CHAPTER 5

Network Verification Procedures

After completing the tests on all nodes, the installer should perform the following network-level verification procedures.

Note Before performing the procedures in this section, the nodes must have been installed and configured. All cabling must be complete.

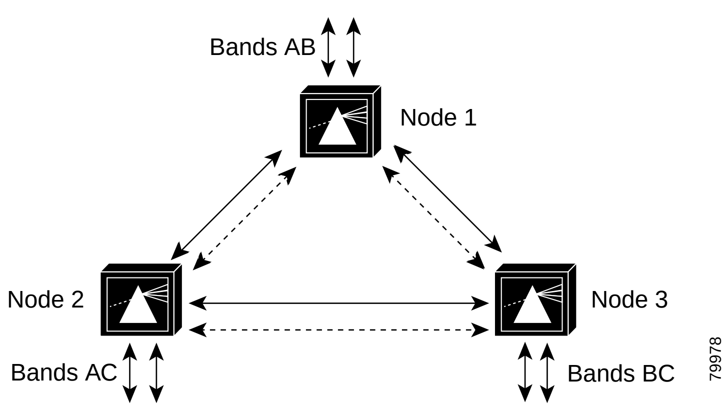
This chapter contains the following major sections:

Performing System Span Testing

This section describes how to perform system span testing in a meshed ring configuration.

A meshed ring is a physical ring that has the logical characteristics of a mesh. While traffic travels on a physical ring, the logical connections between individual nodes are meshed. An example of this type of configuration, which is sometimes called a *logical mesh*, is shown in Figure 5-1.

Figure 5-1 Meshed Ring Topology Example



Verifying a Meshed Ring Configuration

This example procedure shows how to verify the path of each band in a meshed ring. You will test each band in both directions around the ring. Record test measurements in Table A-4 in Appendix A, "Node Data Checklist."

Note Prior to performing this procedure, the node must be installed and configured and all cabling must be completed. To optimize the power budget, mux/demux cabling should be done to minimize insertion loss.

Note You must modify this procedure according to the design of your own meshed ring by testing each node pair for each band in your ring.

Step 1 Make sure that necessary configuration for that particular chassis and interfaces are followed as described above. The specific data rate corresponding to the generator should be configured on the interfaces.

Step 2 Connect a signal generator to node 1 and loopback the transponder at the peer node for band A, node 2.

Step 3 Using an Optical Spectrum Analyzer, measure and record the wavelengths and their optical power on band A between node 1 and node 2. Take measurements at Trunk Out of slot 0 of node 1, and at the Trunk In of slot 1 of node 2.

Step 4 In systems with a splitter-protected configuration, perform a **shutdown** command on the active interface on node 1, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

On node 2, also perform a **shutdown** command on the active interface, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

Step 5 Using an OSA, measure and record the wavelengths and their optical power on band A between node 2 and peer node 1. Take measurements at the Trunk Out of slot 0 of node 2, and at the Trunk In of slot 1 of node 1.

Step 6 Connect a signal generator to node 2 and loopback the transponder at the peer node for band C, node 3.

Step 7 Using an OSA, measure and record the wavelengths and their optical power on band C between node 2 and node 3. Take measurements at the Trunk Out of slot 0 of node 2, and at Trunk In of slot 1 of node 3.

Step 8 In systems with a splitter-protected configuration, perform a **shutdown** command on the active interface on node 2, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

On node 3, also perform a **shutdown** command on the active interface, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

Step 9 Using an OSA, measure and record the wavelengths and their optical power on band C between node 3 and node 2. Take measurements at the Trunk Out of slot 0 of node 3, and at Trunk In of slot 1 of node 2.

Step 10 Connect a signal generator to node 3 and loopback the transponder at the peer node for band B, node 1.

Step 11 Using an OSA, measure and record the wavelengths and their optical power on band B between node3 and node 1. Take measurements at the Trunk Out of slot 0 of node 3, and at Trunk In of slot 1 of node 1.

Step 12 In systems with a splitter-protected configuration, perform a **shutdown** command on the active interface on node 3, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

On node 1, also perform a **shutdown** command on the active interface, and a **no shutdown** command on the inactive interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-intf)# shutdown
Switch(config-intf)# interface wavepatch 2/0/1
Switch(config-intf)# no shutdown
```

Step 13 Using an OSA, measure and record the wavelengths and their optical power on band B between node 1 and node 3. Take measurements at Trunk Out of slot 0 of node 1, and at the Trunk In of slot 1 of node 3.

Step 14 Log into each node and issue the following CLI command to record wavelength and power as seen by Cisco IOS software.

Switch# **show interfaces wave** *slot/subslot*

Step 15 Repeat these tests for all channels on all bands between the nodes.

Step 16 Compare expected results (from network design), recorded/measured results and results as seen by Cisco IOS software.

If the results for a particular wavelength do not match, make sure fibers are fully inserted and transponder modules are inserted in the correct slots. Clean the fibers and connectors, and rerun the test.

If the results still do not match, there may be a hardware problem. On the Cisco ONS 15540 ESP, there may be a problem with the optical backplane. Remove the transponder module and install it in another slot, and rerun the test. Otherwise, there may be a problem with the transponder generating that wavelength.

Checking Connectivity between OSCs

Perform this procedure for each pair of neighbor nodes to check connectivity between OSCs.

Step 1 Use the **show oscp interface** command to display OSCP (Optical Supervisory Channel Protocol) status information for the OSC interfaces.

The following example shows how to display status information for the local and remote interfaces running OSCP.

```
Switch# show oscp interface wave 0
Codes: Bndl - bundling identifier, Pri - OSCP selection priority
       OSCP - dedicated wavelength channel, CDL - in-band wavelength channel

OSCP Interface(s)
 Local Port    Port ID Type Status  OSCP St Bndl Pri  Rem Port ID Rem Node Id
 ~~~~~~~~~~~~~ ~~~~~~~ ~~~~ ~~~~~~  ~~~~~~~ ~~~~ ~~~  ~~~~~~~~~~~ ~~~~~~~~~~~~~~
  Wave0         1000000 OSCP  Active  2way      0   0  1000000     0000.1644.28fb
```

Step 2 Verify that Active is displayed under the Status field. This indicates that the local port status is active.

If the status is not Active, the interface is not enabled. Perform a **no shutdown** command.

```
Switch# configure terminal
Switch(config)# interface wave 0
Switch(config-intf)# no shutdown
```

Step 3 Verify that 2way is displayed under the OSCP St field. This indicates that Hello messages have been received from the neighbor indicating that the neighbor has received Hello packets from this node.

Checking CDP Connectivity

Use the **show cdp neighbors** command to check whether the node can see other nodes in the topology.

Ping the node IP address.

```
Switch# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
man4             Wave1              127         R S       ONS15540  Wave1
man4             Wave0              127         R S       ONS15540  Wave0
```

Checking Power with an OSA

Perform this test to compare the measured power levels to the expected power levels given by a network design tool or by the result of a manual design power calculation. The measured power should be within an acceptable range from the expected power.

Use the wavelength spectrum application of an OSA to perform the following tests. Take measurements at several points in the ring.

Step 1 Check the channel count and power from the wavelength screen.

Step 2 Check the equalization of power. The wavelength screen displays the power peaks and the table format screen displays the measurements.

Step 3 Check the Optical Signal to Noise Ratio (OSNR) of each wavelength on each line fiber. The OSNR figures are listed in the table format screen.

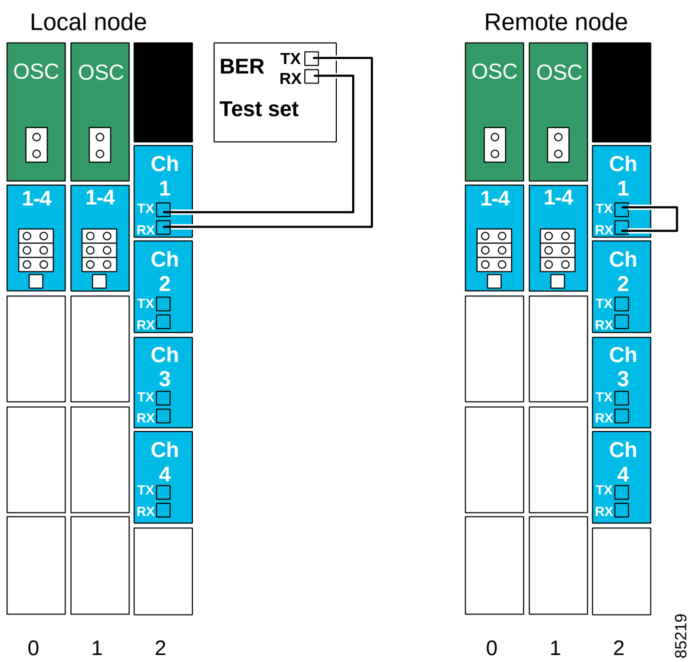
Testing the Bit Error Rate

Perform the following procedure to test bit error rate errors for each wavelength:

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

Step 2 At the peer node, loopback the transponder interface supporting the same channel (Figure 5-2) with appropriate attenuation (typically 5 dB).

Figure 5-2 Testing Bit Error Rate



Step 3 Clear all errors on the Bit Error Rate (BER) test set.

Step 4 Start the traffic with the BER test set.

Step 5 Perform a show interface command for the transponder interface.

Step 6 Verify that the BER test runs error free for 15 minutes.

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

Step 8 Clear all errors on the BER test set.

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

Step 10 Verify that the BER test runs error free for 15 minutes.

Step 11 Repeat this test for all channels on every node.