# Cisco SFP and SFP+ Transceiver Module Installation Notes

**Revised: January 30, 2012**

**Product Numbers:**

| | | | |
|---|---|---|---|
| SFP-10G-SR= | SFP-10G-LR= | SFP-10G-LRM= | SFP-OC48-LR2= |
| SFP-GE-Z= | SFP-OC3-MM= | SFP-OC3-SR= | SFP-OC12-LR2= |
| SFP-OC3-LR2= | SFP-GE-L= | SFP-OC12-SR= | GLC-SX-MM-RGD= |
| SFP-OC3-LR1= | SFP-OC48-SR= | SFP-OC48-IR1= | GLC-ZX-SM-RGD= |
| SFP-GE-S= | GLC-SX-MM= | SFP-OC3-IR1= | GLC-FE-100FX= |
| GLC-ZX-SM= | SFP-OC12-IR1= | GLC-T= | GLC-FE-100FX-RGD= |
| GLC-LH-SM= | GLC-BX-D= | GLC-BX-U= | GLC-FE-100BX-D= |
| GLC-FE-100BX-U= | GLC-FE-100EX= | GLC-FE-100LX= | GLC-FE-100ZX= |
| SFP-H10GB-CU1M= | SFP-H10GB-CU3M= | SFP-H10GB-CU5M= | SFP-10G-ER= |
| SFP-OC12-MM= | DWDM-SFP-xxxx= | SFP-OC12-LR1= | CWDM-SFP-xxxx= |
| GLC-LX-SM-RGD= | GLC-GE-100FX= | GLC-FE-100LX-RGD= | GLC-EX-SMD= |
| SFP-H10GB-ACU7M= | SFP-H10GB-ACU10M= | GLC-SX-MMD= | GLC-LH-SMD= |
| GLC-2BX-D= | SFP-10G-ZR= | SFP-10G-SR-X= | SFP-10G-LR-X= |

This installation note provides the installation instructions for the Cisco small form-factor pluggable (SFP) and SFP+ transceiver modules. These transceiver modules are hot-swappable input/output (I/O) devices that plug into 100BASE, 1000BASE and 10GBASE ports (for SFP+), which connect the module port with the fiber-optic or copper network.

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# Overview

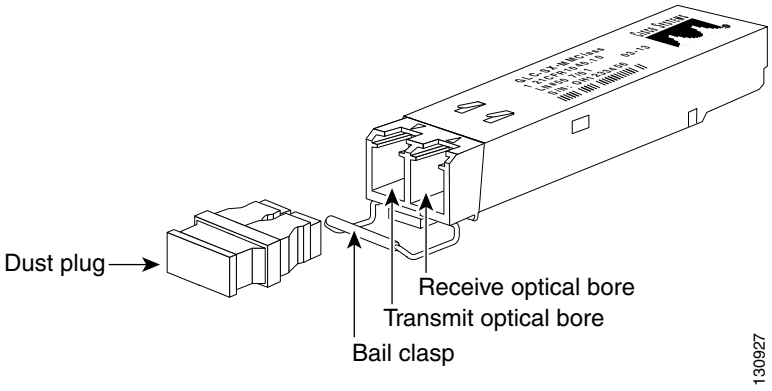
The SFP transceiver modules are hot-pluggable I/O devices that plug into module sockets. The transceiver connects the electrical circuitry of the module with the optical or copper network.

You can use any combination of SFP transceiver modules that your Cisco device supports. The only restrictions are that each port must match the wavelength specifications on the other end of the cable and that the cable must not exceed the stipulated cable length for reliable communications.

Use only Cisco SFP transceiver modules on your Cisco device. Each SFP transceiver module supports the Cisco Quality Identification (ID) feature which allows a Cisco switch or router to identify and validate that the transceiver module is certified and tested by Cisco.

An optical SFP transceiver module is shown in Figure 1.

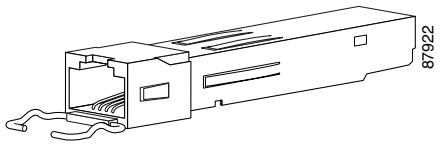
***Figure 1 SFP Transceiver Module (Fiber-Optic LC Connector)***




**Note** SFP transceiver modules that operate with single-strand SMF, have only one optical bore; the other bore is blocked off.

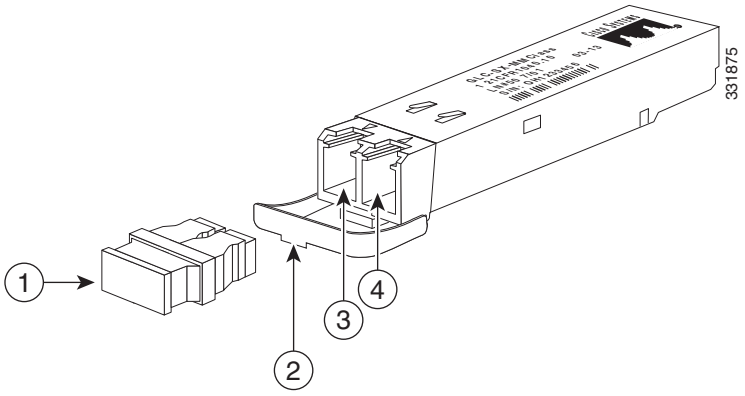
A copper SFP transceiver module in shown in Figure 2.

*Figure 2 1000BASE-T SFP Transceiver Module (RJ-45 Connector)*




An SFP+ transceiver module is shown in Figure 3.

*Figure 3 SFP+ Transceiver Module (Fiber-Optic LC Connector)*




| | | | |
|---|---|---|---|
| **1** | Dustplug | **3** | Transmit bore |
| **2** | Bail clasp with clasp tab | **4** | Receive bore |

The product numbers and brief description of the SFP and SFP+ transceiver modules are listed in Table 1.

*Table 1 Product Numbers and Descriptions*

| SFP Transceiver Module Product Number | Transceiver Description |
|---|---|
| **10-Gigabit Ethernet** | |
| SFP-10G-SR | Cisco 10GBASE-SR SFP+ transceiver module for MMF, 850-nm wavelength |
| SFP-10G-SR-X | Cisco 10GBASE-SR SFP+ transceiver module for MMF, 850-nm wavelength, extended temperature range |
| SFP-10G-LR | Cisco 10GBASE-LR SFP+ transceiver module for SMF, 1310-nm wavelength |
| SFP-10G-LR-X | Cisco multirate 10GBASE-LR/10GBASE-LW/OTU2e SFP+ transceiver module for SMF, 1310-nm wavelength, extended temperature range |
| SFP-10G-LRM | Cisco 10GBASE-LRM SFP+ transceiver module for MMF and SMF, 1310-nm wavelength |
| SFP-10G-ER | Cisco 10GBASE-ER SFP+ transceiver module for SMF, 1550-nm wavelength |
| SFP-10G-ZR | Cisco 10GBASE-ZR SFP+ transceiver module for SMF, 1550-nm wavelength |

*Table 1 Product Numbers and Descriptions (continued)*

| SFP Transceiver Module Product Number | Transceiver Description |
|---|---|
| SFP-H10GB-CU1M | Cisco 10GBASE-CU passive Twinax SFP+ cable assembly, 1 meter |
| SFP-H10GB-CU3M | Cisco 10GBASE-CU passive Twinax SFP+ cable assembly, 3 meters |
| SFP-H10GB-CU5M | Cisco 10GBASE-CU passive Twinax SFP+ cable assembly, 5 meters |
| SFP-H10GB-ACU7M | Cisco 10GBASE-CU active Twinax SFP+ cable assembly, 7 meters |
| SFP-H10GB-ACU10M | Cisco 10GBASE-CU active Twinax SFP+ cable assembly, 10 meters |
| **1-Gigabit Ethernet** | |
| GLC-SX-MM= | Cisco 1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, commercial operating temperature range. |
| GLC-SX-MM-RGD= | Cisco 1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, industrial operating temperature range. |
| SFP-GE-S= | Cisco 1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, extended operating temperature range. |
| GLC-SX-MMD= | Cisco 1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, extended operating temperature range. |
| GLC-LH-SM= | Cisco 1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, commercial operating temperature range. |
| GLC-LX-SM-RGD= | Cisco 1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, industrial operating temperature range. |
| SFP-GE-L= | Cisco 1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, extended operating temperature range. |
| GLC-LH-SMD= | Cisco 1000BASE-LX/LH SFP transceiver module for MMF and SMF, 1300-nm wavelength, extended operating temperature range. |
| GLC-EX-SMD= | Cisco 1000BASE-EX SFP transceiver module for SMF, 1310 nm wavelength, extended operating temperature range. |
| GLC-ZX-SM= | Cisco 1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, commercial operating temperature range. |
| GLC-ZX-SM-RGD= | Cisco 1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, industrial operating temperature range. |
| SFP-GE-Z= | Cisco 1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, extended operating temperature range. |
| GLC-T= | 1000BASE-T SFP transceiver module for copper networks, commercial operating temperature range. |
| SFP-GE-T= | 1000BASE-T SFP transceiver module for copper networks, extended operating temperature range. |
| GLC-BX-D= | 1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX wavelength, commercial operating temperature range. |
| GLC-BX-U= | 1000BASE-BX10 SFP module for single-strand SMF, 1310-nm TX/1490-nm RX wavelength, commercial operating temperature range. |
| GLC-2BX-D= | Dual-channel 1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX waveength, commercial operating temperature range. |

*Table 1 Product Numbers and Descriptions (continued)*

| SFP Transceiver Module Product Number | Transceiver Description |
|---|---|
| **Fast Ethernet** | |
| GLC-FE-100FX= | 100BASE-FX SFP module for 100-Mb ports, MMF, 1310-nm wavelength, commercial operating temperature range. |
| GLC-FE-100FX-RGD= | 100BASE-FX SFP module for 100-Mb ports, MMF, 1310-nm wavelength, industrial operating temperature range. |
| GLC-GE-100FX= | 100BASE-FX SFP module for Gigabit Ethernet ports, MMF, 1310-nm wavelength, commercial operating temperature range. |
| GLC-FE-100LX= | 100BASE-LX10 SFP module for 100-Mb ports, SMF, 1310-nm wavelength, commercial operating temperature range. |
| GLC-FE-100LX-RGD= | 100BASE-LX10 SFP module for 100-Mb ports, SMF, 1310-nm wavelength, industrial operating temperature range. |
| GLC-FE-100BX-D= | 100BASE-BX10-D SFP module for single-strand SMF, 1550-nm TX/1310-nm RX wavelength, commercial operating temperature range. |
| GLC-FE-100BX-U= | 100BASE-BX10-U SFP module for single-strand SMF, 1310-nm TX/1550-nm RX wavelength, commercial operating temperature range. |
| GLC-FE-100EX= | 100BASE-EX SFP module for 100-Mb ports, SMF, 1310-nm wavelength, commercial operating temperature range. |
| GLC-FE-100ZX= | 100BASE-ZX SFP module for 100-Mb ports, SMF, 1550-nm wavelength, commercial operating temperature range. |
| **SONET/SDH** | |
| SFP-OC3-MM | SFP OC-3/STM-1 Multimode |
| SFP-OC3-SR | SFP OC-3/STM-1 Short-Reach |
| SFP-OC3-IR1 | SFP OC-3/STM-1 Intermediate-Reach |
| SFP-OC3-LR1 | SFP OC-3/STM-1 Long-Reach (40 km) |
| SFP-OC3-LR2 | SFP OC-3/STM-1 Long-Reach (80 km) |
| SFP-OC12-MM | SFP OC-12/STM-4 Multimode |
| SFP-OC12-SR | SFP OC-12/STM-4 Short-Reach |
| SFP-OC12-IR1 | SFP OC-12/STM-4 Intermediate-Reach |
| SFP-OC12-LR1 | SFP OC-12/STM-4 Long-Reach (40 km) |
| SFP-OC12-LR2 | SFP OC-12/STM-4 Long-Reach (80 km) |
| SFP-OC48-SR | SFP OC-48/STM-16 Short-Reach |
| SFP-OC48-IR1 | SFP OC-48/STM-16 Intermediate-Reach |
| SFP-OC48-LR2 | SFP OC-48/STM-16 Long-Reach (80 km) |

*Table 1 Product Numbers and Descriptions (continued)*

| SFP Transceiver Module Product Number | Transceiver Description |
|---|---|
| **CWDM (OC-12/STM4, 1-Gigabit Ethernet, 1-Gigabit Fiber Channel, 2-Gigabit Fiber Channel, OC-48/STM-16)** | |
| CWDM-SFP-1470= | Longwave 1470 nm laser, single mode |
| CWDM-SFP-1490= | Longwave 1490 nm laser, single mode |
| CWDM-SFP-1510= | Longwave 1510 nm laser, single mode |
| CWDM-SFP-1530= | Longwave 1530 nm laser, single mode |
| CWDM-SFP-1550= | Longwave 1550 nm laser, single mode |
| CWDM-SFP-1570= | Longwave 1570 nm laser, single mode |
| CWDM-SFP-1590= | Longwave 1590 nm laser, single mode |
| CWDM-SFP-1610= | Longwave 1610 nm laser, single mode |
| **DWDM (OC-12/STM4, 1-Gigabit Ethernet, 1-Gigabit Fibre Channel, 2-Gigabit Fibre Channel, OC-48/STM-16)** | |
| DWDM-SFP-6141= | Longwave 1561.42 nm laser (100-GHz ITU channel 20), single mode |
| DWDM-SFP-6061= | Longwave 1560.61 nm laser (100-GHz ITU channel 21), single mode |
| DWDM-SFP-5979= | Longwave 1559.79 nm laser (100-GHz ITU channel 22), single mode |
| DWDM-SFP-5898= | Longwave 1558.98 nm laser (100-GHz ITU channel 23), single mode |
| DWDM-SFP-5817= | Longwave 1558.17 nm laser (100-GHz ITU channel 24), single mode |
| DWDM-SFP-5736= | Longwave 1557.36 nm laser (100-GHz ITU channel 25), single mode |
| DWDM-SFP-5655= | Longwave 1556.55 nm laser (100-GHz ITU channel 26), single mode |
| DWDM-SFP-5575= | Longwave 1555.75 nm laser (100-GHz ITU channel 27), single mode |
| DWDM-SFP-5494= | Longwave 1554.94 nm laser (100-GHz ITU channel 28), single mode |
| DWDM-SFP-5413= | Longwave 1554.13 nm laser (100-GHz ITU channel 29), single mode |
| DWDM-SFP-5332= | Longwave 1553.33 nm laser (100-GHz ITU channel 30), single mode |
| DWDM-SFP-5252= | Longwave 1552.52 nm laser (100-GHz ITU channel 31), single mode |
| DWDM-SFP-5172= | Longwave 1551.72 nm laser (100-GHz ITU channel 32), single mode |
| DWDM-SFP-5092= | Longwave 1550.92 nm laser (100-GHz ITU channel 33), single mode |
| DWDM-SFP-5012= | Longwave 1550.12 nm laser (100-GHz ITU channel 34), single mode |
| DWDM-SFP-4931= | Longwave 1549.32 nm laser (100-GHz ITU channel 35), single mode |
| DWDM-SFP-4851= | Longwave 1548.51 nm laser (100-GHz ITU channel 36), single mode |
| DWDM-SFP-4772= | Longwave 1547.72 nm laser (100-GHz ITU channel 37), single mode |
| DWDM-SFP-4692= | Longwave 1546.92 nm laser (100-GHz ITU channel 38), single mode |

*Table 1 Product Numbers and Descriptions (continued)*

| SFP Transceiver Module Product Number | Transceiver Description |
|---|---|
| DWDM-SFP-4612= | Longwave 1546.12 nm laser (100-GHz ITU channel 39), single mode |
| DWDM-SFP-4532= | Longwave 1545.32 nm laser (100-GHz ITU channel 40), single mode |
| DWDM-SFP-4453= | Longwave 1544.53 nm laser (100-GHz ITU channel 41), single mode |
| DWDM-SFP-4373= | Longwave 1543.73 nm laser (100-GHz ITU channel 42), single mode |
| DWDM-SFP-4294= | Longwave 1542.94 nm laser (100-GHz ITU channel 43), single mode |
| DWDM-SFP-4214= | Longwave 1542.14 nm laser (100-GHz ITU channel 44), single mode |
| DWDM-SFP-4134= | Longwave 1541.35 nm laser (100-GHz ITU channel 45), single mode |
| DWDM-SFP-4056= | Longwave 1540.56 nm laser (100-GHz ITU channel 46), single mode |
| DWDM-SFP-3977= | Longwave 1539.77 nm laser (100-GHz ITU channel 47), single mode |
| DWDM-SFP-3898= | Longwave 1538.98 nm laser (100-GHz ITU channel 48), single mode |
| DWDM-SFP-3819= | Longwave 1538.19 nm laser (100-GHz ITU channel 49), single mode |
| DWDM-SFP-3739= | Longwave 1537.40 nm laser (100-GHz ITU channel 50), single mode |
| DWDM-SFP-3661= | Longwave 1536.61 nm laser (100-GHz ITU channel 51), single mode |
| DWDM-SFP-3582= | Longwave 1535.82 nm laser (100-GHz ITU channel 52), single mode |
| DWDM-SFP-3504= | Longwave 1535.04 nm laser (100-GHz ITU channel 53), single mode |
| DWDM-SFP-3425= | Longwave 1534.25 nm laser (100-GHz ITU channel 54), single mode |
| DWDM-SFP-3346= | Longwave 1533.47 nm laser (100-GHz ITU channel 55), single mode |
| DWDM-SFP-3268= | Longwave 1532.68 nm laser (100-GHz ITU channel 56), single mode |
| DWDM-SFP-3190= | Longwave 1531.90 nm laser (100-GHz ITU channel 57), single mode |
| DWDM-SFP-3112= | Longwave 1531.12 nm laser (100-GHz ITU channel 58), single mode |
| DWDM-SFP-3033= | Longwave 1530.33 nm laser (100-GHz ITU channel 59), single mode |

The SFP+ and SFP transceiver module cabling and optical transmit and receive specifications are listed in Table 2 through Table 9.

*Table 2 SFP+ Optical Transceiver Module Cabling Specifications*

| SFP+ Transceiver Module Model | Wavelength (nm) | Fiber Type | Core Size (µm) | Modal Bandwidth (MHz/km)[1] | Cable Distance (ft/m) |
|---|---|---|---|---|---|
| SFP-10G-SR<br>SFP-10G-SR-X | 850 | MMF | 62.5<br>62.5<br>50.0<br>50.0<br>50.0 | 160<br>200<br>400<br>500<br>2000 | 85/26<br>108/33<br>216/66<br>269/82<br>984/300 |
| SFP-10G-LR<br>SFP-10G-LR-X | 1310 | SMF | G.652 | — | 6.2 miles (10 km) |
| SFP-10G-LRM | 1310 | MMF<br><br><br><br>SMF | 62.5<br>50.0<br>50.0<br><br>G.652 | 500<br>400<br>500<br><br>— | 722/220<br>328/100<br>722/220<br><br>984/300 |
| SFP-10G-ER | 1550 | SMF | G.652 | — | 24.86 miles (40 km)[2] |
| SFP-10G-ZR | 1550 | SMF | G.652 | — | 49.72 miles (80 km) |

1. At specified wavelength.
2. For distances up to 30 km, no special link design rules need to be considered. Link distances beyond 30 km require that you verify the cable characteristics, especially the cable's loss value.

*Table 3 SFP+ Transceiver Module Optical Transmit and Receive Specifications*

| SFP+ Transceiver Module Model | Transceiver Type | Transmit Power (dBm) | Receive Power (dBm) | Transmit and Receive Wavelength (nm) |
|---|---|---|---|---|
| SFP-10G-SR<br>SFP-10G-SR-X | 10GBASE-SR, 850-nm MMF | –1.3 (Max)<br>–7.3 (Min) | –1.0 (Max)<br>–9.9 (Min) | 840 to 860 |
| SFP-10G-LR<br>SFP-10G-LR-X | 10GBASE-LR, 1310-nm SMF | 0.5 (Max)<br>–8.2 (Min) | 0.5 (Max)<br>–14.4 (Min) | 1260 to 1355 |
| SFP-10G-LRM | 10GBASE-LRM, 1310-nm MMF and SMF | 0.5 (Max)<br>–6.5 (Min) | 0.5 (Max)<br>–8.4 (Min average)<br>–6.4 (Min in OMA) | 1260 to 1355 |
| SFP-10G-ER[1] | 10GBASE-ER, 1550-nm SMF | 4.0 (Max)<br>–4.7 (Min) | –1.0 (Max)<br>–15.8 (Min) | 1530 to 1565 |
| SFP-10G-ZR[2] | 10GBASE-ZR, 1550-nm SMF | 4.0 (Max)<br>0 (Min)[3] | –7.0 (Max)<br>–24.0 (Min) | 1530 to 1565 |

1. Requires a 5-dB, 1550-nm, fixed loss attenuator for distances less than 20 km.
2. Requires a 5- or 10-dB fixed loss attenuator for distances less than 40 km. Please keep receive power below –7 dBm.
3. Receiver sensitivity for 10G Ethernet links with no FEC. With FEC-capable receiver ports and for OTU2/OTU2e links, receiver sensitivity is improved to –27 dBm. Also a 3 dB dispersion penalty should be taken into account for both FEC and non-FEC cases.

*Table 4 100-Mb and 1-Gigabit Optical SFP Transceiver Module Cabling Specifications*

| SFP Module Model | Wavelength (nanometers) | Fiber Type | Core Size (micron) | Modal Bandwidth (MHz/km) | Cable Distance |
|---|---|---|---|---|---|
| GLC-SX-MM<br>SFP-GE-S<br>GLC-SX-MM-RGD<br>GLC-SX-MMD | 850 | MMF | 62.5<br>62.5<br>50.0<br>50.0<br>50.0 | 160<br>200<br>400<br>500<br>2000 | 722 feet (220 m)<br>902 feet (275 m)<br>1640 feet (500 m)<br>1804 feet (550 m)<br>3281 feet (1 km) |
| GLC-LH-SM<br>SFP-GE-L<br>GLC-LX-SM-RGD<br>GLC-LH-SMD | 1310 | MMF[1]<br><br><br>SMF | 62.5<br>50.0<br>50.0<br>G.652 | 500<br>400<br>500<br>— | 1804 feet (550 m)<br>1804 feet (550 m)<br>1804 feet (550 m)<br>6.2 miles (10 km) |
| GLC-BX-D<br>GLC-2BX-D | 1490<br>(downstream) | SMF | G.652 | — | 6.2 miles (10 km) |
| GLC-BX-U | 1310<br>(upstream) | SMF | G.652 | — | 6.2 miles (10 km) |
| GLC-EX-SMD | 1310 | SMF | G.652 | — | 24.9 miles (40 km) |
| GLC-ZX-SM<br>GLC-ZX-SM-RGD<br>SFP-GE-Z | 1550 | SMF | G.652 | — | 43.4 to 62 miles<br>(70 to 100 km) |

*Table 4 100-Mb and 1-Gigabit Optical SFP Transceiver Module Cabling Specifications (continued)*

| SFP Module Model | Wavelength (nanometers) | Fiber Type | Core Size (micron) | Modal Bandwidth (MHz/km) | Cable Distance |
|---|---|---|---|---|---|
| GLC-FE-100FX<br>GLC-FE-100FX-RGD | 1310 | MMF | 62.5<br>62.5<br>50.0<br>50.0 | 160<br>200<br>400<br>500 | 1.24 miles (2 km) |
| GLC-FE-100LX<br>GLC-FE-100LX-RGD | 1310 | SMF | G.652 | — | 6.2 miles (10 km) |
| GLC-FE-100BX-D | 1550 (downstream) | SMF | G.652 | — | 6.2 miles (10 km) |
| GLC-FE-100BX-U | 1310 (upstream) | SMF | G.652 | — | 6.2 miles (10 km) |
| GLC-FE-100EX | 1310 | SMF | G.652 | — | 24.9 miles (40 km) |
| GLC-FE-100ZX | 1550 | SMF | G.652 | — | 49.7 miles (80 km) |

1. A mode-conditioning patch cord is required at all times per IEEE specifications.

**Note** For the GLC-ZX-SM, the minimum attenuation between the transmit bore (TX) and the receive bore (RX) is 8 dB. When using shorter distances of single-mode fiber cable, you might need to insert an inline optical attenuator in the link to avoid overloading the receiver.

Copper SFP transceiver modules can operate at 10, 100, or 1000 Mbps on some Cisco devices. To find the supported speeds for the 1000BASE-T SFP transceiver modules in your Cisco device, see the *Compatibility Matrix for 1000BASE-T Small Form-Factor Pluggable Modules*.

Copper 1000BASE-T SFP transceiver modules use standard four twisted-pair, Category 5 cable at lengths up to 328.08 feet (100 meters).

*Table 5 100M and 1-Gigabit SFP Transceiver Module Optical Transmit and Receive Specifications*

| SFP Transceiver Module Model | Transceiver Type | Transmit Power (dBm) | Receive Power (dBm) | Transmit and Receive Wavelength (nm) |
|---|---|---|---|---|
| GLC-SX-MM<br>SFP-GE-S<br>GLC-SX-MM-RGD<br>GLC-SX-MMD | 1000BASE-SX, 850-nm MMF | –3 (Max)<br>–9.5 (Min) | 0 (Max)<br>–17 (Min) | 770 to 860 |
| GLC-LH-SM<br>SFP-GE-L<br>GLC-LX-SM-RGD<br>GLC-LH-SMD | 1000BASE-LX/LH, 1310-nm SMF | –3 (Max)<br>–9.5 (Min) | –3 (Max)<br>–20 (Min) | 1260 to 1355 |
| GLC-BX-D<br>GLC-2BX-D | 1000BASE-BX-D, 1490-nm SMF | –3 (Max)<br>–9 (Min) | –3 (Max)<br>–19.5 (Min) | 1480 to 1500 (transmit),<br>1260 to 1360 (receive) |

*Table 5 100M and 1-Gigabit SFP Transceiver Module Optical Transmit and Receive Specifications (continued)*

| SFP Transceiver Module Model | Transceiver Type | Transmit Power (dBm) | Receive Power (dBm) | Transmit and Receive Wavelength (nm) |
|---|---|---|---|---|
| GLC-BX-U | 1000BASE-BX-U, 1310-nm SMF | –3 (Max)<br>–9 (Min) | –3 (Max)<br>–19.5 (Min) | 1260 to 1360 (transmit),<br>1480 to 1500 (receive) |
| GLC-EX-SMD | 1000BASE-EX, 1310 nm | +3 (Max)<br>–1 (Min) | +1 (Max)<br>–22 (Min) | 1290 to 1335 |
| GLC-ZX-SM<br>GLC-ZX-SM-RGD<br>SFP-GE-Z | 1000BASE-ZX, 1550 nm SMF | +5 (Max)<br>0 (Min) | –3 (Max)<br>–23 (Min) | 1500 to 1580 |
| GLC-FE-100FX<br>GLC-FE-100FX-RGD<br>GLC-GE-100FX | 100BASE-FX, 1310 nm MMF | –14 (Max)<br>–20 (Min) | –14 (Max)<br>–31 (Min) | 1270 to 1380 |
| GLC-FE-100LX<br>GLC-FE-100LX-RGD | 100BASE-LX, 1310 nm SMF | –8 (Max)<br>–15 (Min) | –8 (Max)<br>–28 (Min) | 1260 to 1360 |
| GLC-FE-100BX-D | 100BASE-BX-D, 1550 nm SMF | –8 (Max)<br>–14 (Min) | –3 (Max)<br>–28.2 (Min) | 1480 to 1580 (transmit),<br>1260 to 1360 (receive) |
| GLC-FE-100BX-U | 100BASE-BX-U, 1310 nm SMF | –8 (Max)<br>–14 (Min) | –3 (Max)<br>–28.2 (Min) | 1260 to 1360 (transmit),<br>1480 to 1580 (receive) |
| GLC-FE-100EX | 100BASE-EX, 1310 nm SMF | 0 (Max)<br>–5 (Min) | –8 (Max)<br>–28 (Min) | 1260 to 1360 |
| GLC-FE-100ZX | 100BASE-ZX, 1550 nm SMF | +2 (Max)<br>–3 (Min) | –8 (Max)<br>–30 (Min) | 1480 to 1600 |

*Table 6 SONET/SDH Optical SFP Transceiver Module Cabling Specifications*

| SFP Module Model | Wavelength (nanometers) | Fiber Type | Core Size (micron) | Modal Bandwidth (MHz/km) | Cable Distance |
|---|---|---|---|---|---|
| SFP-OC3-MM | 1310 | MMF | 62.5<br>50.0 | 500<br>500 | 1.24 miles (2 km)<br>1.24 miles (2 km) |
| SFP-OC3-SR | 1310 | SMF | G.652 | — | 1.24 miles (2 km) |
| SFP-OC3-IR1 | 1310 | SMF | G.652 | — | 9.3 miles (15 km) |
| SFP-OC3-LR1 | 1310 | SMF | G.652 | — | 24.9 miles (40 km) |
| SFP-OC3-LR2 | 1550 | SMF | G.652 | — | 49.7 miles (80 km) |
| SFP-OC12-MM | 1310 | MMF | 62.5<br>50.0 | 500<br>500 | 1640 feet (500 m)<br>1640 feet (500 m) |
| SFP-OC12-SR | 1310 | SMF | G.652 | — | 1.24 miles (2 km) |
| SFP-OC12-IR1 | 1310 | SMF | G.652 | — | 9.3 miles (15 km) |
| SFP-OC12-LR1 | 1310 | SMF | G.652 | — | 24.9 miles (40 km) |
| SFP-OC12-LR2 | 1550 | SMF | G.652 | — | 49.7 miles (80 km) |
| SFP-OC48-SR | 1310 | SMF | G.652 | — | 1.24 miles (2 km) |
| SFP-OC48-IR1 | 1310 | SMF | G.652 | — | 9.3 miles (15 km) |
| SFP-OC48-LR2 | 1550 | SMF | G.652 | — | 49.7 miles (80 km) |

*Table 7 SONET/SDH SFP Transceiver Module Optical Transmit and Receive Specifications*

| SFP Transceiver Module Model | Transceiver Type | Transmit Power (dBm) | Receive Power (dBm) | Transmit and Receive Wavelength (nm) |
|---|---|---|---|---|
| SFP-OC3-MM | OC3-SR0, 1310 nm MMF | –14 (Max)<br>–19 (Min) | –5 (Max)<br>–30 (Min) | 1270 to 1380 |
| SFP-OC3-SR | OC3-SR1/STM1-I-1, 1310 nm SMF | –8 (Max)<br>–15 (Min) | –8 (Max)<br>–23 (Min) | 1260 to 1360 |
| SFP-OC3-IR1 | OC3-IR1/STM1-S-1.1, 1310 nm SMF | –8 (Max)<br>–15 (Min | –8 (Max)<br>–28 (Min) | 1261 to 1360 |
| SFP-OC3-LR1 | OC3-LR1/STM1-L-1.1, 1310 nm SMF | 0 (Max)<br>–5 (Min) | –10 (Max)<br>–34 (Min) | 1263 to 1360 |
| SFP-OC3-LR2 | OC3-LR2/STM1-L-1.2, 1550 nm SMF | 0 (Max)<br>–5 (Min) | –10 (Max)<br>–34 (Min) | 1480 to 1580 |
| SFP-OC12-MM | OC12-SR0, 1310 nm MMF | –14 (Max)<br>–20 (Min) | –6 (Max)<br>–26 (Min) | 1270 to 1380 |
| SFP-OC12-SR | OC12-SR1/STM4-I-4, 1310 nm SMF | –8 (Max)<br>–15 (Min) | –8 (Max)<br>–23 (Min) | 1261 to 1360 |

*Table 7 SONET/SDH SFP Transceiver Module Optical Transmit and Receive Specifications (continued)*

| SFP Transceiver Module Model | Transceiver Type | Transmit Power (dBm) | Receive Power (dBm) | Transmit and Receive Wavelength (nm) |
|---|---|---|---|---|
| SFP-OC12-IR1 | OC12-IR1/STM4-S-4.1, 1310 nm SMF | –8 (Max)<br>–15 (Min | –8 (Max)<br>–28 (Min) | 1293 to 1334 |
| SFP-OC12-LR1 | OC12-LR1/STM4-L-4.1, 1310 nm SMF | +2 (Max)<br>–3 (Min) | –8 (Max)<br>–28 (Min) | 1280 to 1335 |
| SFP-OC12-LR2 | OC12-LR2/STM4-L-4.2, 1550 nm SMF | +2 (Max)<br>–3 (Min) | –8 (Max)<br>–28 (Min) | 1480 to 1580 |
| SFP-OC48-SR | OC48-SR/STM16-I-16, 1310 nm SMF | –3 (Max)<br>–10 (Min) | –3 (Max)<br>–18 (Min) | 1266 to 1360 |
| SFP-OC48-IR1 | OC48-IR1/STM16-S-16.1, 1310 nm SMF | 0 (Max)<br>–5 (Min) | 0 (Max)<br>–18 (Min) | 1260 to 1360 |
| SFP-OC48-LR2 | OC48-LR2/STM16-L-16.2, 1550 nm SMF | +3 (Max)<br>–2 (Min) | –9 (Max)<br>–28 (Min) | 1500 to 1580 |

*Table 8 CWDM SFP Transceiver Module Optical Parameters*

| Parameter | Minimum | Typical | Maximum | Units | Notes and Conditions |
|---|---|---|---|---|---|
| Transmitter Center Wavelength | (x–4) | — | (x + 7) | nm | Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm |
| Side-Mode Suppression Ratio | 30 | — | | dB | |
| Transmitter Optical Output Power | 0 | — | 5.0 | dBm | Average power coupled into single-mode fiber |
| Receiver Optical Input Power (BER <10-12 with PRBS 2-7-1) | –28.0 | — | –7.0 | dBm | Measured at 2.12 Gbps, 140°F (60°C) case temperature |
| Receiver Optical Input Power (BER <10-12 with PRBS 2-7-1) | –29.0 | — | –7.0 | dBm | Measured at 1.25 Gbps, 140°F (60°C) case temperature |
| Receiver Optical Input Wavelength | 1450 | — | 1620 | nm | |
| Transmitter Extinction Ratio | 9 | — | | dB | |
| Dispersion Penalty at 100 km | — | — | 3 | dB | Measured at 2.12 Gbps |
| Dispersion Penalty at 100 km | — | — | 2 | dB | Measured at 1.25 Gbps |

*Table 9 DWDM SFP Transceiver Module Optical Parameters*

| Parameter | Minimum | Typical | Maximum | Units | Notes and Conditions |
|---|---|---|---|---|---|
| **Transmitter** | | | | | |
| Spectral Width | — | — | 0.2 | nm | Full width, –20dB from maximum, with resolution bandwidth (RBW) = 0.01 nm |
| Transmitter Center Wavelength | x – 100 | x | x + 100 | pm | See Table 1 for center wavelengths |
| Side-Mode Suppression Ratio | 30 | — | — | dB | — |
| Transmitter Extinction Ratio | 8.2 | — | — | dB | — |
| Transmitter Optical Output Power | 0 | — | 4.0 | dBm | Average power coupled into single-mode fiber |
| **Receiver** | | | | | |
| Receiver Optical Input Wavelength | 1530 | — | 1565 | nm | — |
| Receiver Damage Threshold | — | — | +5 | dBm | — |
| **Power-Limited Performance at OSNR of 20 dB (1 GbE or 1-Gbps FC) or 21 dB (2 Gbps FC) at 0.1-nm RBW** | | | | | |
| Optical Input Power | –28.0 | — | –9.0 | dBm | — |
| Dispersion Power Penalty < 1 GbE and 1 Gbps FC | — | — | 3 | dB | –800/+3600 ps/nm |
| Dispersion Power Penalty > 2 Gbps FC | — | — | 3 | dB | –800/+2400 ps/nm |
| **Noise-Limited Performance at OSNR of 19 dB 1 GbE or 1 Gbps FC) or 20 dB (2 Gbps FC) at 0.1-nm RBW** | | | | | |
| Optical Input Power | –22.0 | — | –9.0 | dB | — |
| Dispersion OSNR Penalty < 1 GbE and 1 Gbps FC | — | — | 2 | dB | –800/+3600 ps/nm |
| Dispersion OSNR Penalty > 2 Gbps FC | — | — | 3 | — | –800/+2400 ps/nm |

# Safety

Safety warnings appear throughout this publication in procedures that may harm you if performed incorrectly or are ignored. A warning symbol precedes each warning statement.

## Statement 1071—Warning Definition

**Warning** **IMPORTANT SAFETY INSTRUCTIONS**

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.**

**SAVE THESE INSTRUCTIONS**

**Waarschuwing** **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

**Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.**

**BEWAAR DEZE INSTRUCTIES**

**Varoitus** **TÄRKEITÄ TURVALLISUUSOHJEITA**

**Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.**

**SÄILYTÄ NÄMÄ OHJEET**

**Attention** **IMPORTANTES INFORMATIONS DE SÉCURITÉ**

**Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.**

**CONSERVEZ CES INFORMATIONS**

**Warnung** **WICHTIGE SICHERHEITSHINWEISE**

**Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.**

**BEWAHREN SIE DIESE HINWEISE GUT AUF.**

**Avvertenza** **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

**Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.**

**CONSERVARE QUESTE ISTRUZIONI**

**Advarsel** **VIKTIGE SIKKERHETSINSTRUKSJONER**

**Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.**

**TA VARE PÅ DISSE INSTRUKSJONENE**

**Aviso** **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

**Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.**

**GUARDE ESTAS INSTRUÇÕES**

**¡Advertencia!** **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

**Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.**

**GUARDE ESTAS INSTRUCCIONES**

Varning! **VIKTIGA SÄKERHETSANVISNINGAR**

**Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.**

**SPARA DESSA ANVISNINGAR**

Figyelem **FONTOS BIZTONSÁGI ELOÍRÁSOK**

**Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto meg.**

**ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!**

Предупреждение **ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

**Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.**

**СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ**

警告 重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**Aviso** **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

**Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.**

**GUARDE ESTAS INSTRUÇÕES**

**Advarsel** **VIGTIGE SIKKERHEDSANVISNINGER**

**Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.**

**GEM DISSE ANVISNINGER**

**تحذير** **إرشادات الأمان الهامة**

**يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في أخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.**
**قم بحفظ هذه الإرشادات**

**Upozorenje** **VAŽNE SIGURNOSNE NAPOMENE**

**Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.**

**SAČUVAJTE OVE UPUTE**

Upozornění

**DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

**Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.**

**USCHOVEJTE TYTO POKYNY**

Προειδοποίηση

ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה

## הוראות בטיחות חשובות

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

## שמור הוראות אלה

Opomena

ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА
Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.
ЧУВАЈТЕ ГИ ОВИЕ НАПАТСТВИЈА

**Ostrzeżenie** **WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

**Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.**

**NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ**

**Upozornenie** **DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

**Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.**

**USCHOVAJTE SI TENTO NÁVOD**

**Warning** **Class 1 laser product.** Statement 1008

**Warning** **Laser radiation is present when the system is open and interlocks bypassed.** Statement 1014

**Warning** **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

# Required Tools

You will need these tools to install the SFP transceiver module:

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, see the white-paper document at this URL:

  http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

# Installing SFP and SFP+ Transceiver Modules

SFP transceiver modules can have three types of latching devices to secure an SFP transceiver module in a port socket:

- Figure 4 shows an SFP transceiver module with a Mylar tab latch.
- Figure 5 shows an SFP transceiver module with an actuator button latch.
- Figure 6 shows an SFP transceiver module that has a bail clasp latch.
- Figure 7 shows an SFP+ transceiver module that has a bail clasp latch.

Determine which type of latch your SFP transceiver module uses before following the installation and removal procedures.

**Caution** Do not install or remove the SFP transceiver module with fiber-optic cables still attached to it. Doing so may damage cables, cable connectors, or the optical interfaces and may interfere with the SFP transceiver module latching properly into its socket connector. Disconnect all cables before removing or installing an SFP transceiver module.

Removing and installing an SFP transceiver module can shorten its useful life. Do not remove and insert SFP transceiver modules more often than is absolutely necessary.

**Caution** The SFP transceiver modules are static sensitive devices. Always use an ESD wrist strap or similar individual grounding device when handling SFP transceiver modules or coming in contact with modules.

***Figure 4 SFP Transceiver Module with a Mylar Tab Latch***

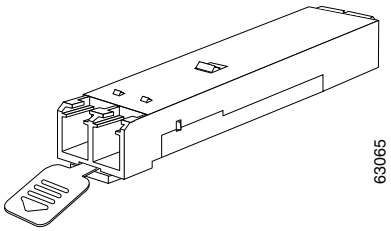



***Figure 5 SFP Transceiver Module with an Actuator Button Latch***

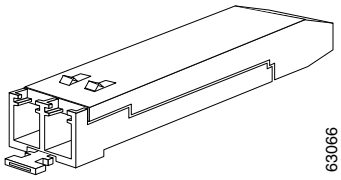


*Figure 6 SFP Module with a Bail Clasp Latch*

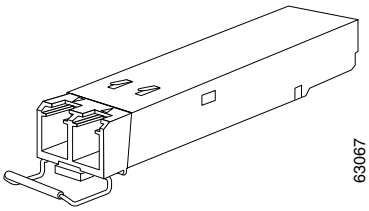
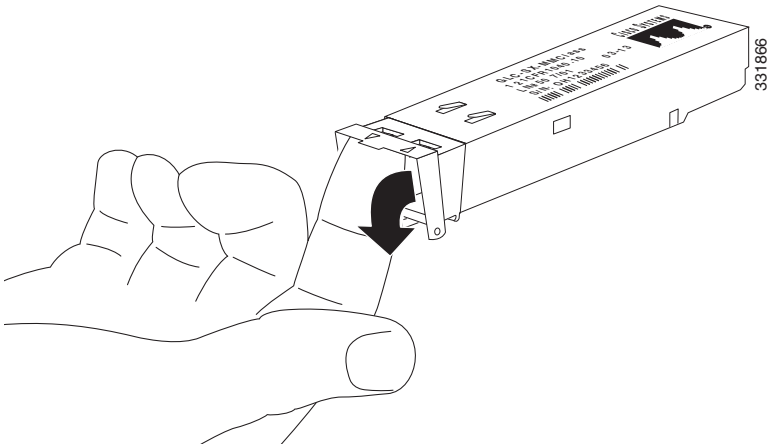



*Figure 7 SFP+ Module with a Bail Clasp Latch*




To install an SFP transceiver module, follow these steps:

**Step 1** Attach an ESD-preventive wrist strap to your wrist and to the ESD ground connector or a bare metal surface on your chassis.

**Step 2** Remove the SFP transceiver module from its protective packaging.

**Note** Do not remove the optical bore dust plugs until directed to do so later in the procedure.

**Step 3** Check the label on the SFP transceiver module body to verify that you have the correct model for your network.

**Step 4** Find the send (TX) and receive (RX) markings that identify the top side of the SFP transceiver module.

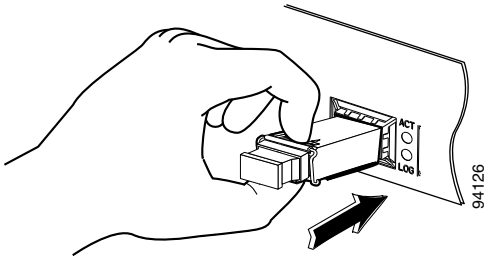
**Note** On some SFP transceiver modules, the TX and RX marking might be replaced by arrowheads pointing from the SFP transceiver module connector (transmit direction or TX) and toward the connector (receive direction or RX).

**Step 5** Position the SFP transceiver module in front of the socket opening.

**Note** Different Cisco devices have different SFP module socket configurations. Your Cisco device could have either a latch-up or a latch-down orientation. Ensure that you are installing the SFP transceiver module in the correct orientation for your Cisco device. For more details, see the hardware installation instructions that came with your Cisco device.

**Step 6** Holding it as shown in Figure 8, insert the SFP into the socket until you feel the connector latch into place.

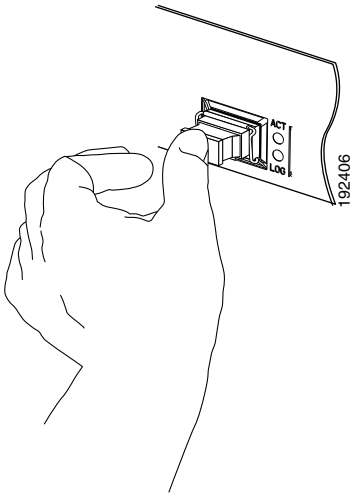
***Figure 8 Inserting an SFP Transceiver Module into a Module Socket***



**Step 7** Press the SFP into the slot firmly with your thumb as shown in Figure 9.

**Note** For SFP transceiver modules equipped with an actuator latch, you must press firmly on both the transceiver faceplate and the actuator button to ensure that the transceiver is properly latched in the socket.

***Figure 9 Latching the SFP***

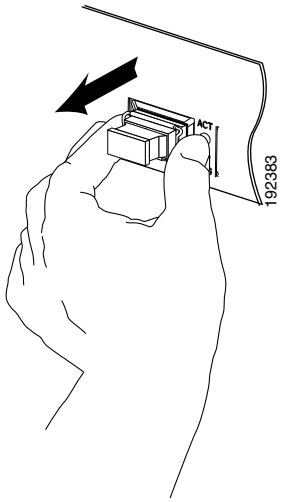



**Step 8** To verify that the SFP is seated and latched properly:

**a.** Grasp the SFP as shown in Figure 10 and try to remove it without releasing the latch.

**b.** If the SFP can not be removed, it is installed and seated properly. If the SFP can be removed, reinsert it and press harder with your thumb, repeating if necessary until it is latched securely into the socket.

***Figure 10 Verifying SFP Installation***



**Note** For optical SFP transceiver modules, before removing the dust plugs and making any optical connections, observe the following guidelines:

- Always keep the protective dust plugs on the unplugged fiber-optic cable connectors and the transceiver optical bores until you are ready to make a connection.
- Always inspect and clean the LC connector end-faces just before making any connections. See the Tip on this page for a pointer to a fiber-optic inspection and cleaning white paper.
- Always grasp the LC connector housing to plug or unplug a fiber-optic cable.

**Step 9** Remove the dust plugs from the network interface cable LC connectors. Save the dust plugs for future use.

**Step 10** Inspect and clean the LC connector's fiber-optic end-faces. See the following Tip for a pointer to a fiber-optic inspection and cleaning white paper.

**Tip** For complete information on inspecting and cleaning fiber-optic connections, see the white-paper document at this URL:

http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

**Step 11** Remove the dust plugs from the SFP transceiver module optical bores.

**Step 12** Immediately attach the network interface cable LC connector to the SFP transceiver module.

**Step 13** To connect 1000BASE-T SFP transceiver modules to a copper network, follow these substeps:

**Caution** To comply with GR-1089 intrabuilding lightning immunity requirements, you must use grounded, shielded, twisted-pair Category 5 cabling.

**a.** Insert the Category 5 network cable RJ-45 connector into the SFP transceiver module RJ-45 connector.

**Note** When connecting to a 1000BASE-T-compatible server, workstation, or router, use four twisted-pair, straight-through Category 5 cabling for the SFP transceiver module port. When connecting to a 1000BASE-T-compatible switch or repeater, use four twisted-pair, crossover Category 5 cabling.

**b.** Insert the other end of the network cable into an RJ-45 connector on a 1000BASE-T-compatible target device.

**Step 14** Observe the port status LED:

- The LED turns green when the SFP transceiver module and the target device have an established link.
- The LED turns amber while the STP feature discovers the network topology and searches for loops. This process takes about 30 seconds, and then the LED turns green.
- If the LED is off, the target device might not be turned on, there might be a cable problem, or there might be a problem with the adapter installed in the target device. See the Troubleshooting section of your switch hardware guide for solutions to cabling problems.

**Step 15** Reconfigure and reboot the target device if necessary.

# Removing SFP and SFP+ Transceiver Modules

**Caution** The SFP and SFP+ transceiver modules are static sensitive devices. Always use an ESD wrist strap or similar individual grounding device when handling the transceiver modules or coming in contact with modules.

**Caution** Be careful when removing GLC-GE-100FX SFPs from a WS-C3750G-12S-S switch. The SFP transceiver module temperature might go over 160°F (70°C) and be too hot to touch with bare hands.

If you are removing an SFP or SFP+ transceiver module, follow these steps:

**Step 1** Attach an ESD-preventive wrist strap to your wrist and to the ESD ground connector or a bare metal surface on your chassis.

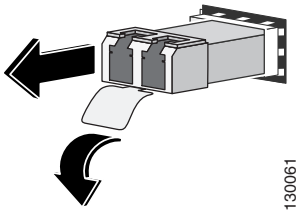
**Step 2** Disconnect the network fiber-optic cable or network copper cable from the transceiver module connector. For optical transceiver modules, immediately reinstall the dust plugs in the transceiver module's optical bores and the fiber-optic cable LC connectors.

**Tip** For reattachment of fiber-optic cables, note which connector plug is send (TX) and which is receive (RX).

**Step 3** Release and remove the transceiver module from the socket connector, as shown in Figure 11, Figure 12, Figure 13, or

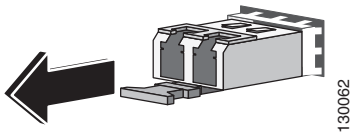
- If the SFP transceiver module has a Mylar tab latch, pull the tab gently in a slightly downward direction until the transceiver disengages from the socket connector, and then pull the SFP transceiver module straight out. Do not twist or pull the Mylar tab because you could detach it from the SFP transceiver module.

*Figure 11 Removing an SFP Transceiver Module Equipped with a Mylar Tab*



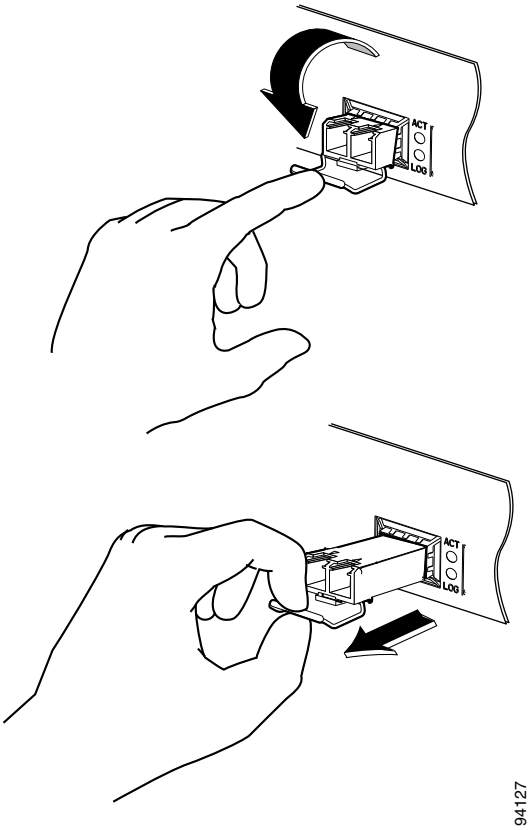

- If the SFP transceiver module has an actuator button latch, gently press the actuator button on the front of the SFP transceiver module until it clicks and the latch mechanism releases the SFP transceiver module from the socket connector. Grasp the actuator button between your thumb and index finger, and carefully pull the SFP transceiver module straight from the module slot.

*Figure 12 Removing an SFP Transceiver Module Equipped with an Actuator Button Latch*



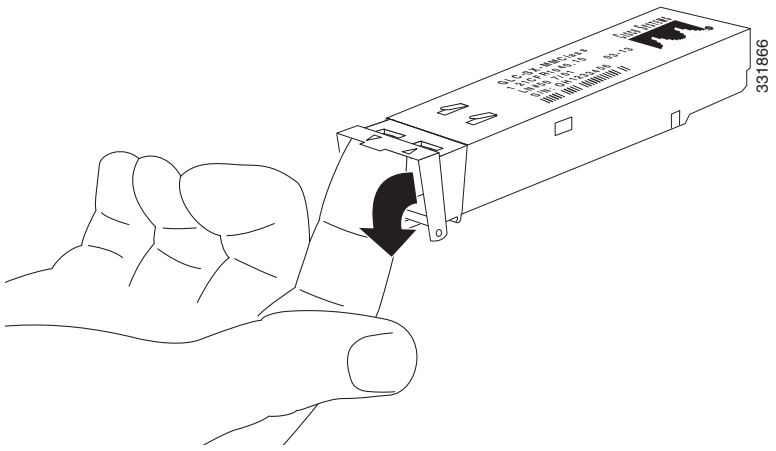

- If the SFP transceiver module has a bail clasp latch, pull the  out and down to eject the SFP transceiver module from the socket connector. If the bail clasp latch is obstructed and you cannot use your index finger to open it, use a small, flat-blade screwdriver or other long, narrow instrument to open the bail clasp latch. Grasp the SFP transceiver module between your thumb and index finger, and carefully remove it from the socket.

*Figure 13 Removing an SFP Transceiver Module Equipped with a Bail Clasp Latch*




- The SFP+ transceiver uses a bail clasp style latch which is slightly different than the bail clasp latch for the SFP transceiver. The SFP+ transceiver bail clasp has a small tab protruding down from the bail clasp handle To release the SFP+ bail clasp, push the small tab up and outwards with your index finger to release the bail clasp. Grasp the SFP+ transceiver between your thumb and index finger and carefully remove the transceiver from the socket.

*Figure 14 Removing an SFP+ Transceiver Equipped with a Bail Clasp Latch with Tab*



**Предупреждение** Установку, замену и обслуживание этого оборудования может осуществлять только специально обученный квалифицированный персонал.

警告 只有经过培训且具有资格的人员才能进行此设备的安装、更换和维修。

警告 [redacted]置の[redacted]を受けた相応の資格[redacted]

**Aviso** **Somente uma equipe treinada e qualificada tem permissão para instalar, substituir ou dar manutenção a este equipamento.**

**Advarsel** **Kun uddannede personer må installere, udskifte komponenter i eller servicere dette udstyr.**

# Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

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