 ES+XT, LAN/WAN PHY, OTN/G.709,Low queue, 2x10GE, XFP, DFC3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD3

Table 2-1 Cisco 7600 ES+ Line Card Summary (continued)

Product Numbers	Description	Maximum Number of SFPs or XFPs	Minimum Cisco IOS Release
76-ES+T-4TG3XCL	7600 ES+XT, LAN/WAN PHY, OTN/G.709,Low queue, 4x10GE, XFP, DFC3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+XC-20G3C 76-ES+XC-20G3CXL	7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3C 7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3CXL	10 SFPs, 1 XFP	Cisco IOS Release 12.2(33)SRE
76-ES+XC-40G3C 76-ES+XC-40G3CXL	7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3C 7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3CXL	20 SFPs, 2 XFPs	Cisco IOS Release 12.2(33)SRE

Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether the Cisco 7600 Series ES+ line cards within a system are compatible, but it does provide the minimum Cisco IOS requirements for individual hardware modules or components.

Note Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Identifying Slots and Subslots for the Cisco 7600 Cisco 7600 Series ES+ Line Cards

This section describes how to specify the physical location of a Cisco 7600 Cisco 7600 Series ES+ line cards on the Cisco 7600 series routers within the command-line interface (CLI) to configure or monitor those devices.

Specifying the Slot Location for a Cisco 7600 Cisco 7600 Series ES+ Line Cards

The Cisco 7600 series routers support different chassis models, each of which supports a certain number of chassis slots.

Note The Cisco 7600 Series ES+ line cards are not supported with a Supervisor Engine 1, Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720-3A, or Supervisor Engine 32.

For information about the chassis slots available in different Cisco 7600 series router models, see http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/hardware/cis_76xx/osr_over.htm.

Some commands allow you to display information about the Cisco 7600 Series ES+ line card itself, such as **show module**, **show idprom module**, **show hw-module slot**, and **show diagbus**. These commands require you to specify the chassis slot location where the Cisco 7600 Series ES+ line card that you want information about is installed.

For example, to display status and information about the Cisco 7600 Series ES+ line card installed in slot 10 of a Cisco 7609 router, enter the following command:

```
Router# show module 10

Mod Ports Card Type                                Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------
 10   20  7600 ES+                                 7600-ES+20G3CXL    JAE1151865I

Mod MAC addresses                       Hw    Fw           Sw           Status
--- ----------------------------------- ------ ------------ ------------ -------
 10  001d.e5e8.2a00 to 001d.e5e8.2a3f   0.301 12.2(33r)SRD 12.2(nightly Ok

Mod  Sub-Module                  Model               Serial       Hw     Status
---- --------------------------- ------------------ ----------- ------- -------
 10  7600 ES+ DFC XL             7600-ES+3CXL       JAE115188YM  0.200  Ok
 10  7600 ES+ 20xGE SFP          7600-ES+20G        JAE1151860R  0.301  Ok

Mod  Online Diag Status
---- -------------------
 10  Pass
Router#
```

For more information about Cisco 7600 Series ES+ line card commands, see the *Cisco IOS Software Releases 12.2 SR Command References*.

Note The Cisco 7600 Series ES+ line card must be in a slot that provides two primary serial channels. Dual serial channels are not available in all slots of a 13-slot chassis. Dual fabric connectivity is supported in slots 9 to 13.

Cisco 7600 ES+ Line Card Slot, Bay, and Port Locations

The Cisco 7600 Series ES+ line card uses a <slot, port> numbering scheme. The slot refers to whichever slot the line card occupies in the router. The port numbering begins at 1 on all versions of the Cisco 7600 Series ES+ line card. The upper limit depends on the card type. This physical port numbering is reflected in CLI messages and all references to port numbers that are visible to the user.

Executing the **show interface** command for a Cisco 7600 Series ES+ line card located in slot 10 of a Cisco 7600 series router chassis produces the following (only first six interfaces are shown):

```
Router# show interfaces gigabitEthernet 10/2

GigabitEthernet10/2 is up, line protocol is up (connected)
  Hardware is X40G 1Gb 802.3, address is 000f.35c2.ec00 (bia 000f.35c2.ec00)
  Description: connect to test 7/2
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
```

```
   reliability 255/255, txload 196/255, rxload 196/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 1000Mb/s
input flow-control is off, output flow-control is off
Clock mode is auto
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output 00:00:24, output hang never
Last clearing of "show interface" counters 00:00:12
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 772455000 bits/sec, 1419960 packets/sec
5 minute output rate 772455000 bits/sec, 1419960 packets/sec
L2 Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes
L3 in Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes mcast
L3 out Switched: ucast: 0 pkt, 0 bytes mcast: 0 pkt, 0 bytes
   11363519 packets input, 772719292 bytes, 0 no buffer
   Received 0 broadcasts (0 IP multicasts)
   0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 watchdog, 0 multicast, 0 pause input
   0 input packets with dribble condition detected
   11363519 packets output, 772719292 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 babbles, 0 late collision, 0 deferred
   0 lost carrier, 0 no carrier, 0 pause output
   0 output buffer failures, 0 output buffers swapped out
```

For more information about Cisco 7600 Series ES+ line card commands, see the *Cisco IOS Software Releases 12.2 SR Command References*.

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Overview

The following sections describe the Cisco 7600 Series ES+ line card:

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards are listed in Table 2-2.

Table 2-2 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Processors

Type	Speed	Description
Processor	300 megahertz (MHz) internal operating frequency	Trident
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card LEDs

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-1 and Figure 2-2. Table 2-3 provides LED descriptions.

Figure 2-1 Cisco 7600 ES+ 2TG3C

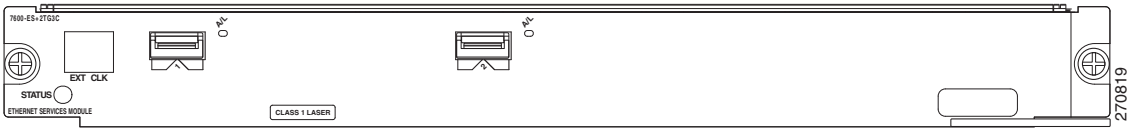
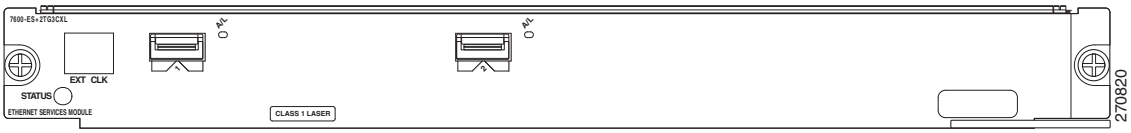


Figure 2-2 Cisco 7600 ES+ 2TG3CXL Faceplate



There is one line card Status LED and two port Status LEDs. Table 2-3 provides LED descriptions.

Table 2-3 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Physical Specifications

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL physical specifications are shown in Table 2-4.

Table 2-4 7600-ES+ 2TG3C,7600-ES+ 2TG33CXL Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)

Table 2-4 7600-ES+ 2TG3C,7600-ES+ 2TG33CXL Physical Specifications (continued)

Description	Specifications
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Memory Options

Table 2-5 lists the memory options available for the 7600-ES+ 2TG3C, -3CXL line cards:

Table 2-5 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 2TG3C	1 GB
Cisco 7600 ES+ 2T3CXL	2 GB

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards support the XFP modules listed in Table 2-6.

Table 2-6 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10.GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF.
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF.
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF.
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF.
XFP-10G-MM-SR	Cisco multirate XFP transceiver module for 10GBASE-SR Ethernet and OC-192/STM-64 short-reach (SR-1) Packet-over-SONET/SDH (POS) applications, SMF, dual LC connector, and Multimode fiber.
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid).
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid).
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid).
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid).
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid).
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid).
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid).

Table 2-6 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid).
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid).
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid).
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid).
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid).
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid).
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid).
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid).
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid).
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid).
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid).
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid).
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid).
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid).
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid).
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid).
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid).
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid).
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid).
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid).
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid).

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

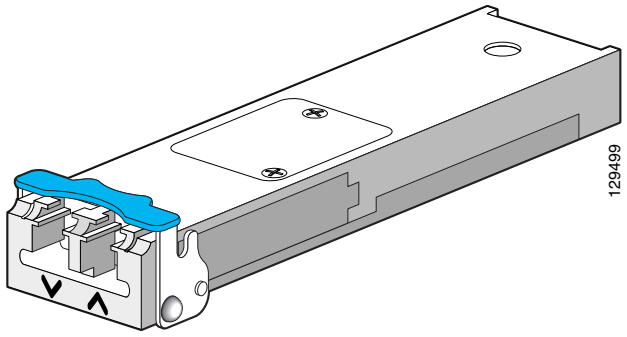
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-3 shows a typical XFP module.

Figure 2-3 XFP Module



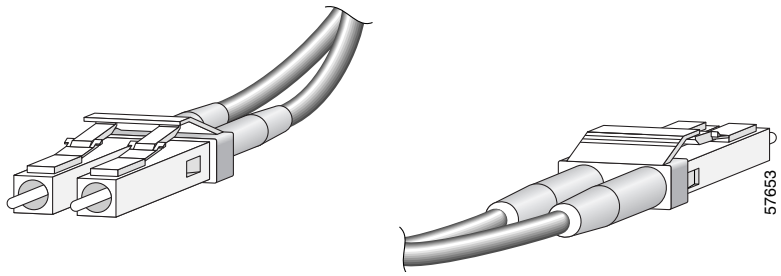
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-4 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card.

Figure 2-4 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards:

- Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules, page 2-11

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards are listed in Table 2-7.

Table 2-7 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card LEDs

The Cisco 7600 ES+ 4TG3C, 7600 ES+4TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-5 and Figure 2-6. Table 2-8 provides LED descriptions.

Figure 2-5 Cisco 7600 ES+ 4TG3C Faceplate

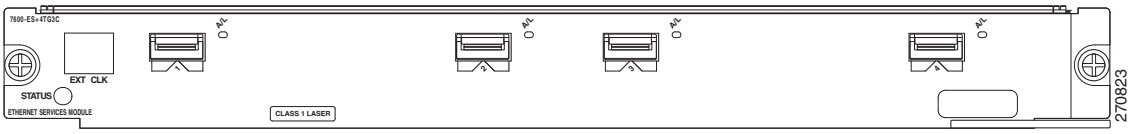
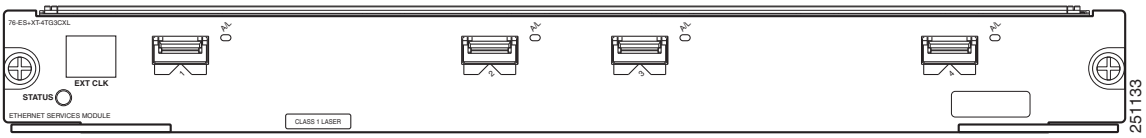


Figure 2-6 Cisco 7600 ES+ 4TG3CXL Faceplate



There is one line card Status LED and two port Status LEDs. Table 2-3 provides LED descriptions.

Table 2-8 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.

Table 2-8 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL LEDs (continued)

LED Label	Color	State	Meaning
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Physical Specifications

The Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL physical specifications are shown in Table 2-9.

Table 2-9 7600-ES+ 4TG3C, 7600-ES+ 4TG3CXL Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Memory Options

Table 2-10 lists the memory options available for the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards:

Table 2-10 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 4TG3C	1 GB
Cisco 7600 ES+ 4TG3CXL	2 GB

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules

The Cisco 7600 ES+ 4TG3C, -3CXL line cards support the XFP modules listed in Table 2-11

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules (continued)

XFP	Description
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

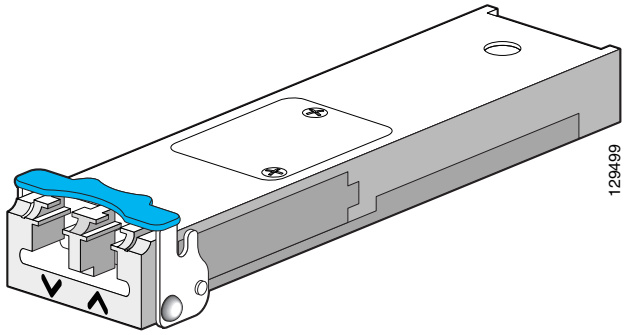
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-7 shows a typical XFP module.

Figure 2-7 XFP Module



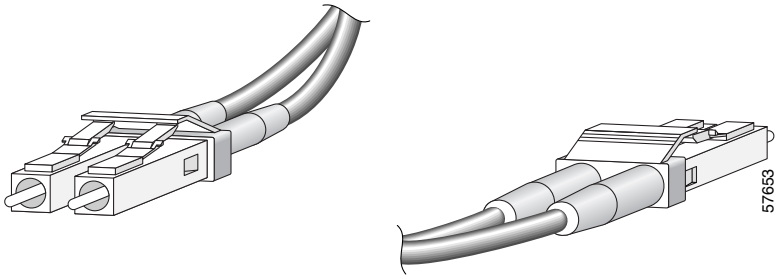
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 4TG3C, -3CXL line cards require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-8 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+ 4TG3C, -3CXL line card.

Figure 2-8 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards:

- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processors, page 2-14
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs, page 2-14
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Physical Specifications, page 2-15
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options, page 2-16
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules, page 2-16

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards are listed in Table 2-12.

Table 2-12 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-9 and Figure 2-10.

Figure 2-9 Cisco 7600 ES+ 20G3C Line Card Faceplate

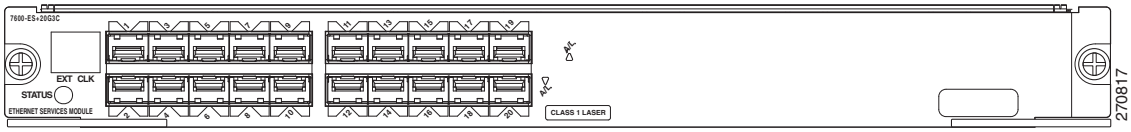


Figure 2-10 Cisco 7600 ES+ 20G3CXL Line Card Faceplate

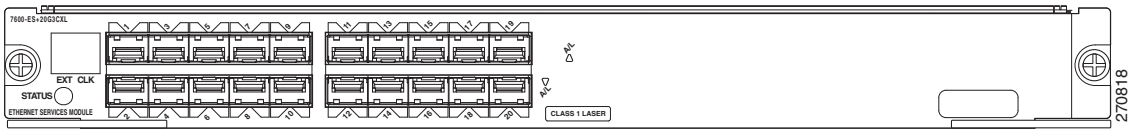


Table 2-13 provides LED descriptions.

Table 2-13 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Physical Specifications

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line card physical specifications are shown in Table 2-14.

Table 2-14 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 20G3C, -20G3CX line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options

Table 2-15 lists the memory options available for the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards:

Table 2-15 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 20G3C	1 GB
Cisco 7600 ES+ 20G3XL	2 GB

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-16

Table 2-16 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-16 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

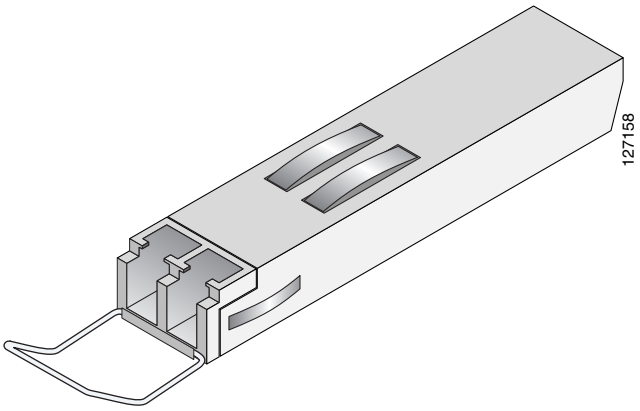
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-11 shows a typical SFP module.

Figure 2-11 SFP Optics Module



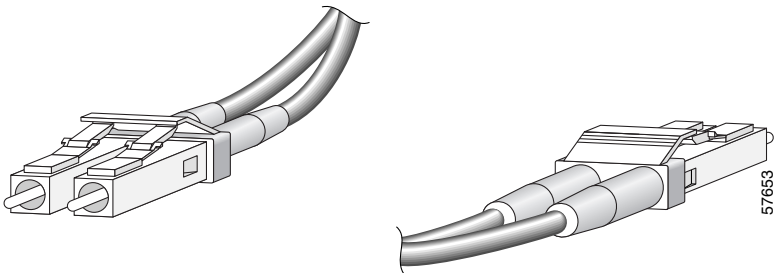
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600 ES+ 20G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-12.

Figure 2-12 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards:

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line card are listed in Table 2-17.

Table 2-17 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card LEDs

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-13 and Figure 2-14.

Figure 2-13 Cisco 7600 ES+ 40G3C Line Card Faceplate

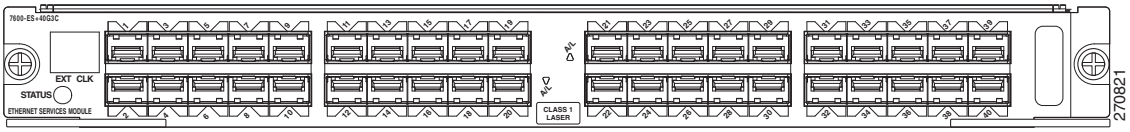


Figure 2-14 Cisco 7600 ES+ 40G3CXL Line Card Faceplate

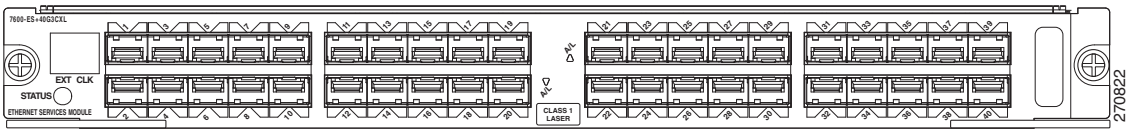


Table 2-18 provides LED descriptions.

Table 2-18 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Physical Specifications

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line card physical specifications are shown in Table 2-19.

Table 2-19 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Memory Options

Table 2-20 lists the memory options available for the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards:

Table 2-20 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 40G3C	1 GB
Cisco 7600 ES+ 40G3CXL	2 GB

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-21.

Table 2-21 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-21 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

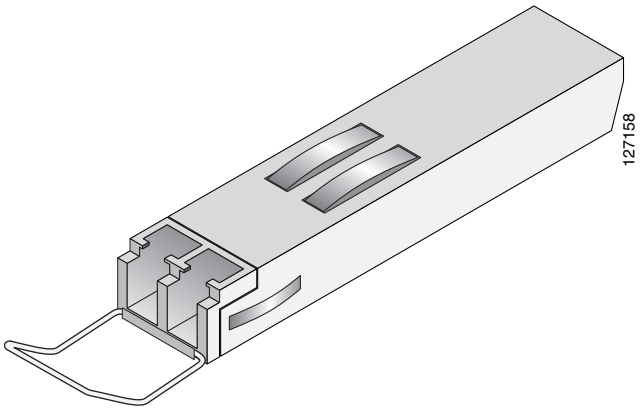
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-15 shows a typical SFP module.

Figure 2-15 SFP Optics Module



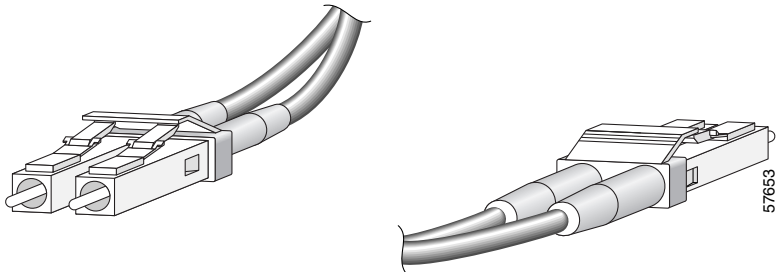
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600 ES+ 40G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-16.

Figure 2-16 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XT-2TG3CX line cards:

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Processors

The processors on the Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line card are listed in Table 2-22.

Table 2-22 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card LEDs

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-17 and Figure 2-18.

Figure 2-17 Cisco 76-ES+XT-2TG3C Line Card Faceplate

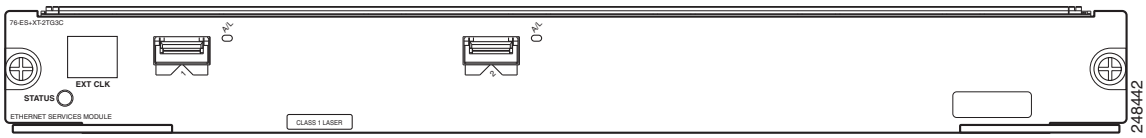


Figure 2-18 Cisco 76-ES+XT-2TG3CXL Line Card Faceplate

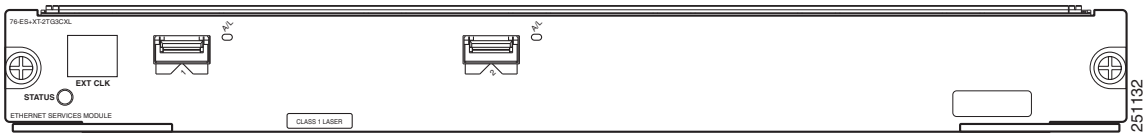


Table 2-23 provides LED descriptions.

Table 2-23 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Physical Specifications

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line card physical specifications are shown in Table 2-24.

Table 2-24 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Memory Options

Table 2-25 lists the memory options available for the Cisco 76-ES+XT-2TG3CXL line cards:

Table 2-25 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XT-2TG3C	1GB
Cisco 76-ES+XT-2TG3CXL	2 GB

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards support the XFP modules listed in Table 2-26.

Table 2-26 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)

Table 2-26 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

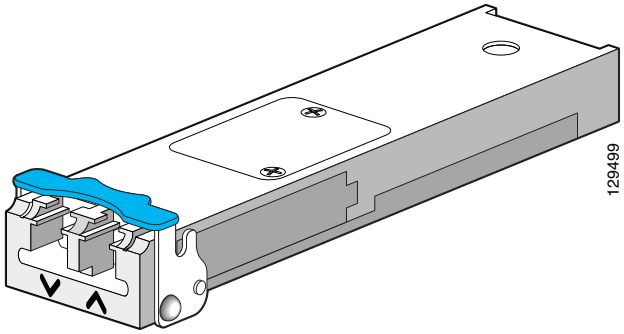
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-19 shows a typical XFP module.

Figure 2-19 XFP Module



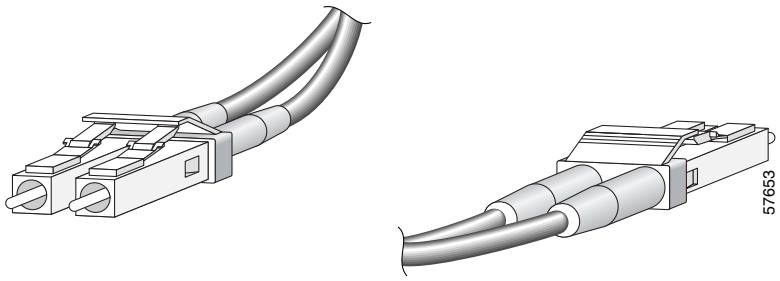
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ XT-2TG3C, 7600 ES+XT-2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-20 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+XT-2TG3C, 7600 ES+ XT-2TG3CXL line cards.

Figure 2-20 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards:

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Processors

The processors on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line card are listed in Table 2-27.

Table 2-27 Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card LEDs

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-21and Figure 2-22.

Figure 2-21 Cisco 76-ES+XT-4TG3C Line Card Faceplate

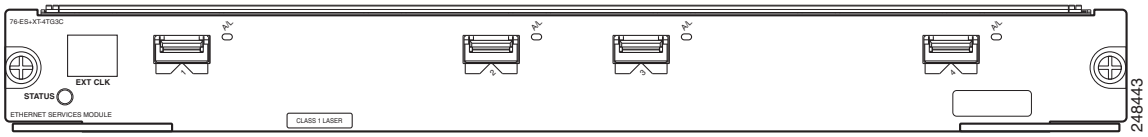


Figure 2-22 Cisco 76-ES+XT-4TG3CXL Line Card Faceplate

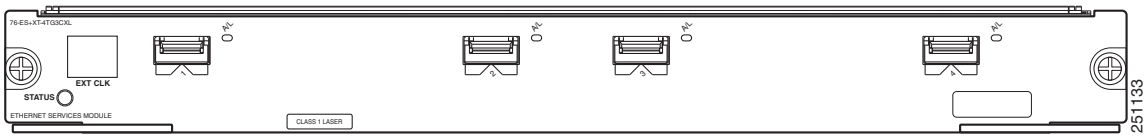


Table 2-28 provides LED descriptions.

Table 2-28 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Physical Specifications

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line card physical specifications are shown in Table 2-29.

Table 2-29 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Memory Options

Table 2-30 lists the memory options available for the Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards:

Table 2-30 Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 76-ES+XT-4TG3C	1 GB
Cisco 7600 76-ES+XT-4TG3CXL	2 GB

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported SFP Modules

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards support the XFP modules listed in Table 2-31.

Table 2-31 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)

Table 2-31 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

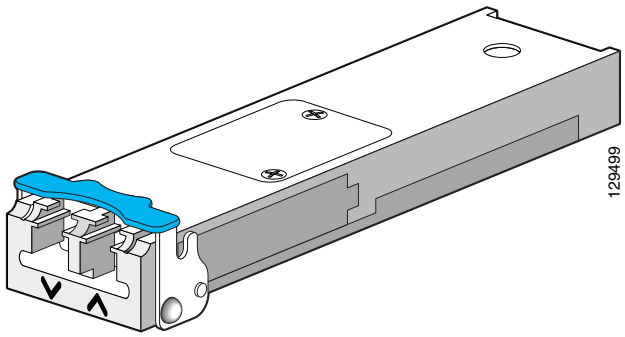
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-3 shows a typical XFP module.

Figure 2-23 XFP Module



Connectors and Cabling

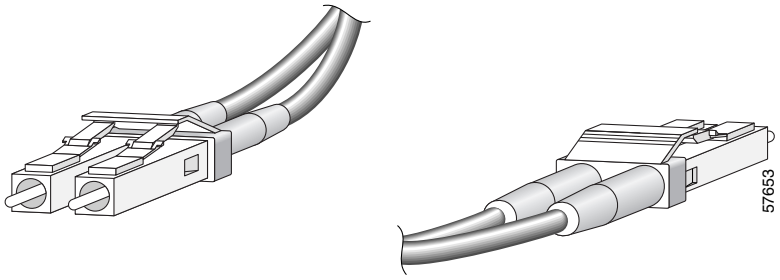
The XFP optical transceiver module on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable

- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-4 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards.

Figure 2-24 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-20G Line Card Overview

The following sections describe the Cisco 76-ES+T-20G line cards:

- Cisco 76-ES+T-20G Line Card Processors, page 2-33
- Cisco 76-ES+T-20G Line Card LEDs, page 2-34
- Cisco 76-ES+T-20G Physical Specifications, page 2-34
- Cisco 76-ES+T-20G Line Card Memory Options, page 2-35
- Cisco 76-ES+T-20G Supported SFP Modules, page 2-35

Cisco 76-ES+T-20G Line Card Processors

The processors on the Cisco 76-ES+T-203CXLG line cards are listed in Table 2-32.

Table 2-32 Cisco 76-ES+T-20G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-20G Line Card LEDs

The Cisco 76-ES+T-20G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-25 and Table 2-33.

Figure 2-25 Cisco 76-ES+T-20G Line Card Faceplate

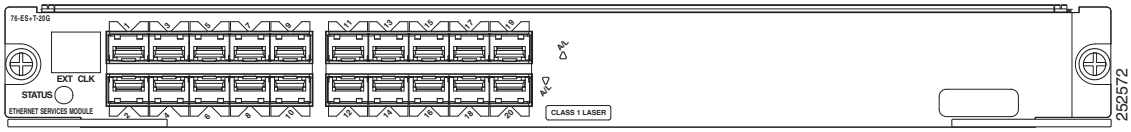


Table 2-33 provides LED descriptions.

Table 2-33 Cisco 76-ES+T-20G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-20G Physical Specifications

The Cisco 76-ES+T-20G line card physical specifications are shown in Table 2-34.

Table 2-34 Cisco 76-ES+T-20G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-20G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-20G Line Card Memory Options

Table 2-35 lists the memory options available for the Cisco 76-ES+T-20G line cards:

Table 2-35 Cisco 76-ES+T-20GLine Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-20G	2 GB

Cisco 76-ES+T-20G Supported SFP Modules

The Cisco 76-ES+T-20G line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-36

Table 2-36 Cisco 76-ES+T-20G Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)

Table 2-36 Cisco 76-ES+T-20G Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

- Height 0.03 in. (8.5 mm)

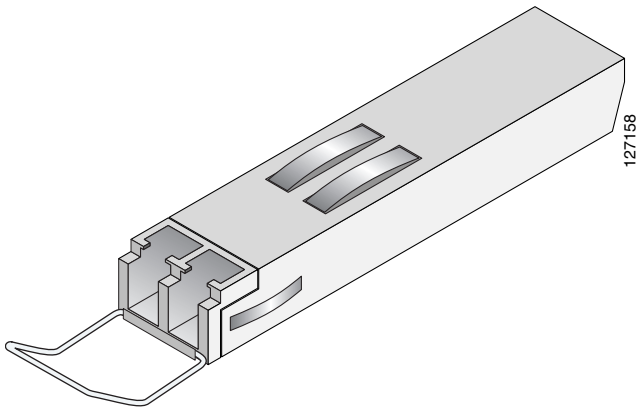
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-26 shows a typical SFP module.

Figure 2-26 SFP Optics Module



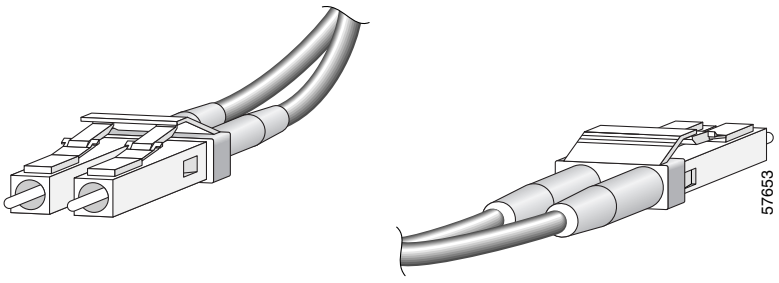
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+T-20G line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-27.

Figure 2-27 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-40G Line Card Overview

The following sections describe the Cisco 76-ES+T-40G line cards:

Cisco 76-ES+T-40G Line Card Processors

The processors on the Cisco 76-ES+T-40G line card are listed in Table 2-37.

Table 2-37 Cisco 76-ES+T-40G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-40G Line Card LEDs

The Cisco 76-ES+T-40G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-28 and Table 2-38.

Figure 2-28 Cisco 76-ES+T-40G Line Card Faceplate

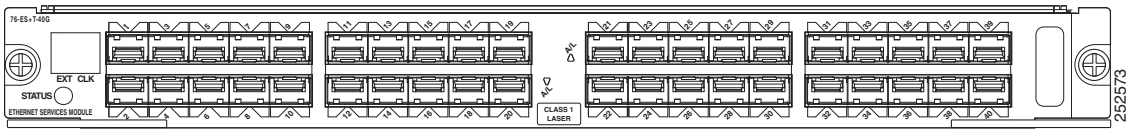


Table 2-38 Cisco 76-ES+T-40G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-40G Physical Specifications

The Cisco 76-ES+T-40G line card physical specifications are shown in Table 2-39.

Table 2-39 Cisco 76-ES+T-40G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-40G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-40G Line Card Memory Options

Table 2-40 lists the memory options available for the Cisco 7600 ES+ 40G3C, -40G3CXL line cards:

Table 2-40 Cisco 7600 ES+ T-40G Line Card Memory Options

Line Card	Memory Options
76-ES+T-40G	2 GB

Cisco 76-ES+T-40G Supported SFP Modules

The Cisco 76-ES+T-40G line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-41.

Table 2-41 Cisco 76-ES+T-40G Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)

Table 2-41 Cisco 76-ES+T-40G Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

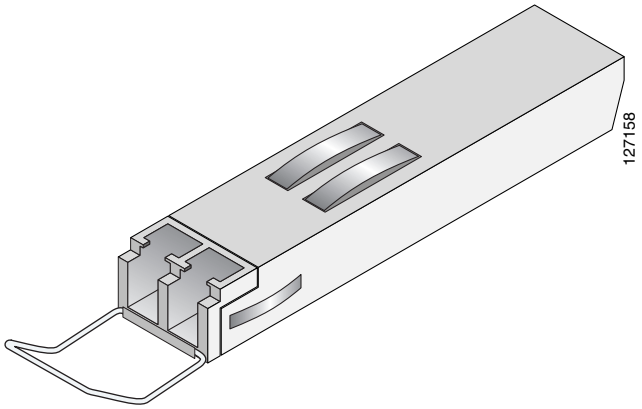
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-29 shows a typical SFP module.

Figure 2-29 SFP Optics Module



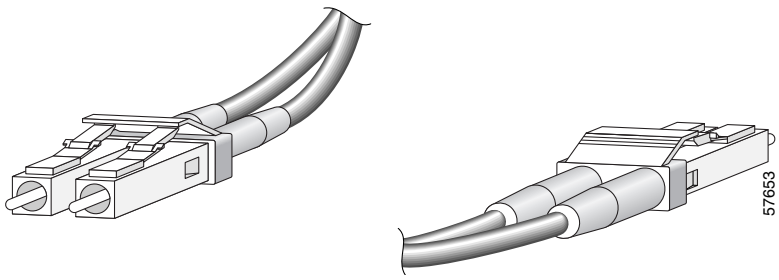
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+T-40G line card requires dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-30.

Figure 2-30 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-2TG Line Card Overview

The following sections describe the Cisco 76-ES+T-2TG line cards:

- Cisco 76-ES+T-2TG Line Card Processors, page 2-43

Cisco 76-ES+T-2TG Line Card Processors

The processors on the Cisco 76-ES+T-2TG line card are listed in Table 2-42.

Table 2-42 Cisco 76-ES+T-2TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-2TG Line Card LEDs

The Cisco 76-ES+T-2TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-31.

Figure 2-31 Cisco 76-ES+T-2TG Line Card Faceplate

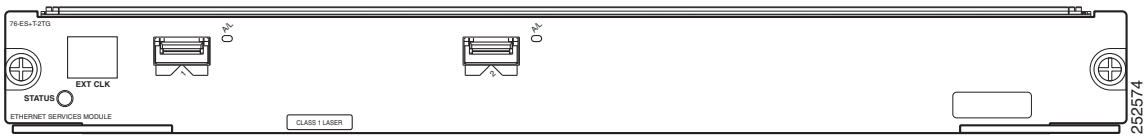


Table 2-43 provides LED descriptions.

Table 2-43 Cisco 76-ES+T-2TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-2TG Physical Specifications

The Cisco 76-ES+T-2TG line card physical specifications are shown in Table 2-44.

Table 2-44 Cisco 76-ES+T-2TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-2TG line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-2TG Line Card Memory Options

Table 2-45 lists the memory options available for the Cisco 76-ES+T-2TG line cards:

Table 2-45 Cisco 76-ES+T-2TGCXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-2TG	2 GB

Cisco 76-ES+T-2TG Supported XFP Modules

The Cisco 76-ES+T-2TG line card supports the XFP modules listed in Table 2-46.

Table 2-46 Cisco 76-ES+T-2TG Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)

Table 2-46 Cisco 76-ES+T-2TG Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

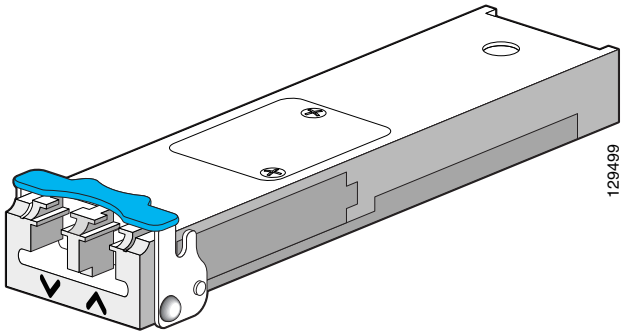
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-32 shows a typical XFP module.

Figure 2-32 XFP Module



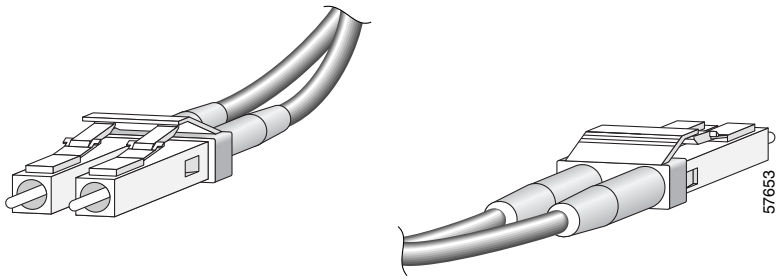
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T-2TG line card requires dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-33 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+T-2TG card.

Figure 2-33 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-4TG Line Card Overview

The following sections describe the Cisco 76-ES+T-4TG line cards:

Cisco 76-ES+T-4TG Line Card Processors

The processors on the Cisco 76-ES+T-4TG line card are listed in Table 2-47.

Table 2-47 Cisco 76-ES+T-4TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-4TG Line Card LEDs

The Cisco 76-ES+T-4TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-34.

Figure 2-34 Cisco 76-ES+T-4TG Line Card Faceplate

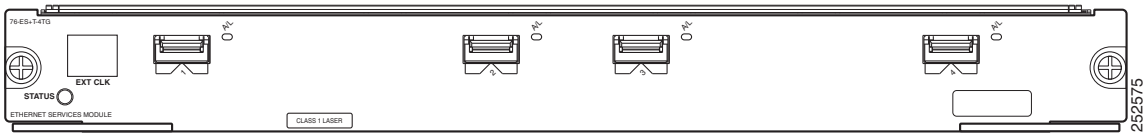


Table 2-48 provides LED descriptions.

Table 2-48 Cisco 76-ES+T-4TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.

Table 2-48 Cisco 76-ES+T-4TG Line Card LEDs (continued)

LED Label	Color	State	Meaning
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-4TG Physical Specifications

The Cisco 76-ES+T-4TG line card physical specifications are shown in Table 2-49.

Table 2-49 Cisco 76-ES+T-4TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-4TG line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-4TG Line Card Memory Options

Table 2-50 lists the memory options available for the Cisco 76-ES+T-4TG line cards:

Table 2-50 Cisco 76-ES+T-4TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-4TG	2 GB

Cisco 76-ES+T-4TG Supported XFP Modules

The Cisco 76-ES+T-4TG line cards support the XFP modules listed in Table 2-51.

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules (continued)

XFP	Description
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

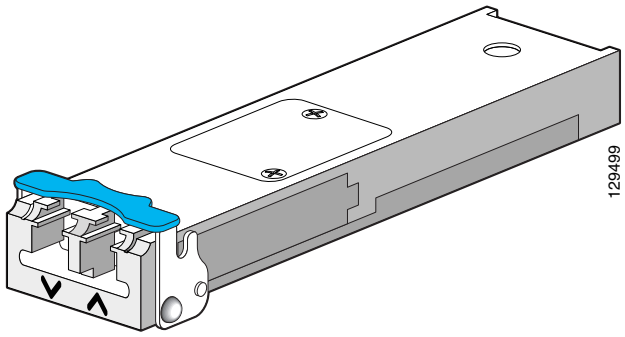
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-35 shows a typical XFP module.

Figure 2-35 XFP Module



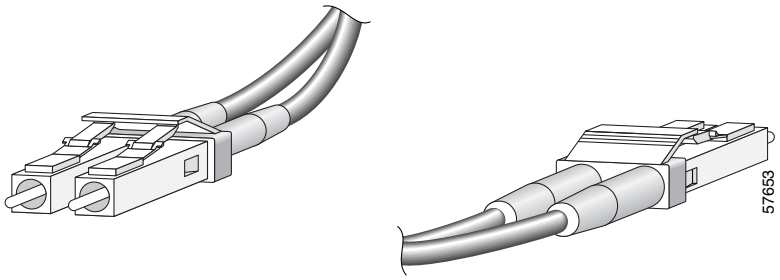
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T-4TG line card requires dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-36 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+T-4TG line card.

Figure 2-36 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards:

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Processors

The processors on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards are listed in Table 2-52.

Table 2-52 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card LEDs

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-37 and Figure 2-38.

Figure 2-37 Cisco 76-ES+XC-20G3C Line Card Faceplate

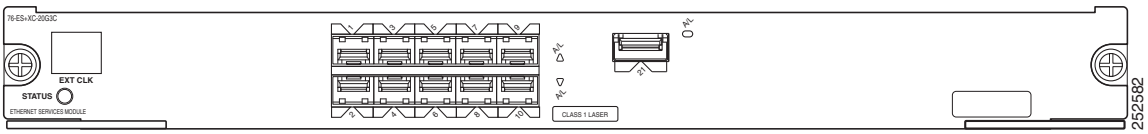


Figure 2-38 Cisco 76-ES+XC-20G3CXL Line Card Faceplate

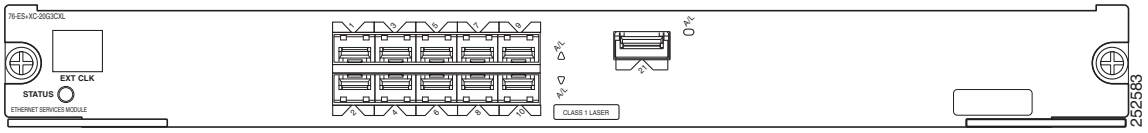


Table 2-53 provides LED descriptions.

Table 2-53 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Physical Specifications

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card physical specifications are shown in Table 2-54.

Table 2-54 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options

Table 2-55 lists the memory options available for the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards:

Table 2-55 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XC-20G3C	1 GB
Cisco 76-ES+XC-20G3CXL	2 GB

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-56

Table 2-56 Cisco 7600-76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)

Table 2-56 Cisco 7600-76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

SFP Modules	Description
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

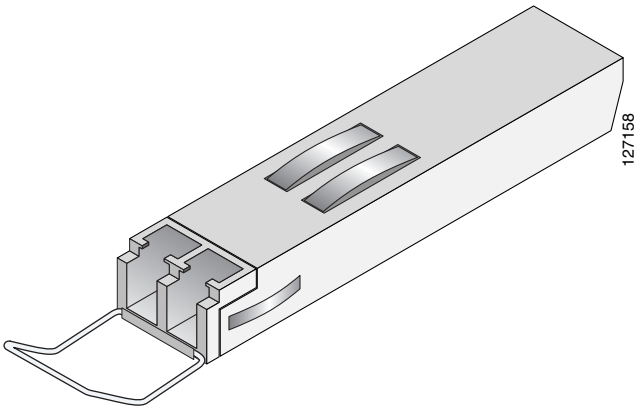
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-39 shows a typical SFP module.

Figure 2-39 SFP Optics Module



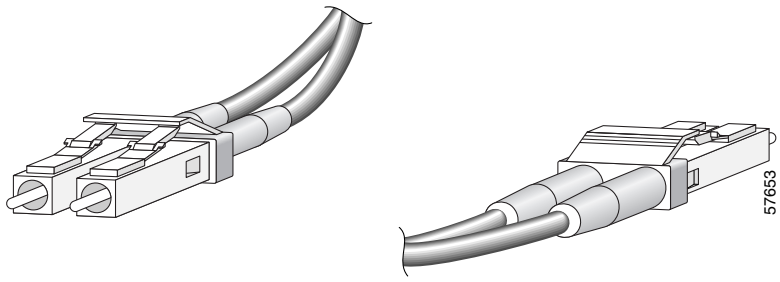
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600-ES+20G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-40.

Figure 2-40 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card supports the XFP modules listed in Table 2-57.

Table 2-57 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)

Table 2-57 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

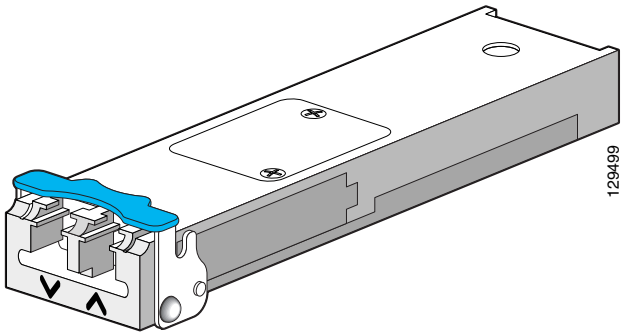
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-41 shows a typical XFP module.

Figure 2-41 XFP Module



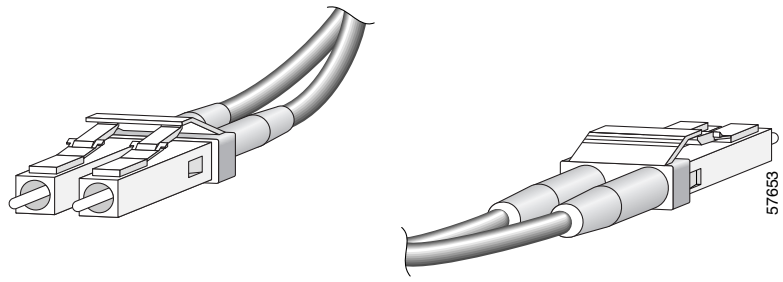
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-42 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card.

Figure 2-42 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards:

- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processors, page 2-59
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs, page 2-59
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Physical Specifications, page 2-60
- Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options, page 2-53
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules, page 2-61
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules, page 2-64

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processors

The processors on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards are listed in Table 2-58.

Table 2-58 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-43 and Figure 2-44.

Figure 2-43 Cisco 76-ES+XC-40G3C Line Card Faceplate

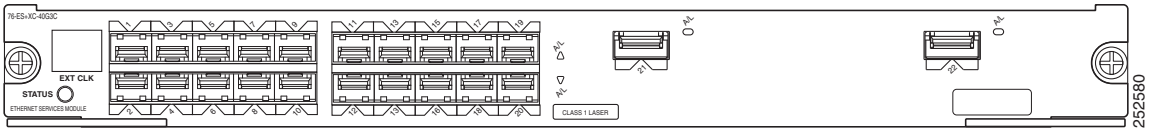


Figure 2-44 Cisco 76-ES+XC-40G3CXL Line Card Faceplate

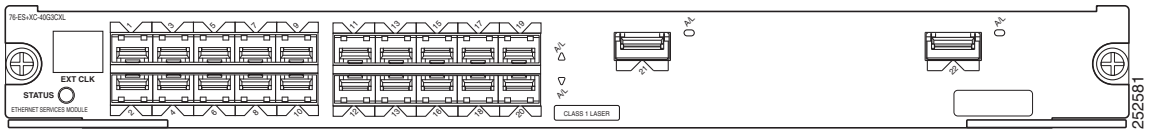


Table 2-59 provides LED descriptions.

Table 2-59 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Physical Specifications

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card physical specifications are shown in Table 2-60.

Table 2-60 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Memory Options

Table 2-61 lists the memory options available for the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards:

Table 2-61 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XC-40G3C	1 GB
Cisco 76-ES+XC-40G3CXL	2 GB

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-62

Table 2-62 Cisco 7600-76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-62 Cisco 7600-76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

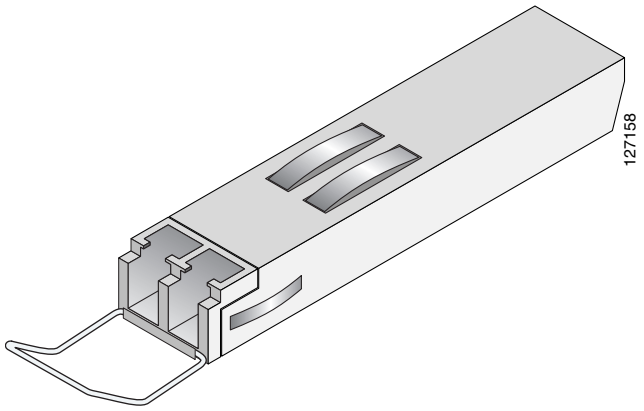
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-45 shows a typical SFP module.

Figure 2-45 SFP Optics Module



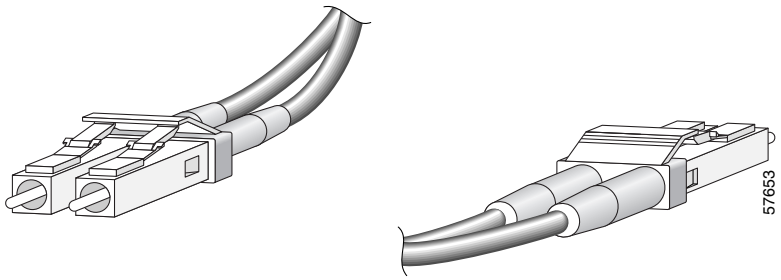
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-46.

Figure 2-46 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card supports the XFP modules listed in Table 2-63.

Table 2-63 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)

Table 2-63 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

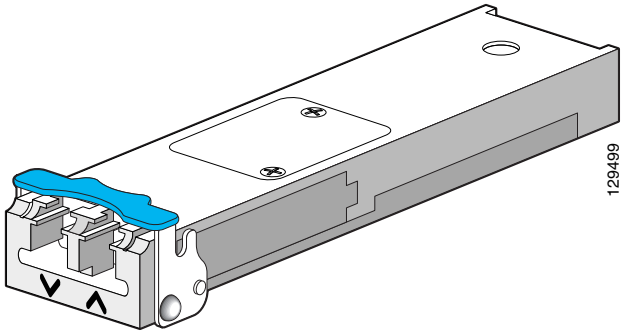
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-47 shows a typical XFP module.

Figure 2-47 XFP Module



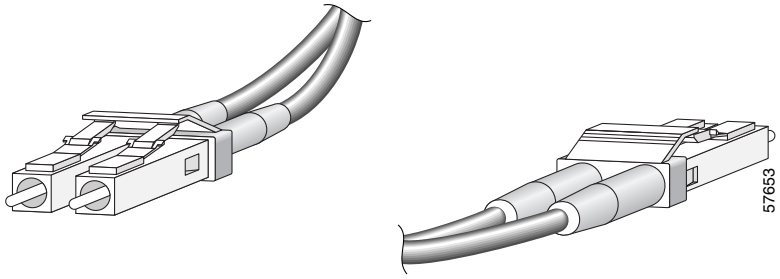
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-48 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card.

Figure 2-48 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T+XC-20G Line Card Overview

The following sections describe the Cisco 76-ES+T+XC-20G line cards:

- Cisco 76-ES+T+XC-20G Supported XFP Modules, page 2-68

Cisco 76-ES+T+XC-20G Line Card Processors

The processors on the Cisco 76-ES+T+XC-20G line card are listed in Table 2-64.

Table 2-64 Cisco 76-ES+T+XC-20G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T+XC-20G Line Card LEDs

The Cisco 76-ES+T+XC-20G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-49.

Figure 2-49 Cisco 76-ES+T+XC-20G Line Card Faceplate

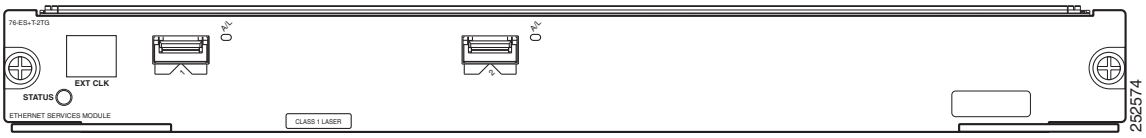


Table 2-65 provides LED descriptions.

Table 2-65 Cisco 76-ES+T+XC-20G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T+XC-20G Physical Specifications

The Cisco 76-ES+T+XC-20G line card physical specifications are shown in Table 2-66.

Table 2-66 Cisco 76-ES+T+XC-20G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T+XC-20G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T+XC-20G Line Card Memory Options

Table 2-67 lists the memory options available for the Cisco 76-ES+T+XC-20G line cards:

Table 2-67 Cisco 76-ES+T+XC-20G Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T+XC-20G	2 GB

Cisco 76-ES+T+XC-20G Supported XFP Modules

The Cisco 76-ES+T+XC-20G line card supports the XFP modules listed in Table 2-68.

Table 2-68 Cisco 76-ES+T+XC-20G Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)

Table 2-68 Cisco 76-ES+T+XC-20G Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) ona single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data, and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier, and passes it to an output driver.

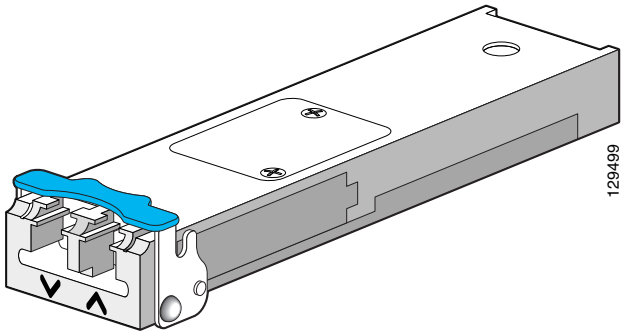
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-50 shows a typical XFP module.

Figure 2-50 XFP Module



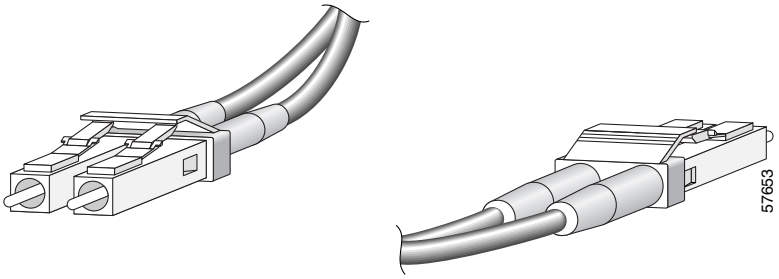
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T+XC-20G line card requires dual LC or PC connectors. Only the patch cord connections with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic requirements for optical fiber and optical fiber cable.
- GR-326-CORE: Generic requirements for singlemode optical connectors and jumper assemblies.
- GR-1435-CORE: Generic requirements for multi-fiber optical connectors.

Figure 2-51 shows the cable type used with the XFP optical transceiver module on the Cisco 76-ES+T+XC-20G card.

Figure 2-51 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T+XC-40G Line Card Overview

The following sections describe the Cisco 76-ES+T+XC-40G line cards:

- Cisco 76-ES+T+XC-40G Line Card Processors, page 2-71

Cisco 76-ES+T+XC-40G Line Card Processors

The processors on the Cisco 76-ES+T+XC-40G line card are listed in Table 2-69.

Table 2-69 Cisco 76-ES+T+XC-40G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T+XC-40G Line Card LEDs

The Cisco 76-ES+T+XC-40G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-52.

Figure 2-52 Cisco 76-ES+T+XC-40G Line Card Faceplate

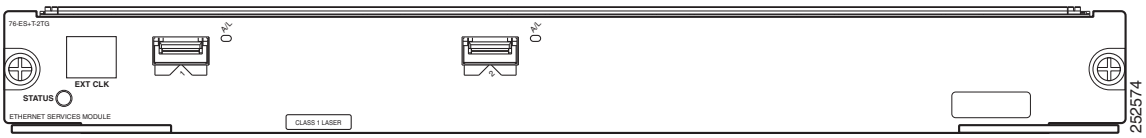


Table 2-70 provides LED descriptions.

Table 2-70 Cisco 76-ES+T+XC-40G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T+XC-40G Physical Specifications

The Cisco 76-ES+T+XC-40G line card physical specifications are shown in Table 2-71.

Table 2-71 Cisco 76-ES+T+XC-40G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T+XC-40G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T+XC-40G Line Card Memory Options

Table 2-72 lists the memory options available for the Cisco 76-ES+T+XC-40G line cards:

Table 2-72 Cisco 76-ES+T+XC-40G Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T+XC-40G	2 GB

Cisco 76-ES+T+XC-40G Supported XFP Modules

The Cisco 76-ES+T+XC-40G line card supports the XFP modules listed in Table 2-73.

Table 2-73 Cisco 76-ES+T+XC-40G Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)

Table 2-73 Cisco 76-ES+T+XC-40G Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) ona single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data, and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier, and passes it to an output driver.

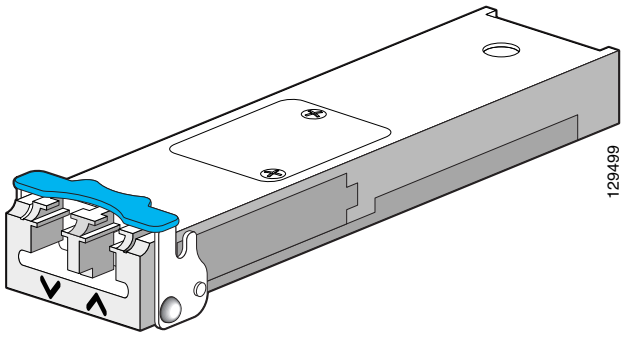
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-32 shows a typical XFP module.

Figure 2-53 XFP Module



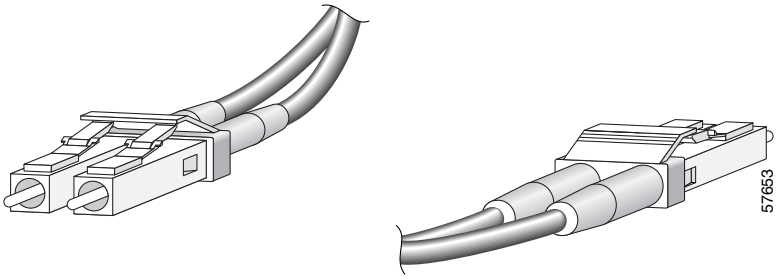
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T+XC-40G line card requires dual LC or PC connectors. Only the patch cord connections with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic requirements for optical fiber and optical fiber cable.
- GR-326-CORE: Generic requirements for singlemode optical connectors and jumper assemblies.
- GR-1435-CORE: Generic requirements for multi-fiber optical connectors.

Figure 2-54 shows the cable type used with the XFP optical transceiver module on the Cisco 76-ES+T+XC-40G card.

Figure 2-54 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-8TG Line Card Overview

The following sections describe the Cisco 76-ES+T-8TG line cards:

Cisco 76-ES+T-8TG Line Card Processors

The processors on the Cisco 76-ES+T-8TG line card are listed in Table 2-74.

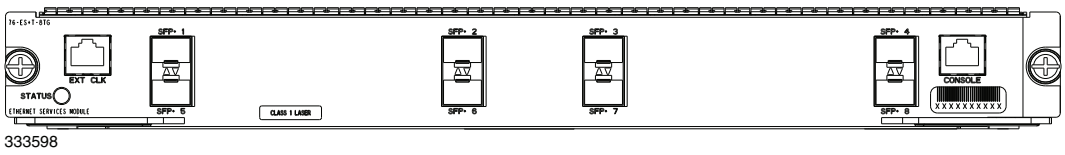
Table 2-74 Cisco 76-ES+T-8TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local Control Processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-8TG Line Card LEDs

The Cisco 76-ES+T-8TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-55.

Figure 2-55 Cisco 76-ES+T-8TG Line Card Faceplate



333598

Table 2-75 provides LED description.

Table 2-75 Cisco 76-ES+T-8TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled, but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-8TG Physical Specifications

Table 2-76 lists the physical specifications of Cisco 76-ES+T-8TG line card.

Table 2-76 Cisco 76-ES+T-8TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-8TG line card occupies a single module slot and can be operated in all the Cisco 7600 series routers except for the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-8TG Line Card Memory Options

Table 2-77 lists the memory options available for the Cisco 76-ES+T-8TG line cards:

Table 2-77 Cisco 76-ES+T-8TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-8TG	2 GB

Cisco 76-ES+T-8TG Supported Features

The Cisco 76-ES+T-8TG line card supports all the features supported on a regular ES+ card, but at a lower scale suitable for a low queue deployment. The line card is limited to 16 queues per port. The following additional features are supported:

- Enhanced small form-factor pluggable (SFP+)

- Port Mapping: The ES+ HD has eight 10GE ports. The first port of each NP is numbered from 1 to 4 (NP 0 to NP 3), and each NP's second 10GE port is numbered from 5 to 8.
- Oversubscription: Theoretically each NP supports 15Gb on the egress side. For instance, 10Gb traffic is sent from the line card to NP, which has 5Gb of multicast and 5Gb of unicast traffic. Using loopback interface, the NP replicates the multicast packets and sends 5Gb traffic on each NP port. This traffic is divided into 2.5Gb on each port. So, effectively each NP port or interface receives 7.5Gb traffic. Since there are two 10Gb ports on each NP, the total rate achieved is 15Gb.

  On the ingress path, more than 10Gb is supported for higher packet size. For instance, when the NP receives the packets at the rate of 10Gb, and each packet size is 64 bytes, it will be 96 bytes (64 +32 byte DBUS header) when it moves from NP to line card. So, it consumes entire bandwidth and restrict the ingress traffic to 10Gb. If the packet size is greater than 64 bytes, it will give more than 10Gb throughput.

Cisco 76-ES+T-8TG Supported SFP+ Modules

The Cisco 76-ES+T-8TG line cards support the enhanced small form-factor pluggable (SFP+) optical transceiver modules listed in Table 2-78.

Table 2-78 Cisco 76-ES+T-8TG Supported SFP+ Modules

SFP+ Modules	Description
SFP-10G-SR-X	10GE SFP+, Short range.
SFP-10G-LR-X	10GE SFP+, Long range.

Cisco 76-ES+XT-8TG Line Card Overview

The following sections describe the Cisco 76-ES+XT-8TG line cards:

Cisco 76-ES+XT-8TG Line Card Processors

The processors on the Cisco 76-ES+XT-8TG line card are listed in Table 2-79.

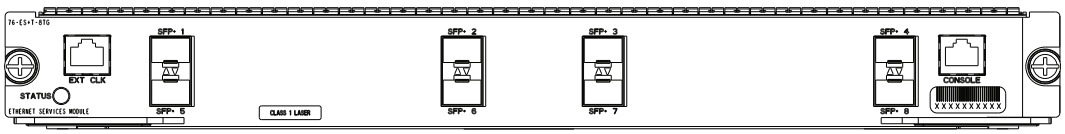
Table 2-79 Cisco 76-ES+XT-8TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local Control Processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-8TG Line Card LEDs

The Cisco 76-ES+XT-8TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-56.

Figure 2-56 Cisco 76-ES+XT-8TG Line Card Faceplate



333598

Table 2-80 provides LED description.

Table 2-80 Cisco 76-ES+XT-8TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled, but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-8TG Physical Specifications

Table 2-81 lists the physical specifications of Cisco 76-ES+XT-8TG line card.

Table 2-81 Cisco 76-ES+XT-8TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-8TG line card occupies a single module slot and can be operated in all the Cisco 7600 series routers except for the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-8TG Line Card Memory Options

Table 2-82 lists the memory options available for the Cisco 76-ES+XT-8TG line cards:

Table 2-82 Cisco 76-ES+XT-8TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XT-8TG	2 GB

Cisco 76-ES+XT-8TG Supported SFP+ Modules

The Cisco 76-ES+XT-8TG line cards support the enhanced small form-factor pluggable (SFP+) optical transceiver modules listed in Table 2-83.

Table 2-83 Cisco 76-ES+XT-8TG Supported SFP+ Modules

SFP+ Modules	Description
SFP-10G-SR-X	10GE SFP+, Short range.
SFP-10G-LR-X	10GE SFP+, Long range.