

**NTN469GF**

**323-1059-222**

Nortel Networks

# **OPTera Metro 3500 Multiservice Platform System Testing**

Standard Release 12.0 Issue 1 November 2003

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## ***What's inside...***

**Safety instructions**

**System testing**

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# About this document

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This document describes how to

- test the signal continuity and protection switching in non-DWDM system
- test the signal continuity and protection switching in DWDM system

## Supported software

This document supports the software release for Nortel Networks OPTera Metro 3500 Multiservice Platform Release 12.0.

## Supported hardware

This document supports the OPTera Metro 3500 shelf and Universal OPTera Metro 3500 shelf.

## Hardware naming conventions

The following naming conventions are used throughout this document to identify the OPTera Metro 3500 Multiservice Platform hardware:

- the extended shelf processor (SPx) is referred to as the shelf processor
- the extended network processor (NPx) is referred to as the network processor

## Audience

The following members of your company are the intended audience of this Nortel Networks technical publication (NTP):

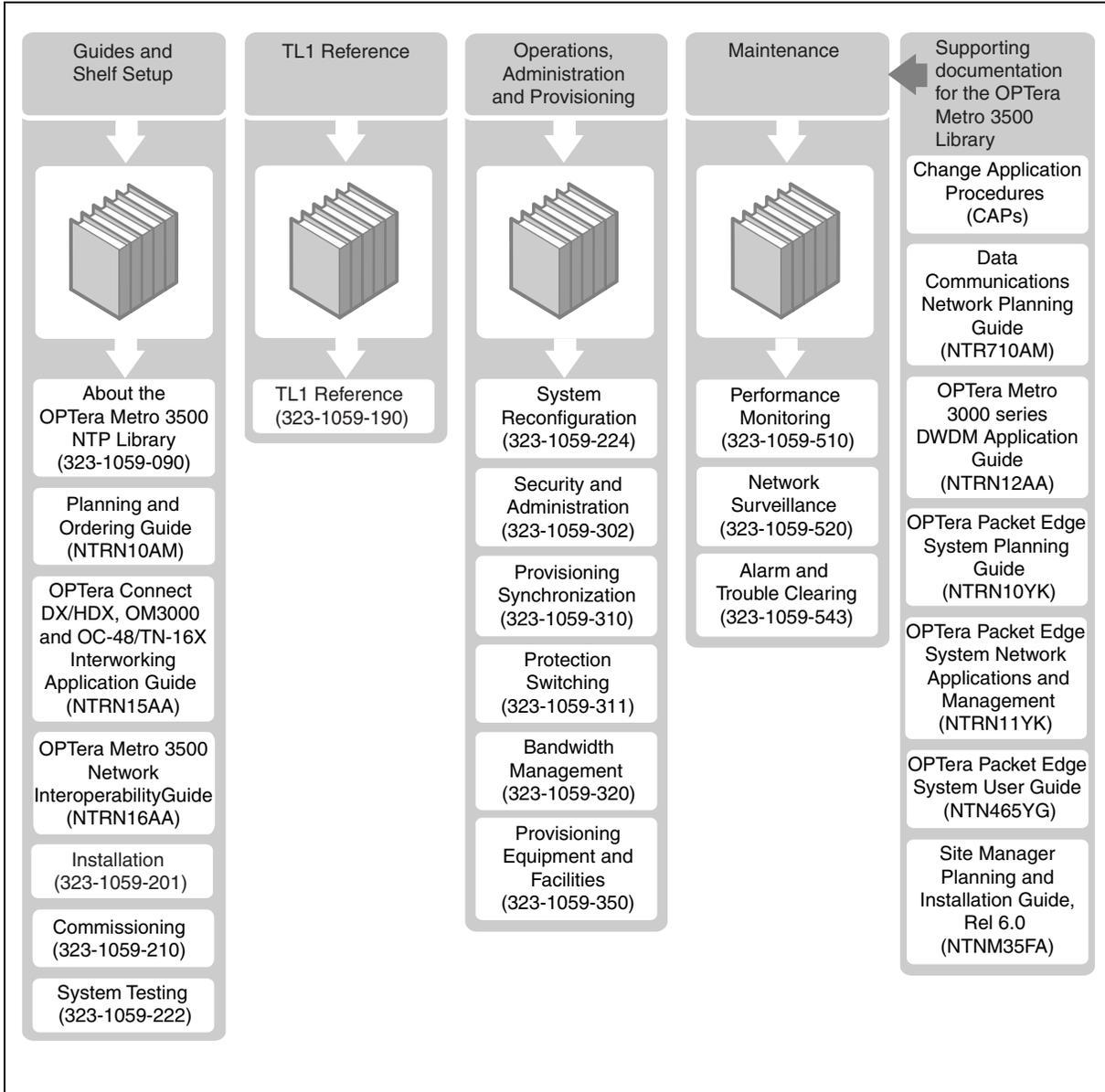
- planners
- provisioners
- network administrators
- transmission standards engineers

## Standards

The Telecommunications Industry Association (TIA) and the Electronics Industries Alliance (EIA) accepted RS-232 as a standard in 1997 and renumbered this standard as TIA/EIA-232. In this document, RS-232 is used to reflect current labels on the hardware and in the software for the OPTera Metro 3500 Multiservice Platform.

# OPTera Metro 3500 NTP library

EX1478p



## Technical support and information

For technical support and information from Nortel Networks, refer to the following table.

<b>Technical Assistance Service</b>	
<p><b>For service-affecting problems:</b> For 24-hour emergency recovery or software upgrade support, that is, for:</p> <ul style="list-style-type: none"> <li>• restoration of service for equipment that has been carrying traffic and is out of service</li> <li>• issues that prevent traffic protection switching</li> <li>• issues that prevent completion of software upgrades</li> </ul>	<p><b>North America:</b> 1-800-4NORTEL (1-800-466-7835)</p> <p><b>International:</b> 001-919-992-8300</p>
<p><b>For non-service-affecting problems:</b> For 24-hour support on issues requiring immediate support or for 14-hour support (8 a.m. to 10 p.m. EST) on non-urgent issues.</p>	<p><b>North America:</b> 1-800-4NORTEL (1-800-466-7835)</p> <p><b>Note:</b> You require an express routing code (ERC). To determine the ERC, see our corporate Web site at <a href="http://www.nortelnetworks.com">www.nortelnetworks.com</a>. Click on the Express Routing Codes link.</p> <p><b>International:</b> Varies according to country. For a list of telephone numbers, see our corporate Web site at <a href="http://www.nortelnetworks.com">www.nortelnetworks.com</a>. Click on the Contact Us link.</p>
<p><b>Global software upgrade support:</b> For non-service affecting software upgrade issues</p>	<p><b>North America:</b> 1-800-4NORTEL (1-800-466-7835)</p> <p><b>International:</b> Varies according to country. For a list of telephone numbers, see our corporate Web site at <a href="http://www.nortelnetworks.com">www.nortelnetworks.com</a>. Click on the Contact Us link</p>



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# Safety instructions

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This section contains safety guidelines that must be followed for personal safety and for correct handling and operation of equipment.

## Warnings and safety precautions

To avoid injury, follow all danger warnings provided with this product and the safety procedures established by your company.

To avoid damage to equipment or service interruptions, follow all caution warnings provided with this product and the safety procedures established by your company.

In this documentation, danger and caution notices look like the following.

**DANGER****Risk of personal injury**

A danger warning with this symbol indicates a risk of personal injury.

**DANGER****Risk of electrical shock**

A danger warning with this symbol indicates a risk of personal injury caused by an electrical hazard.

**CAUTION****Risk of service interruption**

A caution warning with this symbol indicates a risk of service interruption or equipment damage.

**DANGER****Risk of laser radiation exposure**

A danger warning with this symbol indicates a risk of personal injury caused by exposure to a laser beam.



**CAUTION**

**Risk of circuit pack damage**

A caution warning with this symbol is always used to alert the user to use antistatic protection to avoid damaging circuit packs.

**Circuit packs and small form factor pluggable (SFP) modules**

All circuit packs and SFP modules are subject to damage by rough handling or from electrostatic discharge. Review the following information to avoid damaging the circuit packs and SFP modules.

**Avoiding the development of static electricity**

Static electricity charges build up on the body when a person walks a short distance. This static electricity is enough to damage a circuit pack or SFP module. When you work on a shelf, on cables connected to a circuit pack, on a circuit pack, or on an SFP module, always wear a skin-contact ground strap or other appropriate personal grounding device. Ground straps can be the wrist type, or the conductive shoe or heel grounder. Alternatively, your company can provide antistatic protection by mounting the bays on conductive floor coverings.

All circuit packs and SFP modules are shipped in antistatic containers that are marked with the following symbol.

**ATTENTION**  
OBSERVER DES PRECAUTIONS  
POUR LA MANIPULATION. DIS-  
POSITIFS SENSIBLES AUX  
CHARGES STATIQUES



**ATTENTION**  
OBSERVE PRECAUTIONS  
FOR HANDLING ELECTRO-  
STATIC SENSITIVE DEVICES

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## Handling, installing, or replacing circuit packs and SFP modules

**CAUTION****Risk of service interruption**

Using radio communication devices like cellular telephones can cause service interruptions. For example, a -1 W North American cellular telephone must not be used within 30 cm of a system with an open service access front cover.

When handling, installing, or replacing circuit packs and SFP modules, you must observe the following precautions:

- Wear a wrist strap or other static grounding device before removing a circuit pack or SFP module from its package or from a shelf.
- Place each circuit pack or SFP module in an antistatic bag when it is not mounted in a shelf.
- Handle each circuit pack by the faceplate.
- Do not touch the solder side of the circuit pack, the pin connector, or the components.
- Do not stack circuit packs on or against each other.
- Inspect all circuit packs and SFP modules for damage, before installation into the shelf. Inspect all connectors to ensure pins are not damaged.
- Do not force circuit packs and SFP modules into packaging material.
- Cover the connectors of the transmit and receive optical interface circuit packs with clean dust caps at all times.

To prevent damage to circuit packs and SFP modules while in storage, you must prevent the following:

- accumulation of dirt or dust on the pin connectors
- damage to the board or its components

**CAUTION****Risk of service interruption**

Board warpage can occur to boards stored in areas where the humidity exceeds 95% and the temperature exceeds 70° C.

## Transporting circuit packs and SFP modules

When transporting circuit packs or SFP modules, place each circuit pack or SFP module in its original antistatic shielding bag, padding, and box.

## Optical fibers

Optical fibers are either single or multiple strand. The following information and precautions apply to all optical fibers.

### Laser radiation

All Nortel Networks optical products and associated optical test equipment use laser sources that emit light energy into fiber-optic cables. This energy is within the red (visible) and infrared (invisible) areas of the electromagnetic spectrum.

Laser products are subject to federal regulations, state or provincial regulations, and local practices. Regulation 21CFR 1040 of the U.S. Bureau of Radiological Health requires manufacturers to approve each laser product as Class I, II, III, or IV depending on the characteristics of the laser radiation emitted. In terms of health and safety, Class I products present the least hazard (none at all), while class IV products present the greatest hazard.

During testing and maintenance, some procedures require the handling of optical fibers and transmitters with the dust caps removed. Under these conditions, laser radiation within the limits of Class IIIb can be present.

	<p><b>DANGER</b> <b>Risk of personal injury</b> The radiation level produced during testing is of enough amplitude to cause injury to personnel and caution must be exercised to avoid exposure. This precaution applies to any point in the system where the laser signal can be accessed (for example, at the optical connectors on the optical interface circuit packs).</p>
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## Handling optical fibers



### **DANGER**

#### **Risk of personal injury**

Avoid direct exposure to fiber-optic ends or fiber-optic connector ends where the laser signal can be accessed.

Handle fiber-optic cables with caution. Position fiber-optic cables in a safe location during installation.



### **CAUTION**

#### **Risk of equipment damage**

Place all optical fiber cuttings in a appropriate container.

Protect fiber-optic connectors with dust caps when they are not connected.

Follow manufacturer instructions when using an optical test set. Incorrect calibration or control settings can result in hazardous levels of radiation.

## Replacing optical fibers

When there is an accidental break in the fiber-optic cable, power off all laser sources to the cable or disconnect the remote cable end from the laser sources. The sources can be located in a central office, subscriber premises, or a remote location.

## **Radio-frequency emissions**

The following regulatory notice applies to all Nortel Networks SONET transmission products.

This equipment has been tested and found to comply with the limits for a Class A digital device according to Part 15 of the FCC Rules. These limits are designed to provide acceptable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used according to the instruction manual, can cause harmful interference to radio communications. Operation of this equipment in a residential area can cause harmful interference, in which case users must correct the interference at their cost.

## **Equipment location**

To prevent access by unqualified personnel, all equipment must be placed in controlled access areas (dedicated equipment rooms, equipment closets, or the like) as described in articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. If this equipment cannot be installed in a controlled area, the front cover must be locked.

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# System testing

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System testing procedures describe how to test the OPTera Metro 3500 Multiservice Platform in any of the following configurations:

- linear point-to-point
- linear point-to-point with DS1 service module
- UPSR
- UPSR with DS1 service module
- two-fiber BLSR
- two-fiber BLSR with DS1 service module
- DWDM (dense wavelength division multiplexing) system
- DWDM system with DS1 service module

## Procedure 2-1 Getting started

---

Use this procedure to test the OPTera Metro 3500 Multiservice Platform in a unidirectional path switched ring (UPSR), in a bidirectional line-switched ring (BLSR), or in a linear point-to-point configuration. Perform all the steps in the applicable procedures. For the applicable procedures for each configuration, see [System testing flowchart on page 2-3](#).

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Step	Action
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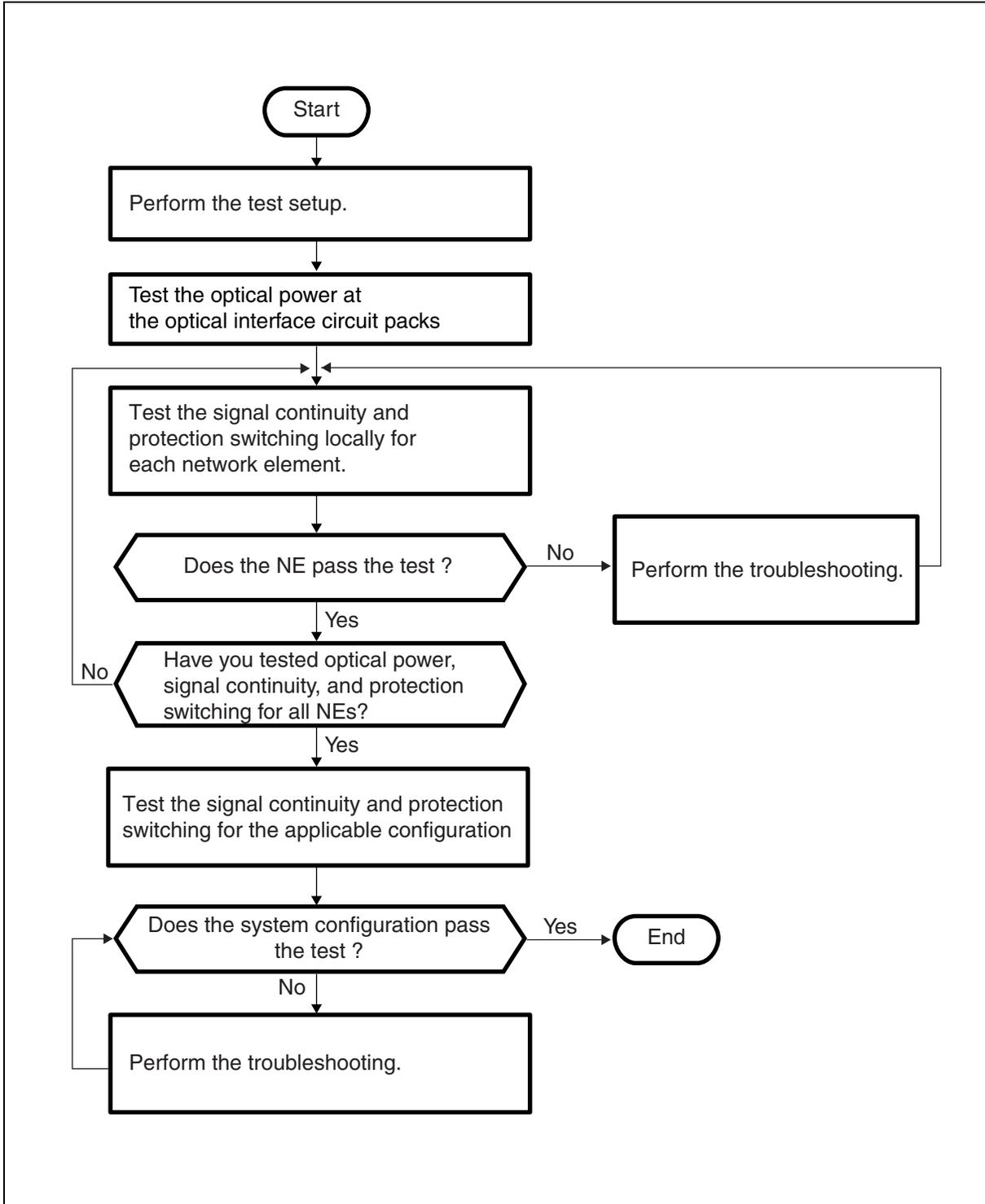
- |   |  |
|---|--|
| 1 | Perform the procedures listed in <a href="#">Procedures for system testing (high level procedures) on page 2-4</a> , in the order that they occur. |
| 2 | At the end of each procedure, return to <a href="#">Procedures for system testing (high level procedures) on page 2-4</a> .                        |

**Note:** The low level testing procedures, that are not listed in [Procedures for system testing \(high level procedures\) on page 2-4](#), are called up from the high level procedures or from maintenance procedures.

—end—

# System testing flowchart

EX1185p



## Procedures for system testing (high level procedures)

Getting started on page 2-2

Setting up the test on page 2-5

Testing the power at the optical interface Tx port on page 2-8

Testing the power at the optical interface Rx port on page 2-10

Testing the transmit power at the OMX on page 2-12

Testing the receive power at a DWDM optical interface on page 2-15

Testing the signal continuity and tributary protection switching in the network element on page 2-18

Testing a basic network configuration on page 2-21

Testing OC-n line switching on page 2-42

Adjusting the variable optical attenuator on page 2-51

Testing a basic network configuration with DWDM optical interface and OMX on page 2-29

**Note 1:** The low level system testing procedures, that are not listed in “Procedures for system testing (high level procedures)”, are called up from the high level procedures or from maintenance procedures.

**Note 2:** For OPTera Packet Edge (OPE) system testing procedures see *OPTera Packet Edge System Network Applications and Management*, NTRN11YK.

## Procedure 2-2

# Setting up the test

Use this procedure to set up the test when you are testing the functionality and protection for signal mappers, and signal cross-connects.

### Requirements

Before you perform this procedure, ensure that you have:

- all the documentation referenced in this procedure
- a test set that supports the test-signal type you will send through your system (DS1, DS3, or STS-1)
- optical power meter (OPM)
- variable optical attenuator (VOA)
- optical patch cords
- antistatic wrist strap or ankle strap
- fiber cleaning materials



#### CAUTION

##### Risk of incorrect setup

When you are testing an EC-1x3 or EC-1x12 circuit pack, you must use an STS-1 test set.

Step	Action								
1	Wear an antistatic wrist strap to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf.								
2	Log in to the network element. For information see <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .								
3	Put the working facility out of service. For information see <a href="#">323-1059-350, Changing a facility state to Out of Service (OOS) on page 2-25</a> .								
4	Select an option: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>If you are using</th> <th>Then go to</th> </tr> </thead> <tbody> <tr> <td>a DS1 test set</td> <td><a href="#">step 5</a></td> </tr> <tr> <td>a DS3 test set</td> <td><a href="#">step 12</a></td> </tr> <tr> <td>an STS-1 test set</td> <td><a href="#">step 19</a></td> </tr> </tbody> </table>	If you are using	Then go to	a DS1 test set	<a href="#">step 5</a>	a DS3 test set	<a href="#">step 12</a>	an STS-1 test set	<a href="#">step 19</a>
If you are using	Then go to								
a DS1 test set	<a href="#">step 5</a>								
a DS3 test set	<a href="#">step 12</a>								
an STS-1 test set	<a href="#">step 19</a>								

—continued—

**Setting up the test**

---

<b>Step</b>	<b>Action</b>
-------------	---------------

---

***Setting the DS1 facility equalization signal attributes***

- |    |   |
|----|---|
| 5  | Select Equipment & Facility Provisioning from the Configuration menu.   |
| 6  | Select the DS1 being tested under Equipment, then the facility under Facility. Click Edit to display the Edit facility DS1 port.  |
| 7  | From the Equalization drop-down list, select the equipment value that matches the cable length for the facility that you are testing. See <a href="#">Signal attributes for a DS1 facility on page 2-37</a> . |
| 8  | Click Apply.  |
| 9  | Click OK.   |
| 10 | Return the facility under test in service. For information see <a href="#">323-1059-350, Changing a facility state to In Service (IS) on page 2-26</a> .  |
| 11 | Go to <a href="#">step 24</a> .   |

***Setting the DS3 facility line build out***

- |    |  |
|----|--|
| 12 | Select Equipment & Facility Provisioning from the Configuration menu   |
| 13 | Select the DS3 being tested under Equipment, then the facility under Facility. Click Edit to display the Edit facility DS3 dialog box.                   |
| 14 | From the Line build out drop-down list, select the equipment value that matches the cable length for the facility that you are testing.                  |
| 15 | Click Apply.   |
| 16 | Click OK.  |
| 17 | Return the facility under test in service. For information see <a href="#">323-1059-350, Changing a facility state to In Service (IS) on page 2-26</a> . |
| 18 | Go to <a href="#">step 24</a> .  |

***Setting the EC-1 facility line build out***

- |    |  |
|----|--|
| 19 | Select Equipment & Facility Provisioning from the Configuration menu   |
| 20 | Select the EC-1 being tested under Equipment, then the facility under Facility. Click Edit to display the Edit facility EC-1 dialog box.                 |
| 21 | From the Line build out drop-down list, select the equipment value that matches the cable length for the facility that you are testing.                  |
| 22 | Click Apply.   |
| 23 | Click OK.  |
|    | Return the facility under test in service. For information see <a href="#">323-1059-350, Changing a facility state to In Service (IS) on page 2-26</a> . |

—continued—

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Procedure 2-2 (continued)

**Setting up the test**

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<b>Step</b>	<b>Action</b>
24	Connect the test set to the working facility at the cross-connect panel. See: <ul style="list-style-type: none"><li>• <a href="#">Testing the protection for EC-1 circuit pack on page 2-41</a></li><li>• <a href="#">Testing the protection for DS3 circuit pack on page 2-40</a></li></ul>
25	Add a terminal loopback at the optical interface. For information see <a href="#">Provisioning a hardware terminal loopback for a network element on page 2-53</a> .

—end—

---

## Procedure 2-3

# Testing the power at the optical interface Tx port

---

Use this procedure to verify the transmit power at a non-DWDM (dense wavelength division multiplexing) optical interface circuit pack.

*Note:* If you are using a DWDM optical interface, see [Testing the transmit power at the OMX on page 2-12](#).

### Requirements

The following tools are mandatory to measure power on the optical interface port.

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist or ankle strap
- fiber-optic patch cords
- fiber microscope



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

---

<b>Step</b>	<b>Action</b>
-------------	---------------

---

- |   |   |
|---|---|
| 1 | Remove the protection cap from the Tx port of the optical interface circuit pack. Clean the port connector. |
| 2 | Ensure the system has been powered up and stable for at least 5 minutes before you start the test.          |

—continued—

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Procedure 2-3 (continued)

### Testing the power at the optical interface Tx port

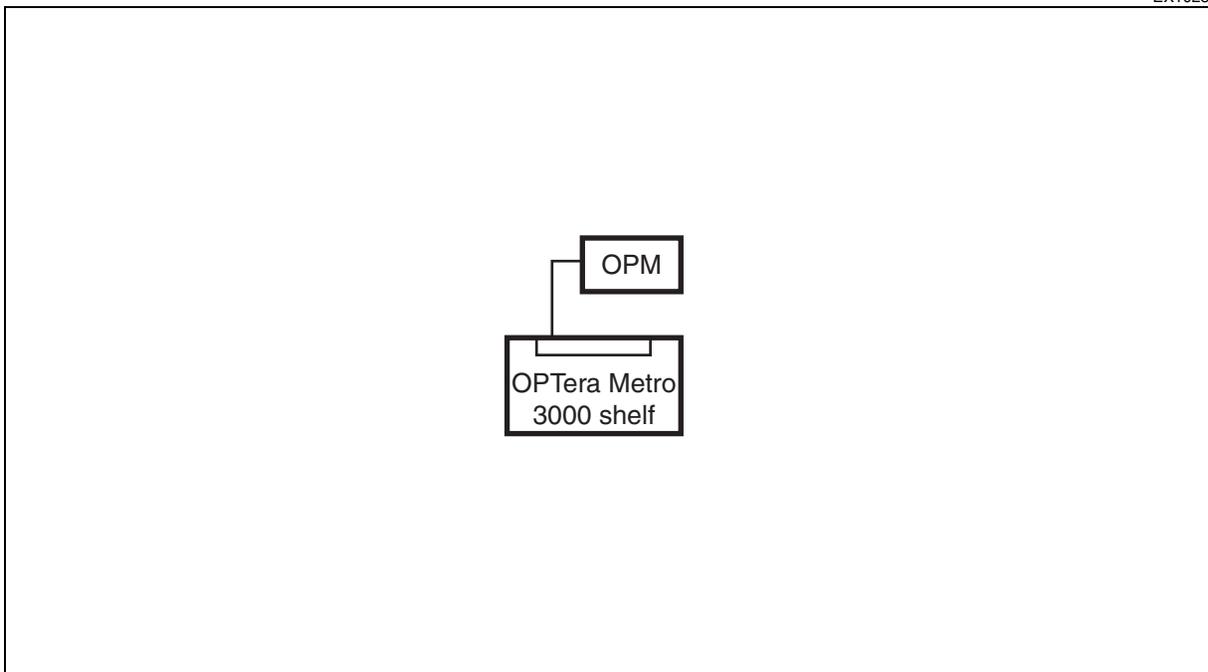
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Step	Action
3	Scope the optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"><li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords.</li><li>• 323-1059-201, Dirty optical fiber</li><li>• 323-1059-201, Clean optical fiber</li></ul>
4	Connect the OPM to the Tx port on the optical interface circuit pack. See <a href="#">Measuring the power at the optical interface Tx port on page 2-9</a> .
5	Switch the OPM power on and record the transmit power.
6	The power recorded is good if the value is equal to or higher than the minimum launch power for the optical interface circuit pack. For the minimum launch power applicable to a circuit pack, see the OPTera Metro 3500 Multiservice Platform Rel 12.0 Planning and Ordering Guide.
7	Switch the OPM power off and disconnect the OPM from the fiber-optic patch cord.

—end—

### Measuring the power at the optical interface Tx port

EX1028t



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## Procedure 2-4

# Testing the power at the optical interface Rx port

---

Use this procedure to verify the receive power at a non-DWDM (dense wavelength division multiplexing) optical interface circuit pack.

*Note:* If you are using a DWDM optical interface, see [Testing the receive power at a DWDM optical interface on page 2-15](#).

### Requirements

The following tools are mandatory to measure power on the optical interface port.

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist or ankle strap
- fiber-optic patch cords
- fiber microscope



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

---

<b>Step</b>	<b>Action</b>
-------------	---------------

---

- |   |   |
|---|---|
| 1 | Test the transmit power. See <a href="#">Testing the power at the optical interface Tx port on page 2-8</a> . |
| 2 | Disconnect the fiber-optic cable from the optical interface Rx port.  |

—continued—

---

Procedure 2-4 (continued)

**Testing the power at the optical interface Rx port**

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<b>Step</b>	<b>Action</b>
<b>3</b>	Scope the connector on the circuit pack, clean if necessary, and scope again. See: <ul style="list-style-type: none"><li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li><li>• 323-1059-201, Dirty optical fiber</li><li>• 323-1059-201, Clean optical fiber</li></ul>
<b>4</b>	Scope the optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"><li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li><li>• 323-1059-201, Dirty optical fiber</li><li>• 323-1059-201, Clean optical fiber</li></ul>
<b>5</b>	Connect the end of the patch cord that you removed from the Rx port on the circuit pack, to the OPM.
<b>6</b>	Switch the OPM power on and record the Receive power.
<b>7</b>	The power recorded is good if the value is within the range of power specification for optical interface circuit pack. For the receiver overload and minimum sensitivity applicable to circuit packs, see the OPTera Metro 3500 Multiservice Platform Rel 12.0 Planning and Ordering Guide.
<b>8</b>	Repeat <a href="#">step 1</a> through <a href="#">step 7</a> for all optical interface circuit packs.
<b>9</b>	Switch the OPM power off and disconnect the OPM from the fiber-optic cable.
<b>10</b>	Connect the fiber-optic cable to the optical interface Rx port.

—end—

---

## Procedure 2-5

# Testing the transmit power at the OMX

---

Use this procedure to verify the transmit power at the OMX (optical multiplexer).

*Note:* If you are not using a DWDM optical interface, see [Testing the power at the optical interface Tx port on page 2-8](#).

### Requirements

The following tools are mandatory to perform this procedure:

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist or ankle strap
- fiber-optic patch cords
- fiber microscope



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

---

<b>Step</b>	<b>Action</b>
-------------	---------------

---

- |   |   |
|---|---|
| 1 | Measure the output power at the Tx port on the optical interface circuit pack. See <a href="#">Testing the power at the optical interface Tx port on page 2-8</a> . |
| 2 | Disconnect the OPM from the Tx port on the optical interface circuit pack.  |

—continued—

---

 Procedure 2-5 (continued)

**Testing the transmit power at the OMX**


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Step	Action
3	Scope the connector on the optical interface circuit pack, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>
4	Scope the optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>
5	Connect one end of the patch cord to the Tx port on the optical interface circuit pack, and the other end to the OTS In on the OMX. See <a href="#">Measuring the Tx power at the OMX on page 2-14</a> .
6	Scope another optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>
7	Connect one end of the patch cord to OTS Out port on the OMX, and the other end to the OPM. <a href="#">Measuring the Tx power at the OMX on page 2-14</a>
8	Switch the OPM power on and record the value read on the OPM. <b>Note:</b> During the power measurement, you must take the OPM accuracy into account.  The Tx power measured at the OMX output is good if the value of A is higher or equal to B+C, where: A= value read by the OPM B= power at the optical interface Tx port ( <a href="#">step 1</a> ) C= total loss by adding all the applicable losses. See <a href="#">Maximum loss summary -for OMX NTN449ZW on page 2-14</a> or <a href="#">Maximum loss summary -for OMX + Fiber manager 4CH NT0H32AE-HE, NT0H32AF-HF on page 2-14</a> .
9	Repeat <a href="#">step 1</a> through <a href="#">step 8</a> for all Tx channels.

—end—

### Maximum loss summary -for OMX NTN449ZW

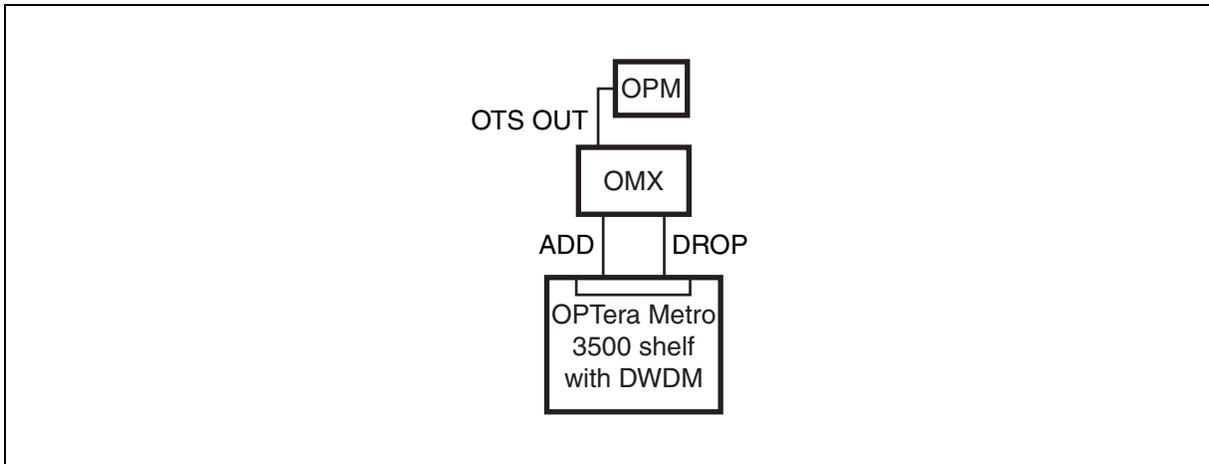
Type	Loss (dB)
Add loss	4.0
Drop loss	4.0
Connector loss	0.4
Pass-through loss	1.6

### Maximum loss summary -for OMX + Fiber manager 4CH NT0H32AE-HE, NT0H32AF-HF

Type	Loss (dB)
Add loss	4.1
Drop loss	4.5
Connector loss	0.4
Pass-through loss	0.8

### Measuring the Tx power at the OMX

EX10311



---

## Procedure 2-6

# Testing the receive power at a DWDM optical interface

---

Use this procedure to verify the receive power at the DWDM optical interface circuit pack.

*Note:* If you are not using a DWDM optical interface, see [Testing the power at the optical interface Tx port on page 2-8](#)

### Requirements

The following tools are mandatory to perform this procedure

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist or ankle strap
- fiber-optic patch cords
- fiber microscope



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 2-6 (continued)

**Testing the receive power at a DWDM optical interface**

Step	Action
1	<p>If your DWDM optical interface circuit pack is an OC-48 DWDM optical interface circuit pack or an OC-192 DWDM optical interface circuit pack</p> <p><b>Then</b> go to <a href="#">step 2</a> or <a href="#">step 2</a></p>
2	<p>Adjust the VOA to have an output power of -15 dBm. See <a href="#">Adjusting the variable optical attenuator on page 2-51</a>. Go to <a href="#">step 4</a>.</p>
3	<p>Adjust the VOA to have an output power of &lt;TBD&gt; dBm. See <a href="#">Adjusting the variable optical attenuator on page 2-51</a>.</p>
4	<p>Scope the optical patch cord, clean if necessary, and scope again. See:</p> <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>
5	<p>Connect one end of the VOA to OTS in and the other end to OTS OUT on the OMX. See <a href="#">Measuring the Rx power at the OMX on page 2-17</a>. Connect channel 1 of the OMX add port to the Tx port on the optical interface circuit pack.</p>
6	<p>Connect channel 1 of the OMX drop port to the OPM.</p>
7	<p>Switch the OPM power on and record the value read on the OPM.</p> <p><b>Note:</b> During the power measurement, you must take the OPM accuracy into account.</p> <p>The power measured at the Rx port of the optical interface is good if the value of A is higher than or equal to B+C-15 dBm, and if the value of A meets the requirement in <a href="#">OC-192 DWDM Rx power specifications on page 2-17</a> or <a href="#">OC-192 DWDM Rx power specifications on page 2-17</a> (as required), where:</p> <p>A= value read by the OPM (<a href="#">step 8</a>)</p> <p>B= power at the optical interface Tx port (<a href="#">step 1</a> in <a href="#">Testing the transmit power at the OMX on page 2-12</a>).</p> <p>C= total loss by adding all the applicable losses. See <a href="#">Maximum loss summary -for OMX NTN449ZW on page 2-14</a> or <a href="#">Maximum loss summary -for OMX + Fiber manager 4CH NT0H32AE-HE, NT0H32AF-HF on page 2-14</a>.</p>
8	<p>Repeat <a href="#">step 1</a> through <a href="#">step 7</a> for all Rx channels.</p>

—end—

## OC-48 DWDM Rx power specifications

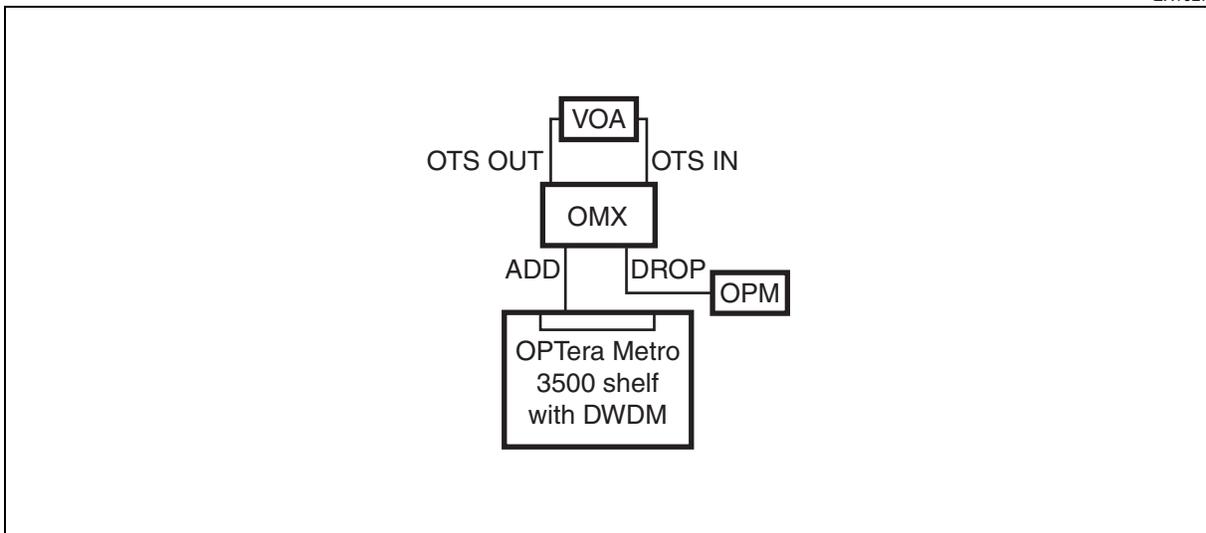
Parameter	Power specification
Receive sensitivity Start of life (SOL)	-31.6 dBm
Receive sensitivity End of life (EOL)	-28.9 dBm
Receiver optical overload	-9 dBm

## OC-192 DWDM Rx power specifications

Parameter	Power specification
Receive sensitivity Start of life (SOL)	<TBD> dBm
Receive sensitivity End of life (EOL)	<TBD> dBm
Receiver optical overload	-5 dBm

## Measuring the Rx power at the OMX

EX10271



## Procedure 2-7

# Testing the signal continuity and tributary protection switching in the network element

---

Use this procedure to test the signal continuity and the tributary protection switching in the network element.

### Requirements

Before you perform this test, you must ensure the protection equipment is identical to the working equipment. Ensure that you have:

- a DS1, DS3, or STS-1 test set as required (depending on the test-signal type you will send through the system)
- optical patch cords
- antistatic wrist strap or ankle strap
- fiber cleaning materials



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 2-7 (continued)

### Testing the signal continuity and tributary protection switching in the network element

Step	Action								
1	Ensure that the test setup is completed. For information, see <a href="#">Setting up the test on page 2-5</a> .								
2	Identify your next step.								
	<table border="1"> <thead> <tr> <th>If you are</th> <th>Then go to</th> </tr> </thead> <tbody> <tr> <td>using a DS1 test set to test tributary circuit packs</td> <td><a href="#">step 3</a></td> </tr> <tr> <td>using a DS3 or STS-1 test set to test tributary circuit packs</td> <td><a href="#">step 5</a></td> </tr> <tr> <td>testing signal continuity and protection switching on a DS1 service module.</td> <td><a href="#">step 10</a></td> </tr> </tbody> </table>	If you are	Then go to	using a DS1 test set to test tributary circuit packs	<a href="#">step 3</a>	using a DS3 or STS-1 test set to test tributary circuit packs	<a href="#">step 5</a>	testing signal continuity and protection switching on a DS1 service module.	<a href="#">step 10</a>
If you are	Then go to								
using a DS1 test set to test tributary circuit packs	<a href="#">step 3</a>								
using a DS3 or STS-1 test set to test tributary circuit packs	<a href="#">step 5</a>								
testing signal continuity and protection switching on a DS1 service module.	<a href="#">step 10</a>								
3	Test the signal continuity on the working path. See <a href="#">Testing the signal continuity in a network element using an external DS1 test set on page 2-33</a> .								
4	Go to <a href="#">step 6</a> .								
5	Test the signal continuity on the working path. See <a href="#">Testing the signal continuity in a network element using a DS3 or STS-1 test set on page 2-38</a> .								

#### Testing the tributary circuit pack protection

6	<p>Pull out the working DS1, DS3 or EC-1 circuit pack, then verify the status indicated by the LED on the protection circuit pack.</p> <p>The DS1 or DS3 path passes the circuit pack protection switching test if the status of the protection circuit pack has changed to Active.</p>						
7	As required repeat <a href="#">step 6</a> for all working circuit packs.						
8	<p>Test the signal continuity on the protection path.</p> <table border="1"> <thead> <tr> <th>If you are testing a</th> <th>Then see</th> </tr> </thead> <tbody> <tr> <td>DS1 circuit pack</td> <td> <a href="#">Testing the signal continuity in a network element using an external DS1 test set on page 2-33</a>  <b>Note:</b> In most cases you only need to complete <a href="#">step 10</a> to <a href="#">step 14</a> and <a href="#">step 16</a> of this procedure. </td> </tr> <tr> <td>DS3 or EC-1 circuit pack</td> <td> <a href="#">Testing the signal continuity in a network element using a DS3 or STS-1 test set on page 2-38</a>  <b>Note:</b> In most cases you only need to complete <a href="#">step 9</a> to <a href="#">step 12</a> and <a href="#">step 15</a> of this procedure. </td> </tr> </tbody> </table>	If you are testing a	Then see	DS1 circuit pack	<a href="#">Testing the signal continuity in a network element using an external DS1 test set on page 2-33</a> <b>Note:</b> In most cases you only need to complete <a href="#">step 10</a> to <a href="#">step 14</a> and <a href="#">step 16</a> of this procedure.	DS3 or EC-1 circuit pack	<a href="#">Testing the signal continuity in a network element using a DS3 or STS-1 test set on page 2-38</a> <b>Note:</b> In most cases you only need to complete <a href="#">step 9</a> to <a href="#">step 12</a> and <a href="#">step 15</a> of this procedure.
If you are testing a	Then see						
DS1 circuit pack	<a href="#">Testing the signal continuity in a network element using an external DS1 test set on page 2-33</a> <b>Note:</b> In most cases you only need to complete <a href="#">step 10</a> to <a href="#">step 14</a> and <a href="#">step 16</a> of this procedure.						
DS3 or EC-1 circuit pack	<a href="#">Testing the signal continuity in a network element using a DS3 or STS-1 test set on page 2-38</a> <b>Note:</b> In most cases you only need to complete <a href="#">step 9</a> to <a href="#">step 12</a> and <a href="#">step 15</a> of this procedure.						
9	<p>Restore the network element to its initial state. See <a href="#">Restoring the network element to its initial state on page 2-59</a>.</p> <p>You have completed this procedure.</p>						

—continued—

Procedure 2-7 (continued)

**Testing the signal continuity and tributary protection switching in the network element**

---

<b>Step</b>	<b>Action</b>
-------------	---------------

---

***Testing the signal continuity and protection switching on the DS1 service module***

- |           |   |
|-----------|---|
| <b>10</b> | Connect the DS1 service module to the OPTera Metro 3500. See 323-1059-201, Connecting the DS1 service module to OPTera Metro 3500. See <a href="#">Example of testing the signal continuity and protection switching on a DS1 service module on page 2-26</a> . |
| <b>11</b> | Define a site address for the DS1 service module. See <a href="#">323-1059-350, Defining or editing a site address for a DSM on page 2-11</a> .   |
| <b>12</b> | Connect DS1 I/O modules (1-28, 29-56, 57-84) to the cross-connect panel.  |
| <b>13</b> | Connect Tx port on the DS1 test set to the DS1 no.1 IN port on the DS1 cross-connect panel.   |
| <b>14</b> | Connect Rx port on the DS1 test set to the DS1 no.1 OUT port on the DS1 cross-connect panel.  |
| <b>15</b> | Ensure the test set is switched on.   |
| <b>16</b> | Ensure the working DSM DS1X84 termination module indicates working transmit and receive activity.   |
| <b>17</b> | Ensure the working OC-3 or OC-3x4 optical interface connected to the DSM indicates working transmit and receive activity.   |

***Testing the signal continuity***

- |           |   |
|-----------|---|
| <b>18</b> | Set the test set to introduce an error free signal.   |
| <b>19</b> | Clear the error count on the test set.  |
| <b>20</b> | Read the error count on the test set. The working path passes the signal continuity test if the signal is back, error free. |
| <b>21</b> | Repeat <a href="#">step 13</a> through <a href="#">step 20</a> for all 84 channels.   |

***Testing the protection switching***

- |           |  |
|-----------|--|
| <b>22</b> | On the DS1 service module, disconnect the Tx or Rx fiber-optic cable from the DSM DS1X84 termination module in slot 1.<br>The DS1 service module passes the protection switching test if <ul style="list-style-type: none"><li>• the LEDs on DSM DS1X84 termination module in DS1 service module slot 1 indicate a loss of signal</li><li>• the LEDs on DSM DS1X84 termination module in DS1 service module slot 2 indicate traffic is on.</li></ul> |
| <b>23</b> | Review the test results. If any of the tests failed, solve the problem. See <a href="#">323-1059-543, Procedures for active alarms on page 2-1</a> .   |

—end—

## Procedure 2-8

# Testing a basic network configuration

Use this procedure to test the signal continuity and protection switching in a basic network configuration (linear, UPSR, or BLSR).

*Note:* If you are using DWDM (dense wavelength division multiplexing) optical interface and OMX (optical multiplexer), see [Testing a basic network configuration with DWDM optical interface and OMX on page 2-29](#).

### Requirements

Before you perform this procedure, you must ensure that:

- the system is set up according to the required configuration (linear, UPSR, or two-fiber BLSR)
- you have:
  - all the documentation referenced in this procedure
  - a DS1, DS3, or STS-1 test set as required (depending on the test-signal type you will send through the system)
  - optical patch cords
  - antistatic wrist strap or ankle strap
  - fiber cleaning materials



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 2-8 (continued)

**Testing a basic network configuration**

Step	Action						
1	Log in to a network element. See <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .						
2	Ensure the system has been powered up and stable for at least 5 minutes before you start the test.						
3	Provision the system synchronization for near-end, far-end, and pass-through network elements. See <a href="#">323-1051-310, Procedures for provisioning system synchronization on page 1-1</a> .						
	<table border="1"> <thead> <tr> <th>If you are provisioning</th> <th>Then go to</th> </tr> </thead> <tbody> <tr> <td>linear or UPSR</td> <td><a href="#">step 4</a></td> </tr> <tr> <td>BLSR</td> <td><a href="#">step 9</a></td> </tr> </tbody> </table>	If you are provisioning	Then go to	linear or UPSR	<a href="#">step 4</a>	BLSR	<a href="#">step 9</a>
If you are provisioning	Then go to						
linear or UPSR	<a href="#">step 4</a>						
BLSR	<a href="#">step 9</a>						
4	Provision protection switching for the near-end network element: UPSR for rings and linear 1+1 for linear point-to-point configuration. See <ul style="list-style-type: none"> <li><a href="#">323-1059-311, Changing the protection scheme on an optical facility from 1+1 linear to UPSR on page 1-6</a>.</li> <li><a href="#">Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8</a>.</li> </ul>						
5	Provision protection switching for the far-end network elements: UPSR for rings and linear 1+1 for linear point-to-point configuration. See <ul style="list-style-type: none"> <li><a href="#">323-1059-311, Changing the protection scheme on an optical facility from 1+1 linear to UPSR on page 1-6</a>.</li> <li><a href="#">Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8</a>.</li> </ul>						
6	Provision 2WAY connections for all pass-through network elements.						
7	At the near-end network element, provision 2WAY cross-connect from the working tributary facility to slot x optical interface (VT1.5 cross-connect for DS1 and STS-1 cross-connect for DS3). See: <ul style="list-style-type: none"> <li><a href="#">323-1059-320, Procedures for end-to-end connection management on page 1-1</a>.</li> <li><a href="#">Example of testing the signal continuity and line protection in a linear point-to-point configuration on page 2-25</a></li> <li><a href="#">Example of testing the signal continuity and line protection in a UPSR on page 2-27</a>.</li> </ul>						
8	At the far-end network element, provision 2WAY cross-connect from the working tributary facility to slot x optical interface (VT1.5 cross-connect for DS1 and STS-1 cross-connect for DS3). See <a href="#">323-1059-320, Procedures for end-to-end connection management on page 1-1</a> . Go to <a href="#">step 10</a> .						

—continued—

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 Procedure 2-8 (continued)

**Testing a basic network configuration**


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Step	Action
9	Provision a two-fiber BLSR configuration. See <a href="#">323-1059-320, Provisioning a BLSR (bidirectional) on page 4-2</a> .
10	Provision a software terminal loopback at the far-end network element. See <a href="#">Provisioning a software loopback on page 2-56</a> .

**Testing the signal continuity in the system**

11	Test the signal continuity as follows: Connect a DS1 or DS3 test set to the near-end network element. See <a href="#">Setting up the test on page 2-5</a> .
12	See example of the applicable configurations: <ul style="list-style-type: none"> <li>• <a href="#">Example of testing the signal continuity and line protection in a linear point-to-point configuration on page 2-25</a>.</li> <li>• <a href="#">Example of testing the signal continuity and line protection in a UPSR on page 2-27</a>.</li> <li>• <a href="#">Example of testing the signal continuity and line protection in a two-fiber BLSR on page 2-28</a>.</li> </ul>
13	Ensure the test set is switched on and connected to the I/O port that corresponds to the circuit pack you are using.
14	Verify that the working optical interface circuit pack indicates working transmit and receive activity. For information see <a href="#">323-1059-350, Retrieving equipment and facility details on page 2-2</a> .
15	Set the test set to introduce an error free signal.
16	Clear the error count on the test set.
17	Read the error count on the test set. The working path passes the signal continuity test if the signal is back, error free.

—continued—

Procedure 2-8 (continued)

**Testing a basic network configuration**

Step	Action
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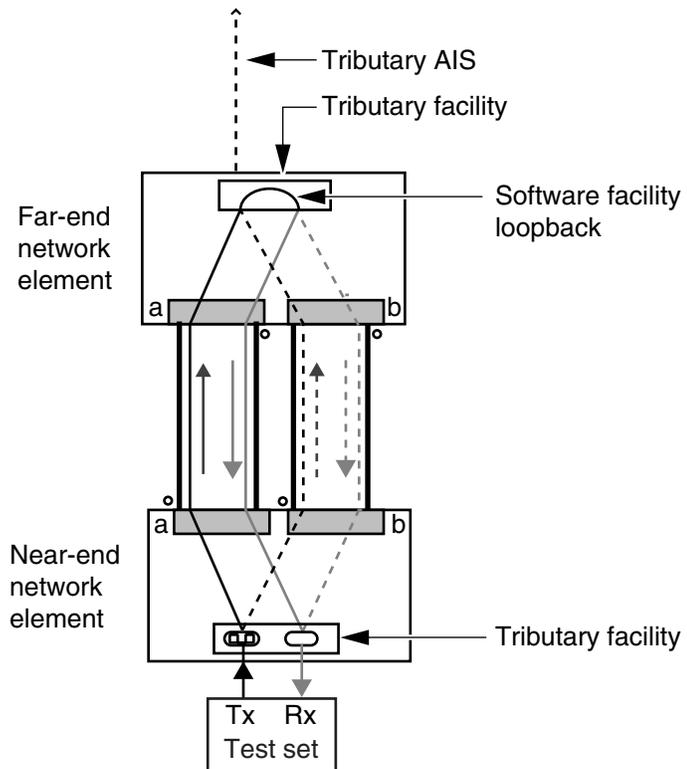
**Testing the protection switching**

- | <b>18</b>               | Clear the error count on the test set.   |                         |      |                       |   |      |   |                |   |
|-------------------------|--|-------------------------|------|-----------------------|---|------|---|----------------|---|
|                         | <table border="1"> <thead> <tr> <th style="text-align: left;">If the configuration is</th> <th style="text-align: left;">Then</th> </tr> </thead> <tbody> <tr> <td>linear point-to-point</td> <td>disconnect the Tx and Rx fiber-optic cable from the optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a linear point-to-point configuration on page 2-25</a></td> </tr> <tr> <td>UPSR</td> <td>disconnect the Tx and Rx fiber-optic cables from the W optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a UPSR on page 2-27</a></td> </tr> <tr> <td>two-fiber BLSR</td> <td>disconnect the Tx and Rx fiber-optic cables from the working optical interface circuit pack at the near-end; refer to <a href="#">Example of testing the signal continuity and line protection in a two-fiber BLSR on page 2-28</a></td> </tr> </tbody> </table> | If the configuration is | Then | linear point-to-point | disconnect the Tx and Rx fiber-optic cable from the optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a linear point-to-point configuration on page 2-25</a> | UPSR | disconnect the Tx and Rx fiber-optic cables from the W optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a UPSR on page 2-27</a> | two-fiber BLSR | disconnect the Tx and Rx fiber-optic cables from the working optical interface circuit pack at the near-end; refer to <a href="#">Example of testing the signal continuity and line protection in a two-fiber BLSR on page 2-28</a> |
| If the configuration is | Then   |                         |      |                       |   |      |   |                |   |
| linear point-to-point   | disconnect the Tx and Rx fiber-optic cable from the optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a linear point-to-point configuration on page 2-25</a>  |                         |      |                       |   |      |   |                |   |
| UPSR                    | disconnect the Tx and Rx fiber-optic cables from the W optical interface circuit pack; refer to <a href="#">Example of testing the signal continuity and line protection in a UPSR on page 2-27</a>  |                         |      |                       |   |      |   |                |   |
| two-fiber BLSR          | disconnect the Tx and Rx fiber-optic cables from the working optical interface circuit pack at the near-end; refer to <a href="#">Example of testing the signal continuity and line protection in a two-fiber BLSR on page 2-28</a>  |                         |      |                       |   |      |   |                |   |
| <b>19</b>               | Verify that the X or b optical interface circuit pack indicates working transmit and receive activity.   |                         |      |                       |   |      |   |                |   |
| <b>20</b>               | Set the test set to introduce an error free signal.  |                         |      |                       |   |      |   |                |   |
| <b>21</b>               | Clear the error count on the test set.   |                         |      |                       |   |      |   |                |   |
| <b>22</b>               | Read the error count on the test set. The UPSR, BLSR, or linear 1+1 passes the protection switching test if the signal is back, error free.  |                         |      |                       |   |      |   |                |   |
| <b>23</b>               | Perform <a href="#">step 11</a> through <a href="#">step 17</a> to test the signal continuity on the protection path.  |                         |      |                       |   |      |   |                |   |
| <b>24</b>               | Release the terminal loopback at the far-end network element. See <a href="#">Releasing a software loopback on page 2-58</a> .   |                         |      |                       |   |      |   |                |   |
| <b>25</b>               | Return the near-end and the far-end network elements to their initial states. See <a href="#">Restoring the network element to its initial state on page 2-59</a> .  |                         |      |                       |   |      |   |                |   |
| <b>26</b>               | Restore the pass-through network elements to their initial states.   |                         |      |                       |   |      |   |                |   |
| <b>27</b>               | Review the test results. If any of the tests failed, solve the problem. See <a href="#">323-1059-543, Retrieving active alarms for a network element on page 2-3</a> .   |                         |      |                       |   |      |   |                |   |

—end—

## Example of testing the signal continuity and line protection in a linear point-to-point configuration

EX0208



**Note 1:** a and b represent slot numbers for the optical interface circuit packs. The slot numbers represented by these variables can vary from network element to network element.

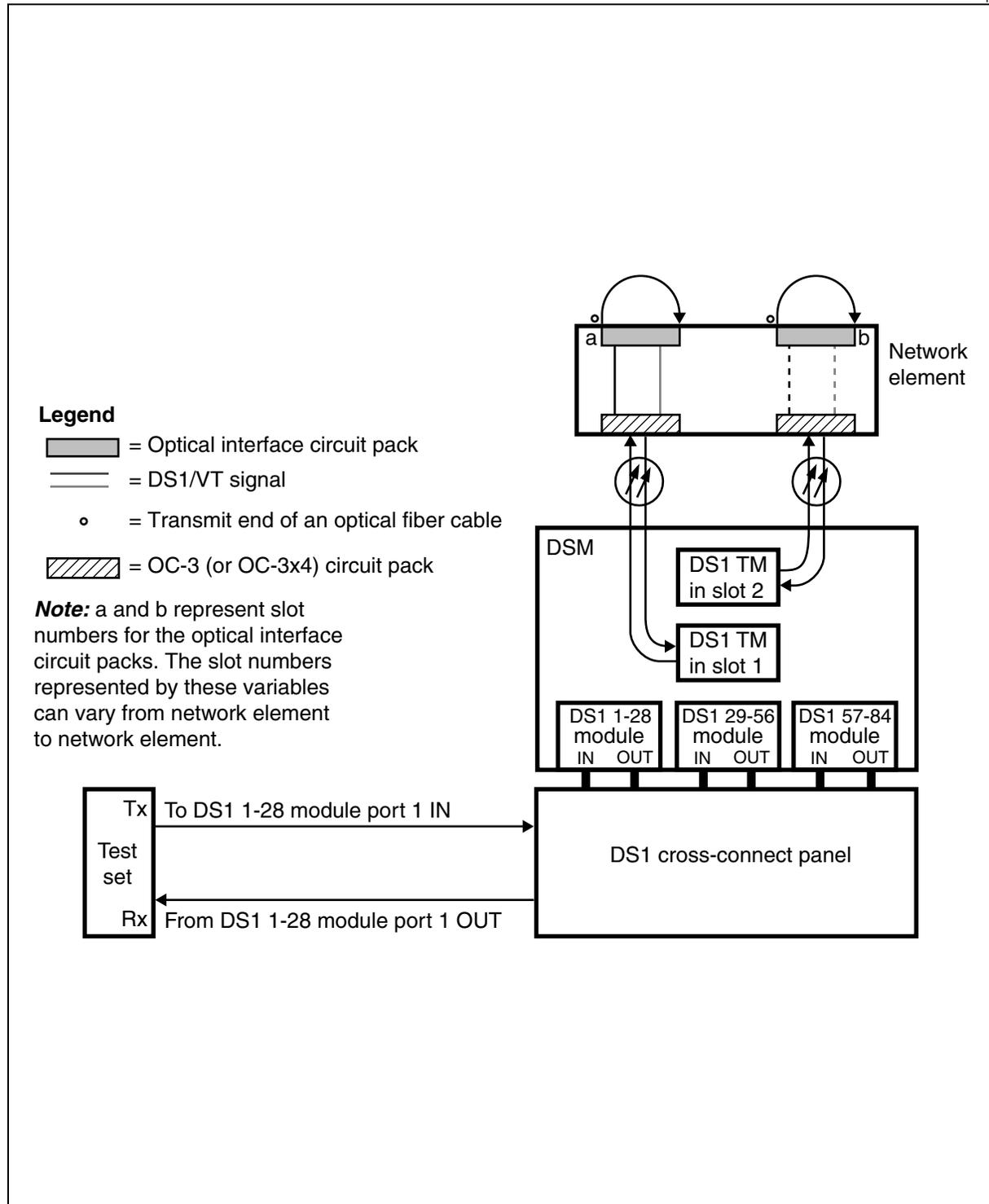
**Note 2:** This linear system is shown with 2 network elements. Your system may have anywhere from 2 to 16 network elements.

### Legend

- = Optical interface circuit pack
- = Tributary signal
- = Transmit end of an optical fiber cable

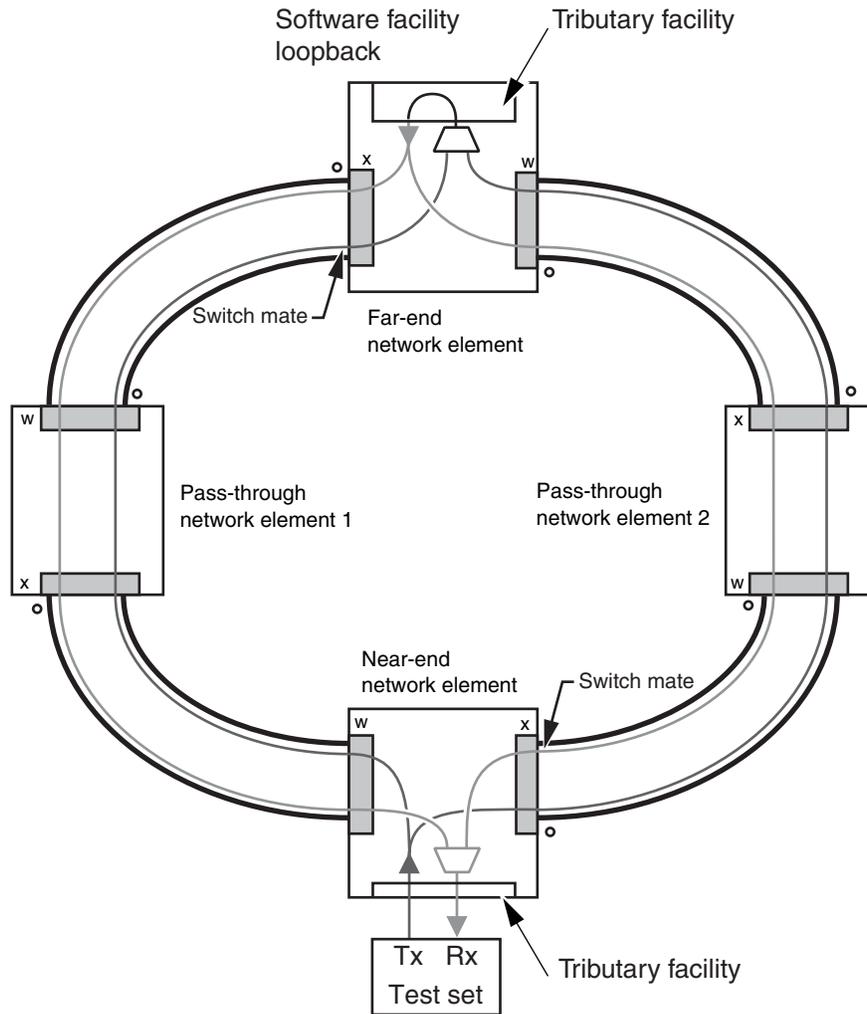
## Example of testing the signal continuity and protection switching on a DS1 service module

EX1298p



## Example of testing the signal continuity and line protection in a UPSR

EX0851p



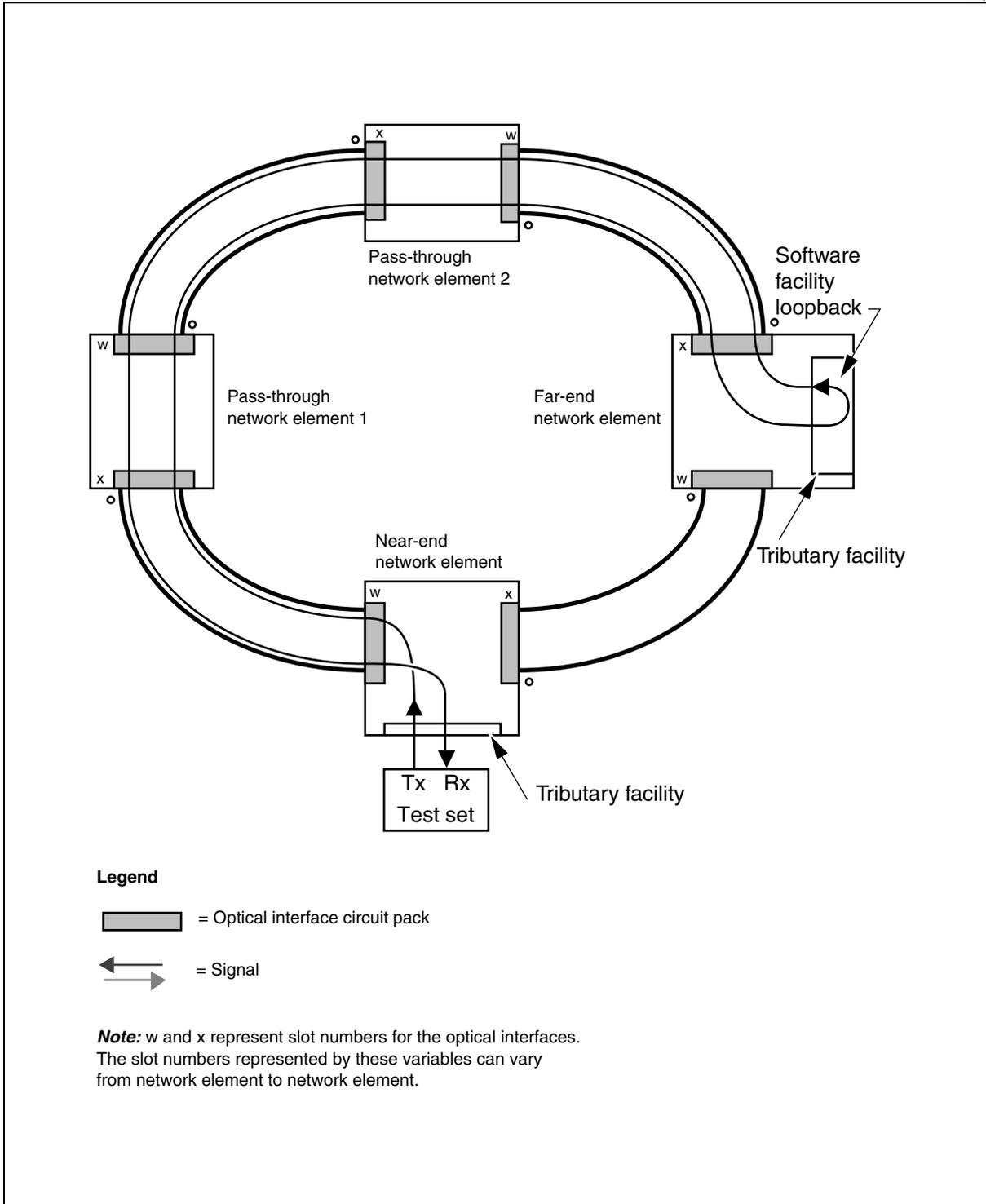
**Note:** w and x represent slot numbers for the optical interfaces. The slot numbers represented by these variables can vary from network element to network element.

### Legend

-  = Optical interface circuit pack
-  = Signal
-  = Path selector

## Example of testing the signal continuity and line protection in a two-fiber BLSR

EX1198p



---

## Procedure 2-9

# Testing a basic network configuration with DWDM optical interface and OMX

---

Use this procedure to test the signal continuity and protection switching in a basic network configuration equipped with DWDM (dense wavelength division multiplexing) optical interface circuit packs and OMX.

*Note:* If you are not using DWDM optical interface and OMX, see [Testing a basic network configuration on page 2-21](#).

### Requirements

The following tools are mandatory to measure the power at the test points:

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist strap or ankle strap

Before you perform this procedure, you must:

- ensure you have all the documentation referenced in this procedure
- ensure that the system is set up according to the considered configuration
- ensure that the two optical multiplexers (OMX's) have the same band
- ensure that all equipment is protected (tributary circuit packs, optical interface circuit packs, and OMX modules)



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 2-9 (continued)

**Testing a basic network configuration with DWDM optical interface and OMX**

Step	Action
1	Ensure the test setup is completed at the near-end network element. See <a href="#">Setting up the test on page 2-5</a> .
2	Provision the system synchronization. For information see <a href="#">323-1051-310, Procedures for provisioning system synchronization on page 1-1</a> .
3	Provision the appropriate protection for the near-end network elements (1+1 Linear, UPSR, or BLSR). See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from 1+1 linear to UPSR on page 1-6</a> .
4	At the near-end, connect the OPTera Metro 3500 shelf to the OMX. See: <ul style="list-style-type: none"> <li>• <a href="#">323-1059-201, Connecting an OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves, or</a></li> <li>• <a href="#">323-1059-201, Connecting OMX + Fiber Manager 4CH equipment drawers (NTN0H32AE-HE) to OPTera Metro 3500 shelves</a></li> </ul>
5	Provision the appropriate protection for the far-end network elements (1+1 Linear, UPSR, or BLSR). See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from 1+1 linear to UPSR on page 1-6</a> .
6	At the far-end, connect the OPTera Metro 3500 shelf to the OMX shelf. See: <ul style="list-style-type: none"> <li>• <a href="#">323-1059-201, Connecting an OMX shelf (NTN449ZW) to OPTera Metro 3500 shelves, or</a></li> <li>• <a href="#">323-1059-201, Connecting OMX + Fiber Manager 4CH equipment drawers (NTN0H32AE-HE) to OPTera Metro 3500 shelves</a></li> </ul>
7	At the far-end, provision a terminal loopback. See <a href="#">Provisioning a software loopback on page 2-56</a> .

**Testing the signal continuity**

8	Test the power at the optical interface Tx port. See <a href="#">Testing the power at the optical interface Tx port on page 2-8</a> .
9	Adjust the variable optical attenuator. See <a href="#">Adjusting the variable optical attenuator on page 2-51</a> .
10	Test the Tx power at the OMX. See <a href="#">Testing the transmit power at the OMX on page 2-12</a> .
11	Test the receive power. See <a href="#">Testing the receive power at a DWDM optical interface on page 2-15</a> . See <a href="#">Measuring the Rx power in a DWDM system on page 2-32</a> .
12	Disconnect the optical power meter from the OMX.
13	Connect the free end of the OMX cable to the optical interface Rx port.

—continued—

Procedure 2-9 (continued)

**Testing a basic network configuration with DWDM optical interface and OMX**

Step	Action
14	As required, repeat <a href="#">step 8</a> through <a href="#">step 13</a> for all wavelengths. <b>Note:</b> Wait for loss of signal alarms on OPTera Metro 3500 to clear before you perform the next step.
15	Ensure the test set is switched on and connected to the I/O port that corresponds to the circuit pack you are using.
16	Verify that the working optical interface circuit pack indicates working transmit and receive activity. For information see <a href="#">323-1059-350, Retrieving equipment and facility details on page 2-2</a> .
17	Set the test set to introduce an error free signal.
18	Clear the error count on the test set.
19	Read the error count on the test set. The working path passes the signal continuity test if the signal is back, error free.

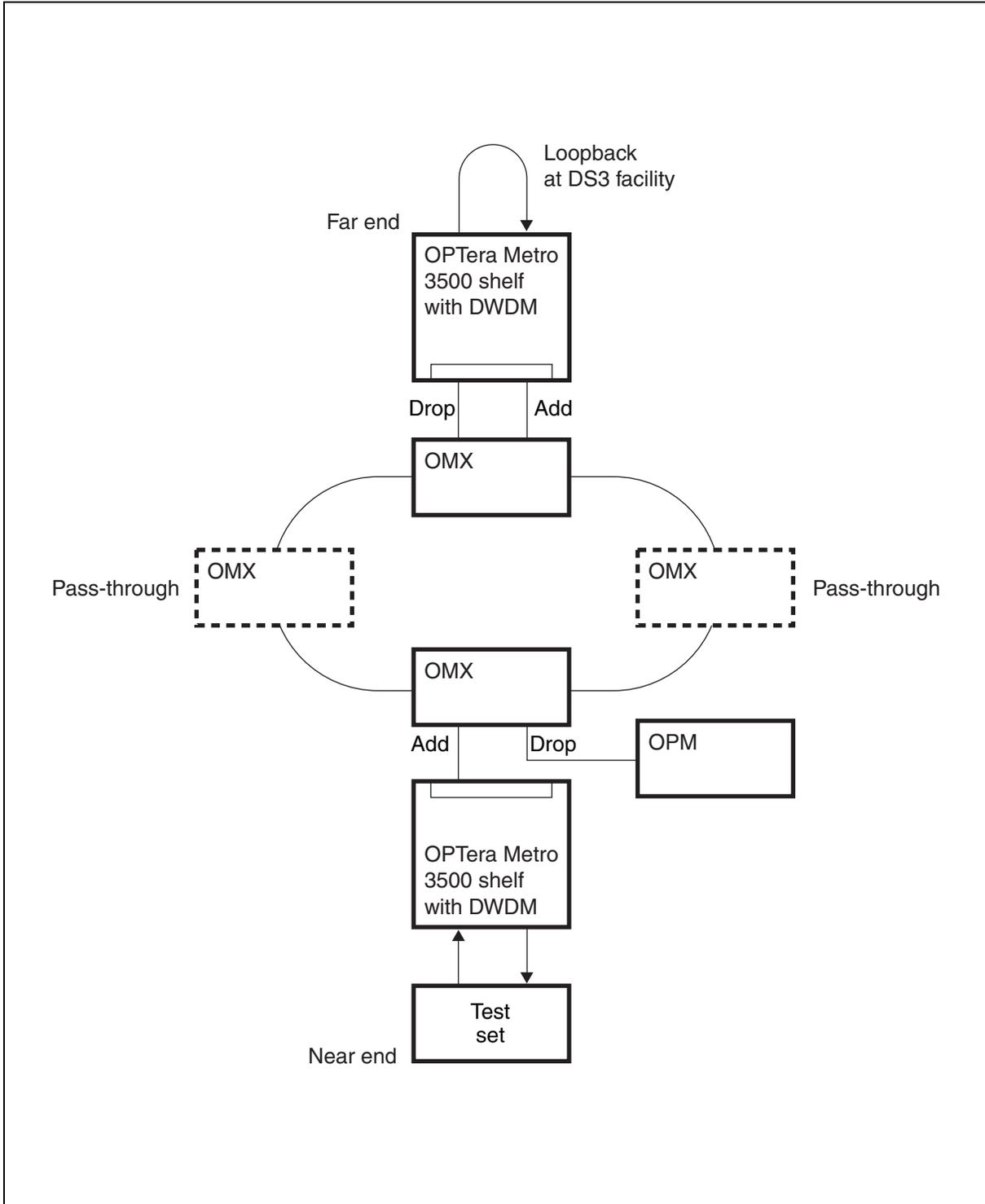
**Testing the protection switching**

20	Perform a manual switch at the far-end network element. See <a href="#">323-1059-311, Operating a manual switch on a tributary circuit pack on page 1-16</a> .
21	Clear the error count on the test set.
22	The far-end network element passes the equipment protection switching, if the traffic is back, error free.
23	Disconnect one Tx fiber-optic cable from the optical interface circuit pack.
24	Clear the error count on the test set.
25	The system passes the line protection switching, if the traffic is back, error free.
26	Perform <a href="#">step 15</a> to <a href="#">step 19</a> to test the signal continuity on the protection path.
27	Release the software terminal loopback. See <a href="#">Releasing a software loopback on page 2-58</a> .
28	Return the near-end and the far-end network elements to their initial states. See <a href="#">Restoring the network element to its initial state on page 2-59</a> .
29	Restore the pass-through network elements to their initial states.
30	Review the test results. If any of the tests failed, solve the problem. See <a href="#">323-1059-543, Detailed procedures for active alarms on page 4-1</a> .

—end—

## Measuring the Rx power in a DWDM system

EX0840p



## Procedure 2-10

# Testing the signal continuity in a network element using an external DS1 test set

**Note:** VT1.5 management and the DS1 signal rate and facility type are not supported on the STX-192 platform. Perform this procedure only if your shelf is equipped with VTX-48 or VTX-48e circuit packs.

Use this procedure to test the signal continuity in a network element, using an external DS1 test equipment.

### Requirements

Before you perform this procedure, ensure that you have all the documentation referenced in this procedure.



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Ensure you are logged in to a network element. See <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .
2	Ensure the system has been powered up and stable for at least 5 minutes before you start the test. <b>Note:</b> At the test set, set the framing attribute of the DS1 test signal to Super frame.
3	Set the equalization signal attribute of the DS1 facility to match the cable length for the facility under test. See <a href="#">Signal attributes for a DS1 facility on page 2-37</a> .



—continued—

Procedure 2-10 (continued)

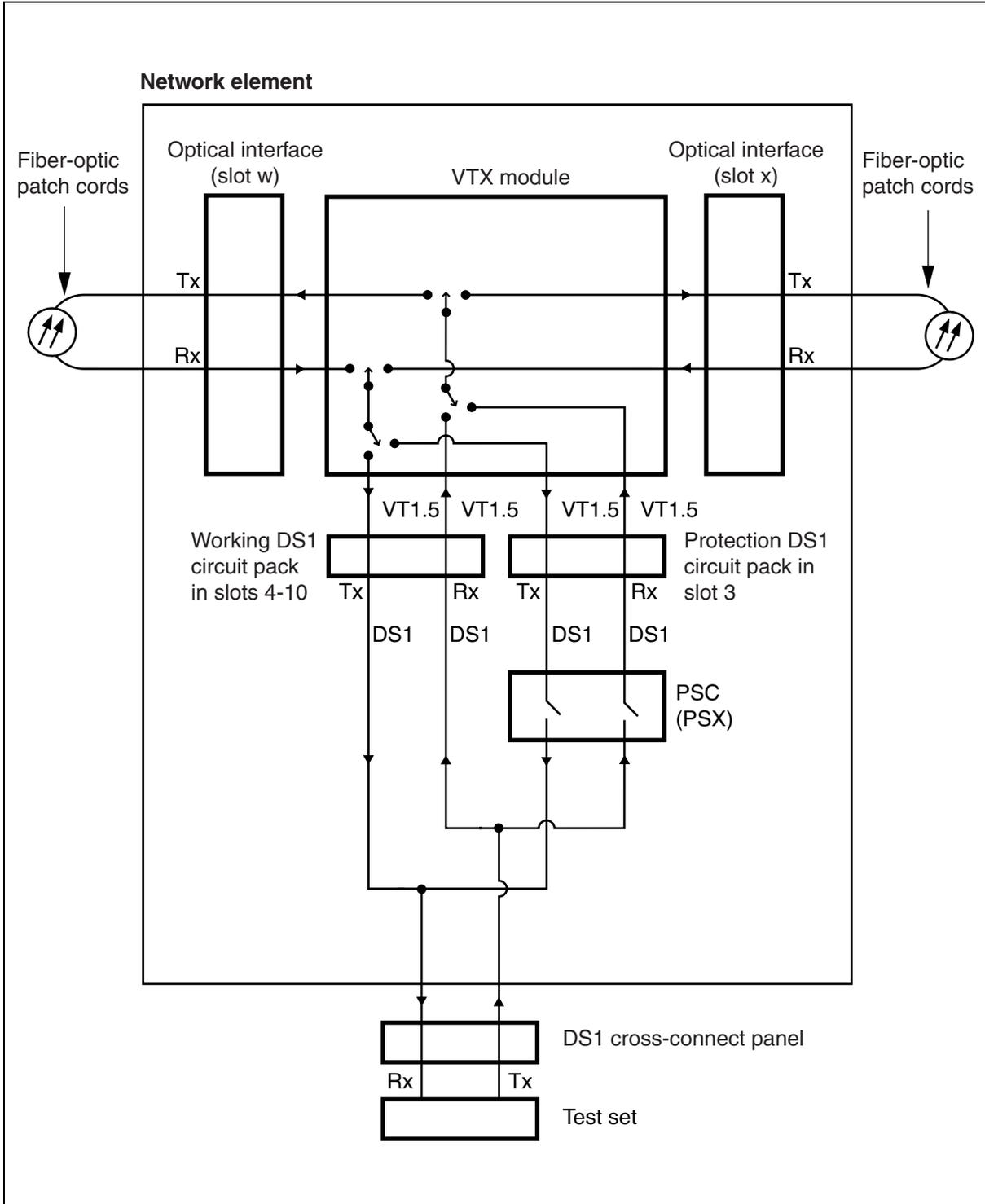
**Testing the signal continuity in a network element using an external DS1 test set**

Step	Action						
4	Provision a hardware loopback for the working optical interface circuit pack. See <a href="#">Provisioning a hardware terminal loopback for a network element on page 2-53</a> . Refer to <a href="#">Testing the protection for DS1 circuit pack on page 2-35</a> .						
5	Ensure 1+1 linear protection is provisioned for the slot x optical interface. See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8</a> .						
6	Repeat <a href="#">step 5</a> for slot w optical interface.						
7	Provision a 2WAY VT cross-connect from the slot 4 DS1 facility to the slot x optical interface. See <a href="#">323-1059-320, Procedures for end-to-end connection management on page 1-1</a> .						
8	Repeat <a href="#">step 7</a> for all working DS1 circuit packs in the shelf.						
9	Verify that the working optical interface circuit pack indicates working transmit and receive activity. For information see <a href="#">323-1059-350, Retrieving equipment and facility details on page 2-2</a> .						
10	Ensure the test set is switched on and connected to the DS1 I/O port that corresponds to the circuit pack you want to test.						
11	Set the test set to introduce an error free signal.						
12	Clear the error count on the test set.						
13	Read the error count on the test set. The working path passes the signal continuity test, if the signal is back, error free.						
14	As required repeat <a href="#">step 10</a> through <a href="#">step 13</a> for all ports of the circuit pack.						
15	Select an option: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: left;">If you are testing a</th> <th style="text-align: left;">Then</th> </tr> </thead> <tbody> <tr> <td>working path</td> <td>repeat <a href="#">step 10</a> through <a href="#">step 14</a> for all working DS1 circuit packs in the shelf.</td> </tr> <tr> <td>protection path</td> <td>repeat <a href="#">step 10</a> through <a href="#">step 14</a> for protection DS1 circuit pack in slot 3 of the shelf.</td> </tr> </tbody> </table>	If you are testing a	Then	working path	repeat <a href="#">step 10</a> through <a href="#">step 14</a> for all working DS1 circuit packs in the shelf.	protection path	repeat <a href="#">step 10</a> through <a href="#">step 14</a> for protection DS1 circuit pack in slot 3 of the shelf.
If you are testing a	Then						
working path	repeat <a href="#">step 10</a> through <a href="#">step 14</a> for all working DS1 circuit packs in the shelf.						
protection path	repeat <a href="#">step 10</a> through <a href="#">step 14</a> for protection DS1 circuit pack in slot 3 of the shelf.						
16	Review the test results. If any of the tests failed, solve the problem. See <a href="#">323-1059-543, Retrieving active alarms for a network element on page 2-3</a> .						

—end—

# Testing the protection for DS1 circuit pack

EX0855p



## Protection switch status details for Autonomous, Manual, and Forced switching

Switching type	DS1 tributary state	Other tributaries but DS1	Optical interface state	Switch
AUTONOMOUS				
<u>before switching:</u>				
a	IS	IS, Active, Working	IS, Active	Idle
b	IS, Active	IS, Hot standby	IS, Idle	Idle
<u>after switching:</u>				
a	Unequipped, hot standby	IS, Hot standby		Aut
b	IS, Active	IS, Active, Working		Idle
FORCED				
<u>before switching:</u>				
a	IS	IS, Active, Working	IS, Active	Idle
b	IS, Active	IS, Hot standby	IS, Idle	Idle
<u>after switching:</u>				
a	IS, working	IS, Hot standby	IS, Idle	Forced
b	IS, STBYS	IS, Active, Working	IS, working	Idle
MANUAL				
<u>before switching:</u>				
a	IS	IS, Active, Working	IS, Active	Idle
b	IS, Active	IS, Hot standby	IS, Idle	Idle
<u>after switching:</u>				
a	IS, working	IS, Hot standby	IS, Idle	Idle (Manual for tributary only)
b	IS, STBYS	IS, Active, Working	IS, Active	Idle

## Signal attributes for a DS1 facility

Signal attribute	Attribute description	Domain	Domain description
EQLZ	Cable length connecting T1 to DS1 cross-connect. If the cables for the incoming and outgoing streams are different, add "TX" or "RX" to the domain, for example "1RX" or "2TX".  1, 2, and 3 set the values for both TX and RX cables.	1	0-220 ft. both directions (default)
		1TX 1RX	0-220 ft. transmit 0-220 ft. receive
		2	220-430 ft. both directions
		2TX 2RX	220-430 ft. transmit 220-430 ft. receive
		3	430-655 ft. both directions
		3TX 3RX	430-655 ft. transmit 430-655 ft. receive

---

## Procedure 2-11

# Testing the signal continuity in a network element using a DS3 or STS-1 test set

---

Use this procedure to test the signal continuity in a network element, using an external DS3 or STS-1 test set.

### Requirements

Before you perform this procedure, ensure that you have all the documentation referenced in this procedure.



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

---

<b>Step</b>	<b>Action</b>
-------------	---------------

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- |   |   |
|---|---|
| 1 | Ensure you are logged in to a network element. See <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .   |
| 2 | Ensure the system has been powered up and stable for at least 5 minutes before you start the test.  |
| 3 | Ensure 1+1 linear protection is provisioned for the slot x optical interface. See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8</a> . |
| 4 | Repeat <a href="#">step 3</a> for slot w optical interface.   |
| 5 | Ensure there is a hardware terminal loopback at the optical interface circuit packs.  |

—continued—

Procedure 2-11 (continued)

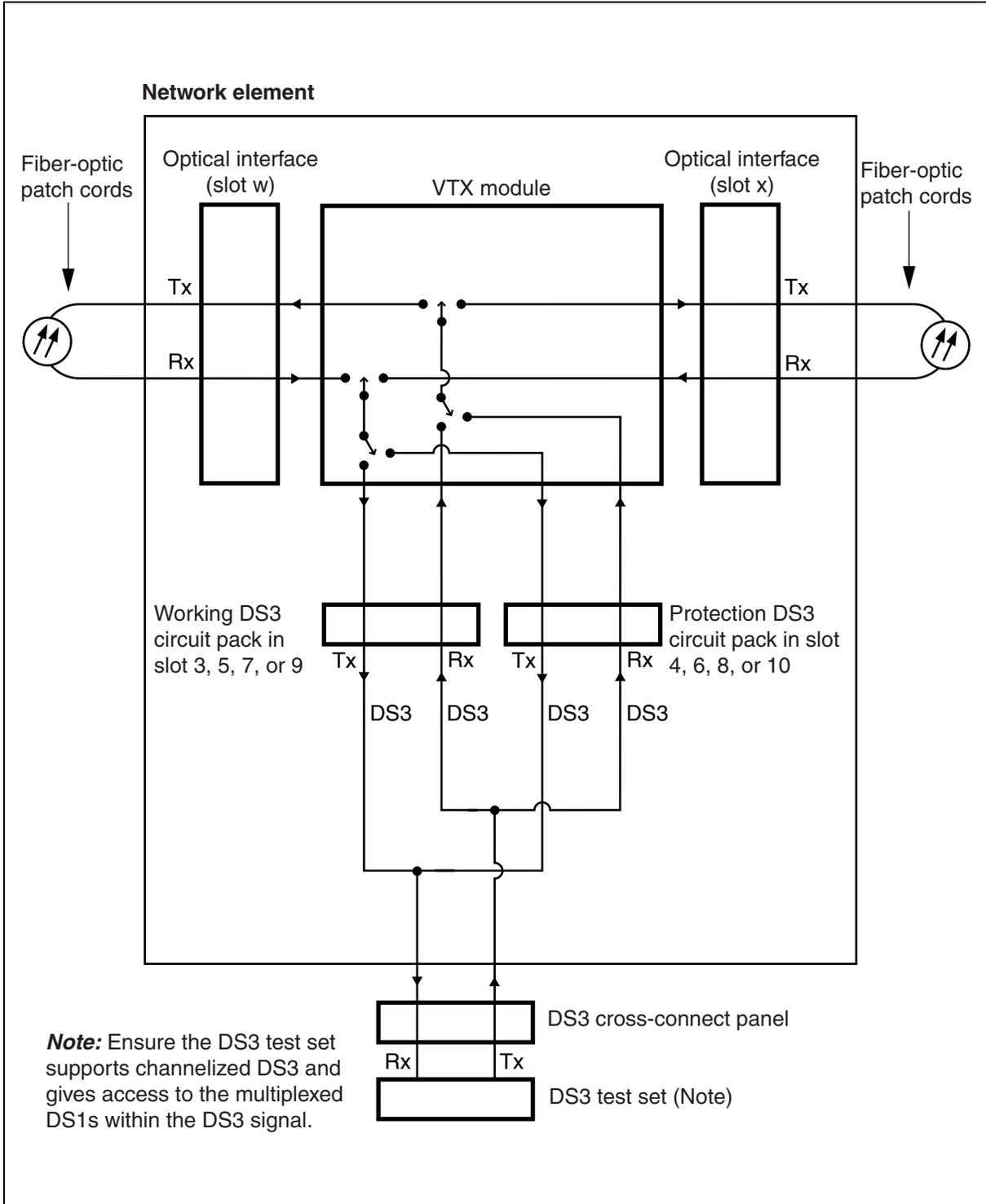
**Testing the signal continuity in a network element using a DS3 or STS-1 test set**

Step	Action				
6	Provision a 2WAY STS-1 cross-connect from the slot 3 DS3 or EC-1 facility to the slot x optical interface. See <a href="#">323-1059-350, Adding a facility on page 2-20</a> .				
7	Repeat <a href="#">step 6</a> for all working DS3 circuit packs in the shelf.				
8	Verify that the working optical interface circuit pack indicates working transmit and receive activity. See <a href="#">323-1059-350, Retrieving equipment and facility details on page 2-2</a> .				
9	Ensure the test set is switched on and connected to the DS3 I/O port that corresponds to the circuit pack you want to test.				
10	Clear the error count on the test set.				
11	Set the test set to introduce an error free signal.				
12	Read the error count on the test set. The working path passes the signal continuity test, if the signal is back, error free.				
13	As required repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all ports of the circuit pack.				
14	<p><b>If you are testing a    Then</b></p> <table border="0"> <tr> <td>working path</td> <td>repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all working DS3 or EC-1 circuit packs in the shelf</td> </tr> <tr> <td>protection path</td> <td>repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all protection DS3 or EC-1 circuit packs in the shelf</td> </tr> </table>	working path	repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all working DS3 or EC-1 circuit packs in the shelf	protection path	repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all protection DS3 or EC-1 circuit packs in the shelf
working path	repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all working DS3 or EC-1 circuit packs in the shelf				
protection path	repeat <a href="#">step 9</a> through <a href="#">step 12</a> for all protection DS3 or EC-1 circuit packs in the shelf				
15	Review the test results. If any of the tests failed, solve the problem. See <a href="#">323-1059-543, Retrieving active alarms for a network element on page 2-3</a> .				

—end—

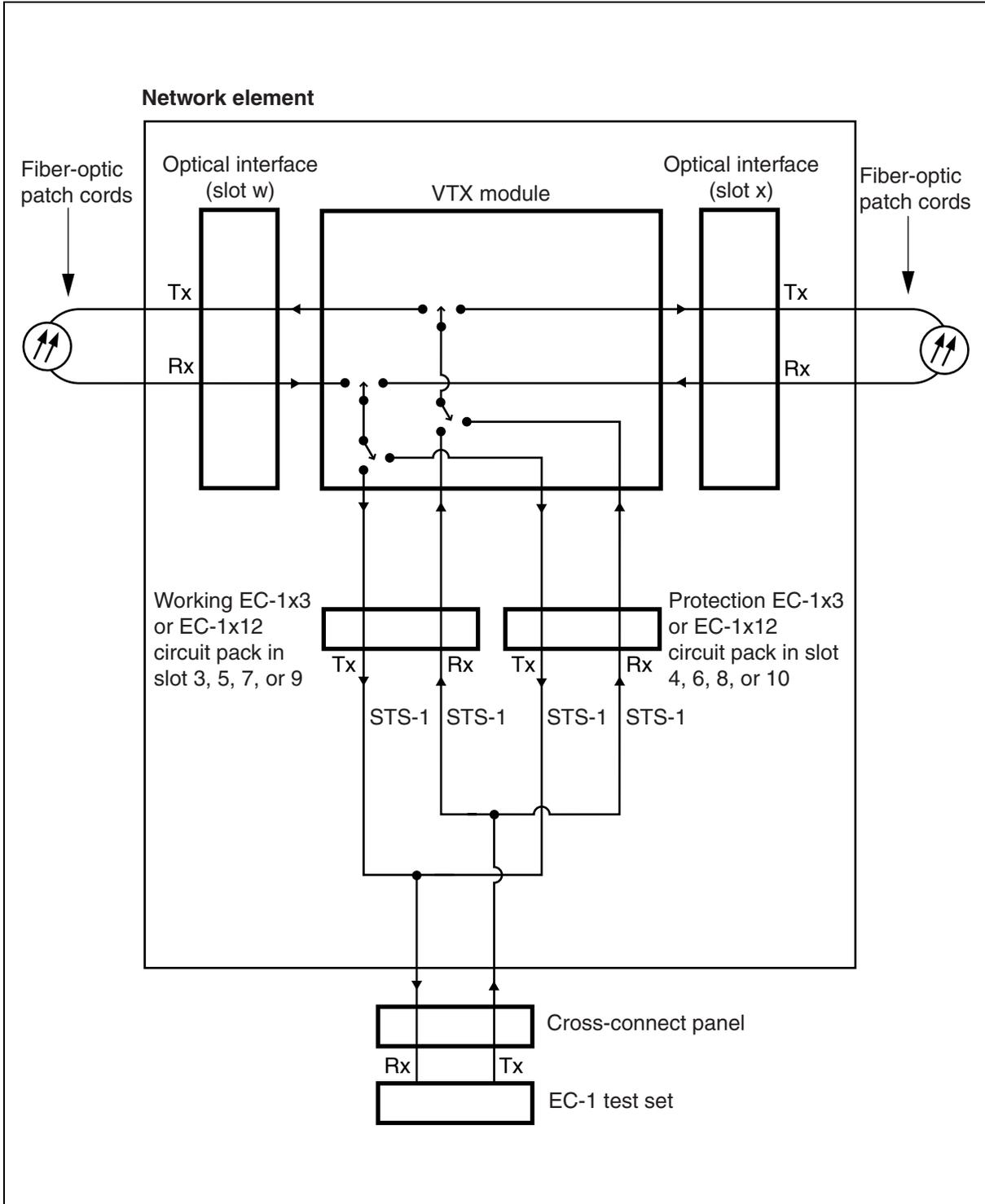
## Testing the protection for DS3 circuit pack

EX0854p



## Testing the protection for EC-1 circuit pack

EX1171p



## Procedure 2-12

# Testing OC-n line switching

---

Use this procedure to test the ability of the VTX or STX modules to perform optical line switching in a OPTera Metro 3500 shelf.

Perform this procedure for each pair of 1+1 protected OC-n optical interfaces in a network element.

For multiport optical circuit packs (OC-3x4, OC-12x4 STS), two pairs of 1+1 protected optical circuit packs (slots a/b, and slots c/d) are required to perform this procedure.

**Note 1:** Operating a terminal or facility loopback on the primary optics from where the network element gets its timing reference from may cause a loss of synchronization, generating the "Loss of Shelf Primary Timing Reference" alarm or "Loss of Shelf Secondary Timing Reference" alarm. In addition to the shelf timing alarms, the following alarms could also be generated on the network element:

- Link Down 1/1, Link Down 1/2, Link Down 1/3,
- Link Down 1/1, Link Down 1/2, Link Down 1/3,
- Link Down 1/4, Link Down 2/1, or Link Down 2/2
- Link Down (2x10BT-P2P)
- SDCC Link Failure
- Node ID mismatch

These alarms clear when the network element is restored to its initial state.

### **ATTENTION**

If you operate a terminal or facility loopback on all SDCC sources on a node, you cannot communicate with that node through Site Manager. To reestablish communication with Site Manager, log in to the network element through the TL1 interface and release the loopback. For more information on the how to log in to a network through the TL1 interface and TL1 loopback commands, refer to 323-1059-190, *TL1 Reference*.

—continued—

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 Procedure 2-12 (continued)  
**Testing OC-n line switching**


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**Requirements**

To perform these procedures, you must:

- ensure the network element is equipped with 1+1 protected optical interface circuit packs
- make a copy of [Protection switching test checklist on page 2-50](#)
- ensure that the network element has been installed and commissioned successfully
- bring a calibrated DS1 or DS3 test set to the test site as required  
*Note:* DS1 facilities are not supported on the STX-192 platform.
- ensure that two optical patch cords are available for looping an optical signal at the network element

**DANGER****Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit packs emit laser light which can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

---

**Step    Action**


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- 1      Ground yourself to the shelf to eliminate the possibility of electrostatic discharge into the shelf.
- 2      Ensure you are logged in to the network element. See [323-1059-302, Procedures for logging in to a network element on page 2-1](#).

**Connecting optical patch cords**

*Note:* For [step 3](#) to [step 40](#), see [Signal flow through 1+1 protected optical interfaces on page 2-48](#) for reference.

- 3      Connect an optical patch cord between the transmit connector of the optical interface in slot a and the receive connector of the optical interface in slot c.
- 4      Connect an optical patch cord between the receive connector of the optical interface in slot a and the transmit connector of the optical interface in slot c.
- 5      Connect an optical patch cord between the transmit connector of the optical interface in slot b and the receive connector of the optical interface in slot d.
- 6      Connect an optical patch cord between the receive connector of the optical interface in slot b and the transmit connector of the optical interface in slot d.

—continued—

Procedure 2-12 (continued)  
**Testing OC-n line switching**

Step	Action
------	--------

**Connecting the DS1 or DS3 test set**

- |                           |   |                           |   |              |  |              |                                       |
|---------------------------|---|---------------------------|---|--------------|--|--------------|---------------------------------------|
| 7                         | Select a DS1 facility or DS3 facility (slot y) as a connection point for the test set.  |                           |   |              |  |              |                                       |
| 8                         | At the DS1 or DS3 cross-connect panel, connect the appropriate test set to the facility selected in <a href="#">step 7</a> .  |                           |   |              |  |              |                                       |
| 9                         | Set up the test set to inject a small, known error rate (for example, 1 error/second) or set up the test set for manually injected errors.  |                           |   |              |  |              |                                       |
| 10                        | <table border="0"> <tr> <td style="vertical-align: top;"><b>If</b> you are using a</td> <td style="vertical-align: top;"><b>Then</b> set the signal framing attribute to</td> </tr> <tr> <td style="border-top: 1px solid black;">DS1 test set</td> <td style="border-top: 1px solid black;">Superframe and go to <a href="#">step 11</a></td> </tr> <tr> <td>DS3 test set</td> <td>M13 and go to <a href="#">step 13</a></td> </tr> </table> | <b>If</b> you are using a | <b>Then</b> set the signal framing attribute to | DS1 test set | Superframe and go to <a href="#">step 11</a> | DS3 test set | M13 and go to <a href="#">step 13</a> |
| <b>If</b> you are using a | <b>Then</b> set the signal framing attribute to   |                           |   |              |  |              |                                       |
| DS1 test set              | Superframe and go to <a href="#">step 11</a>  |                           |   |              |  |              |                                       |
| DS3 test set              | M13 and go to <a href="#">step 13</a>   |                           |   |              |  |              |                                       |

*Setting the DS1 facility equalization signal attribute*

- |    |   |
|----|---|
| 11 | <p>At the near-end network element, set the DS1 facility equalization signal attribute for the required DS1 facility. See <a href="#">DS1 facility signal attributes on page 2-49</a>.</p> <ol style="list-style-type: none"> <li>a. Select Equipment &amp; Facility Provisioning in the Configuration menu.</li> <li>b. Select the required DS1 circuit pack in the Name column, under Equipment.</li> <li>c. Select the required DS1 facility in the Port column, under Facility.</li> <li>d. Click Edit.</li> <li>e. If the DS1 facility is in service, put it out of service. See <a href="#">323-1059-350, Changing a facility state to Out of Service (OOS) on page 2-25</a>.</li> <li>f. In the Edit Facility dialog box, select an equalization value to match the cable length for the facility under test, from the Equalization menu.</li> <li>g. Click Apply.</li> <li>h. Put the DS1 facility back in service. See <a href="#">323-1059-350, Changing a facility state to In Service (IS) on page 2-26</a>.</li> </ol> |
| 12 | Go to <a href="#">step 14</a> .   |

—continued—

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 Procedure 2-12 (continued)  
**Testing OC-n line switching**


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Step	Action
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**Setting DS3 line build out**

- |    |   |  |
|----|---|--|
| 13 | <b>If</b> the length of the DS3 cable is equal to or above 225 ft | <b>Then</b> go to Set DS3 facility line build out to LONG. See <a href="#">323-1059-350, Editing DS1, DS3, EC-1, 2x100BT-P2P or GE/FC SFP facility signal attributes on page 2-28.</a> |
|    | is below 225 ft   | Set DS3 facility line build out to SHORT. See <a href="#">323-1059-350, Editing DS1, DS3, EC-1, 2x100BT-P2P or GE/FC SFP facility signal attributes on page 2-28.</a>                  |

**Testing path continuity through the slot a and c optical interfaces**

- |    |  |
|----|--|
| 14 | Provision 1+1 linear protection for the slot a optical interface. See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8.</a>   |
| 15 | Provision 1+1 linear protection for the slot c optical interface. See <a href="#">323-1059-311, Changing the protection scheme on an optical facility from UPSR to 1+1 linear on page 1-8.</a>   |
| 16 | Provision a 2WAY cross-connect from the slot y facility to the slot a optical interface. See <a href="#">323-1059-320, Adding a 2WAY or 1WAY cross-connect (linear or UPSR networks) on page 6-9.</a>                                    |
| 17 | Provision a 2WAY cross-connect from the slot z facility to the slot c optical interface. See <a href="#">323-1059-320, Adding a 2WAY or 1WAY cross-connect (linear or UPSR networks) on page 6-9.</a>                                    |
| 18 | Provision a terminal loopback for the slot z facility. See <a href="#">Provisioning a software loopback on page 2-56.</a>  |
| 19 | Clear the error count on the test set.   |
| 20 | Wait 5 minutes, then read the error count on the test set.<br><br>The slot a and c optical interfaces and the VTX/STX module pass the path continuity test if the number of errors on the test set equals the number of errors injected. |
| 21 | Record the test result. See <a href="#">Protection switching test checklist on page 2-50.</a>  |

**Testing path continuity through the slot b and d optical interfaces**

- |    |  |
|----|--|
| 22 | Perform a forced switch on the slot a optical interface. See <a href="#">323-1059-311, Operating a forced optical line switch in a 1+1 linear system on page 1-27.</a> |
| 23 | Release the forced switch. See <a href="#">323-1059-311, Releasing an optical line switch on page 1-30.</a>  |
| 24 | Clear the error count on the test set.   |

—continued—

## Procedure 2-12 (continued)

**Testing OC-n line switching**

Step	Action
25	Wait 5 minutes, then read the error count on the test set. The slot b and d optical interfaces and the VTX/STX module pass the path continuity test if the number of errors on the test set equals the number of errors injected.
26	Record the test result. See <a href="#">Protection switching test checklist on page 2-50</a> .
27	Perform a forced switch on the slot b optical interface. See <a href="#">323-1059-311, Operating a forced optical line switch in a 1+1 linear system on page 1-27</a> .
28	Release the forced switch. See <a href="#">323-1059-311, Releasing an optical line switch on page 1-30</a> .

**Testing autonomous line switching**

29	At the slot a optical interface, disconnect the optical patch cord at the input connector. This causes the slot a optical interface to do an autonomous line switch to the slot b optical interface.
30	Verify the autonomous switch to the slot b optical interface. <ul style="list-style-type: none"> <li>a. Select Status in the Protection menu.</li> <li>b. Select the OC-n circuit pack in the Type column, under Protection Summary.</li> <li>c. The autonomous optical line switch test passes if the following appears under OC-n Equipment protection:</li> <li>d. OCn-&lt;aslot&gt;[-&lt;facility&gt;]: IS, Idle / IS, Hot standby</li> <li>e. OCn-&lt;bslot&gt;[-&lt;required facility&gt;]: IS Active / IS, Working</li> <li>f. Record the test result. See <a href="#">Protection switching test checklist on page 2-50</a>.</li> </ul>
31	At the slot a optical interface, reconnect the optical patch cord at the input connector.
32	Perform a forced switch on the slot b optical interface. See <a href="#">323-1059-311, Operating a forced optical line switch in a 1+1 linear system on page 1-27</a> .
33	Release the forced switch. See <a href="#">323-1059-311, Releasing an optical line switch on page 1-30</a> . The following should appear in the Status window: <ul style="list-style-type: none"> <li>— OCn-&lt;bslot&gt;-&lt;required facility&gt;: IS, Idle / IS, Hot standby</li> <li>— OCn-&lt;aslot&gt;-&lt;required facility&gt;: IS, Active / IS, Working</li> </ul>

**Testing forced line switching**

34	Perform a forced line switch on the slot a optical interface. See <a href="#">323-1059-311, Operating a forced optical line switch in a 1+1 linear system on page 1-27</a> .
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—continued—

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 Procedure 2-12 (continued)  
**Testing OC-n line switching**


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Step	Action
35	Verify the forced line switch. <ol style="list-style-type: none"> <li>a. Select Status in the Protection menu.</li> <li>b. Select the OC-n circuit pack in the Type column, under Protection Summary.</li> <li>c. The forced optical line switch test passes if the following appears under OC-n Equipment protection:               <ul style="list-style-type: none"> <li>— OCn-&lt;aslot&gt;[-&lt;required facility&gt;]: IS, Idle / IS, Hot standby</li> <li>— OCn-&lt;bslot&gt;[-&lt;required facility&gt;]: IS Active / IS, Working</li> </ul> </li> <li>d. Record the test result. See <a href="#">Protection switching test checklist on page 2-50</a>.</li> </ol>
36	Release the forced line switch. See <a href="#">323-1059-311, Releasing an optical line switch on page 1-30</a> .

**Restoring the network element to its initial state**

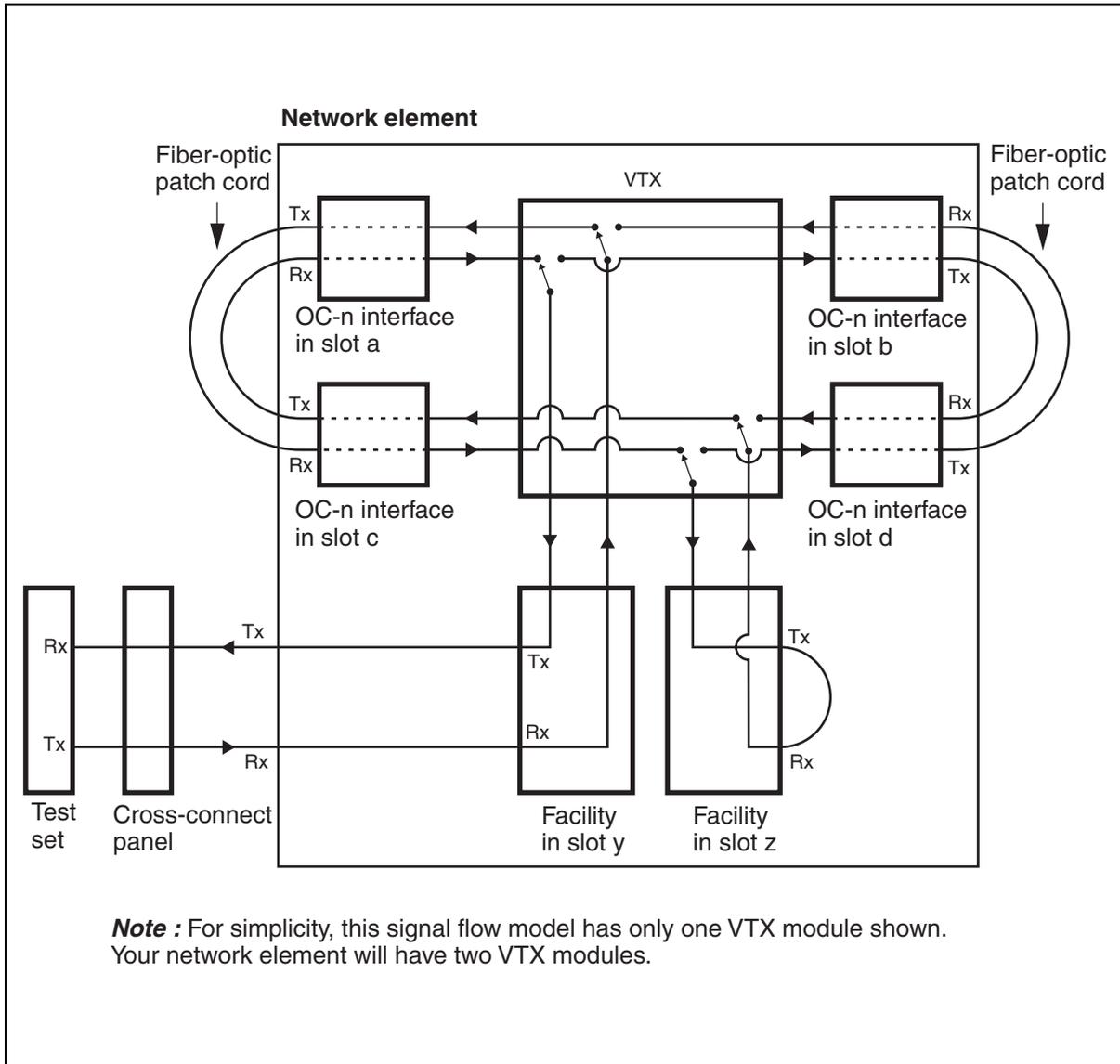
**Note:** See [Signal flow through 1+1 protected optical interfaces on page 2-48](#).

- |    |  |
|----|--|
| 37 | At the DS1 or DS3 cross-connect panel, disconnect the test set.  |
| 38 | Delete the DS1 or DS3 cross-connects you provisioned. See <a href="#">323-1059-320, Deleting a cross-connect on page 6-4</a> . |
| 39 | Disconnect the fiber-optic patch cords from the optical interfaces.  |
| 40 | Reconnect the fiber-optic cables as they were originally configured.   |
| 41 | Review the test results for this network element. See <a href="#">Protection switching test checklist on page 2-50</a> .       |
- If any of the tests failed, resolve the problem. See [323-1059-543, Detailed procedures for active alarms on page 4-1](#).

—end—

## Signal flow through 1+1 protected optical interfaces

EX1409



**DS1 facility signal attributes**

Signal attribute	Attribute description	Domain	Domain description
EQLZ	Cable length connecting T1 to DS1 cross- connect. If the cables for the incoming and outgoing streams are different, add "TRANSMIT" or "RECEIVE" to the domain.	SHORT SHORT TRANSMIT SHORT RECEIVE	0-220 ft. both directions (default) 0-220 transmit 0-220 receive
		MEDIUM MEDIUM TRANSMIT MEDIUM RECEIVE	220-430 ft. both directions 220-430 transmit 220-430 receive
		LONG LONG TRANSMIT LONG RECEIVE	430-655 ft. both directions 430-655 transmit 430-655 receive

## Protection switching test checklist

Network element (TID)	Optical interface protected pair	Test	Pass (√)	Fail (√)
	a slot#= ____ port#= ____ b slot# = ____ port#= ____	Slot a optical interface		
		Slot b optical interface		
		Autonomous optical line switching		
		Forced optical line switching		
		Manual optical line switching		
	a slot#= ____ port#= ____ b slot# = ____ port#= ____	Slot a optical interface		
		Slot b optical interface		
		Autonomous optical line switching		
		Forced optical line switching		
		Manual optical line switching		
	a slot#= ____ port#= ____ b slot# = ____ port#= ____	Slot a optical interface		
		Slot b optical interface		
		Autonomous optical line switching		
		Forced optical line switching		
		Manual optical line switching		
	a slot#= ____ port#= ____ b slot# = ____ port#= ____	Slot a optical interface		
		Slot b optical interface		
		Autonomous optical line switching		
		Forced optical line switching		
		Manual optical line switching		
	a slot#= ____ port#= ____ b slot# = ____ port#= ____	Slot a optical interface		
		Slot b optical interface		
		Autonomous optical line switching		
		Forced optical line switching		
		Manual optical line switching		

## Procedure 2-13

# Adjusting the variable optical attenuator

Use this procedure to set the variable optical attenuator (VOA) to -15 dBm. The recommended optical receive power level is -20 dBm.

### Requirements

The following tools are mandatory to perform this procedure

- variable optical attenuator (VOA)
- optical power meter (OPM)
- antistatic wrist or ankle strap
- fiber-optic patch cords
- fiber microscope



#### **DANGER**

##### **Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.



#### **CAUTION**

##### **Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Measure the output power at the optical interface Tx port. See <a href="#">Testing the power at the optical interface Tx port on page 2-8</a> .
2	Remove the protective cap from the VOA connector. Scope the connector, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>



—continued—

Procedure 2-13 (continued)

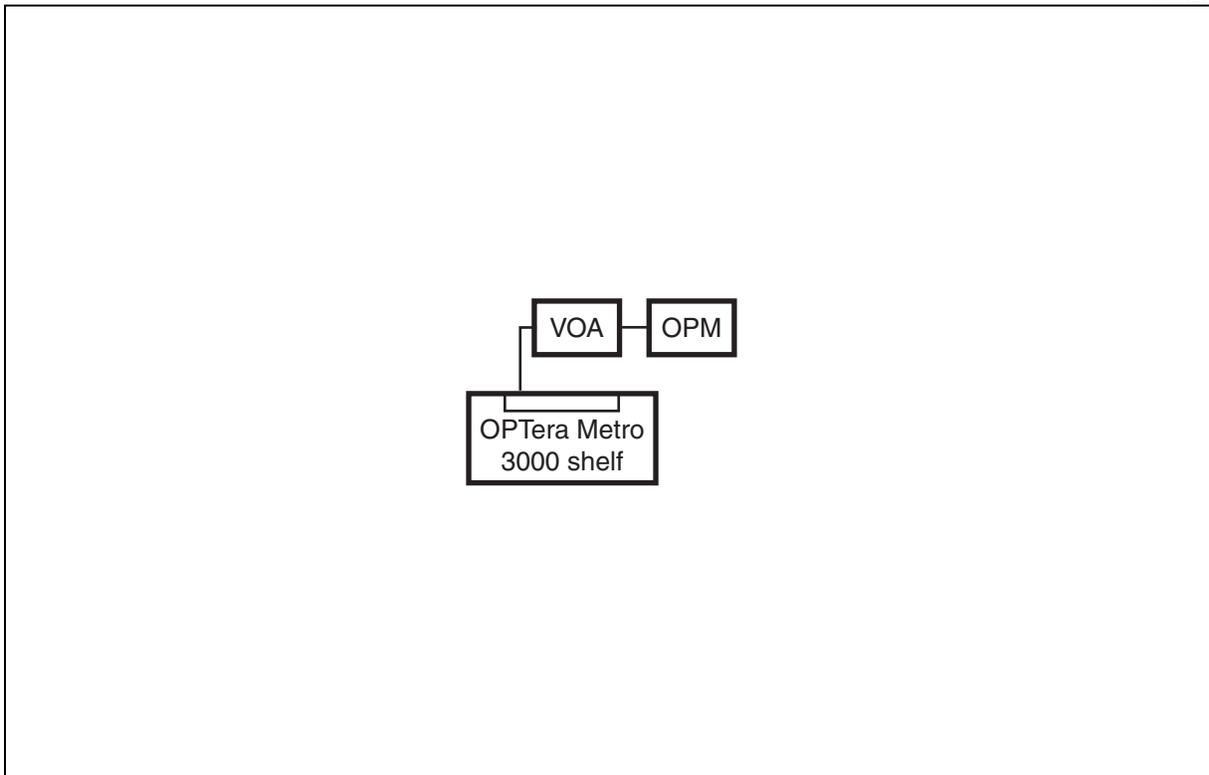
**Adjusting the variable optical attenuator**

Step	Action
3	Connect one end of the VOA to the Tx port of the optical interface circuit pack.
4	Connect the other end of the VOA to the optical power meter (OPM) connector. See <a href="#">Adjusting the VOA on page 2-52</a> .
5	Switch the OPM power on, then adjust the set screw of the VOA until the display of the meter reads - 15 dBm.
6	Switch the OPM power off and disconnect the OPM from the VOA.

—end—

**Adjusting the VOA**

EX1029t



---

## Procedure 2-14

# Provisioning a hardware terminal loopback for a network element

---

Use this procedure to provision a hardware terminal loopback for a network element.

**DANGER****Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

**CAUTION****Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

**CAUTION****Risk of equipment damage**

You can add a hardware terminal loopback directly between the Tx and Rx ports of most optical interface circuit packs. The following optical interface circuit packs require an optical padding: OC-12 LR (NTN404AA), OC-12 ER (NTN404CA), OC-48 LR (NTN440DA), OC-48 DWDM (NTN442EA, NTN442FB), OC-192, and OC-192 DWDM.

—continued—

Procedure 2-14 (continued)

**Provisioning a hardware terminal loopback for a network element**

**Requirements**

Before you perform this procedure, ensure that you have all the documentation referenced in this procedure.

Step	Action		
1	<p>Identify the type of optical interface circuit pack and proceed as follows:</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 60%;"><b>If</b> you are provisioning a hardware loopback for OC-12 LR, OC-12 ER, OC-48 LR, OC-48 DWDM, OC-192, or OC-192 DWDM optical interface circuit pack</td> <td style="width: 40%; text-align: right;"><b>Then</b> go to <a href="#">step 2</a></td> </tr> </table> <p>another optical interface circuit pack supported in release 11.0 and not listed above <a href="#">step 7</a></p>	<b>If</b> you are provisioning a hardware loopback for OC-12 LR, OC-12 ER, OC-48 LR, OC-48 DWDM, OC-192, or OC-192 DWDM optical interface circuit pack	<b>Then</b> go to <a href="#">step 2</a>
<b>If</b> you are provisioning a hardware loopback for OC-12 LR, OC-12 ER, OC-48 LR, OC-48 DWDM, OC-192, or OC-192 DWDM optical interface circuit pack	<b>Then</b> go to <a href="#">step 2</a>		
2	Add an optical pad to the Tx port on the working optical interface circuit pack. See <a href="#">Adjusting the variable optical attenuator on page 2-51</a> .		
3	Scope an optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>		
4	Connect the variable optical attenuator (VOA) to the Rx port on the working optical interface circuit pack.		
5	Repeat <a href="#">step 2</a> through <a href="#">step 4</a> for the protection optical interface circuit pack.		
6	Go to <a href="#">step 10</a> .		
7	Scope an optical patch cord, clean if necessary, and scope again. See: <ul style="list-style-type: none"> <li>• 323-1059-201, Cleaning optical connectors and adapters on patch cords</li> <li>• 323-1059-201, Dirty optical fiber</li> <li>• 323-1059-201, Clean optical fiber</li> </ul>		
8	Connect the transmit port to the receive port on the working optical interface circuit pack. See <a href="#">Testing the protection for DS1 circuit pack on page 2-35</a> , and <a href="#">Testing the protection for DS3 circuit pack on page 2-40</a> .		
9	Repeat <a href="#">step 7</a> through <a href="#">step 8</a> for the protection optical interface circuit pack.		

—continued—

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Procedure 2-14 (continued)

**Provisioning a hardware terminal loopback for a network element**

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<b>Step</b>	<b>Action</b>
<b>10</b>	<p>The optical loopback sets an SDCC failure alarm (the SPx is expecting data from an other shelf). Clear the SDCC failure alarms for the working optical interface circuit pack.</p> <ol style="list-style-type: none"><li><b>a.</b> Select Equipment &amp; Facility Provisioning from the Configuration drop-down menu to open the Equipment &amp; Facility Provisioning window.</li><li><b>b.</b> Select the working optical interface from the Equipment area.</li><li><b>c.</b> Click SDCC under Facility.</li><li><b>d.</b> Select Inactive from the Change status drop-down list.</li><li><b>e.</b> Click Apply.</li><li><b>f.</b> Click OK.</li></ol>

—end—

## Procedure 2-15 Provisioning a software loopback

Use this procedure to provision a software loopback for a DS1, DS3, EC-1, OC-3, OC-3x4, OC-12, OC-12x4 STS, 2x100BT-P2P, 2xGigE/FC-P2P, OC-48, OC-48 STS or OC-192 circuit pack.

**Note 1:** If a terminal loopback is activated on a DS3x12 enhanced (DS3x12e) mapper circuit pack (NTN435BA), the system does not transmit an Alarm Indication Signal (AIS).

**Note 2:** If a facility loopback is activated on a DS3VTx12 mapper (NTN435FA), the VT Rx Unequipped alarm (raised against far-end path terminating equipment) does not clear after this loopback is activated. This alarm clears once you release this software loopback and place the facility in-service.

**Note 3:** On OC-3x4 and OC-12x4 STS circuit packs, ensure you select the correct port.

**Note 4:** OC-192 supports facility loopback only. Performance measurements (PM) counts are collected on OC-192 circuit packs while in the loopback state. Upon completion of the loopback, you should clear the collected PM counts. See [323-1059-510, Clearing facility PM counts on page 1-25](#).

### Requirements

Before you begin this procedure, ensure that you:

- have all the documentation referenced in this procedure.
- provision all required cross-connects



**CAUTION**

**Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Log in to a network element. See <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .
2	Select a network element in the navigation area.
3	Select Equipment & Facility Provisioning from the Configuration drop-down menu to open the Equipment & Facility Provisioning window.



—continued—

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 Procedure 2-15 (continued)

**Provisioning a software loopback**


---

Step	Action
4	<p><b>If</b> the circuit pack for which you are provisioning a loopback is an optical interface circuit pack and has a provisioned protection scheme of either 1+1 linear or BLSR <b>Then</b> go to <a href="#">step 5</a></p> <p>does not have a provisioned protection scheme of 1+1 linear or BLSR <a href="#">step 6</a></p>
5	<p>Provision a lockout on the optical circuit pack in the mate slot of the circuit pack for which you will provision a software loopback. See <a href="#">323-1059-311, Operating a lockout on an optical interface circuit pack in a 1+1 linear system on page 1-28</a>.</p>
6	<p>If the facility is currently in service, put the facility out of service. See <a href="#">323-1059-350, Changing a facility state to Out of Service (OOS) on page 2-25</a>.</p>
7	<p>Add a loopback.</p> <ol style="list-style-type: none"> <li>a. Click Test under Facility.</li> <li>b. Select loopback from the Test type drop-down list.</li> <li>c. Select Terminal for a terminal loopback or Facility for a facility loopback from the Direction drop-down list.</li> <li>d. Click Operate.</li> <li>e. Click Close.</li> <li>f. In the Facility area, click Refresh. Loopback active must be displayed for the current facility, under Primary state or Secondary state.</li> </ol>

**Note 1:** To operate a terminal loopback on a LAN port of a 2x100BT-P2P circuit pack, the LAN port must be in full duplex mode. See [323-1059-350, Procedures for facility provisioning on page 2-1](#), to change the duplex mode of a LAN port.

**Note 2:** During a terminal loopback of a 2x100BT-P2P circuit pack, the LAN port sends a link pulse, even though the port is out-of-service. Also, several operational measurements of the LAN port (In Frames, In Octets, Out Frames, and Out Octets) increment, in relation to the number of packets received by the WAN port.

—end—

## Procedure 2-16

# Releasing a software loopback

Use this procedure to release a software loopback.

### Requirements

Before you perform this procedure, ensure that you have all the documentation referenced in this procedure.

Step	Action						
1	Log in to a network element. See <a href="#">323-1059-302, Procedures for logging in to a network element on page 2-1</a> .						
2	Select a network element in the navigation area.						
3	Select Equipment & Facility Provisioning from the Configuration drop-down menu to open the Equipment & Facility Provisioning window.						
4	Release the loopback. <ol style="list-style-type: none"> <li>Click Test under Facility.</li> <li>Select loopback from the Test type drop-down list.</li> <li>Click Release.</li> <li>Click Refresh.</li> </ol>						
5	Put the facility in service. See <a href="#">323-1059-350, Changing a facility state to In Service (IS) on page 2-26</a> .						
6	Clear any performance measurements that were collected while the OC-192 was in the loopback state. See <a href="#">323-1059-510, Clearing facility PM counts on page 1-25</a> .						
7	<table border="1"> <thead> <tr> <th>If</th> <th>Then</th> </tr> </thead> <tbody> <tr> <td>you provisioned a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback</td> <td>go to <a href="#">step 8</a></td> </tr> <tr> <td>you did not provision a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback</td> <td>you have completed this procedure</td> </tr> </tbody> </table>	If	Then	you provisioned a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback	go to <a href="#">step 8</a>	you did not provision a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback	you have completed this procedure
If	Then						
you provisioned a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback	go to <a href="#">step 8</a>						
you did not provision a lockout on the circuit pack in the mate slot of the circuit pack for which you provisioned a loopback	you have completed this procedure						
8	Release the lockout on the optical circuit pack in the mate slot (the other circuit pack of this protected pair) of the circuit pack for which you provisioned a software loopback. See <a href="#">323-1059-311, Releasing an optical line switch on page 1-30</a> .						

—end—

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## Procedure 2-17

# Restoring the network element to its initial state

---

Use this procedure to restore a network element to its initial state.

**DANGER****Risk of personal injury**

When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

**CAUTION****Risk of equipment damage**

Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

---

Step	Action
------	--------

---

- |   |   |
|---|---|
| 1 | Disconnect the DS1 cross-connect panel from the test set.           |
| 2 | Delete the cross-connects.  |
| 3 | Disconnect the fiber-optic patch cords from the optical interfaces. |
| 4 | Connect the fiber-optic cables as the original configuration.       |

—end—





Nortel Networks

# **OPTera Metro 3500 Multiservice Platform System Testing**

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