



Basic Network Verification Procedures

This chapter describes the procedures for basic network-level verification.



Note

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



Note

This chapter contains preliminary procedures for network 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-23 Verify the Optical Power Budget Between Nodes, page 5-2](#)—Complete this procedure to verify the power of the signal between two nodes.
 - Step 2** [NTP-24 Verify the Connectivity Between OSC Modules, page 5-3](#)—Complete this procedure to verify the connectivity between the OSC modules on separate nodes.
 - Step 3** [NTP-25 Verify the Topology Neighbor Connectivity, page 5-4](#)—Complete this procedure to verify the network topology connectivity on the network.
 - Step 4** [NTP-26 Verify the Power Levels, page 5-4](#)—Complete this procedure to verify the channel power levels on the node.
 - Step 5** [NTP-27 Test the Optical Transmission Quality, page 5-5](#)—Complete this procedure to verify the status of the optical signal transmission between nodes.
 - Step 6** [NTP-28 Verify the Optical Signal Protection Configuration, page 5-8](#)—Complete this procedure to verify the correct configuration and functioning of APS on the network.
-

You need the following test equipment:

- OSA (optical spectrum analyzer)
- BER test set (for 2.5-Gbps traffic)
- SONET analyzer or Ethernet analyzer (for 2.5-Gbps traffic)
- Native 10-GE traffic generator and traffic analyzer set (for 10-GE traffic)

NTP-23 Verify the Optical Power Budget Between Nodes

Purpose	This procedure verifies the optical power budget between the nodes.
Tools/Equipment	Traffic generator OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-31
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged



Note

Record the test measurements in [Table A-4](#) in [Appendix A, “Node Data Record.”](#)



Note

Prior to performing this procedure, each node must be installed and configured and all cabling must be completed. To optimize the power budget, OADM module cabling should be done to minimize insertion loss.

- Step 1** Set the data rate on the traffic generator based on the protocol rate or clock rate configured on the interfaces.
- Step 2** Connect a traffic generator to the client ports on the local node and loop back the client TX and RX ports at the remote peer node.
- Step 3** Use an OSA to measure and record the wavelengths and the optical power of the band added and dropped on the shelf. Take measurements at the TRUNK_OUT port on the OADM module local node, and at the TRUNK_IN port on the OADM module on the remote peer node.
- Step 4** On systems with splitter protected configurations, perform a **shutdown** command on the active interface on node 1, and a **no shutdown** command on the standby interface. For example:
- ```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-if)# shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 2/0/1
Switch(config-if)# no shutdown
```
- Repeat [Step 3](#).
- Step 5** For 2.5-Gbps transponder modules, issue **show interfaces wave** commands on each node for all wave interfaces and record wavelength and power displayed in the command outputs.
- Step 6** For 10-GE transponder modules, issue **show interfaces waveethernetphy** commands on each node for all waveethernetphy interfaces and record wavelength and power displayed in the command outputs.

- Step 7** Compare the expected results from the network design, the results recorded in [Step 3](#), and the results from the command outputs.
- If the results for a particular wavelength do not match, make sure the connectors are fully inserted and the transponder modules are correctly installed. Clean the fibers and connectors, if necessary. Rerun the test.
- If the results still do not match, there might be a hardware problem or incorrect calibration in the transponder module IDPROM.
- Step 8** Go to the remote peer node and repeat [Step 2](#) through [Step 7](#) for the opposite direction.
- 

## NTP-24 Verify the Connectivity Between OSC Modules

|                                |                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This procedure verifies the connectivity between the OSC modules on two adjacent nodes. |
| <b>Tools/Equipment</b>         | None                                                                                    |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a>                       |
| <b>Required/As Needed</b>      | As needed                                                                               |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                        |
| <b>Security Level</b>          | Privileged                                                                              |

---

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

```
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 in the Status column. 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 on the OSC wave interface.
- Step 3** Verify that 2way is displayed in the OSCP St column. This indicates that the local node has received Hello messages from the neighbor node and verifies that the neighbor has received Hello packets from the local node.
-

## NTP-25 Verify the Topology Neighbor Connectivity

|                                |                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This procedure verifies connectivity of neighboring nodes in the network topology. |
| <b>Tools/Equipment</b>         | None                                                                               |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a>                  |
| <b>Required/As Needed</b>      | Required                                                                           |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                   |
| <b>Security Level</b>          | Privileged                                                                         |

---

**Step 1** Use the **show topology neighbor detail** command to verify network neighbors in the topology.

```
Switch# show topology neighbor detail
Physical Topology:

Local Port: Wdm0/0
Neighbor Node : node3
Neighbor Port : Wdm1/0
Neighbor Agent Address: 172.20.50.21
Neighbor Discovery : Via CDP (Proxy Port: Wave1)
Link Direction : Both

Local Port: Wdm1/0
Neighbor Node : node1
Neighbor Port : Wdm0/0
Neighbor Agent Address: 172.20.42.27
Neighbor Discovery : Via CDP (Proxy Port: Wave0)
Link Direction : Both
```

**Step 2** Use the **ping** command on the IP addresses listed for the network neighbors to verify connectivity.

**Step 3** If the **ping** command fails, recheck the IP configuration on each node.

---

## NTP-26 Verify the Power Levels

|                                |                                                                                                                                                                  |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This procedure verifies the expected power levels provided by a network design. The measured power should be within an acceptable range from the expected power. |
| <b>Tools/Equipment</b>         | OSA (optical spectrum analyzer)                                                                                                                                  |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-15 Verify the Interface Status, page 4-2</a>                                |
| <b>Required/As Needed</b>      | Required                                                                                                                                                         |
| <b>Onsite/Remote</b>           | Onsite                                                                                                                                                           |
| <b>Security Level</b>          | Privileged                                                                                                                                                       |

---

**Step 1** Connect the OSA to the TAP.

- Step 2** Use the wavelength spectrum application to verify the channel count and power on the wavelength screen of the OSA.
- Step 3** Verify the channel power equalization. The wavelength screen displays the power peaks and the table format screen displays the measurements.
- Step 4** Verify the optical signal-to-noise ratio (OSNR) of each channel on each line fiber. The OSNR figures are listed in the table format screen on the OSA.
- Step 5** Repeat these steps for all nodes in the topology.
- 

## NTP-27 Test the Optical Transmission Quality

|                                |                                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This procedure tests optical transmission quality between the nodes that add and drop the same channel.                                       |
| <b>Tools/Equipment</b>         | BER test set for 2.5-Gbps transponder modules<br>Native 10-GE traffic analyzer for 10-GE transponder modules                                  |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-19 Verify the Optical Power and Frequency, page 4-15</a> |
| <b>Required/As Needed</b>      | Required                                                                                                                                      |
| <b>Onsite/Remote</b>           | Onsite                                                                                                                                        |
| <b>Security Level</b>          | Privileged                                                                                                                                    |

---

- Step 1** As needed, complete the “[DLP-72 Test 2.5-Gbps Transponder Module Transmission Quality](#)” task on [page 5-5](#).
- Step 2** As needed, complete the “[DLP-73 Test 10-GE Transponder Module Transmission Quality](#)” task on [page 5-7](#).
- 

## DLP-72 Test 2.5-Gbps Transponder Module Transmission Quality

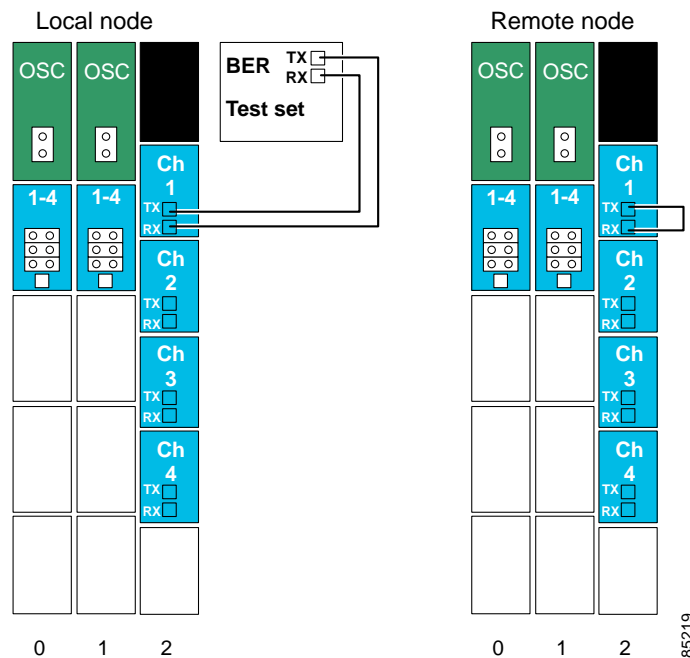
|                                |                                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This task tests optical transmission quality of 2.5-Gbps transponder modules between the nodes that add and drop the same channel.            |
| <b>Tools/Equipment</b>         | BER test set                                                                                                                                  |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-19 Verify the Optical Power and Frequency, page 4-15</a> |
| <b>Required/As Needed</b>      | As needed                                                                                                                                     |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                                                                              |
| <b>Security Level</b>          | Privileged                                                                                                                                    |

- Step 1** Connect the BER test set transmit port and receive port to the client RX port and client TX port, respectively, on the 2.5-Gbps transponder module on the local node.
- Step 2** Loop back the client TX port to the client RX port on the 2.5-Gbps transponder module supporting the same channel on the remote node with appropriate attenuation. See the example setup in [Figure 5-1](#).



**Note** Determine the attenuation using the power values recorded in the “[DLP-66 Verify the Power Levels on the 2.5-Gbps Transponder Module Client Interfaces](#)” task on page 4-18.

*Figure 5-1 Example Setup for 2.5-Gbps Transponder Modules*



- Step 3** Clear all errors on the BER test set.
- Step 4** Start the traffic with the BER test set.
- Step 5** Verify that the test runs error free for 15 minutes.
- Step 6** If the 2.5-Gbps transponder module has splitter protection, perform the following steps:
- Issue **shutdown** commands on the active wavepatch interfaces on both nodes.
  - Issue **no shutdown** commands on the standby wavepatch interfaces on both nodes.
  - Perform [Step 3](#) through [Step 5](#) on the client interface.
- Step 7** Verify that the test runs error free for 15 minutes.
- Step 8** Repeat [Step 1](#) through [Step 7](#) for all client interfaces on every node in the network.

## DLP-73 Test 10-GE Transponder Module Transmission Quality

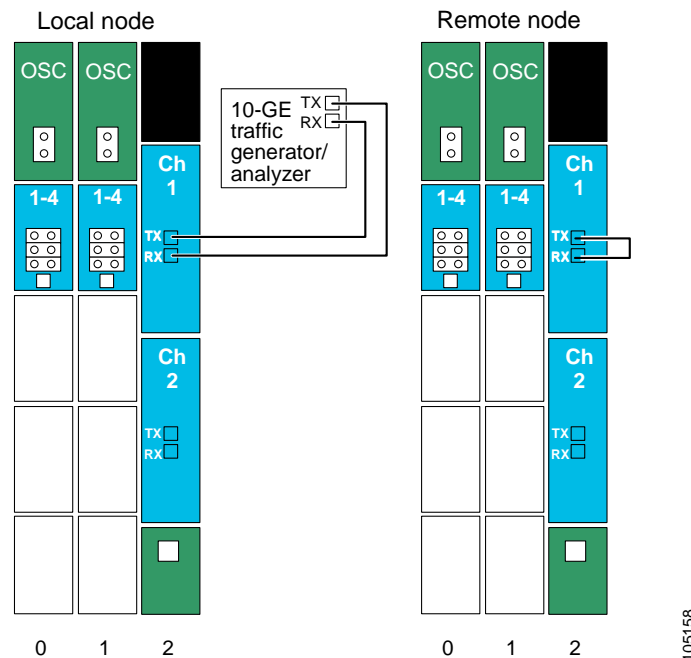
|                                |                                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This task tests optical transmission quality of 10-GE transponder modules between the nodes that add and drop the same channel.               |
| <b>Tools/Equipment</b>         | Native 10-GE traffic analyzer                                                                                                                 |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-19 Verify the Optical Power and Frequency, page 4-15</a> |
| <b>Required/As Needed</b>      | As needed                                                                                                                                     |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                                                                              |
| <b>Security Level</b>          | Privileged                                                                                                                                    |

- Step 1** Connect the traffic generator transmit port to the 10-GE transponder module client RX port on the local node.
- Step 2** Connect the traffic analyzer receive port to the 10-GE transponder module client TX port on the local node.
- Step 3** Loop back the client TX port to the client RX port on the 10-GE transponder module supporting the same channel on the remote node with appropriate attenuation. See the example setup in [Figure 5-2](#).



**Note** Determine the attenuation using the power values recorded in the “[DLP-67 Verify the Power Levels on the 10-GE Transponder Module Client Interfaces](#)” task on page 4-22.

*Figure 5-2 Example Setup for 10-GE Transponder Modules*



105158

- Step 4** Clear all errors on the traffic analyzer.
- Step 5** Start the traffic generator.
- Step 6** Verify that the test runs error free for 15 minutes.
- Step 7** If the 10-GE transponder module has splitter protection, perform the following steps:
- Issue **shutdown** commands on the active wavepatch interfaces on both nodes.
  - Issue **no shutdown** commands on the standby wavepatch interfaces on both nodes.
  - Perform [Step 3](#) through [Step 5](#) on the client interface.
- Step 8** Verify that the test runs error free for 15 minutes.
- Step 9** Repeat [Step 1](#) through [Step 7](#) for all client interfaces on every node in the network.
- 

## NTP-28 Verify the Optical Signal Protection Configuration

|                                |                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This procedure describes how to verify that APS configuration is correctly configured and that it is operating properly. |
| <b>Tools/Equipment</b>         | SONET analyzer                                                                                                           |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a>                                                        |
| <b>Required/As Needed</b>      | As needed                                                                                                                |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                                                         |
| <b>Security Level</b>          | Privileged                                                                                                               |

---

- Step 1** Complete the “[DLP-74 Verify the APS Configuration](#)” task on page 5-8.
- Step 2** As needed, complete the “[DLP-75 Verify the Splitter Protection Operation](#)” task on page 5-9.
- Step 3** As needed, complete the “[DLP-76 Verify the Y-Cable Protection Operation](#)” task on page 5-10.
- Step 4** As needed, complete the “[DLP-77 Verify the Trunk Fiber Based Protection Operation](#)” task on page 5-11.
- 

## DLP-74 Verify the APS Configuration

|                                |                                                                   |
|--------------------------------|-------------------------------------------------------------------|
| <b>Purpose</b>                 | This task verifies the APS configuration on the system.           |
| <b>Tools/Equipment</b>         | None                                                              |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a> |
| <b>Required/As Needed</b>      | As needed                                                         |
| <b>Onsite/Remote</b>           | Onsite or remote                                                  |
| <b>Security Level</b>          | Privileged                                                        |



**Step 1** Issue a **show aps group** command for each APS group on both nodes in the topology.

```
Switch# show aps group sonet-group

APS Group sonet-group :

 architecture.: 1+1, remote prov: 1+1
 span.....: end-to-end
 prot. mode...: client side y-cable
 direction...: prov: bi, current: bi, remote prov: bi
 revertive....: no
 aps state....: enabled (associated)
 request timer: holddown: 5000 ms, max: 15000 ms, count 2
 msg-channel...: auto (up on osc)
 created.....: 17 hours, 10 minutes
 auto-failover: enabled
 transmit k1k2: reverse-request, 1, 1, 1+1, bi
 receive k1k2: forced-switch, 1, 1, 1+1, bi
 switched chan: 1
 protection(0): Transparent2/0/0 (ACTIVE - UP), Wave2/0 (UP)
 : channel request: no-request
 : switchover count: 2
 : last switchover: 15 hours, 14 minutes
 working...(1): Transparent4/0/0 (STANDBY - UP), Wave4/0 (UP)
 : channel request: no-request
 : switchover count: 3
 : last switchover: 14 hours, 41 minutes
```

- Step 2** Check the prot. mode field for the state of the protection switching. For each APS group, both nodes should be configured with the same type of protection switch, either unidirectional (uni) or bidirectional (bi).
- Step 3** Check the aps state field for the status of each APS group. The state should be enabled and associated. If it is not enabled, perform an **aps enable** command on the APS group.
- Step 4** Check the protection and working fields for the state of the interfaces. Both should be UP. If they are not up, perform **no shutdown** commands on the interfaces on both nodes.
- Step 5** Check the msg-channel field for the state of the message channel for the APS channel messages. The state should be up. If the message channel is not up, check the status of the OSC and OSCP, and the configuration of the patch connections for the OSC modules and OADM modules on both nodes.

## DLP-75 Verify the Splitter Protection Operation

|                                |                                                                                                                               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This task verifies the operation of the splitter protection configuration on your network.                                    |
| <b>Tools/Equipment</b>         | SONET analyzer or Ethernet analyzer (for 2.5-Gbps traffic)<br>10-GE traffic analyzer (for 10-GE traffic)                      |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-26 Verify the Power Levels, page 5-4</a> |
| <b>Required/As Needed</b>      | As needed                                                                                                                     |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                                                              |
| <b>Security Level</b>          | Privileged                                                                                                                    |

**Note**

To perform these measurements with a SONET analyzer, you must have SM transponder modules or MM transponder modules configured to SONET OC-3 or OC-12 protocol encapsulation. Otherwise, use an Ethernet analyzer, measure how many frames are lost, and divide by the frame rate to determine the restoration time.

- 
- Step 1** To verify restoration time after a fiber break on the trunk, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Disconnect the active trunk fiber.
  - Verify that the restoration time is less than 50 ms.
- Step 2** To verify protection switching from the working path to the protection path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch *group-name* manual working-to-protection**
  - Verify that the restoration time is less than 50 ms.
- Step 3** To verify protection switching from the protection path to the working path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch *group-name* manual protection-to-working**
  - Verify that the restoration time is less than 50 ms.
- Step 4** Enter an **aps clear *group-name*** to remove all APS switchover requests.
- Step 5** For bidirectional switching configurations, repeat [Step 1](#) through [Step 4](#) on the remote node.
- 

## DLP-76 Verify the Y-Cable Protection Operation

|                                |                                                                                                                               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This task verifies the operation of the y-cable protection configuration on your network.                                     |
| <b>Tools/Equipment</b>         | SONET analyzer or Ethernet analyzer (for 2.5-Gbps traffic)<br>10-GE traffic analyzer (for 10-GE traffic)                      |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-26 Verify the Power Levels, page 5-4</a> |
| <b>Required/As Needed</b>      | As needed                                                                                                                     |
| <b>Onsite/Remote</b>           | Onsite or remote                                                                                                              |
| <b>Security Level</b>          | Privileged                                                                                                                    |



**Note** To perform these measurements with a SONET analyzer, you must have SM transponder modules or MM transponder modules configured to SONET OC-3 or OC-12 protocol encapsulation. Otherwise, use an Ethernet analyzer, measure how many frames are lost, and divide by the frame rate to determine the restoration time.

- 
- Step 1** To verify restoration time after removing an active transponder module, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Remove the active transponder module.
  - Verify that the restoration time is less than 50 ms.
- Step 2** To verify restoration time after a fiber break on the trunk, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Disconnect the active trunk fiber.
  - Verify that the restoration time is less than 50 ms.
- Step 3** To verify protection switching from the working path to the protection path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch group-name manual working-to-protection**
  - Verify that the restoration time is less than 50 ms.
- Step 4** To verify protection switching from the protection path to the working path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch group-name manual protection-to-working**
  - Verify that the restoration time is less than 50 ms.
- Step 5** Enter an **aps clear group-name** to remove all APS switchover requests.
- Step 6** For bidirectional switching configurations, repeat [Step 1](#) through [Step 5](#) on the remote node.
- 

## DLP-77 Verify the Trunk Fiber Based Protection Operation

|                                |                                                                                                                               |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | This task verifies the operation of the trunk fiber based protection configuration on your network.                           |
| <b>Tools/Equipment</b>         | SONET analyzer or Ethernet analyzer                                                                                           |
| <b>Prerequisite Procedures</b> | <a href="#">NTP-14 Verify the System Configuration, page 3-31</a><br><a href="#">NTP-26 Verify the Power Levels, page 5-4</a> |
| <b>Required/As Needed</b>      | As needed                                                                                                                     |

|                       |                  |
|-----------------------|------------------|
| <b>Onsite/Remote</b>  | Onsite or remote |
| <b>Security Level</b> | Privileged       |

**Note**

To perform these measurements with a SONET analyzer, you must have 2.5-Gbps transponder modules configured to SONET OC-3 or OC-12 protocol encapsulation. Otherwise, use an Ethernet analyzer, measure how many frames are lost, and divide by the frame rate to determine the restoration time.

- 
- Step 1** To verify restoration time after a fiber break on the trunk, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Disconnect the trunk fiber the active PSM.
  - Verify that the restoration time is less than 50 ms.
- Step 2** To verify protection switching from the working path to the protection path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch *group-name* manual working-to-protection**
  - Verify that the restoration time is less than 50 ms.
- Step 3** To verify protection switching from the protection path to the working path, perform these steps:
- Connect a SONET analyzer (with service time disruption measurement) to the client side.
  - Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:  
**aps switch *group-name* manual protection-to-working**
  - Verify that the restoration time is less than 50 ms.
- Step 4** Enter an **aps clear *group-name*** to remove all APS switchover requests.
- Step 5** For bidirectional switching configurations, repeat [Step 1](#) through [Step 4](#) on the remote node.
-