OSIRIS® Shelf Testing Guide

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POSITRON
Networks Division

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Table of Contents

Chapter 1

Testing the OSIRIS®-PWR Shelf

Before you test an OSIRIS optical multiplexer, you must verify that the power supply is functioning properly. This chapter explains how to check the LEDs on the OSIRIS-PWR Shelf.

Note: Skip this chapter if you are not using a Positron power supply.

Checking the LEDs

The OSIRIS-PWR Shelf is powered by an AC/DC power module which converts 105V-135V AC to -28V DC. The OSIRIS-PWR Shelf can accept two power modules. The power modules are installed in the two card slots located at the left side of the OSIRIS-PWR Shelf. See Figure 1 for the location of the power modules.

Four LEDs and a battery test button reside on the edge of each power module. Follow the procedures in this chapter to test the status of each LED.

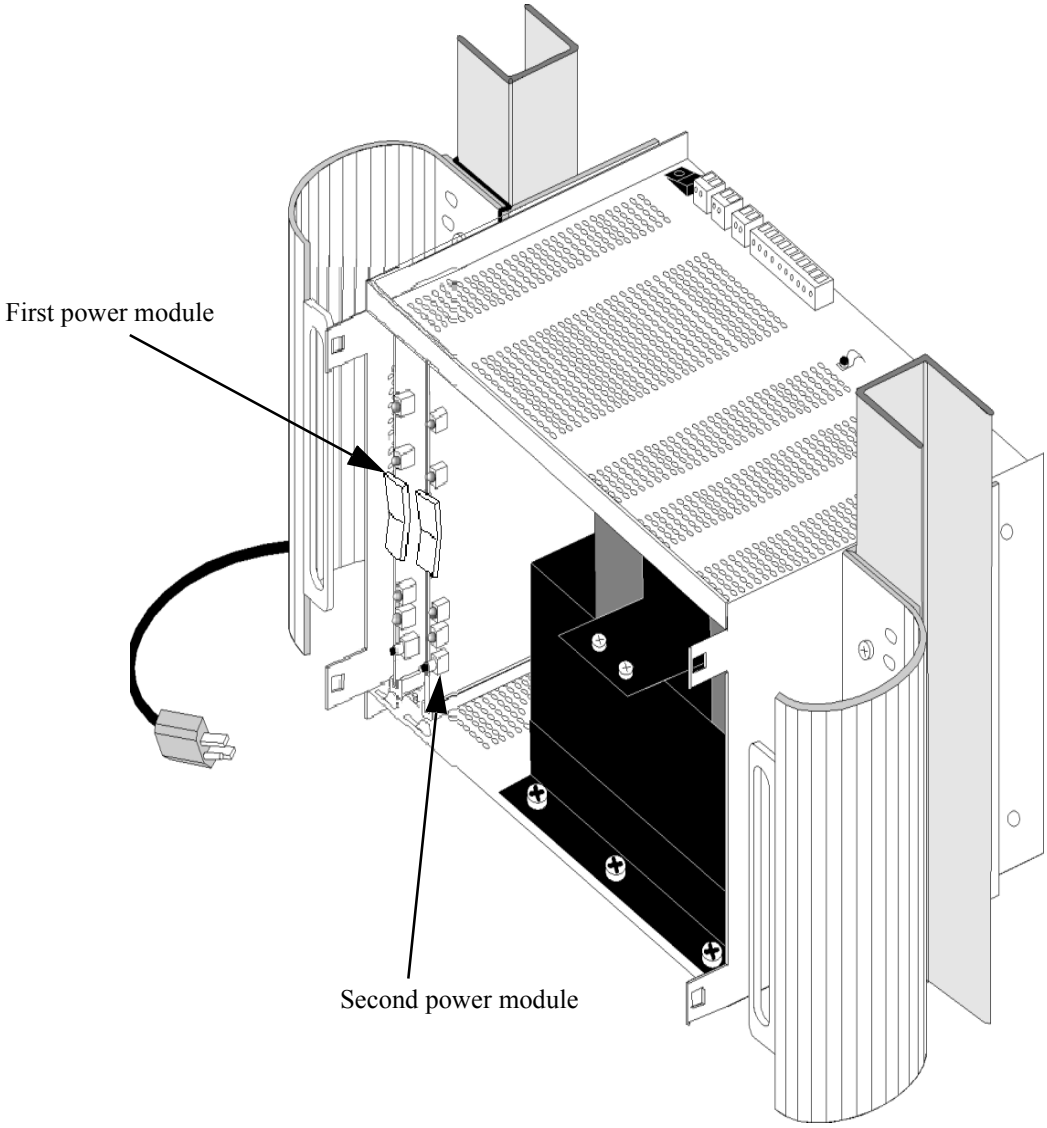
1. Check the AC Power LED. If it is not green, contact Positron's TAC (Technical Assistance Center) at 1-866-331-3003 or 1-514-345-2202, or visit our web site at www.positronnetworks.com.
2. Check the Shelf Alarm LED. If it is not green, refer to the following table:

Error Condition	Recommended Action
No AC power detected after fuse.	The power cord is disconnected. Reconnect power cord.
Output voltage of the AC/DC converter fell below 24V.	The AC/DC power module is defective. You must change the power module.
Battery is low (<23 V).	Perform the battery test. See Step 4.
No voltage after output fuse.	The fuse has blown. You must change the fuse or replace the AC/DC module.

3. Check the Card Fail LED. If it is not green, contact Positron.
4. Press the battery button. A five-second battery self-test begins. If the Shelf Alarm LED is not green, refer to the following table:

If the LED is:	
Off	The battery is not connected or the battery switch is turned off.
Green	Voltage is >23 V. Normal condition.
Amber	The voltage is weak (between 18V and 23 V). This is a normal condition after an AC power failure. Wait a few hours for the battery to recharge.
Red	The battery is defective or completely discharged (voltage is < 18 V). Replace the battery.

Figure 1 Installing the AC/DC Power Modules



Chapter 2
Preparing for Testing

This chapter describes the prerequisites for testing OSIRIS optical multiplexers, the power supply, mappers, and OAUs.

All required mappers and OAUs should be installed before you start testing. For installation information, refer to these documents:

- *OSIRIS®-STD Shelf Installation Guide (203-002)*
- *OSIRIS®-Micro Shelf Installation Guide (203-004)*
- *OSIRIS®-Micro WMU Installation Guide (203-005)*
- *OSIRIS®-XTD Shelf Installation Guide (203-003)*

Testing Requirements

This testing guide describes the procedures for testing OSIRIS optical multiplexers and networks. Follow the procedures in Chapters 1 to 5 to ensure that each network element is operating properly.

You should perform these tests during initial shelf installation. Thorough testing prevents serious problems from occurring later on.

The OSIRIS-STD Shelf is used for all examples and illustrations in this document; however, the testing procedures can be applied to all types of OSIRIS optical multiplexers.

You should know how to use the following test equipment before you proceed:

- DS1 digital transmission test set
- DS3 digital transmission test set
- Digital voltmeter
- Optical test set
- Optical power meter
- Optical attenuator

You also need these items:

- IBM® PC or compatible computer running Windows 95/NT/2000/XP with OSIRIS-VUE™ version 2.50D or higher. The following hardware and memory requirements apply to OSIRIS-VUE.

	Platform	Minimum	Recommended
OSIRIS-VUE	Windows 95	486DX2 66Mhz 16 MB RAM	Pentium 75Mhz 32 MB RAM
	Windows NT	Pentium 75Mhz 32 MB RAM	Pentium 133Mhz 64 MB RAM
OSIRIS-VUE PLUS!™	Windows 95	Pentium 166Mhz 32 MB RAM	Pentium 166Mhz 64 MB RAM
	Windows NT	Pentium 166Mhz 64 MB RAM	Pentium 166Mhz 64 MB RAM

  Note: OSIRIS-VUE does not support the Windows 95 32-bit/64-bit color palettes.

- Craft cable (an RS-232 cable with a 9-pin female)
- Wrist strap
- Two fiber patch cords
- DSX patch panel for DS1 and DS3 traffic

Safety Guidelines

You must take appropriate safety precautions when you test an OSIRIS optical multiplexer. This section describes safety measures that you should observe when you are working with plug-in units and single-fiber cables.

Plug-in units

Follow these precautions when you are handling or storing mappers or OAUs:

- Wear a ground wrist strap or heel grounder to prevent electrostatic discharge. The ground strap should be plugged into the ESD connector on the Alarm and Craft Interface Unit (ACIU). You may use additional personal grounding methods, such as standing on a conductive carpet or wearing conductive shoes.
- Hold plug-in units by the faceplate or the card ejector. Do not touch the solder side of the card, its pin connectors, or any metallic components.
- Store plug-in units in their original antistatic bags when they are not mounted on a shelf.
- Do not stack plug-in units on or against each other.
- Store plug-in units in a temperature ranging from – 40° C to +50° C (- 40 to 122° F).

Single-fiber cables

Follow these precautions when you are working with single-fiber cables:

- Protect optical connectors with dust caps at all times.
- Wear safety glasses when you are installing fiber cables.
- Clean your hands after handling single fiber cables to make sure that your hands are free of fiber particles.
- Handle optical fibers carefully and always position them in a safe and secure location during installation.
- Do not handle pieces of cut fiber with your bare fingers. Use tweezers or the sticky side of a piece of vinyl tape to pick up and discard any loose fiber ends.

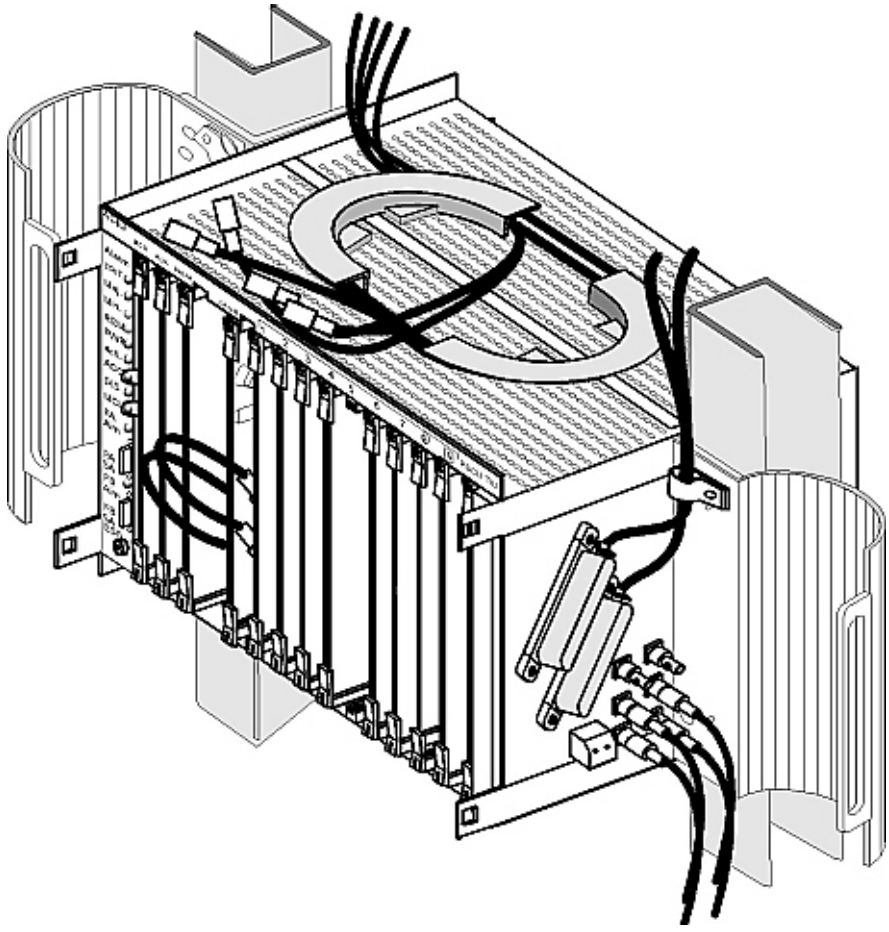
Looping Back an OAU

Before testing power, fuse and shelf alarms, you must loop back the OAUs.

Note: You must use an optical attenuator for long reach OAUs; otherwise, you can damage the OAU receiver. See Appendix A for OAU product codes.

1. Remove the OAU card.
2. Clean the fibers with lint-free tissues and rubbing alcohol.
3. Connect one end of the fiber patch cord to the OUT transmitter on the OAU card.
4. Connect the other end of the fiber patch cord to the IN receiver on the same OAU card.
5. Reinsert the OAU. See Figure 2.
6. If a second OAU card is installed, repeat Steps 1 to 5.

Figure 2 OAU Loop-back Connection



Chapter 3
Testing Power to the Shelf

Testing procedures are performed after the mechanical installation procedure. Once a reliable power source is established, you may test the shelf. OSIRIS optical multiplexer power source tests are performed in the following order:

- Testing the power of the OSIRIS optical multiplexer
- Testing power source switching
- Testing a fuse alarm condition
- Testing the battery connection (OSIRIS-Micro WMU only)

Testing the Power of the OSIRIS optical multiplexer

The OSIRIS optical multiplexer must receive adequate power to function properly.

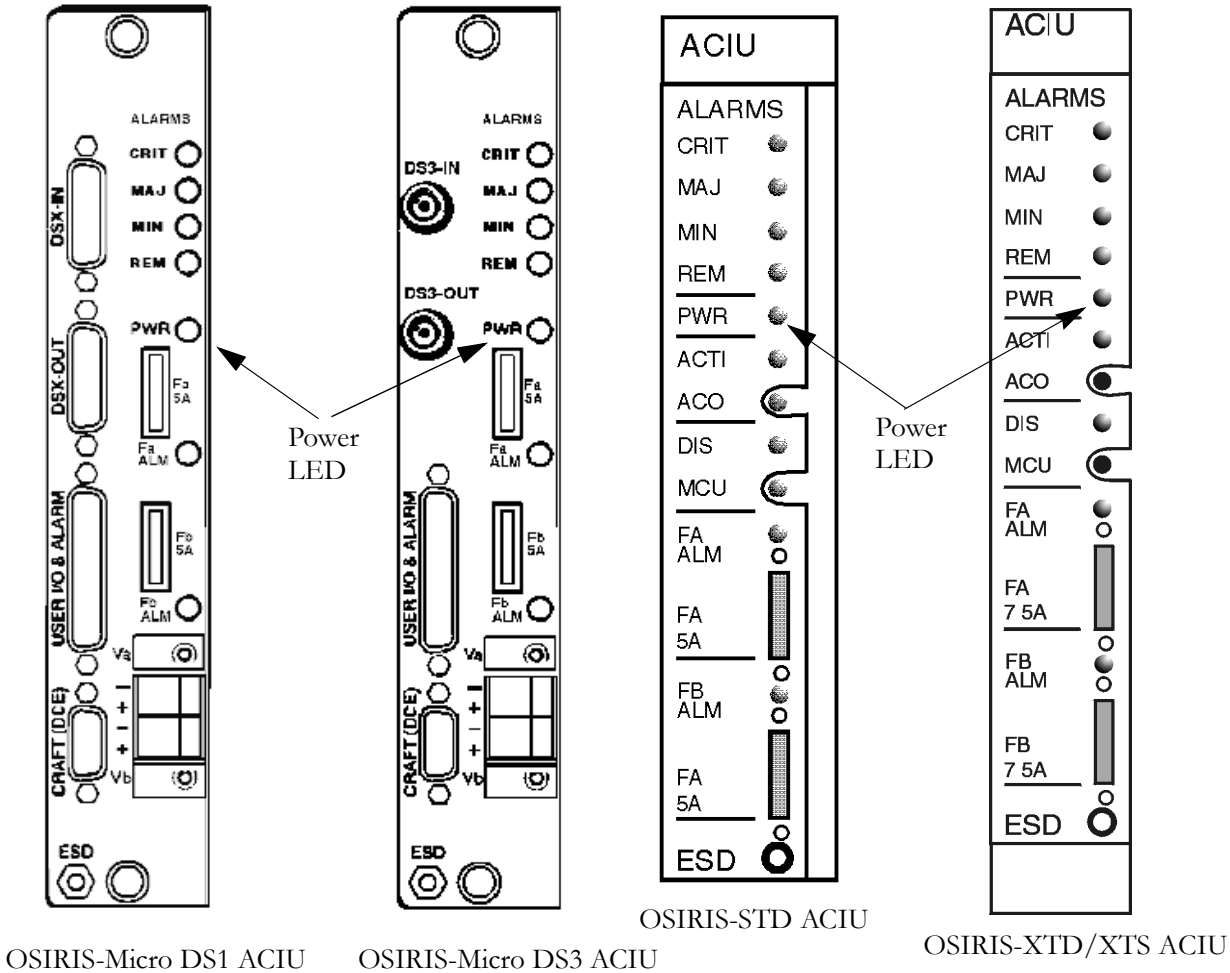
1. At the Main Power Input connector, verify that the A power input voltage is between -20 to -60 VDC with a digital voltmeter. Refer to Figure 4 and Figure 5 for location of main power input connectors.

   If the Power Status (PWR) LED is on and the ACIU LED is not green, make sure that fuses A and B are installed and undamaged. Refer to Figure 3 to locate the Power LEDs.

   - The PWR LED is off when the two power sources drop below -19.5V ±0.6V.
   - The PWR LED is on when at least one power source exceeds -20.5V ±0.6V.

2. Repeat step 1 for the B power source.

Figure 3 Power LED Location on OSIRIS *optical multiplexers*



OSIRIS-Micro DS1 ACIU OSIRIS-Micro DS3 ACIU OSIRIS-STD ACIU OSIRIS-XTD/XTS ACIU

Figure 4 Power Input Connectors (OSIRIS-STD Shelf)

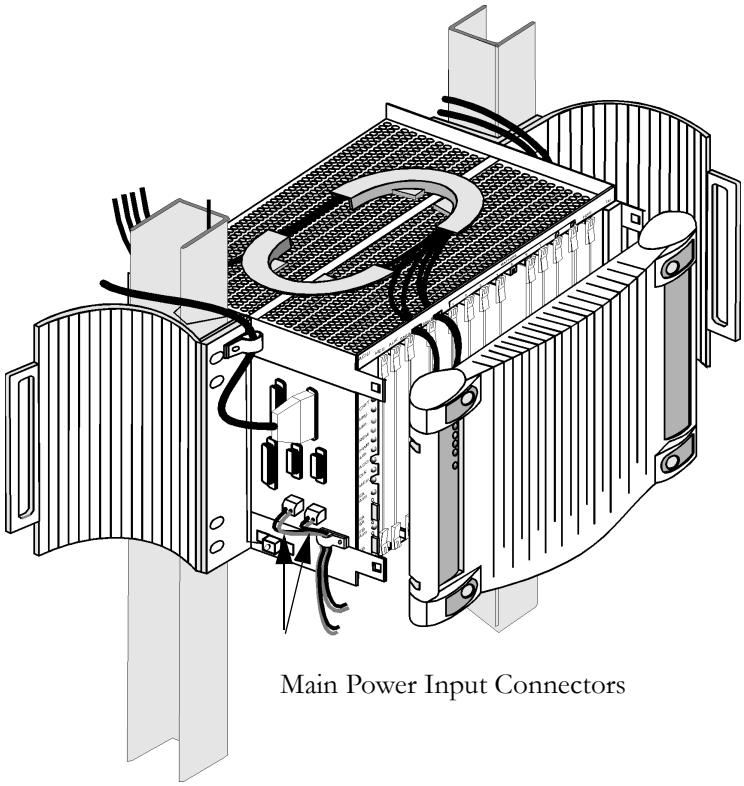
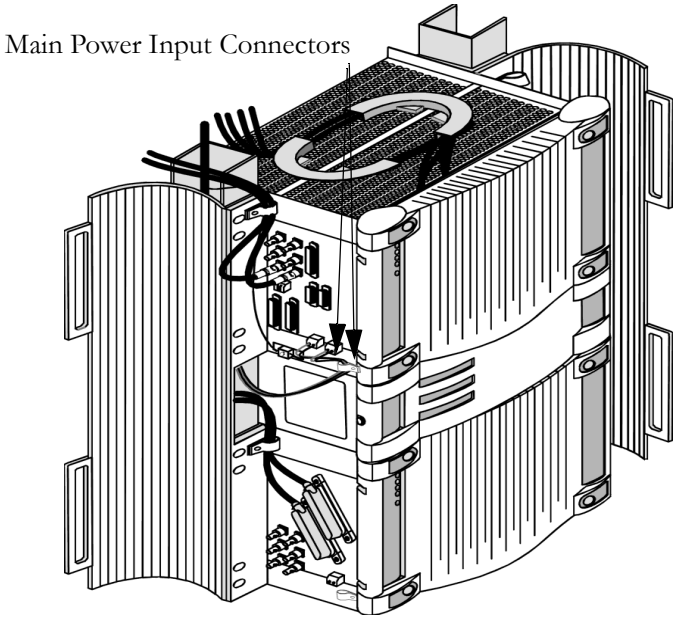


Figure 5 Power Input Connectors (OSIRIS-XTD Shelf)



Testing Power Source Switching

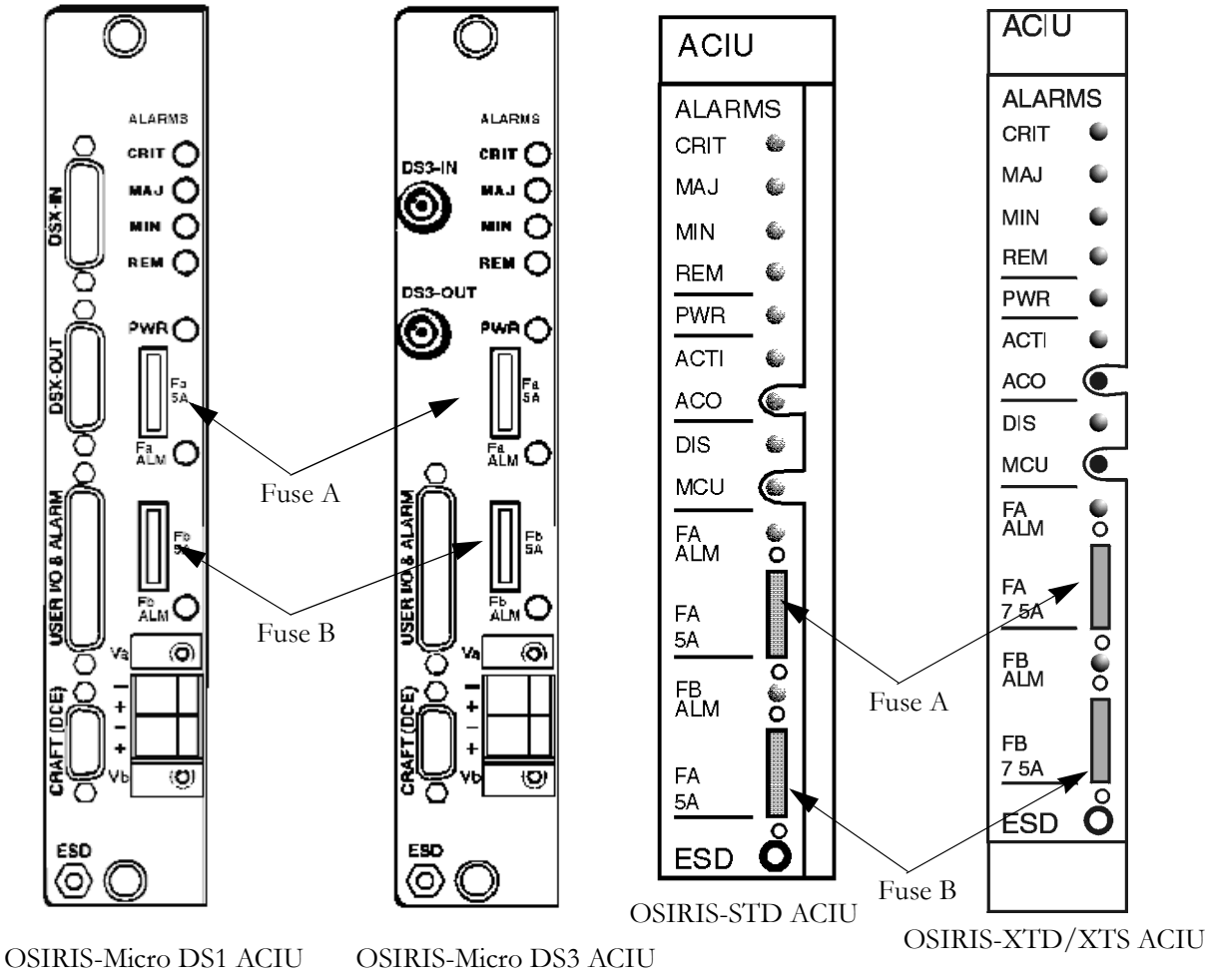
This test verifies whether the shelf switches to an alternative power source if a fuse is removed from the ACIU.

1. Remove fuse A from the ACIU. Refer to Figure 6.
2. Check the Power Status LED (PWR). If the PWR LED remains green, the shelf is receiving power.

   If the PWR LED is not lit, this means that the shelf is not receiving power or the power source is not within required parameters. See "Testing the Power of the OSIRIS optical multiplexer" on page 14.
3. Verify that the ACIU displays a minor alarm and that the alarm appears in the OverView Alarm Logger.
4. Reinsert fuse A. If the power alarm is connected, it turns off and the Alarm LED extinguishes.
5. Remove fuse B from the ACIU. Refer to Figure 6.
6. Check the PWR LED. If the PWR LED remains green, the shelf is receiving power.
7. Verify that the ACIU displays a minor alarm and that the alarm appears in the OverView Alarm Logger.

   If the PWR LED is not lit, this means that the shelf is not receiving power or the power source is not within required parameters. See "Testing the Power of the OSIRIS optical multiplexer" on page 14.
8. Reinsert fuse B. If the audible or visual power alarms are connected, they turn off and the Alarm LED extinguishes.

Figure 6 Fuse Location on OSIRIS optical multiplexers



Testing a Fuse Alarm Condition

The fuse alarm condition indicates that a fuse has blown and must be replaced. The fuse alarm condition triggers a power alarm, and the fuse alarm LED turns red. Follow this procedure to make sure that the fuse alarm is working properly.

1. Remove fuse A from the ACIU and insert a blown fuse in its place.
   Refer to Figure 6 for the location of the fuse.
2. Check the fuse A alarm LED (FA ALM). Refer to the following table for fuse alarm LED states.

	OSIRIS-STD Shelf	OSIRIS-XTD Shelf	OSIRIS-Micro Shelf
Power LED (PWR)	Green	Green	Green
General Alarm (ACIU)	Minor	Minor	Minor
Fuse LED (FA/FB ALM) - Normal	Off	On	Off
Fuse LED (FA/FB ALM) - Blown fuse	Red	Red	Red

   If the fuse alarm LED is not red, contact Positron's TAC (Technical Assistance Center) at 1-866-331-3003 or 1-514-345-2202 or visit our Web site at www.positronnetworks.com.
3. Verify that the OSIRIS-VUE Alarm Logger displays the proper alarm message.
4. Replace the blown fuse with a good fuse. The LED turns off.
5. Verify that the alarm clears in the Alarm Logger.
6. Repeat Steps 1 to 5 for fuse B.

Testing the OSIRIS-Micro WMU Battery Connection

This test verifies whether the OSIRIS-Micro WMU switches to the battery power source if the main power source is cut.

Battery LED

1. Use a long-handled non-conductive instrument (plastic or wood) to press and hold the battery test pushbutton.

   See Figure 7 for the location of the pushbutton.

2. While you are holding down the pushbutton, check the color of the Battery LED.

   If the LED turns green and remains green for approximately five seconds, all is well. Go to the Shelf Alarm LED test.

3. If the battery LED is:

yellow	The battery is weak. This is a normal condition after an AC power failure. Wait a few hours for the battery to recharge.
red	The battery is defective or completely discharged. Replace the battery.
off	The battery is not connected, or the battery switch is turned off. Connect the battery. See the *OSIRIS®-Micro WMU Installation Guide (203-005)* for details.

   Proceed to the next test only when the battery LED test is successful.

Shelf Alarm LED

The shelf alarm is always active when the door is open. Press and hold the OSIRIS-Micro WMU switch to deactivate the alarm, or tape down the switch if you want to work with the door open.

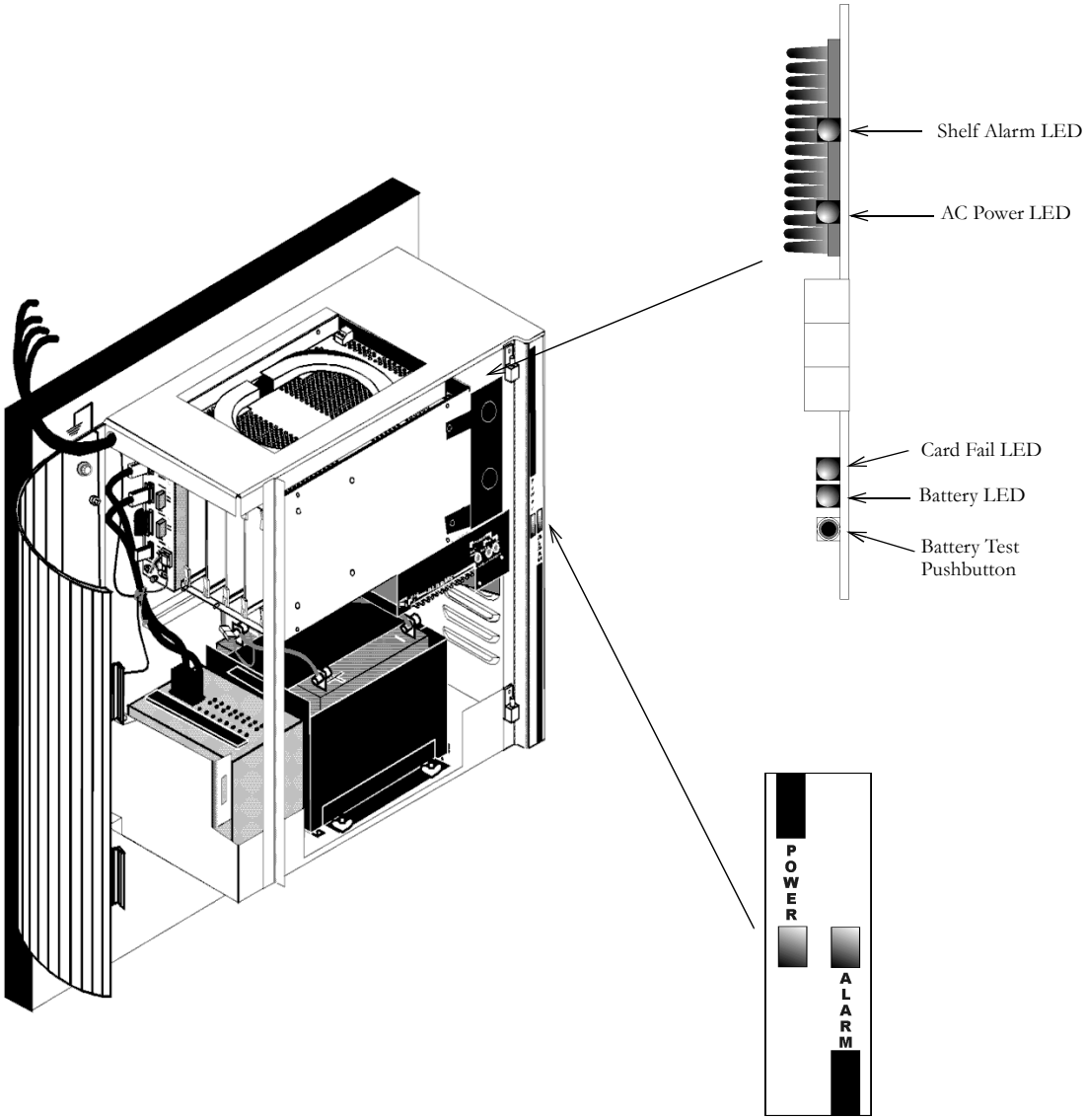
Power LED

1. Verify that the batteries are installed properly and that the battery switch is turned to the ON position. See the *OSIRIS®-Micro WMU Installation Guide (203-005)* manual for details.
2. Unplug the power cord from the AC outlet.
3. Check the color of the power LED. See Figure 7 for the location of the LED.
4. If the power LED is green, plug in the power cord.

   If the power LED is not green:

   - plug in the power cord
   - make sure that the battery is installed properly
   - if the power LED is still not green, check the battery LED
   - go to step 3 in the battery LED section, then re-start at step 1.

Figure 7 LEDs on the OSIRIS-Micro WMU



Chapter 4
Testing OAUs and Local Alarms

Testing alarm conditions lets you ensure that the OSIRIS optical multiplexer and power supply react properly during situations which may be service affecting. However, first you must test the power output and receiver sensitivity of the OAUs. Once you have installed and tested the OSIRIS optical multiplexer, power supply, and plug-in units, you can test the alarms. These procedures are performed in the following order:

- Testing power output of the OAU
- Testing receiver sensitivity of the OAU
- Testing minor, major, and critical alarm conditions

Testing the Power Output of the Optical Access Units (OAU)

See Appendix A to determine the power levels for your specific OAUs. Power levels vary according to the model of OAU.

Note: Before you begin this procedure, the MCU/NMCU must be installed. The software on the MCU/NMCU must be appropriate for the OAUs, i.e. OC3, OC12 or OC48.

1. Unseat both OAUs from the shelf.

When installing an OC48, the voltage rating must be -40 V DC to -60 V DC. Invisible laser radiation from uncoupled connectors may be present in an operational OAU; avoid direct exposure to the beam. For safety, remove the OAU module prior to disengaging fiber connectors.

Avoid direct exposure to the beam; invisible light can blind. Keep all optical connectors capped.

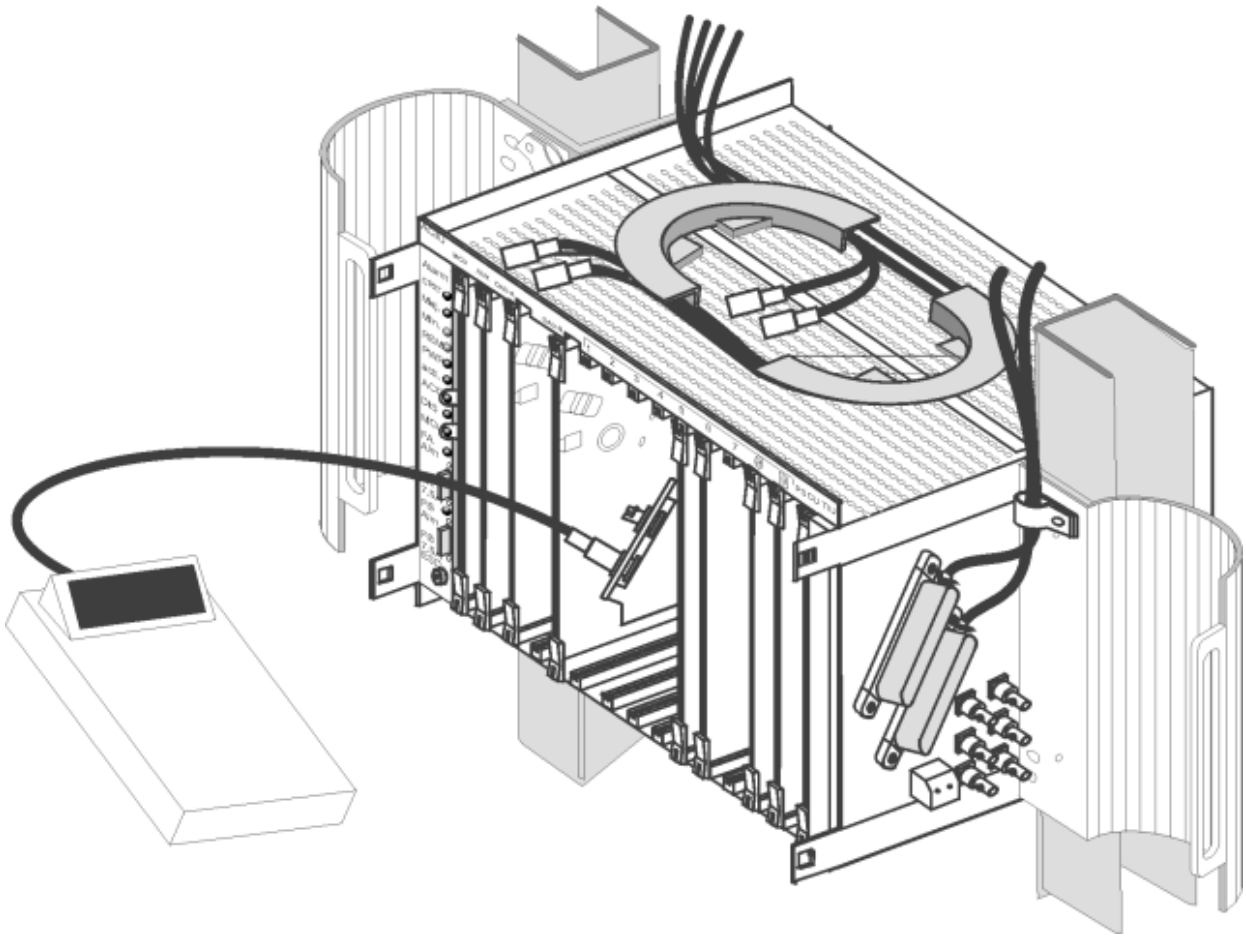
2. If the loopback optical patch cords are installed on the OAUs, remove them.
3. Connect an optical power meter to the OUT connector of OAU-A. Use an optical patch cord, as shown in Figure 8.
4. Reinsert the OAU into slot OAU-A.
5. Set the optical power meter to one of the following wavelengths (λ):
   - 1310 nm
   - 1550 nm

   Refer to Appendix A for the wavelengths associated with each OAU.

   Check the optical power level.

   If the power level does not match OAU card specifications in Appendix A, it must be replaced. Contact Positron's TAC (Technical Assistance Center) at 1-866-331-3003 or 1-514-345-2202, or visit our web site at www.positronnetworks.com.
6. Unseat the OAU in slot OAU-A and disconnect the power meter from the card.
7. Re-loopback OAU-A. Refer to "Looping Back an OAU" on page 12.
8. Re-insert the OAU.
9. Repeat Step 3 to 8 for the OAU in slot B.

Figure 8 Testing the Power Output of the OAU



Testing Receiver Sensitivity of Optical Access Units (OAU)

This test verifies OAU receiver sensitivity. You can test receiver sensitivity by attenuating the OAU signal until the OAU LED starts flashing. Alternatively, you can send a test pattern through a DS1/DS3 mapper, and then attenuate the signal until the test set shows errors. Both methods determine the threshold of OAU receiver sensitivity and are equally effective for this test.

See Appendix A to find out what the power levels are for your specific OAUs. Power levels vary according to the model of OAU.

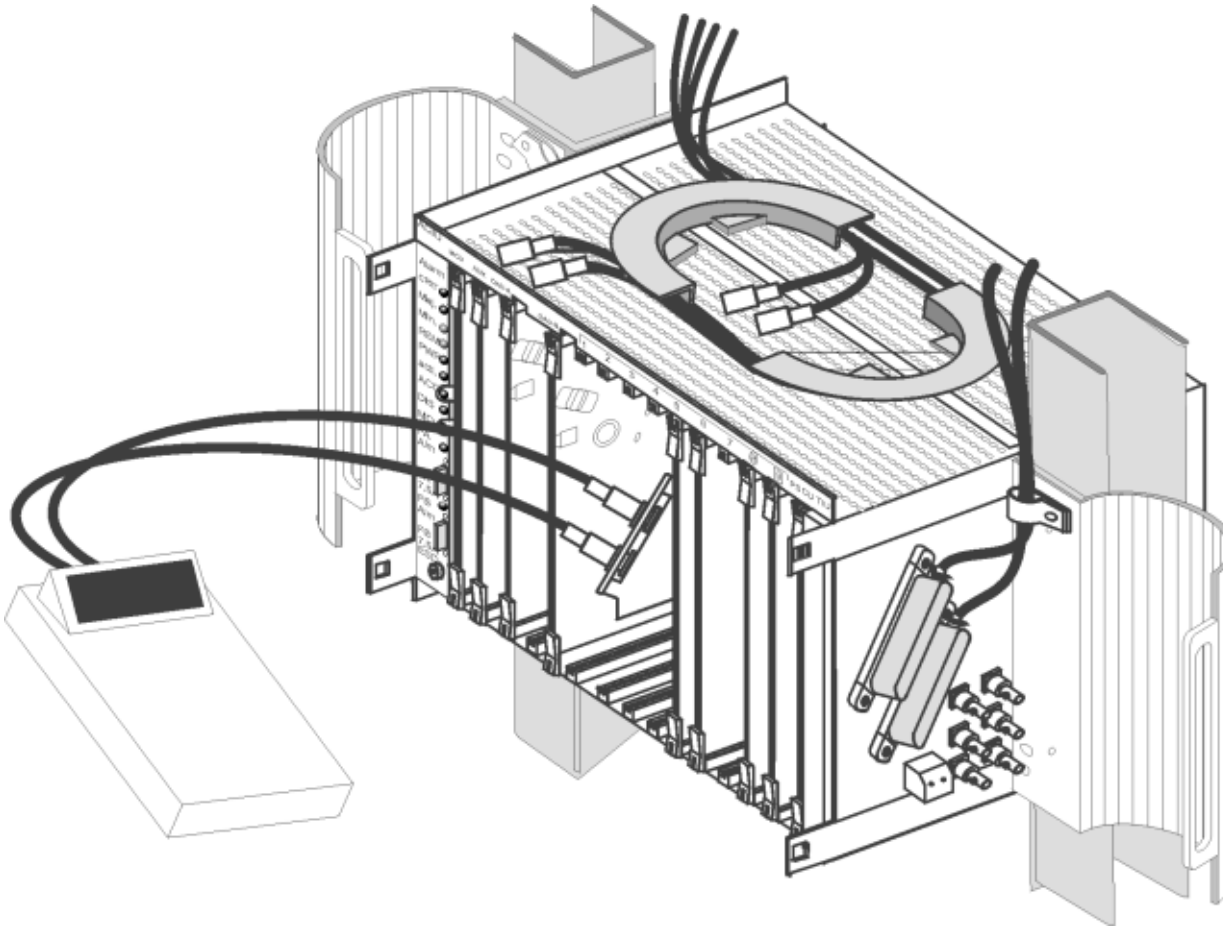
1. Unseat both OAUs from the shelf. If the loopback optical patch cords are installed on the OAUs, remove them.

Invisible laser radiation from uncoupled connectors may be present in an operational OAU; avoid direct exposure to the beam. For safety, remove the OAU module prior to disengaging fiber connectors.

Avoid direct exposure to the beam; invisible light can blind. Keep all optical connectors capped.

2. Connect the input of the variable optical attenuator (VOA) to the OUT connector on the OAU in slot OAU-A. Connect the output of the VOA to the IN connector on OAU-A. Use an optical patch cord to make the connection. See Figure 9.
3. Reinsert OAU-A.
4. Attenuate the signal until the OAU LED begins to flash or until bit errors are displayed on the test set.
5. Note the amount of optical attenuation and verify that receiver sensitivity is within ranges specified in Appendix A. If the receiver sensitivity is not within acceptable ranges, the OAU must be replaced. Contact Positron's TAC (Technical Assistance Center) at 1-866-331-3003 or 1-514-345-2202, or visit our web site at www.positronnetworks.com.
6. Repeat steps 1 to 5 for OAU-B.

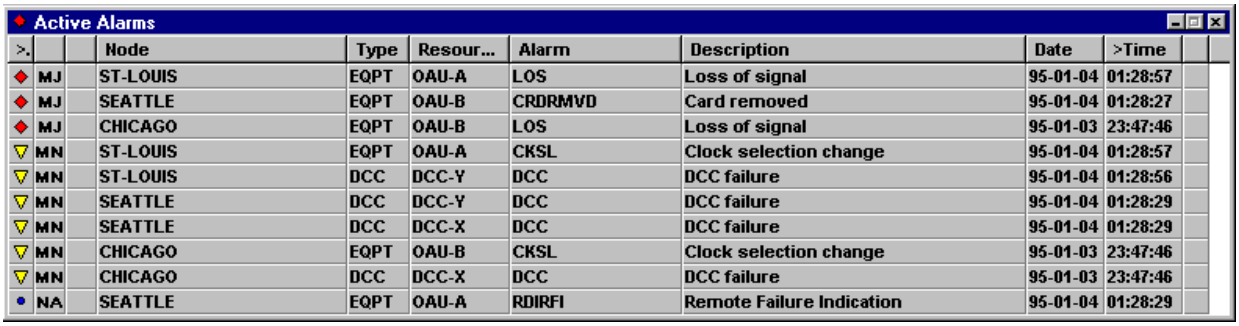
Figure 9 Testing Receiver Sensitivity of the OAU



Testing Minor, Major, and Critical Alarm Conditions

Both audible and visual alarms are supported by OSIRIS optical multiplexers. To use the audible alarm system, you need to attach an alarm cable from the ALARMS connector to local alarm equipment. For more information, refer to the *Installation* Guide for your shelf.

You can monitor alarm conditions by looking at the LEDs that reside on each component card as well as on the ACIU. You can also view these alarm conditions through OSIRIS-VUE. When an alarm condition occurs on the equipment, OSIRIS-VUE immediately displays the alarm in the **Active Alarms** report.



Active Alarms

>.			Node	Type	Resour...	Alarm	Description	Date	>Time		
◆	MJ		ST-LOUIS	EQPT	OAU-A	LOS	Loss of signal	95-01-04	01:28:57		
◆	MJ		SEATTLE	EQPT	OAU-B	CRDRMVD	Card removed	95-01-04	01:28:27		
◆	MJ		CHICAGO	EQPT	OAU-B	LOS	Loss of signal	95-01-03	23:47:46		
▽	MN		ST-LOUIS	EQPT	OAU-A	CKSL	Clock selection change	95-01-04	01:28:57		
▽	MN		ST-LOUIS	DCC	DCC-Y	DCC	DCC failure	95-01-04	01:28:56		
▽	MN		SEATTLE	DCC	DCC-Y	DCC	DCC failure	95-01-04	01:28:29		
▽	MN		SEATTLE	DCC	DCC-X	DCC	DCC failure	95-01-04	01:28:29		
▽	MN		CHICAGO	EQPT	OAU-B	CKSL	Clock selection change	95-01-03	23:47:46		
▽	MN		CHICAGO	DCC	DCC-X	DCC	DCC failure	95-01-03	23:47:46		
•	NA		SEATTLE	EQPT	OAU-A	RDIRFI	Remote Failure Indication	95-01-04	01:28:29		

Before you start to test alarm conditions described in this chapter, make sure that you have looped the transmit port of the OAU back to the receive port of the same OAU. Refer to "Looping Back an OAU" on page 12.

1. Unseat the MCU.
2. Verify that a Minor alarm appears on the ACIU. A Minor alarm is represented by an yellow LED. Refer to Figure 10 for LED location.
3. Reinsert the MCU. Verify that the alarm condition disappears, and that the alarm is cleared from the Active Alarms report.
4. Unseat an OAU.
5. Verify that a Major alarm appears on the ACIU. A Major alarm is represented by a red LED. Refer to Figure 10 for LED location.
6. Verify that a Major alarm appears in the Active Alarms report. Click **Active Alarms** from the **Session** menu to display the Active Alarms report.
7. Reinsert the OAU. Verify that the alarm condition extinguishes, and that the alarm is cleared from the Active Alarms report.
8. Unseat **both** OAUs.

9. Verify that a Critical alarm appears on the ACIU. A Critical alarm is represented by a red LED. Refer to Figure 10 for LED location.
10. Verify that a Critical alarm appears in the Active Alarms report. Click **Active Alarms** from the **Session** menu to display the Active Alarms report.
11. Reinsert both OAUs. Verify that the alarm condition disappears, and that the alarm is cleared from the Active Alarms report. LED statuses are summarized in the following table.

Alarm Test	LED	Card to Remove	LED Alarm Status
Minor	MIN	Monitor and Control Unit (MCU)	yellow
Major	MAJ	One OAU card	red
Critical	CRIT	Both OAU cards	red

If any of these tests fail to generate the correct alarm conditions, contact Positron's TAC (Technical Assistance Center) at 1-866-331-3003 or 1-514-345-2200 (ext. 642), or visit our web site at www.positronnetworks.com.

Testing the REM Alarm

Note: Remote Alarm is only supported with proprietary DCC. When using OSI/DCC, this alarm is disabled.

Follow this procedure to test the REM (remote) alarm.

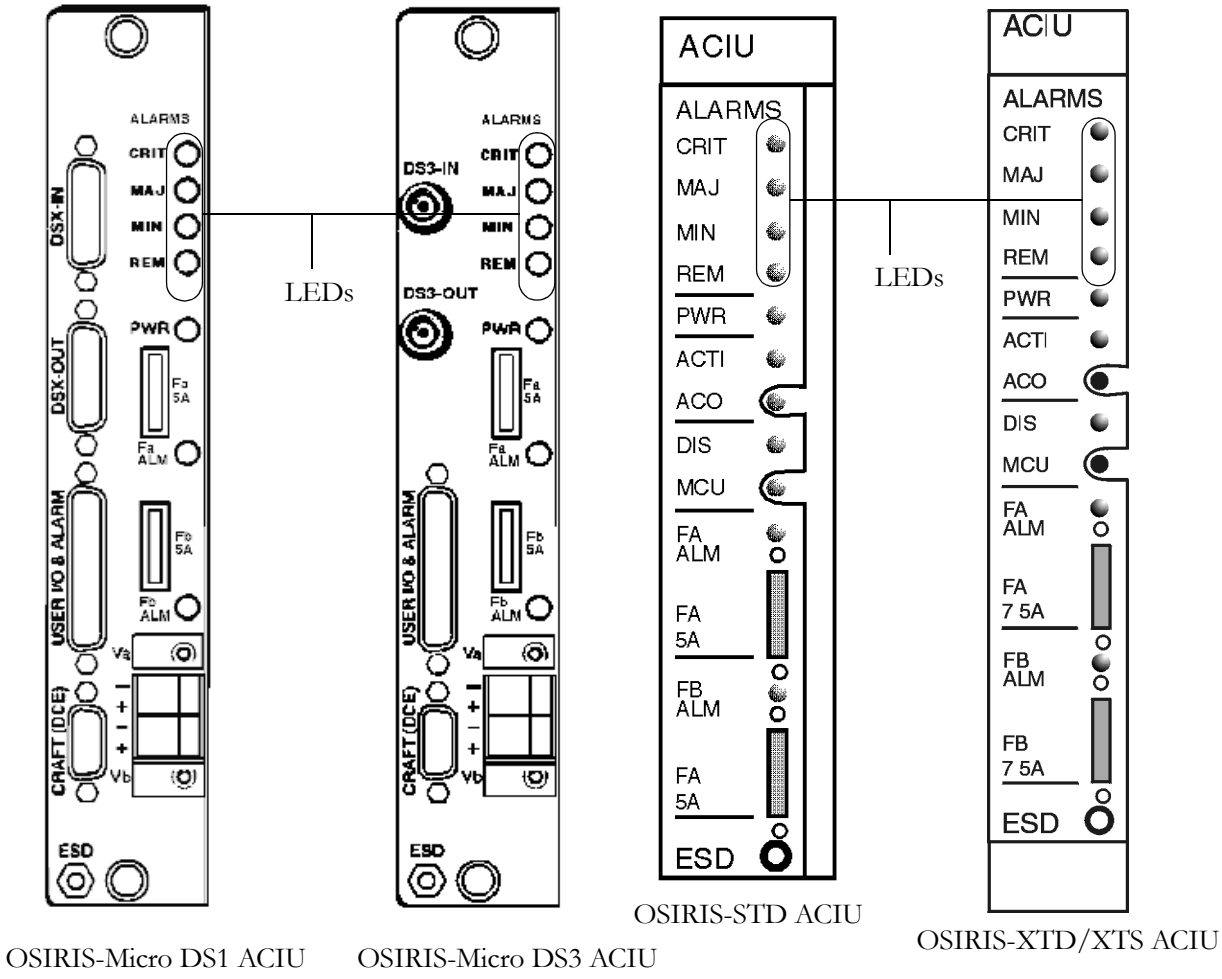
1. Log in to the shelf using OSIRIS-VUE. See Appendix C for details.
2. In the **Network Status** window, right-click the node, then click **Set Shelf Info**.
3. Set the **TID**, then click OK.
4. On the Network menu, click **Node Identity Manager**.
5. Click the **Download** button, then click **OK** to exit the dialog box.
6. Verify that a Remote alarm appears on the ACIU. Refer to Figure 10 for LED location.

To remove the alarm:

1. On the Network menu, click **Node Identity Manager**.
2. Click the **Copy On-Line** button.
3. Click the **Download** button.

4. Click **OK** to exit the dialog box.

Figure 10 LED Location on OSIRIS optical multiplexers



OSIRIS-Micro DS1 ACIU OSIRIS-Micro DS3 ACIU OSIRIS-STD ACIU OSIRIS-XTD/XTS ACIU

Chapter 5
Testing the OSIRIS optical multiplexer

Once you have tested the physical OSIRIS optical multiplexer power and alarm status, you may test the integrity of traffic flowing through the system. Testing is performed in the following order.

- Daisy chaining mapper card channels and connecting the test set
- Testing the mapper card channels
- Testing equipment protection switching
- Testing path protection switching

Note: It is recommended that you test all mapper slots on the OSIRIS optical multiplexer for cabling continuity. This may be performed using DS1 and DS3 mappers.

Daisy Chaining Mapper Card Channels and Connecting the Test Set

To test a OSIRIS optical multiplexer, you must log on using OSIRIS-VUE, and then provision several cross-connections. Refer to *Appendix C* for login instructions.

Before you test mapper cards, you must daisy chain all appropriate channels. This shortens the network element tests. DS1 channels must be daisy-chained separately from DS3 channels, so you must follow this procedure twice if you are using both DS1 and DS3 mapper cards.

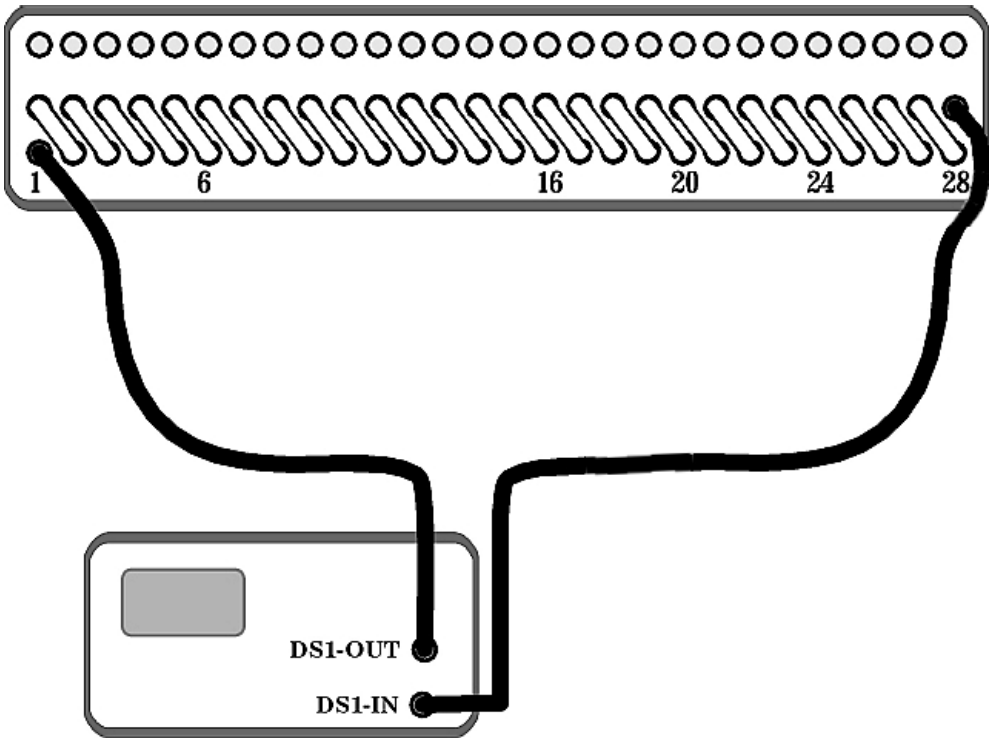
1. Connect the transmit of the DS1/DS3 test set to the input of the first channel to be tested. This connection should be performed on a typical DSX patch panel as shown in Figure 11.
2. Connect the output of the first channel to the input of the second channel.
3. Continue to daisy-chain the channels until all of them are connected.
4. Connect the receive end of the DS1/DS3 test set to the output of the last daisy-chained channel.

If only one DS1 channel is used for testing, Positron recommends that the system be monitored for 48 hours to make sure that transmission is error-free. However, when 28 DS1 channels are daisy-chained, the time is reduced to 15 minutes.

If only one DS3 channel is used for testing, Positron recommends that the system be monitored for 48 hours.

Full daisy-chain will ensure that all slots and ports are thoroughly tested.

Figure 11 Example of DS1 Channel Daisy Chaining



Testing the Mapper Card Channels

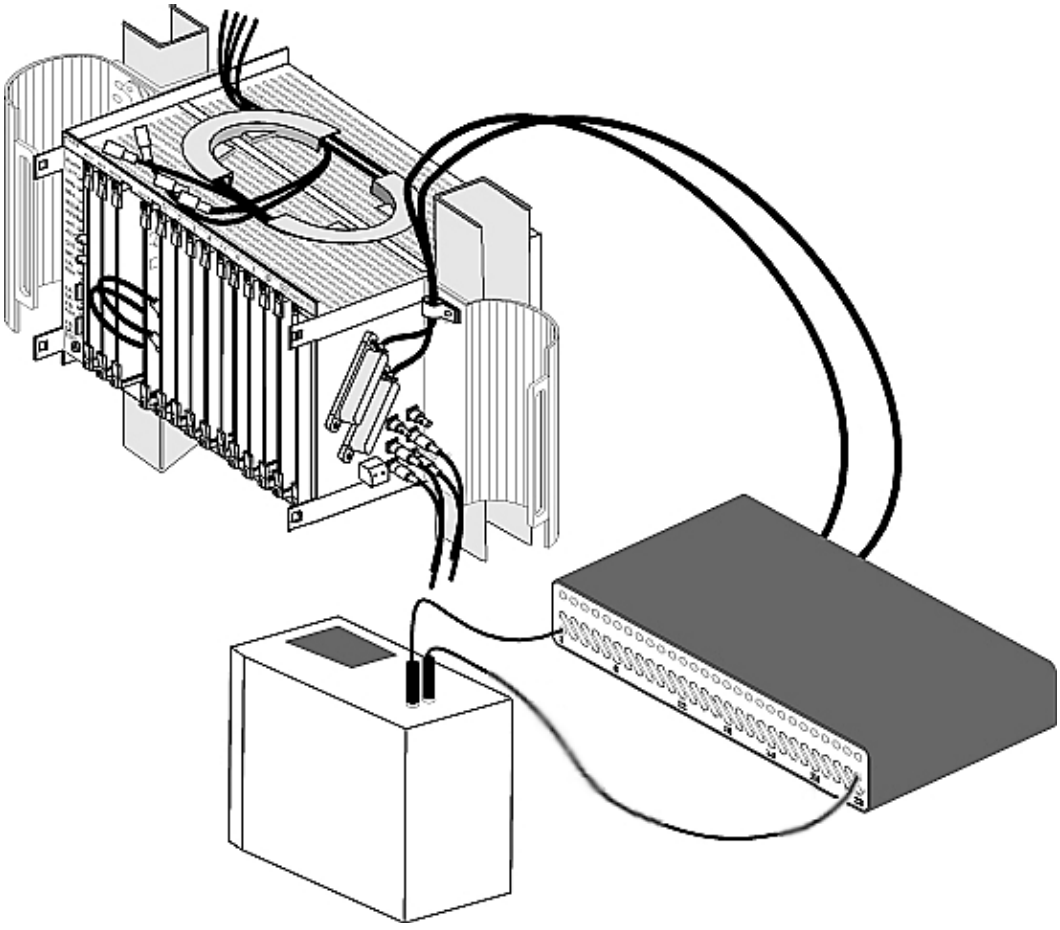
To make sure that mapper card channels are operational, use a test set to send a signal, then monitor the results.

1. Make sure that both OAUs are looped back.
   See "Looping Back an OAU" on page 12.
2. Make sure that the mapper card channels are daisy chained. See "Daisy Chaining Mapper Card Channels and Connecting the Test Set" on page 30.
3. Make sure that a digital transmission test set is connected to the mapper channels.
4. Send an error test signal and verify that the test set displays error bits.

   If no error bits are displayed, verify the physical hook-up again, and repeat Steps 1-3.

   If an alarm appears, contact Positron's TAC (Technical Assistance Center) 1-866-331-3003 or 1-514-345-2202, or visit our web site at www.positronnetworks.com.
5. Perform the equipment and path protection switching tests in the next sections.

Figure 12 Testing DS1 Mapper Channels



Testing Equipment Protection Switching

This test verifies the switching of traffic from a working mapper to a protected mapper, as well as a switch back to the working mapper. Testing includes:

- Performing the forced switch
- Releasing the forced switch

For a detailed overview of equipment protection switching, refer to Appendix B.

Performing the Forced Switch

To test equipment protection switching, perform the following steps:

1. Use a test set to send a signal, as described in "Testing the Mapper Card Channels" on page 32.
2. Provision all DS1/DS3 working and protection mappers. See "Provisioning a Mapper and Channels with OSIRIS-VUE" on page 74 for details.
3. In the **Network Status** window, double-click the node to display the shelf-level dialog box.
4. Double-click a working mapper that is protected.
5. Click the EPS tab to display this dialog box.

6. Click the Forced Switch button, then click Yes to confirm.

   If you are near the shelf when the force switch is activated, you will hear a click as the traffic is routed from the working mapper to the protection mapper.
7. Click OK to exit the EPS dialog box.
8. Verify that traffic is operating properly on the protection mapper.

   Check the following items:

   - On the shelf, verify that no **major** alarms appear on the working mapper, protection mapper, or the PSCU. All LEDs on these cards should be solid green.
   - Using Positron OSIRIS-VUE, verify that no **major** alarms appear on these same elements.

- Verify that no **major** alarms appear in the Active Alarms report.

Note: When you request a forced switch to protection, a minor alarm occurs on the shelf. This alarm appears in the Active Alarms report but is not service-affecting.

9. Check that no errors are displayed on the test set.
10. Release the Forced Switch as described in the next section, then repeat this test for all DS1 and DS3 cards that are provisioned for protection.

Releasing the Forced Switch

Once you have performed a forced switch to protection, you must verify that traffic switches back by removing the forced switch.

1. In the **Network Status** window, double-click the node to display the shelf-level dialog box.
2. Double-click the working mapper that has switched to protection.
3. Click the EPS tab to display this dialog box.

4. Click the Forced Switch button to remove the forced switch from the protection mapper card and allow traffic to return to the working mapper card, then click Yes to confirm the change.
5. Verify that traffic is transferred back to the working mapper card, and that no major alarms appear on the mapper cards, the PSCU, or in OSIRIS-VUE.

Testing Path Protection Switching

This test verifies the switching of traffic from the working fiber to the protected fiber, as well as a switch back to the working mapper. Testing includes:

- Performing the forced switch
- Releasing the forced switch

For a detailed overview of path protection switching, refer to Appendix B.

Performing the Forced Switch

To test path protection switching, perform the following steps:

1. Use a test set to send a signal, as described in "Testing the Mapper Card Channels" on page 32.
2. In the **Network Status** window, right-click the node, then click Maintenance Path Switching, Switching Reported.
3. Double-click the node to display the shelf-level dialog box.
4. Double-click a mapper and provision a cross-connection. For details, see "Provisioning a Mapper and Channels with OSIRIS-VUE" on page 74.
5. Double-click the cross-connection.
6. Click the **PPS** tab to display this dialog box.

7. Click **Force traffic on B fiber**, then click **Yes** to confirm.
8. Verify that traffic is operating properly on the B path.

   Make sure to check the following items:

   - On the OSIRIS optical multiplexer, verify that no **major** alarms appear on the mapper. All LEDs on these cards should be solid green.

- Using OSIRIS-VUE, verify that no **major** alarms appear on these same elements.
- Verify that no **major** alarms have occurred in the Active Alarms report.

Note: When you request a forced switch to protection, OSIRIS-VUE records a minor alarm that is also displayed on the ACIU of the OSIRIS optical multiplexer. This alarm appears in the Active Alarms report but is not service affecting.

9. Verify that no errors are displayed on the digital test set.

Releasing the Forced Switch

To release the Forced Switch, perform the following steps:

1. Click **Force traffic on B fiber**, then click **Yes** to confirm to release the forced switch.

   The forced switch has been removed.

   At this point, traffic still flows on fiber B. The default level of path protection switching in an OSIRIS network does not switch traffic from a fiber until the signal quality degrades below a certain level. Therefore, traffic still remains on fiber B. The release of the forced switch means that traffic may switch to fiber A in the event of signal degradation on fiber B.

   Perform Step 2 to switch traffic back to fiber A.

2. Click **Manual traffic switch on A fiber**.

   Traffic is now travelling on the A fiber.

Appendix A

Optical Interface Specifications

Optical Interfaces

The OAUs have the following optical interface specifications:

SONET OC-3 Optical System

OC-3 Optical System

Format	SONET OC-3
Transmission capacity	2, 016 channels per system DS0
Tributaries	84 DS1/VT1.5
Line rate	155.52 Mbps
Line code	Scrambled NRZ
Modulation	PCM-IM
Wavelength	1310 nm
System gain - intermediate reach 800310/3	13 dB (minimum output power - minimum sensitivity)
System gain - intermediate reach 800311/3	19 dB (minimum output power - minimum sensitivity)
System gain - long reach 800317/2, 800318/2	28 dB (minimum output power - minimum sensitivity)

OC-3 Optical Receiver and Transmitter - Intermediate Reach (800310/4)

OC-3 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-6 dBm
Minimum	-34 dBm
Connector faceplate	SC, ST, FC

OC-3 Optical Transmitter - Intermediate Reach

Optical source	InGaAs Laser (MLM)
Spectral width - RMS maximum	4 nm
Center Wavelength	1310 nm
Minimum	1260 nm
Maximum	1360 nm
Output power (average)	
Minimum	-21 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

OC-3 Optical Receiver and Transmitter Intermediate Reach (800311/4)

OC-3 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-6 dBm
Minimum	-34 dBm
Connector faceplate	SC, ST, FC

OC-3 Optical Transmitter

Optical source	InGaAs Laser (MLM)
Spectral width (RMS) maximum	4 nm
Center Wavelength	1310 nm
Minimum	1260 nm
Maximum	1360 nm
Output power (average)	
Minimum	-15 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

OC-3 Optical Receiver and Transmitter Long Reach (800317/2 and 800318/2)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

OC-3 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-6 dBm
Minimum	-34 dBm
Connector faceplate	SC, ST, FC

OC-3 Optical Transmitter - 800317/4

Optical source	InGaAs Laser[1] (SLM)
Spectral width (-20 dB) maximum	1 nm
Center Wavelength	1550 nm
Minimum	1480 nm
Maximum	1580 nm
Output power (average)	
Minimum	-6 dBm
Typical	-3 dBm
Maximum	0 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

1. Cavity design structure technique, Distributed Feed Back (DFB)

OC-3 Optical Transmitter - 800318/4

Optical source	InGaAs Laser[1] (SLM)
Spectral width (RMS) maximum	4 nm
Center Wavelength	1310 nm
Minimum	1280 nm
Maximum	1335 nm
Output power (average)	
Minimum	-6 dBm
Typical	-3 dBm
Maximum	0 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

1. Cavity design structure technique, Distributed Feed Back (DFB)

SONET OC-12 Optical System

OC-12 Optical System

Format	SONET OC-12
Transmission capacity	8, 064 channels per system DS0
Tributaries	336 DS1/VT1.5
Line rate	622.08 Mbps
Line code	Scrambled NRZ
Modulation	PCM-IM
Wavelength	1310 nm/1550 nm
System gain - intermediate reach 800510/2	13 dB (minimum output power - minimum sensitivity)
System gain - long reach 800511/2, 800512/2	25 dB (minimum output power - minimum sensitivity)

OC-12 Optical Receiver Intermediate and Long Reach (800510/2, 800511/2, 800512/2)

OC-12 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-8 dBm
Minimum	-28 dBm
Connector faceplate	SC, ST, FC

OC-12 Optical Transmitter Intermediate Reach (800510/2)

OC-12 Optical Transmitter - Intermediate Reach

Optical source	InGaAsLaser (MLM)
Spectral width (RMS) maximum	2.5 nm
Center Wavelength	1310 nm
Minimum	1274 nm
Maximum	1356 nm
Output power (average)	
Minimum	-15 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	8.2 dBm
Connector faceplate	SC, ST, FC

OC-12 Optical Transmitter Long Reach (800511/2)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

OC-12 Optical Transmitter - Long Reach	
Optical source	InGaAs Laser (MLM)
Center Wavelength	1310 nm
Minimum	1280 nm
Maximum	1335 nm
Output power (average)	
Minimum	-3 dBm
Typical	0 dBm
Maximum	2 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC
Spectral width (-20 dB width)	1 nm

OC-12 Optical Transmitter Long Reach (800512/2)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

OC-12 Optical Transmitter - Long Reach	
Optical source	InGaAs Laser (MLM)
Center Wavelength	1550 nm
Minimum	1480 nm
Maximum	1580 nm
Output power (average)	
Minimum	-3 dBm
Typical	0 dBm
Maximum	2 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC
Spectral width (-20 dB width)	1 nm

Fiber Patch Cords		
Outside plant fiber is single mode	OAU Transmitter	Single-mode pigtail
	OAU Receiver	Multi-mode pigtail

Note: For short distances, multi-mode fiber is supported. Distance is subject to vary with multi-mode fiber type and quality.

SONET OC-48 Optical System

OC-48 Optical System

Format	Sonet OC-48
Transmission capacity	32256 channels per system DS0
Tributaries	1344 DS1/VT1.5
Line rate	2,488.32 Mbps
Line code	Scrambled NRZ
Modulation	PMC-IM
Wavelength	1310nm/1550nm
System gain - short reach (SR-1)	8 dB
System gain - intermediate reach (IR-1 & IR-2)	13 dB
System gain - long reach 1 (LR-1)	25 dB
System gain - long reach 2 (LR2)	26 dB
Power Consumption:	
Per OC-48 OAU	26.5 Watts
Per OC-48 OAU coupled with BIU	31.5 Watts

OC-48 Optical Interfaces - Short Reach (1310 nm 800813, 800833 FC/SC/ST)

Optical Receiver	Unit	SR-1 (>2km)
Parameter		
Maximum received power	dBm	-3
Minimum received power	dBm	-18
Optical Path Power Penalty	dB	1
Max reflectance	dB	-27
Detector type		InGaAs PIN detector
Maximum dispersion	ps/nm	not applicable
Optical budget	dB	8

Optical Transmitter	Unit	SR-1 (>2km)
Parameter		
Wavelength Range	nm	1266 - 1360
Spectral Width	nm	1
Full Spectral Width	nm	N/A
Side-mode Suppression Ratio	dB	N/A
Maximum Transmitter Power	dBm	-3
Minimum Transmitter Power	dBm	-10
Extinction Ratio	dB	8.2
Connector		ST, FC, SC
Note		FP SLM laser

OC-48 Optical Interfaces - Intermediate Reach (1310 nm 800810, 800830 FC/SC/ST)

Optical Receiver	Unit	IR-1 (2km to 20km)
Parameter		
Maximum received power	dBm	0
Minimum received power	dBm	-18
Optical Path Power Penalty	dB	1
Max reflectance	dB	-27
Detector type		InGaAs PIN detector
Maximum dispersion	ps/nm	N/A
Optical budget	dB	13

Optical Transmitter	Unit	IR-1 (2km to 20 km)
Parameter		
Wavelength Range	nm	1260 - 1360
Spectral Width	nm	1
Full Spectral Width	nm	N/A
Side-mode Suppression Ratio	dB	30
Maximum Transmitter Power	dBm	0
Minimum Transmitter Power	dBm	-5
Extinction Ratio	dB	8.2
Connector		ST, FC, SC
Note		DFB SLM laser

OC-48 Optical Interfaces - Intermediate Reach (1550 nm 800815, 800835 FC/SC/ST)

Optical Receiver	Unit	IR-2 (2km to 20km)
Parameter		
Maximum received power	dBm	0
Minimum received power	dBm	-18
Optical Path Power Penalty	dB	2
Max reflectance	dB	-27
Detector type		INGaAs PIN detector
Maximum dispersion	ps/nm	1600
Optical budget	dB	13

Optical Transmitter	Unit	IR-2 (2km to 20km)
Parameter		
Wavelength Range	nm	1430 - 1580
Spectral Width	nm	N/A
Full Spectral Width	nm	1
Side-mode Suppression Ratio	dB	30
Maximum Transmitter Power	dBm	3

Optical Transmitter	Unit	IR-2 (2km to 20km)
Minimum Transmitter Power	dBm	-2
Extinction Ratio	dB	8.2
Connector		ST, FC, SC
Note		DFB SLM laser

OC-48 Optical Interfaces - Long Reach (1310 nm 800814, 800834 FC/SC/ST)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

Optical Receiver	Unit	LR-1 (20km to 60km)
Parameter		
Maximum received power	dBm	-9
Minimum received power	dBm	-27
Optical Path Power Penalty	dB	1
Max reflectance	dB	-27
Detector type		APD detector
Maximum dispersion	ps/nm	N/A
Optical budget	dB	25

Optical Transmitter	Unit	LR-1 (20km to 60 km)
Parameter		
Wavelength Range	nm	1280 - 1335
Spectral Width	nm	N/A
Full Spectral Width	nm	1
Side-mode Suppression Ratio	dB	30
Maximum Transmitter Power	dBm	3
Minimum Transmitter Power	dBm	-2
Extinction Ratio	dB	8.2
Connector		ST, FC, SC
Note		DFB SLM laser

OC-48 Optical Interfaces - Long Reach (1550 nm 800816, 800836 FC/SC/ ST)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

Optical Receiver	Unit	LR-2 (20km to 60km)
Parameter		
Maximum received power	dBm	-9
Minimum received power	dBm	-28
Optical Path Power Penalty	dB	2
Max reflectance	dB	-27
Detector type		APD detector
Maximum dispersion	ps/nm	1600
Optical budget	dB	26

Optical Transmitter	Unit	LR-2 (20km to 60 km)
Parameter		
Wavelength Range	nm	1500 - 1580
Spectral Width	nm	N/A
Full Spectral Width	nm	1
Side-mode Suppression Ratio	dB	30
Maximum Transmitter Power	dBm	3
Minimum Transmitter Power	dBm	-2
Extinction Ratio	dB	8.2
Connector		ST, FC, SC
Note		DFB SLM laser

SDH STM-1 Optical System

STM-1 Optical System

Format	SDH STM-1
Transmission capacity	1890 channels per system
Tributaries	63 E1/TU-12
Line rate	155.52 Mbps
Line code	Scrambled NRZ
Modulation	PCM-IM
Wavelength	1310 nm/1550 nm
System gain - intermediate reach 800312	13 dB (minimum output power - minimum sensitivity)
System gain - intermediate reach 800313	19 dB (minimum output power - minimum sensitivity)
System gain - long reach 800316, 800319	28 dB (minimum output power - minimum sensitivity)

STM-1 Optical Receiver (800312, 800313, 800316, 800319)

STM-1 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-8 dBm
Minimum	-34 dBm
Connector faceplate	SC, ST, FC

STM-1 Optical Transmitter

STM-1 Optical Transmitter - Intermediate Reach (800312)

Optical source	InGaAs Laser (MLM)
Spectral width (RMS) maximum	4 nm
Center Wavelength	1310 nm
Minimum	1260 nm
Maximum	1360 nm
Output power (average)	
Minimum	-21 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

STM-1 Optical Transmitter - Intermediate Reach (800313)	
Optical source	InGaAs DFB[1] Laser (SLM)
Spectral width (RMS) maximum	4 nm
Center Wavelength	1310 nm
Minimum	1260 nm
Maximum	1360 nm
Output power (average)	
Minimum	-15 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

1. Cavity design structure technique, Distributed Feed Back (DFB)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

STM-1 Optical Transmitter - Long Reach (800316)	
Optical source	InGaAs DFB[1] Laser (SLM)
Spectral width (RMS) maximum	4 nm
Center Wavelength	1310 nm
Minimum	1260 nm
Maximum	1360 nm
Output power (average)	
Minimum	-6 dBm
Typical	-3 dBm
Maximum	0 dBm
Extinction ratio (minimum)	
Connector faceplate	SC, ST, FC

1. Cavity design structure technique, Distributed Feed Back (DFB)

Note: A 10 DB attenuator must be used when looping long reach OAUs.

STM-1 Optical Transmitter - Long Reach (800319)

Optical source	InGaAs DFB[1] Laser (SLM)
Spectral width (-20 dB) maximum	1 nm
Center Wavelength	1550 nm
Minimum	1480 nm
Maximum	1580 nm
Output power (average)	
Minimum	-6 dBm
Typical	-3 dBm
Maximum	0 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

1. Cavity design structure technique, Distributed Feed Back (DFB)

SDH STM-4 Optical System

STM-4 Optical System

Format	SDH STM-4
Transmission capacity	7560 channels per system
Tributaries	252 E1/TU-12
Line rate	622.08 Mbps
Line code	Scrambled NRZ
Modulation	PCM-IM
Wavelength	1310 nm/1550 nm
System gain - intermediate reach 800520/2	13 dB (minimum output power - minimum sensitivity)
System gain - long reach 800521/2, 800522/2	25 dB (minimum output power - minimum sensitivity)

STM-4 Optical Receiver (800520/2, 800521/2, 800522/2)

STM-1 Optical Receiver

Detector	InGaAs PIN
Sensitivity - input power:	
Maximum	-8 dBm
Minimum	-28 dBm
Connector faceplate	SC, ST, FC

STM-4 Optical Transmitter

STM-4 Optical Transmitter - Intermediate Reach (800520/2)

Optical source	InGaAs Laser (MLM)
Spectral width (RMS) maximum	2-5 nm
Center Wavelength	1310 nm
Minimum	1274 nm
Maximum	1356 nm
Output power (average)	
Minimum	-15 dBm
Typical	-11 dBm
Maximum	-8 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

Note: A 10 DB attenuator must be used when looping long reach OAUs.

STM-4 Optical Transmitter - Long Reach (800521/2)

Optical source	InGaAs Laser (MLM)
Spectral width (-20 dB) maximum	1 nm
Center Wavelength	1310 nm
Minimum	1280nm
Maximum	1335 nm
Output power (average)	
Minimum	-3 dBm
Typical	0 dBm
Maximum	2 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

Note: A 10 DB attenuator must be used when looping long reach OAUs.

STM-4 Optical Transmitter - Long Reach (800522/2)	
Optical source	InGaAs Laser (MLM)
Spectral width (-20 dB) maximum	1 nm
Center Wavelength	1550 nm
Minimum	1480 nm
Maximum	1580 nm
Output power (average)	
Minimum	-3 dBm
Typical	0 dBm
Maximum	2 dBm
Extinction ratio (minimum)	10 dBm
Connector faceplate	SC, ST, FC

Appendix B
Equipment & Path Protection Switching

This appendix describes OSIRIS optical multiplexer equipment and path protection switching concepts. The following items are described:

- Overview of equipment protection switching
- Equipment protection switching hierarchy
- Equipment protection switching in OSIRIS-VUE
- Overview of path protection switching
- Path protection switching hierarchy
- Path protection switching in OSIRIS-VUE

Equipment Protection Switching

Equipment protection switching means that OSIRIS optical multiplexers have additional components available for backup. In the event of mapper failure, traffic switches to the backup equipment. Equipment protection switching is provisioned using OSIRIS-VUE.

For example, in an OSIRIS-STD Shelf, DS1 cards are protected in a 1:7 configuration. This implies that for seven mapper cards, an additional DS1 card is available in standby mode for protection. DS3 cards are protected in a 1:3 configuration. This implies that for three mapper cards, an additional DS3 card is available in standby mode for protection.

In the event that hardware fails or a working mapper is removed, equipment payload is switched to the protection card. A switch may take place automatically in the event of an equipment failure or a card removal. In addition, a switch may be user initiated when a maintenance procedure is being performed.

Because OSIRIS optical multiplexer mappers are protected in a 1:N format, one mapper is available for backup purposes. However, many mappers may be provisioned as protected. If more than one mapper is provisioned as protected, priority status are used to determine which traffic switches to the protection mapper.

The equipment protection switching test verifies the switching of traffic to/from a working mapper and a protection mapper.

There are five levels of equipment protection switching. During OSIRIS optical multiplexer testing and configuration procedures, protection switching characteristics may be altered as a required part of many procedures.

The five levels of equipment protection switching vary in their strictness, or revertability. For example, a **Lockout of Protection** prevents any mapper from switching to the backup (protection) mapper. Under no circumstances can traffic switch to another card, and traffic may **never revert** to the protection mapper. A **Manual Switch** to protection lets you switch traffic to the protection mapper. However, in the event of protection mapper failure, traffic switches back to the original mapper. In this case, traffic is **revertive**.

The Five States and Their Hierarchical Order

Five protection states exist in the following descending order of priority:

- Lockout of protection
- Lockout of working
- Forced switch to protection
- Automatic switch to protection
- Manual switch to protection

Lockout of Protection

A Lockout of Protection is provisioned on the protection mapper using OSIRIS-VUE. This prohibits a switch to that mapper for protection purposes for all mappers currently provisioned as protected. If a working mapper fails, a switch to the protection card **does not** take place. A Lockout of Protection may be used when performing maintenance on the protection mapper.

Lockout of Protection holds the highest priority and overrides all other protection switches.

Lockout of Working

A Lockout of Working is provisioned for a working mapper using OSIRIS-VUE. Lockout of Working prohibits traffic from switching from this mapper to the protection mapper. A Lockout of Working lets you perform maintenance on the protection mapper.

Note: If maintenance is being performed on the protection mapper, a Lockout of Working must be placed on each mapper in the shelf.

Lockout of Working holds the second level of priority and takes place only if a lockout of protection is not enforced.

Forced Switch to Protection

A Forced Switch to Protection is provisioned on a specific mapper using OSIRIS-VUE. This action forces traffic from this card to the protection mapper.

This switch is non-revertive. In other words, if the protection mapper fails, traffic still remains on the protection mapper. A Forced Switch to Protection lets you perform maintenance procedures on the working mapper.

Note: A Forced Switch to Protection may be service affecting. If traffic is forced to the protection mapper and that mapper fails, traffic is lost.

Forced Switch to Protection holds the third level of priority and occurs only if two conditions are satisfied: no lockouts are enforced, and no other working card of higher hardware protection priority has demanded a Forced Switch to Protection.

Automatic Switch to Protection

An Automatic Switch to Protection is provisioned using OSIRIS-VUE. This type of switch is initiated by the OSIRIS optical multiplexer equipment under certain conditions. If a mapper provisioned for protection fails, traffic automatically switches to the protection mapper.

A switch of this nature may indicate hardware problems with the working mapper card. However, since this switch is revertive, once the working card is operational, traffic switches back to the working card.

Automatic Switch to Protection holds the fourth level of priority and occurs only if two conditions are satisfied: no lockouts or forced switches are enforced, and no other working card of higher hardware protection priority requires an automatic switch to protection.

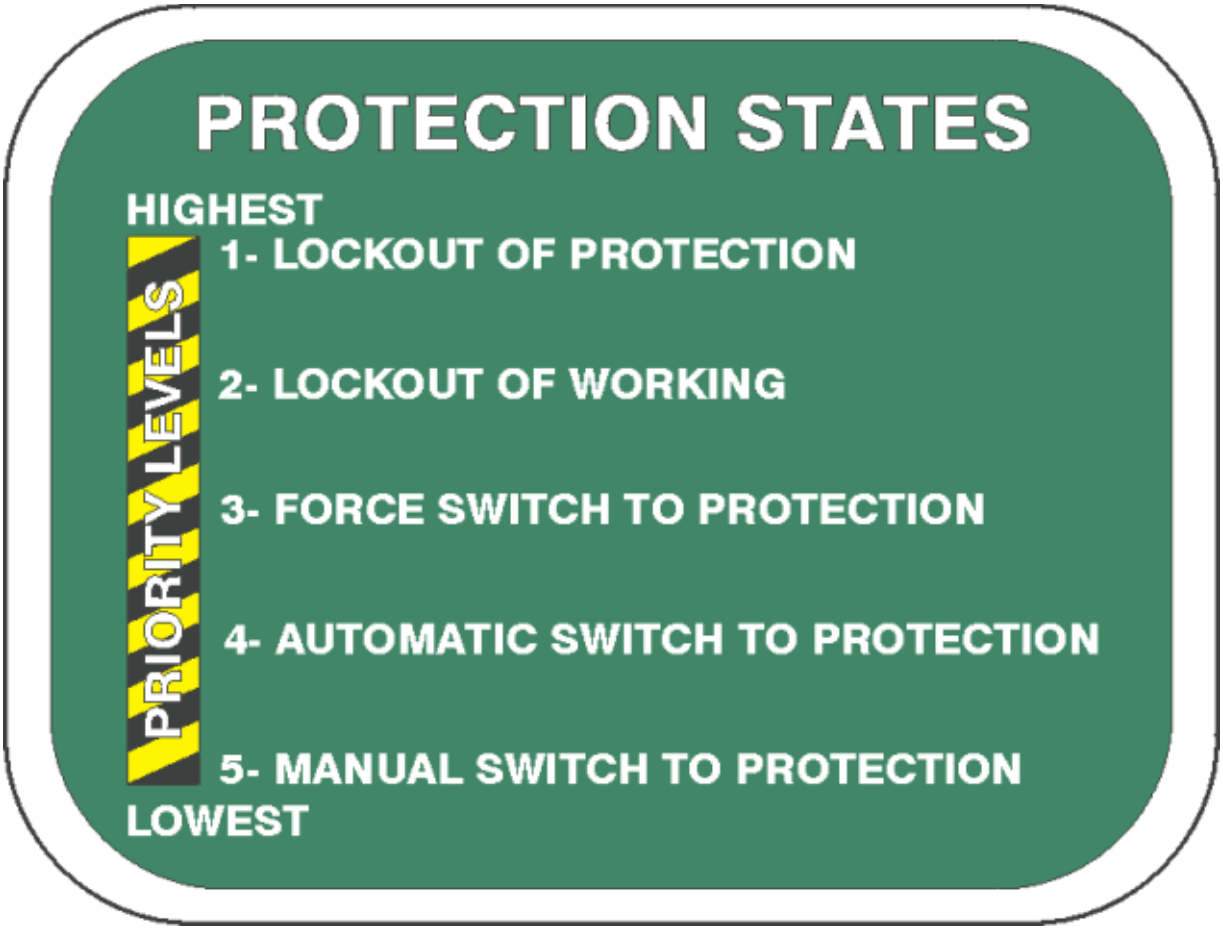
Manual Switch to Protection

A Manual Switch to Protection is provisioned on a specific working mapper using OSIRIS-VUE. During a Manual Switch to Protection, traffic switches to the protection mapper. This switch is revertive. If the protection mapper fails, traffic switches back to the working mapper. A switch of this nature allows work to be done on the working mapper card.

Note: A Manual Switch to Protection may be service affecting. For example, because this switch is revertive, traffic may switch back to the working mapper in the event of protection mapper failure. However, if you have removed the working mapper, traffic is lost.

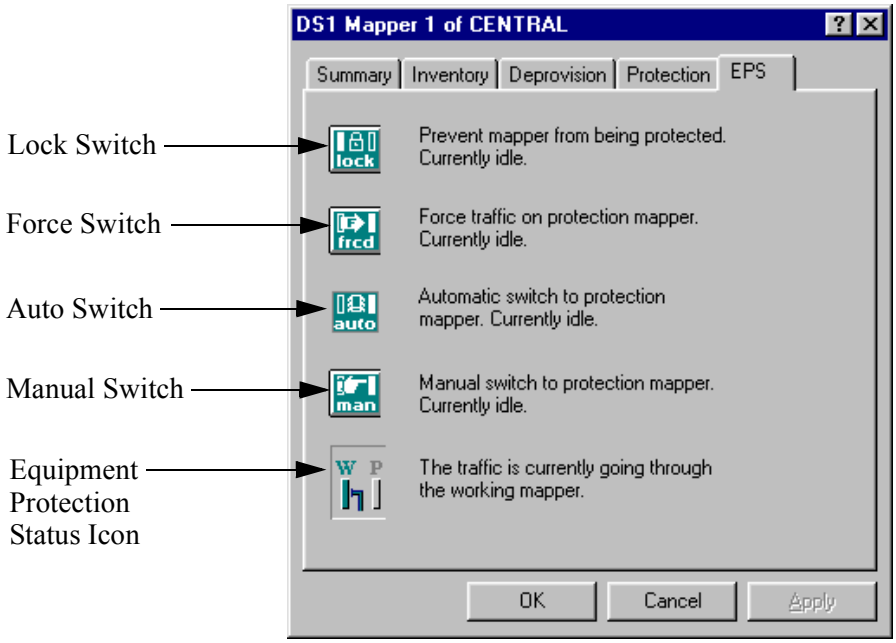
Manual Switch to Protection holds the lowest level of priority and occurs only if two conditions are satisfied: no lockouts, forced switches, or automatic switches are enforced, and no other working card of higher hardware protection priority has demanded a manual switch to protection.

Figure 13 Five Hierarchical Levels of Equipment Protection

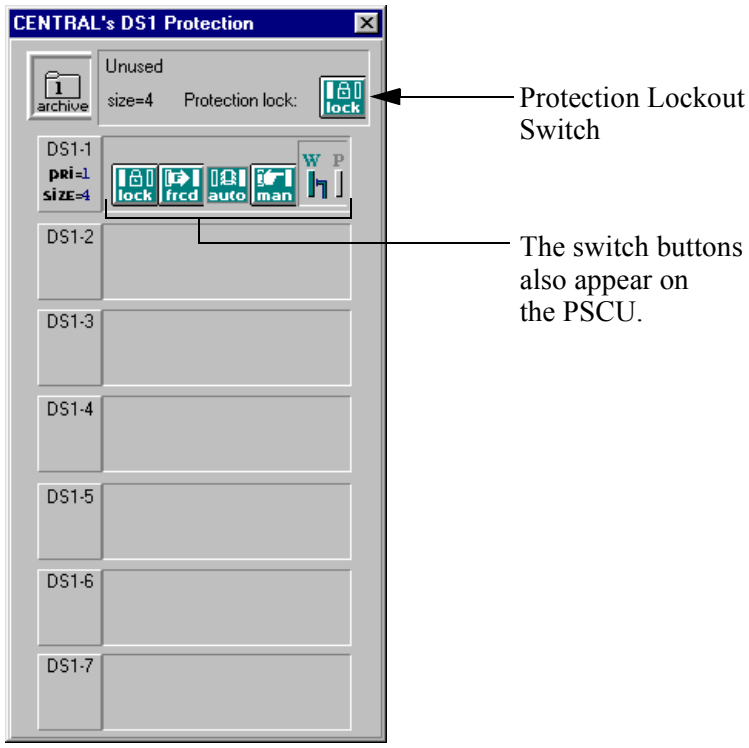


Equipment Protection Switching in OSIRIS-VUE

Equipment protection switching is managed through the OSIRIS-VUE Mapper-level dialog box. The **EPS** tab displays the current card protection status, letting you provision switching characteristics.



Lockouts of Protection are performed through the DS1 Protection dialog box. You may also provision the equipment protection status for all mappers which are currently protected.



This section describes the following:

- Protection Lockout Switch
- Lock Switch
- Force Switch
- Auto Switch
- Manual Switch
- Equipment Protection Status Icon

Protection Lockout Switch

The Protection Lockout Switch lets you perform a Lockout of Protection.

Lockout of Protection has the highest priority level. This action overrides any equipment protection switching instructions which may already be present.

The Lock Switch

The **Lock** switch lets you perform a Lockout of Working.

The Force Switch

The **Force** switch lets you switch network traffic to the protection fiber. This switch has priority over the following switches:

- The Auto switch

- The Manual switch

The Auto Switch

The **Auto** switch is activated by the shelf when the working fiber is not operational. The Auto switch is never active if a Force switch is active. In revertive mode, the Auto switch deactivates once the working fiber becomes operational.

The Manual Switch

The **Manual** switch lets you manually switch network traffic from the working to the protection path. If a Force or Auto switch is active, the Manual switch is not enabled. If network traffic is manually switched to the protection path and that path becomes defective, traffic automatically switches back to the working path.

The manual switch has the lowest level of priority.

Equipment Protection Status icon

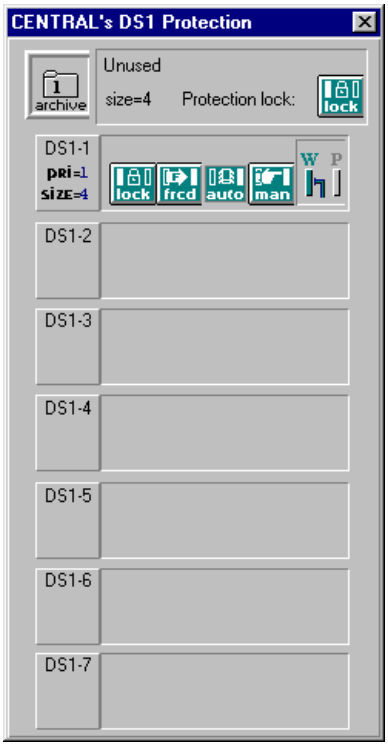
The **Equipment Protection Status** icon indicates whether the protection card is carrying network traffic.

Interpreting Equipment Protection Status

You should perform these equipment protection switching testing procedures during or immediately after mechanical installation. However, there may be times when you want to perform equipment protection switching testing procedures on an active OSIRIS optical multiplexer or its components. Equipment protection switching may also be performed during maintenance procedures.

Therefore, it is important to be able to interpret the existing equipment protection switching status and be able to return it to an idle state.

Current equipment protection switching status may be displayed by double-clicking the **PSCU** mapper icon which appears in the **Shelf-level** dialog box. This displays the **Protection** dialog box.



The Protection dialog box lets you provision the characteristics of equipment protection switching. The status of equipment protection switching icons is displayed in the following table.

Element	Icon	Status
Protection Lockout (Protection Priority Level: 1)		Unlocked - indicating that a Lockout of Protection (LOP) is not in enabled.
		Locked - indicating that an LOP is enabled. LOPs have the highest priority among protection states. No other switching may take place while an LOP is in force.
Lockout of Working (Protection Priority Level: 2)		Unlocked - indicating that a Lockout of Working (LOW) for the current mapper is not enabled.
		Locked - indicating that an LOW of the Working mapper is enabled.
		Pending - indicating that an LOW of the Working mapper is pending. An LOW has been initiated, but may not be enabled because an LOP is currently in force. Because an LOP has a higher protection status than an LOW, this switch will remain pending until an LOP is removed.
Forced Switch (Protection Priority Level: 3)		Unswitched - indicating that a Forced Switch (FSW) to the protection mapper has not been initiated.
		Switched - indicating that an FSW to the protection mapper is enabled. An FSW may be enabled only if an LOW or LOP is not in force.
Automatic Switch (Protection Priority Level: 4)		Default - Automatic Switching (ASW) is an OSIRIS optical multiplexer network's default level of equipment protection switching. Without provisioning any protection characteristics, OSIRIS optical multiplexers always automatically switches to protection under the following conditions: Protection mappers exist in the protection slot(s) on an OSIRIS optical multiplexer. The removed or failed mapper is provisioned as protected through OSIRIS-VUE.
Manual Switch (Protection Priority Level: 5)		Unswitched - indicating that a Manual Switch (MSW) is not enabled.
		Switched - indicating that an MSW is enabled. MSWs have the lowest priority level. An MSW takes place only if no other switches are in force.

Returning Equipment Protection Switching to an Idle State

To return equipment protection switching to an idle state, perform the following steps:

1. Double-click the PSCU card icon in the Shelf-level dialog box.

   The Protection dialog box appears.

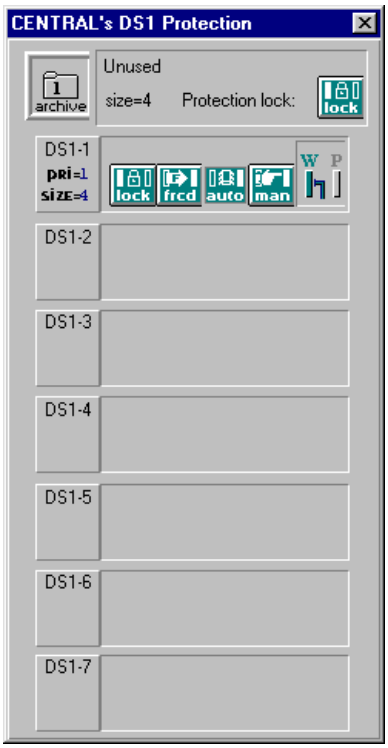
2. Return protection status to default conditions in the following order for **each** mapper appearing in the Protection dialog box:

   - Manual Switches
   - Forced Switches
   - Lockouts of the Working mapper

   Note: Automatic switching is a default characteristic of OSIRIS optical multiplexers. You cannot provision it using OSIRIS-VUE.

3. Return the **Lockout of Protection** to default.

   The Protection dialog box appears.



Path Protection Switching

Path Protection switching protects traffic that has been defined along a specific path. Because OSIRIS networks are designed as Unidirectional Path Switching Rings (UPSR), a duplicate, or backup copy of traffic flowing on fiber A is also available on fiber B. This lets the OSIRIS network switch between fibers in the event of single fiber failure.

In addition, a switch may be user-initiated when a maintenance procedure is being performed.

There are four states of path protection:

- Lockout of working
- Forced switch to protection
- Automatic switch to protection
- Manual switch to protection

Lockout of Working

A Lockout of Working (LOW) is initiated through OSIRIS-VUE for an individual cross-connection. An LOW forces traffic to remain on the fiber on which it currently flows. In other words, if traffic flows on fiber A, an LOW placed in fiber A *traps* traffic on fiber A. Traffic never switches to fiber B. An LOW is therefore known as non-revertive because traffic never reverts to the protection fiber.

An LOW lets you perform maintenance or installation procedures on the protection fiber.

An LOW has the highest priority of path protection.

Forced Switch

A Forced Switch (FSW) is provisioned using OSIRIS-VUE. An FSW switches OSIRIS network traffic from the working fiber to the protection fiber. An FSW is non-revertive. Traffic will not switch back from the protection fiber in the event of protection fiber failure.

FSWs are used to perform installation and maintenance procedures on the working fiber.

An FSW has the second highest priority of path protection.

Automatic Switch to Protection

An Automatic Switch to Protection (ASW) is the default switching characteristic of an OSIRIS network. For example, if network traffic is travelling in fiber A and that fiber fails, traffic automatically switches to fiber B.

ASWs are revertive switches. Traffic that has switched to protection switches back when the main fiber has been repaired.

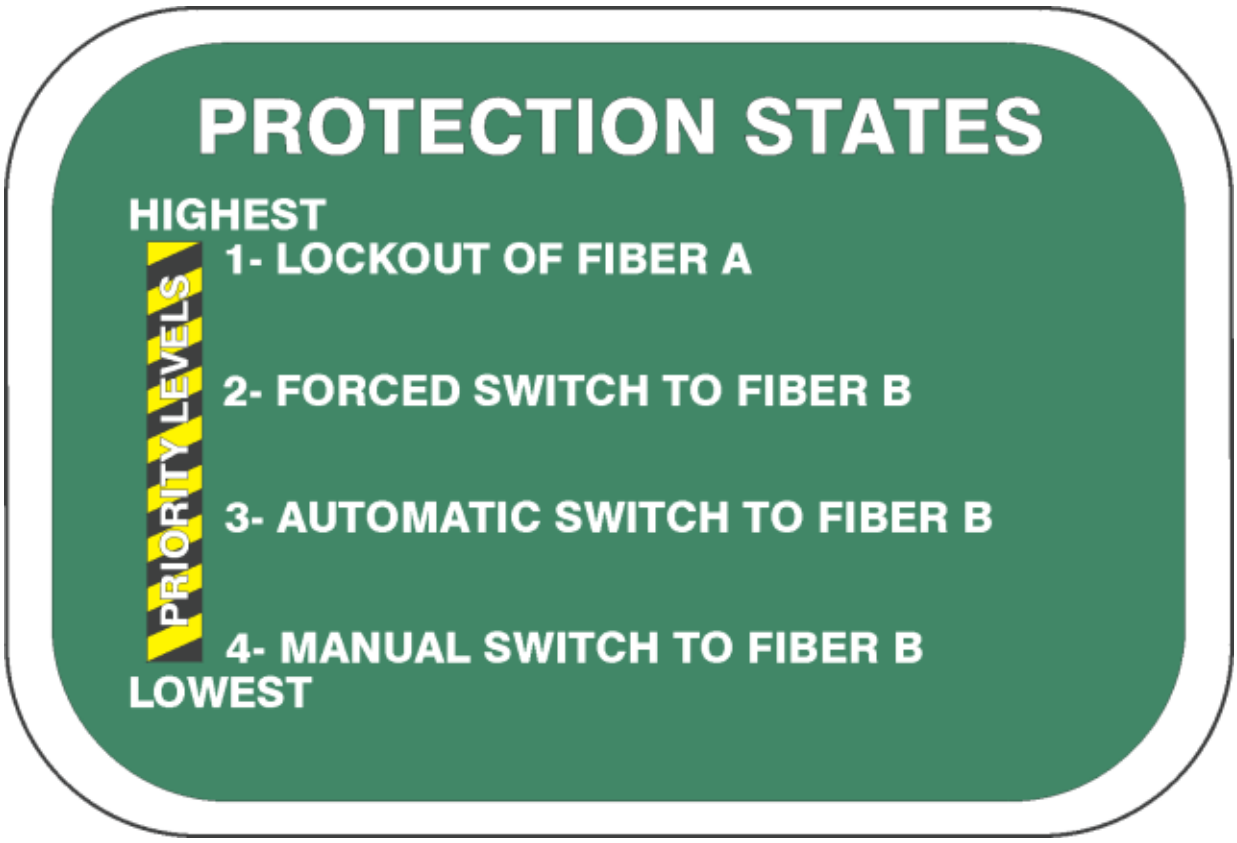
ASWs have the third priority level of path protection.

Manual Switch to Protection

A Manual Switch to Protection (MSW) is a revertive switch of traffic to the protection fiber provisioned using OSIRIS-VUE. If traffic is switched to protection and the signal quality on the protection fiber begins to degrade, traffic switches back to the main fiber.

MSWs have the lowest path protection priority.

Figure 14 Hierarchical Levels of Equipment Protection



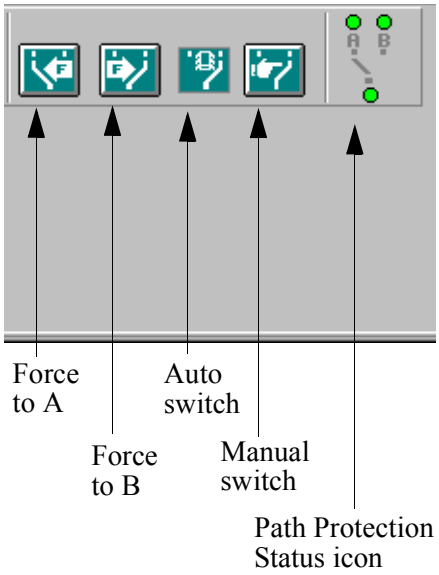
Path Protection Switching in OSIRIS-VUE

This section describes the path protection buttons.

The path protection buttons are used to perform switches from the working fiber to protection fiber. In Unidirectional Path Switching Rings (UPSRs), one fiber provides backup for all traffic travelling in the main, or working, fiber.

This section describes the following:

- Lock switch
- Force switch
- Auto switch
- Manual switch
- Path Protection Status icon



The Lock Switch

The **Lock** switch lets you prevent a switch to the protection card associated with the displayed mapper card.

The Force Switch

The **Force** switch lets you switch network traffic to the protection fiber. This switch has priority over the following switches:

- Auto switch
- Manual switch

The Auto Switch

The **Auto** switch is activated by the shelf when the working fiber is not operational. The Auto switch is never active if a force switch is active. In revertive mode, the auto switch deactivates once the working fiber becomes operational.

The Manual Switch

The **Manual** switch lets you manually switch network traffic from the working to the protection path. If a force or auto switch is active, the manual switch is not enabled. If network traffic is manually switched to the protection path and that path becomes defective, traffic automatically switches back to the working path.

Note: The Manual switch has the lowest level of priority.

The Path Protection Status Icon

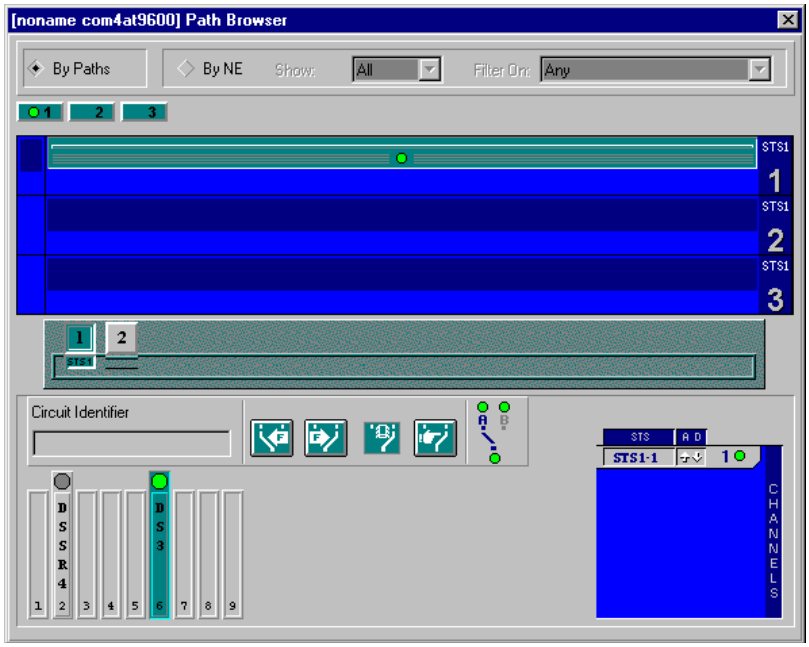
The **Path Protection Status** icon indicates whether the working path or the protection path is currently carrying network traffic. It also indicates the status (normal or alarm) of each fiber, and the status of the input signal. The LED above the A indicates the status of fiber A. The LED above the B indicates the status of fiber B. The LED at the button indicates the status of the input signal.

Interpreting Path Protection Status

You should perform these path protection switching testing procedures during or immediately after mechanical installation. However, there may be times when you want to perform path protection switching testing procedures on an active OSIRIS optical multiplexer or its components. Path protection switching may also be performed during maintenance procedures.

Therefore, it is important to be able to interpret the existing path protection switching status and be able to return it to an idle state.

Current path protection switching status is displayed by the **Path Browser**.



The Path Browser lets you provision the characteristics of path protection switching. The status of path protection switching icons is displayed in the following table.

Element	Icon	Status
Path Lockout (Protection Priority Level: 1)		Unlocked - indicating that a Lockout of Path (LOP) is enabled.
		Locked - indicating that an LOP is enabled. Traffic is locked on fiber A. Maintenance procedures may be performed on fiber B. LOPs have the highest priority among protection states. No other switching may take place when an LOP is in force.
Forced Switch to Protection (Protection Priority Level: 2)		Unlocked - indicating that a Forced Switch to Protection (FSW) for the current path is not enabled.
		Locked - indicating that an FSW of the current path mapper is enabled.
Automatic Switch (Protection Priority Level: 3)		Default - Automatic Switching (ASW) is a OSIRIS optical multiplexer network's default level of path protection switching. Without provisioning any protection characteristics, OSIRIS optical multiplexers always automatically switches to protection.
Manual Switch (Protection Priority Level: 4)		Switch to fiber A - indicating that traffic currently travels on fiber B. Click this button to switch traffic to fiber A. Because manual switches have the lowest level of protection priority and are revertive, maintenance procedures are typically not performed with these switches.
		Switch to fiber B - indicating that traffic currently travels on fiber A. Click this button to switch traffic to fiber B.

Appendix C
Logging on to a Shelf

This Appendix describes the procedures used to log on to an OSIRIS optical multiplexer with OSIRIS-VUE:

- Logging on to an OSIRIS optical multiplexer
- Provisioning a Mapper and Channels Using OSIRIS-VUE

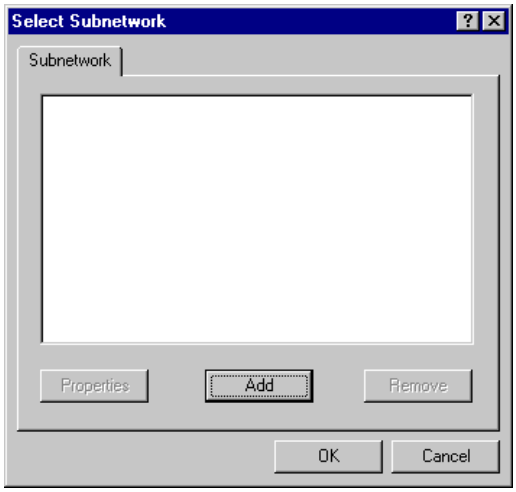
Logging on to a OSIRIS-VUE

To test an OSIRIS optical multiplexer, you must log on using OSIRIS-VUE. Starting with version 3.01 of OSIRIS-VUE, you must define a subnetwork login definition before you log on to a shelf. Follow the procedures below to connect to a shelf.

Note: You can establish a telnet session to any network element that has an IP address. To assign an IP address to a network element, see the *Network MCU (NMCU) (202-016)* release note.

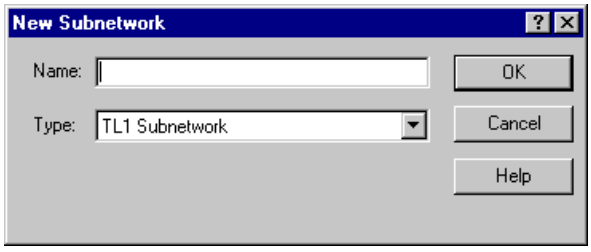
1. Connect the computer running OSIRIS-VUE to the network element. Place the male DB-9 end of a Craft cable in the connector labelled CRAFT on the ACIU card. Connect the other end of the cable to one of your computer's serial ports.
2. Start OSIRIS-VUE. The **Welcome** screen appears.
3. Click the **Login** button and start an **On-Line** session.

   The **Select Subnetwork** dialog box appears.



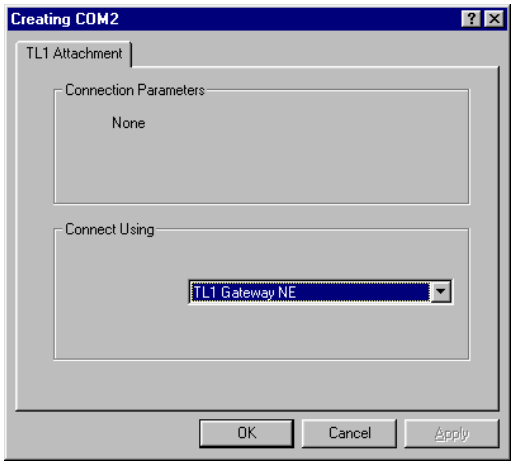
4. Click the **Add** button.

   The **New Subnetwork** dialog box appears.



5. Enter a **Name** for this set of connection parameters, then click **OK**.

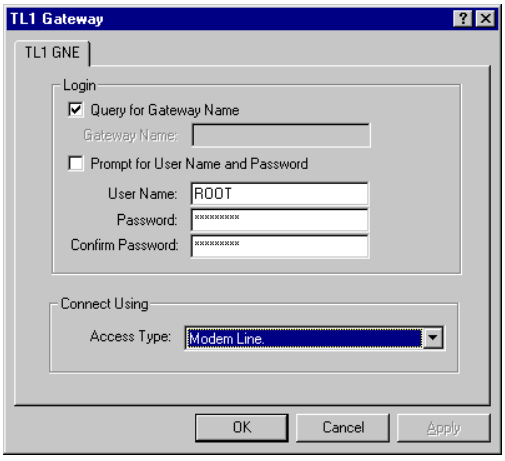
The **Creating** dialog box appears.



If you are connected to a TCP/IP terminal server, you may need to set **Connect Using** to **TL1 Gateway Server**.

6. Click **OK**.

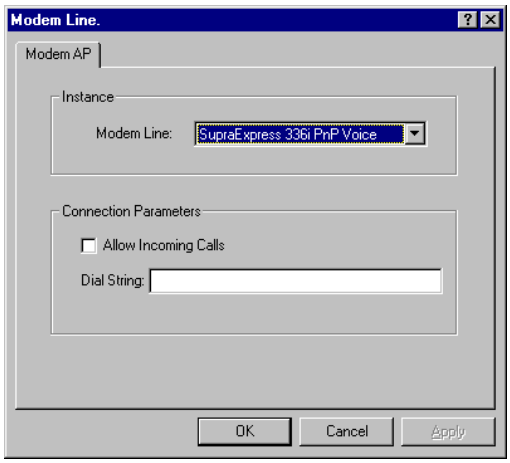
   The **TL1 Gateway** dialog box appears.



7. Set **Access Type** to either **Modem Line**, **Serial Port** or **Telnet Protocol**, depending on how you want to connect.
8. Click **OK**, then proceed to the appropriate section.

Modem Line

The Modem Line dialog box appears



1. Enter the **Dial String** to be dialed.

   Include any extra numbers required to access external locations. You can also add commas (pauses) if needed.

2. Click **OK**.

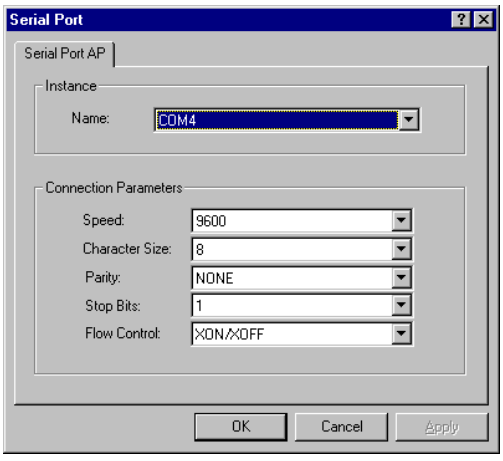
Note: **Modem Line** lists all modems that are auto-discovered by OverView.

The Select Subnetwork dialog box reappears.

3. Select the connection definition that you configured, then click **OK**.
4. The Node Status window appears when you are connected to the network element.

Serial Port

The Serial Port dialog box appears.



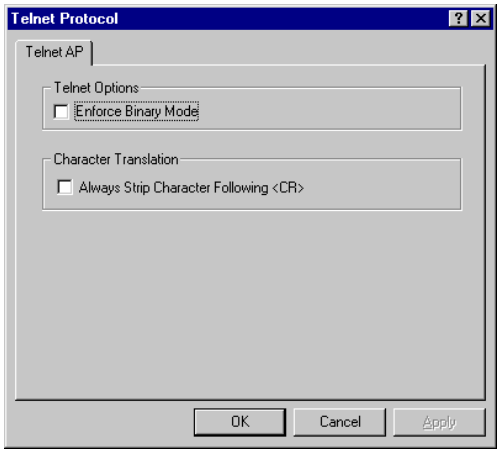
1. Set the serial port and other serial port parameters. The default settings on a shelf are 8N1.
2. Click **OK**.

   The Select Subnetwork dialog box reappears.

3. Select the connection definition that you configured, then click **OK**.
4. The Node Status window appears when you are connected to the network element.

Telnet

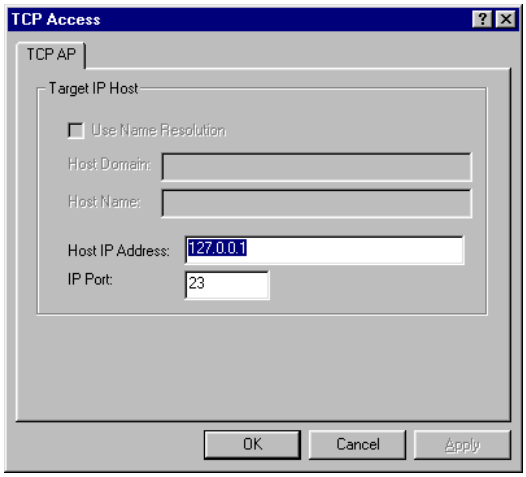
The Telnet Protocol dialog box appears.



1. Click **OK** if you are connected directly to an Ethernet port.

   If you are connected to a TCP/IP terminal server, you may need to select **Always Strip Characters**.

   The **TCP Access** dialog box appears.



2. Set the **Host IP Address** to the network element's IP address.
3. Click **OK**.

   The Select Subnetwork dialog box reappears.
4. Select the connection definition that you configured, then click **OK**.
5. The Node Status window appears when you are connected to the network element.

Provisioning a Mapper and Channels with OSIRIS-VUE

Before testing channels on the OSIRIS optical multiplexer mappers, you must provision traffic with OSIRIS-VUE. This test consists of two procedures:

- Provisioning working and protection mappers
- Provisioning a cross-connection

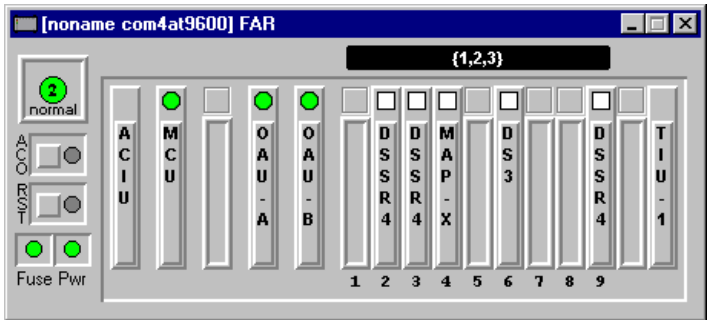
Note: The following procedure describes how to provision a DS1/DS3 mapper. Although provisioning other mappers is similar, you require only the following mapper combinations to fully test the shelf: DS1 **and** DS1 protection; DS3 **and** DS3 protection.

Provisioning Working and Protection Mappers Using OSIRIS-VUE

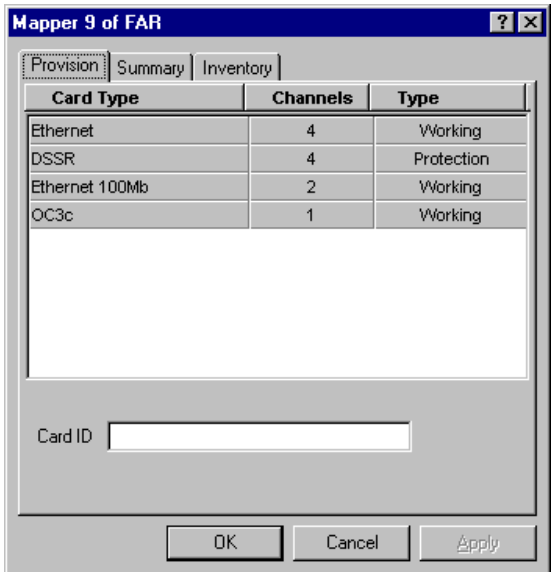
Once equipment is present in the shelf, you can provision it with OSIRIS-VUE.

To provision working and protection mappers, perform the following steps.

1. In the **Network Status** window, double-click the node icon for the shelf on which you want to view equipment protection switching status. The **Shelf-level** dialog box appears.



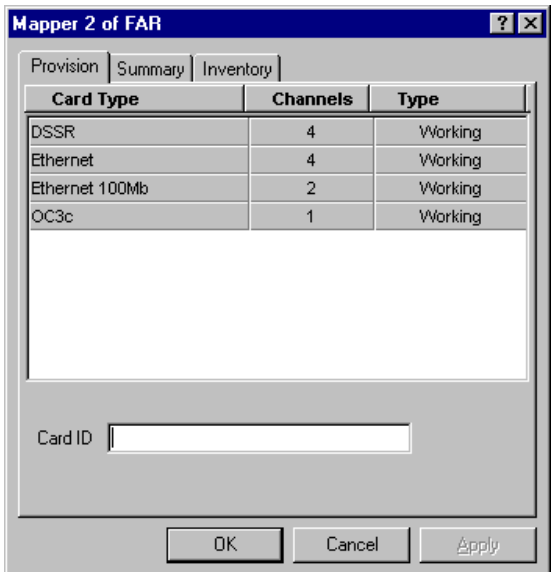
2. Double-click Slot 9. The Mapper dialog box appears.



3. Select the **DSSR-4-Protection** row.
4. Click **Apply**, then click Yes to confirm.

   This mapper is now provisioned as the protection mapper.
5. Click **OK** to close the Protection Mapper dialog box.

   The Shelf-level view dialog box reappears. The protection mapper appears as a provisioned mapper.
6. Double-click the slot representing the working mapper. The **Mapper** dialog box appears.

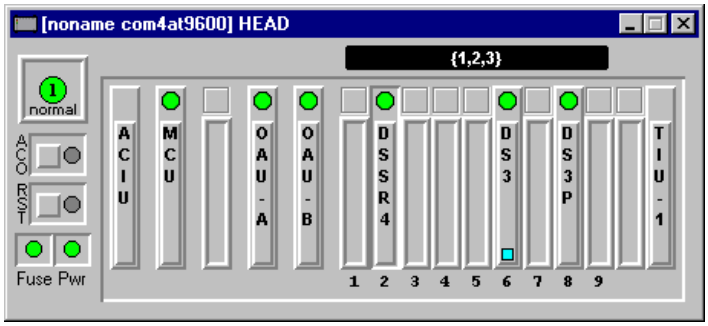


7. Select the **DSSR-4-Working** row.

   Note: Make sure to provision this mapper as the same type as the protection mapper.

8. Click **Apply**, then click Yes to confirm.
9. Click **OK** to exit the dialog.
10. Click the **Protection** tab.
11. Click the **Protected** check box.
12. Click **Apply**, then click Yes to confirm.

    The mapper is now provisioned as protected.
13. Click **OK** to exit the dialog. The **Shelf-level** dialog box reappears.



A mapper may not be provisioned for equipment protection switching unless a protection mapper is present and has been provisioned. A mapper provisioned as protected displays an icon indicating a protection state.

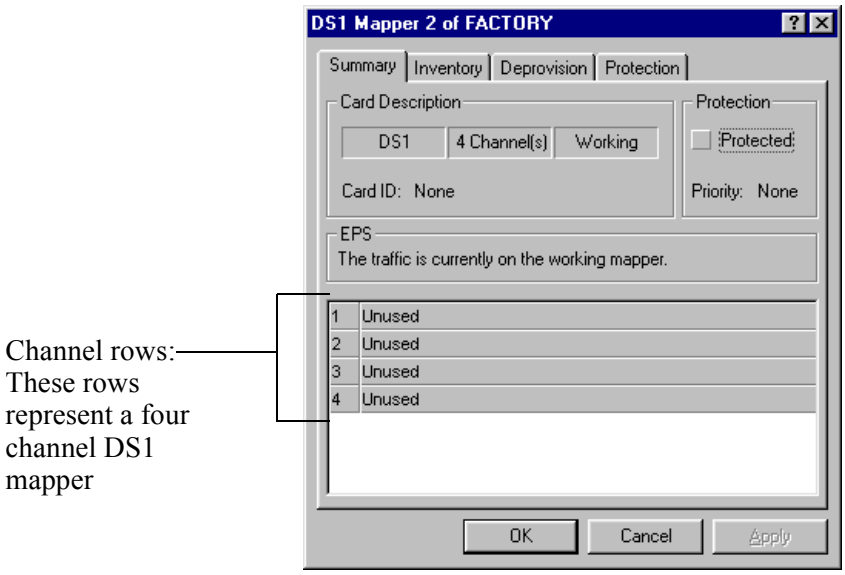
Note: If you are performing shelf testing procedures with only two mappers (one DS1 **and** one DS3), you must provision the mapper each time it is placed in a new slot on the OSIRIS-STD Shelf. For example, provisioning a DS1 in Slot 1 of an OSIRIS-STD Shelf lets you perform testing procedures for that slot. However, in order to test Slot 2 for DS1 traffic, the mapper must be deprovisioned in Slot 1, removed and placed in Slot 2, and provisioned in Slot 2.

Provisioning a Cross-connection with OSIRIS-VUE

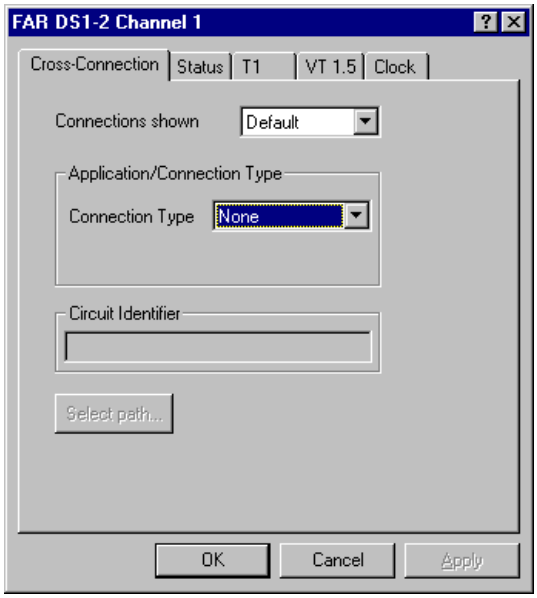
Once you have provisioned the working mapper, you must provision a cross-connection on the working mapper. To test all channels on a DS1 mapper, you must provision four cross-connections (one for each channel).

To provision a cross-connection, perform the following steps.

1. Double-click the working mapper icon from the **Shelf-level** dialog box. The **Mapper-level** dialog box appears.

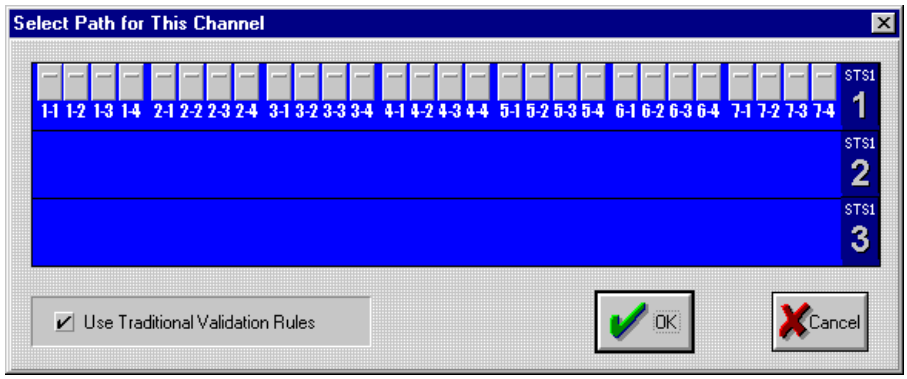


2. Double-click a **Channel** row. The **Channel-level** dialog box appears.



3. Click the **Cross-connection** tab.
4. Select **Add/Drop** as the **Connection Type**.

5. Click the **Select Path** button. The **Select Path for this Channel** dialog box appears.



6. Right-click **STS1-1** and click **Use this STS1 for VT traffic.** Click **Yes**.
7. Click a **VT1.5** icon.
8. Click **OK**. The **Channel-level** dialog box reappears.
9. Click **Apply**. The **Create Cross-connection** dialog box appears.
10. Click **Yes**.
11. Click **OK** to exit the Channel-level dialog box.
12. Click **OK** to exit the Mapper-level dialog box. The Shelf-level dialog box reappears. The cross-connection is provisioned.
13. Repeat Step 1 to 12 for each channel located on the mapper.

Appendix D

Shelf Test Report

This Appendix lists system testing procedures that should be performed on a new shelf. Use this report as a guide when you are testing a shelf.

OSIRIS Test Report

Site Name	
Shelf Type	
Shelf #	
Rack #	

Test	
LEDs on the OSIRIS-PWR Shelf	☐
Power to the OSIRIS optical multiplexer	☐
Power Source Switching	☐
Fuse Alarm Condition	☐
Power Output of the Optical Access Units (OAU)	☐
Receiver Sensitivity of the Optical Access Units (OAU)	☐
Minor, Major, and Critical Alarm Conditions	☐
Mapper Card Channels	☐
Equipment Protection Switching	☐
Path Protection Switching	☐