Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections

This document describes the processes and procedures for cleaning the fiber optic connectors and component interfaces of the Cisco ONS 15540 ESPx. It is intended for use by service personnel, field service technicians, and hardware installers. It is assumed that the user has knowledge of basic inspection techniques and cleaning processes for fiber optic connectors and component interfaces.

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

Warning **Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

This document includes the following sections:

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Introduction

Cleaning the fiber optic components of the Cisco ONS 15540 ESPx is important for maintaining the system. Any contamination in the fiber connection can cause failure of the component or failure of the entire system.

Microscopic dust particles can cause a variety of problems for optical connectors. A particle that partially or completely blocks the fiber core generates strong back reflections, which can cause instability in the laser system. Dust particles trapped between two fiber faces can scratch the glass surfaces. Even if a particle is only situated on the cladding or the ferrule, it can cause an air gap or misalignment between the fiber cores that can significantly degrade the optical signal.

- A 1-micrometer dust particle on a single-mode core can block up to 1% of the light (a 0.05 dB loss).
- A 9-micrometer speck is too small to see without a microscope, but it could completely block the fiber core.

By comparison, a typical human hair is 50 to 75 micrometers in diameter, as much as 8 times larger. So, even though dust may not be visible, it is still present in the air and can deposit onto the connector.

In addition to dust, other types of contamination must also be cleaned off the fiber. Such materials include:

- Oils (frequently from human hands)
- Film residues (condensed from vapors in the air)
- Powdery coatings (left after water or other solvents evaporate away)

These contaminants can be more difficult to remove than dust particles.

Caution With 1- to 200-mW power in a fiber (0 to 23 dBm) now in use for communications systems, any contaminant can be burned into the fiber end face if it blocks the core while the laser is turned on. This burning may damage the optical surface such that it cannot be cleaned.

When cleaning fiber components, procedures must be followed precisely and carefully with the goal of eliminating any dust or contamination. A clean component connects properly; a dirty component may transfer contamination to the connector, or it may even damage the optical contacts.

Inspecting, cleaning, and re-inspecting are critical steps that must be done before making any fiber connection.

Inspection Equipment

It is important that every fiber connector be inspected with a microscope before a connection is made as many of the contaminants are too small to see with the naked eye. The fiber inspection scopes (not included in the Cisco ONS 15540 ESPx cleaning kit) described in this section are designed to magnify and display the critical portion of the ferrule where the connection is made.

Video and Optical Fiberscopes

Fiberscopes are customized microscopes used to inspect optical fiber components. Figure 1, Figure 2, and Figure 3 show examples of the various fiber scopes available. The scope you chose should provide at least 200x magnification. Specific adapters are needed to properly inspect the ferrule faces of some connector types (such as the MPO, E2000, or MU connectors). In instances where multiple connector types need inspection, it may be more efficient to have a dedicated scope for each type of adapter.

Note To ensure personal eye safety, we strongly recommend that a video fiberscope be used for inspections. Be certain that optical fiberscopes have the appropriate wavelength band filters to protect the user.

Figure 1 Video Fiberscope—Desktop

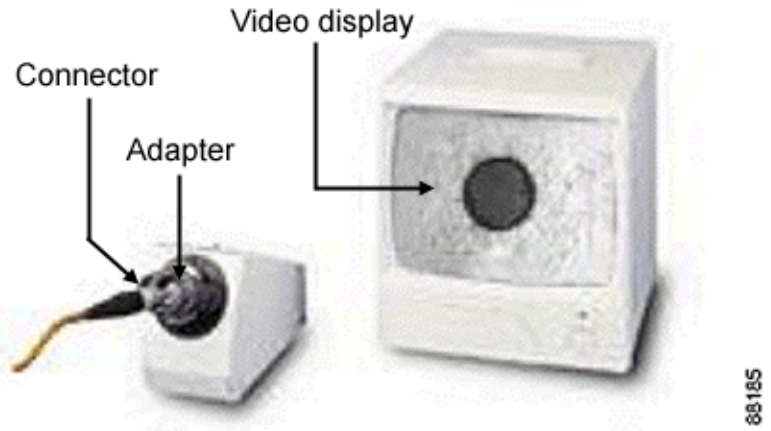


Figure 2 Optical Fiberscopes—Handheld

Bulkhead Fiberscope

The bulkhead fiberscope is a handheld fiberscope used to inspect connectors in bulkhead ports. The scope should provide at least 200x magnification displayed on a video monitor. Specific adapters are needed to properly inspect the ferrule faces of some connector types (such as the MPO, E2000, or MU connectors). See Figure 3.

Figure 3 Bulkhead Fiberscope—Handheld

Laser Safety Glasses

Laser safety glasses can protect a person's eyes from laser light while handling fiber. They are intended to provide a level of protection across specific wavelengths. Be sure that the glasses are matched to the laser's wavelength. Laser safety glasses must meet federal and state regulations.

Cisco ONS 15540 ESPx Cleaning Kits

The Cisco ONS 15540 ESPx cleaning kit is available in two versions. The 2.5-Gbps transponder kit is used in systems with SM (single-mode), MM (multimode), and extended range transponder modules. Table 1 lists the contents of this kit. The 10-GE transponder kit is used in systems with the 10-GE transponder module. Table 2 lists the contents of this kit.

Table 1 2.5-Gbps Transponder Cleaning Kit Contents

Quantity	Part Number	Item Description
20	51-3507-01	Cleaning adapter for MU connector w/cut-out
5	51-3357-01	Cleaning adapter for MPO/MTP connector
1	74-3168-01	Cartridge cleaner (OPTIPOP) one slot
1	74-3167-01	Cartridge cleaner (OPTIPOP) for MPO/MTP w/pins
1	51-3513-01	Package of 50 optical cleaning lint-free swabs (1.25 mm)
1	51-3359-01	Package of 250 optical cleaning lint-free swabs (2.5 mm)
1	800-22001-01	2.5-Gbps transponder cleaning module with dust caps

Table 2 10-GE Transponder Cleaning Kit Contents

Quantity	Part Number	Item Description
20	51-3507-01	Cleaning adapter for MU connector w/cut-out
5	51-3357-01	Cleaning adapter for MPO/MTP connector
1	51-3613-01	Cartridge cleaner (OPTIPOP) one slot
1	51-3612-01	Cartridge cleaner (OPTIPOP) for MPO/MTP w/pins
1	51-3513-01	Package of 50 optical cleaning lint-free swabs (1.25 mm)
1	51-3359-01	Package of 250 optical cleaning lint-free swabs (2.5 mm)
1	800-22481-01	10-Gbps transponder cleaning module with dust caps

Cartridge Cleaners

Cartridge cleaners contain a roll of woven material packaged in a cassette (see Figure 4). When a lever is pressed, a shutter opens to provide access to a fresh span of cleaning material. The following cartridges are included in the cleaning kit:

- Cartridge cleaner (OPTIPOP) MPO/MTP with/pins

  Used to perform dry cleaning of MPO/MTP male connectors. It has two guide slots in the cleaning window. When the lever is pressed a shutter opens to provide a new section of the cleaning material.

- Cartridge cleaner (OPTIPOP) one slot

  Used to perform dry cleaning of 2.5-mm (SC, FC, and so on) and 1.25-mm (MU, LC, and so on) ferrule connectors and female multi-fiber connectors such as MT-RJ. When the lever is pressed, a shutter opens to provide a new section of the cleaning material.

Note The ferrule is the part of the connector that keeps the fiber accurately aligned within the connector.

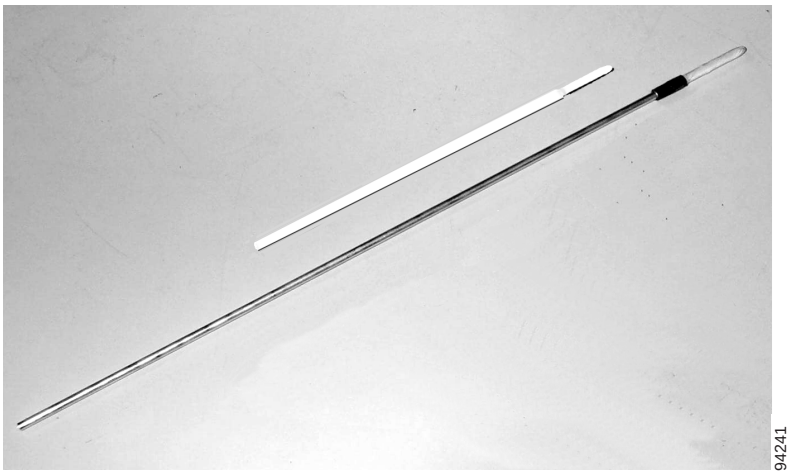
Figure 4 Cartridge Cleaner

Lint-Free Swabs

Swabs have a fabric tip at the end of a long stick. Lint-free swabs should be stored in a clean container to avoid contamination of the tip. Be sure to use a swab sized properly for the ferrule type (1.25 mm or 2.5 mm). See Figure 5.

Caution Never reuse a swab, it could transfer dirt or oils from one connector to another.

Figure 5 1.25-mm and 2.5-mm Lint-Free Swabs



Inspecting the Cisco ONS 15540 ESPx Fiber Optic Connections

Inspecting the fiber optic connectors for dust particles or other contaminants before bringing the card or module online can help to prevent system failures. Always work carefully around lasers and fiber optic connections. Keep the following information in mind.

- Always turn off any laser sources before you inspect fiber connectors or optical components.
- Always inspect the connectors or adapters before you clean.
- Always inspect and clean the connectors before you make a connection.
- Always use the connector housing to plug or unplug a fiber.
- Always keep the protective cap on unplugged fiber connectors.
- Always store unused protective caps in a resealable box and locate them near the connectors for easy access.
- Always discard used lint-free swabs properly.
- Always wear appropriate safety glasses when required in your production area.
- Never look into a fiber while the system lasers are on.
- Never use unfiltered handheld magnifiers or focusing optics to inspect fiber connectors.
- Never connect a fiber to a fiberscope while the system lasers are on.
- Never touch the end face of the fiber connectors.

- Never twist or pull forcefully on the fiber cable.
- Never reuse any lint-free swab or OPTIPOP cartridge cleaner reel.
- Never touch the clean area of a lint-free swab or OPTIPOP cartridge cleaner.

Warning **Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard.**

Cleaning Fiber Optic Connectors of the Cisco ONS 15540 ESPx

The Cisco ONS 15540 ESPx cleaning kits provide the necessary tools and accessories to clean the various fiber optic connectors used on the system. This section describes the use of the cleaning kit with the various cards and modules installed in the Cisco ONS ESPx, and it includes the following topics:

We recommend inspecting the optical connectors both before and after cleaning.

Mux/Demux Modules

To clean the optical connections of the mux/demux modules, follow these steps:

Caution Be certain the modules are not cabled before cleaning.

Step 1 Remove the fiber optic cables (or the end cap) from the desired port.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 7.

Step 3 Insert the appropriate connector cleaning adapter (see Figure 6 and Figure 7) into the vacated port. The adapter protects the lint-free swab from becoming contaminated as you push the swab towards the fiber end.

Figure 6 Cleaning Adapter for MPO/MTP Connectors

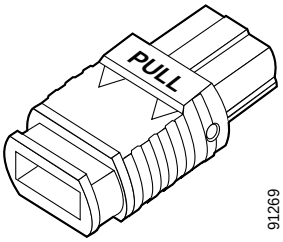
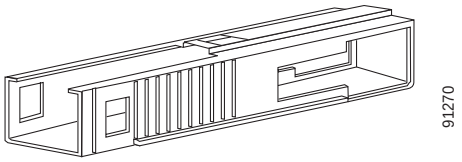


Figure 7 Cleaning Adapter for MU Connectors



Step 4 Insert a 1.25-mm lint-free swab into the MU connector adapter until contact is made with the optical connector and give the swab a few turns and remove it from the cleaning adapter. Or, insert a 2.5-mm lint-free swab into the MPO/MTP connector adapter until contact is made with the optical connector and swipe the swab across the surface of the ferrule several times and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 5 Re-inspect the optical connector. If the connector is still dirty, return to Step 4.

Step 6 Remove the connector cleaning adapter from the module and cover the port with a protective cap until ready to install the fiber optic cable.

Step 7 Proceed to the "Cleaning the Fiber Optic Cables" section on page 19.

Protection Switch Modules

To clean the optical connections of the PSMs (protection switch modules), follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables (or the end cap) from the desired port.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 7.

Step 3 Insert an MU cleaning adapter (see Figure 7) into the vacated port. The adapter protects the lint-free swab from becoming contaminated as you push the swab towards the fiber end.

Step 4 Insert a 1.25-mm lint-free swab into the connector adapter until contact is made with the optical connector. Give the swab a few turns and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 5 Re-inspect the bulkhead optical connector. If the connector is still dirty, return to Step 4.

Step 6 Remove the connector cleaning adapter from the module and cover the port with a protective cap until ready to install the fiber optic cable.

Step 7 Proceed to the "Cleaning the Fiber Optic Cables" section on page 19.

Transponder Modules

This section describes the procedures for cleaning the fiber optic connections of the transponder modules and includes these topics:

2.5-Gbps Transponder Modules

Cleaning the 2.5-Gbps transponder module optical connections includes the optical connectors on the backplane, the optical connectors on the transponder module (front and back), and the fiber optic cable connectors. The following sections describe this process:

Cleaning the 2.5-Gbps Line Card Backplane Connectors

To clean the 2.5-Gbps line card backplane connectors, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables from the desired transponder module and cover the connectors with a protective cap.

Step 2 Remove the transponder module by gently pulling it out of the slot in the motherboard and place it in a clean container.

Step 3 Inspect the backplane optical connector on the line card motherboard. If the connector is clean, proceed to Step 9.

Step 4 Insert the 2.5-Gbps transponder cleaning module (see Figure 8) carefully into the motherboard slot while guiding the upper and lower edges of the module in the tracks until it clicks into place. See Figure 9.

Figure 8 2.5-Gbps Transponder Cleaning Module

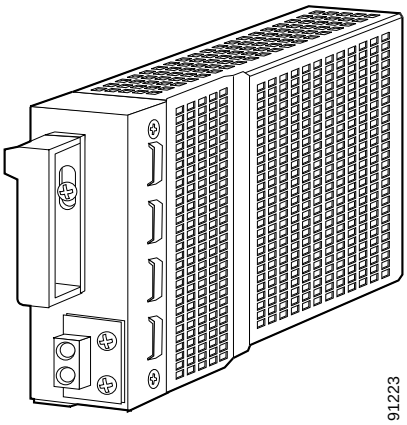
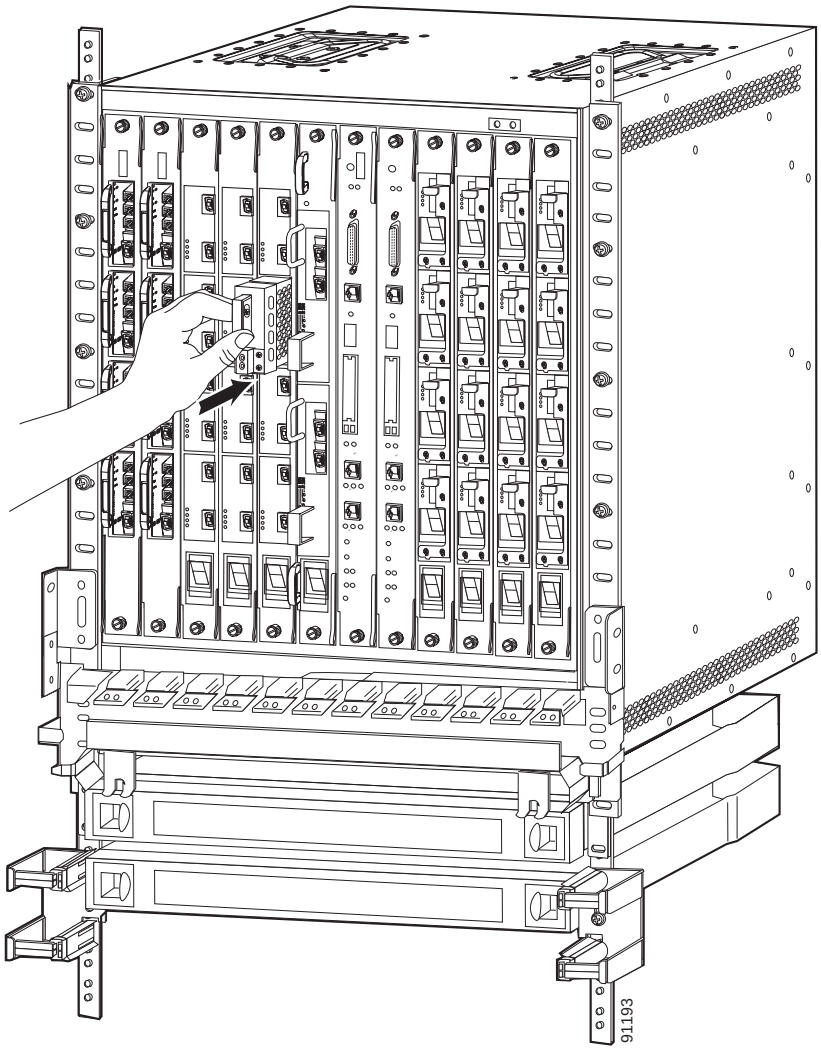
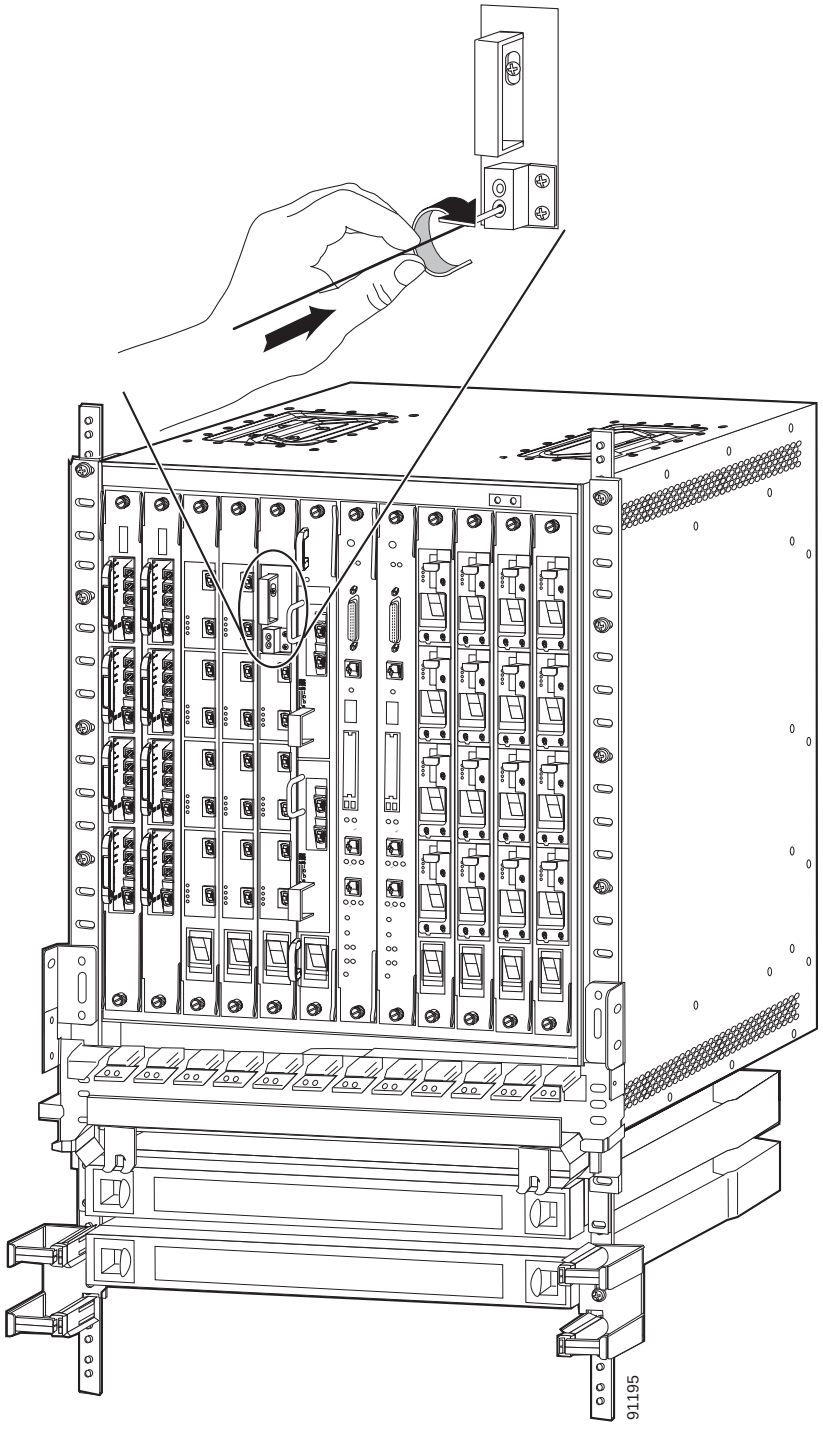


Figure 9 Installing the 2.5-Gbps Transponder Cleaning Module



Step 5 Remove the protective cap from the 2.5-Gbps transponder cleaning module and carefully insert one of the 2.5-mm lint-free swabs into the first opening at the bottom of the 2.5-Gbps transponder cleaning module until contact is made, and then give the swab a few turns. See Figure 10. Carefully remove the swab and discard it.

Figure 10 Cleaning the Backplane Connections of the 2.5-Gbps Line Card Motherboard



Step 6 Repeat Step 5 for the other opening at the bottom of the 2.5-Gbps transponder cleaning module.

Step 7 Replace the protective cap and remove the 2.5-Gbps transponder cleaning module. Store the module in a clean container.

Step 8 Re-inspect the backplane optical connector on the line card motherboard. If the connector is still dirty, return to Step 4.

Step 9 Carefully pick up the 2.5-Gbps transponder module and inspect the connector on the rear of the module. If the connector is clean, proceed to Step 12.

Step 10 Use one 1.25-mm lint-free swab to clean each optical connector on the rear of the module. Give the swab a few turns and remove it from the port. Discard the used lint-free swabs.

Note Never reuse a lint-free swab.

Step 11 Re-inspect the connectors on the rear of the 2.5-Gbps transponder module. If they are still dirty, return to Step 10.

Step 12 Carefully re-insert the 2.5-Gbps transponder module into its slot.

Step 13 Proceed to the "Cleaning the 2.5-Gbps Line Card Motherboard Faceplate Connectors" section on page 13.

Cleaning the 2.5-Gbps Transponder Module Faceplate Connectors

To clean the fiber optic connectors on the front of the 2.5-Gbps transponder module, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables (or the end cap) from the desired 2.5-Gbps transponder module.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 6.

Caution Some pluggable transceivers do not have cleanable optical surfaces. Do not attempt to clean these transceivers.

Step 3 Use a 1.25-mm or 2.5-mm lint-free swab to clean the optical connector. Give the swab a few turns and remove it from the port. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 4 Re-inspect the optical connector. If the connector is still dirty, return to Step 3.

Step 5 Cover the port with a protective cap until ready to install the fiber optic cable.

Step 6 Proceed to the "Cleaning the 2.5-Gbps Line Card Motherboard Faceplate Connectors" section on page 13.

Cleaning the 2.5-Gbps Line Card Motherboard Faceplate Connectors

To clean the MPO/MTP ports on the bottom front of the 2.5-Gbps line card motherboard, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables (or the protective cap) from the desired MPO/MTP port.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 6.

Step 3 Insert an MPO/MTP cleaning adapter (see Figure 6) into the vacated MPO/MTP port. The adapter protects the lint-free swab from becoming contaminated as you push the swab towards the fiber end.

Step 4 Insert a 2.5-mm lint-free swab into the cleaning adapter until contact is made with the optical connector. Swipe the swab across the fiber ends a few times and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 5 Re-inspect the optical connector. If the connector is still dirty, return to Step 4.

Step 6 Remove the connector cleaning adapter from the MPO/MTP port and cover the port with a protective cap until ready to install the fiber optic cable.

Step 7 Proceed to the "Cleaning the Fiber Optic Cables" section on page 19.

10-GE Transponder Modules

Cleaning the10-GE transponder module optical connections includes the optical connectors on the backplane, the optical connectors on the transponder module (front and back), and the fiber optic cable connectors. The following sections describe this process:

Cleaning the 10-GE Line Card Backplane Connectors

To clean the 10-GE line card backplane connections, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables from the desired transponder module and cover the connectors with a protective cap.

Step 2 Remove the transponder module by gently pulling it out of the slot in the motherboard and place it in a clean container.

Step 3 Inspect the backplane optical connector on the line card motherboard. If the connector is clean, proceed to Step 9.

Step 4 Carefully insert the 10-GE transponder cleaning module (see Figure 11) into the motherboard slot while guiding the upper and lower edges of the module in the tracks until it clicks into place. See Figure 12.

Figure 11 10-GE Transponder Cleaning Module

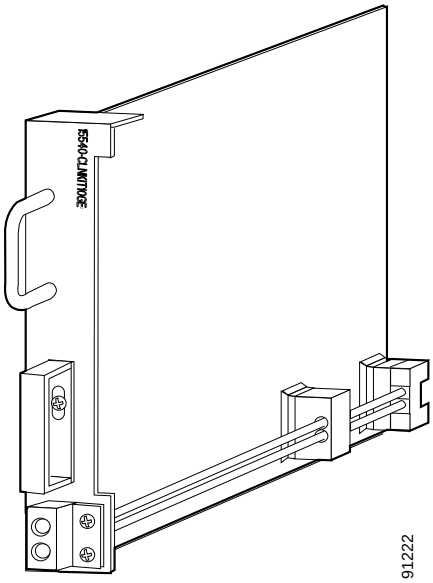
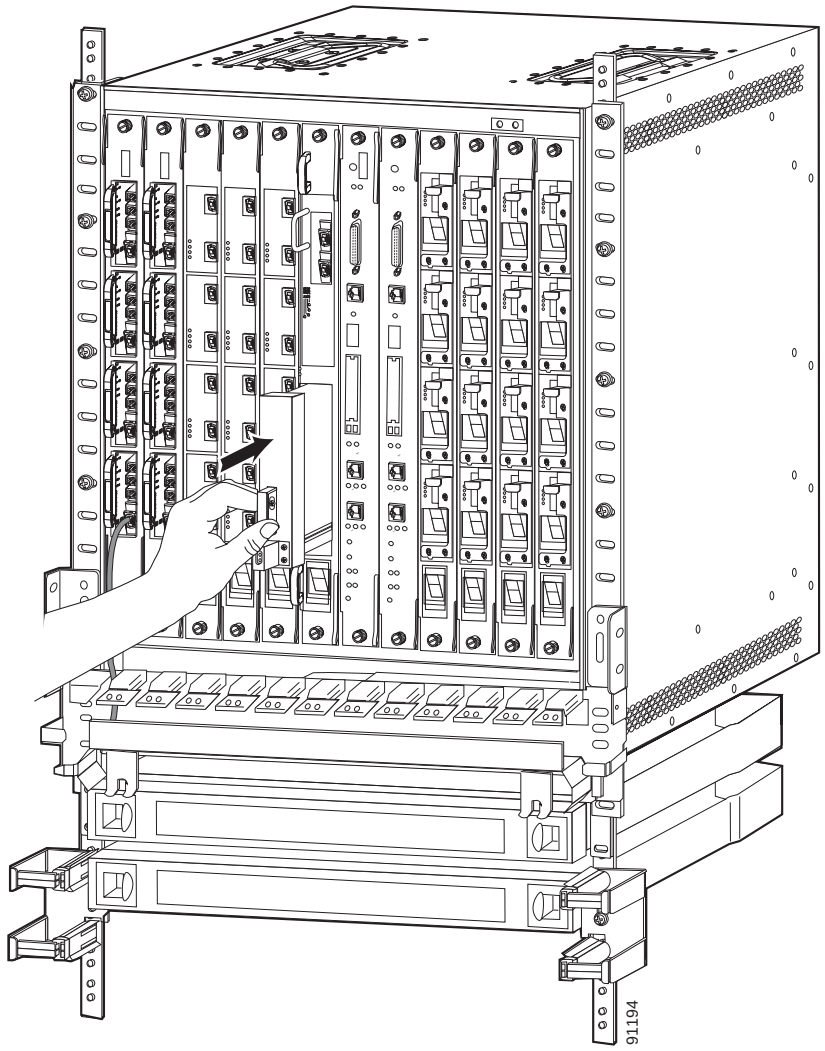


Figure 12 Installing the 10-GE Transponder Cleaning Module



Step 5 Remove the protective cap from the 10-GE transponder cleaning module and carefully insert one of the 2.5-mm lint-free swabs into the first opening at the bottom of the 10-GE transponder cleaning module until contact is made, and then give the swab a few turns. See Figure 13. Carefully remove the swab and discard it.

Step 6 Repeat Step 5 for the other opening at the bottom of the 10-GE transponder cleaning module.

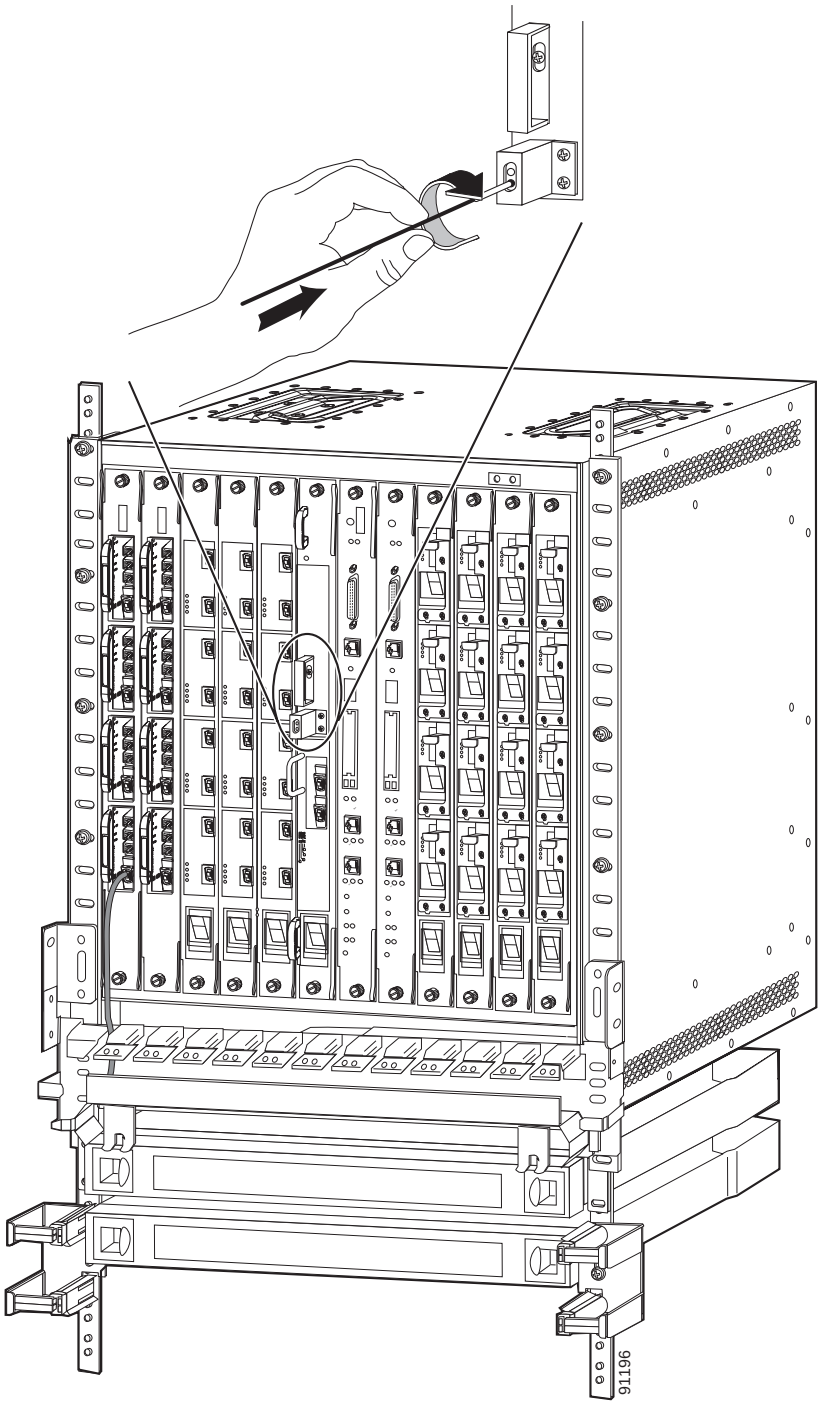
Step 7 Replace the protective cap and remove the10-GE transponder cleaning module. Store the module in a clean container.

Step 8 Re-inspect the backplane optical connector on the line card motherboard. If the connector is still dirty, return to Step 4.

Step 9 Carefully pick up the 10-Gbps transponder module and inspect the connectors on the rear of the module. If the connectors are clean, proceed to Step 12.

Step 10 Use one 1.25-mm lint-free swab to clean each optical connector on the rear of the module. A few turns of the swab is sufficient to clean the connector. Discard the used swabs.

Figure 13 Cleaning the Backplane Connections of the 10-GE Line Card Motherboard



Note Never reuse a lint-free swab.

Step 11 Re-inspect the optical connectors on the rear of the 10-Gbps transponder module. If the connectors are still dirty, return to Step 10.

Step 12 Carefully re-insert the 10-GE transponder module into its slot.

Step 13 Proceed to the "Cleaning the 10-GE Transponder Module Faceplate Connectors" section on page 18.

Cleaning the 10-GE Transponder Module Faceplate Connectors

To clean the SC connectors on the front of the 10-GE transponder module, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables (or the protective cap) from the desired transponder module.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 6.

Step 3 Insert a 2.5-mm lint-free swab to the cleaning adapter until contact is made with the optical connector. Give the swab a few turns and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 4 Re-inspect the optical connector. If the connector is still dirty, return to Step 3.

Step 5 Remove the connector cleaning adapter from the 10-GE transponder module and cover the port with a protective cap until ready to install the fiber optic cable.

Step 6 Proceed to the "Cleaning the 10-GE Line Card Motherboard Faceplate Connectors" section on page 18.

Cleaning the 10-GE Line Card Motherboard Faceplate Connectors

To clean the MPO/MTP ports on the bottom front of the10-GE line card motherboard, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Remove the fiber optic cables (or the protective cap) from the desired MPO/MTP port.

Step 2 Inspect the optical connector. If the connector is clean, proceed to Step 6.

Step 3 Insert an MPO/MTP cleaning adapter (see Figure 6) into the vacated MPO/MTP port. The adapter protects the lint-free swab from becoming contaminated as you push the swab towards the fiber end.

Step 4 Insert a 2.5-mm lint-free swab into the cleaning adapter until contact is made with the optical connector. Swipe the swab across the fiber ends a few times and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 5 Re-inspect the optical connector. if the connector is still dirty, return to Step 4.

Step 6 Remove the connector cleaning adapter from the MPO/MTP port and cover the port with a protective cap until ready to install the fiber optic cable.

Step 7 Proceed to the "Cleaning the Fiber Optic Cables" section on page 19.

Cleaning the Fiber Optic Cables

To clean the fiber optic cables, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Disconnect the cables from the transponder and the cross connect panel or other equipment. The cables should be free at both ends.

Step 2 Inspect the optical connectors. If the connectors are clean, proceed to Step 11.

Step 3 Remove the connector protective cap and store it in a resealable box, if necessary.

Step 4 Select the appropriate OPTIPOP cartridge cleaner to use on the cable. Two OPTIPOP cartridge cleaners are provided in the cleaning kit. One is for MPO/MTP connectors with pins and is shaped to allow the cleaning fabric to make contact between the pins; the other is for SC, LC, MU and female ribbon connectors such as MT-RJ and has a flat surface.

Step 5 Press on the lever to open the OPTIPOP cartridge cleaner. The shutter slides back and exposes a new cleaning area. See Figure 14. If you are cleaning an MPO/MTP connector with pins, proceed to Step 6. If you are cleaning an SC, LC, MU, or female ribbon connector such as MT-RJ, proceed to Step 7.

Figure 14 Using the OPTIPOP Cleaner

Step 6 Hold the fiber tip lightly against the cleaning area, making sure the cleaning fabric is making contact with the flat area between the pins. Then pull the tip across the cleaning fabric. Proceed to Step 8.

Step 7 Hold the fiber tip lightly against the cleaning, give the tip a half turn (the MT-RJ connector does not need to be turned) and pull it across the cleaning fabric.

Caution Do not scrub the fiber against the fabric; doing so creates particles.

Step 8 Release the lever to close the cleaning window.

Note Never reuse the same area of cartridge cleaner fabric.

Step 9 Repeat Step 4 through Step 8 for each optical connector.

Step 10 Re-inspect the optical connectors. If the connectors are still dirty, return to Step 4.

Step 11 Reconnect the optical cables.

Breakout Cable and Cross Connect Drawer Connectors

The cable connectors in the cross connect drawer and the breakout cable connectors are MU.

Cleaning the Breakout Cable Connectors

To clean the breakout cable connectors, follow these steps:

Caution Be certain that lasers are turned off before cleaning.

Step 1 Disconnect the breakout cable.

Step 2 Inspect the optical cable connectors. If the connectors are clean, proceed to Step 2.

Step 3 Select the OPTIPOP cartridge cleaner for MU connectors.

Step 4 Press down on the lever to open the OPTIPOP cartridge cleaner. The shutter slides back and exposes a new cleaning area. See Figure 14.

Step 5 Hold the fiber tip lightly against the cleaning area. Then give the tip a few turns and pull it across the cleaning fabric.

Step 6 Release the lever to close the cleaning window.

Step 7 Re-inspect the optical cable connectors. If the connectors are still dirty, return to Step 3.

Step 8 Proceed to "Cleaning the Cross Connect Drawer Connectors" section on page 22.

Cleaning the Cross Connect Drawer Connectors

To clean the cross connect drawer connectors, follow these steps:

Step 1 Inspect the cross connect drawer connector. If the connector is clean, proceed to Step 6.

Step 2 Insert an MU cleaning adapter (see Figure 7) into the open cross connect drawer connector.

Step 3 Insert a 1.25-mm lint-free swab into the connector adapter until contact is made with the optical connector. Give the swab a few turns and remove it from the cleaning adapter. Discard the lint-free swab.

Note Never reuse a lint-free swab.

Step 4 Remove the MU cleaning adapter from the cross connect drawer connector.

Step 5 Re-inspect the optical connector. If the connector is still dirty, return to Step 2

Step 6 Reconnect the optical cables.

Step 7 Repeat Step 1 through Step 7 for each optical connector.

Related Documentation

Refer to the following documents for more information about the Cisco ONS 15540 ESPx:

- *Regulatory Compliance and Safety Information for the Cisco ONS 15500 Series*
- *Cisco ONS 15540 ESPx Planning Guide*
- *Cisco ONS 15540 ESPx Hardware Installation Guide*
- *Cisco ONS 15540 ESPx Optical Transport Turn-Up and Test Guide*
- *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections*
- *Cisco ONS 15540 ESPx Configuration Guide*
- *Cisco ONS 15540 ESPx Command Reference*
- *Cisco ONS 15540 ESPx System Alarms and Error Messages*
- *Cisco ONS 15540 ESPx Troubleshooting Guide*
- *Network Management for the Cisco ONS 15540 ESPx*
- *Cisco ONS 15540 ESPx TL1 Commands*
- *MIB Quick Reference for the Cisco ONS 15500 Series*
- *Cisco ONS 15540 ESPx Software Upgrade Guide*

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

International Cisco websites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

  http://www.cisco.com/en/US/partner/ordering/index.shtml

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit e-mail comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, the Cisco Technical Assistance Center (TAC) provides 24-hour-a-day, award-winning technical support services, online and over the phone. Cisco.com features the Cisco TAC website as an online starting point for technical assistance. If you do not hold a valid Cisco service contract, please contact your reseller.

Cisco TAC Website

The Cisco TAC website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The Cisco TAC website is available 24 hours a day, 365 days a year. The Cisco TAC website is located at this URL:

http://www.cisco.com/tac

Accessing all the tools on the Cisco TAC website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a login ID or password, register at this URL:

http://tools.cisco.com/RPF/register/register.do

Opening a TAC Case

Using the online TAC Case Open Tool is the fastest way to open P3 and P4 cases. (P3 and P4 cases are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Case Open Tool automatically recommends resources for an immediate solution. If your issue is not resolved using the recommended resources, your case will be assigned to a Cisco TAC engineer. The online TAC Case Open Tool is located at this URL:

http://www.cisco.com/tac/caseopen

For P1 or P2 cases (P1 and P2 cases are those in which your production network is down or severely degraded) or if you do not have Internet access, contact Cisco TAC by telephone. Cisco TAC engineers are assigned immediately to P1 and P2 cases to help keep your business operations running smoothly.

To open a case by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete listing of Cisco TAC contacts, go to this URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

TAC Case Priority Definitions

To ensure that all cases are reported in a standard format, Cisco has established case priority definitions.

Priority 1 (P1)—Your network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Priority 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Priority 3 (P3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Priority 4 (P4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Go to this URL to visit the company store:

  http://www.cisco.com/go/marketplace/

- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

  http://www.cisco.com/en/US/learning/index.html

This document is to be used in conjunction with the documents listed in the "Related Documentation" section.

Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections