Node Verification Procedures

Use the procedures in this chapter to perform basic node verification. Note that details of isolating possible problems are not described here.

Before performing the procedures in this chapter, you must install the chassis, power it up, and complete the hardware and software installation and verification tasks of the previous chapter.

This chapter contains the following major sections:

Required Equipment

You need the following test equipment:

- Handheld power meter
- Optical spectrum analyzer
- Fiber cleaning kit
- Attenuators
- MU-SC connector (per DWDM interface)
- Traffic generator for bit error rate testing

Optical Power and Frequency Checks

Perform the following procedures to verify power levels at the DWDM trunk interfaces and the client interfaces.

- Verifying power levels at the DWDM trunk interfaces
- Verifying power levels on the client interfaces

Verifying Power Levels at the DWDM Trunk Interfaces

This section lists procedures for measuring and verifying the power levels at the DWDM trunk interfaces. Following the procedures are tables listing power specifications.

Verifying Transmit Launch Power and Insertion Losses

Perform the following steps to verify the transmit launch power and insertion losses:

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 Tx of the trunk port on the mux/demux connected to the trunk fiber slot 0.

Step 3 Check and record all power levels and frequencies.

Step 4 Using the following tables, compute Minimum Tx power (dBm) minus Maximum Loss (dBm).

Step 5 Verify that the Tx optical power measurements are greater than the above figure.

Step 6 Loop back the Trunk Out port to the Trunk In port on the mux/demux module with a 10 dB attenuator.

Caution You must add attenuation so that receive power is not too high and does not damage the receiver.

Step 7 Perform a **show interface wave** command to check the optical power.

Step 8 Refer to the below optical budget losses and compute total losses for connectors and filters.

Step 9 Verify that the optical power figure listed by Cisco IOS is greater than the following figure:

```
Minimum Tx power (dBm) - total losses
(Total losses = maximum link loss (dBm) + attenuation + other insertion losses)
```

Step 10 Repeat Step 8 through Step 10 for each interface.

Step 11 Repeat Step 1 through Step 10 for the other trunk side, slot 1.

Table 4-1 lists trunk side optical power specifications. Note that for extended range (with SFP) and transparent transponders the specifications are very similar.

Table 4-1 Trunk Side Laser Specifications

Receiver specification	Minimum	Typical	Maximum
Receive sensitivity		–32 dBm	–28 dBm
Receive overload			–8 dBm
Input wavelength	1430 nm		1580 nm
Transmitter power	4 dBm	6 dBm	8 dBm
Output wavelength	1530.33 nm		1560.61

Table 4-2 shows the optical link loss for the splitter and unprotected motherboards supported by the Cisco ONS 15540 in the transmit and receive directions.

Table 4-2 Optical Link Loss for 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 4-3 shows the optical link loss for the data channels between the 4-channel or 8-channel add/drop mux/demux modules and the transponders, and between the pass-through add and drop connectors on the modules.

Table 4-3 Optical Link Loss for Data Channels Through the Add/Drop Mux/Demux Modules

Optical Mux/Demux Module Type	Trunk IN to Line Card Motherboard (Data Drop) (dB)	Line Card Motherboard to Trunk OUT (Data Add) (dB)	Trunk IN to Thru OUT (Pass-through Drop) (dB)	Thru IN to Trunk OUT (Pass-through Add) (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 4-4 list the optical link loss for the 32-channel terminal mux/demux modules.

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

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

Table 4-5 shows the optical link loss for the OSC between the mux/demux motherboard and the optical mux/demux modules.

Table 4-5 Optical Link 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

Verifying Power Levels on the Client Interfaces

Perform the following steps to check the client side interface Tx power.

Step 1 Run a jumper cable from the client Tx port of the first client interface 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 power meter to 1310 nm.

Step 3 Measure and record the output power of the client side transmit.

Step 4 Compare the measured power with the specifications provided in Table 4-6.

Step 5 Repeat these steps for all other interfaces.

Table 4-6 lists the optical power of the client side interfaces for SM transponders and MM transponders.

Table 4-6 Client Side Laser Specifications - SM Transponder and MM Transponder

	Single Mode Transponder			Multimode Transponder		
Receiver specification	**Minimum**	**Typical**	**Maximum**	**Minimum**	**Typical**	**Maximum**
Bit rate	16 Mbps		2.5 Gbps	16 Mbps		622 M
Receive sensitivity	–19 dBm	–23 dBm[1]		–25 dBm	–28 dBm	
Receive overload			–1.5 dBm			–8 dBm
Input wavelength	1249 nm[2]		1600 nm	1249 nm		1600 nm
Transmitter power	–5 dBm	–2 dBm	0 dBm	–5 dBm	–2 dBm	0 dBm
Output wavelength	1260 nm		1360 nm	1260 nm		1360 nm

1. dBm = decibels per milliwatt. 0 dBm is defined as 1 mW at 1 kHz of frequency and at 600 ohms of impedance.
2. nm = nanometers.

Note For extended range transponders the optical launch power and receive sensitivity is SFP dependent. If the specifications of the client equipment interfaces do not fall within these ranges, attenuators might be required.

Table 4-7 lists the optical power of the client side interfaces for extended range transponders.

Table 4-7 Selectable Transceiver Receiver and Laser Specifications

Receiver Specification	Minimum	Typical	Maximum
ESCON, SONET OC-3, and SDH STM-1 MM			
Bit rate	10 Mbps		200 Mbps
Receive sensitivity	–33 dBm		–14 dBm
Receive overload			–14 dBm
Input wavelength	1280 nm		1380 nm
Transmitter power	–19.5 dBm		–15 dBm
Output wavelength	1280 nm	1320 nm	1380 nm
Gigabit Ethernet and Fibre Channel MM			
Bit rate		1.0625 Gbps, 1.25 Gbps	
Receive sensitivity		–21 dBm	–18 dBm
Receive overload			–13.5 dBm
Input wavelength	770 nm		860 nm
Transmitter power	–9.5 dBm		–4 dBm
Output wavelength	830 nm		860 nm

Table 4-7 Selectable Transceiver Receiver and Laser Specifications (continued)

Receiver Specification	Minimum	Typical	Maximum
Gigabit Ethernet and Fibre Channel SM			
Bit rate		1.0625 Gbps, 1.25 Gbps	
Receive sensitivity		–25 dBm	–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
Gigabit Ethernet and Fibre Channel (1 Gbps and 2 Gbps) SM			
Bit rate		1.0625 Gbps, 2.125 Gbps	
Receive sensitivity (<= 1.06 Gbps)		–24 dBm	–20.5 dBm
Receive sensitivity (> 1.06 Gbps)		–22 dBm	–20.5 dBm
Input wavelength	1270 nm		1600 nm
Transmitter power	–9.5 dBm		–3 dBm
Output wavelength	1275 nm		1350 nm
Fibre Channel (2 Gbps) MM			
Bit rate		1.062 Gbps, 2.125 Gbps	
Receive sensitivity (<= 1.06 Gbps)		–22 dBm	–18 dBm
Receive sensitivity (> 1.06 Gbps)		–20 dBm	–15 dBm
Receive overload (<= 1.06 Gbps)			–13.5 dBm
Receive overload (> 1.06 Gbps)		–18 dBm	–12.1 dBm
Input wavelength	770 nm		860 nm
Transmitter power	–9 dBm		–4 dBm
Output wavelength	830 nm		860 nm
SONET OC-12 SM			
Bit rate	50 Mbps	622 Mbps	700 Mbps
Receive sensitivity	–28 dBm	–31 dBm	
Receive overload	–7 dBm	–3 dBm	
Input wavelength	1100 nm		1600 nm
Transmitter power	–15 dBm	–11 dBm	–8 dBm

Table 4-7 Selectable Transceiver Receiver and Laser Specifications (continued)

Receiver Specification	Minimum	Typical	Maximum
Output wavelength	1261 nm	1310 nm	1360 nm
SONET OC-48 SM			
Bit rate	155 Mbps		2667 Mbps
Receive sensitivity		–22 dBm	–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

Verifying the Interfaces

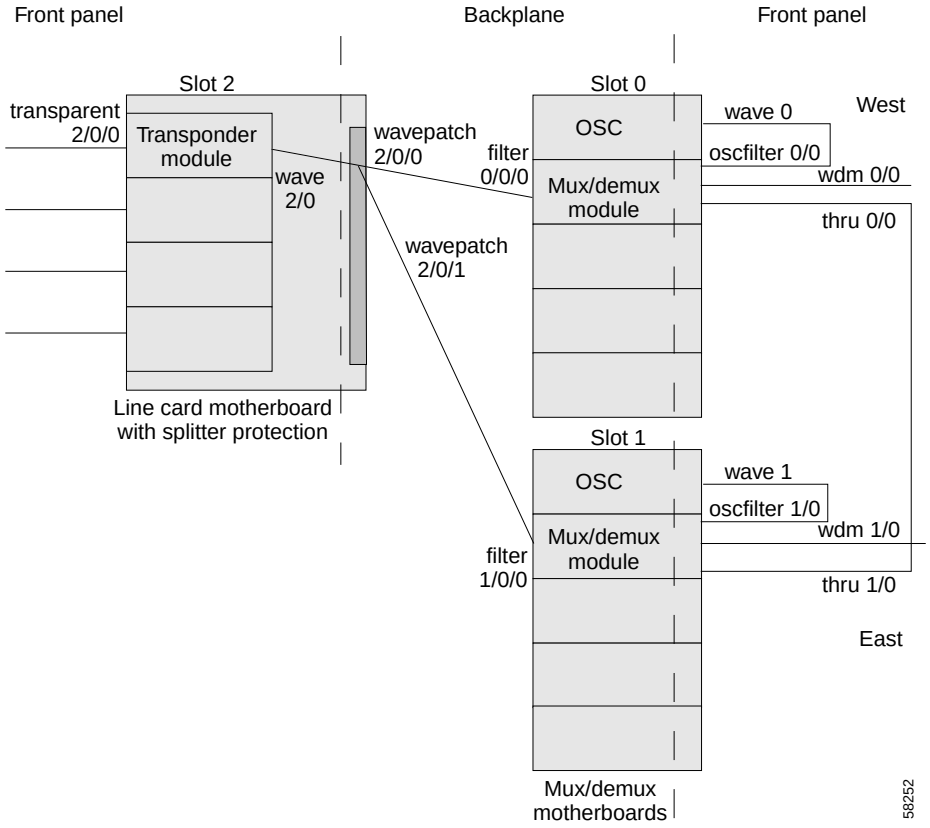
Figure 4-1 on page 4-8 show examples of interfaces on the Cisco ONS 15540 ESP.

Although the interfaces do not yet carry traffic, verify that the interfaces are administratively up on the client, DWDM trunk, and OSC. Use the **show interfaces** commands as described in this section. Perform these commands for the following interfaces:

- Transparent interfaces
- Transponder wave interfaces
- OSC wave interfaces
- Wavepatch interfaces

For more information on interfaces, refer to the *Cisco ONS 15540 ESP Configuration Guide and Command Reference*.

Figure 4-1 Optical Cross Connection Example on the Cisco ONS 15540 ESP




```
Switch# show interfaces transparent 11/3/0
Transparent11/3/0 is up, line protocol is up
  Signal quality: Good
  Encapsulation: Sonet    Rate: oc48
  Signal monitoring: on
  Time of last "monitor" state change 00:02:20
  Time of last "encapsulation" change 00:02:23
  Forward laser control: Off
  Loopback not set

  Configured threshold Group: None
  Section code violation error count(bip1): 0
  Number of errored seconds(es): 0
  Number of severely errored seconds(ses): 0
  Number of severely errored framing seconds(sefs): 0
  Last clearing of "show interface" counters 00:02:23
  Hardware is transparent

Switch# show interfaces wave 11/3
Wave11/3 is up, line protocol is up
  Channel: 32   Frequency: 195.9 Thz   Wavelength: 1530.33 nm
  Active Wavepatch         : Wavepatch11/3/1
  Splitter Protected       : No
  Signal quality           : Good
  Receiver power level     : -26.54 dBm
  Forward laser control    : Off
  Laser safety control     : Off
  Osc physical port        : No
  Wavelength used for inband management: No
```

```
  Loopback not set

  Configured threshold Group: None
  Section code violation error count(bip1): 1
  Number of errored seconds(es): 1
  Number of severely errored seconds(ses): 0
  Number of severely errored framing seconds(sefs): 0

  Last clearing of "show interface" counters 00:02:33
  Hardware is data_only_port

Switch# show interfaces wave0
Wave0 is up, line protocol is up
  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

OSC interface
  Number of times SF threshold exceeded: 0
  Number of times SD threshold exceeded: 0
  Code violation and running disparity error count( 8b10b cvrd): 914
  Last clearing of "show interface" counters never
  Hardware is OSC_phy_port
  MTU 1492 bytes, BW 10000000 Kbit, DLY 0 usec,
     reliability 239/255, 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
     191 packets input, 13849 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
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out

Switch# show interfaces wavepatch 11/3/0
Wavepatch11/3/0 is up, line protocol is up
  Receiver power level: -24.77 dBm
  Hardware is passive_port

Switch# show interfaces wavepatch 11/3/1
Wavepatch11/3/1 is up, line protocol is up
  Receiver power level: Unknown
  Hardware is passive_port
```

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
------------  ------------  -------  ------  ----- -------
Tran2/1/0     Wave2/1        2/1/0*  0/0/1    0/0    2
                             2/1/1   1/0/1    1/0    2
Tran2/3/0     Wave2/3        2/3/0*  0/0/3    0/0    4
                             2/3/1   1/0/3    1/0    4
Tran11/0/0    Wave11/0      11/0/0   0/2/12  0/2/1   29
                            11/0/1*  1/3/4    1/3    29
Tran11/3/0    Wave11/3      11/3/0   0/2/15  0/2/0   32
                            11/3/1*  1/3/7    1/3    32
```

Perform a **show patch detail** command.

```
Switch# show patch detail
Patch Interface     Patch Interface     Type       Dir   Error
------------------  ------------------  ---------  ----  ----------------
Filter0/0/1         Wavepatch2/1/0      AUTOMATIC  Both
Filter0/0/3         Wavepatch2/3/0      AUTOMATIC  Both
Filter0/2/12        Wavepatch11/0/0     AUTOMATIC  Both
Filter0/2/15        Wavepatch11/3/0     AUTOMATIC  Both
Filter1/0/1         Wavepatch2/1/1      AUTOMATIC  Both
Filter1/0/3         Wavepatch2/3/1      AUTOMATIC  Both
Filter1/3/4         Wavepatch11/0/1     AUTOMATIC  Both
Filter1/3/7         Wavepatch11/3/1     AUTOMATIC  Both
```

Perform a **show fast ethernet 0** command.

```
Switch# show fast ethernet 0
FastEthernet0 is up, line protocol is up
  Hardware is AmdFE, address is 0000.1644.28ed (bia 0000.1644.28ed)
  Internet address is 172.20.54.155/29
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:01, 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 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     342 packets input, 117639 bytes
     Received 316 broadcasts, 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
     94 packets output, 6390 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Verifying Laser Frequency

The laser frequency (channel number) corresponds with the frequency label on the transponder faceplate. Make sure that the laser frequency (channel number) is configured to the proper wavelength using the **show interfaces wave** command. Compare the frequency with the expected frequency as shown by the **show optical wavelength mapping** command.

Note In case the frequency does not match the expected result, check to make sure that the transponder is installed in the correct subslot. For more information on shelf rules, refer to the *Cisco ONS 15540 ESP Planning Guide*.

```
Switch# show interfaces wave 11/3
Wave11/3 is up, line protocol is up
  Channel: 32   Frequency: 195.9 Thz   Wavelength: 1530.33 nm
  Active Wavepatch         : Wavepatch11/3/1
  Splitter Protected       : No
  Signal quality           : Good
  Receiver power level     : -26.54 dBm
  Forward laser control    : Off
  Laser safety control     : Off
  Osc physical port        : No
  Wavelength used for inband management: No
  Loopback not set

  Configured threshold Group: None
  Section code violation error count(bip1): 1
  Number of errored seconds(es): 1
  Number of severely errored seconds(ses): 0
  Number of severely errored framing seconds(sefs): 0

  Last clearing of "show interface" counters 00:02:33
  Hardware is data_only_port
```

Table 4-8 lists the channels, wavelengths, and frequencies for each band.

Table 4-8 Channel to Wavelength Mapping

Cisco ONS 15540 Band	Cisco ONS 15540 Channel	ITU Channels	ITU Wavelength[1]	ITU Frequency[2]
OSC[3]		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

Table 4-8 Channel to Wavelength Mapping (continued)

Cisco ONS 15540 Band	Cisco ONS 15540 Channel	ITU Channels	ITU Wavelength[1]	ITU Frequency[2]
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

1. Wavelengths in vacuum in nm
2. Frequency in THz, 100 GHz grid
3. OSC = optical supervisory channel

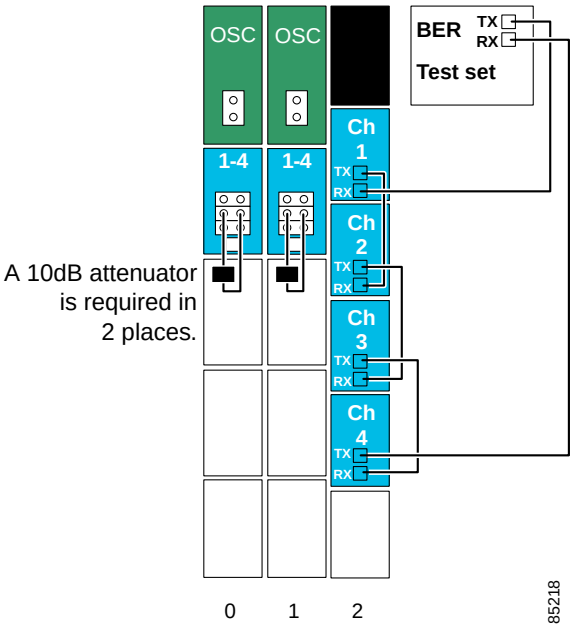
Testing the Bit Error Rate

Perform the following procedure to test bit error rate errors:

Step 1 Measure the power level on the BER test transmit and use appropriate attenuation. Connect the BER test set transmit port to the receive port of the first transponder interface to be tested.

Step 2 Measure the power level on all the interfaces using the hand-held power meter. Daisy-chain the remaining interfaces with the appropriate attenuation (approximately 5 dB) in between. The transmit port of the last interface connects to the receive port of the BER test set (see Figure 4-2).

Figure 4-2 Testing Bit Error Rate



Step 3 Loop back the WDM interfaces on the mux/demux modules on slot 0 and slot 1 that connect to the trunk fiber. For systems with splitter motherboards, add 5dB of attenuators to make sure that the laser receive power is not too high. For non-splitter motherboards, add 10 dB of attenuation to make sure that laser receive power is not too high.

Step 4 Clear all errors on the BER test set.

Step 5 Perform a **show interface** command for each transponder interface.

Step 6 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 7 If the system uses splitter protection, perform a **shutdown** command on the active wavepatch interface and a **no shut** command on the inactive wavepatch interface.

Step 8 Clear all errors on the BER test set.

Step 9 Perform a **show interface** command for each transponder interface.

Step 10 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.

Checking Alarms

Verify that alarms are generated for the following common fault conditions.

Table 4-9 Verifying Alarms are Generated for Common Fault Conditions

Action	Alarm Generated
Remove the client Rx and verify that a loss of light alarm is generated. Perform the **show facility-alarm status** command.	Loss of light alarm on the client Rx
Remove the trunk cable and verify a loss of light alarm on the wave interface. Perform the **show facility-alarm status** command.	Loss of light alarm on the wave interface
Use a SONET analyzer to inject errors such as loss of frame, and verify that corresponding alarms are generated. To perform this test, you must have either an SM transponder that is configured for SONET, an MM transponder that is configured for SONET, or an extended range transponder that has a SONET SFP. Perform the **show facility-alarm status** command.	There should be an alarm generated according to the injected error.
Configure threshold levels for signal degrade and signal fail (use the **show threshold list** command to see current threshold levels). Use the analyzer to degrade the signal by injecting errors, and verify that a threshold alarm is displayed.	Signal degrade and signal fail threshold alarms

Example

The following example shows how do display the alarm status information:

```
Switch# show facility-alarm status
Source: Chassis         Severity: CRITICAL Description: 0    Chassis fan tray missing
Source: Transponder SC  Severity: MAJOR    Description: 0    Access to Tsp card failed
Source: Transponder SC  Severity: MINOR    Description: 1    Access to IDPROM failed
Source: Transponder SC  Severity: MAJOR    Description: 2    Line laser failure detected
```

Verifying Redundancy of Dual Processor Cards

The Cisco ONS 15540 ESP runs in redundant mode only if certain conditions are met. Verify that the prerequisites in Table 4-10 have been met. Then perform the commands as described in the following table.

Table 4-10 Prerequisites for Installing a Redundant Processor Card

Requirement	Notes
Two processor cards are required. The processor cards have identical hardware configurations.	The processor cards must have identical configurations such as DRAM size. Perform a **show redundancy capability** command.
Both processor cards have the same functional image.	After power up, this can be verified with a **show hardware** command.
Both processor cards are running compatible system images.	System images are compatible across one major release.
Both the running and startup configurations are automatically synchronized between the processor cards.	Perform a **show redundancy** command. Verify that the running and startup configurations are listed as synchronized.
Both processor cards are set to autoboot (default setting).	Perform a **show version** command. Verify that the configuration register reads 0x2102.

These examples show the output of the **show redundancy capability**, **show redundancy**, and **show version** commands. The **show redundancy** command displays capabilities for the active and standby processor cards. Verify that all results in the Sby Compat columns indicate 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         3.5    OK          CPU hardware major.minor version
   1.20        1.18   OK          CPU functional major.minor version

Linecard driver major.minor versions, (counts: Active=18, Standby=18)

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

```
   1.1        1.1     OK          0x100F Modular 8-ch Mux/Demux plus OSC
   1.1        1.1     OK          0x1010 Mux-Demux Motherboard, no OSC
   1.1        1.1     OK          0x1011 Line Card Motherboard, no splitter

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=2, Standby=2

 Active CPU  Sby CPU   Sby Compat  Cl ID  Redundancy Client description
 ---------- ---------- ----------- ----- -----------------------------------
 ver  1-1   ver  1-1   OK          17    CPU Redundancy
 ver  1-1   ver  1-1   OK          6     OIR Client

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   N/A                  N/A
 description_str            YES   Manhattan_Backplane_PHASE_0
                                                       Manhattan_Backplane_PHASE_0
 board_part_num_str         YES   73-5655-03           73-5655-03
 board_revision_str         YES   02                   02
 serial_number_str          YES   TBC05031572          TBC05031572
 date_of_manufacture_str    YES   02/16/2001           02/16/2001
 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
 snmp_oid_substr            NO    0
 schematic_num_str          YES   92-4113-03           92-4113-03
 hardware_major_version     YES   3                    3
 hardware_minor_version     YES   0                    0
 engineering_use_str        YES   1                    1
 crc16                      OK    5913                 24184
 user_track_string          NO    lab
 diagst                     YES   ^A                    ^A
 board_specific_revision    YES   1                    1
 board_specific_magic_number YES  153                  153
 board_specific_length      YES   56                   56
 mac_address_block_size     YES   16                   16
 mac_address_base_str       YES   0000164428fb0        0000164428fb0
 cpu_number                 OK    1                    1
 optical_backplane_type     YES   255                  255
```

Perform a **show redundancy** command. Verify that the running and startup configurations are listed as synchronized, as shown in the highlighted portion of the output.

```
Redundant system information
-----------------------------
Available Uptime:              14 minutes
sysUpTime (switchover clears): 14 minutes
Switchover Count:              0

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

Last Running Config sync:      0 minutes
Running Config sync status:    In Sync
Last Startup Config sync:      0 minutes
```

```
Startup Config sync status:    In Sync

This CPU is the Active CPU.
-------------------------------
Slot:                          7
Time since CPU Initialized:    14 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.1(10)EV2,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File:                    bootflash:ons15540-i-mz.121-10.EV2
Software Redundancy State:     ACTIVE
Hardware State:                ACTIVE
Hardware Severity:             0

Peer CPU is the Standby CPU.
-------------------------------
Slot:                          6
Time since CPU Initialized:    0 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.1(10)EV2,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File (on sby-CPU):       bootflash:ons15540-i-mz.121-10.EV2
Software Redundancy State:     STANDBY HOT
Hardware State:                STANDBY
Hardware Severity:             0
Privilege Mode:                Enabled
```

Perform a **show version** command. Verify that the configuration register reads 0x2102, as shown in the highlighted portion of the output.

```
Switch# show version
Cisco Internetwork Operating System Software
IOS (tm) ONS-15540 Software (ONS15540-I-M), Version 12.1(10)EV2, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Mon 07-Oct-02 13:30 by eaarmas
Image text-base: 0x60010950, data-base: 0x60700000

ROM: System Bootstrap, Version 12.1(10r)EV1, RELEASE SOFTWARE (fc1)
BOOTLDR: ONS-15540 Software (ONS15540-I-M), Version 12.1(10)EV2, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)

man4 uptime is 16 minutes
System returned to ROM by reload at 15:00:43 PDT Mon Oct 21 2002
System restarted at 15:01:32 PDT Mon Oct 21 2002
System image file is "bootflash:ons15540-i-mz.121-10.EV2"

cisco ONS15540 (RM7000) processor with 98304K/32768K bytes of memory.
R7000 CPU at 234Mhz, Implementation 39, Rev 2.1, 256KB L2, 2048KB L3 Cache

Last reset from s/w nmi
2 FastEthernet/IEEE 802.3 interface(s)
509K bytes of non-volatile configuration memory.

16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
16384K bytes of Flash internal SIMM (Sector size 256K).
Standby CPU is up
Standby CPU has 98304K/32768K bytes of memory.
Configuration register is 0x2102
```