Avaya Ethernet Routing Switch 3500 Series Installation - SFPs

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Contents

Chapter 1: Purpose of this document

This document describes how to select, install, and remove Small Form Factor Pluggable (SFP) transceivers. This document also provides specifications for each supported device.

Chapter 2: New in this release

There are no changes to this document as a result of software features for Avaya Ethernet Routing Switch (ERS) 3500 Series Release 5.1.

Chapter 3: Safety and equipment care

Safety and equipment care

About this task

This section contains important safety and regulatory information. Read this section before you install small form factor pluggable (SFP) transceivers.

SFPs are static sensitive.

Dust contamination can reduce the performance of optical parts in transceivers. When you store a transceiver, or after you disconnect it from a fiber optic cable, always keep a dust cover over the optical bore.

Dispose of this product according to all national laws and regulations.

To prevent equipment damage, observe the following electrostatic discharge (ESD) precautions when you handle or install the components:

- Ground yourself and the equipment to an earth or building ground. Use a grounded workbench mat (or foam that dissipates static charge) and a grounding wrist strap. The wrist strap must touch the skin and you must ground it through a one megaohm resistor.
- Do not touch anyone who is not grounded.
- Leave all components in their ESD-safe packaging until installation, and use only a static-shielding bag for all storage, transport, and handling.
- Clear the area of synthetic materials such as polyester, plastic, vinyl, or styrofoam because these materials carry static electricity that damages the equipment.

Job aid

You must keep fiber optic equipment connections clean and damage-free. Use the information in this job aid to properly maintain and care for fiber optic equipment.

Fiber optic cable care

Although reinforcing material and plastic insulation protects the glass fiber in fiber optic cable , it is subject to damage. Use the following precautions to avoid damaging the glass fiber.

- Do not kink, knot, or vigorously flex the cable.
- Do not bend the cable to less than a 40 mm radius.
- Do not stand on fiber optic cable; keep the cable off the floor.
- Do not pull fiber optic cable harder than you do a cable containing copper wire of comparable size.
- Do not allow a static load of more than a few pounds on a section of the cable.
- Place protective caps on fiber optic connectors that are not in use.
- Store unused fiber optic patch cables in a cabinet, on a cable rack, or flat on a shelf.

Frequent overstressing of fiber optic cable causes progressive degeneration that leads to failure.

If you suspect damage to a fiber optic cable, either due to mishandling or an abnormally high error rate observed in one direction, reverse the cable pairs. If the high error rate appears in the other direction, replace the cable.

⚠ Caution:

Risk of equipment damage

Do not crush fiber optic cable. If fiber optic cable is in the same tray or duct with large, heavy electrical cables, the weight of the electrical cable can damage the fiber optic cable.

Fiber optic connector care

Before you connect fiber optic connectors to transmission equipment, test equipment, patch panels, or other connectors, ensure fiber optic connectors are clean. The performance of an optical fiber connector depends on how clean the connector and coupling are at the time of connection.

A damaged or dirty connector can damage a connector with which it pairs. A connector must be clean before you insert it into a transmitter or receiver.

Never clean an optical connector while it carries light. Optical power can cause ignition of the cleaning material when it contacts the end of the optical connector and can destroy the connector. Typical cleaning materials, for example, tissues saturated with alcohol, combust almost instantaneously after you expose them to optical power levels of +15 dBm or higher.

Visually inspect the connector to determine cleanliness and to determine if it needs replacing. You must replace a connector that has a scratch across the core, or a scratch that appears to end in the core.

The proper connector cleaning method depends on the connector contaminants:

- Judge cleanliness by visual inspection with a fiber microscope. First inspect the connector, and then clean as required.

⚠ Warning:

Risk of eye injury

When you inspect a connector, ensure that light sources are off. The light source in fiber optic cables can damage your eyes.

- If you suspect only the possibility of dust particles, for example, if you leave a connector uncapped in a clean environment, use high-quality canned air or a reel cleaner, for example, a Cletop, to clean the connector. A reel cleaner is a good choice to ensure that no dust contaminates the connector.
- If the connector is visibly dirty or you suspect contamination by chemicals (for example, matching gel), use high-quality alcohol and canned air to clean the connector. This method is the most thorough cleaning method. In some cases, a reel cleaner can suffice.

The more surface manipulation you apply to the connector, the more likely you are to damage the connector.

When you insert a connector ferrule into a connector or adapter, ensure that the ferrule tip does not touch the outside of the mating connector or adapter. This action can produce scratches and dirt deposits on the connector.

To help prevent connectors from collecting dust, cover them when not in use. To avoid the transfer of oil or other contaminants from your fingers to the end face of the ferrule, handle connectors with care. Do not touch the connector end face.

Cleaning single connectors

Before you begin

- You need a lens-grade, lint-free tissue, for example, Kimwipes.
- You need an optical-grade isopropyl alcohol (IPA) (98% or more pure).
- You need a high-quality canned compressed air with extension tube.

  Compressed air must be free of dust, water, and oil, or filmy deposits or scratches on the surface of the connector can result.
- You need a fiber optic microscope to inspect connectors.

⚠ Warning:

Risk of eye injury

When you inspect a connector, ensure that light sources are off. The light source used in fiber optic cables can damage your eyes.

To avoid getting debris in your eyes, wear safety glasses when you work with the canned air duster.

To avoid eye irritation on contact, wear safety glasses when you work with isopropyl alcohol.

About this task

Clean connectors so that the optical signal is minimally attenuated by the connector.

Perform this procedure if you suspect more than dust contamination.

Procedure

1. Remove dust or debris by applying canned air to the cylindrical and end-face surfaces of the connector.
2. Gently wipe the cylindrical and end-face surfaces with a tissue dampened with optical-grade isopropyl alcohol.
3. Gently wipe the cylindrical and end-face surfaces with a dry tissue.

   Important:

   Do not let the IPA evaporate; wipe it dry immediately. Alcohols can leave a residue that is difficult to remove.
4. Dry the connector surfaces by applying canned air.
5. Inspect the connector to ensure it is clean and undamaged.

   To prevent contamination, do not touch the connector surfaces after cleaning; and cover connectors with dust caps if they are not in use.

Cleaning duplex connectors

Before you begin

- You need a lens-grade, lint-free tissue, for example, Kimwipes.
- You need an optical-grade isopropyl alcohol (IPA) (98% or more pure).
- You need a high-quality canned compressed air with extension tube.

  Compressed air must be free of dust, water, and oil, or filmy deposits or scratches on the surface of the connector can result.
- You need a fiber optic microscope to inspect connectors.

About this task

Clean connectors so that the optical signal is minimally attenuated by the connector.

Perform this procedure when you suspect more than dust contamination.

⚠ Warning:

Risk of eye injury

When you inspect a connector, ensure that light sources are off. The light source in fiber optic cables can damage your eyes.

To avoid getting debris in your eyes, wear safety glasses when you work with the canned air duster.

To avoid eye irritation on contact, wear safety glasses when you work with isopropyl alcohol.

Procedure

1. Remove or retract the shroud.

   On removable shroud connectors, hold the shroud on the top and bottom at the letter designation, apply medium pressure, and then pull it free from the connector body. Do not discard the shroud.

   OR

   On retractable shroud connectors, hold the shroud in the retracted position.
2. Remove dust or debris by applying canned air to the cylindrical and end-face surfaces of the connector.
3. Gently wipe the cylindrical and end-face surfaces of both ferrules using a tissue saturated with optical-grade isopropyl alcohol.
4. Gently wipe the cylindrical and end-face surfaces with a dry tissue.

   Important:

   Do not let the IPA evaporate; wipe it dry immediately. Alcohols can leave a residue that is difficult to remove.
5. Blow dry the connector surfaces with canned air.
6. Inspect the connector to ensure it is clean and undamaged.
7. Using care to not touch the clean ferrules, gently push the shroud back onto the connector until it seats and locks in place.

Cleaning receptacles

Before you begin

- You need an optical-grade isopropyl alcohol (IPA) (98% or more pure).
- You need cleaning swabs (also called cleaning sticks or wands).
- You need a high-quality canned compressed air with extension tube.

  Compressed air must be free of dust, water, and oil, or filmy deposits or scratches on the surface of the connector can result.

⚠ Caution:

Risk of equipment damage

To avoid contamination, only clean optical ports if you see evidence of contamination or reduced performance exists, or during their initial installation.

To prevent oil contamination of connectors, use only high-quality canned compressed air.

Do not allow the air extension tube to touch the bottom of the optical port.

About this task

Clean connector receptacles or ports so that the optical signal is minimally attenuated by the connection.

Procedure

1. Remove dust or debris by blowing canned air into the optical port of the device using the canned air extension tube.
2. Clean the optical port by inserting a wand moistened with alcohol into the receptacle and rotating it.

   Use each cleaning wand to clean only one optical port.
3. Dry the optical port by inserting a dry wand into the receptacle and rotating it.

   Important:

   Do not let the IPA evaporate; wipe it dry immediately. Alcohols can leave a residue that is difficult to remove.
4. Remove lint by blowing compressed air into the optical port.
5. Reconnect the optical connector and check for proper function.

   If you do not reinstall the connector, use a protective cap.

   If problems persist, ensure that the connector or receptacle is free from damage.

Chapter 4: SFP transceivers

Selecting an SFP

About this task

Use an SFP transceiver to connect a device motherboard to a fiber optic or unshielded twisted pair network cable. Select the appropriate transceiver to provide the required reach.

Procedure

1. Determine the required reach.

   Depending on the product, you can obtain SFPs for cable distances of up to 100 meters (m), 550 m, 10 kilometers (km), 40 km, 70 km, and 120 km.

2. Determine the required media and connector type.

   You need fiber optic cable for a reach over 100 m.

   Possible media include CAT5, single mode fiber, and multimode fiber. Possible connectors include Lucent connector (LC) and RJ-45.

3. If the media is optical fiber, determine wavelength restrictions or requirements.

   To expand available bandwidth on a common optical fiber, use Coarse Wavelength Division Multiplexing (CWDM) SFPs.

4. Determine if you need digital diagnostic monitoring (DDM).

   Not all SFPs or products support DDM.

5. Use the following job aid to determine the appropriate SFP for your application.

Job aid

The following table describes the reach provided by various SFPs. This table is informational only—not all Avaya products support all the SFPs listed here.

SFP model	Common application
1000BASE-T	Lowest-cost gigabit Ethernet solution. Up to 100 m reach over Category 5 (CAT5) unshielded twisted pair (UTP).

SFP model	Common application
1000BASE-SX	Well-suited for campus local area networks (LAN) and intrabuilding links. Up to 275 or 550 m reach (fiber-dependent) over a fiber pair.
1000BASE-LX	Up to 10 km reach over a single mode fiber (SMF) pair. Up to 550 m reach over a multimode fiber (MMF) pair.
1000BASE-XD	Up to 40 km reach over a single mode fiber pair.
1000BASE-ZX	Up to 70 km reach over a single mode fiber pair.
1000BASE-BX	Up to 10 km reach over single mode fiber.
1000BASE-EX	Up to 120 km reach over a single mode fiber pair.
100BASE-FX	Up to 2 km reach over multimode fiber pair.

SFPs are hot-swappable input and output enhancement components that permit Gigabit Ethernet ports to link with other Gigabit Ethernet ports over various media types.

The system also supports Coarse Wavelength Division Multiplexer (CWDM) SFPs. CWDM technology consolidates multiple optical channels on a common optical fiber. CWDM uses multiple wavelengths to expand available bandwidth.

CWDM SFPs support high speed data communications for Metropolitan Area Networks (MAN). The system uses a grid of eight CWDM optical wavelengths in both ring and point-to-point configurations. All components are color-coded by wavelength.

Important:

The attainable cable length can vary depending on the quality of the fiber optic cable used.

Use Digital Diagnostic Monitoring (DDM) to monitor SFP laser operating characteristics. Support for Digital Diagnostic Interfaces (DDI—an interface that supports DDM) involves data collection and alarm and warning monitoring. Static data collection includes SFP vendor information, DDI support information, and DDI alarm and warning threshold values. Dynamic data collection includes temperature, supply voltage, laser bias current, transmit power, and receive power. DDM works during active laser operation without affecting data traffic.

The ERS 3500 Series only checks warning and alarm status bits during initialization and during requests for dynamic data. If the system asserts or clears an alarm or warning, the system logs a message and generates a trap. The system maps DDM warning and alarm messages into Warning and Fatal message categories for system logging purposes. If you activate the ddm-alarm-portdown option, DDI shuts down the corresponding port if a high or low alarm occurs on the port.

The following table lists and describes the Avaya SFP models the ERS 3500 Series supports. The SFPs that support DDI are indicated by (DDI) after the ROHS Product Number.

Model	ROHS product number	Description
100BASE-FX	AA1419074–E6	1270 nm to 1380 nm, up to 2 km using 500 Mhz-km MMF optic cable
1000BASE-T	AA1419043–E6	CAT5 UTP, up to 100 m. Because the 1000BASE-T device is all electrical, it does not need DDI support.
1000BASE-SX	AA1419048-E6 (DDI) AA1419013–E5 AA1419014–E5	850 (nm), up to 275 or 550 m
1000BASE-LX	AA1419049-E6 (DDI) AA1419015–E5	1310 nm, up to 10 km
1000BASE-XD	AA1419050-E6	1310 nm, up to 40 km
	AA1419051-E5	1550 nm, up to 40km (non-CWDM)
1000BASE-ZX	AA1419052-E5	1550 nm, up to 70 km (non-CWDM)
1000BASE-BX-U	AA1419069-E5	1310nm up to 10km
	AA1419076-E5 (DDI)	1310nm up to 40km
1000BASE-BX-D	AA1419070–E5	1490nm up to 10km
	AA1419077–E5 (DDI)	1490nm up to 40km
1000BASE-EX	AA1419071-E5	1550 nm, up to 120 km (non-CWDM)
1000BASE-CWDM	AA1419053-E6 (DDI)	1470 nm, up to 40 km
	AA1419054-E6 (DDI)	1490 nm, up to 40 km
	AA1419055-E6 (DDI)	1510 nm, up to 40 km
	AA1419056-E6 (DDI)	1530 nm, up to 40 km
	AA1419057-E6 (DDI)	1550 nm, up to 40 km
	AA1419058-E6 (DDI)	1570 nm, up to 40 km
	AA1419059-E6 (DDI)	1590 nm, up to 40 km
	AA1419060-E6 (DDI)	1610 nm, up to 40 km
	AA1419061-E6 (DDI)	1470 nm, up to 70 km
	AA1419062-E6 (DDI)	1490 nm, up to 70 km
	AA1419063-E6 (DDI)	1510 nm, up to 70 km
	AA1419064-E6 (DDI)	1530 nm, up to 70 km
	AA1419065-E6 (DDI)	1550 nm, up to 70 km
	AA1419066-E6 (DDI)	1570 nm, up to 70 km
	AA1419067-E6 (DDI)	1590 nm, up to 70 km

Model	ROHS product number	Description
	AA1419068-E6 (DDI)	1610 nm, up to 70 km
1000BASE-XD-CWDM	AA1419025–E5	1470 nm, up to 40 km
	AA1419026–E5	1490 nm, up to 40 km
	AA1419027–E5	1510 nm, up to 40 km
	AA1419028–E5	1530 nm, up to 40 km
	AA1419029–E5	1550 nm, up to 40 km
	AA1419030–E5	1570 nm, up to 40 km
	AA1419031–E5	1590 nm, up to 40 km
	AA1419032–E5	1610 nm, up to 40 km
1000BASE-ZX-CWDM	AA1419033–E5	1470 nm, up to 70 km
	AA1419034–E5	1490 nm, up to 70 km
	AA1419035–E5	1510 nm, up to 70 km
	AA1419036–E5	1530 nm, up to 70 km
	AA1419037–E5	1550 nm, up to 70 km
	AA1419038–E5	1570 nm, up to 70 km
	AA1419039–E5	1590 nm, up to 70 km
	AA1419040–E5	1610 nm, up to 70 km

Installing an SFP

Before you begin

- Verify that the SFP is the correct model for your network configuration.
- Before you install the optical connector, ensure it is clean.

⚠ Warning:

Risk of eye injury by laser

Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables connect to a light source.

⚠ Electrostatic alert:

Risk of equipment damage

To prevent damage from electrostatic discharge, always wear an antistatic wrist strap connected to an ESD jack.

⚠ Caution:

Risk of equipment damage

Only trained personnel can install this product.

About this task

Install an SFP to provide an interface between the device and the network cable.

Installing an SFP takes approximately three minutes.

Procedure

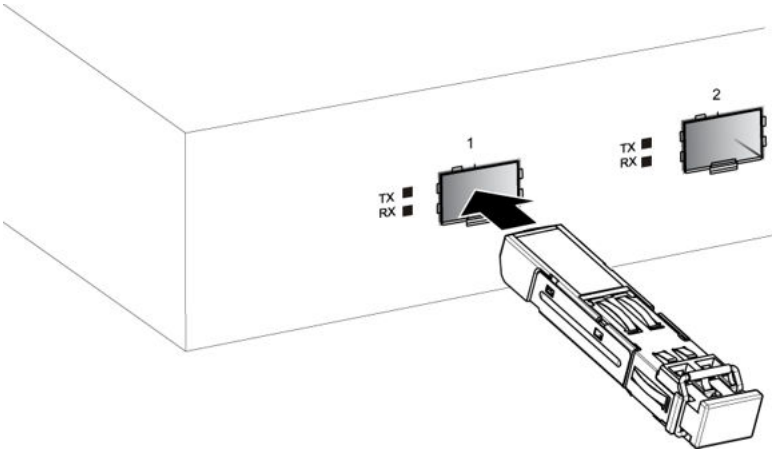
1. Remove the SFP from its protective packaging.
2. Grasp the SFP between your thumb and forefinger.
3. As shown in the following figure, insert the device into the slot on the module.

   ⚠ Caution:

   Risk of equipment damage

   SFPs are keyed to prevent incorrect insertion. If the SFP resists pressure, do not force it; turn it over, and reinsert it.

   Apply a light pressure to the device until it clicks and locks into position.

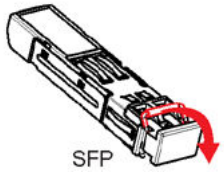


4. Remove the dust cover from the optical bore and insert the fiber optic connector.

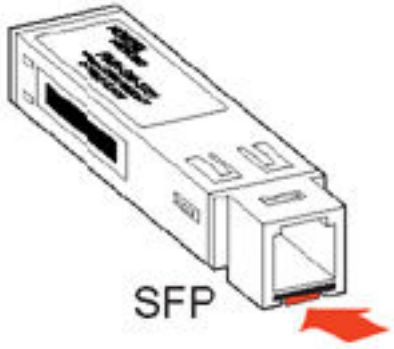
Job aid

Depending on the transceiver manufacturer, the SFP transceiver can use different types of locking and extractor mechanisms.

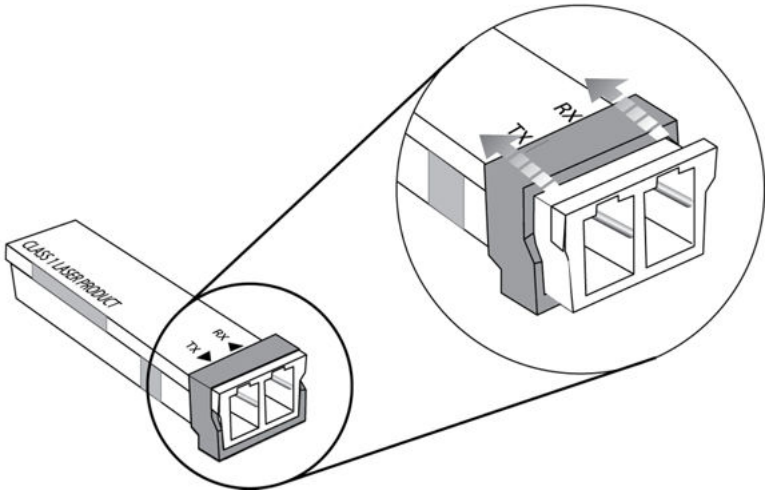
The following figures show typical mechanisms used on SFP transceivers; other locking and extractor mechanisms exist, although they are not shown here. In the following figure, the SFP still uses the bore plug. Pull the bail to release the device.



The following figure shows the 1000BASE-SX MT-RJ SFP. Push the tab to release the device.



The following figure shows the wrap-around latch-type extraction mechanism. To remove the device, push the collar towards the module.



Removing an SFP

Before you begin

- Wear an antistatic wrist strap.

⚠ Warning:

Risk of eye injury by laser

Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables connect to a light source.

⚠ Electrostatic alert:

Risk of equipment damage

To prevent damage from electrostatic discharge, always wear an antistatic wrist strap connected to an ESD jack.

About this task

Remove an SFP to replace it or to commission it elsewhere.

Procedure

1. Disconnect the network fiber optic cable from the SFP connector.
2. Depending on your SFP model, to release the SFP, pull the latch handle and use it to extract the module.
3. Slide the SFP out of the module SFP slot.

If the SFP does not slide easily from the module slot, use a gentle side-to-side rocking motion while firmly pulling the SFP from the slot.

4. Affix dust covers over the fiber optic bore and connector.
5. Store the SFP in a safe place until needed.

Important:

If you discard the SFP, dispose of it according to all national laws and regulations.

Chapter 5: SFP specifications

SFP labels

The Avaya label on a typical SFP contains an Avaya serial number, a bar code, an interface type, and a part number.

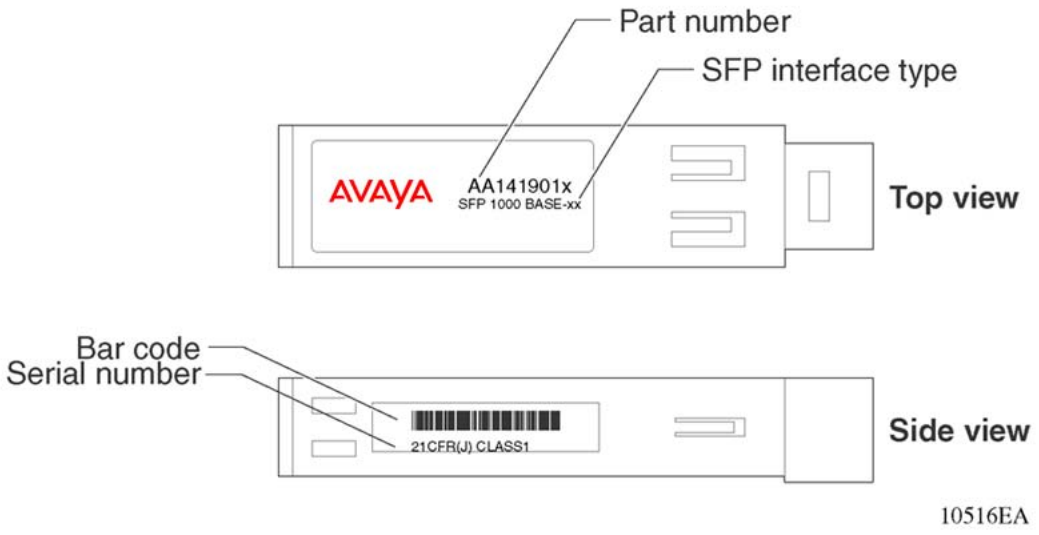


Figure 1: SFP label

General SFP specifications

The following table describes general SFP specifications.

Table 1: General SFP specifications

Parameter	Description
Dimensions (H x W x D)	13.4 x 8.50 x 56.4 millimeters (mm) 0.53 x 0.33 x 2.22 inches (in.) unless otherwise stated

Parameter	Description
Operating temperature	– 5 to 85C for RoHS -E6 models 0 to 60C for RoHS -E5 models
Storage temperature	– 40 to 85C
Maximum supply current	300 mA unless otherwise stated
Maximum power consumption	1.0 W unless otherwise stated

SFPs

The following sections provide specifications for supported SFPs.

1000BASE-T SFP specifications

The 1000BASE-T SFP provides gigabit Ethernet connectivity using a single eight-pin RJ-45 connector. The 1000BASE-T SFP only operates at 1 Gb/s and does not support 100BASE-T or 10BASE-T interfaces. The part number for this model is AA1419043-E6.

Important:

You must disable autonegotiation before you operate the 1000BASE-T SFP. After you insert SFPs into certain product-specific modules, the system activates autonegotiation by default.

The maximum current requirement of the SFP is 375 milliamperes (mA) at 5 volts (V).

The following table describes the 1000BASE-T SFP specifications.

Table 2: IEEE 802.3z 1000BASE-T SFP specifications

Parameter	Specifications
Standards	IEEE 802.3z, IEEE 802.3ab
Connectors	RJ-45
Cabling	CAT5E or better UTP
Distance	Up to 100 m

100BASE-FX SFP specifications

The 100BASE-FX SFP provides 100 Mbit/s Ethernet Carrier Sense Multiple Access with Collision Detection (CSMA-CD) connectivity using multimode optical fiber. The 100BaseFX uses an LED transmitter. The centre wavelength, spectral width, and optical rise/fall time satisfy the trade-off curves in the FDDI PMD document (ISO/IEC 9314–3:1900). The supported link length is up to 2 km over MMF. The part number for this model is AA1419074–E6.

The following table describes the 100BASE-FX SFP specifications.

Table 3: 100BASE-FX SFP specifications

Parameter	Specifications
Maximum electrical power consumption	0.8 W
Connectors	Duplex LC
Cabling	• 62.5 µm MMF optic cable • 50 µm MMF optic cable
Distance	Up to 2 km using 500 Mhz-km MMF optic cable
Wavelength	1300 nm
Link optical power budget	10 dB
Transmitter characteristics	
Transmitter type	LED
Nominal wavelength	1300 nm
Transmit output power (max)	-14 dBm
Transmit output power (min)	-23.5 to —20 dBm
Spectral width	140 nm (FHWM)
Minimum extinction ratio	10 dB
Receiver characteristics	
Receiver type	PIN photodiode
Wavelength range	1270 nm to 1380 nm
Nominal wavelength	
Receiver sensitivity	-33.5 dBm
Maximum input power	-14 dBm
Path penalty	
Maximum receive reflectance	

1000BASE-SX (LC) SFP specifications

The 1000BASE-SX SFP provides 1000BASE-SX gigabit Ethernet connectivity at 850 nm using multimode optical fiber. This SFP supports full-duplex operation only. The part number for this model is AA1419013-E5.

Important:

This SFP is no longer available for purchase, but it is still supported in Release 5.1.

The following table describes standards, connectors, cabling, and distance for the 1000BASE-SX SFP.

Table 4: IEEE 802.3z 1000BASE-SX (LC) SFP specifications

Parameter	Specifications
Connectors	Duplex LC
Cabling	• 62.5 µm MMF optic cable • 50 µm MMF optic cable
Distance	• up to 275 m using 62.5 µm MMF optic cable • up to 550 m using 50 µm MMF optic cable
Wavelength	850 nanometers (nm)
Link optical power budget	7.0 deciBels (dB)
Transmitter characteristics	
Launch power	-10 to -4.0 deciBels referenced to 1 milliwatt (dBm)
Receiver characteristics	
Receiver sensitivity	-17 dBm
Maximum input power	0 dBm

1000BASE-SX (MT-RJ) SFP specifications

The 1000BASE-SX (MT-RJ type) SFP provides gigabit Ethernet connectivity using MT-RJ multimode fiber connectors. The following table describes standards, connectors, cabling, and distance for the 1000BASE-SX (MT-RJ type) SFP. The part number for this model is AA1419014-E5.

Important:

This SFP is no longer available for purchase, but it is still supported in Release 5.1.

The following table describes the 1000BASE-SX (MT-RJ) SFP specifications.

Table 5: IEEE 802.3z 1000BASE-SX (MT-RJ) SFP specifications

Parameter	Specifications
Connectors	Duplex MT-RJ
Cabling	• 62.5 µm MMF optic cable • 50 µm MMF optic cable
Distance	• up to 275 m using 62.5 µm MMF optic cable • up to 550 m using 50 µm MMF optic cable
Wavelength	850 nm

Parameter	Specifications
Link optical power budget	7.0 dB
Transmitter characteristics	
Launch power	– 10 to – 4.0 dBm
Receiver characteristics	
Receiver sensitivity	– 17 dBm
Maximum input power	0 dBm

1000BASE-SX DDI SFP specifications

The following table describes the 1000BASE-SX DDI SFP, which has a reach of up to 550 m using 50 µm MMF, and of 275 m using 62.5 µm MMF. This SFP operates at 850 nm. The part number of this SFP is AA1419048-E6.

Table 6: 1000BASE-SX SFP DDI (550 m) specifications

Parameter	Specifications
Maximum electrical power consumption	1 watt (W)
Connector	Duplex LC
Cabling	MMF
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	7.5 dB
Transmitter characteristics	
Launch power	– 9.5 to -4.0 dBm
Receiver characteristics	
Receiver sensitivity	– 17 dBm
Maximum receiver power	0 dBm

1000BASE-LX SFP specifications

The 1000BASE-LX SFP provides 1000BASE-LX gigabit Ethernet connectivity at 1310 nanometers (nm) using single mode or multimode optical fiber. The 1000BASE-LX SFP supports full-duplex operation only. The part number for this model is AA1419015-E5.

Important:

This SFP is no longer available for purchase, but it is still supported in Release 5.1.

The following table describes standards, connectors, cabling, and distance for the 1000BASE-LX SFP.

Table 7: IEEE 802.3z 1000BASE-LX SFP specifications

Parameter	Specifications
Connectors	Duplex LC
Cabling	• 50 micrometer (µm) multimode fiber (MMF) • 62.5 µm multimode fiber • 9 µm single mode fiber (SMF)
Distance	• Up to 550 meters (m) using MMF • Up to 10 kilometers (km) using SMF
Wavelength	1310 nm
Link optical power budget	10.5 dB
Transmitter characteristics	
Launch power	– 9.5 to – 3.0 dBm
Receiver characteristics	
Receiver sensitivity	– 20 dBm
Maximum input power	– 3.0 dBm

1000BASE-LX DDI SFP specifications

This SFP provides 1000BASE-LX gigabit Ethernet connectivity at 1310 nanometers (nm) using single mode or multimode optical fiber. The part number of this SFP is AA1419049-E6.

The following table describes standards, connectors, cabling, and distance for the 1000BASE-LX DDI SFP.

Table 8: 1000BASE-LX DDI SFP specifications

Parameter	Specifications
Maximum electrical power consumption	1.0 watt (W)
Connectors	Duplex LC
Cabling	• 50 micrometer (µm) multimode fiber (MMF) • 62.5 µm multimode fiber • 9 µm single mode fiber (SMF)
Distance	• Up to 550 meters (m) using MMF • Up to 10 kilometers (km) using SMF
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s

Parameter	Specifications
Link optical power budget	9.5 dB
Transmitter characteristics	
Launch power	– 9.5 to -3.0 dBm
Receiver characteristics	
Receiver sensitivity	– 19.0 dBm
Maximum receiver power	– 3.0 dBm

1000BASE-XD CWDM SFP specifications

The 1000BASE-XD SFPs provides CWDM gigabit Ethernet connectivity using single mode fiber. These SFPs support full-duplex operation only. The part numbers of the 40 km models range from AA1419025-E5 to AA1419032-E5.

Important:

For the 40 km CWDM SFPs, a minimum attenuation of 4 dB must be present between the transmitter and receiver. To avoid receiver saturation, you must insert a minimum attenuation of 4 dB after you test the CWDM SFP in loopback mode, or use short runs of fiber with no intermediate CWDM OADM or CWDM OMUX.

Important:

These SFPs are no longer available for purchase, but are still supported in Release 5.1.

Table 9: 1000BASE-XD CWDM (40 km) SFP specifications

Parameter	Specifications
Connectors	Duplex LC
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Operating temperature range	0 to 60C
Link optical power budget	17 dB
Transmitter characteristics	
Launch power	– 4.0 to 1.0 dBm
Receiver characteristics	
Receiver sensitivity	– 21 dBm
Maximum input power	– 3.0 dBm

1000BASE-XD DDI CWDM 40 km SFP specifications

The 1000BASE SFPs provides CWDM gigabit Ethernet connectivity using single mode fiber. These SFPs support full-duplex operation only.

Important:

For the 40 km CWDM SFPs, a minimum attenuation of 4 dB must be present between the transmitter and receiver. To avoid receiver saturation, you must insert a minimum attenuation of 4 dB when you test the CWDM SFP in loopback mode.

The following table describes specifications for 1000BASE DDI CWDM SFPs numbered AA1419053-E6 to AA1419060-E6.

⚠ Caution:

Risk of equipment damage

To prevent damage to the optical receiver, ensure that at least 4 dB of attenuation exists between the transmit and receive ports.

Table 10: 1000BASE CWDM SFP DDI (40 km) specifications

Parameter	Specifications
Maximum electrical power consumption	1.0 W
Connectors	Duplex LC
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	17 dB
Maximum dispersion power penalty	1 dB at 40 km
Transmitter characteristics	
Launch power	– 4.0 to 1.0 dBm
Receiver characteristics	
Receiver sensitivity	– 21 dBm
Maximum receiver power	– 3.0 dBm

1000BASE-XD DDI 1310 nm SFP specifications

The following table describes the 1000BASE-XD DDI SFP. This SFP operates at 1310 nm and has a reach of up to 40 km. The part number is AA1419050-E5.

Table 11: 1000BASE-XD DDI 1310 nm SFP specifications

Parameter	Specifications
Maximum electrical power consumption	1.0 W
Connectors	Duplex LC

Parameter	Specifications
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B) code	1.25 Gb/s
Link optical power budget	18 dB
Transmitter characteristics	
Launch power	– 4.5 to 0 dBm
Receiver characteristics	
Receiver sensitivity	– 22.5 dBm
Maximum receiver power	0 dBm

1000BASE-XD DDI 1550 nm SFP specifications

The following table describes the 1000BASE-XD DDI SFP. This SFP operates at 1550 nm and has a reach of up to 40 km. The part number is AA1419051-E5.

⚠ Caution:

Risk of equipment damage

To prevent damage to the optical receiver, ensure that at least 3 dB of attenuation exists between the transmit and receive ports.

Table 12: 1000BASE-XD DDI 1550 nm SFP specifications

Parameter	Specification
Maximum electrical power consumption	1.0 W
Connectors	Duplex LC
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	22 dB
Maximum dispersion power penalty	2 dB at 40 km
Transmitter characteristics	
Launch power	– 2.0 to 3.0 dBm
Receiver characteristics	
Receiver sensitivity	– 24 dBm
Maximum receiver power	0 dBm

1000BASE-ZX CWDM SFP specifications

The 1000BASE-ZX SFPs provides CWDM gigabit Ethernet connectivity using single mode fiber. These SFPs support full-duplex operation only. The part numbers of the 70 km models range from AA1419033-E5 to AA1419040-E5.

Important:

For the 70 km CWDM SFPs, a minimum attenuation of 10 dB must be present between the transmitter and receiver.

Important:

These SFPs are no longer available for purchase, but are still supported in Release 5.1.

Table 13: 1000BASE-ZX CWDM (70 km) SFP specifications

Parameter	Specifications
Connectors	Duplex LC
Cabling	
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Operating temperature range	0 to 60C
Link optical power budget	20 dB
Transmitter characteristics	
Launch power	– 3.0 to 2.0 dBm
Receiver characteristics	
Receiver sensitivity	– 23 dBm
Maximum input power	– 3.0 dBm

1000BASE-ZX DDI SFP specifications

The following table describes the 1000BASE-ZX DDI SFP. This SFP operates at 1550 nm and has a reach of up to 70 km. The part number is AA1419052-E5.

⚠ Caution:

To prevent damage to the optical receiver, ensure that at least 5 dB of attenuation exists between the transmit and receive ports.

Table 14: 1000BASE-ZX DDI SFP specifications

Parameter	Specification
Maximum electrical power consumption	1.0 W
Connectors	Duplex LC

Parameter	Specification
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	24 dB
Maximum dispersion power penalty	2 dB at 70 km
Transmitter characteristics	
Launch power	0 to 5 dBm
Receiver characteristics	
Receiver sensitivity	– 24 dBm
Maximum receiver power	0 dBm

1000BASE-BX DDI SFP specifications

The 1000BASE-BX bidirectional SFPs provide gigabit Ethernet connectivity over a single fiber.

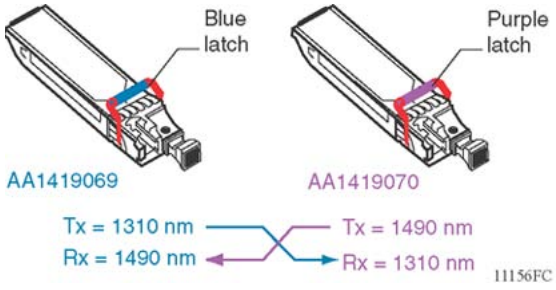


Figure 2: 1000BASE-BX

As shown in the preceding figure, the transmit (Tx) and receive (Rx) paths share the same fiber by using two different wavelengths. One model transmits at 1310 nm and receives at 1490 nm, while the mating model transmits at 1490 nm and receives at 1310 nm. You can only connect a mating pair. The following table provides the part numbers for mating pairs.

Table 15: 1000BASE-BX DDI SFP part numbers

Reach	1310 nm	1490 nm
10 km	AA1419069-E5	AA1419070-E5
40 km	AA1419076-E5	AA1419077-E5

You can use 1000BASE-BX SFPs to double the number of your fiber links. For example, if you install 20 fiber pairs with 20 conventional ports connected, you can use 1000BASE-BX SFPs to expand to 40 ports, using the same fiber.

The long wavelength optical transceivers used in these models provide variable distance ranges using single mode fiber optic cabling.

The following table describes standards, connectors, cabling, and distances for the 1000BASE-BX SFP.

Table 16: IEEE 802.3ah 1000BASE-BX10 SFP specifications

Parameter	Specification
Connectors	Single-fiber LC
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Distance	Up to 10 or 40 km
Wavelength	1310 nm and 1490 nm
Link optical power budget	11.0 dB
Maximum transmitter and dispersion power penalty	3.3 dB
Transmitter characteristics	
Maximum launch power	– 3.0 dBm
Minimum launch power	– 9.0 dBm
Receiver characteristics	
Maximum receiver sensitivity	– 19.5 dBm
Maximum input power (maximum average receive power)	– 3.0 dBm

1000BASE-BX40 DDI SFP specifications

The 1000BASE-BX bidirectional SFPs (part numbers AA1419076-E6 and AA1419077-E6) provide gigabit Ethernet connectivity over a single fiber.

The transmit and receive paths share the same fiber by using two different wavelengths. One model transmits at 1310 nm and receives at 1490 nm, while the mating model transmits at 1490 nm and receives at 1310 nm. You can only connect a mating pair.

You can use 1000BASE-BX SFPs to double the number of your fiber links. For example, if you have 20 installed fiber pairs with 20 conventional ports connected, you can use 1000BASE-BX SFPs to expand to 40 ports, using the same fiber.

The long wavelength optical transceivers used in these models provide variable distance ranges using single mode fiber optic cabling.

The 1000BASE-BX SFPs (part numbers AA1419076-E6 and AA1419077-E6) can attain a reach of up to 40 km.

The following table describes standards, connectors, cabling, and distances for the 1000BASE-BX SFP.

⚠ Caution:

Risk of equipment damage

Connect 1000BASE-BX SFP AA1419076-E6 to 1000BASE-BX SFP AA1419077-E6 using a single mode fiber with at least 6 dB of attenuation. Damage can result if insufficient attenuation is provided or if the same 1000-BASE-BX SFPs are connected.

Table 17: IEEE 802.3ah 1000BASE-BX40 SFP specifications

Parameter	Specifications
Connectors	Single-fiber LC
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Distance	Up to 40 km with SMF
Wavelength	1310 nm and 1490 nm
Link optical power budget	20.0 dB
Maximum transmitter and dispersion power penalty	3.3 dB
Transmitter characteristics	
Maximum launch power	3.0 dBm
Minimum launch power	– 3.0 dBm
Receiver characteristics	
Maximum receiver sensitivity	– 23 dBm
Maximum input power (maximum average receive power)	– 3.0 dBm

1000BASE-EX DDI SFP specifications

The following table describes the 1000BASE-EX DDI SFP. This SFP operates at 1550 nm and has a reach of up to 120 km. The part number of this SFP is AA1419071-E5.

⚠ Caution:

Risk of equipment damage

To prevent damage to the optical receiver, ensure that at least 14 dB of attenuation exists between the transmit and receive ports.

To attain the BER of 10^{-12}, the minimum attenuation between the transmit and receive ports is 15 dB.

Table 18: 1000BASE-EX DDI SFP specifications

Parameter	Specification
Maximum electrical power consumption	1.2 W
Connectors	Duplex LC
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	30 dB
Maximum dispersion power penalty	2.0 dB at 120 km
Transmitter characteristics	
Launch power	0 to 5.0 dBm
Receiver characteristics	
Receiver sensitivity	– 30 dBm
Maximum receiver power	– 9.0 dBm

1000BASE DDI CWDM 70 km SFP specifications

The 1000BASE SFPs provides CWDM gigabit Ethernet connectivity using single mode fiber. These SFPs support full-duplex operation only.

Important:

For the 70 km CWDM SFPs, a minimum attenuation of 10 dB must be present between the transmitter and receiver.

The following table describes specifications for CWDM SFPs numbered AA1419061-E6 to AA1419068-E6.

⚠ Caution:

Risk of equipment damage

To prevent damage to the optical receiver, ensure that at least 8 dB of attenuation exists between the transmit and receive ports.

Table 19: 1000BASE-ZX CWDM SFP DDI (70 km) specifications

Parameter	Specifications
Maximum electrical power consumption	1.0 W
Connectors	Duplex LC
Cabling	SMF, 9 µm
Data rate	1.0 Gb/s

Parameter	Specifications
Line rate (8B/10B code)	1.25 Gb/s
Link optical power budget	24 dB
Maximum dispersion power penalty	2 dB at 70 km
Transmitter characteristics	
Launch power	0 to 5.0 dBm
Receiver characteristics	
Receiver sensitivity	– 24 dBm
Maximum receiver power	– 3.0 dBm

Chapter 6: Customer service

Customer service

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