ProCurve Networking
HP Innovation

Installation Guide

ProCurve Series 8100fl Switches: Switch fl Modules

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ProCurve Switch 8100fl Series: Switch fl Modules

Installation Guide

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Applicable Products

ProCurve 8108fl Redundant Switch Fabric Module (J8729A)

ProCurve 8116fl Redundant Switch Fabric Module (J8730A)

ProCurve Switch fl Redundant Management Module (J8731A)

ProCurve Switch fl 1-Port 10-GbE LR Interface Module (J8733A)

ProCurve Switch fl 10-Port 100/1000-T Interface Module (J8734A)

ProCurve Switch fl 10-Port Mini-GBIC Interface Module (J8735A)

ProCurve Switch fl 1-Port X2 10GbE Interface Module (J8736A)

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Contents

ProCurve Switch fl Modules

For the ProCurve Switch 8100fl Series

ProCurve Switch fl modules are components used in the ProCurve 8100fl Switch Series (Switch 8108fl and Switch 8116fl) to provide a variety of network connectivity options. Each module is shipped separately from the chassis. The different types of modules are described in this chapter.

As of this printing, the following modules are supported in ProCurve 8100fl switches:

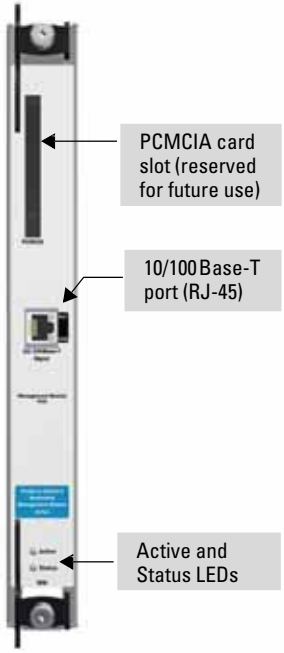
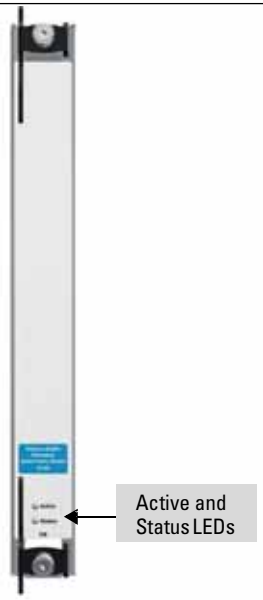
- ProCurve 8108fl Redundant Switch Fabric Module (J8729A)
- ProCurve 8116fl Redundant Switch Fabric Module (J8730A)
- ProCurve Switch fl Redundant Management Module (J8731A)
- ProCurve Switch fl 1-Port 10-GbE LR Interface Module (J8733A)*
- ProCurve Switch fl 10-Port 100/1000-T Interface Module (J8734A)
- ProCurve Switch fl 10-Port Mini-GBIC Interface Module (J8735A)
- ProCurve Switch fl 1-Port X2 10GbE Module (J8736A)

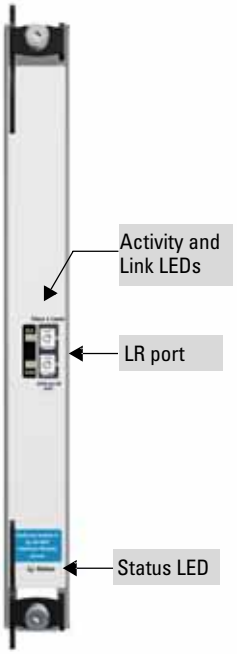
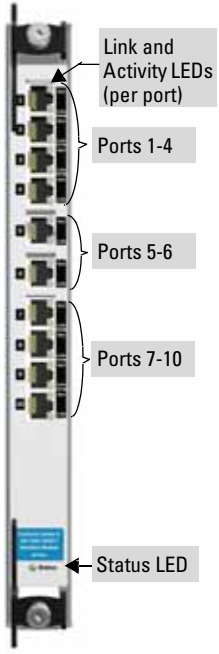
* End-of-life in Summer 2006. The 1-Port X2 10Gbe Module (J8736A), provides functionally-equivalent LR connectivity (with separate purchase of LR transceivers) in an X2, media-flexible package.

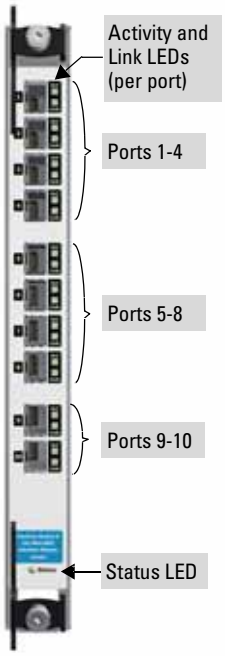
Ordering ProCurve Switch fl modules. Contact your ProCurve Networking Sales and Service Office or authorized dealer for information on availability of other fl modules and supported ProCurve mini-GBICs and transceivers. You can also visit the ProCurve Networking web site http://www.procurve.com to get more information.

Caution

To avoid damaging modules and the backplane, be sure that you insert the right type of module into the appropriate slot (see the illustration on page 8). If you attempt to install a module in the wrong slot, physical keying prevents the module from fully entering into the slot.

Module	Module Type and Description
	**ProCurve Switch fl Redundant Management Module (J8731A)** A ProCurve Switch 8100fl requires at least one primary management module to operate. You can install a second management module for redundancy. The management module maintains persistent images of all software that runs on the system. The primary non-volatile storage medium is a Compact Flash card located on the module. A front-accessible PCMCIA Flash card provides another method of loading system images (reserved for future software releases). Management module components include: **PCMCIA card - flash memory slot**. The PCMCIA card slot holds a PC flash memory card used to upgrade and store system image software (reserved for future software releases). **10/100Base-T Data Terminal Equipment (DTE) port.** Use the RJ-45 port on the management module to manage a ProCurve 8100fl Switch from a management workstation through an inband Telnet session or SNMP-based management software. The RJ-45 port is configured as a media data interface (MDI). **Active and Status LEDs.** See Table 2 on page 19 for information on management module LEDs.
	**ProCurve 8108fl Redundant Switch Fabric Module (J8729A)** and **ProCurve 8116fl Redundant Switch Fabric Module (J8730A)** At least one switch fabric module is required to process traffic on any installed interface module. A second switch fabric module can be installed for redundancy. The Switch 8108fl uses a half-height module (shown in picture) the Switch 8116fl uses a full-height module (not shown). These modules are not interchangeable. **Active and Status LEDs.** See Table 2 on page 19 for information on switch fabric module LEDs.

Module	Module Type and Description
	**ProCurve Switch fl 1-Port GbE LR Interface Module (J8733A)** **Long-reach (LR) LAN port.** LR port with SC connector for 10 Gigabit operation over single-mode fiber optic cable. **Activity, Link, and Status LEDs.** See Table 3 on page 19 for information on interface module LEDs. This module's end-of-life is Summer 2006. The 1-Port X2 10Gbe Module (J8736A) shown on page 4, provides functionally-equivalent LR connectivity (with separate purchase of LR transceivers) in an X2, media-flexible package.
	**ProCurve Switch fl 10-Port 100/1000-T Interface Module (J8734A)** **Twisted-pair ports.** Ten twisted-pair ports with RJ-45 connectors for 1000 Mbps (1 Gigabit) or 100 Mbps operation over Category 5 or better 100-ohm UTP or STP cable *(category 5e recommended for Gigabit).* **Activity, Link, and Status LEDs.** See Table 3 on page 19 for information on interface module LEDs.

Module	Module Type and Description
	**ProCurve Switch fl 10-Port Mini-GBIC Interface Module (J8735A)** **Gigabit Ethernet ports.** Ten 1-Gigabit Ethernet ports that use only the following supported mini-GBICs: • ProCurve Gigabit-SX LC mini-GBIC (J4858B) • ProCurve Gigabit-LX LC mini-GBIC (J4859B) • ProCurve Gigabit-LH LC mini-GBIC (J4860B) • ProCurve Gigabit 1000Base-T mini-GBIC (J8177B) **Activity, Link, and Status LEDs.** See Table 3 on page 19 for information on interface module LEDs.
	**ProCurve Switch fl 1-Port X2 10GbE Module (J8736A)** **Transceiver slot.** The X2 10GbE module supports the following transceivers (as of this printing)*: • 10 Gigabit-X2-SC SR Optic transceiver (J8436A) • 10 Gigabit-X2-SC LR Optic transceiver (J8437A) • 10 Gigabit-X2-SC ER Optic transceiver (J8438A) • 10 Gigabit-X2-CX4 Copper transceiver (J8440A) – 10 Gigabit-X2-CX4 Optical Media Converter (J8439A). **Activity, Link, and Status LEDs.** See Table 3 on page 19 for information on interface module LEDs. * For the latest information on supported transceivers, visit the ProCurve Networking Web site: http://www.procurve.com.

Interface Module Features

The ProCurve Switch 8100fl interface modules have the following features:

- Module LEDs provide information about the link status and network activity on each port.
- Hot swapping modules—you can insert a new module or replace an existing module while the switch is operating. It is not necessary to shut down the switch.
- Hot swapping mini-GBICs—you can install new and change or replace existing mini-GBICs used in the 10-Port Mini-GBIC Interface Module while the switch is operating. It is not necessary to shut down the switch.
- Hot swapping transceivers—you can install new and change or replace existing transceivers used in the 1-Port X2 10GbE Interface Module while the switch is operating. It is not necessary to shut down the switch.
- Standards supported:
  - The port on the 1-Port 10 GbE LR Interface Module is compatible with the IEEE 802.3ae wavelength standard.
  - The 10-Port 100/1000-T Interface Module is compatible with the IEEE 802.3 1000Base-T and IEEE 802.3u 100Base-TX industry standards.
  - The ports on the Gigabit-SX and Gigabit-LX LC mini-GBICs installed in the10-Port Mini-GBIC Interface Module are compatible with IEEE 802.3z Gigabit-SX and Gigabit-LX standards, respectively.
  - The transceiver ports on the 1-Port X2 10GbE Interface Module are compliant with X2 and XENPAK MSAs, and are compatible with the IEEE 802.3ak CX4 and IEEE 802.3ae XAUI industry standards.

Hot Swapping and Redundancy

All modules can be “hot swapped”; that is, they can be removed or installed while the switch is powered on. However, note the following differences between module types with respect to redundancy:

- When the primary switch fabric module fails, the redundant switch fabric module takes over (in less than five seconds) and continues to function as the primary module even after the failed module is replaced.
- When the primary management module fails, the redundant management module takes over immediately as the new primary management module. However, this new primary management module will reboot the other modules resulting in a loss of traffic until all modules are back on line. When the failed management module is replaced, the replacement management module serves as the redundant management module.

- Interface modules do not have redundant protection. If an interface module fails, traffic on the module will stop until you can replace the module.
- When hot swapping interface and switch fabric modules, use the CLI **redundancy switchover fabric-module lock** command to prevent a redundant switch fabric module from taking over as the primary switch fabric module. Once the hot swap is completed, re-enable fabric protection switching by using the **redundancy switchover fabric-module clear** command
- When hot swapping modules, it is recommended that you use the CLI **power down** and **power up** commands on the slot where the module is inserted. This will help maintain a consistent inventory of modules in the system.

Fail Over Protection

If the primary management module fails, the redundant management module will reboot the switch fabric module and interface modules. During this time, service is affected.

To perform a controlled shutdown on a management or fabric module, and cause the redundant module to take over, enter the following command:

```
ProCurve 8100fl# halt <slot>
```

You can also perform a controlled shutdown on a management or fabric module and cause the redundant module to take over, by entering the following command:

```
ProCurve 8100fl# power down <slot>
```

Note

To display a list of the slot numbers of all installed modules, type **?** after the command; for example, **halt ?** or **power down ?**.

Configuration Changes to Management Module

In normal operation, whenever you make configuration changes to the primary management module, the changes are copied to the redundant management module's configuration file. In this way, if the primary management module fails, the redundant module has all the configuration information necessary to take over as the primary management module.

Installing Modules

Installation procedures are similar for all modules. However, because there are three different types of modules—switch fabric, management, and interface modules—make sure that you insert each module in its appropriate slot. See the following sections for details.

Types of Modules Supported

A ProCurve Switch 8100fl supports three types of modules:

- *Switch fabric modules* (half-height modules for the Switch 8108fl; full-height modules for the Switch 8116fl) are installed in the central slots labeled **FM**. Install the primary switch fabric module in slot **FM-A**; install the redundant switch fabric module into slot **FM-B**. (You can use either slot in a single switch fabric module installation.)
- *Management modules* (thicker, half-height modules) are installed in slots labeled **MM**.
  - If you are installing only one management module, you can install it in either slot **MM-A** or **MM-B**.
  - If you are installing two management modules, the primary management module is the one installed in slot **MM-A**. The redundant management module is the module installed in slot **MM-B**.
- *Interface modules* (narrow half-height modules) are installed in numbered slots (**1-8** on the Switch 8108fl; **1-16** on the Switch 8116fl).

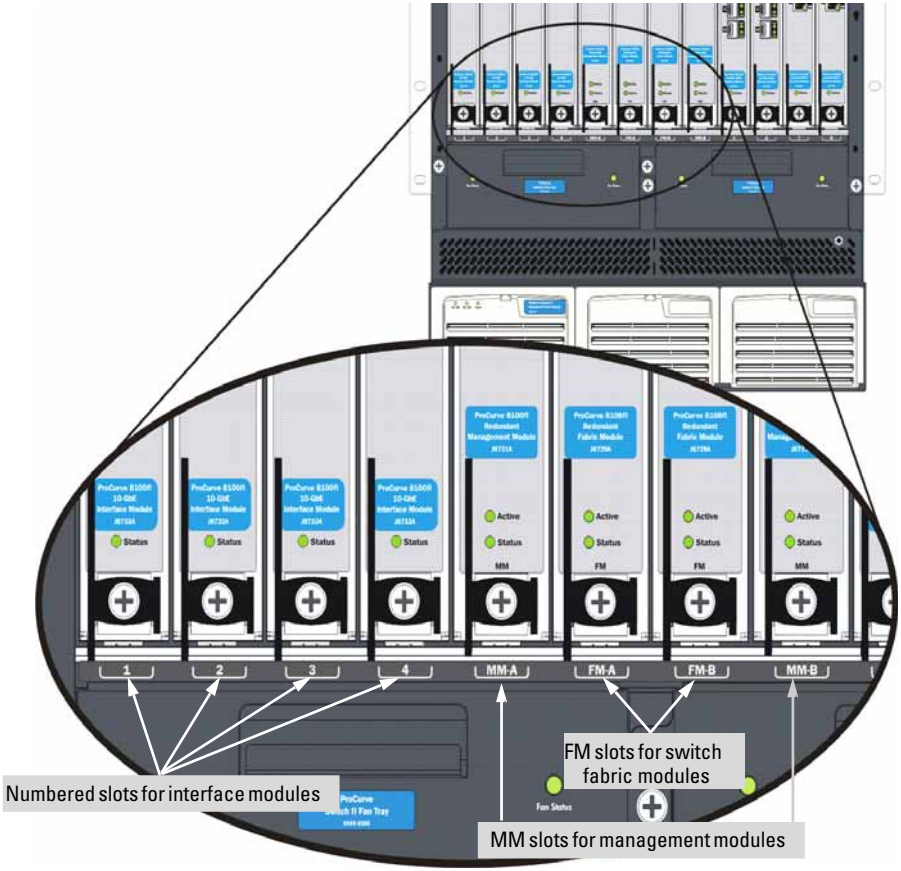
Installation Overview

You can install modules in the switch both when the switch is powered on and when the switch is powered off. The procedures described in this chapter assume that the switch is powered on.

1. Install each module in its appropriate slot by following one of these procedures:
   - For a switch fabric module, see "Installing a Switch Fabric Module" on page 10.
   - For a management module, see "Installing a Management Module" on page 12.
   - For an interface module, see "Installing an Interface Module" on page 14.

Caution

To avoid damaging modules and the backplane, be sure to insert each type of module in its appropriate slot by referring to the slot number or label, as shown in the following illustration.



2. If you are using a 10-Port Mini-GBIC Interface Module, install the mini-GBICs in the module. You can install mini-GBICs before or after you install the module in the switch (see "Installing a mini-GBIC" on page 26).
3. Verify that the modules are installed correctly (see "Verifying Module Installation" on page 16).
4. Connect the network cabling (see "Connecting the Network Cables" on page 17).

5. Verify that network connections are working properly (see "Verifying Cable Connections" on page 19).
6. Configure the ports on any newly installed interface module (see "Customizing a Port Configuration" on page 23).

Installation Precautions

- ***Avoid damage from static electricity***. Static electricity can severely damage the electronic components on the modules. When handling and installing the modules in your switch, follow these procedures to avoid damage from static electricity:
  - Use proper ESD grounding procedures before handling modules.
  - Handle the module by its bulkhead or edges and avoid touching the components and the circuitry on the board.
  - When installing the module, equalize any static charge difference between your body and the switch's metal body, or by frequently touching the switch's metal body.
- ***Ensure you fully insert the modules.*** Insert a module into its slot until the bulkhead on the module is contacting or is very close to contacting the front face of the switch chassis.
  - ***Do not force a module into its slot***. If a module does not seat correctly, ease it back out and check alignment. Forcing a module can damage it and the backplane.
  - ***Check for alignment***. Make sure that the metal plate of the module - not the circuit board - is between the module guides. Check both the upper and lower guides for proper alignment.
- ***Secure the module.*** Once the module is fully inserted, make sure that you fully close the ejector levers and screw in the two retaining screws to secure the module in place.
- For safe operation, proper switch cooling, and reduction of electromagnetic emissions, ensure that a slot cover is installed on any unused module slot. ***For safety, no more than one slot should be uncovered at a time when the switch is powered on.***
- Do not install the modules in an environment where the operating ambient temperature might exceed 40°C (104°F).

Installing a Switch Fabric Module

A ProCurve Switch 8100fl requires at least one switch fabric module to process traffic for any interface module. Only one switch fabric module is required for full throughput. Note that the 8-slot Switch 8108fl uses the half-height switch fabric module. The 16-slot Switch 8116fl uses a full-height switch fabric module. These modules are not interchangeable.

- If you are installing only one switch fabric module, you can install it in either slot **FM-A** or **FM-B**.
- If you are installing two switch fabric modules, the primary switch fabric module is the one installed in slot **FM-A**. The redundant switch fabric module is the module installed in slot **FM-B**.
- For information on hot swapping and redundancy, see page 5.

Caution

To prevent equipment damage, review the installation precautions on page 9.

To install a switch fabric module (J8729A or J8730A)**:**

1. If a cover plate is installed in the switch fabric module slot, remove it by loosening the captive screws (using a slotted or P2 Phillips screwdriver) and pulling on the ejectors.
2. Open the ejectors at the top and bottom of the module, and hold the upper ejector lever in the unlocked position while you are installing the module (see step 1 in the illustration opposite).
3. Position the module in slot **FM-A** (for the primary switch fabric module) or slot **FM-B** (for the redundant switch fabric module). (You can use either slot in a single switch fabric module installation.)
4. Slide the module all the way into the slot, firmly but gently pressing to make sure that the pins on the back of the module are completely seated in the backplane.

Caution

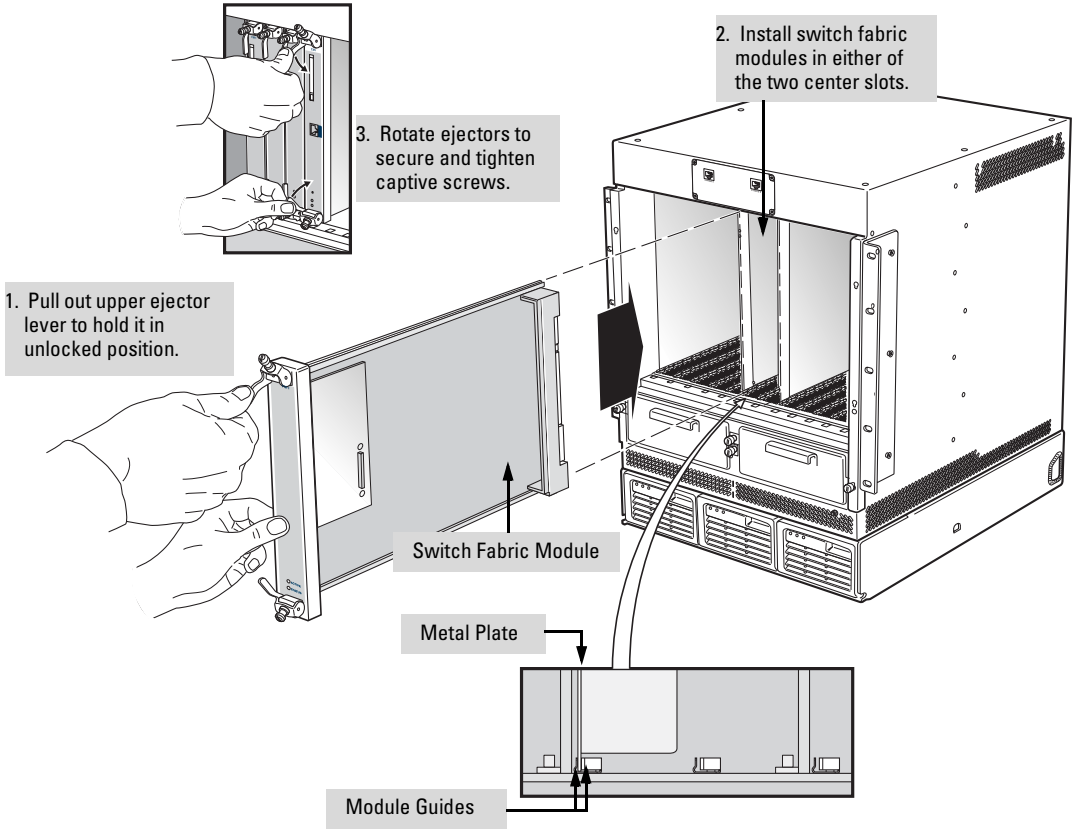
Because the 8116fl switch fabric module is a double-height module, it is heavier than the other modules. Be careful when you insert this module and make sure that it is properly seated.

Make sure that the metal plate of the module, and not the circuit board, is between the guides. Check both the upper and lower guides for proper alignment.

Do not force a module into its slot. If the module does not seem to be seating correctly, ease it back out and check alignment. Forcing a module can damage it and the chassis.

5. To lock the module into the slot, close the ejectors until they are vertical.

6. Tighten the captive screw on each ejector by hand and seat with a screw driver to keep the module from being removed accidentally. Do not overtighten the captive screws. (You can tighten the thumb screws with a P2 Phillips screwdriver to eliminate the possibility of casual removal by unauthorized personnel.)



Note

The module must be fully seated and the ejectors must be fully locked (vertical) before the captive screws will align properly. Also, by fully seating the module, you ensure proper contact of the module with the backplane, which is necessary for optimal performance.

7. Repeat steps 1 to 6 to install a second switch fabric module to provide full (100%) redundancy in case of failure of the primary switch fabric module.

Installing a Management Module

The management module is the main processing unit of a ProCurve Switch 8100fl and is required for the switch to operate. The management module contains system-wide bridging and routing tables, and runs the main control protocols. You can install the same management module in both the Switch 8108fl and Switch 8116fl chassis.

In addition to a slot for the primary management module, the switch also has a slot for a second (optional) redundant management module:

- If you are installing only one management module, you can install it in either slot **MM-A** or **MM-B**.
- If you are installing two management modules, the primary management module is the one installed in slot **MM-A**. The redundant management module is the module installed in slot **MM-B**.

Caution

To prevent equipment damage, be sure to follow the installation precautions on page 9.

To install a management module (J8731A)**:**

1. If a cover plate is installed in the management module slot **MM-A** or **MM-B**, remove the cover plate: loosen the captive screws on the ejectors until the screws pop out, then open the ejectors and pull out the plate.
2. Open the ejectors at the top and bottom of the module, and hold the upper ejector lever in the unlocked position while you are installing the module (see step 1 in the illustration opposite).
3. Align the metal plate of the management module with the guides at the top and the bottom of the slot opening, as shown in the illustration.

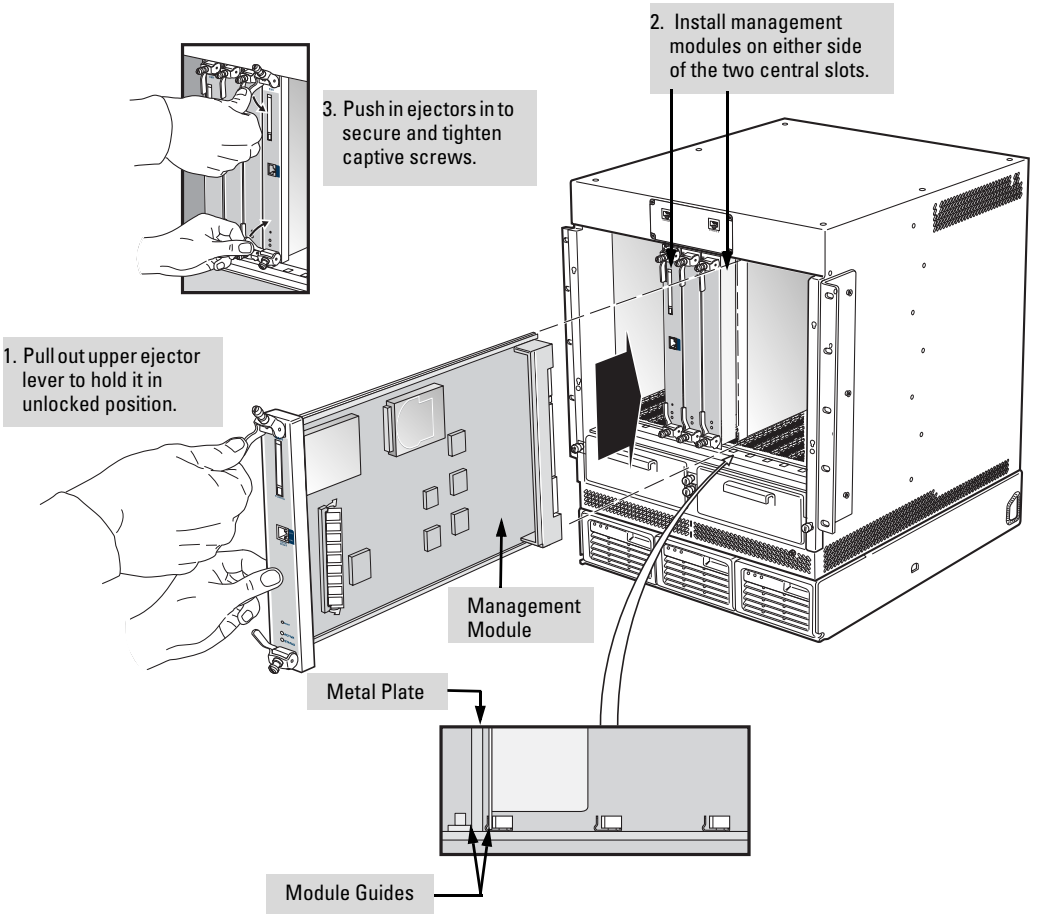
Caution

Make sure that the metal plate of the management module, and not the circuit board, is between the guides. Check both the upper and lower guides.

Do not force a module into its slot. If the module does not seem to be seating correctly, ease it back out and check alignment. Forcing a module can damage it and the chassis.

4. Slide the management module all the way into the slot, firmly but gently pressing to make sure that the pins on the back of the management module are completely seated in the backplane.
5. To lock the module into the slot, close the ejectors until they are vertical.

6. Tighten the captive screw on each ejector by hand and seat with a screw driver to keep the module from being removed accidentally. Do not overtighten the captive screws. (You can tighten the thumb screws with a P2 Phillips screwdriver to eliminate the possibility of casual removal by unauthorized personnel.)



Note

A management module must be fully seated and the ejectors must be fully locked (vertical) before the captive screws will align properly. Also, by fully seating the module, you ensure proper contact of the module with the backplane, which is necessary for optimal performance.

7. Repeat steps 1 through 6 if you are installing a second, redundant management module.

Installing an Interface Module

ProCurve 8100fl switches provide non-blocking throughput regardless of the software features you are using. Therefore, you do not need to "load balance" interface modules by placing them in certain physical relationships to balance the load on the backplane. Regardless of where you install the interface modules, the backplane can provide full, non-blocking throughput.

You can install interface modules in any numbered slot (**1–8** on the Switch 8108fl and **1–16** on the Switch 8116fl). The illustration on page 15 shows an example of how to install an interface module.

Caution

To prevent equipment damage, review the installation precautions on page 9.

To install an interface module (J8734A, J8735A, or J8736A)**:**

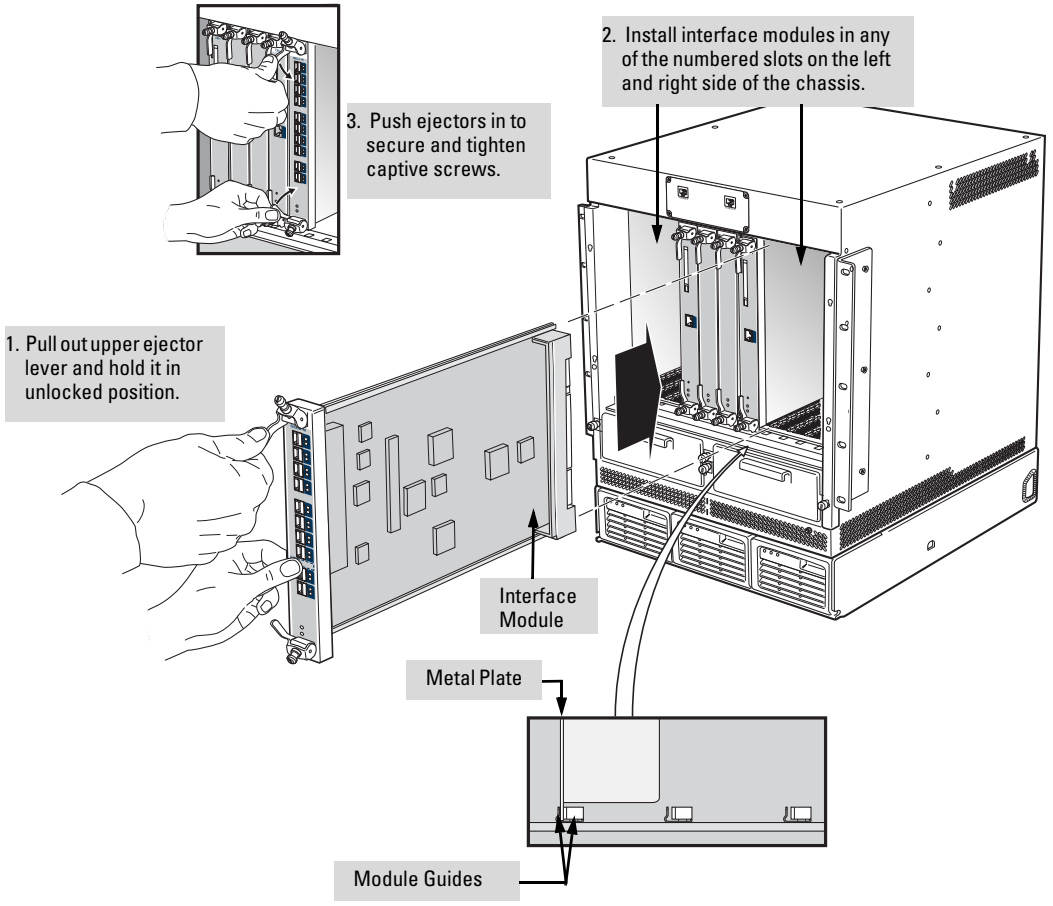
1. If a cover plate is installed in the interface module slot, remove the cover plate: loosen the screws on the ejectors, then open the ejectors and pull out the plate.
2. Open the ejectors at the top and bottom of the module, and hold the upper ejector lever in the unlocked position while you are installing the module (see step 1 in the illustration opposite).
3. Align the metal plate of the interface module between the module guides, as shown in the illustration.

Caution

Make sure that the metal plate of the interface module, and not the circuit board, is between the guides. Check both the upper and lower guides.

Do not force a module into its slot. If the module does not seem to be seating correctly, ease it back out and check alignment. Forcing a module can damage it and the chassis.

4. Slide the interface module all the way into the slot, firmly but gently pressing the interface module in place to make sure that the pins on the back of the interface module are completely seated in the backplane.
5. To lock the module into the slot, close the ejectors until they are vertical.
6. Tighten the captive screw on each ejector by hand and seat with a screw driver to keep the module from being removed accidentally. Do not overtighten the captive screws. (You can tighten the thumb screws with a P2 Phillips screwdriver to eliminate the possibility of casual removal by unauthorized personnel.)



Note

An interface module must be fully seated and the ejectors must be fully locked (vertical) before the captive screws will align properly. Also, by fully seating the module, you ensure proper contact of the module with the backplane, which is necessary for optimal performance.

7. Repeat steps 1 to 6 to install any additional interface modules.
8. If you have installed a 1-Port X2 10GbE Interface Module, you can now install a transceiver in the module (see page 24).

   If you have installed a 10-Port Mini-GBIC Interface Module, you can now install mini-GBICs in the module (see page 26).

Verifying Module Installation

After you have installed all the modules necessary for your switch, follow the procedure in this section verify correct module installation.

To verify module installation:

1. Make sure all exposed interface module slots and power supply bays are free of foreign objects, such as tools, and have the correct slot covers.
2. Replace the power and slot covers over any empty power bays and module slots.

   Make sure that you use the correct type of cover for each empty slot. Each cover is labeled as follows to indicate the type of slot for which it is designed (part numbers are in parentheses):

   - FM Cover for switch fabric module slots:
     - for Switch 8108fl (5069-0122)
     - for Switch 8116fl (5069-7937)
   - MM Cover for management module slots (5069-0123)
   - IM Cover for interface module (numbered) slots (5069-0124)
   - EM Cover for expansion module slots in the Switch 8116fl (5069-0125)

Caution

To provide proper air flow through the chassis, do not leave any open slots with missing slot covers. Also, failure to use the correct slot cover may result in improper switch cooling.

3. Connect the power supplies to a power source.
4. Verify proper operation by observing the LEDs. Make sure that the Status LED on each active module is solid green.

Notes on LEDs

- The Link and Activity LEDs on the 1-Port X2 10-Gbe module will go on for two seconds when a transceiver is inserted into the port. They will then go off until a network cable is plugged into the transceiver and the LEDs follow their normal operational behavior. See page 19 for details.
- The Activity LED on the 1-Port 10-GbE LR Module will flash once every four seconds. This is a safety feature known as Auto Laser Shutdown.
- The Link Status LED for the ports on the 10-Port 100/1000Base-T Module will show solid green when a port is connected at 1000 Mbps, and solid amber when a port is connected at 100 Mbps.

  For more details on LED conditions, see "Verifying Cable Connections" on page 19.

Connecting the Network Cables

After you verify the installation of each module and have installed the requisite mini-GBICs or transceivers, connect the appropriate network cable to each port according to the cable types defined in Table 1. For more information about cabling, see "Connectors and Cables" on page 34.

Table 1. Supported Cable Types

Module	Port Type/ Transceiver	Cable Type	Length Limits
		Twisted-Pair and Copper Cables	
10-Port 100/1000-T Interface Module (J8734A)	100/1000Base-T	**For either 100 Mbps or 1000 Mbps operation:** Category 5 or better, 100-ohm UTP or shielded twisted-pair (STP) balanced cable. For 1000 Mbps (gigabit) operation, Category 5e cabling or better is recommended.	100 meters
1-Port X2 10GbE Module (J8736A)	CX4	Speed 3.125Gbx4 (Cables compliant with the 802.3ak standard)	0.5 – 15 meters
		Fiber Optic Cables	
10-Port Mini-GBIC Interface Module (J8735A)*	Gigabit-SX (on Gigabit-SX-LC mini-GBIC)	Multimode fiber-optic cables fitted with LC connectors See "Fiber-Optic Cables" on page 36 for information on the different fiber-optic cables supported.	220 meters to 550 meters depending on the cable used.
	Gigabit-LX** (on Gigabit-LX-LC mini-GBIC)	Single-mode fiber-optic cables fitted with LC connectors. The multimode cables specified for the Gigabit-SX mini-GBIC may also be used, but a mode-conditioning patch cord may be needed—see "Fiber-Optic Cables" on page 36.	10 kilometers (single-mode cable) 550 meters (multimode cable)
	Gigabit-LH*** (on Gigabit-LH mini-GBIC)	The same single-mode fiber-optic cables as for Gigabit-LX.	70 kilometers

***10-Port mini-GBIC connections** – The 10-Port Mini-GBIC Interface Module supports fiber optic connections that require the use of mini-GBICs (see "Installing a mini-GBIC" on page 26).

****Gigabit-LX** – If multimode cable is used, a **mode conditioning patch cord** may be needed — see "Mode Conditioning Patch Cord for Gigabit-LX" on page 32 for more information.

*****Gigabit-LH** - Between the transmit and receive ends of the cable, at least 5db of attenuation is required for a reliable connection. This is equivalent to 20Km of the fiber-optic cable. For distances less than 20Km, you must add attenuators to bring the total attenuation to at least 5db. Most cable vendors carry attenuators.

Module	Port Type/ Transceiver	Cable Type	Length Limits
1-Port 10-GbE Interface Module (J8733A)	10-Gbe LR	9/125 μm (core-cladding) diameter, 1310 nm, low metal content, **single-mode** fiber optic cables fitted with SC connectors. The cables must comply with the ITU-T G.651 and ISO/ IEC 793-2 Type A1b or A1a standards.	10 kilometers (single-mode cable)
1-Port X2 10GbE Module (J8736A)	10-GbE SR	Multimode fiber-optic cable designed for Gigabit Ethernet: 62.5/125 μm (core/ cladding) diameter or 50/125 μm, 850 nm, low metal content, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	**62.5 μm cable:** • 160 Mhz*km = 2-26 meters • 200 Mhz*km = 2-33 meters **50 μm cable:** • 400 Mhz*km = 2-66 meters • 500 Mhz*km = 2-82 meters • 2000 Mhz*km = 2-300 meters
	10-GbE LR	9/125 μm (core/cladding) diameter, 1480 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	**single-mode cable:** 2-10 kilometers
	10-GbE ER	9/125 μm (core/cladding) diameter, 1550 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	**single-mode cable:** 2-30 kilometers (40 kilometers, on an engineered fiber optic link that meets standards in the specification).
	OMC CX4 Fiber (Optical Media Converter) for CX4 transceiver	12 fiber 50/125 μm (core/cladding) diameter, multimode Fiber ribbon cable. 12 fiber 62.5/ 125 μm (core/cladding) diameter, multimode Fiber ribbon cable is also supported.	1-300 meters

Note: Conditioning patch cord cables are not supported on 10-GbE speeds.

Verifying Cable Connections

For Switch fl interface modules, when you connect a network cable from an active network device to the switch, the LED for the switch port should light on as described in Table 2 and Table 3.

Management and Switch Fabric Modules LEDs

The ProCurve Switch fl Redundant Management and Switch Fabric Modules have an Active LED (on top) and a Status LED (on bottom). The LED states described in Table 2 are common to both types of module.

Table 2. Management and Switch Fabric Module LEDs.

LED	Color	State	Meaning
Active	Green	Flashing	Negotiating active/backup module(s) during bootup sequence.
	Green	Solid	Module is active - normal.
	n/a	Off	Module is in back up mode.
Status	n/a	Off	No power to the module.
	Green	Flashing	Module is booting up and downloading operating software.
	Green	Solid	Module is in service - normal.
	Yellow/ Orange	Flashing	Self-test failure.

Interface Modules LEDs

The ProCurve Switch fl Interface Modules have the LEDs described in Table 3—a pair of Activity and Link LEDs for each port, and a Status LED at the bottom of each module. Note that the meaning of the per-port Activity and Link LEDs may differ according to module.

Table 3. Interface Module LEDs

LED	Color	State	Meaning
1-Port 10GB LR Module (J8733A)			
Activity	Green	Flashing	Transmitting data.
	Green	Solid	Link is up, no data is being transferred.

LED	Color	State	Meaning
1-Port 10GB LR Module (J8733A) (Continued)			
Activity (Continued)	Off	Flashing	When no connector is plugged into the port, the LED will flash approximately once every four seconds. This on/off cycle is a safety feature known as Auto Laser Shutdown.
Link	Green	Solid	Link is up.
	n/a	Off	No connector is plugged into the port.
Status	n/a	Off	No power is reaching the module.
	Green	Flashing	Module is powering up and downloading operating software.
	Green	Solid	Software image loaded successfully.
	Yellow/ Orange	Flashing	Self-test failure.
10-Port 100/1000Base-T Module (J8734A)			
Link (Lnk) (per port)	Green	Solid	Port is in 1000 Mbps mode.
	Amber	Solid	Port is in 100 Mbps mode.
	n/a	Off	No connector is plugged into the port.
Activity (Act) (per port)	Green	Flashing	Data is being transmitted.
	n/a	Off	No data is being transferred, and/or no connector is plugged into the port.
Status	n/a	Off	No power is reaching the module.
	Green	Flashing	Module is powering up and downloading operating software.
	Green	Solid	Software image loaded successfully.
	Yellow/ Orange	Flashing	Self-test failure.
10-Port mini-GBIC Module (J8735A)			
Activity (Act) (per port)	Green	Flashing	Data is being transmitted.
	Green	Solid	Link is up, no data is being transferred.

LED	Color	State	Meaning
10-Port mini-GBIC Module (J8735A) (Continued)			
Activity (Act) (Continued)	Off	Flashing	When no connector is plugged into the port, the LED will flash approximately once every four seconds. This is a safety feature known as Auto Laser Shutdown
Link (Lnk) (per port)	Green	Solid	Link is up.
	n/a	Off	No connector is plugged into the port.
Status	n/a	Off	No power is reaching the module.
	Green	Flashing	LED is solid green to flashing green during boot up. Solid green indicates that the module is loading the system image.
	Green	Solid	Software image loaded successfully.
	Orange	Flashing	Self-test failure.
1-Port X2 10GbE Interface Module (J8736A)			
Link	Green	Solid	Link is up.
	Orange	Flashing	Self-test failure or unsupported transceiver. See Error Log for details.
	n/a	Off	No connector is plugged into the port.
Activity (Act)	Green	Flashing	Transmitting data. Blink rate indicates traffic utilization of the port.
	Green	Solid	Traffic exceeds 90% of link capacity.
	n/a	Off	No connector is plugged into the port, or no traffic is being passed through the port.
Link and Activity (both port LEDs together)	Orange/ Green/Off	Solid Orange (0.5 secs), then Solid Green (1.5 secs), and then Off	A transceiver has been correctly inserted into the transceiver port. After the insertion test, the LEDs will remain Off until a network cable is inserted into the transceiver and the LEDs follow their normal operational behavior.
Status	n/a	Off	No power to the module.
	Green	Flashing	Module is powering up and downloading operating software.
	Green	Solid	Software image loaded successfully.
	Yellow/ Orange	Flashing	Self-test failure.

Troubleshooting Module Operation

If the Link LED for a port does *not* light on, follow the procedures in Table 4 to troubleshoot the module operation.

Table 4. Using LEDs to Troubleshoot

Error Condition	Diagnostic Procedure
A port LED remains off after you connect a cable.	• Verify that both ends of the port's cabling (at the switch and at the connected device) are securely connected. • Verify that the connected device and switch are both powered *on* and operating correctly. • Verify that you are using the correct cable type for the connection—see "Connectors and Cables" on page 34 for more information. • For fiber-optic connections, verify that the transmit port on the switch is connected to the receive port on the connected device, and the switch receive port is connected to the transmit port on the connected device. • Verify that the port has not been disabled through a switch configuration change. • Verify that the connection parameters configured for the port match the connection configured for the device. Mismatched configurations are a frequent cause of connection problems. You can use the console interface to determine the state and configuration of the port. Re-enable the port if necessary. (If you configured an IP address on the switch, you can also use a Telnet session or SNMP-based management software.) • If the preceding procedures do not resolve the problem, try using a different port or a different cable.

Customizing a Port Configuration

The ProCurve Switch 8100fl allows you to build a configuration for a module that is not yet installed. For example, although slot 2 is empty, you can still configure an interface, add an IP address to it, and then save the configuration for later use. If the slot in which you install a module has not been preconfigured, you must configure the module and enable its ports for network operation.

The default connection parameters in a Switch fl port configuration are as follows:

- **Ports Enabled:** No.
  Note: *By default, all ports are disabled at initial startup. You must use the* **no shutdown** *command to activate interfaces on the switch once they have been created.*
- **Mode:** Auto — The port auto-negotiates the speed, and communication mode (full duplex).
  Note: *You have the option to modify the port speed or configure a port to act in slave mode to a connected device.*
- **Flow Control:** Yes.
  Note: *Flow control is enabled by default and is not reported in show interface configuration displays. To disable flow control on an active port, you must use the* **no flowcontrol** *command.*
- **Advanced features** — Spanning Tree, Trunking, VLANs, LACP, Routing, Class of Service, Security, and so forth: all Disabled.

If these connection settings in the default port configuration are not acceptable for your network, use the command-line interface (CLI) to configure one or more ports on a module. For more information, refer to the *Management and Configuration Guide* shipped on the documentation CD with the switch.

Installing or Removing Transceivers

If you installed a 1-Port X2 10GbE module, you can now install a copper or fiber optic transceiver to enable network connectivity to the port.

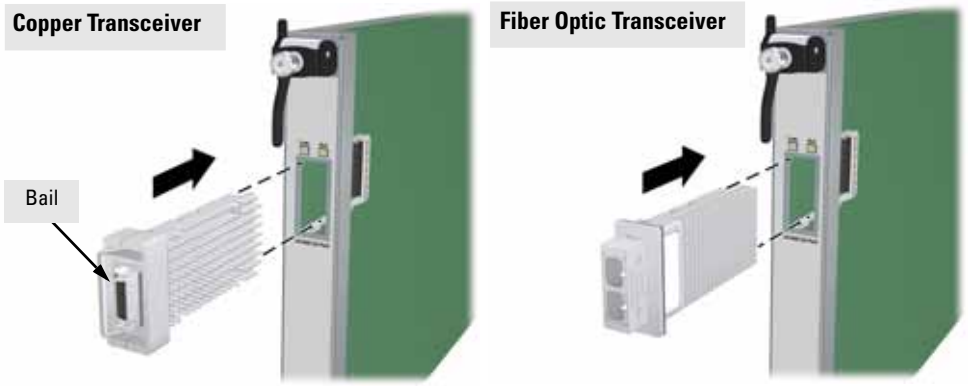
Note

You can install or remove a transceiver without having to power off the switch. Use only the ProCurve supported transceivers (see page 5).

Installing Transceivers

To install a transceiver:

1. Remove the port cover on the transceiver slot by squeezing the metal tabs together.
2. Slide the transceiver into the empty slot until it stops.



3. Push firmly until you hear a click and the gasket seat against the bulkhead.

Note

When switch power is on, the Link and Activity LEDs will come on for approximately two seconds and then go off. This is confirmation the transceiver is installed.

4. If your transceiver has a bail, move the bail up to lock the transceiver in place; if not your transceiver is now completely installed. Network cables can now be connected.

Removing Transceivers

To remove a transceiver:

1. Disconnect the network cable from the transceiver before removing it from the module.
2. If your transceiver has a wire bail, lower the bail and then use the bail to pull the transceiver from the slot.

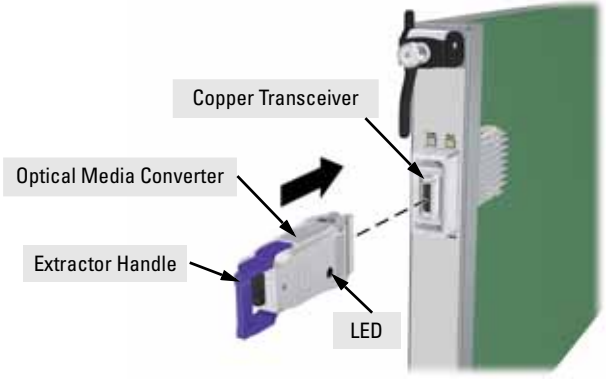
   If your transceiver does not have a bail, pull the transceiver straight out.

(Optional) Installing an Optical Media Converter

An optical media converter (OMC) can be installed into the copper transceiver to enable a fiber-optic cable connection.

To install a media converter:

1. Connect the media converter to the copper transceiver port until it clicks into place.



2. Install a multimode fiber ribbon cable to establish a network link.

Note on LED

The OMC has a single bi-color LED to indicate Power and Link. The LED goes Orange when it has power but no link, and goes Green when a link is established with the other end of a 12-strand flat MTP cable.

To remove a media converter:

1. Disconnect the network cable from the converter before removing it from the module.
2. Pull the extractor handle to remove the converter from the transceiver.

Installing and Removing mini-GBICs

You can remove or install a mini-GBIC from the 10-port mini-GBIC Module without having to power off the switch. Use only ProCurve mini-GBICs. The following mini-GBICs are supported by the 10-port mini-GBIC module (as of this printing):

- Gigabit-SX LC mini-GBIC (J4858B)
- Gigabit-LX LC mini-GBIC (J4859B)
- Gigabit-LH LC mini-GBIC (J4860B)
- Gigabit 1000Base-T mini-GBIC (J8177B)

Caution

Use only the supported genuine ProCurve mini-GBICs with your switch. Non-ProCurve mini-GBICs are not supported. Should you require additional ProCurve mini-GBICs, contact your ProCurve Networking Sales and Service Office or authorized dealer.

Installing a mini-GBIC

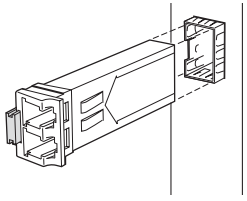
⚠WARNING

The ProCurve fiber optic mini-GBICs are Class 1 laser devices. Avoid direct eye exposure to the beam coming from the transmit port.

Although ProCurve mini-GBICs use slightly different release mechanisms, the installation procedure is the same for all types.

To install a mini-GBIC in the 10-Port mini-GBIC Module:

1. Position the mini-GBIC as shown in the following illustration. Note that the release mechanism is on the left of the receptacle.



2. Insert the mini-GBIC into the receptacle until it locks into position.

Caution

If the mini-GBIC does not go in easily, do not force it. If it is not oriented properly, it will stop about one quarter of the way into the slot—remove and reorient the mini-GBIC so that it slides easily into the slot.

Keep the dust plug in the mini-GBIC when no fiber cable is plugged in. The optics will not work properly when obstructed with dust or contaminants. It is recommended that you clean the optic surfaces of the fiber cable prior to plugging it into the optical bores of the mini-GBIC.

Removing a mini-GBIC

The removal procedure is different for different types of mini-GBICs (see the illustrations and examples in this section). To remove a mini-GBIC, you must disengage the unit from its port, using the extraction mechanism, and then pull the unit straight out of the receptacle.

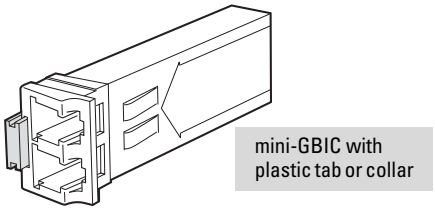
Note

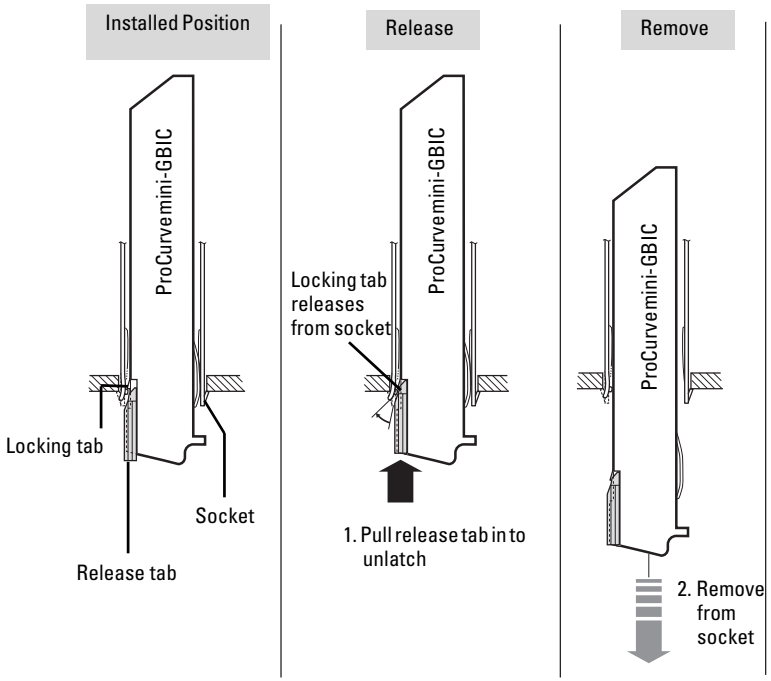
You should disconnect the network cable from the mini-GBIC before removing it from the module.

Depending on when you purchased a ProCurve mini-GBIC, it may have one of three different release mechanisms: a plastic tab on the bottom of the mini-GBIC, a wire bail, or a plastic collar around the mini-GBIC (see the procedures in this section for details).

To remove a mini-GBICs with a plastic tab or plastic collar:

1. Remove the fiber cable from the mini-GBIC.
2. Push in the plastic tab or collar toward the switch until the mini-GBIC is released from the switch (you can see it move outward slightly).

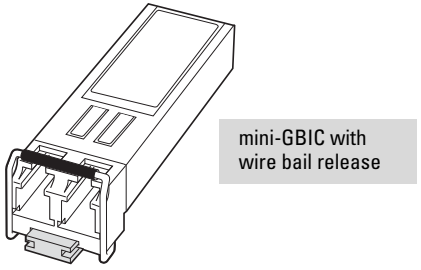


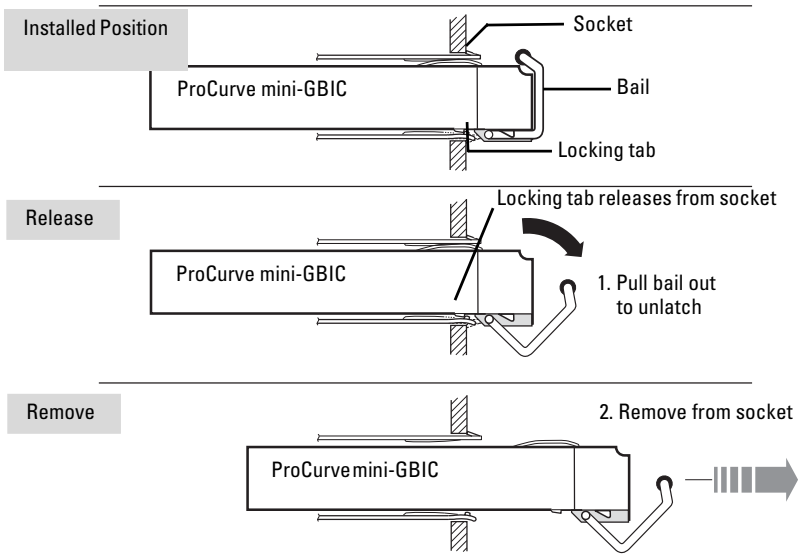


3. Pull the mini-GBIC out of the slot.
4. If the device is not defective (disposable), insert a dust plug to protect it.

To remove a mini-GBICs with a wire bail:

1. Remove the fiber cable from the mini-GBIC.
2. Lower the bail until it is approximately horizontal.





3. Using the bail, pull the mini-GBIC out of the slot.
4. If the mini-GBIC is not defective (disposable), protect it by inserting a dust plug.

Replacing or Removing a Module

Follow the procedures in this section to replace an installed module with a new module, or to remove a module without replacing it. When installing a new module, it is not necessary to reset the switch. However, some configuration changes may be required for the module to be made operational. See below for details.

Caution

Be careful when you remove an interface module from the switch. It may be very hot from normal operation. Also, be sure to follow all the installation precautions described on page 9.

To remove or replace a module in the switch:

1. Remove network cables attached to the ports on the module.
2. Loosen the captive screws on each side of the module.
3. Unseat the module by pushing on the ejector levers on the top and bottom of the module.
4. Carefully remove the module from its slot in the chassis.
5. Do one of the following:
   - If you install another module in the slot, go to "Installing Modules" on page 7 and follow the relevant installation procedure for the type of Switch fl module that you install.
   - If you do not install another module and leave the slot empty, install a blank slot cover over the empty slot.

Caution

For proper cooling and reduction of electromagnetic emissions, make sure that a slot cover is installed in any unused slot.

6. If you replace one type of interface module (for example, the 10-Port 100/1000-T Interface Module) with a different type of module (for example, the 10-Port Mini-GBIC Interface Module) in the same slot, it is not necessary to reset the switch. The port configuration settings are automatically applied to the new module.

Note

If the replacement module is both a different type *and* speed (for example, you replace the 1-Port X2 10GbE Interface Module with the 10-Port Mini-GBIC Interface Module), the new module will be inoperative until you reconfigure the ports to recognize the new module type.

Troubleshooting and Support

One of the main ways to troubleshoot the operation of Switch fl modules is by using the LEDs on the front of the switch and on the modules. Refer to the tables in "Verifying Cable Connections" on page 19 for a description of normal LED behavior. Also, refer to the *ProCurve Switch 8100fl Series: Installation and Getting Started Guide* for more detailed troubleshooting information.

ProCurve Networking Customer Support Services

If you have a problem with the operation of a ProCurve 8100fl switch, Hewlett-Packard offers support 24 hours a day, seven days a week through the use of a number of automated electronic services. See the Customer Support/ Warranty booklet that comes with the switch for information on how to use these services to get technical support. The ProCurve Networking web site, http://www.procurve.com also provides up-to-date support information.

Additionally, your ProCurve Networking-authorized network reseller can provide you with assistance, both with services that they offer and with services offered by ProCurve Networking.

Before Calling Support

Before you call your networking dealer or ProCurve Networking technical support, first gather the following information:

Information Item	Information Location
• Product identification, including the chassis, modules, transceivers*, and mini-GBICs**	On the front of the switch and on modules, transceivers, and mini-GBICs
• Details about the switch's status including the OS (software) version, a copy of the switch configuration, a copy of the switch Event Log, and a copy of the switch status and counters information	Switch console: **show tech-support** command
• Copy of your network topology map, including network addresses assigned to the relevant devices	Your network records
* Transceivers are installed in the 1-Port X2 10GbE Interface Module ** Mini-GBICs are installed in the 10-Port Mini-GBIC Interface Module	

Mode Conditioning Patch Cord for Gigabit-LX

The following information applies to installations in which multimode fiber-optic cables are connected to a Gigabit-LX port.

Unlike Gigabit-SX, which connects to only multimode fiber-optic cabling, Gigabit-LX can use either single-mode or multimode cable. Multimode cable has a design characteristic called "Differential Mode Delay", which requires that the transmission signals be "conditioned" to compensate for the cable design and thus prevent resulting transmission errors. Since Gigabit-SX is designed to operate only with multimode cable, Gigabit-SX mini-GBICs can provide that transmission conditioning internally.

Gigabit-LX mini-GBICs, since they are designed to operate with both single-mode and multimode cable, do not provide the transmission conditioning internally. Thus, under certain circumstances, depending on the cable used and the lengths of the cable runs, an external **Mode Conditioning Patch Cord** may need to be installed between the Gigabit-LX transmitting device and the multimode network cable to provide the transmission conditioning.

If you experience a high number of transmission errors on the Gigabit-LX ports, usually CRC or FCS errors, you may need to install one of these patch cords between the Gigabit-LX port in your switch and your multimode fiber-optic network cabling, *and between the Gigabit-LX transmission device and the network cabling at the other end of the multimode fiber-optic cable run.* ***A patch cord must be installed at both ends.***

The patch cord consists of a short length of single-mode fiber cable coupled to graded-index multimode fiber cable on the transmit side, and only multimode cable on the receive side. The section of single-mode fiber is connected in such a way that it minimizes the effects of the differential mode delay in the multimode cable.

Note

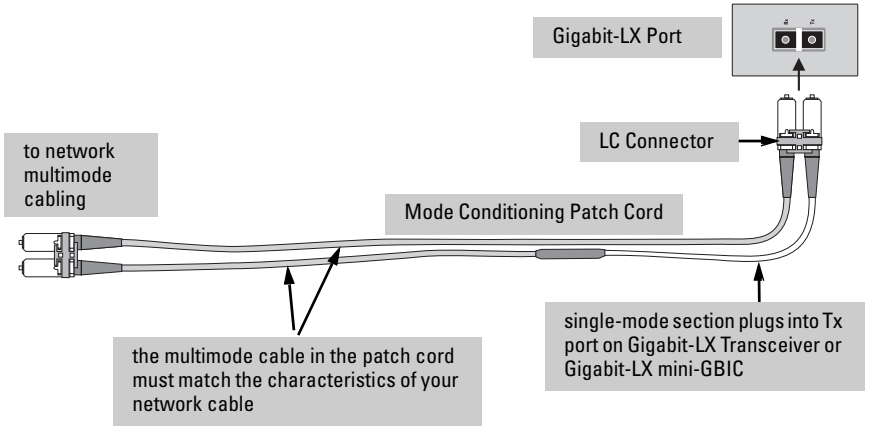
Most of the time, if you are using good quality graded-index multimode fiber cable that adheres to the standards listed on page 36, there should not be a need to use mode conditioning patch cords in your network. This is especially true if the fiber runs in your network are relatively short.

If you are using **single-mode** fiber-optic cabling in your network, there is no need to use mode conditioning patch cords. Connect the single-mode network cable directly to the Gigabit-LX mini-GBIC.

Installing the Patch Cord

As shown in the illustration below, connect the patch cord to the Gigabit-LX mini-GBIC with the section of single-mode fiber plugged in to the Tx (transmit) port. Then, connect the other end of the patch cord to your network cabling patch panel, or directly to the network multimode fiber.

If you connect the patch cord directly to the network cabling, you may need to install a **female-to-female adapter** to allow the cables to be connected together.



Ensure you purchase a patch cord that has LC connectors on the end that connects to the Gigabit-LX mini-GBIC, and has multimode fibers that match the characteristics of the multimode fiber in your network.

Specifications

Environmental

	Operating	Non-Operating
Temperature:	5°C to 40°C (41°F to 104°F)	-40°C to 70°C (-40°F to 158°F)
Relative humidity: (non-condensing)	15% to 80% (@40°C, 24 hours)	90% (@ 65°C, 12 hours)
Maximum altitude:	3.0 Km (10,000 ft)	4.6 Km (15,000 ft)

Lasers

The Gigabit-SX, Gigabit-LX, and Gigabit-LH mini-GBICs, which can be installed in the 10-Port mini-GBIC Module, are Class 1 Laser Products. Laser Klasse 1. These mini-GBICs comply with IEC 825-2: 1993.

The following transceivers, that can be installed in the 1-Port X2 10-Gbe Module, are Class 1 Laser Products.
Laser Klasse 1:

- The 10-GbE X2-SC SR transceiver
- The 10-GbE X2-SC LR transceiver
- The 10-GbE X2-SC ER transceiver

The transceivers comply with IEC 825-2: 1993.

Connectors and Cables

Twisted-Pair

- **10/100Base-T RJ-45** connectors on the Management Module are compatible with the IEEE 802.3 10Base-T and 802.3u 100Base-TX standards and accept the 10 Mbps or 100 Mbps cables listed in Table 5.
- **100/1000Base-T RJ-45** connectors on the 10-Port 100/1000Base-T Interface Module are compatible with the IEEE 802.3u 100Base-TX and IEEE 802.3ab 1000Base-T standards, and accept the 100 Mbps or 1000 Mbps cables listed in Table 5.

Table 5. Twisted-Pair Cables

Port Type	Cable Specifications	Maximum Length
10 Mbps Operation	Category 3, 4, or 5 100-ohm balanced unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable, complying with IEEE 802.3 10Base-T specifications, fitted with RJ-45 connectors	100 meters
100 Mbps Operation	Category 5 100-ohm balanced UTP or STP cable, complying with IEEE 802.3u 100Base-TX specifications, fitted with RJ-45 connectors	100 meters
1000 Mbps Operation	Category 5e 100-ohm balanced UTP or STP cable, complying with IEEE 802.3ab 1000Base-T specifications, fitted with RJ-45 connectors *(please see "Note on 1000Base-T Cable Requirements" below)*	100 meters

Note on 1000Base-T Twisted-Pair Cable Requirements. The Category 5 networking cables that are used for 100Base-TX connections should also support 1000Base-T connections. However, for the most robust connections, you should use cabling that complies with the Category 5e (or better) specifications, as described in Addendum 5 to the TIA-568-A standard (ANSI/TIA/EIA-568-A-5).

Because of the increased speed provided by 1000Base-T (Gigabit-T), the quality of the network cable is more important than for 10Base-T or 100Base-TX connections. Cabling plants being used to carry 1000Base-T networking must comply with the IEEE 802.3ab standards. In particular, the cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). Additionally, unlike the cables for 100Base-TX, 1000Base-T cables must pass tests for Equal-Level Far-End Crosstalk (ELFEXT), Multiple Disturber ELFEXT, and Return Loss.

When testing your cabling, be sure to include the patch cables that connect the switch and other end devices to the patch panels on your site. The patch cables are frequently overlooked when testing cable and they must also comply with the cabling standards.

Fiber-Optic

- **Gigabit-SX LC** connectors on the **G**igabit-SX mini-GBIC (used on the 10-Port Mini-GBIC Interface Module) transmit at 850 nm wavelength, and are compatible with the IEEE 802.3z Gigabit-SX standard. These connectors accepts the low metal content, multimode fiber-optic cables for Gigabit-SX described in Table 6.
- **Gigabit-LX LC** connectors on the **G**igabit-LX mini-GBIC (used on the 10-Port Mini-GBIC Interface Module) transmit at 1310 nm wavelength, and are compatible with the IEEE 802.3z Gigabit-LX standard. These connectors accept the low metal content, single-mode or multimode fiber-optic cables for Gigabit-LX described in Table 6.
- **Gigabit-LH LC** connectors on the **G**igabit-LHX mini-GBIC (used on the 10-Port Mini-GBIC Interface Module) transmit at 1550 nm wavelength, and accept the low metal content, single-mode fiber-optic cables for Gigabit-LH described in Table 6.

Table 6. Fiber-Optic Cables

Port Type	Cable Specifications	Connector Type	Maximum Length
Gigabit-SX	62.5/125 μm or 50/125 μm (core/cladding) diameter, graded-index, low metal content, **multimode** fiber-optic cables, complying with the ITU-T G.651 and ISO/IEC 793-2 Type A1b or A1a respectively.	LC	• **62.5 mm cable:** – 160 MHz*km = 220 meters – 200 MHz*km = 275 meters • **50 mm cable:** – 400 MHz*km = 500 meters – 500 MHz*km = 550 meters
Gigabit-LX	9/125 μm (core/cladding) diameter, 1310 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards. OR the **multimode** fiber-optic cables listed for Gigabit-SX.	LC	• **single-mode cable:** 10 kilometers • **multimode cable:** 550 meters
	Note: To use multimode cables for Gigabit-LX, a **mode conditioning patch cord** may be needed — see "Mode Conditioning Patch Cord for Gigabit-LX" on page 32 for more information.		
Gigabit-LH	9/125 μm (core/cladding) diameter, 1550 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	LC	70 kilometers
	Note: Between the transmit and receive ends of the cable, at least 5dB of attenuation is required for a reliable connection. This is equivalent to 20Km of the fiber-optic cable. For distances less than 20Km, you must add attenuators to bring the total attenuation to at least 5dB. Most cable vendors carry attenuators.		

Port Type	Cable Specifications	Connector Type	Maximum Length
10-GbE SR	Multimode fiber-optic cable designed for Gigabit Ethernet: 62.5/125 μm (core/cladding) diameter or 50/125 μm, 850 nm, low metal content, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	SC	■ **62.5 μm cable:** – 160 Mhz/km = 2-26 meters – 200 Mhz/km = 2-33 meters ■ **50 μm cable:** – 400 Mhz/km = 2-66 meters – 500 Mhz/km = 2-82 meters – 2000 Mhz/km = 2-300 meters
10-GbE LRM	Multimode fiber-optic cable designed for Gigabit Ethernet: 62.5/125 μm (core/cladding) diameter or 50/125 μm, 850 nm, low metal content, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	SC	■ **62.5 μm cable:** – 160 Mhz/km = 2-26 meters – 200 Mhz/km = 2-33 meters ■ **50 μm cable:** – 400 Mhz/km = 2-66 meters – 500 Mhz/km = 2-82 meters – 2000 Mhz/km = 2-300 meters
10-GbE LR	9/125 μm (core/cladding) diameter, 1310 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	SC	**single-mode cable:** 2-10 kilometers
10-GbE ER	9/125 μm (core/cladding) diameter, 1550 nm, low metal content, **single mode** fiber-optic cables, complying with the ITU-T G.652 and ISO/IEC 793-2 Type B1 standards.	SC	**single-mode cable:** 2-30 kilometers (40 kilometers on an engineered fiber optic link that meets standards in the specification).
OMC CX4 Fiber	12 fiber 50/125 μm (core/cladding) diameter, multimode Fiber ribbon cable. 12 fiber 62.5/125 μm (core/cladding) diameter, multimode Fiber ribbon cable is also supported.	Optical Media Converter	150 Mhz/km = 1-50 meters 500 Mhz/km = 1-100 meters 2000 Mhz/km = 1-300 meters

CX4 Copper Cables

Cabling that complies with the 802.3ak IEEE standard supports 10 Gigabit Ethernet speeds over CX4, or four twin-axial copper cable pairs.

Port Type	Cable Specifications	Connector Type	Supported Length
CX4	Speed 3.125Gbx4 (Cables compliant with the 802.3ak standard)	CX4	0.5-15 meters

EMC Regulatory Statements

U.S.A.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area may cause interference in which case the user will be required to correct the interference at his own expense.

Canada

This product complies with Class A Canadian EMC requirements.

Australia/New Zealand

This product complies with Australia/New Zealand EMC Class A requirements.

Japan

VCCI Class A

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korea

사용자 안내문 : A 급기기

이기기는 업무용으로 전자파 적합등록을 받은 기기이오니, 판매자 또는 사용자는 이점을 주의하시기 바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에서 비업무용으로 교환하시기 바랍니다.

Taiwan

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

European Community Declaration of Conformity

These products are designed for operation with the ProCurve Switch 8100fl Series. Please see the Declarations of Conformity included in the *ProCurve Switch 8100fl Series: Installation and Getting Started Guide.*

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