C H A P T E R **5**

Troubleshooting 2.5-Gbps Transponder Module Problems

This chapter describes how to troubleshoot 2.5-Gbps transponder module problems. This document contains the following sections:

5.1 Overview

The 2.5-Gbps transponder module on the Cisco ONS 15540 ESPx converts the client signal to an ITU-compliant wavelength, which is cross-connected over the optical backplane to the mux/demux modules. A single system can hold up to eight 2.5-Gbps line card motherboards, each of which accepts four 2.5-Gbps transponder modules.

There are two types of 2.5-Gbps line card motherboards, splitter and nonsplitter.

The 2.5-Gbps line card motherboards support three types of transponder modules: SM (single-mode), MM (multimode), and Type 2 extended range with SFP optics.

The client interfaces on the SM transponder modules and MM transponder modules are protocol transparent and bit-rate transparent, and accept either single-mode or multimode client signals on the 1310-nm wavelength through SC connectors. The multimode transponder module supports 62.5 mMM, 50 mMM, and 9 or 10 m SM fiber; the single-mode transponder module supports 50 m MM fiber and 9 or 10 m SM fiber.

The Type 2 extended range transponder module accepts two types of SFP optics:

- Fixed rate
- Variable rate

Fixed rate SFP optics modules support specific protocols. Variable rate SPF optics modules support a range of clock rates. For detailed information about interface configuration, refer to the *Cisco ONS 15540 ESPx Configuration Guide*. For information on transceiver specifications, refer to the *Cisco ONS 15540 ESPx Hardware Installation Guide*.

5.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Ensure encapsulation is set correctly.

- Enable monitoring if needed or supported.

- Ensure transparent, wave, and wavepatch interfaces are administratively up.

- Check that the receive signal power level on the trunk side is between –28 dBm and –8 dBm.

- Check that the receive signal power level on the client side is between –19 dBm and 1.5 dBm for the SM transponder module, –25 dBm and –8 dBm for the MM transponder module, and –28 dBm and –8 dBm for Type 2 extended range transponder module.

- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

- Ensure that the MTP connectors are firmly connected to the mux/demux module and to the line card motherboard.

- If you are using the cross connect drawer, ensure that the MU connectors are firmly connected.

- Issue **show interfaces** commands to ensure that the transparent, wave, and wavepatch interfaces are administratively up, that there are no errors on the interfaces, and that the ITU laser is powered up.

- Issue the **show connect** command to verify the status of the cross connections to the aggregation cards.

- Check that the LEDs on the cards show the proper state.

- Issue the **show facility-alarm status** command to display the alarms on the interfaces.

- Check that the transponder modules are patched to the correct mux/demux module ports. Issue the **show patch** command to verify that there are no frequency mismatches.

5.3 Cabling the 2.5-Gbps Transponder Module

Correctly connecting the 2.5-Gbps transponder module is very important to avoid problems. You can connect the 2.5-Gbps transponder module to a mux/demux module either directly using an MTP-to-MTP cable or through the cross connect drawer using MTP-to-8-MU cables.

5.3.1 Direct Cabling Using MTP-to-MTP Cables

The MTP-to-MTP cable for the 2.5-Gbps line card motherboard is the 15500-CAB-MTP-01 (blue) cable. Use it to directly connect the 2.5-Gbps transponder modules to the mux/demux module. See Figure 5-1.

Figure 5-1   MTP-to-MTP Cabling Example
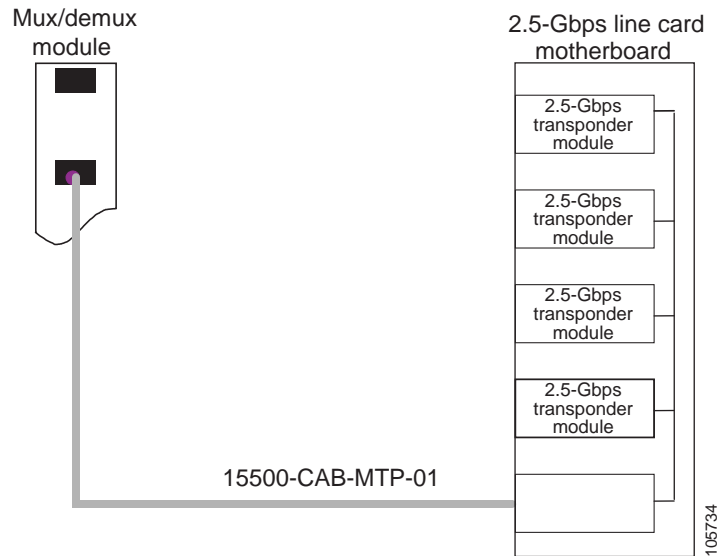
5.3.2 Cross Connect Drawer Cabling Using MTP-to-8-MU Cables

The MTP-to-8-MU cables for the 2.5-Gbps line card motherboard are the 15500-CAB-MTPMU-M (grey) and the 15500-CAB-MTPMU-L (green) cables. Figure 5-2 shows an example of how to connect the 2.5-Gbps line card motherboard to the cross connect drawer.

Figure 5-2   Cross Connect Drawer Cabling Using MTP-to-8-MU Cables
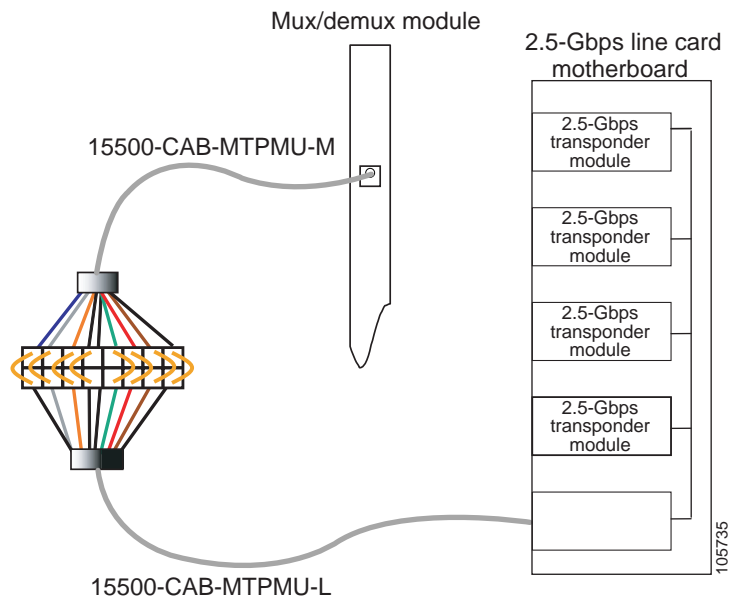
5.4 Troubleshooting 2.5-Gbps Transponder Module Interface Problems

This section contains troubleshooting procedures for 2.5-Gbps transponder module interface problems.

5.4.1 Transponder Module Not in show hardware Command Output

Symptom Transponder module is not listed in the **show hardware** command output.

Table 5-1 describes the potential causes of the symptom and the solutions.

Table 5-1   Transponder Module Not in show hardware Command Output

Possible Problem	Solution
Transponder module is not seated properly.	Reseat the transponder module. Issue the **show hardware detail** command to verify the SFP is recognized and the correct type.
Incompatible software.	Verify the software supports the hardware being used.
Bad transponder module.	Replace the transponder module.

5.4.2 Wave Interface Is Down and Shows Loss of Light

Symptom The wave interface is down and shows Loss of Light.

Table 5-2 describes the potential causes of the symptom and the solutions.

Table 5-2   Wave Interface Is Down and Shows Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces wave** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output. Verify that the cable connections are correct.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Incoming power level is low.	Inspect the receive cable and clean if necessary. Remove unnecessary attenuation between the two nodes.

5.4.3 Transparent Interface Is Down and Shows Loss of Light

Symptom The transparent interface is down and shows Loss of Light.

Table 5-3 describes the potential causes of the symptom and the solutions.

Table 5-3   Transparent Interface Down and Shows Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces transparent** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output. Verify that the correct cable type (SM/MM) is being used.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.4 Active Wavepatch Interfaces Down Due to Loss of Light

Symptom The active wavepatch interfaces are down due to Loss of Light.

Table 5-4 describes the potential causes of the symptom and the solutions.

Table 5-4   Wavepatch Interfaces Down Due to Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces wave** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Incoming power level is low.	Use a power meter to check the power level from the client to the transponder module.

5.4.5 Wave Interface Shows Loss of Lock

Symptom The wave interface shows Loss of Lock.

Table 5-5 describes the potential causes of the symptom and the solutions.

Table 5-5   Wave Interface Shows Loss of Lock

Possible Problem	Solution
Incorrect encapsulation or clock rate.	Issue the **show interfaces wave** command to verify that the correct encapsulation and clock rate are configured and monitoring is enabled if needed.
Remote client reporting errors.	Issue the **show interfaces transparent** command on the remote system to verify that the remote client interface is not reporting errors.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.6 Transparent Interface Shows Loss of Lock

Symptom The transparent interface shows Loss of Lock.

Table 5-6 describes the potential causes of the symptom and the solutions.

Table 5-6   Wave Interface Shows Loss of Lock

Possible Problem	Solution
Incorrect encapsulation or clock rate.	Issue the **show interfaces transparent** command to verify that the correct encapsulation and clock rate are configured and monitoring is enabled if needed.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.7 Interface Shows Loss of Sync

Symptom The wave or transparent interface shows Loss of Sync.

Table 5-7 describes the potential causes of the symptom and the solutions.

Table 5-7   Interface Shows Loss of Sync

Possible Problem	Solution
Remote client reporting errors.	Issue the **show interfaces transparent** command on the remote system to verify that the remote client interface is not reporting errors.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.8 Interface Shows Loss of Frame

Symptom The wave or transparent interface shows Loss of Frame (applies to SONET/SDH encapsulations only).

Table 5-8 describes the potential causes of the symptom and the solutions.

Table 5-8   Interface Shows Loss of Frame

Possible Problem	Solution
Incorrect encapsulation.	Issue the **show interfaces** command to verify that the correct encapsulation is configured and monitoring is enabled if needed.
Excessive attenuation.	Use a power meter to ensure that the receive power level is within specifications for that interface. Reduce the attenuation as needed.

Table 5-8   Interface Shows Loss of Frame

Possible Problem	Solution
Overload (high receive power).	Use a power meter to ensure that the receive power level is within specifications for that interface. Attenuate the receive path as needed.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.9 Active Wavepatch Interfaces Down Due to Low Alarm

Symptom The active wavepatch interfaces are down due to low alarm.

Table 5-9 describes the potential causes of the symptom and the solutions.

Table 5-9   Active and Standby Wavepatch Interfaces Down Due to Low Alarm

Possible Problem	Solution
Excessive attenuation.	Use a power meter to ensure that the receive power level is within specifications for that interface.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Optical threshold is exceeded.	Issue the **show interfaces wavepatch** command to verify that the receive power is within the threshold range.

5.4.10 Unable to Configure Protocol Encapsulation or Clock Rate

Symptom The CLI (command-line interface) rejects the protocol encapsulation or clock rate for the transparent interface.

Table 5-10 describes the potential cause of the symptom and the solution.

Table 5-10   Protocol Encapsulation or Clock Rate Not Configurable for the Wave Interface

Possible Problem	Solution
Incorrect transponder module.	Verify that you have the correct type of transponder module, either SM or MM. If not, replace it with the correct transponder module.
Incorrect SFP.	Verify that the correct SFP is installed in the transponder module.

5.5 Troubleshooting 2.5-Gbps Transponder Module Problems Using Loopbacks

This section describes how to perform fault isolation on 2.5-Gbps transponder modules using the following types of loopbacks:

- Physical fiber loopbacks

• Client signal software loopbacks

• Trunk software loopbacks

5.5.1 Physical Fiber Loopbacks

You can use physical fiber loopbacks at various places to check the connectivity and isolate a bad or dirty fiber. Using an SC-to-MU cable with a 15 dB attenuator, you can set up a loopback in the cross connect drawer for the MU pair of the channel being verified. This ensures that the connectivity between the 2.5-Gbps transponder module through the 2.5-Gbps line card motherboard onto the MTP-to-8-MU fiber is good (see Loopback 1 in the example in Figure 5-3). You can also loop back the multiplexed trunk fiber coming out of the trunk port in/out interfaces of the mux/demux module. This loopback verifies the connectivity from the 2.5-Gbps transponder module through the cross connect drawer and the mux/demux module (see Loopback 2 in the example in Figure 5-3).
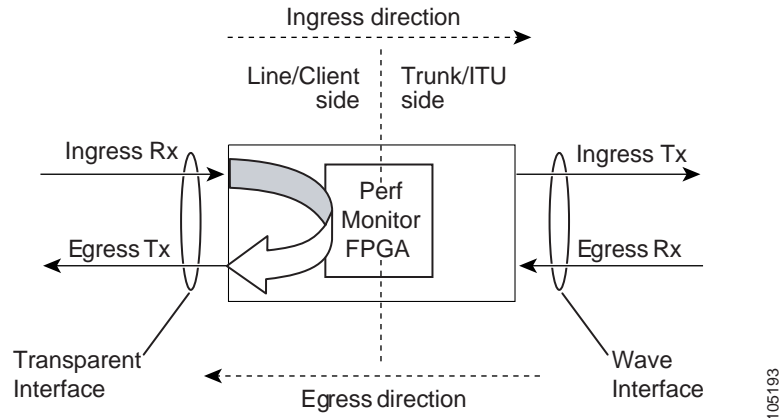
Figure 5-3   *Physical Fiber Loopback Examples*
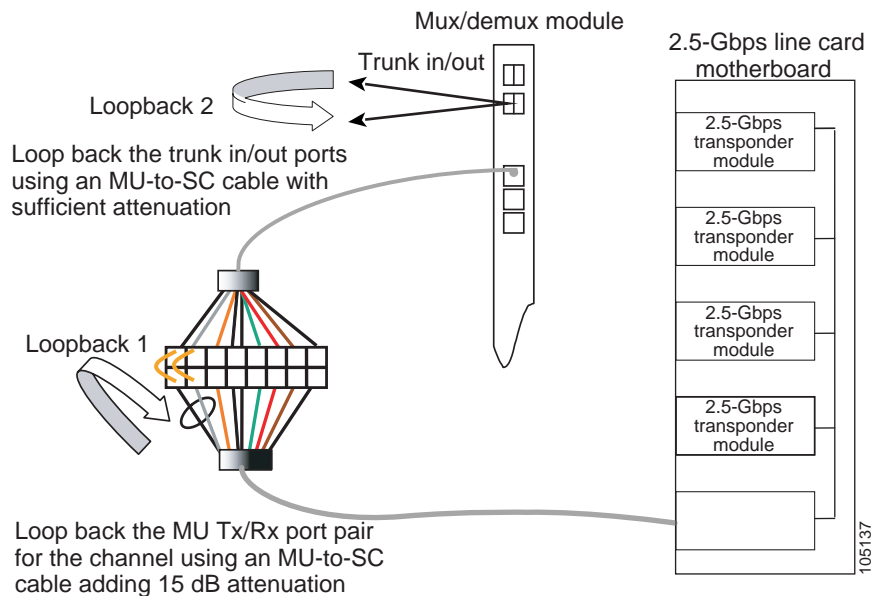
5.5.2 Client Signal Software Loopbacks

A client signal software loopback verifies the functioning between the client equipment and the 2.5-Gbps transponder module (see Figure 5-4).

Figure 5-4   Client Signal Loopback Example on a 2.5-Gbps Transponder Module
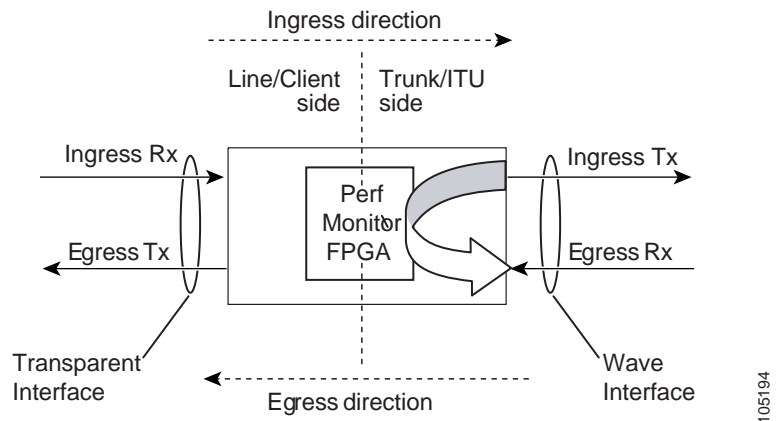

Procedure: Create a Client Signal Software Loopback

Step 1   Issue a **loopback** command on the transparent interface.

Step 2   Check that the signal reaches the local client equipment.

Step 3   If the signal does not reach the local client equipment, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.

5.5.3 Trunk Software Loopbacks

A trunk software loopback verifies the functioning of the 2.5-Gbps transponder module on the trunk side (see Figure 5-5). With this feature, you can verify the communication between two 2.5-Gbps transponder modules.

Figure 5-5   Trunk Side Loopback Example on a 2.5-Gbps Transponder Module

Procedure: Create a Trunk Software Loopback

Step 1   Issue a **loopback** command on the wave interface.

Step 2   Check that the signal reaches the system at the far end.

Step 3   If the signal does not reach the far end, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.