Connect Router to the Network

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Port Connection Guidelines

Depending on the chassis and installed line cards, you can use Quad Small Form-Factor Pluggable Plus (QSFP+), QSFP28, SFP, SFP+, CFP2, CFP-DCO, and RJ-45 connectors to connect the ports on the line cards to other network devices.

To prevent damage to the fiber-optic cables, Cisco recommends that you keep the transceivers disconnected from their fiber-optic cables when installing the transceiver in the line card. Before removing a transceiver from the router, remove the cable from the transceiver.

To maximize the effectiveness and life of your transceivers and optical cables, do the following:

- Wear an ESD-preventative wrist strap that is connected to an earth ground whenever handling transceivers. The router is typically grounded during installation and provides an ESD port to which you can connect your wrist strap.

- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.

- Keep the transceivers and fiber-optic cables clean and dust free to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be kept below 0.35 dB.

  - Clean these parts before installation to prevent dust from scratching the fiber-optic cable ends.

  - Clean the connectors regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors when they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.

  - Do not touch the ends of connectors. Touching the ends can leave fingerprints and cause other contamination.
• Inspect routinely for dust and damage. If you suspect damage, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

⚠️ Warning  Statement 1051—Laser Radiation

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

Connecting a Console to the Router

Before you create a network management connection for the router or connect the router to the network, you must create a local management connection through a console terminal and configure an IP address for the router. You also can use the console to perform the following functions, each of which can be performed through the management interface after you make that connection:

• Configure the router using the command-line interface (CLI).

• Monitor network statistics and errors.

• Configure Simple Network Management Protocol (SNMP) agent parameters.

• Download software updates.

You make this local management connection between the asynchronous serial port on a route processor card and a console device capable of asynchronous transmission. Typically, you can use a computer terminal as the console device. On the route processor cards, you use the console serial port.

⚠️ Note

Before you can connect the console port to a computer terminal, make sure that the computer terminal supports VT100 terminal emulation. The terminal emulation software makes communication between the router and computer possible during setup and configuration.

**Before you begin**

• The router must be fully installed in its rack, connected to a power source, and grounded.

• The necessary cabling for the console, management, and network connections must be available.
  
  • An RJ-45 rollover cable and DB9F/RJ-45 adapter are provided in the router accessory kit.

  • Network cabling should already be routed to the location of the installed router.

**Step 1**

Configure the console device to match the following default port characteristics:

• 9600 baud

• 8 data bits

• 1 stop bit
• No parity

Step 2  Connect an RJ-45 rollover cable to the CONSOLE SERIAL PORT.
You can find this cable in the accessory kit.

Step 3  Route the RJ-45 rollover cable through the center slot in the cable management system and then to the console or modem.

Step 4  Connect the other end of the RJ-45 rollover cable to the console or to a modem.
If the console or modem cannot use an RJ-45 connection, use the DB-9F/RJ-45F PC terminal adapter found in the accessory kit for the router. Alternatively, you can use an RJ-45/DSUB F/F or RJ-45/DSUB R/P adapter, but you must provide those adapters.

What to do next
You are ready to create the initial router configuration (see Create the Initial Router Configuration).

Connect the Management Interface

The Route Processor management port (MGMT ETH) provides out-of-band management, which enables you to use the command-line interface (CLI) to manage the router by its IP address. This port uses a 10/100/1000 Ethernet connection with an RJ-45 interface.

Note
In a dual Route Processor router, you can ensure that the active Route Processor card is always connected to the network by connecting the management interface on both Route Processor cards to the network. That is, you can perform this task for each Route Processor card. When the Route Processor card is active, the router automatically has a management interface that is running and accessible from the network.

Caution
To prevent an IP address conflict, do not connect the MGMT 10/100/1000 Ethernet port until the initial configuration is complete. For more information, see Create the Initial Router Configuration.

Before you begin
You must have completed the initial router configuration (see Create the Initial Router Configuration).

Step 1  Connect a modular, RJ-45, UTP cable to the MGMT ETH port on the Route Processor card.
Step 2  Route the cable through the central slot in the cable management system.
Step 3  Connect the other end of the cable to a 10/100/1000 Ethernet port on a network device.

What to do next
You are ready to connect the interface ports on each of the line cards to the network.
Install and Remove Transceiver Modules

Install and Remove SFP Modules

Before you remove or install an SFP or SFP+ module, read the installation information in this section.

⚠️ **Warning**
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

⚠️ **Caution**
Protect the line card by inserting a clean SFP/SFP+ module cage cover, shown in the figure below, into the optical module cage when there is no SFP or SFP+ module installed.

*Figure 1: SFP/SFP+ Module Cage Cover*

⚠️ **Caution**
Protect the SFP or SFP+ modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module. Avoid getting dust and other contaminants into the optical ports of your SFP or SFP+ modules, because the optics do not work correctly when obstructed by dust.

⚠️ **Caution**
We strongly recommended that you do not install or remove the SFP or SFP+ module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the module. Disconnect all cables before removing or installing an SFP or SFP+ module. Removing and inserting a module can shorten its useful life, so you should not remove and insert modules any more than is absolutely necessary.
When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the module snaps into the hole in the receptacle. The click indicates that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP or SFP+ module.

**Bale Clasp SFP or SFP+ Module**

The bale clasp SFP or SFP+ module has a clasp that you use to remove or install the module (see the figure below).

*Figure 2: Bale Clasp SFP or SFP+ Module*

**Install a Bale Clasp SFP or SFP+ Module**

To install this type of SFP or SFP+ module, follow these steps:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Close the bale clasp before inserting the SFP module.
3. Line up the SFP module with the port and slide it into the port (see the figure below).

*Figure 3: Installing a Bale Clasp SFP Module into a Port*

**Note**

When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle. This click indicates that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.
Remove a Bale Clasp SFP or SFP+ Module

To remove this type of SFP or SFP+ module, follow these steps:

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Open the bale clasp on the SFP module with your index finger, as shown in the figure below. If the bale clasp 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 bale clasp.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in the figure below.</td>
</tr>
</tbody>
</table>

**Note** This action must be performed during your first instance. After all the ports are populated, this may not be possible.
Step 5  
Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6  
Protect your line card by inserting a clean SFP module cage covers into the optical module cage when there is no SFP module installed.
Install and Remove QSFP+/QSFP28 Transceiver Modules

This section provides the installation, cabling, and removal instructions for the 40-Gigabit Quad Small Form-Factor Pluggable Plus (QSFP+) and 100 Gigabit (QSFP28) transceiver modules. The modules are hot-swappable input/output (I/O) devices that connect the system’s module port electrical circuitry with either a copper or a fiber-optic network.

The following figure shows the 40-Gigabit optical QSFP+ transceiver. The transceiver is used primarily in short reach applications in switches, routers, and data center equipment where it provides higher density than SFP+ modules. The 100-Gigabit optical QSFP28 transceiver is similar to the 40-Gigabit optical QSFP transceiver.

Figure 5: 40-Gigabit QSFP+ Transceiver Module (Optical)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40GBASE QSFP+ transceiver body</td>
</tr>
<tr>
<td>2</td>
<td>Bail-clasp latch</td>
</tr>
<tr>
<td>3</td>
<td>Electrical connection to the module circuitry</td>
</tr>
</tbody>
</table>

Required Tools and Equipment

You need these tools to install the 40-Gigabit QSFP+ / 100-Gigabit QSFP28 transceiver modules:

- 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 information on inspecting and cleaning fiber-optic connections, see Maintain Transceivers and Optical Cables.

Installing the 40-Gigabit QSFP+ or 100-Gigabit Transceiver Module

The QSFP+ or QSFP28 transceiver module can have either a bail-clasp latch or a pull-tab latch. Installation procedures for both types of latches are provided.

Caution

The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with system modules.

To install an QSFP+ or QSFP28 transceiver module, follow these steps:
Step 1  Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.
Step 2  Remove the QSFP+ or QSFP28 transceiver module from its protective packaging.
Step 3  Check the label on the QSFP+ or QSFP28 transceiver module body to verify that you have the correct model for your network.
Step 4  For optical QSFP+ or QSFP28 transceiver modules, remove the optical bore dust plug and set it aside.
Step 5  For QSFP+ or QSFP28 transceiver modules equipped with a pull-tab, hold the transceiver so that the identifier label is on the top.
Step 6  For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch, keep the bail-clasp aligned in a vertical position.
Step 7  Align the QSFP+ or QSFP28 transceiver module in front of the module’s transceiver socket opening and carefully slide the QSFP+ or QSFP28 transceiver into the socket until the transceiver makes contact with the socket electrical connector (see the figure below).

*Figure 6: Installing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)*

Step 8  Press firmly on the front of the QSFP+ or QSFP28 transceiver module with your thumb to fully seat the transceiver in the module’s transceiver socket (see the below figure).

*Caution*  If the latch is not fully engaged, you might accidentally disconnect the QSFP+ or QSFP28 transceiver module.
Step 9  For optical QSFP+ or QSFP28 transceiver modules, reinstall the dust plug into the QSFP+ or QSFP28 transceivers optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

Attach the Optical Network Cable

Before you begin
Before you remove the dust plugs and make any optical connections, follow these guidelines:

• Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.

• Inspect and clean the MPO connector end faces just before you make any connections.

• Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.

Note
40-Gigabit QSFP+ or QSFP28 transceiver modules are keyed to prevent incorrect insertion.
The multiple-fiber push-on (MPO) connectors on the optical QSFP+ or QSFP28 transceivers support network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The MPO connectors on the optical QSFP+ or QSFP28 transceivers do not support network interface cables with an angle-polished contact (APC) face type.

**Step 1**
Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.

**Step 2**
Inspect and clean the MPO connector’s fiber-optic end faces.

**Step 3**
Remove the dust plugs from the QSFP+ or QSFP28 transceiver module optical bores.

**Step 4**
Immediately attach the network interface cable MPO connectors to the QSFP+ or QSFP28 transceiver module (see the figure below).

*Figure 8: Cabling a 40-Gigabit QSFP+ or QSFP28 Transceiver Module*

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**Removing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module**

**Caution**
The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with modules.

To remove a QSFP+ or QSFP28 transceiver module, follow these steps:

**Step 1**
For optical QSFP+ or QSFP28 transceiver modules, disconnect the network interface cable from the QSFP+ or QSFP28 transceiver connector.

**Step 2**
For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch (see the below figure, top view):
   a) Pivot the bail-clasp down to the horizontal position.
   b) Immediately install the dust plug into the transceivers optical bore.
   c) Grasp the sides of the QSFP+ or QSFP28 transceiver and slide it out of the module socket.

**Step 3**
For QSFP+ or QSFP28 transceivers equipped with a pull tab latch (see the below figure, bottom view):
   a) Immediately install the dust plug into the transceiver’s optical bore.
   b) Grasp the tab and gently pull to release the transceiver from the socket.
c) Slide the transceiver out of the socket.

Figure 9: Removing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module

Step 4 Place the QSFP+ or QSFP28 transceiver module into an antistatic bag.

Installing and Removing CFP2 Modules

Before you remove or install a CFP2 module, read the installation information in this section.

⚠️ Warning
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

⚠️ Caution
The CFP2 module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling the CFP2 modules or coming into contact with the modules.

Installing a CFP2 Module

To install a CFP2 module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
Step 2 Align the CFP2 module into the transceiver port socket of the line card.
Step 3 Slide the CFP2 module in until the EMI gasket flange makes contact with the line card faceplate.

Step 4 Press firmly on the front of the CFP2 module with your thumbs to fully seat it in the transceiver socket.

The CFP2 module is properly seated in the slot by applying symmetrical force of at least 80N on its front surface, along the centerline. The latching mechanisms on both the sides of the pluggable should be fully engaged, and the electrical connectors should be completely mated.

Note

Removing a CFP2 Module

To remove a CFP2 module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Open the bail latch on the CFP2 module with your index finger. If the bail 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 latch.

Step 4 Grasp the CFP2 module between your thumb and index finger and carefully remove it from the port.

Step 5 Place the removed CFP2 module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Connect Interface Ports

You can connect optical interface ports on line cards with other devices for network connectivity.

Connect a Fiber-Optic Port to the Network

Depending on the line card model that you are using, you can use either QSFP+ or QSFP28 transceivers. Some transceivers work with fiber-optic cables that you attach to the transceivers and other transceivers work with pre-attached copper cables. When installing fiber-optic cables for a port, you must install SFP transceivers for 1-Gigabit optical ports or install SFP+ transceivers for 10-Gigabit optical ports or QSFP+ transceivers for 100-Gigabit ports before installing the fiber-optic cable in the transceivers.

Caution

Removing and installing a transceiver can shorten its useful life. Do not remove and insert transceivers any more than is absolutely necessary. We recommended that you disconnect cables before installing or removing transceivers to prevent damage to the cable or transceiver.

Disconnect Optical Ports from the Network

When you need to remove fiber-optic transceivers, you must first remove the fiber-optic cables from the transceiver before you remove the transceiver from the port.

Maintain Transceivers and Optical Cables

Transceivers and fiber-optic cables must be kept clean and free of dust to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be below 0.35 dB.

Refer to Inspection and Cleaning Procedures for Fiber-Optic Connections document for inspection and cleaning processes for fiber optic connections.