Basic Node Verification Procedures

This chapter describes the procedures for basic node verification.

Before performing the procedures in this chapter, you must install the chassis, power it up, and complete the hardware installation described in Chapter 2, "Hardware Installation Procedures," and complete the software setup and verification tasks described in Chapter 3, "Software Setup Procedures."

Note This chapter contains preliminary procedures for node installation and setup verification and does not cover the final turn-up procedures for an entire network.

Before You Begin

This section lists the chapter non-trouble procedures (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

Step 1 NTP-15 Verify the Interface Status, page 4-2—Complete this procedure to verify the status and configuration of the interfaces in the system.

Step 2 NTP-16 Verify the Optical Patch Configuration, page 4-11—Complete this procedure to verify the configuration of the patch connections in the system.

Step 3 NTP-17 Verify the Cross Connect Status, page 4-11—Complete this procedure to verify the status of the cross connects in the system.

Step 4 NTP-18 Verify the ITU Laser Frequency, page 4-12—Complete this procedure to verify the ITU laser frequency transmitted on cards with tunable lasers.

Step 5 NTP-19 Verify the Optical Power and Frequency, page 4-15—Complete this procedure to verify the optical power frequency.

Step 6 NTP-20 Verify the Optical Transmission Quality, page 4-23—Complete this procedure to verify the signal quality between nodes.

Step 7 NTP-21 Verify the Alarm Status, page 4-27—Complete this procedure to check the function of the alarm messages on the system.

Step 8 NTP-22 Verify the Status of Redundant Processor Cards, page 4-28—Complete this procedure to verify the redundancy of the processor cards, if a redundant switch module is present on the system.

You need the following test equipment:

- Handheld OPM (optical power meter)
- OSA (optical spectrum analyzer)
- Fiber cleaning kit
- Attenuators
- MU-SC connector (per DWDM interface)
- Traffic generator for BER (bit error rate) testing (for 2.5-Gbps traffic)
- Native 10-GE traffic generator and traffic analyzer set (for 10-GE traffic)

NTP-15 Verify the Interface Status

Purpose	This procedure describes how to verify the interface status.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Complete the "DLP-55 Verify the Transparent Interface Status" task on page 4-3.

Step 2 Complete the "DLP-56 Verify the 2.5-Gbps Transponder Module Wave Interface Status" task on page 4-3.

Step 3 As needed, complete the "DLP-57 Verify the OSC Wave Interface Status" task on page 4-4.

Step 4 As needed, complete the "DLP-58 Verify the 2.5-Gbps Transponder Module Wavepatch Interface Status" task on page 4-5.

Step 5 As needed, complete the "DLP-59 Verify the Tengigethernetphy Interface Status" task on page 4-6.

Step 6 As needed, complete the "DLP-60 Verify the Waveethernetphy Interface Status" task on page 4-7.

Step 7 As needed, complete the "DLP-61 Verify the 10-GE Transponder Module Wavepatch Interface Status" task on page 4-7.

Step 8 As needed, complete the "DLP-92 Verify the Ethernetdcc Interface Status" task on page 4-8.

Step 9 As needed, complete the "DLP-62 Verify the Wdmsplit Interface Status" task on page 4-9.

Step 10 Complete the "DLP-63 Verify the Fastethernet 0 Interface Status" task on page 4-10.

Note For more information on interfaces and interface configuration, refer to the *Cisco ONS 15540 ESPx Configuration Guide* and the *Cisco ONS 15540 ESPx Command Reference*.

DLP-55 Verify the Transparent Interface Status

Purpose	This task verifies the status of the transparent interface on the client side of the 2.5-Gbps transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the transparent interfaces on the system.

Step 2 Use the **show interfaces transparent** command to display the status and configuration of the client side interface on the 2.5-Gbps transponder module. The interface and line protocol should be up and the encapsulation or clock rate should be correct.

```
Switch# show interfaces transparent 10/0/0
Transparent10/0/0 is up, line protocol is up
  Signal quality: Signal degrade threshold exceeded
  Encapsulation: Sonet    Rate: oc3
  Signal monitoring: on
  Forward laser control: Off
  Configured threshold Group: None
  Section code violation error count(bip1): 3714369135
  Number of errored seconds(es): 57209
  Number of severely errored seconds(ses): 57209
  Number of severely errored framing seconds(sefs): 0
  Number of times SEF alarm raised: 0
 Number of times SF threshold exceeded: 0
  Number of times SD threshold exceeded: 0
  Loopback not set
  Last clearing of "show interface" counters never
  Hardware is transparent
```

Step 3 If there are problems with the interface status or configuration, see the "DLP-48 Configure 2.5-Gbps Transponder Module Interfaces" task on page 3-12.

DLP-56 Verify the 2.5-Gbps Transponder Module Wave Interface Status

Purpose	This task verifies the status of the wave interface on the ITU side of the 2.5-Gbps transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output and the **show hardware** command output to locate the 2.5-Gbps transponder module wave interfaces on the system.

Step 2 Use the **show interfaces wave** command to display the status and configuration of the DWDM side interface on the 2.5-Gbps transponder module. The interface and line protocol should be up.

```
Switch# show interfaces wave 10/0
Wave10/0 is up, line protocol is up
  Channel: 25   Frequency: 195.1 Thz    Wavelength: 1536.61 nm
  Splitter Protected: No
  Receiver power level: -7.0 dBm
  Laser safety control: Off
  Forward laser control: Off
  Osc physical port: No
  Wavelength used for inband management: No
  Configured threshold Group: None
  Section code violation error count(bip1): 929326
  Number of errored seconds(es): 30
  Number of severely errored seconds(ses): 30
  Number of severely errored framing seconds(sefs): 0
  Number of times SEF alarm raised: 0
  Number of times SF threshold exceeded: 0
 Number of times SD threshold exceeded: 0
  Loopback not set
  Last clearing of "show interface" counters never
  Hardware is data_only_port
```

DLP-57 Verify the OSC Wave Interface Status

Purpose	This task verifies the status of the wave interface on the OSC module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output and the **show hardware** command output to locate the OSC wave interfaces on the system.

Step 2 Use the **show interfaces wave** command to display the status and configuration of the DWDM side interface on the OSC module. The interface and line protocol should be up.

```
Switch# show interfaces wave 2/0
Wave2/0 is up, line protocol is up
  Patched Interface(s) :Oscfilter0/0
  Channel:0    Frequency:191.9 Thz   Wavelength:1562.23 nm
  Signal quality        :Good
  Laser safety control     :Off
  Osc physical port        :Yes
  Wavelength used for inband management:No
  Threshold monitored for:None
  CDL HEC error count:0
  Code violation and running disparity error count( 8b10b cvrd):0
```

```
Last clearing of "show interface" counters never
Hardware is OSC_phy_port
Internet address is 10.0.0.15/24
MTU 1492 bytes, BW 10000000 Kbit, DLY 0 usec,
   reliability 255/255, txload 1/255, rxload 1/255
Encapsulation SNAP, loopback not set
Last input 00:00:02, output never, output hang never
Last clearing of "show interface" counters never
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   89371 packets input, 6640468 bytes, 0 no buffer
   Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
   94418 packets output, 6589506 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 output buffer failures, 0 output buffers swapped out
```

DLP-58 Verify the 2.5-Gbps Transponder Module Wavepatch Interface Status

Purpose	This task checks the status of the wavepatch interfaces on the ITU side of the 2.5-Gbps transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the wavepatch interfaces on the system. The 2.5-Gbps transponder module wavepatch interfaces connect the 2.5-Gbps transponder module to the filter interfaces on the mux/demux modules.

Step 2 Use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/0 interface.

```
Switch# show interfaces wavepatch 4/0/0
Wavepatch4/0/0 is up, line protocol is up
  Receiver power level: -21.84 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -24.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 3 For splitter 2.5-Gbps transponder modules, use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/1 interface.

```
Switch# show interfaces wavepatch 4/0/1
Wavepatch4/0/1 is up, line protocol is up
  Receiver power level: -21.32 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -24.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

DLP-59 Verify the Tengigethernetphy Interface Status

Purpose	This task checks the status of the waveethernetphy and wavepatch interfaces on the 10-GE transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the tengigethernetphy interfaces on the system.

Step 2 Use the **show interfaces tengigethernetphy** command to display the status and configuration of the tengigethernetphy interface on the 10-GE transponder module. The interface and line protocol should be up.

```
Switch# show interfaces tengigethernetphy 3/0
TenGigEthernetPhy3/0 is up, line protocol is up
  Signal quality         : Good
  Laser shut down        : No
  Forward laser control  : Off
  CDL Enabled            : Off
  Threshold monitored for: None
  Code violation and running disparity error count( 64b66b cvrd): 0
  TenGige Non CDL Pkt count: 0
  Loopback not set
  Last clearing of "show interface" counters 17:02:20
  Hardware is data_enabled_port
```

DLP-60 Verify the Waveethernetphy Interface Status

Purpose	This task checks the status of the waveethernetphy interfaces on the 10-GE transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the waveethernetphy interfaces on the system.

Step 2 Use the **show interfaces waveethernetphy** command to display the status and configuration of the waveethernetphy interface on the 10-GE transponder module. The interface and line protocol should be up.

```
Switch# show interfaces waveethernetphy 3/0
WaveEthernetPhy3/0 is up, line protocol is up
  Channel: 17   Frequency: 194.1 Thz   Wavelength: 1544.53 nm
  Active Wavepatch         : Wavepatch3/0/1
  Splitter Protected       : No
  Signal quality           : Good
  Receive power level      : -18.92 dBm
  Transmit condition       : Good
  Laser shut down          : No
  Forward laser control    : Off
  Osc physical port        : No
  Wavelength capable for inband management: Yes
  Loopback not set
  Threshold monitored for: None
  Code violation and running disparity error count( 64b66b cvrd): 104568
  TenGige Non CDL Pkt count: 1
  CDL HEC error count: 608
  TenGige CDL idle Pkt count: 4020834390

  Defect Indication Status      : up
  Configured Node Behavior      : None
  Current Node Behavior         : Path Terminating
  Defect Indication Receive     : FDI-E
  Defect Indication Transmit    :          None

  Last clearing of "show interface" counters 17:03:17
  Hardware is data_and_cdl_enabled_port
```

DLP-61 Verify the 10-GE Transponder Module Wavepatch Interface Status

Purpose	This task checks the status of the wavepatch interfaces on the 10-GE transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the 10-GE transponder module wavepatch interfaces on the system.

Step 2 Use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/0 interface.

```
Switch# show interfaces wavepatch 3/0/0
Wavepatch3/0/0 is down, line protocol is down
  Receiver power level: Unknown

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -22.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -20.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 3 For splitter 10-GE transponder modules, use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/1 interface.

```
Switch# show interfaces wavepatch 3/0/1
Wavepatch3/0/1 is up, line protocol is up
  Receiver power level: -18.92 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -22.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -20.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

DLP-92 Verify the Ethernetdcc Interface Status

Purpose	This task checks the status of the ethernetdcc interfaces on the 10-GE transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the 10-GE transponder module ethernetdcc interfaces on the system.

Step 2 Use the **show interfaces ethernetdcc** command to verify the status of the ethernetdcc *slot*/*subcard*/0 interface.

```
Switch# show interfaces ethernetdcc 3/0/0
EthernetDcc3/0/0 is up, line protocol is up
This is the message channel interface on WaveEthernetPhy3/0
  Hardware is cdl_enabled_port
  MTU 1492 bytes, BW 500000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     62 packets input, 4491 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24499 packets output, 1422496 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

Step 3 If CDL is enabled on the tengigethernetphy interface, use the **show interfaces ethernetdcc** command to verify the status of the ethernetdcc *slot*/*subcard*/1 interface.

```
Switch# show interfaces ethernetdcc 3/0/1
EthernetDcc3/0/1 is up, line protocol is up
This is the message channel interface on Tengigethernetphy3/0
  Hardware is cdl_enabled_port
  MTU 1492 bytes, BW 500000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     62 packets input, 4491 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24499 packets output, 1422496 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

DLP-62 Verify the Wdmsplit Interface Status

Purpose	This task checks the status of the wdmsplit interfaces on the PSMs.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the wdmsplit interfaces on the system.

Step 2 Use the **show interfaces waveethernetphy** command to display the status and configuration of the wdmsplit interface on the PSM. The interface and line protocol should be up.

```
Switch# show interfaces wdmsplit 0/1/0
WdmSplit0/1/0 is up, line protocol is up
  Status                : Active
  Signal quality           : Good
  Received power        : -16.20 dBm (A1A)
  Threshold Value       : -22.00 dBm (89F)

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -22.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -18.0 dBm  (default)
  Low Warning Severity       = not alarmed
  Hardware is split wavelength_add_drop
```

DLP-63 Verify the Fastethernet 0 Interface Status

Purpose	This task verifies the status of the NME fastethernet 0 interface.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show interfaces fastethernet 0** command to display the status and configuration of the fastethernet 0 interface. The interface and line protocol should be up.

```
Switch# show intefaces fastethernet 0
FastEthernet0 is up, line protocol is up
  Hardware is AmdFE, address is 0008.a35d.7a80 (bia 0008.a35d.7a80)
  Internet address is 172.25.22.59/31
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 10Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:09, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 2000 bits/sec, 3 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     18340 packets input, 1413069 bytes
     Received 17327 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
```

```
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog
0 input packets with dribble condition detected
1179 packets output, 181490 bytes, 0 underruns
0 output errors, 10 collisions, 2 interface resets
0 babbles, 0 late collision, 12 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out
```

NTP-16 Verify the Optical Patch Configuration

Purpose	This procedure verifies the optical patch configuration on the system.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show patch detail** command to verify the patch connections configured on the system.

```
Switch# show patch detail
Patch Interface     Patch Interface     Type       Dir   Error
------------------  ------------------  ---------  ----  ----------------
Filter0/0/0         Wavepatch1/0/0      USER       Both
Filter1/1/0         Wavepatch1/0/1      USER       Both
Filter0/0/1         Wavepatch2/0/0      USER       Both
Filter1/1/1         Wavepatch2/0/1      USER       Both
Oscfilter0/0        Wave0               USER       Both
Oscfilter1/1        Wave1               USER       Both
```

Step 2 Check that the patch configuration shown in the command output matches the actual system cable connections. If it does not match or there is an error condition, correct the configuration with the **patch** command or correct the cabling on the system.

NTP-17 Verify the Cross Connect Status

Purpose	This procedure verifies the status of the cross connection on the system.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31 NTP-16 Verify the Optical Patch Configuration, page 4-11
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Perform a **show connect intermediate** command. This command shows the complete path of the traffic through all components and interfaces.

```
Switch# show connect intermediate
client/       wave          wave           wdm
wave          client        patch   filter  trk  channel
------------  ------------  -------  ------  ---  -------
Trans3/0/0    Wave3/0       3/0/0*  0/0/4   0/0    5
                            3/0/1
Trans3/1/0    Wave3/1       3/1/0*  0/0/5   0/0    6
                            3/1/1
Trans3/2/0    Wave3/2       3/2/0*  0/0/6   0/0    7
                            3/2/1
Trans3/3/0    Wave3/3       3/3/0*  0/0/7   0/0    8
                            3/3/1
```

Note The asterisk after the interface identifiers in the wave patch column indicate the active wavepatch interface.

Step 2 Perform a **show connect edges** command. This command shows the edge connection information.

```
Switch# show connect edges
client/
wave        wdm  channel
----------  ---  -----
Trans3/0/0  0/0    5
Trans3/1/0  0/0    6
Trans3/2/0  0/0    7
Trans3/3/0  0/0    8
```

Step 3 Check that the connections appear as expect. If they do not, recheck the channels supported by the transponder module, the laser frequency configured on the 2.5-Gbps transponder module wave interface, and the channel supported by the port on the mux/demux module cabled to the transponder module.

NTP-18 Verify the ITU Laser Frequency

Purpose	This procedure describes how to verify the ITU laser frequency on cards with tunable lasers.
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-15 Verify the Interface Status, page 4-2 NTP-17 Verify the Cross Connect Status, page 4-11 NTP-16 Verify the Optical Patch Configuration, page 4-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 As needed, complete the "DLP-64 Verify the 2.5-Gbps Transponder Module Laser Frequency" task on page 4-13.

DLP-64 Verify the 2.5-Gbps Transponder Module Laser Frequency

Purpose	This task verifies the ITU laser frequency current configured on the 2.5-Gbps transponder module wave interface. The ITU laser can be tuned to one of two channel frequencies. The frequencies correspond to the channel number in the part number listed on the front panel of the 2.5-Gbps transponder module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31 NTP-16 Verify the Optical Patch Configuration, page 4-11
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Verify which channels the 2.5-Gbps transponder module supports.

Look at the front panel of the transponder module and locate the part number. The part number format is 15540-TSP1-*ccmz* or 15540-TSP2-*cc*00, where *cc* indicates the lower channel number of the two channels supported by the transponder module, *m* indicates multimode (value A) or single-mode (value B), and *z* is the SC connector (value 3). For example, 15540-TSP1-03B3 is the part number for a single-mode transponder module with an SC connector that supports channels 3 or 4. This transponder module should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT ports on the mux/demux module.

Step 2 Verify the current channel configured on the 2.5-Gbps transponder module using the **show interfaces wave** command.

```
Switch# show interfaces wave 10/0
Wave10/0 is up, line protocol is up
  Channel: 31   Frequency: 195.8 Thz   Wavelength: 1530.33 nm
<Information deleted>
```

Step 3 Compare the frequency information with channel frequency supported by the filter interface on the mux/demux module using the **show interfaces filter** command.

```
Switch# show interfaces filter 0/0/3
Filter0/0/3 is up, line protocol is up
  Patched Interface(s) :Wavepatch10/0/0
  Channel:32 Frequency:195.9 Thz    Wavelength:1530.33 nm
  Hardware is filter
```

Step 4 Change an incorrectly configured frequency using the **laser frequency** command.

```
Switch# global configuration
Switch(config)# interface wave 10/0
Switch(config-if)# laser frequency 195900
```

Table 4-1 lists the channels, wavelengths, and frequencies for each band.

Table 4-1 Channel to Wavelength Mapping

Cisco ONS 15540 ESPx Band	Cisco ONS 15540 ESPx Channel	ITU Channel	ITU Wavelength (nm)	ITU Frequency (THz)
OSC		19	1562.23	191.9000
A	1	21	1560.61	192.100
	2	22	1559.79	192.200
	3	23	1558.98	192.300
	4	24	1558.17	192.400
B	5	26	1556.55	192.600
	6	27	1555.75	192.700
	7	28	1554.94	192.800
	8	29	1554.13	192.900
C	9	31	1552.52	193.100
	10	32	1551.72	193.200
	11	33	1550.92	193.300
	12	34	1550.12	193.400
D	13	36	1548.51	193.600
	14	37	1547.72	193.700
	15	38	1546.92	193.800
	16	39	1546.12	193.900
E	17	41	1544.53	194.100
	18	42	1543.73	194.200
	19	43	1542.94	194.300
	20	44	1542.14	194.400
F	21	46	1540.56	194.600
	22	47	1539.77	194.700
	23	48	1538.98	194.800
	24	49	1538.19	194.900
G	25	51	1536.61	195.100
	26	52	1535.82	195.200
	27	53	1535.04	195.300
	28	54	1534.25	195.400
H	29	56	1532.68	195.600
	30	57	1531.90	195.700
	31	58	1531.12	195.800
	32	59	1530.33	195.900

NTP-19 Verify the Optical Power and Frequency

Purpose	This procedure describes how to verify the power and frequency of the data channel.
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-15 Verify the Interface Status, page 4-2 NTP-16 Verify the Optical Patch Configuration, page 4-11 NTP-17 Verify the Cross Connect Status, page 4-11
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Complete the "DLP-65 Verify the Power Levels at the DWDM Trunk Signal" task on page 4-15.

Step 2 As needed, complete the "DLP-66 Verify the Power Levels on the 2.5-Gbps Transponder Module Client Interfaces" task on page 4-18.

Step 3 As needed, complete the "DLP-67 Verify the Power Levels on the 10-GE Transponder Module Client Interfaces" task on page 4-22.

DLP-65 Verify the Power Levels at the DWDM Trunk Signal

Purpose	This task verifies the power levels of the channel signal transmitted from the shelf on the trunk fiber.
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-66
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Power up the OSA and make sure that the OSA wavelength value range is set in the 1530 to 1563 nm range.

Step 2 Connect an OSA to the TRUNK_OUT port on the mux/demux module.

Step 3 Check and record all power levels and frequencies.

Step 4 Compute the minimum transmit power (in dBm) by subtracting the maximum loss (in dBm) from the recorded powers, using Table 4-2 through Table 4-4.

Step 5 Verify that the transmit optical power measurements recorded in Step 3 are greater than the figure computed in Step 4.

Step 6 Loop back the TRUNK_OUT port to the TRUNK_IN port on the mux/demux module with a adequate attenuation.

Caution You must add attenuation to ensure that the optical signal power at the TRUNK_IN port is less than the receiver overload value for the transponder modules (–8 dBm). Use the optical power values measured in Step 4 to determine the amount of attenuation needed on the loopback.

Step 7 For 2.5-Gbps transponder modules, issue **show interfaces wave** commands to check the optical power.

Note For accurate power transmit levels from the transponder modules, ensure that correct protocol encapsulation and monitoring are configured using the **show interfaces transparent** command, and that the client equipment connected to the transponder module is sending valid data.

Step 8 For 10-GE transponder modules, issue **show interfaces waveethernetphy** commands to check the optical power.

Step 9 See the optical budget losses in Table 4-5 through Table 4-9 to compute total losses for connectors and mux/demux modules, in both the transmit and receive directions.

Step 10 Verify that the optical power figure listed in the **show interfaces** command output is greater than the following calculation:

Minimum Tx power (dBm) – total losses

where

Total losses = maximum link loss (dBm) + attenuation + other insertion losses

Step 11 Repeat Step 7 through Step 10 for each interface.

Step 12 If another mux/demux module is connected to the trunk in the opposite direction, repeat Step 1 through Step 11 for that module.

Table 4-2 Trunk Side Specifications for Type 1 MM and SM Transponder Modules (2.5-Gbps)

Specification	Minimum	Maximum
Receive sensitivity	–28 dBm	
Receive overload		–8 dBm
Input wavelength	1260 nm	1580 nm
Transmitter power	4 dBm	8 dBm

Table 4-3 Trunk Side Specifications for Type 2 Extended Range Transponder Modules (2.5-Gbps)

Specification	Minimum	Maximum
Receive sensitivity	–28 dBm	
Receive overload		–8 dBm
Input wavelength	1430 nm	1580 nm
Transmitter power	5 dBm	10 dBm

Table 4-4 Trunk Side Specifications for 10-GE Transponder Modules

Specification	Minimum	Maximum
Receive sensitivity	–22 dBm	
Receive overload		–8 dBm
Input wavelength	1430 nm	1580 nm
Transmitter power	1 dBm	6 dBm

Table 4-5 Optical Loss for 2.5-Gbps Line Card Motherboards

Line Card Motherboard Type and Direction	Loss (dB)
Splitter motherboard Tx	4.5
Splitter motherboard Rx	1.8
Unprotected motherboard Tx	1.0
Unprotected motherboard Rx	1.0

Table 4-6 Optical Loss for 10-Gbps Line Card Motherboards

Protection Type and Direction	Loss (dB)
Splitter Tx	3.5
Splitter Rx	0.8
Nonsplitter Tx	0.5
Nonsplitter Rx	0.5

Table 4-7 Optical Loss for Data Channels Through the OADM Modules

Optical Mux/Demux Module Type	Trunk IN to Line Card Motherboard (Data Drop) in dB	Line Card Motherboard to Trunk OUT (Data Add) in dB	Trunk IN to Thru OUT (Pass Through Drop) in dB	Thru IN to Trunk OUT (Pass Through Add) in dB
4-channel with OSC	4.1	4.1	1.5	1.5
8-channel with OSC	4.8	4.8	2.0	2.0
4-channel without OSC	4.1	4.1	1.0	1.0
8-channel without OSC	4.8	4.8	1.5	1.5

Table 4-8 Optical Loss for Data Channels Through the 32-Channel Terminal Mux/Demux Modules

Optical Mux/Demux Module Type	IN to Line Card Motherboard (Data Drop) in dB	Line Card Motherboard to OUT (Data Add) in dB
32-channel (channels 1–32)	5.4	5.4

Table 4-9 Optical Loss for the OSC Through the Optical Mux/Demux Modules

Optical Mux/Demux Module Type	Trunk IN to OSC Transceiver (dB)	OSC Transceiver to Trunk OUT (dB)
4-channel with OSC	2.8	2.8
8-channel with OSC	3.3	3.3
32-channel with OSC	7.1	7.1

DLP-66 Verify the Power Levels on the 2.5-Gbps Transponder Module Client Interfaces

Purpose	This task verifies the power levels of the client side signal on the 2.5-Gbps transponder module.
Tools/Equipment	OPM (optical power meter)
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-66
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Run a jumper cable from the client Tx port of the first 2.5-Gbps transponder module to the external power meter.

Note When using a jumper cable to test, the cable should be pretested for its own loss and the same cable should be used for all tests.

Step 2 Set the wavelength on the OPM to 1310 nm.

Step 3 Measure and record the OPM of the client side transmitter.

Step 4 Compare the measured power with the specifications provided in Table 4-10, Table 4-11, and Table 4-12.

Table 4-10 Client Side Specifications for SM Transponder Modules and MM Transponder Modules

Specification	SM[1] Transponder Module		MM[2] Transponder Module	
	Minimum	Maximum	Minimum	Maximum
Bit rate	16 Mbps	2.5 Gbps	16 Mbps	622 Mbps
Receive sensitivity	–19 dBm		–25 dBm	
Receive overload		–1.5 dBm		–8 dBm
Input wavelength	1249 nm[3]	1600 nm	1249 nm	1600 nm
Transmitter power	–5 dBm	0 dBm	–5 dBm	0 dBm
Output wavelength	1260 nm	1360 nm	1260 nm	1360 nm

1. SM = single mode
2. MM = multimode
3. nm = nanometers

Table 4-11 Specifications for Fixed Rate SFP Optics for Type 2 Extended Range Transponder Modules

Part Number	Specification	Minimum	Maximum
15500-XVRA-01A2	Bit rate	155 Mbps	200 Mbps
	Receive sensitivity	–33 dBm	–14 dBm
	Input wavelength	1280 nm	1380 nm
	Transmitter power	–19.5 dBm	–15 dBm
	Output wavelength	1280 nm	1380 nm
15500-XVRA-02C1	Bit rate	1.0625 Gbps	1.25 Gbps
	Receive sensitivity	–18 dBm	
	Stressed receive sensitivity	–13.5 dBm	
	Input wavelength	770 nm	860 nm
	Transmitter power	–9.5 dBm	–4 dBm
	Output wavelength	830 nm	860 nm
15500-XVRA-03B1	Bit rate	1.0625 Gbps	1.25 Gbps
	Receive sensitivity	–20.5 dBm	
	Receive overload		–3 dBm
	Input wavelength	1270 nm	1600 nm
	Transmitter power	–9.5 dBm	–3 dBm
	Output wavelength	1275 nm	1350 nm

Table 4-11 Specifications for Fixed Rate SFP Optics for Type 2 Extended Range Transponder Modules (continued)

Part Number	Specification	Minimum	Maximum
15500-XVRA-03B2	Bit rate	1.0625 Gbps	2.125 Gbps
	Receive sensitivity	–20.5 dBm	
	Input wavelength	1270 nm	1600 nm
	Transmitter power	–9.5 dBm	–3 dBm
	Output wavelength	1275 nm	1350 nm
15500-XVRA-02C2	Bit rate	2.125 Gbps	2.125 Gbps
	Receive sensitivity	–15 dBm	
	Stressed receive sensitivity	–12.1 dBm	
	Input wavelength	770 nm	860 nm
	Transmitter power	–9 dBm	–4 dBm
	Output wavelength	830 nm	860 nm
15500-XVRA-06B1	Bit rate	622 Mbps	622 Mbps
	Receive sensitivity	–28 dBm	
	Receive overload		–7 dBm
	Input wavelength	1100 nm	1600 nm
	Transmitter power	–15 dBm	–8 dBm
	Output wavelength	1260 nm	1360 nm
15500-XVRA-07B1	Bit rate	2.488 Mbps	2.488 Mbps
	Receive sensitivity	–18 dBm	
	Receive overload		–3 dBm
	Input wavelength	1270 nm	1600 nm
	Transmitter power	–9.5 dBm	–3 dBm
	Output wavelength	1285 nm	1340 nm

Table 4-12 Specifications for Variable Rate SFP Optics for Type 2 Extended Range Transponder Modules

Part Number	Specification	Minimum	Maximum
15500-XVRA-10A1	Bit rate range	8 Mbps	200 Mbps
	Receive sensitivity@10–12 BER[1]	–32 dBm	
	Receive sensitivity@10–15 BER	–29 dBm	
	Receive overload @10–12 BER		–3 dBm
	Input wavelength	1100 nm	1600 nm
	Transmitter power	–19 dBm	–14 dBm
	Output wavelength	1260 nm	1360 nm
15500-XVRA-10B1	Bit rate range	8 Mbps	200 Mbps
	Receive sensitivity@10–12 BER	–32 dBm	
	Receive sensitivity@10–15 BER	–29 dBm	
	Receive overload @10–12 BER		–14 dBm
	Input wavelength	1100 nm	1600 nm
	Transmitter power	–8 dBm	–4 dBm
	Output wavelength	1280 nm	1380 nm

1. BER = bit error rate

Step 5 Repeat these steps for all other 2.5-Gbps transponder modules.

DLP-67 Verify the Power Levels on the 10-GE Transponder Module Client Interfaces

Purpose	This task verifies the power levels of the client side signal on the 10-GE transponder module.
Tools/Equipment	OPM (optical power meter)
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-66
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Run a jumper cable from the client Tx port of the first 10-GE transponder module to the external power meter.

Note When using a jumper cable to test, the cable should be pretested for its own loss and the same cable should be used for all tests.

Step 2 Set the wavelength on the OPM to 1310 nm.

Step 3 Measure and record the OPM of the client side transmitter.

Step 4 Compare the measured power with the specifications provided in Table 4-13.

Table 4-13 Client Side Specifications for 10-GE Transponder Modules

Specification	Minimum	Maximum
Receive sensitivity	–13.23 dBm	
Receive overload		0.5 dBm
Stressed receive sensitivity	–10.3 dBm	
Input wavelength	1249 nm[1]	1600 nm
Transmitter power	–5.2 dBm	0.5 dBm
Output wavelength	1260 nm	1355 nm

1. nm = nanometers.

Step 5 Repeat these steps for all other 10-GE transponder modules.

NTP-20 Verify the Optical Transmission Quality

Purpose	This procedure describes how to test the quality of the optical transmission from the node for transponder modules.
Tools/Equipment	BER test set for 2.5-Gbps transponder modules Native 10-GE traffic generator and traffic analyzer set for 10-GE transponder modules
Prerequisite Procedures	NTP-19 Verify the Optical Power and Frequency, page 4-15 DLP-65 Verify the Power Levels at the DWDM Trunk Signal, page 4-15
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 As needed, complete the "DLP-68 Verify the Optical Transmission Quality for 2.5-Gbps Transponder Modules" task on page 4-23.

Step 2 As needed, complete the "DLP-69 Verify the Optical Transmission Quality for 10-GE Transponder Modules" task on page 4-25.

DLP-68 Verify the Optical Transmission Quality for 2.5-Gbps Transponder Modules

Purpose	This task verifies the quality of the optical transmission from the node for 2.5-Gbps transponder modules.
Tools/Equipment	BER test set
Prerequisite Procedures	NTP-19 Verify the Optical Power and Frequency, page 4-15 DLP-65 Verify the Power Levels at the DWDM Trunk Signal, page 4-15
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

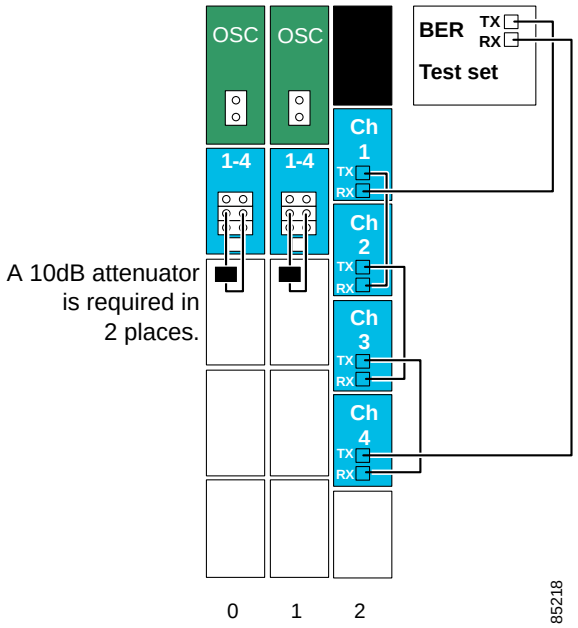
Step 1 Connect the BER test set transmit port to the receive port of the first transponder interface to be tested.

Note Measure the power level on the BER test set transmit port and use appropriate attenuation.

Step 2 Measure the power level on the ITU TX port on each 2.5-Gbps transponder module using the optical power meter and record the results.

Step 3 Daisy chain the client interfaces with the appropriate attenuation. Connect the client TX port of the first 2.5-Gbps transponder module to the receive port of the BER test set. Connect the client RX port of the last 2.5-Gbps transponder module to the transmit port of the BER test set. See the example in Figure 4-1.

Figure 4-1 Example Setup for Testing Bit Error Rate for 2.5-Gbps Transponder Modules



Note You can daisy chain as many as four 2.5-Gbps transponder modules.

Step 4 Loop back the TRUNK_OUT port to the TRUNK_IN port on the mux/demux modules (see the example in Figure 4-1).

Caution Add adequate attenuation, if necessary, to ensure that the optical signal power at the TRUNK_IN port is less than the receiver overload value for the 2.5-Gbps transponder modules (–8 dBm), minus the insertion loss (see Table 4-5, Table 4-7, and Table 4-8). Use the optical power values measured in the "DLP-65 Verify the Power Levels at the DWDM Trunk Signal" task on page 4-15 to determine the amount of attenuation needed on the loopback.

Step 5 Issue the **encapsulation** command on each transparent interface using a SONET protocol encapsulation supported by the client side interface.

Step 6 Set the data rate on the BER test set for the encapsulation configured on the transparent interface.

Step 7 Clear all errors on the BER test set.

Step 8 Start the BER test, and verify that the test runs error free for 15 minutes.

If there are errors within the 15-minute test period, remove the daisy chain configuration and try to isolate the problem by performing the BER test on each individual channel.

Step 9 If the system supports splitter protection, perform the following steps:

a. Issue **shutdown** commands on the active wavepatch interfaces.

b. Issue **no shutdown** commands on the standby wavepatch interfaces.

c. Repeat Step 7 through Step 8 on the new active wavepatch interfaces.

Step 10 Issue an **encapsulation** command or **clock rate** command on each transparent interface to revert to the original protocol or clock rate.

DLP-69 Verify the Optical Transmission Quality for 10-GE Transponder Modules

Purpose	This task verifies the quality of the optical transmission from the node for 10-GE transponder modules.
Tools/Equipment	Native 10-GE traffic generator and traffic analyzer set
Prerequisite Procedures	NTP-19 Verify the Optical Power and Frequency, page 4-15 DLP-65 Verify the Power Levels at the DWDM Trunk Signal, page 4-15
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

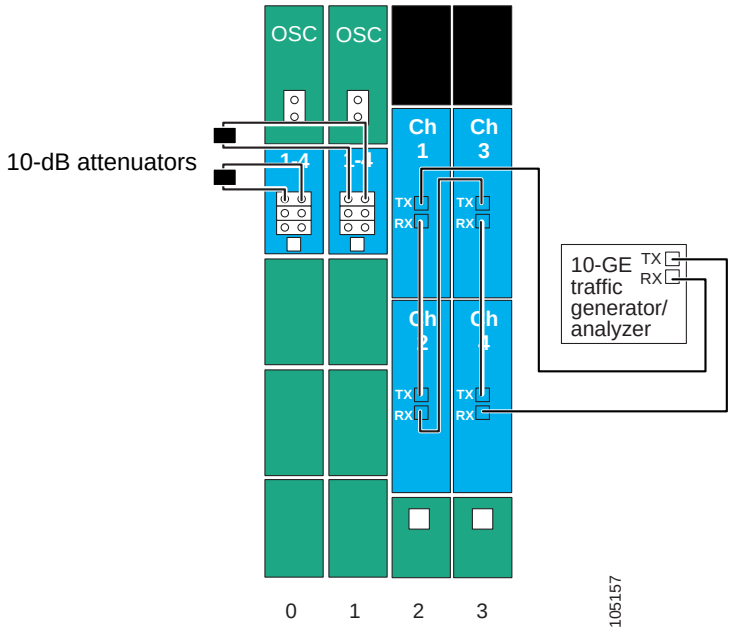
Step 1 Connect the BER test set transmit port to the receive port of the first transponder interface to be tested.

Note Measure the power level on the BER test set transmit port and use appropriate attenuation.

Step 2 Measure the power level on the ITU TX port on each 10-GE transponder module using the optical power meter and record the results.

Step 3 Daisy chain the client interfaces with the appropriate attenuation. Connect the client TX port of the first 10-GE transponder module to the receive port of the traffic analyzer. Connect the client RX port of the last 10-GE transponder module to the transmit port of the traffic generator. See the example in Figure 4-2.

Figure 4-2 Example Setup for Testing Bit Error Rate for 10-GE Transponder Modules



Note You can daisy chain as many as four 10-GE transponder modules.

Step 4 Loop back the TRUNK_OUT port to the TRUNK_IN port on the mux/demux modules (see the example in Figure 4-2).

Caution Add adequate attenuation, if necessary, to ensure that the optical signal power at the TRUNK_IN port is less than the receiver overload value for the 10-GE transponder modules (–8 dBm), minus the insertion loss (see Table 4-6, Table 4-7, and Table 4-8). Use the optical power values measured in the "DLP-65 Verify the Power Levels at the DWDM Trunk Signal" task on page 4-15 to determine the amount of attenuation needed on the loopback.

Step 5 Clear all errors on the traffic analyzer.

Step 6 Start the traffic generator, and verify that the test runs error free for 15 minutes.

If there are errors within the 15-minute test period, remove the daisy chain configuration and try to isolate the problem by performing the test on each individual channel.

Step 7 If the system supports splitter protection, perform the following steps:

a. Issue **shutdown** commands on the active wavepatch interfaces.

b. Issue **no shutdown** commands on the standby wavepatch interfaces.

c. Repeat Step 7 through Step 8 on the new active wavepatch interfaces.

NTP-21 Verify the Alarm Status

Purpose	This procedure verifies the operation and status of the alarms on the shelf.
Tools/Equipment	SONET analyzer
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 As needed, complete the "DLP-70 Verify the Alarm Status for 2.5-Gbps Transponder Modules" task on page 4-27.

Step 2 As needed, complete the "DLP-71 Verify the Alarm Status for 10-GE Transponder Modules" task on page 4-28.

DLP-70 Verify the Alarm Status for 2.5-Gbps Transponder Modules

Purpose	This task verifies the operation and status for 2.5-Gbps transponder module.
Tools/Equipment	SONET analyzer
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Remove the client Rx and verify that a Loss of Light alarm is generated. A Loss of Lock alarm on the client Rx should appear in the **show facility-alarm status** command output.

Step 2 Remove the trunk cable and verify a Loss of Light alarm on the wave interface of the 2.5-Gbps transponder module. A Loss of Light alarm on the wave interface should appear in the **show facility-alarm status** command output.

Step 3 Use a SONET analyzer to inject errors on a 2.5-Gbps transponder module, such as Loss of Frame, and verify that corresponding alarms are generated.

Note To perform this test, you must have a 2.5-Gbps transponder module configured for SONET protocol encapsulation.

Alarms for the injected errors should appear in the **show facility-alarm status** command output.

DLP-71 Verify the Alarm Status for 10-GE Transponder Modules

Purpose	This task verifies the operation and status of the alarms for 10-GE transponder modules.
Tools/Equipment	None
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	As needed.
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Remove the client Rx and verify that a Loss of Light alarm is generated. A Loss of Lock alarm on the client Rx should appear in the **show facility-alarm status** command output.

Step 2 Remove the trunk cable and verify a Loss of Lock alarm on the waveethernetphy interface of the 10-GE transponder module. A Loss of Lock alarm on the waveethernetphy interface should appear in the **show facility-alarm status** command output.

NTP-22 Verify the Status of Redundant Processor Cards

Purpose	This procedure verifies the status of the redundant processor cards.
Tools/Equipment	None
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Verify that the conditions in Table 4-14 have been met. If all the conditions are not met, then the system is only conditionally redundant, not fully redundant.

Table 4-14 Conditions for Full Redundancy

Requirement	Notes
Two processor cards are required. The processor cards have identical hardware configurations.	Verify that both processor cards have identical configurations such as DRAM size with the **show redundancy capability** command.
Both processor cards have the same functional image.	Verify after power-up that both processor cards have the same functional image with the **show hardware detail** command.
Both processor cards are running compatible system images.	Verify that the system images are compatible across one major release with the **show version** command.
Both the running and startup configurations are automatically synchronized between the processor cards.	Verify that the running and startup configurations are listed as synchronized using the **show redundancy** command.
Both processor cards are set to autoboot (default setting).	Verify that the configuration register reads 0x2102 using the **show version** command.

Step 2 Use the **show redundancy capability** command to display capabilities for the active and standby processor cards. Verify that all results in the Sby Compat columns are OK.

```
Switch# show redundancy capability

CPU capability support

 Active CPU  Sby CPU    Sby Compat        CPU capability description
 ---------- ---------- ----------- ----------------------------------------
    96 MB      96 MB   OK          CPU DRAM size
    32 MB      32 MB   OK          CPU PMEM size
   512 KB     512 KB   OK          CPU NVRAM size
    16 MB      16 MB   OK          CPU Bootflash size
    3.5         2.1    OK          CPU hardware major.minor version
    1.27       1.27    OK          CPU functional major.minor version

Linecard driver major.minor versions, (counts: Active=43, Standby=43)

 Active CPU  Sby CPU   Sby Compat  Drv/Ch/F ID  Driver description
 ---------- ---------- ----------- ----------- ----------------------------
    1.1         1.1     OK          0x1000/0/0  CPU w/o Switch Fabric
    1.1         1.1     OK          0x1001/1/0  Fixed Transponder, w/monitor
    1.1         1.1     OK          0x1002/0/0  Fixed Transponder, no monitor
    1.1         1.1     OK          0x1003/1/0  Pluggable Transponder, w/monit
    1.1         1.1     OK          0x1004/0/0  Pluggable Transponder, no moni
    2.1         2.1     OK          0x1005/0/0  Line Card Motherboard
    1.1         1.1     OK          0x1006/0/0  Backplane
    1.1         1.1     OK          0x1007/0/0  32-ch Mux/Demux
    1.1         1.1     OK          0x1008/0/0  Fixed 4-ch Mux/Demux, no OSC
    1.1         1.1     OK          0x1009/0/0  Fixed 8-ch Mux/Demux, no OSC
    1.1         1.1     OK          0x100A/0/0  Modular 4-ch Mux/Demux, no OSC
    1.1         1.1     OK          0x100B/0/0  Modular 8-ch Mux/Demux, no OSC
    1.1         1.1     OK          0x100C/0/0  32-ch Array Wave Guide
    2.1         2.1     OK          0x100D/0/0  Mux/Demux Motherboard
    1.1         1.1     OK          0x100E/0/0  Modular 4-ch Mux/Demux plus OS
```

```
   1.1        1.1     OK          0x100F/0/0  Modular 8-ch Mux/Demux plus OS
   2.1        2.1     OK          0x1010/0/0  Mux-Demux Motherboard, no OSC
   2.1        2.1     OK          0x1011/0/0  Line Card Motherboard, no prot
   3.1        3.1     OK          0x1012/0/0  Down Link Motherboard
   1.1        1.1     OK          0x1013/0/0  OC192 Down Link DaughterCard
   2.1        2.1     OK          0x1014/1/0  10G Down Link DaughterCard
   1.1        1.1     OK          0x1015/0/0  Modular 16-ch Mux/Demux, no OS
   1.1        1.1     OK          0x1016/0/0  Modular 16-ch Mux/Demux plus O
 Active CPU  Sby CPU   Sby Compat  Drv/Ch/F ID  Driver description
 ---------- ---------- ----------- ----------- ------------------------------
   2.1        2.1     OK          0x1017/0/0  Line Card Motherboard, no prot
   1.1        1.1     OK          0x1018/1/0  Low bit rate Type-1 transponde
   2.1        2.1     OK          0x1019/0/0  CN Tower Line Card Motherboard
   2.1        2.1     OK          0x101A/0/0  Mux/Demux Motherboard
   1.1        1.1     OK          0x101B/0/0  Modular 4-ch Mux/Demux no OSC
   1.1        1.1     OK          0x101C/0/0  Modular 4-ch Mux/Demux plus OS
   1.1        1.1     OK          0x101D/0/0  Modular 8-ch Mux/Demux no OSC
   1.1        1.1     OK          0x101E/0/0  Modular 8-ch Mux/Demux plus OS
   1.1        1.1     OK          0x101F/0/0  32-ch Array Wave Guide
   2.1        2.1     OK          0x1020/0/0  Mux/Demux Motherboard, no OSC
   1.1        1.1     OK          0x1021/0/0  POM Adapter
   2.1        2.1     OK          0x1022/0/0  Down Link Motherboard, no prot
   2.1        2.1     OK          0x1023/0/0  Down Link Motherboard, no prot
   2.1        2.1     OK          0x1024/0/0  Line Card Motherboard, no prot
   1.1        1.1     OK          0x1025/0/0  Modular 16-ch Mux/Demux, no OS
   1.1        1.1     OK          0x1026/0/0  Modular 16-ch Mux/Demux plus O
   1.1        1.1     OK          0x1027/0/0  PSM Trunk switch proctection m
   1.1        1.1     OK          0x1028/1/0  non-plug type1 xpder with cont
   1.1        1.1     OK          0x1029/1/0  Low bit rate type-1 xpdr w/con
   1.1        1.1     OK          0x1000/0/1  ONS15540 Rommon

Software sync client versions, listed as version range X-Y.
 X indicates the oldest peer version it can communicate with.
 Y indicates the current sync client version.
 Sync client counts: Active=6, Standby=6

 Active CPU  Sby CPU   Sby Compat  Cl ID  Redundancy Client description
 ---------- ---------- ----------- ----- -----------------------------------
 ver  1-2   ver  1-2   OK          17    CPU Redundancy
 ver  1-1   ver  1-1   OK          19    Interface Sync
 ver  1-1   ver  1-1   OK          36    MetOpt Password Sync
 ver  1-2   ver  1-2   OK          18    Online Diagnostics
 ver  1-2   ver  1-2   OK          6     OIR Client
 ver  1-1   ver  1-1   OK          27    metopt cm db sync

Backplane IDPROM comparison
 Backplane IDPROM field      Match Local CPU            Peer CPU
 --------------------------- ----- -------------------- --------------------
 idversion                   YES   1                    1
 magic                       YES   153                  153
 card_type                   YES   4102                 4102
 order_part_num_str          YES   15540-CHSB=          15540-CHSB=
 description_str             YES   15540_Chassis_with_external_patch_support

15540_Chassis_with_external_patch_support
 board_part_num_str          YES   73-5655-04           73-5655-04
 board_revision_str          YES   A0                   A0
 serial_number_str           YES   TBC07392048          TBC07392048
 date_of_manufacture_str     YES   10/07/2003           10/07/2003
 deviation_numbers_str       YES   0                    0
 manufacturing_use           YES   0                    0
 rma_number_str              YES   0x00                 0x00
 rma_failure_code_str        YES   0x00                 0x00
 oem_str                     YES   Cisco_Systems        Cisco_Systems
```

```
clei_str                    YES   0                   0
snmp_oid_substr             YES   0                   0
schematic_num_str           YES   92-4113-03          92-4113-03
hardware_major_version      YES   3                   3
hardware_minor_version      YES   2                   2
engineering_use_str         YES   0                   0
crc16                       OK    46433               21421
user_track_string           YES   0                   0
diagst                      YES   ^A                   ^A
board_specific_revision     YES   1                   1
board_specific_magic_number YES   153                 153
board_specific_length       YES   57                  57
mac_address_block_size      YES   16                  16
mac_address_base_str        YES   000c302228a0        000c302228a0
cpu_number                  OK    0                   1
optical_backplane_type      YES   2                   2
```

Step 3 Use the **show redundancy summary** command to verify that the running and startup configurations are synchronized.

```
Switch# show redundancy summary

Redundant system information
-----------------------------
Available Uptime:              1 day, 20 hours, 36 minutes
sysUpTime (switchover clears): 1 day, 20 hours, 36 minutes
Switchover Count:              0

Inter-CPU Communication State: UP
Last Restart Reason:           Normal boot

Last Running Config sync:      46 minutes
Running Config sync status:    In Sync
Last Startup Config sync:      1 day, 20 hours, 36 minutes
Startup Config sync status:    In Sync

This CPU is the Active CPU.
-------------------------------
Slot:                          6
Time since CPU Initialized:    1 day, 20 hours, 36 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.2(18)SV,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File:                    bootflash:ons15540-i-mz.122-18.SV
Software Redundancy State:     ACTIVE
Hardware State:                ACTIVE
Hardware Severity:             0

Peer CPU is the Standby CPU.
-------------------------------
Slot:                          7
Time since CPU Initialized:    1 day, 20 hours, 25 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.2(18)SV,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File (on sby-CPU):       bootflash:ons15540-i-mz.122-18.SV
Software Redundancy State:     STANDBY HOT
Hardware State:                STANDBY
Hardware Severity:             0
Privilege Mode:                Enabled
```