

Lucent Technologies
Bell Labs Innovations



***WaveStar*[®] Network Management System (NMS)**

Release 4.2 (Topaz)

Provisioning Guide

365-309-243
Issue 1
July 2001



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About this information product

Purpose This chapter is a preface that provides an overview of this information product.

The purpose of this Provisioning Guide is to provide an overview of WaveStar Network Management System (NMS) Release 4.2, explain its capabilities, and describe the planning activities that must be done before a system can be installed.

Reason for reissue This Provisioning Guide, Issue 1, is a new document that supports WaveStar NMS, Release 4.2.

Safety labels This information product does not use safety labels.

Intended audience This guide is written primarily for network planners, engineers, and sales teams. It may be used by anyone desiring specific information about the features, applications, and operations of WaveStar NMS.

How to use this information product This section provides information that will help users of this information product.

The following table describes the information in each chapter of this document.

Section	Title	Description
Preface	About this information product	Describes this document's purpose and intended audience, how to use the document, and how to comment on it.
Chapter 1	Chapter 1, "The WaveStar NMS Provisioning Process"	Provides an overview of the WaveStar NMS provisioning process.
Chapter 2	Chapter 2, "Network Element Configuration Tasks"	Describes tasks associated with controlled and noncontrolled network elements.
Chapter 3	Chapter 3, "Provisioning Tasks"	Describes tasks related to digital link, connection, optical layer, subnet, and preplan restoration provisioning.
Chapter 4	Chapter 4, "Provisioning Concepts"	Describes provisioning concepts associated with network elements, connections, optical layers, subnets, and preplan restoration.
Chapter 5	Chapter 5, "Digital Transmission Rates"	Describes the SDH and PDH hierarchies, the relationships among digital links, circuits and the digital transmission hierarchy WaveStar NMS supports.
Chapter 6	Chapter 6, "Network Element Port Addresses"	Lists the port addresses associated with WaveStar NMS network elements.
Index	Index	

Conventions used

This document uses the following typographical conventions to distinguish between computer input and output.

- When describing the WaveStar NMS software, fields in windows and field entries are identified with **this font**.
- When describing the UNIX environment, text and numbers that the user inputs to the computer are identified with boldface type.
- In the UNIX environment, text and numbers that the computer outputs to the user are identified with monospace type.

Related documentation

This information product is part of a set of documents that supports WaveStar NMS.

List of documents

The document set that supports WaveStar NMS includes:

1. *WaveStar NMS Getting Started Guide*, (365-309-241) - provides information needed when you are learning how to use the WaveStar NMS software. It describes how to start and stop WaveStar NMS, how to use the software, and how to interpret the graphical user interface.
This document includes tasks and conceptual information.
2. *WaveStar NMS Applications and Planning Guide*, (365-309-242) - describes the WaveStar NMS features and applications, provides a product description and the hardware platforms for the product, and describes system planning and engineering, ordering, and product support.
This document contains conceptual information only.
3. *WaveStar NMS Administration Guide*, (365-309-245) - instructs users on how to administer WaveStar NMS and the network.
This document includes tasks and conceptual information.
4. *WaveStar NMS Maintenance Guide*, (365-309-244) - instructs users on how to maintain WaveStar NMS and the network.
This document includes tasks and conceptual information.
5. *WaveStar NMS Provisioning Guide*, (365-309-243) - instructs users how to use WaveStar NMS to provision and manage a network.
This document includes tasks and conceptual information.

Online documentation

An online HTML version of this document set is provided with WaveStar NMS.

Screen help

The WaveStar NMS software includes screen help for each window, which describes the purpose of the window, each of the fields, and each of the buttons.

How to comment

Customer satisfaction is extremely important to Lucent Technologies. All users are encouraged to provide feedback on the WaveStar NMS information products.

A customer comment form appears immediately after the title page of this document. Please fill out the form and submit it as instructed on the form.

How to order

To order WaveStar NMS information products, contact your Lucent Technologies customer team representative or contact the Lucent Technologies Customer Information Center (CIC):

From the United States, call 1-888-LUCENT8, prompt 1.

From Canada, call 1-317-322-6619.

From Europe, the Middle East, and Africa, call 1-317-322-6416.

From Asia, the Pacific Region, China, the Caribbean, and Latin America, call 1-317-322-6411.



1 The WaveStar NMS Provisioning Process

Overview

Purpose This chapter provides an overview of the WaveStar NMS provisioning process.

Important note This document instructs users how to provision WaveStar NMS. This document contains two types of chapters:

- **Task** chapters describe provisioning tasks (that is, step-by-step instructions).
- **Conceptual** chapters contain detailed information related to the tasks.

Task chapters are located in the front of the document; conceptual chapters follow the task chapters.

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What is provisioning?	1-2
Terminology overview	1-3
Provisioning process description	1-8



What is provisioning?

Overview Provisioning, as it pertains to WaveStar NMS, is the process of establishing a connection through a WaveStar NMS managed network and setting appropriate transmission parameters for a digital link, optical link, optical multiplex section, optical channel trails, and SDH/PDH circuit/trails for a specified rate.

This overview assumes that all of the administrative procedures needed to have the system fully operational have been completed.

Supported actions WaveStar NMS allows users to perform the following actions for provisioning:

- **Add:** users can provision new digital links, circuit/trails and optical layers from WaveStar NMS.
- **Disconnect:** users can delete existing digital links, circuit/trails and optical layers from WaveStar NMS.
- **Modify:** users can modify an existing circuit/trail to create a new route.
- **Merge:** users can merge two or more circuits/trails of the same or equivalent rate to form one new circuit/trail. This activity from WaveStar NMS will not create any implementation commands.
- **Preplan:** users can establish a preplan circuit/trail in WaveStar NMS for use with a service circuit/trail to restore service in case of a service circuit/trail failure.

□

Terminology overview

- Overview** This section provides an overview of the common terms and concepts necessary to understand the WaveStar NMS provisioning process.
- For a complete listing of WaveStar NMS-related terms, refer to the glossary section of the *WaveStar NMS 4.0 Administration Guide*.
- Aggregate** An *aggregate* is a collection of one or more network elements and/or aggregates. An aggregate is represented by a single icon on the Network Map.
- Area** Networks managed by WaveStar NMS can be subdivided into smaller, manageable networks called *areas*. An area is a collection of nodes and/or aggregates, and their associated links. An area is represented by a single icon on the Network Map. Subdividing a network into areas reduces overcrowding on the display and improves system performance because smaller amounts of information are exchanged by the subsystems.
- Areas can be defined for any purpose. Examples of potentially useful areas are:
- A set of nodes/aggregates dedicated to a subscriber
 - A set of nodes/aggregates, which are or are not connected
 - A set of nodes/aggregates in a geographic location or building
- Black box** A *black box* is a network element, displayed on the Network Map, that is not monitored or controlled by WaveStar NMS. An example of a black box is a non-Lucent network element.
- Channels** When either a digital link or trail is channelized, it is subdivided into *channels*. For time division multiplexing (TDM) equipment, channels represent the time slots with which information is carried within a digital link or in a server trail. Channels are created by WaveStar NMS for use during circuit/trail provisioning. When creating channels for digital links, depending on the network element capability, alternate channels, to accommodate provisioning different rates of circuits/trails, are created.

Circuits *Circuits* generally carry customer service. Typically, circuits are plesiochronous digital hierarchy (PDH) and can ride on PDH channels or be mapped to SDH trails. Circuits can ride on trails and digital links.

Circuits ride on:

- Paths (for example, a CEPT-1 circuit riding on a VC-12 path)
- Digital links (a circuit can ride on a digital link directly if the digital link is channelized to one channel, such as a CEPT-1 circuit riding on a CEPT-1 digital link).

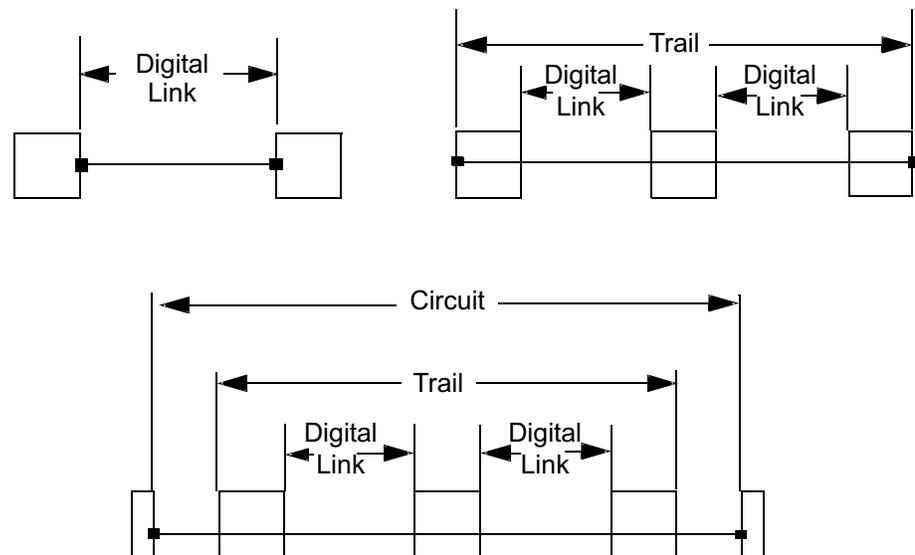
PDH circuits can be provisioned over:

- PDH facilities (for example, a CEPT-1 circuit on a channel of a CEPT-4 facility)
- SDH paths (for example, a CEPT-1 circuit on a VC-12 path)

SDH circuits cannot be provisioned over a PDH facility.

The following figure shows an example of the relationship among digital links, trails, and circuits.

Figure 1-1 Relationship between digital links, trails, and circuits



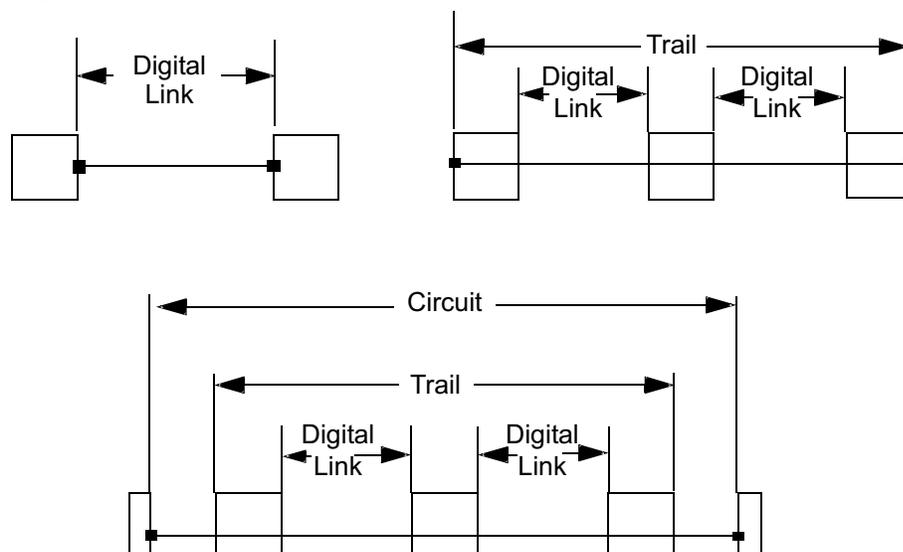
Digital links *Digital links* are fiber or electrical connections between two points. These transport facilities are assignable to high-order and low-order circuits to carry customer services. Digital links can be of two types: SDH digital links or PDH digital links.

SDH digital links connect two SDH network elements or an SDH network element and a black box or equipment.

PDH digital links are asynchronous connections between two PDH ports of the network elements assignable to the PDH circuits.

The following figure shows an example of the relationship among digital links, trails, and circuits.

Figure 1-2 Relationship between digital links, trails, and circuits



Equipment *Equipment* is a functional unit in a network that is not displayed on the Network Map and which WaveStar NMS cannot monitor or control. An example of equipment is customer premises equipment. Black boxes and equipment are also known as noncontrolled network elements.

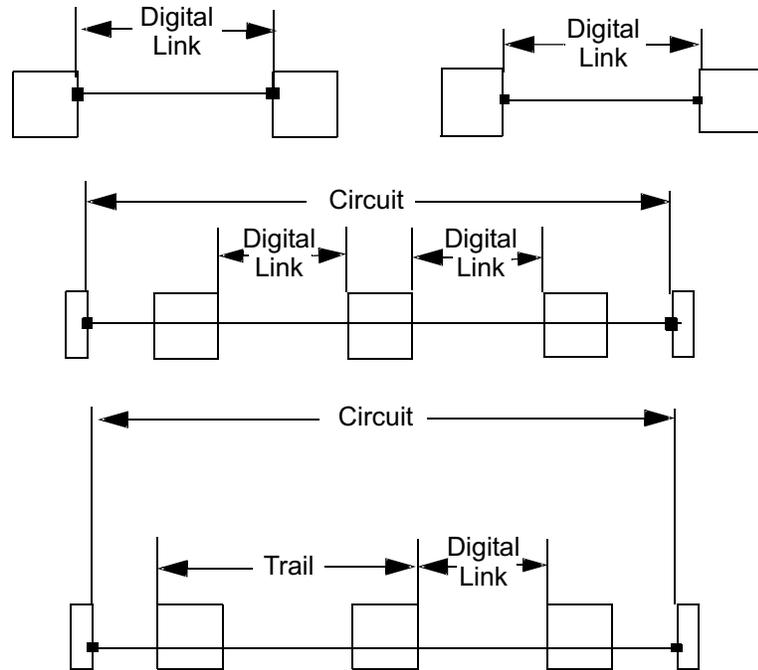
Network A *network* carries a payload from one point to another. This payload can consist of data, voice, video, or images. Digital links and trails carry the circuits that carry the data.

Network element A *network element* is a functional unit in a customer's network that displays on the Network Map and is controlled by the user. Network elements supply switching, transmission, or multiplexing functionality in a network and are either controlled or noncontrolled.

- PDH** *Plesiochronous Digital Hierarchy* is a transmission hierarchy that involves multiple digital synchronous circuits running at different clock rates.
- Preplan Restoration** *Preplan Restoration* allows for a back-up facility to be predefined for an existing in service facility. WaveStar NMS stores the preplan circuit in a database and accesses it when a failure occurs so as to restore the facility.
- Rings** *Rings* are formed when the digital links connect all participating network elements to form a closed loop, and the network elements have ring forming capabilities.
- SDH** *Synchronous Digital Hierarchy* is a transmission hierarchy designed to transport multiple digital signals with different capacities.
- Tandem connection** A *tandem connection* is the sublayer between the multiplex section layer and the path layer that allows users to monitor the quality of the signal transport within its managed domain. A tandem connection also provides users with information about the total quality of a signal before the signal travels from the user's managed network to a network managed by a different user. Users can create tandem connections on paths that do not terminate in its managed network but traverse its network from other user managed networks.
- Trails** A *trail* is a logical connection between two adjacent, or nonadjacent network element. It may traverse one or more channels and supports add/drop capability along the path.
- Trails simplify provisioning by allowing users to establish routes through digital links and network elements so that circuits can be assigned to the path. This capability allows users to assign a circuit to a path at the path's A and Z ends without spelling out a list of digital links and cross-connections that make up the trail. Two or more trails may be connected as part of a circuit.
- Trails ride on one or more digital links and also contain their own payload and overhead sections.

The following figure shows an example of the relationship between digital links, trails, and circuits.

Figure 1-3 Relationship between digital links, trails and circuits



□

Provisioning process description

Overview The following is an overview of the WaveStar NMS provisioning process as it relates to the order in which actions should occur.

Recommended order The order in which provisioning tasks should occur is as follows:

1. Add a network element.
2. Create aggregates and subnets (if needed).
3. Create an optical layer.
4. Provision digital links between the network elements (create subnets if needed).
5. Provision trails and circuits.
6. Create preplans, if needed.





2 Network Element Configuration Tasks

Overview

Purpose This chapter contains tasks used to create, modify, and delete controlled and noncontrolled network elements.

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Section I: Controlled Network Elements

Overview

Purpose This section discusses the provisioning tasks associated with adding and deleting controlled network elements.

Important Note that WaveStar SNMS-controlled network elements are not added to WaveStar NMS; they are automatically discovered by WaveStar NMS.

Contents

Add an ITM-SC-controlled network element	2-4
Add an ITM-XM controlled network element	2-6
Delete an ITM-SC, ITM-XM, or WaveStar SNMS-controlled network element	2-8



Add an ITM-SC-controlled network element

Purpose Use this procedure to add an ITM-SC controlled network element to the Network Map. This procedure is not intended for WaveStar DACS or DACS VI network elements.

Important! Note that WaveStar SNMS-controlled network elements are not added to WaveStar NMS; they are automatically discovered by WaveStar NMS.

Before you begin Before you add a network element, consider the following items:

- The number of allowable network elements on a Network Map varies with the WaveStar NMS configuration. When the limit is reached, an error message will appear to inform the user the network element could not be added because it exceeded the number allowed.
- When a network element is first added to WaveStar NMS, its corresponding icon is always displayed as green, regardless of whether equipment or environment alarms exist. Therefore, you should perform a manual database synchronization in order to display the network element's true state.
- Users must use the correct network element identification number format. The identification number consists of up to 20 alphanumeric characters, including the /, - and _ characters. No leading delimiters are allowed. The system does not, however, support the following characters: space (), quote ("), percent (%), star (*), dot (.), backslash (\), and pipe (|). Currently, only upper case alphabetical characters are supported.
- Not all controlled network elements (e.g., ADM 16/1, TM1, AM1, AM1Plus) can implement a one-way cross-connection.

Task Perform the following task to add an ITM-SC controlled network element to the Network Map.

- 1 From the Network Map, select **Configuration > Network Element > Add > (Select an NE Type from the list except for WaveStar DACS or DACS VI)**.

Result:

The NE window appears.

-
- 2** In the **EMS ID** field, select an EMS ID from the list.

-
- 3** Click **OK**.

Result:

The Connection dialog box appears. If the connection occurs, the **Create MIB Image from NE** window appears.

-
- 4** Specify the Network Element Name, NSAP Format, Area ID (optional), Network Element SID, and Connection Type.

-
- 5** Click **Apply**.

Result:

The network element appears on the Network Map and a success message appears within the window's Message panel.

END OF STEPS



Add an ITM-XM controlled network element

Purpose Use this procedure to add an ITM-XM controlled network element to the Network Map. This procedure applies to both WaveStar DACS and DACS VI.

Before you begin Before you add an ITM-XM controlled network element, refer to the items listed in the preceding task *Add an ITM-SC controlled network element*.

Task Complete the following task to add an ITM-XM controlled network element.

- 1 On the Network Map, select **Configuration > Network Element > Add > (select either WaveStar DACS or DACSVI)**.

Result:

The Frame/Controller Profile form is displayed. The **Main** tab is highlighted, and the **Model** field contains the selected network element.

- 2 In the **NE ID** field, enter the network element identification.
-

- 3 (Optional) In the **Acronym** field, enter the acronym.
-

- 4 Click the **Parameters** tab.
-

- 5 In the **User ID** field, enter the user ID.
-

- 6 In the **Password** field, enter the password.
-

- 7 In the **TCP/IP Address1** field, enter the TCP/IP address. In the case of DACS VI, the NTN 1 and NTN 2 (Network Telephone Numbers) have to be populated.

8 Click **OK**.

Result:

You are returned to the Frame/Controller Profile form.

9 Click **OK**.

Result:

The system adds a WaveStar DACS (or DACS VI) network
element.

END OF STEPS



Delete an ITM-SC, ITM-XM, or WaveStar SNMS-controlled network element

Purpose Use this procedure to delete an ITM-SC, ITM-XM or WaveStar SNMS-controlled network element from the Network Map.

Important! A network element may only be deleted if it is not assigned with any digital link or circuit/trail (pending or in-effect). If you delete a network element linked to another network element, the network element is put in a “pending delete” state and not deleted from the system database or Network Map.

Before you begin Before you delete a controlled network element, consider the following items:

- A network element should only be deleted if there are no in-effect or pending circuits connected to it. If there are links/paths/circuits associated with the network element, the corresponding network element will not be deleted (but will turn gray). Note that users cannot back out of the pending delete state. However, a database synchronization with the EMS can bring the network element back to a normal state so long as the EMS still reports that network element is still managed by it.
- No commands, such as delete cross-connect or port reprovisioning, will be sent to a network element once it is in a pending delete state.

In the case of an inadvertent deletion

If a network element is inadvertently deleted, perform a database synchronization with the corresponding network element to recover it to its original state.

If a network element is completely deleted, a database synchronization cannot be performed on the network element. To recover the network element in this case, perform a network element database synchronization on the corresponding controller (EMS).

Task Complete the following task to delete a controlled network element. Note that this procedure only deletes the network element from the WaveStar NMS database; it leaves any cross-connect information on the network element. If the database has cross-connect information this procedure will fail. If you

want the cross-connect information to remain in the EMS or network element database, you will need to disconnect the cross-connect through a virtual disconnect in WaveStar NMS.

- 1 On the Network Map, right-click the network element to be deleted.

Result:

The Node menu is displayed.

- 2 Select **Node Operation > Delete Node**.

Result:

A confirmation dialog box is displayed.

- 3 Click **Yes**.

Result:

The network element is deleted or put in a “pending delete” state.

END OF STEPS



Section II: Noncontrolled Network Elements

Overview

Purpose This section presents provisioning tasks for adding, modifying and deleting noncontrolled network elements, such as black boxes and equipment.

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Add a black box	2-11
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Add a black box

Purpose Use this procedure to add a black box to the Network Map.

Task Complete the following task to add a black box to the Network Map.

- 1 From the Network Map, select **Configuration > Black Box > Add**.

Result:

The Add Black Box form appears.

- 2 In the **BBOX** field, enter a name for the black box. This name will appear on the Network Map.
-

- 3 In the **Acronym** field, specify an acronym.
-

- 4 (*Optional*) In the **Customer Information** field, enter any relevant information about the black box you wish other users to view.
-

- 5 Click **OK**.

Result:

A confirmation window appears and informs you of either the success or failure of the operation.

- 6 Click **OK**.

Result:

The black box is added to the Network Map.

END OF STEPS



Modify a black box

Purpose Use this procedure to modify a preexisting black box.

Task Perform the following steps to modify a preexisting black box. This task assumes that you have already located a black box that you wish to modify. To locate black boxes, refer to the *Display Black Box List* task.

- 1 From the Network Map, right-click on a black box and select **Service Domain > Display/Modify Ports**.

Result:

The Service Domain Query Form is displayed.

- 2 From the Ports tab, press **Node**.

Result:

A query form appears.

- 3 From this form, specify a new node.
-

- 4 Press **OK**.

Result:

The form disappears, and the Node field alters to reflect the choice.

- 5 Select **Rate** to specify a new rate for the black box.
-

- 6 If applicable, specify a new **Service Domain**.
-

- 7 Press **OK**.

Result:

A form appears.

-
- 8** Using the arrow icons, specify a member port from the **Non-Member** ports list.
-

- 9** Press **OK**.

Result:

A window appears to confirm the modification.

END OF STEPS



Display black box list

Purpose Use this procedure to view all currently existing black boxes known to WaveStar NMS.

Task Perform the following steps to display a complete listing of all existing black boxes.

- 1 From the Network Map, select **Configuration > Black Box > Display List**.

Result:

The Black Box Display List Query window appears.

- 2 Enter * within the **Black Box ID** field.
-

- 3 Press **OK**.

Result:

All the currently existing black boxes appear within the Black Box Display List window.

END OF STEPS



Search for a specific black box

Purpose Use this procedure to search for a specific black box.

Task Perform the following steps to search for a specific black box.

- 1 From the Network Map, select **Configuration > Black Box > Display List**.

Result:

The Black Box Display List Query window appears.

- 2 Enter the black box name within the **Black Box ID** field.
-

- 3 Press **OK**.

Result:

If you entered a valid name, the specified black box will appear within the Black Box Display List window.

END OF STEPS



Delete a black box

Purpose Use the following procedure to delete a black box from the Network Map.

Before you begin Before you delete a black box from the Network Map, consider the following items:

- Similar to deleting a network element, users must delete any digital links or circuits/trails associated with the black box prior to deleting it.

Task Perform the following procedure to delete a black box from the Network Map.

- 1 From the Network Map, right-click on the black box you wish to delete.

Result:

The Node menu appears.

- 2 From the menu, select **Node Operation > Delete Node**.

Result:

A confirmation window appears asking you to confirm the deletion.

- 3 Select **Yes**.

Result:

A confirmation window appears and informs you of either the success or failure of the operation.

- 4 Press **OK**.

Result:

The black box is deleted from the Network Map.

END OF STEPS



Add equipment

Purpose Use this procedure to add equipment to the Network Map.

Task Complete the following task to add equipment to the Network Map.

- 1 From the Network Map, select **Configuration > Equipment > Add**.

Result:

The Add equipment form is displayed. The **Model** field displays **EQPT**.

- 2 In the **Equipment ID** field, enter the network element identification.
-

- 3 In the **Acronym** field, enter the acronym.
-

- 4 In the **Customer Information** field, enter any information you wish other users to view.
-

- 5 Click **OK**.

Result:

A window informs you of the success or failure of the operation, and the newly added equipment can be viewed on the Equipment Display List.

END OF STEPS



Modify equipment

Purpose Use this procedure to modify existing equipment.

Task Perform the following steps to modify existing equipment.

- 1 From the Network Map, select **Configuration > Equipment > Display List**.

Result:

The Equipment Display List Query Box appears.

- 2 In the **Equipment ID** field, enter an equipment ID (or enter * to list all equipment).
-

- 3 Press **OK**.

Result:

The Equipment Display List window appears.

- 4 From the list, select the equipment you wish to modify.

Result:

The equipment becomes highlighted, and the **Actions** menu item becomes enabled.

- 5 Select **Actions > NE Port Assignments**.

Result:

The NE Port Assignments Query Box form appears.

- 6 From this form, make your modifications and then press **Apply**.

Result:

The equipment is modified.

END OF STEPS



Display equipment list

Purpose Use this task to display a listing of existing equipment.

Task Perform the following steps to display a listing of existing equipment.

- 1 From the Network Map, select **Configuration > Equipment > Display List**.

Result:

The Equipment Display List Query Box form displays.

- 2 In the Equipment ID field, enter the ID of the equipment you wish to display (or enter * to list all existing equipment).
-

- 3 Click **OK**.

Result:

The Equipment Display List appears and displays all the equipment in the network with the specified ID.

END OF STEPS



Delete equipment

Purpose Use this procedure to delete equipment from the Network Map.

Task Complete the following task to delete equipment from the Network Map.

1 Displays the equipment list (see last task).

2 Select an entry.

3 Select **Actions > Delete Node**.

Result:

The equipment is deleted from the Network Map.

END OF STEPS



Display ODO List

Purpose The following procedure allows users to display the out-of-domain objects (ODOs) existing for WaveStar NMS and WaveStar TMS.

Task Perform the following steps to display a list of ODOs.

- 1 From the Network Map, select **Configuration > ODO Display List**.

Result:

The ODO Display List Query Box form appears.

- 2 Enter * within the **ODO ID** field to get a complete listing of all ODOs. To locate a specific object, enter its name within this field.
-

- 3 Press **OK**.

Result:

The specified ODOs appear within the ODO Display List form.

END OF STEPS





3 Provisioning Tasks

Overview

Purpose This chapter presents provisioning tasks usable with WaveStar NMS.

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Section I: Digital Links

Overview

Purpose Digital Links are transport facilities that are assignable to high order and low order digital links to carry customer services. In WaveStar NMS, digital links are always modelled as bi-directional links that carry two way traffic. Digital Links are of two types - SDH/SONET and PDH.

SDH digital links are synonymous with multiplexer sections, in SDH standard terminology, that connect two SDH network elements or black boxes/equipment. In WaveStar NMS, the regenerator sections within the multiplexer section layer are not explicitly provisioned; however the WaveStar NMS will be able to add regenerators to the digital links and monitor alarms at regenerator sections. The similar rules/applications using SONET terminology/NEs applied to SONET digital links.

PDH digital links are physical links that connect two PDH ports of SDH network elements or black boxes/equipment. Except for LAN8 (a.k.a. TransLAN) (SDH), VACTDL (a.k.a. TransLAN+) (SDH) and GigaLanDL (SDH/SONET), all digital links are channelized in WaveStar NMS in order to be able to be assigned to carry SDH trails or PDH circuits. The digital links can be unprotected or protected. When protected by another link, it is called Multiplex Section Protection (MSP). The MSP protection can be of two types - 1+1 or 1x1. When MSP is 1+1, the protection link is totally dedicated to the working (service) link and cannot carry preemptible extra traffic. When MSP is 1x1, the protection link serves as a protection to the working (service) link but can be configured to carry extra traffic that is preemptible when the traffic in the working link gets switched.

This section discusses provisioning tasks associated with digital links.

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Add a digital link between two controlled network elements

Purpose Use this procedure to add a digital link between two controlled (ITM-SC or ITM-XM) network elements.

Task Complete the following task to add a digital link between two controlled network elements on the Network Map. This task assumes that two controlled network elements are already provisioned.

- 1 From the Network Map, select two controlled (either ITM-SC or ITM-XM) network elements.

Result:

The selected network elements are highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.

Add a digital link between two controlled network elements

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

- 8 On the Network Map, select **Configuration > Digital Link > Add > (Select a digital link type from the list)**.

Result:

The Network Map becomes the Provisioning Profile form.

- 9 Under the **Essentials** tab, enter a circuit ID.
-

- 10 Press the **A port** button.

Result:

A window appears.

- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 13 Verify that **Auto** is checked for **Path Selection**.
-

- 14 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.
-

Add a digital link between two controlled network elements

15 Press **OK**.

Result:

The graphical layout form appears.

16 Press **OK**.

Result:

A confirmation window appears.

17 Confirm all confirmation windows that appear.

18 From the Network Map, select **File > Query Again**.

Result:

The new digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS



Add a digital link between a controlled network element and a noncontrolled network element

Purpose Use this procedure to add a digital link between a controlled network element and a noncontrolled network element.

Task Complete the following task to add a digital link between a controlled network element and a noncontrolled network element.

- 1 From the Network Map, select a controlled network element (either ITM-SC or ITM-XM) and a noncontrolled network element (such a black box or equipment).

Result:

The selected network elements are highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.

Add a digital link between a controlled network element and a noncontrolled network element

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 On the Network Map, select **Configuration > Digital Link > Add > (Select a digital link type from the list)**.

Result:

The Network Map becomes the Provisioning Profile form.

-
- 9 Under the **Essentials** tab, enter a circuit ID.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

-
- 13 Verify that **Auto** is checked for **Path Selection**.

-
- 14 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.

Add a digital link between a controlled network element and a noncontrolled network element

15 Press **OK**.

Result:

The graphical layout form appears.

16 Press **OK**.

Result:

A confirmation window appears.

17 Confirm all confirmation windows that appear.

18 From the Network Map, select **File > Query Again**.

Result:

The new digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS



Provision a 1+1 MSP digital link

Purpose Use this task to provision a 1+1 multiplex section protected (MSP) digital link.

Task Complete the following procedure to provision a 1+1 MSP digital link.

- 1 From the Network Map, select two network elements that allow for 1+1 protection.

Result:

The selected network elements are highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-

- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).
-

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 On the Network Map, select **Configuration > Digital Link > Add > (Select a digital link type from the list)**.

Result:

The Network Map becomes the Provisioning Profile form.

-
- 9 Under the **Essentials** tab, enter a circuit ID.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

-
- 13 Verify that **Auto** is checked for **Path Selection**.

-
- 14 In the **MSP Protected?** field, select **1+1**. Note: this field will only allow a selection if the network elements specified earlier in this procedure allow for 1+1 protection.

-
- 15 Under the **Parameters** tab, verify that **Order Action** is set to **Add**.

16 Press **OK**.

Result:

The graphical layout form appears.

17 Press **OK**.

Result:

A confirmation window appears.

18 Confirm all confirmation windows that appear.

19 From the Network Map, select **File > Query Again**.

Result:

The new 1+1 digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS



Provision a 1x1 MSP digital link

Purpose Use this task to provision a 1x1 MSP digital link.

1x1 MSP occurs when a single protection link protects a single service digital link. With a 1x1 MSP digital link, the protection link can carry extra traffic that will be preempted whenever the MSP switching takes place. As a result, both the service and protection links of a 1x1 MSP have separate digital link identifications.

Before you begin Before you provision a 1x1 MSP-protected digital link, consider the following items:

- 1x1 MSP provides a dedicated protection to a digital link that remains idle until it is needed. When not used to carry traffic from the working digital link, the line can carry extra, unprotected traffic which can be pre-empted if a switching fault occurs in the working digital link.
- 1x1 MSP is primarily used as a span protection in a 4-fiber MS-SPRING. Users must first create a protection digital link before any service digital links are created and associated to it.
- The only allowed value for the MSP Switch Type is BI (bidirectional switching). All other values are disabled.
- Each of the two digital links (service and protection) for a 1x1 MSP must be created or deleted with two separate provisioning orders having separate implementations.
- Prior to provisioning, the system will validate that both the service and protection links terminate on the same network element at their A and Z ends. The system will also check the uniqueness of the MS Protection Group Name.
- Separate channel termination and assignment records for the service and protection digital links are created when each service and protection link are provisioned. This allows you or the system to provision unprotected pre-emptable extra traffic on the protection digital link.
- You cannot rearrange a 1x1 MSP-protected digital link. You can only delete and add a new digital link with a new layout.
- A protection link cannot be associated to more than one service link.

- You may specify a switching operation to preempt extra traffic carried on a protection link. Note, however, that WaveStar NMS does not determine if a protection link is carrying extra traffic. Thus, users must manually check for extra traffic.
- Separate channel termination and assignment records for service and protection digital links will be created when each service and protection link are provisioned. This allows the system or user to provision unprotected preemptible extra traffic on the protection digital link.

Task Perform the following procedure to provision a 1x1 MSP-protected digital link.

- 1 From the Network Map, select two network elements that allow for 1x1 protection (WaveStar bandwidth manager or black boxes) .

Result:

The selected network elements are highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 On the Network Map, select **Configuration > Digital Link > Add > (Select a digital link type from the list)**.

Result:

The Network Map becomes the Provisioning Profile form.

-
- 9 Under the **Essentials** tab, enter a circuit ID.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

-
- 13 Verify that **Auto** is checked for **Path Selection**.

-
- 14** In the **MSP Protected?** field, select **1x1**. Note: this field will only allow a selection if the network elements specified earlier in this procedure allow for 1x1 protection.
-

- 15** For **Role**, choose a value depending on what the link type should be. There are two choices — **Service** and **Protection**. Note: a protection link should always be created before any service links.

Result:

MS Protection Group Name field gets enabled.

.....

- 16** Enter a name for the MS protection group. Note: for a service link, the MS protection group name must already exist with the provisioning of the protection link.
-

- 17** Under the **Parameters** tab, verify that **Order Action** is set to **Add**.
-

- 18** Press **OK**.

Result:

The graphical layout form appears.

.....

- 19** Press **OK**.

Result:

A confirmation window appears.

.....

- 20** Confirm all confirmation windows that appear.
-

- 21** From the Network Map, select **File > Query Again**.

Result:

The new 1x1 digital link, linking the specified network elements, appears on the Network Map.

END OF STEPS

.....



Display protection group names associated with digital links

Purpose Use this task to display a list of protection group names associated with MSP digital links.

In addition to the procedure described below, MSP group names are also displayed in the Graphical Layout, Modify Parameters, and Order Parameters forms. This procedure allows you to view a complete listing of protection group names.

Task Use this task to display a list of protection group names associated MSP digital links.

- 1 From the Network Map, select **Configuration > Connection > Display > MS Protection Group Names**.

Result:

The Protection Group Names list is displayed.

END OF STEPS



Add a regenerator to a digital link

Purpose Use this task to add a regenerator to a digital link.

Task Complete the following task to add a regenerator to a digital link.

1 From the Network Map, select a digital link.

2 Right click on the digital link.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the digital link you wish to add the regenerator to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Regenerator Selection form appears.

7 Select a regenerator from the **Non-Members** sub-window.

Result:

The **Add** and **Remove** buttons become enabled.

- 8** Press **Add**.

Result:

The regenerator is moved to the **Service** window.

- 9** Specify the regenerator's left/right ports and the service protection.
-

- 10** Press **OK**.

Result:

A confirmation window appears.

- 11** Press **OK**.
-

- 12** From the Network Map, select **File > Query Again**.

Result:

A regenerator is added to the digital link.

END OF STEPS



Delete a regenerator from a digital link

Purpose Use this task to delete a regenerator from a digital link.

Task Perform the following steps to delete a regenerator from a digital link.

1 From the Network Map, select a digital link.

2 Right click on the digital link.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the digital link you wish to add the regenerator to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Regenerator Selection form appears.

7 Select a regenerator from the **Service** window.

Result:

The **Add** and **Remove** buttons become enabled.

- 8** Press **Remove**.

Result:

The regenerator is moved to the **Non-Members** window.

- 9** Press **OK**.

Result:

A confirmation window appears.

- 10** Press **OK**.
-

- 11** From the Network Map, select **File > Query Again**.

Result:

The regenerator is deleted from the digital link.

END OF STEPS



Modify a digital link

Purpose Use this procedure to modify the features of an existing digital link.

Task Perform the following procedure to modify the features of an existing digital link.

1 From the Network Map, select a digital link by clicking on it.

2 Right-click on the digital link.

Result:

A menu appears.

3 Select **Service Domain > Display/Modify Trails/Channels**.

Result:

The Service Domain Query form appears.

4 Use the **Trails** tab to modify the digital link's trail information; use the **Channels** tab to modify the digital link's channel information.

5 After making your modifications, click **OK**.

Result:

The Service Domain Display/Modify Channels form appears.

6 Specify member channels using the arrow icons. The arrow icons become enabled once you select a trail from the list.

7 After making modifications, click **Apply**.

Result:

The modifications made to the digital link go into effect.

END OF STEPS



Disconnect a digital link

Purpose Use this procedure to disconnect a digital link. The below listed caveats apply to this procedure depending upon the type of digital link you wish to disconnect.

Before you begin Before disconnecting a digital link, note the following:

- Users are not required to stop already running performance monitoring data collection prior to disconnecting the digital link.
- Deletion of a digital link is permitted only if there are no in-effect and/or pending circuits or paths riding on it.
- Any circuits or lower-order paths riding on a higher order path, must be disconnected before there is any attempt at disconnecting a digital link.
- Any preplan paths riding on a soon to be disconnected circuit must be disassociated from the service path they are protecting before there is any attempt to disconnect them.
- When deleting 1x1 digital links, the working service link must be deleted before the protection link.

Task Complete the following task to disconnect a digital link from a facility or circuit. Be sure to read the *Before You Begin* information for important considerations to make before attempting to disconnect a digital link.

1 From the Network Map, select a digital link.

2 From the Network Map, select **Configuration > Digital Link > Disconnect**.

Result:

The Ckt/Trail Query Box is displayed.

3 In the **Order Number** field, enter the order number of the digital link to be disconnected.

4 Click **OK**.

Result:

A confirmation window appears.

- 5** Click **Yes**.

Result:

An action window appears.

- 6** Click **OK**.

Result:

The system disconnects the digital link if all validations are successful.

- 7** From the Network Map, select **File > Query Again**.

Result:

The digital link, linking the specified network elements, disappears from the Network Map.

END OF STEPS



Section II: Connections

Overview

Purpose A circuit/trail is a concatenation of link connections and sub-network connections (cross-connects in WaveStar NMS terminology) to provide an end-to-end service to a customer. A circuit/trail is identified by a rate at which the service is provided. The “rate” of a circuit/trail is defined by the ITU and ETSI standards for SDH and PDH circuit/trails and by ITU and ANSI standards for SONET and Asynchronous circuit/trails. An SDH/SONET trail is provisioned over the SDH/SONET link connections and over SDH/SONET cross-connects in WaveStar NMS managed network elements. It is possible that the link connections (SDH/SONET) may go through an optical layer. In general, a PDH/Asynchronous circuit is provisioned on SDH/SONET trails. With the “One-Step (Combo) Provisioning” feature in WaveStar NMS, it is possible to provision both SDH trails and PDH circuits or SONET/trails and Asynchronous circuits in a single provisioning step.

A circuit is a PDH/Asynchronous terminology that provides a service to a customer at a specified rate.

A trail is a SDH/SONET terminology that is often referred as a path. A trail can be assignable or non-assignable depending on the terminating port or based on the sub-structuring of the port to carry lower order traffic. In WaveStar NMS, if one or both end ports of a trail are PDH/Asynchronous, or if one or both end ports are sub-structured to carry lower order traffic, the trail is called an “assignable” entity. If both end ports are SDH/SONET and not sub-structured to carry low order traffic, then the trail is called as an “non-assignable” entity. Certain trails, such as VC4-4c, VC4-16c and VC2, are always non-assignable. WaveStar NMS creates channels for assignable trails in order to carry the low order trails or PDH/asynchronous circuits.

WaveStar NMS allows users to provision a circuit/trail in one of the three modes - auto, manual or partial.

- In auto mode, WaveStar NMS finds a route from the user specified end ports for the trail and presents it to the user for approval, if requested.
- In manual mode, the user can select the link and channel along a path, and WaveStar NMS shall build the layout based on the user selection(s).
- In partial mode, the user can pick all the links along the path of the circuit/trail. The channels within the link are picked by WaveStar NMS.

This section discusses provisioning tasks associated with connections.

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Add a circuit between two controlled network elements

Purpose Use this procedure to add a circuit between two controlled network elements.

Before you begin Before adding a circuit between two controlled network elements, note the following items:

- WaveStar NMS does not support the provisioning of an unprotected broadcast circuit on an ADM4/1 STM4 network element.
- Not all controlled network elements (e.g., ADM 16/1, TM1, AM1, AM1Plus) can implement a one-way cross-connection.

Task Complete the following task to add a circuit between two controlled network elements.

- 1 On the Network Map, select two network element icons.

Result:

The icons become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

Add a circuit between two controlled network elements

-
- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 On the Network Map, select **Configuration > Connection > Add > (Desired Circuit Rate)**.

Result:

The Provision Profile form is displayed.

-
- 9 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

Add a circuit between two controlled network elements

.....
13 Verify that **Auto** is checked for **Path Selection**.

.....
14 Under the Parameters tab, verify that **Order Action** is set at **Add**.

.....
15 Press **OK**.

Result:

The graphical layout form appears.

.....
16 Press **OK**.

Result:

A confirmation window appears.

.....
17 Press **OK**.

Result:

The circuit is created.

END OF STEPS



Add a circuit between two noncontrolled network elements

Purpose Use this procedure to add a circuit between two noncontrolled network elements.

Before you begin Before you add a circuit between two noncontrolled network elements, note the following items:

- A circuit cannot be created directly between two noncontrolled network elements without at least one intermediate controlled network element.
- Digital links must already be provisioned from the network element to each of the two equipment.

Task Complete the following task to add a circuit between two noncontrolled network elements.

- 1 On the Network Map, select two noncontrolled network element icons that already have a digital link joining them and have at least one intermediate controlled network element.

Result:

The icons become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.
-

Add a circuit between two noncontrolled network elements

Result:

The network element's ports are synchronized.

- 6** Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-

- 7** Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

- 8** On the Network Map, select **Configuration > Connection > Add > (Desired Circuit Rate)**.

Result:

The Provision Profile form is displayed.

- 9** Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-

- 10** Press the **A port** button.

Result:

A window appears.

- 11** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 12** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).
-

Add a circuit between two noncontrolled network elements

Result:

The selected port appears within the Essentials tab as the **Z port**.

13 Verify that **Auto** is checked for **Path Selection**.

14 Under the Parameters tab, verify that **Order Action** is set at **Add**.

15 Press **OK**.

Result:

The graphical layout form appears.

16 Press **OK**.

Result:

A confirmation window appears.

17 Press **OK**.

Result:

The circuit is created.

END OF STEPS



Add a circuit between a controlled network element and a noncontrolled network element

Purpose Use this procedure to add a circuit between a controlled network element and a noncontrolled network element.

Before you begin Before you add a circuit between a controlled network element and a noncontrolled equipment, note the following items:

- A digital link between the noncontrolled equipment and the network element must exist.
- Provisioning of broadcast circuits through WaveStar DACS is supported on all rates (TU3/TU12/AU3/AU4).
- The equipment list menu item is only highlighted on the node menu for those network elements connected to originating or terminating equipment.

Task Perform the following steps to add a circuit between a controlled network element and a noncontrolled network element.

- 1 On the Network Map, select one noncontrolled network element icon and one controlled network element icon that already have a digital link joining them.

Result:

The icons become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

Add a circuit between a controlled network element and a noncontrolled network element

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-

- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

- 8 On the Network Map, select **Configuration > Connection > Add > (Desired Circuit Rate)**.

Result:

The Provision Profile form is displayed.

- 9 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.
-

- 10 Press the **A port** button.

Result:

A window appears.

- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

Add a circuit between a controlled network element and a noncontrolled network element

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

.....

- 13 Verify that **Auto** is checked for **Path Selection**.
-

- 14 Under the Parameters tab, verify that **Order Action** is set at **Add**.
-

- 15 Press **OK**.

Result:

The graphical layout form appears.

.....

- 16 Press **OK**.

Result:

A confirmation window appears.

.....

- 17 Press **OK**.

Result:

The circuit is created.

END OF STEPS

.....



Provision an AU3-AU4 trail using the WaveStar BandWidth Manager's adaptation feature

Purpose Use this procedure to provision a trail using the WaveStar BandWidth Manager's AU3-AU4 adaptation feature.

The AU3-AU4 adaptation feature maps a higher order VC3 payload (AU3) at the interface of a STM1E port to a lower order VC3 payload (TUG structured), which is multiplexed into a VC4 (AU4). A STM1E port can be provisioned to carry one AU4/VC4 or three AU3 (higher order VC3) signals, in which case the AU3-AU4 adaptation is not enabled, or it can be provisioned to enable the adaptation. If the adaptation is enabled, the STM1E signal at the (external) interface will represent 3 AU3 signals, and a single AU4 (VC4) signal structured to contain 3 TU3/VC3 signals will leave the port unit (internally in the BandWidth Manager) to interface with the switching structure of the BandWidth Manager. Although the AU3-AU4 adaptation can be enabled in one direction (ingress or egress), only bidirectional TU3-AU3 type trails are supported.

In the most common application of the feature, a DS3 is mapped into a lower order VC3 at one end of the trail (e.g. in Europe), which in turn is multiplexed into a VC4. The DS3 is extracted from a higher order VC3/AU3 (STS1) at the other end of the trail (e.g. in N. America). If the DS3 within the AU3 needs to be dropped at the same BandWidth Manager, or the AU3 needs to be multiplexed into a higher level optical signal (OC3 or higher) to be transported farther, an external loop-back can be employed at the BandWidth Manager.

The adaptation feature is supported as a provisionable option on STM1E ports only, on the BandWidth Manager's STM1E universal shelf. An STM-1 signal can be looped back at a BandWidth Manager, and the AU3 signals from the STM1E port can be dropped at DS3 ports or consolidated over higher level facilities after being cross-connected through the same BandWidth Manager as AU3 signals. Note that a loop-back is external to BandWidth Manager. It should be configured in advance as a digital link and inventoried in WaveStar NMS.

Provision an AU3-AU4 trail using the WaveStar BandWidth Manager's adaptation feature

Before you begin Before provisioning a trail using the WaveStar BandWidth Manager's AU3-AU4 adaptation feature, note the following items:

- WaveStar NMS only supports bi-directional TU3-AU3 trails.
- WaveStar NMS only supports the manual provisioning of TU3-AU3 trails.
- WaveStar NMS supports merge and protection features for TU3-AU3 trails.
- WaveStar NMS does not support preplan restoration for TU3-AU3 trails.

Task Complete the following task to provision a trail using the WaveStar BandWidth Manager's AU3-AU4 adaptation feature. This task assumes that you have already provisioned a VC4 trail that terminates on a WaveStar BandWidth Manager.

- 1 On the Network Map, select a pair of WaveStar BandWidth Manager icons.

Result:

The icons become highlighted.

- 2 Right click on the icon.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

Provision an AU3-AU4 trail using the WaveStar BandWidth Manager's adaptation feature

-
- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 On the Network Map, select **Configuration > Connection > Add > (select a VC4 rate)**.

Result:

The Provision Profile form is displayed.

-
- 9 Under the **Essentials** tab, enter a circuit ID next to where the connection type is listed.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

Provision an AU3-AU4 trail using the WaveStar BandWidth Manager's adaptation feature

.....
13 Verify that **Auto** is checked for **Path Selection**.

.....
14 Under the Parameters tab, verify that **Order Action** is set at **Add**.

.....
15 For the **Enable AU4-AU3** option, select **Yes**.

.....
16 Press **OK**.

Result:

The graphical layout form appears.

.....
17 Press **OK**.

Result:

A confirmation window appears.

.....
18 Press **OK**.

Result:

The AU3-AU4 trail is created.

.....
E N D O F S T E P S



Display circuit list

Purpose Use this procedure to display a list of existing circuits.

Task Perform the following procedure to display a complete listing of existing circuits.

- 1 From the Network Map, select **Configuration > Display > Circuit/Trail List**.

Result:

The Circuit/Trail List Query Box form appears.

- 2 Place a check in the **Free Form** box.

Result:

The Free Form field alters.

- 3 Within the **Free Form** field, enter *.
-

- 4 From the field's pull-down menu, select **All**.

Result:

The OK button will become active.

- 5 Click **OK**.

Result:

The Circuit/Trail List form appears listing all existing circuits.

END OF STEPS



Display circuit list by type

Purpose Use this procedure to display a list of particular circuit types.

Task Perform the following procedure to display a list of particular circuit types.

- 1 From the Network Map, select **Configuration > Display > Circuit/Trail List**.

Result:

The Circuit/Trail List Query Box form appears.

- 2 Place a check in the **Free Form** box.

Result:

The Free Form field alters.

- 3 Within the **Free Form** field, enter *.
-

- 4 From the field's drop-down menu, specify a transmission rate.

Result:

The **OK** button becomes active.

- 5 For **Status**, specify an order status. Your query will show all the circuits that abide by this criteria. For example, if you select **Pending**, only pending circuits will be polled for.
-

- 6 For **Order Action**, select an order action if desired.
-

- 7 Press the **More** button if you wish to apply additional search criteria.

Result:

If pressed, the form lengthens to provide additional selections.

8 Click **OK**.

Result:

The Circuit/Trail List form appears and lists all existing circuits that fit the search criteria.

END OF STEPS



Copy a connection using the Clone feature

Purpose Use this task to use the Clone feature to copy an existing circuit.

Task Perform the following steps to copy a circuit using the Clone feature.

- 1 From the Network Map, select **Configuration > Connection > Clone**.

Result:

A query box form appears.

- 2 Enter a circuit identification so as to filter through all the currently existing circuits.
-

- 3 Press **OK**.

Result:

The Circuit/Trail List form appears.

- 4 Select a circuit to clone.

Result:

A provisioning screen appears pre-populated.

- 5 From the Essentials tab, change the **ID** field to name the clone of the circuit.
-

- 6 Change the port addresses for the circuit clone.
-

- 7 Click **OK**.

Result:

The circuit is cloned.

END OF STEPS



View a work order record document

Purpose Use the following procedure to view a work order record document (WORD). The WORD feature describes a customer service order or a network infrastructure/engineering order and includes the end-to-end design of the circuit associated with that order. The primary use of the WORD feature is for circuit installation, testing and fault tracing by technicians in the field.

Before you begin Before you view a work order record document, consider the following items:

- The WORD feature must be turned on by an administrator. Administrators may turn on/off the WORD feature using the license tool. Refer to the *WaveStar NMS 4.0 Administration Guide* for details.
- Prior to using the WORD feature, an administrator must set the IP address of the DNA server.
- The user's system must have a web browser installed in order to view the WORD.

Task Use the following procedure to view a work order record document (WORD).

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query box form appears.

- 2 Within the **CKT/Trail ID** field, enter a valid circuit/trail identification.
-

- 3 Select a valid **Order Status** and **Order Action**.

Result:

The OK button becomes active.

- 4 Press **OK**.
-

Result:

The Circuit/Trail List form appears.

- 5** With the circuit selected, go to **Actions > Enable WORD Display**.

Result:

The system will launch the resident web browser (in most cases, Microsoft Internet Explorer).

- 6** In the web page's entry field, enter a valid IP address.

Result:

The WORD for the entered IP address will appear.

END OF STEPS



Modify circuit order transmission parameters

Purpose Use this procedure to modify circuit order transmission parameters.

Important! Modifying transmissions can only be done for in-effect circuits only.

Task Complete the following task to modify a circuit's order transmission parameters.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Transmission Parameters**.

Result:

The Transmission Parameters form appears.

-
- 7** Make the modifications to the circuit's order parameters.
-

- 8** Select **OK**.

Result:

The circuit's new transmission parameters are saved.

END OF STEPS



Disconnect a circuit

Purpose Use this procedure to disconnect a circuit.

When attempting to disconnect a circuit, note that a backbone circuit cannot be disconnected unless all its tributaries, or other backbones it is feeding, are disconnected first. Users may disconnect backbones and tributaries in the same manner as with any other circuit except for the first circuit that terminates at a customer's location containing the backbone.

Keep the following items in mind:

- You must disconnect all circuits fed by the backbone circuit.
- You may not disconnect the first circuit in WaveStar NMS.
- You must disconnect the circuit that contains the backbone and add a new circuit. This circuit will contain the new backbone.
- You may then add remaining circuits you wish to maintain.

Before you begin Before you disconnect a circuit, consider the following items:

- You are not required to stop data collection prior to disconnecting a circuit.
- Preplan paths, riding on a circuit to be disconnected, must be first disassociated from the service path they are protecting before there is any attempt at canceling them.
- If the circuit to be deleted is part of a broadcast circuit, the circuit that was added last *must* be disconnected first.

Task Complete the following task to disconnect a circuit.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

- 4** Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

- 5** Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

- 6** Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

- 7** Select **Yes**.

Result:

The circuit is disconnected.

END OF STEPS



Perform a virtual disconnect

Purpose Use this procedure to perform a virtual disconnect on a circuit.

Task Complete the following task to perform a virtual disconnect on a circuit.

1 From the Network Map, select a circuit.

2 Right click on the circuit.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the circuit you wish to disconnect.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Virtual (DB only)**.

Result:

A confirmation window appears.

7 Select **Yes**.

Result:

A virtual disconnect is performed on the circuit.

END OF STEPS



Section III: Optical Layers

Overview

Purpose An optical layer refers to an existing optical multiplex section (OMS), optical link or optical channel trail that connects particular types of network elements on the Network Map. For example, an optical link can connect a SDH network element with a DWDM network element, a DWDM network element with a Lambda Router, two Lambda Routers together, or a Lambda Router with an SDH network element. Unlike an optical multiplex section (OMS), however, an optical link can not join two DWDM network elements.

This section discusses the provisioning tasks associated with optical layers.

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Create an optical multiplex section

Purpose Use this procedure to create an optical multiplex section (OMS). An OMS is used to connect two DWDM network elements.

Before you begin Before you create an OMS, note the following:

- The OMS between two OLS80G DWDMs can be unprotected or 1+1 protected.
- The optical amplifier list contains only the amplifiers that support the OMS section with the appropriate number of channels (16 or 40/80). It is assumed that the optical amplifiers are all bi-directional.

Task Use the following procedure to create an OMS. This procedure assumes that the appropriate network elements have already been provisioned.

- 1 From the Network Map, select two DWDM network element icons.

Result:

The two selected network elements become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.
-

Result:

The network element's ports are synchronized.

- 6** Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-

- 7** Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

- 8** From the Network Map, select **Configuration > Optical Layer > Add > OMS**.

Result:

The Network Map becomes the Provisioning Profile form.

- 9** Under the **Essentials** tab, enter a circuit ID next to where **OMS** is listed.
-

- 10** Press the **A port** button.

Result:

A window appears.

- 11** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 12** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).
-

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 13** Verify that **Auto** is checked for **Path Selection**.
-

- 14** Press **OK**.

Result:

The graphical layout form appears.

- 15** Press **OK**.

Result:

A confirmation window appears.

- 16** Confirm all confirmation windows that appear.

Result:

The newly created OMS appears on the Network Map.

END OF STEPS



Create an optical multiplex section with 1+1 protection

Purpose Use this procedure to create an optical multiplex section (OMS) with 1+1 protection.

Before you begin Before you create an OMS with 1+1 protection, note the following:

- The OMS must be between two OLS80G DWDMs.
- The optical amplifier list contains only the amplifiers that support the OMS section with the appropriate number of channels (16 or 40/80). It is assumed that the optical amplifiers are all bi-directional.

Task Use the following procedure to create an OMS with 1+1 protection. This procedure assumes that the appropriate network elements have already been provisioned.

- 1 From the Network Map, select two OLS80G DWDM network element icons.

Result:

The two selected network elements become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

Create an optical multiplex section with 1+1 protection

-
- 6** Repeat Steps 2 through 5 to synchronize the ports of the second network element.
-
- 7** Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).
- Result:**
- The cross-connects associated with both network elements are synchronized.
-
- 8** From the Network Map, select **Configuration > Optical Layer > Add > OMS**.
- Result:**
- The Network Map becomes the Provisioning Profile form.
-
- 9** Under the **Essentials** tab, enter a circuit ID next to where **OMS** is listed.
-
- 10** Press the **A port** button.
- Result:**
- A window appears.
-
- 11** Select a port and press **OK**.
- Result:**
- The selected port appears within the Essentials tab as the **A port**.
-
- 12** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).
- Result:**
- The selected port appears within the Essentials tab as the **Z port**.
-

Create an optical multiplex section with 1+1 protection

.....
13 Verify that **Auto** is checked for **Path Selection**.
.....

14 Set **MSP** (for multiplex section protection) to **Y**.
.....

15 Press **OK**.

Result:

The graphical layout form appears.
.....

16 Press **OK**.

Result:

A confirmation window appears.
.....

17 Confirm all confirmation windows that appear.

Result:

The newly created OMS with 1+1 protection appears on the Network Map.

.....
E N D O F S T E P S
.....



Create an optical link

Purpose Use this procedure to create an optical link. An optical link can connect a SDH network element with a DWDM network element, a DWDM network element with a Lambda Router, two Lambda Routers together, or a Lambda Router with an SDH network element. Unlike an OMS, an optical link can not join two DWDM network elements.

Task Use the following procedure to create an optical link. This procedure assumes that the appropriate network elements have already been provisioned.

- 1 From the Network Map, select two network element icons. As stated previously, the network elements can be DWDM, SDH or a Lambda Router. However, only one network element you select can be a DWDM.

Result:

The two selected network elements become highlighted.

- 2 Right click on one network element.

Result:

The Node menu appears.

- 3 Select **Session > Start Database Synchronization**.

Result:

A window appears.

- 4 Under **Type**, select **Port**.
-

- 5 Press **Apply**.

Result:

The network element's ports are synchronized.

-
- 6 Repeat Steps 2 through 5 to synchronize the ports of the second network element.

-
- 7 Synchronize the cross-connects of both network elements by performing Steps 2 through 5 (except select **Cross-connect** for the **Type**).

Result:

The cross-connects associated with both network elements are synchronized.

-
- 8 From the Network Map, select **Configuration > Optical Layer > Add > OL**.

Result:

The Network Map becomes the Provisioning Profile form.

-
- 9 Under the **Essentials** tab, enter a circuit ID next to where **OL** is listed.

-
- 10 Press the **A port** button.

Result:

A window appears.

-
- 11 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 12 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

13 Ensure that **Auto** is checked for **Path Selection**.

14 Press **OK**.

Result:

The graphical layout form appears.

15 Press **OK**.

Result:

A confirmation window appears.

16 Confirm all confirmation windows that appear.

Result:

The newly created optical link appears on the Network Map.

END OF STEPS



Create an optical channel trail

Purpose Use this procedure to create an optical channel trail. An optical channel trail transverses the connections established by either an OMS or and OMS/optical link combination. As such, an optical channel trail can span such combinations as two DWDMs (in the case of a single OMS), or an SDH network element (optical link) DWDM (OMS) DWDM (optical link) SDH network element scheme.

Before you begin Before you create an optical channel trail, note the following:

- There must be at least one OMS provisioned. There also must be the desired number of optical links provisioned prior to creating an optical channel trail.
- Optical channel SNCP is supported for Lambda Router 256/128.
- Cascaded SNCPs are not supported.

Task Use the following procedure to create an optical channel trail. This procedure assumes that the appropriate network elements, OMSs and optical links have already been provisioned.

- 1 From the Network Map, select an existing OMS. For sake of clarity, this procedure will discuss the provisioning of an optical channel trail for a single OMS. Note that an optical channel trail can be provisioned so as to include several optical links and OMSs.

Result:

The selected OMS becomes highlighted.

- 2 From the Network Map, select **Configuration > Optical Layer > Add > OChTrail**.

Result:

The Network Map becomes the Provisioning Profile form.

- 3 Under the **Essentials** tab, enter a circuit ID next to where **OChTrail** is listed.
-

- 4 Press the **A port** button.
-

Result:

A window appears.

- 5** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

- 6** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

- 7** Verify that **Auto** is checked for **Path Selection**.
-

- 8** Press **OK**.

Result:

The graphical layout form appears.

- 9** Press **OK**.

Result:

A confirmation window appears.

- 10** Confirm all confirmation windows that appear.

Result:

The newly created optical channel trail appears on the Network Map.

END OF STEPS



Add an optical amplifier to an optical multiplex section

Purpose Use this task to add an optical amplifier to an optical multiplex section (OMS).

Task Complete the following task to add an optical amplifier to an OMS.

1 From the Network Map, select an OMS.

2 Right click on the OMS.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the OMS you wish to add the optical amplifier to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Optical Amplifier Selection form appears.

Add an optical amplifier to an optical multiplex section

.....
7 Select an optical amplifier from the **Non-Members** sub-window.

Result:

The **Add** and **Remove** buttons become enabled.

.....
8 Press **Add**.

Result:

The optical amplifier is moved to the **Service** window.

.....
9 Specify the optical amplifier's left/right ports and the service protection.

.....
10 Press **OK**.

Result:

A confirmation window appears.

.....
11 Press **OK**.

.....
12 From the Network Map, select **File > Query Again**.

Result:

An optical amplifier is added to the OMS.

END OF STEPS



Delete an optical amplifier from an optical multiplex section

Purpose Use this task to delete an optical amplifier from an optical multiplex section (OMS).

Task Complete the following task to delete an optical amplifier from an OMS.

1 From the Network Map, select an OMS.

2 Right click on the OMS.

Result:

The Node menu appears.

3 Select **Circuit/Trail List**.

Result:

The Circuit/Trail List form appears.

4 Select the CKT/Trail ID corresponding to the OMS you wish to add the optical amplifier to.

Result:

The selection becomes highlighted, and the **Actions** menu item becomes enabled.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Modify > Regenerators/Optical Amplifiers**.

Result:

The Optical Amplifier Selection form appears.

Delete an optical amplifier from an optical multiplex section

-
- 7 Select an optical amplifier from the **Service** window.

Result:

The **Add** and **Remove** buttons become enabled.

- 8 Press **Remove**.

Result:

The amplifier is moved to the **Non-Members** window.

- 9 Press **OK**.

Result:

A confirmation window appears.

- 10 Press **OK**.
-

- 11 From the Network Map, select **File > Query Again**.

Result:

The optical amplifier is deleted from the OMS.

END OF STEPS



Create a preplan for an optical channel trail

Purpose Use this procedure to create assign preplan restoration to an optical channel trail. Preplan restoration allows a user to re-route traffic temporarily so as to restore service in the event of a failure with the optical channel trail.

- Before you begin** Before you create a preplan for an optical channel trail, note the following:
- WaveStar NMS will not perform validation to insure compliance with the following assumptions: the service path includes the Lambda Router; the service and preplan paths use the same Lambda Router where the restoration cross connect occurred.
 - WaveStar NMS can provide the capability to restore an optical channel trail if the following items occur: the service and preplan paths have the same channel/client service type; the service and preplan paths have different optical channel trails; the service path optical channel and the preplan path optical channel trail have the same end port.
 - WaveStar NMS supports preplan for OCh trail for OLS80G and all models of OLS400G.
 - Lambda Router 256 and 128 are supported.

Task Use the following procedure to create a preplan for an optical channel trail. This procedure assumes that the appropriate network elements, OMSs and optical links have already been provisioned.

- 1 From the Network Map, select an existing OMS that supports preplan (see above caveats). For sake of clarity, this procedure will discuss the provisioning of an optical channel trail for a single OMS. Note that an optical channel trail can be provisioned so as to include several optical links and OMSs.

Result:

The selected OMS becomes highlighted.

- 2 From the Network Map, select **Configuration > Optical Layer > Add > OChTrail**.
-

Result:

The Network Map becomes the Provisioning Profile form.

-
- 3** Under the **Essentials** tab, enter a circuit ID next to where **OChTrail** is listed.

-
- 4** Press the **A port** button.

Result:

A window appears.

-
- 5** Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

-
- 6** Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

-
- 7** Verify that **Auto** is checked for **Path Selection**.

-
- 8** Under the Parameters tab, specify **Order Action** as **Pre-plan**.

-
- 9** Press **OK**.

Result:

The graphical layout form appears.

-
- 10** Press **OK**.

Result:

A confirmation window appears.

Create a preplan for an optical channel trail

-
- 11** Confirm all confirmation windows that appear.

Result:

The newly created optical channel trail with preplan restoration appears on the Network Map.

END OF STEPS



Insert an optical layer into a digital link

Purpose Use this procedure to insert an optical layer into an existing digital link. An optical layer, in this case, refers to an existing OMS, optical link or optical channel trail.

Before you begin Before attempting to insert an optical layer into a digital link, consider the following items:

- In the case of an MSP-protected digital link, it is not necessary to have an optical layer both in the service link and protection link. One of the links need not go through the optical layer.

Task Perform the following steps to insert an optical layer into a digital link. This task assumes that all necessary optical layer components are provisioned in WaveStar NMS before attempting to insert the optical layer.

- 1 From the Network Map, right click on a terminating network element icon of a digital link.

Result:

The Node menu appears.

- 2 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

- 3 From the list, select a digital link.

Result:

The digital link becomes highlighted.

- 4 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

Insert an optical layer into a digital link

.....
5 Select **Actions > Insert Optical Layer**.

Result:

A confirmation window appears.

.....
6 Press **Yes**.

Result:

The optical layer is inserted into the digital link.

.....
E N D O F S T E P S
.....



Create a digital link through an optical channel trail

Purpose Use this procedure to create a digital link through an optical channel trail.

Task Perform the following steps to create a digital link through an optical channel trail. This task assumes that all necessary optical layer components are provisioned in WaveStar NMS before attempting to create the digital link.

1 From the Network Map, select the terminating SDH network element icons of an optical trail.

2 From the Network Map, select **Configurations > Digital Link > Add > (select rate)**.

Result:

The Network Map becomes the Provisioning Profile form.

3 Under the **Essentials** tab, enter a circuit ID.

4 Press the **A port** button.

Result:

A window appears.

5 Select a port and press **OK**.

Result:

The selected port appears within the Essentials tab as the **A port**.

6 Repeat steps 10 and 11 to add the **Z port** (of course, exchange any instances of **A port** with **Z port**).

Result:

The selected port appears within the Essentials tab as the **Z port**.

Create a digital link through an optical channel trail

.....
7 Verify that **Auto** is checked for **Path Selection**.

.....
8 Press **OK**.

Result:

The graphical layout form appears.

.....
9 Press **OK**.

Result:

A confirmation window appears.

.....
10 Confirm all confirmation windows that appear.

Result:

The newly created digital link follows the optical channel trail.

.....
E N D O F S T E P S



Disconnect an optical channel trail

Purpose Use the following procedure to disconnect an optical channel trail.

Task Complete the following steps to disconnect an optical channel trail.

1 From the Network Map, select an optical channel trail (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select an optical channel trail. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The optical channel trail is disconnected.

END OF STEPS



Disconnect an optical link

Purpose Use the following procedure to disconnect an optical link.

Task Complete the following steps to disconnect an optical link.

1 From the Network Map, select an optical link (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select the optical link. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The optical link is disconnected.

END OF STEPS

Disconnect an optical multiplex section

Purpose Use the following procedure to disconnect an optical multiplex section (OMS).

Task Complete the following steps to disconnect an OMS.

1 From the Network Map, select an OMS (by selecting one of its end points).

2 Right click on the end point (a network element icon).

Result:

The Node menu appears.

3 Select **Assigned Ports List**.

Result:

The Assigned Ports List window appears.

4 From the listing, select the OMS. Make sure it is **In-Effect (IE)**.

Result:

The selection becomes highlighted.

5 Select **Actions > Graphical Layout**.

Result:

The Graphical Layout form appears.

6 Select **Actions > Disconnect > Actual**.

Result:

A confirmation window appears.

7 Press **OK**.

Result:

The OMS is disconnected.

END OF STEPS



Section IV: Trenches

Overview

Purpose In order to provide physical separacy between a protected and service route, WaveStar NMS supports the association of trenches to digital links. One or more trenches can be associated with one digital link, or a number of digital links can be associated with one trench.

The main reason to incorporate trench IDs is to achieve physical separacy for protected and service path. All fibers, cables and conduits in a given trench may not survive physical disaster. In order to design a network for maximum survivability, trenches, which are used for working paths/circuits, must not be used for protection paths/circuits. In case of rings or linear protection, network designers must take care of physical separacy, because links and path are well defined.

This section discusses provisioning tasks associated with trenches.

Rules about trenches Before you attempt to create a trench identification, consider the following items:

- A maximum of five trench identifications can be associated with a single digital link.
- One trench identification can be used by multiple digital links.
- A trench identification can not exceed 83 alphanumeric characters.
- A trench identification description can not exceed 32 alphanumeric characters.
- Trench identifications are only applicable to digital links, optical links and an OMS.

Contents

Create a trench ID	3-84
Display a list of trenches	3-85
Display the trenches associated with a digital link	3-86
Display the digital links associated with a trench	3-87
Associate a trench with a digital link	3-88

<u>Modify a trench ID</u>	<u>3-90</u>
<u>Delete a trench ID</u>	<u>3-91</u>



Create a trench ID

Purpose Use this procedure to create a trench ID.

Task Complete the following task to create a trench ID.

- 1 On the Network Map, select **Configuration > Trench ID > Add**.

Result:

A window containing two fields appears.

- 2 In the **Trench ID** field, enter a unique identification for the trench.
-

- 3 In the **Description** field, provide a description of the trench so as to distinguish it from other trenches.
-

- 4 Click **OK**.

Result:

The trench ID is created.

END OF STEPS



Display a list of trenches

Purpose Use this procedure to display a list of existing trenches.

Task Complete the following task to display a list of existing trenches.

- 1** From the Network Map, select **Configuration > Trench ID > Display List**.

Result:

The Trench ID Display Query Box appears.

- 2** In the **Trench ID** field, enter a trench identification (or enter * to list all trenches).
-

- 3** Press **OK**.

Result:

The Trench Display List form appears and displays a list of all the existing trenches.

END OF STEPS



Display the trenches associated with a digital link

Purpose Use this task to display the trenches associated with a digital link.

Task Complete the following task to display the trenches associated with a digital link.

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query Box window appears.

- 2 In the **Order Status** field, specify an order status.
-

- 3 In the **Ckt/Trail ID** field, select a rate.
-

- 4 Press **OK**.

Result:

The Circuit Trail List window appears.

- 5 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

- 6 Select **Actions > Trench ID Associations/Display**.

Result:

A window appears showing all the trenches associated with the digital link.

END OF STEPS



Display the digital links associated with a trench

Purpose Use this task to display the digital links associated with a trench.

Task Complete the following task to display the digital links associated with a trench.

- 1 From the Network Map, select **Configuration > Trench ID > Display List**.

Result:

The Trench ID Display Query Box appears.

- 2 In the **Trench ID** field, enter a trench ID.
-

- 3 Press **OK**.

Result:

The Trench Display List form appears and lists the trenches according to the query information that was specified.

- 4 From the list, select a trench.

Result:

The selection is highlighted.

- 5 Select **Actions > Trench ID-Links Associations List**.

Result:

The Trench ID-Links Associations List form appears and displays all the digital links associated with the specified trench.

END OF STEPS



Associate a trench with a digital link

Purpose Perform the following procedure to associate a trench with a digital link.

Task Complete the following task to associate a trench with a digital link.

- 1 From the Network Map, select **Configuration > Connection > Display > Circuit/Trail List**.

Result:

The Circuit/Trail Query Box form appears.

- 2 In the **Order Status** field, specify an order status.
-

- 3 In the **Ckt/Trail ID** field, select a rate.
-

- 4 Press **OK**.

Result:

The Circuit/Trail List form appears.

- 5 From the list, select a circuit/trail identification.

Result:

The selected identification is highlighted.

- 6 Select **Actions > Trench ID Associations/Display**.

Result:

A form appears displaying all the trenches associated with the digital link.

- 7 Using the window's arrow icons, associate (or dissociate) trenches with a digital link.
-

8 Select **Apply**.

Result:

The trench is associated (or disassociated) with the digital link.

END OF STEPS



Modify a trench ID

Purpose Use this task to modify a trench ID.

Task Complete the following task to modify a trench ID.

- 1 From the Network Map, select **Configuration > Trench ID > Display List**.

Result:

The Trench ID Display List Query Box form appears.

- 2 In the **Trench ID** field, enter an existing trench identification. If you enter nothing, you will get a complete list of existing trenches.
-

- 3 Press **OK**.

Result:

The Trench Display List form appears.

- 4 In the **Trench ID** field, select a trench.
-

- 5 Select **Actions > Update**.

Result:

A form appears.

- 6 In the **New Trench ID** and **New Description** fields, enter new information for the trench.
-

- 7 Click **OK**.

Result:

The trench ID is modified.

END OF STEPS



Delete a trench ID

Purpose Use this procedure to delete a trench ID.

Task Complete the following task to delete a trench ID.

- 1 From the Network Map, select **Configuration > Trench ID > Display List**.

Result:

The Trench ID Display List Query Box form appears.

- 2 In the **Trench ID** field, enter an existing trench identification. If you enter nothing, you will get a complete list of existing trenches.
-

- 3 Press **OK**.

Result:

The Trench Display List form appears and lists the trenches according to the query information specified within the previous window.

- 4 From the list, select a trench.

Result:

The selection is highlighted.

- 5 Select **Actions > Delete**.
-

- 6 From the Network Map, select **File > Query Again**.

Result:

The trench ID is deleted.

END OF STEPS



Section V: Subnets

Overview

Purpose Subnets are defined as devices on a network that shares a common address component. For example, all devices with IP addresses that start with 100.100.100. could be part of the same subnet. Dividing a network into subnets is useful for both security and performance reasons.

The WaveStar NMS subnet support allows users to create rings from the Network Map. In terms of the WaveStar NMS Network Map, a ring is defined as when three or more network elements are connected in a closed loop. Messages travel around the ring, with each network element reading those messages addressed to it. One of the advantages of ring networks is that they can span larger distances than other types of networks, such as bus networks, because each network element regenerates messages as they pass through it. Another advantage is that one half of the ring's channels can be defined as working (carrying data) while the other half can be defined as protection.

This section describes the provisioning tasks associated with subnets.

Contents

Add a subnet	3-93
Name a subnet	3-95
Modify a subnet	3-96
Delete a subnet	3-97



Add a subnet

Purpose Use this task to add a subnet to WaveStar NMS.

Manual task Perform the following steps to manually create a subnet. This task assumes that you have already provisioned the desired number of network elements and digital links.

- 1 From the Network Map, select **Configuration > Subnet > Add > (select either PSR or LSR depending upon the desired rate) > (select a rate)**. Note that the rate you select must be compatible with the network elements and digital links you are planning to create the subnet with.

Result:

The Subnet Manual Creation form appears.

- 2 From the Network Map, select a digital link you wish to make part of the subnet.

Result:

The **A** and **Z** fields within the Subnet Manual Creation form become populated with the digital link information.

- 3 From the Subnet Manual Creation form, select the digital link.

Result:

Selection becomes highlighted and the arrow icon becomes enabled.

- 4 Press the arrow icon to move the digital link to the Subnet Designation sub-window.

Result:

The sub-window's fields become populated with the digital link information. The digital link on the Network Map becomes thicker to signify the creation of a piece of the subnet.

-
- 5** Repeat Steps 2 through 4 until you form an enclosure using digital links and network elements.
-

- 6** Press **OK**.

Result:

The subnet is created.

END OF STEPS



Name a subnet

Purpose Use this procedure to name an existing subnet.

Task Complete the following task to name a subnet. This task assumes that a subnet has already been created.

- 1 From the Network Map, select **Configuration > Subnet > Display/Modify**.

Result:

The Subnet Display List form appears.

- 2 In the **Subnet IDs** column, select a subnet.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Modify Parameters**.

Result:

The Subnet window appears.

- 4 Enter a new subnet ID in the **Subnet ID** field. You must assign a unique ID.
-

- 5 Click **OK**.

Result:

A confirmation window is displayed informing you of the operation's success.

- 6 Select **File > Query Again**.

Result:

The Network Map displays the new subnet name.

END OF STEPS



Modify a subnet

Purpose Use this task to modify an existing subnet.

Task Perform the following steps to modify an existing subnet.

- 1 From the Network Map, select **Configuration > Subnet > Display/Modify**.

Result:

The Subnet Display List form appears.

- 2 In the **Subnet IDs** column, select a subnet.

Result:

The selection is highlighted, and the **Actions** menu item becomes enabled.

- 3 Select **Actions > Modify Parameters**.

Result:

The Subnet window appears.

- 4 Make the desired modifications to the subnet.
-

- 5 Click **OK**.

Result:

A confirmation window is displayed informing you of the operation's success.

- 6 Select **File > Query Again**.

Result:

The Network Map reflect any modifications made to the subnet.

END OF STEPS



Delete a subnet

Purpose Use this task to delete a subnet.

Task Perform the following steps to delete a subnet.

1 Select a digital link that is part of the subnet you wish to delete.

2 From the Network Map, select **Configuration > Digital Link > Disconnect**.

Result:

The Ckt/Trail Query Box is displayed.

3 In the **Order Number** field, enter the order number of the digital link.

4 Click **OK**.

Result:

A confirmation window appears.

5 Click **Yes**.

Result:

An action window appears.

6 Click **OK**.

Result:

The system disconnects the digital link if all validations are successful.

7 From the Network Map, select **File > Query Again**.

Result:

The digital link, that was part of the subnet, disappears from the Network Map and thus deletes the subnet.

END OF STEPS

Section VI: Preplan Restoration

Overview

Purpose Restoration allows a user to re-route traffic temporarily so as to restore service in the event of a network failure. Preplan restoration is one type of restoration provided by WaveStar NMS. Preplan restoration allows for a back-up circuit to be predefined for an existing in-service circuit. WaveStar NMS stores a preplan in a database and accesses it when a failure occurs so as to restore the circuit.

Preplan restoration works best where:

- one portion of the service circuit is controlled by WaveStar NMS while the other end is outside WaveStar NMS control and on the end customers premise;
- customers have mixed network elements in their network;
- restoration paths are “off-network” and must be defined by the customer;
- ring protection is not provided by the network element;
- there is a fiber cut between rings;
- more efficient usage of spare capacity is desired.

This section describes the provisioning tasks associated with preplan restoration.

Contents

Add a preplan circuit	3-100
Assign a preplan circuit to a service circuit	3-101
Create a preplan plan	3-102
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Create a preplan group	3-105
Assign a preplan plan to a preplan group	3-106
Restore a service circuit with a preplan circuit	3-108
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<u>Delete a preplan plan</u>	<u>3-114</u>
<u>Delete a preplan group</u>	<u>3-115</u>



Add a preplan circuit

Purpose Use this procedure to add a preplan circuit. If the service circuit fails, the associated preplan circuit can be invoked manually or automatically.

Task Complete the following task to create a preplan circuit that is reserved for one specific service circuit.

- 1 On the Network Map, select two network element icons.

Result:

The icons become highlighted.

- 2 On the Network Map, select **Configuration > Connection > (Desired Circuit Rate)**.

Result:

The Provision Profile form is displayed.

- 3 Under the Essentials tab, enter a circuit ID next to where the circuit rate is displayed.
-

- 4 Specify an **A port** and a **Z port**.
-

- 5 Under the Parameters tab, specify **Order Action** as **Pre-plan**.
-

- 6 Click **OK**.

Result:

A preplan circuit is created.

END OF STEPS



Assign a preplan circuit to a service circuit

Purpose Use this procedure to associate a preplan circuit with a service circuit. By assigning a preplan circuit to a service circuit, you create a preplan pair.

Before you begin Before you associate a preplan circuit with a service circuit, consider the following items:

- The service circuit being protected must be in-effect
- The preplan circuit must be in the pending state.

Task Complete the following task to associate a preplan circuit with a service circuit.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pairs > Add**.

Result:

The Preplan Pairs Add form appears.

- 2 In the **Service Circuit ID** field, enter the service circuit ID.
-

- 3 In the **Preplan Circuit ID** field, enter the preplan circuit ID.
-

- 4 In the **Preference** field, enter a preference.
-

- 5 In the **Priority** field, enter a priority.
-

- 6 Press **Apply**.

Result:

An association between the service circuit and the preplan circuit is created. The preplan circuit now protects the service circuit.

END OF STEPS



Create a preplan plan

Purpose Use this procedure to create a preplan plan. A preplan plan must be created before you can assign preplan pairs to it.

Task Complete the following task to create a preplan plan.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Add**.

Result:

A window appears.

- 2 In the **Preplan ID** field, enter a preplan ID.
-

- 3 Press **OK**.

Result:

The preplan plan is created. A message appears indicating the success or failure of the task.

END OF STEPS



Assign a preplan pair to a preplan plan

Purpose A preplan circuit can not be assigned to a preplan plan by itself. It has to be associated with a service circuit first (becoming a preplan pair), before it can be assigned to a preplan plan. Use this procedure to assign a preplan pair to a preplan plan.

Before you begin Before you assign a preplan pair to a preplan plan, the following conditions must be met:

- The service facility being protected must be in an in-effect (IE) state.
- The preplan facility must be in a pending state (CPL).
- The preplan pairs must already exist.

Task Complete the following task to assign a preplan pair to a preplan plan. Note: you can also assign a preplan pair to a preplan plan through the Preplan Pairs form.

1 Create a preplan plan.

2 Create a preplan pair by assigning a preplan circuit to a service circuit.

3 Select **Configuration > Preplan Restore Management > Preplan Pairs > Add**.

Result:

The Preplan Plan Pairs Add form appears.

4 Select a preplan pair.

Result:

The selection becomes highlighted.

5 Select **Link to Plan**.

Result:

The **Plan ID** field becomes active.

-
- 6** Within the **Plan ID** field, enter a plan ID.
-

- 7** Press **Apply**.

Result:

The preplan pair is assigned to the preplan plan. A message appears indicating the success or failure of the task.

END OF STEPS



Create a preplan group

Purpose Use this procedure to add a preplan group. A preplan group must be created before you can assign preplan plans to it.

Task Complete the following task to add a preplan group.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Group > Add**.

Result:

A window appears.

- 2 In the **Preplan ID** field, enter an ID for the preplan group.
-

- 3 Press **OK**.

Result:

The preplan group is created. A message appears indicating the success or failure of the task.

END OF STEPS



Assign a preplan plan to a preplan group

Purpose Use this procedure to assign a preplan plan to a preplan group.

Before you begin Before you assign a preplan plan to a preplan group, the following conditions must be met:

- The service facility being protected must be in an in-effect (IE) state and the preplan facility must be in a pending state (CPL).
- The preplan plan must already exist.

Task Complete the following task to assign a preplan plan to a preplan group.

1 Create a preplan plan.

2 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**.

Result:

The Preplan Query Box form appears.

3 Press **OK**.

Result:

The Preplan Plan form appears.

4 Select a preplan plan.

5 Select **Actions > Link Plan to Group**.

Result:

The Link Plan to Group form appears.

6 For **Group ID**, enter a valid preplan group ID.

7 Press **OK**.

Result:

The preplan plan is assigned to the preplan group.

END OF STEPS



Restore a service circuit with a preplan circuit

Purpose Use this procedure to restore service with a preplan circuit.

Task Complete the following task to restore service with a preplan circuit.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > (select any one of the three preplan types) > Display/Modify**.

Result:

A preplan form appears.

- 2 Select a preplan.
-

- 3 Select **Actions > Reinstate**.

Result:

A query window appears.

- 4 Select **Yes**.

Result:

The Preplan Parameters form appears.

- 5 If desired, specify a value for **Reinstatement** and **Preemption**.
-

- 6 Press **OK**.

Result:

The preplan circuit restores the service circuit it is associated with.

END OF STEPS



Reinstate a preplan pair

Purpose Use this procedure to reinstate a preplan pair.

Task Complete the following task to reinstate a preplan pair.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pairs > Display/Modify**.

Result:

A preplan form appears.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Reinstate**.

Result:

A query window appears.

- 4 Select **Yes**.

Result:

The Preplan Parameters form appears.

- 5 If desired, specify a value for **Reinstatement** and **Preemption**.
-

- 6 Press **OK**.

Result:

The preplan pair is reinstated.

END OF STEPS



Disassociate a preplan circuit from a service circuit

Purpose Use this procedure to disassociate a preplan circuit from a service circuit. You must perform this procedure before you can delete a preplan pair, preplan plan, or preplan group.

Before you begin Before you disassociate a preplan circuit from a service circuit, the following conditions must be met:

- The service circuit being protected must be in-effect.
- The preplan circuit must be in the pending state.
- The preplan circuit is associated with a service circuit.

Task Complete this task to disassociate a preplan circuit from a service circuit.

- 1 Select **Configuration > Preplan Restore Management > Preplan Pairs > Display/Modify**.

Result:

The Preplan Pairs query box is displayed.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Delete**.

Result:

A confirmation window appears.

- 4 Confirm the confirmation window.

Result:

The preplan pair is dissociated from the service circuit.

END OF STEPS



Cancel a preplan circuit order

Purpose Use this procedure to cancel a preplan circuit order.

Before you begin Before you cancel a preplan circuit order, consider the following item:

- The preplan cannot be associated with any service paths.

Task Complete the following task to cancel a preplan circuit order.

1 From the Network Map, select a service circuit with a preplan associated with it.

2 Right click on either network element icon associated with the circuit.

Result:

The node menu appears.

3 Select **Assigned Port List**.

Result:

The Assigned Port List window appears.

4 Press **OK**.

Result:

A window appears.

5 Select a preplan.

6 Select **Actions > Cancel Order**.

Result:

The preplan circuit order is cancelled.

END OF STEPS



Unlink a preplan pair from a preplan plan

Purpose Use this procedure to unlink a preplan pair from a preplan plan.

Task Perform the following steps to unlink a preplan pair from a preplan plan.

- 1 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Pair > Display/Modify**.

Result:

The Preplan Pairs form appears.

- 2 Select a preplan pair.
-

- 3 Select **Actions > Unlink Pair from Plan**.

Result:

A window appears.

- 4 For **Plan ID**, enter the preplan plan ID.
-

- 5 Press **OK**.

Result:

A confirmation window appears.

- 6 Confirm the confirmation.

Result:

The preplan pair is unlinked from the preplan plan.

END OF STEPS



Unlink a preplan plan from a preplan group

Purpose Use this procedure to unlink a preplan plan from a preplan group.

Task Perform the following steps to unlink a preplan plan from a preplan group.

1 Ensure that there are no preplan pairs linked to the preplan plan.

2 From the Network Map, select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**.

Result:

The Preplan Plan form appears.

3 Select a preplan plan.

4 Select **Actions > Unlink Plan from Group**.

Result:

A window appears.

5 For **Group ID**, enter the preplan group ID.

6 Press **OK**.

Result:

A confirmation window appears.

7 Confirm the confirmation.

Result:

The preplan plan is unlinked from the preplan group.

END OF STEPS



Delete a preplan plan

Purpose Use this procedure to delete a preplan plan.

Before you begin Before you delete a preplan plan, consider the following item:

- The preplan circuits included in the preplan plan cannot be associated with any service paths.

Task Complete the following task to delete a preplan plan.

1 Ensure that any preplan pairs are unlinked from the preplan plan.

2 Select **Configuration > Preplan Restore Management > Preplan Plan > Display/Modify**

Result:

The Preplan Plan query box is displayed.

3 Select a preplan plan.

4 Select **Actions > Delete**.

5 Click **OK**.

Result:

The preplan plan is deleted.

END OF STEPS



Delete a preplan group

Purpose Use this procedure to delete a preplan group.

Before you begin Before you delete a preplan group, consider the following item:

- The preplan circuit included in the preplan group cannot be associated with any service paths.

Task Complete the following task to delete a preplan group.

1 Ensure that there are no preplan plans associated with the preplan group.

2 Select **Configuration > Preplan Restore Management > Preplan Plan Group > Display/Modify**.

Result:

The Preplan Group query box is displayed.

3 Select a preplan group.

4 Select **Actions > Delete**.

5 Click **OK**.

Result:

The preplan group is deleted.

END OF STEPS





4 Provisioning Concepts

Overview

Purpose This chapter provides conceptual material related to network elements, digital links, connections, optical layers, subnets, and preplan restoration with WaveStar NMS. This material supplements the task-related information presented in the previous chapters.

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Section I: Network Elements

Overview

Purpose This section provides conceptual information for controlled and noncontrolled network elements.

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Controlled network elements

Definition Controlled network elements are network elements that can be controlled by WaveStar NMS.

Characteristics Controlled network elements have the following characteristics:

- They are displayed on the Network Maps as nodes (physical locations) interconnected by digital links. A unique icon represents each network element type.
- They are in constant communication with their EMS.
- They are controlled by commands sent from the EMS. (The EMS receives and processes the responses from the controllable network element.)
- They report and show alarms.

Control techniques Controlled network elements may be controlled:

- Directly, by ITM-XM
- Indirectly, through the ITM-SC or WaveStar SNMS

Additional information For additional information about controlled network elements, refer to Chapter 3 of the *WaveStar NMS 4.0 Applications and Planning Guide* .



Noncontrolled network elements

Definition Noncontrolled network elements are network elements that cannot be controlled by WaveStar NMS.

Characteristics Noncontrolled network elements:

- Support only manual provisioning
- Do not report alarms
- Are listed in the database as part of provisioning records

List of noncontrolled network elements There are two noncontrolled network elements:

- Black box
- Customer equipment

Additional information For additional information about noncontrolled network elements, refer to Chapter 3 of the *WaveStar NMS 4.0 Applications and Planning Guide* .



Provisioning concepts

Overview Digital Links are transport facilities that are assignable to high order and low order digital links to carry customer services. In WaveStar NMS, digital links are always modelled as bidirectional links that will carry two way traffic. Digital Links are of two types - SDH/SONET and PDH.

SDH digital links are synonymous with multiplexer sections, in SDH standard terminology, that connect two SDH network elements or black boxes/equipment. In WaveStar NMS, the regenerator sections within the multiplexer section layer are not explicitly provisioned; however the WaveStar NMS will be able to add regenerators to the digital links and monitor alarms at regenerator sections. The similar rules/applications using SONET terminology/network elements applied to SONET digital links.

PDH digital links are physical links that connect two PDH ports of SDH network elements or black boxes/equipment. Except for LAN8 (a.k.a. TransLAN) (SDH), VACTDL (a.k.a. TransLAN+) (SDH) and GigaLanDL (SDH/SONET), all digital links are channelized in WaveStar NMS in order to be able to be assigned to carry SDH trails or PDH circuits.

Digital links can be unprotected or protected. When protected by another link, it is called Multiplex Section Protection (MSP). The MSP protection can be of two types - 1+1 or 1x1. When MSP is 1+1, the protection link is totally dedicated to the working (service) link and cannot carry preemptible extra traffic. When MSP is 1x1, the protection link serves as a protection to the working (service) link but can be configured to carry extra traffic that is preemptible when the traffic in the working link gets switched.

Provisioning order action There are basically three order types for any digital link - Add (order action=A), In-effect (order action=IE) and Delete (order action = D). There are several order actions for any digital link - A = Add, D = Disconnect, R = Rearrange, IE = In-Effect, RS = Restoration, RI = Reinstatement, PP = Pre-Plan.

The "Add" order is used when the digital link is first added in to the network from WaveStar NMS. This means that port provisioning

commands will be generated and sent to the EMS for putting the ports in-service, if they are not already in-service.

The “In-Effect” order is used when the digital link is already put in-service through the EMS or from a local craft terminal and needs to be inventoried in WaveStar NMS. Since the digital link is already provisioned, the appropriate provisioning commands are used by the EMS to verify that the ports are put “in-service” and the MSP protection (when specified) exists. The “In-Effect” digital link may or may not be carrying any higher order trails.

The “DeleteDisconnect” order is used to delete the digital link from WaveStar NMS database although the link can still physically exist with the terminations. During the “DeleteDisconnect” order, commands are generated and send to the EMS to put the ports “out-of-service”. In WaveStar NMS, the “DeleteDisconnect” order will not be processed if there are any “in-effect” or “pending” higher order trails or PDH circuits that are provisioned on any of the channels of the digital link.

The “Rearrange” order is used when changing any components (e.g. facilities/channel, A port, A location, Z port, Z location) on the layout of an In-Effect facility/circuit. The “Restoration” order is used when rerouting an IE facility/circuit onto an alternate path.

The “Reinstatement” order is used when reinstating a facility/circuit that was previously restored back to its original service path.

The “Pre-Plan” order is used when restoring the failed facility including each of the affected circuits over to the pre-planned route.

Creation of channel termination records

Depending on the type of digital link and the terminating network element type, WaveStar NMS creates Channel Termination records with a fixed number of channels depending on the channel type specified by the WaveStar NMS during provisioning. In the case of SDH digital links, the channel types can be either VC4-4c, VC4-16c, VC4 or AU3. When a network element supports multiple higher order cross-connect rates, complementary channels are created to give the flexibility to the user to provision any of those higher order trails without having the need to re-provision the digital link with other channel types. The creation of complementary channels is determined by the capability of the network element(s) that terminate the digital link. Such network element specific capability data is stored in WaveStar NMS. In general, an STM-n digital link (where n=0,1,4,16 or 64) will have 3*n AU3 channels (except for n=0 where it will have one AU3 channel) or n VC4 channels. For PDH links, the channel type depends on the rate and the terminating port characteristics. For example, a CEPT-1 digital link will have one C1 channel to carry a CEPT-1 circuit. A CEPT-3 digital link can have either one C3 channel or 16 C1 channels depending on the network element type.

Provisioning of STM-n digital links

Adding regenerators during STM-n digital link provisioning: WaveStar NMS allows user to add regenerators of appropriate type to STM-1 (only for NERA Regenerators), STM-4 and STM-16 digital links during provisioning. No regenerators shall be allowed to be added for STM-0 or STM-1 or 2.5GB digital links except for STM-1 digital links terminating on NERA Radio terminals. When adding regenerators to digital links, the user is required to enter the port addresses for the east and west sides. No validation is made in WaveStar NMS whether the east and west sides are correctly chosen by the user, however, the rate shall be compatible as the rate of the digital link terminating on regenerators. No provisioning commands are generated for the regenerators when they are either added or removed from a digital link. However, the layout of the digital link shall be updated to reflect the addition or deletion of regenerators.

Deleting regenerators from a digital link : user can delete the regenerators from an “in-effect” digital link. Deleting a regenerator from a digital link shall only remove the regenerator from the digital link layout and shall not delete it from WaveStar NMS, e.g. from Location Reference Table.

Creation of alternate channel types for STM-n digital links:

depending on the capability in both the terminating network elements based on the cross-connect rates as listed in Table 2, the channel types of AU3, V4, V4-4c and V4-16c shall be created for STM-n digital links as specified in the table below. When more than one channel type is created based on the network element support, the channels created are considered as alternate channels.

Provisioning of unprotected STM-64 digital links: users can provision a regular unprotected STM-64 digital link between two network elements which both supporting STM-64 (e.g. between two BWMs, or between a BWM and a TDM 10G, or between a BWM and a black box, or between two black boxes, etc.). The provisioning of unprotected STM-64 digital link shall be denied if WaveStar NMS discovers from SNMS, a Protection Group is already formed on either of the two (A or Z) ports.

Provisioning of PDH digital links

Provisioning of unprotected E4 (CEPT-4) digital links: users can provision an unprotected E4 (CEPT-4) digital link between two 140 Mb/s ports of two network elements or between a 140 Mb/s port of an network element and a Black Box or Equipment.

Provisioning of unprotected E3 (CEPT-3) digital links: users can provision an unprotected E3 (CEPT-3) digital link between two 34 Mb/s ports of two network elements or between a 34 Mb/s port of an network element and a Black Box or Equipment.

Provisioning of unprotected E1 (CEPT-1) digital links: users can provision an unprotected E1 (CEPT-1) digital link between two 2 Mb/s ports of two network elements or between a 2 Mb/s port of an network element and a Black Box or Equipment.

Provisioning of unprotected DS-3 digital links: users can provision an unprotected DS-3 digital link between two 45 Mb/s ports of two network elements or between a 45 Mb/s port of an network element and a Black Box or Equipment.

Provisioning of unprotected DS-1 digital links: users can provision an unprotected DS-1 digital link between two 1.5 Mb/s ports of two network elements or between a 1.5 Mb/s port of an network element and a Black Box or Equipment.

Provisioning of PCT digital links : users can provision a PCT digital link between a PCT port of an ISM-5E network element and a Black Box (which is used to represent a 5ESS switching system). The PCT

digital link is inherently always protected and therefore the ‘MSP’ field in the provisioning screen shall always be set to “1+1” and the MSP Switch Type shall be set to “BI” (bidirectional).

Channel termination creation for PDH links: a channel termination record is created for every provisioning of a PDH link. There are no alternate channels that are required for PDH digital links. The following table summarizes the type and number of channels that shall be created.

□

Protection concepts

Multiplexer section protection (MSP)

Multiplexer Section Protection provides protection of service for STM-n (N=0, 1, 4, 16 or 64), digital links in case of a fiber cut or a failure. The protection is provided by grouping two physical fibers (both bidirectional) into a MSP group. The MSP grouping of the two ports is performed at each network element where the two fibers terminate. There are two types of MSP protection - 1+1 MSP and 1x1 MSP. Each type is described in the following two sections.

1+1 MSP protection is supported by most of the network elements that support provisioning of unprotected STM-n digital links (except for 2.5 GB digital link). In the case of 1+1 MSP protection, one working digital link is protected by a protection digital link and they are both grouped with one trail ID. In some network elements, the MSP protection group has to be previously formed from the EMS before it can be provisioned from WaveStar NMS. Also, in some network elements the port address for a MSP protected digital link takes the form a “group address” that always represents the ports in adjacent physical slots. Where “group address” is not supported by some network elements, any two physical port with the same rate can be combined to form a MSP protection, in which case, the WaveStar NMS allows the user to enter the working and protection port addresses separately. Depending on the network element support, there are three types of MSP switch types that can be provisioned on a 1+1 MSP protected digital link. The three switch types are - UNI (unidirectional), BI (bidirectional) or NTT (a variation of bi-directional switching for Japanese customers).

Adding Regenerators to 1+1 MSP protected STM-n (n=4 or 16)

digital link: users can add regenerators of appropriate type to the 1+1 MSP protected STM-4 or STM-16 digital link during provisioning. The user shall be able to add regenerators for working and protection links separately. Certain regenerators can accept up to two inputs and two outputs in which case, the same regenerator could be used in both the working and protection links. The user shall be able to delete the regenerators from an “in-effect” digital link. No provisioning commands are generated for the regenerators when they are either added or removed from a digital link. However, the layout of the digital link shall be updated to reflect the addition or deletion of regenerators.

1x1 MSP Protection on STM-n (n=16 or 64) digital links: the Bandwidth Manager supports 1x1 MSP protection for STM-n (n=16 or 64 in WaveStar NMS Rel. 1.0) digital links. 1x1 MSP protection is different from 1+1MSP protection that is well known to the WaveStar NMS user in the previous releases. In 1x1 MSP protection scheme, one digital link will protect one service digital link. In the case of 1x1 MSP protected digital link, the protection link can carry extra traffic that will be preemptible when the MSP switching takes place. Because of this, both the service and protection links of the 1x1 MSP have to be separately identified with Digital Link IDs. The Protection Digital Link must be created first and associated with a unique Protection Group Name before any of the service digital links are created and associated.

□

Section III: Connections

Overview

Purpose This section describes the provisioning concepts associated with connections.

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Provisioning concepts

Overview A circuit/trail is a concatenation of digital links and cross-connects used to provide an end-to-end service to a customer. A circuit/trail is identified by a rate at which the service is provided. The “rate” of a circuit/trail is defined by the ITU and ETSI standards for SDH and PDH circuit/trails and by ITU and ANSI standards for SONET and Asynchronous circuit/trails. An SDH/SONET trail is provisioned over the SDH/SONET link connections and over SDH/SONET cross-connects in WaveStar NMS managed network elements. It is possible that the link connections (SDH/SONET) may go through an optical layer. In general, a PDH/Asynchronous circuit is provisioned on SDH/SONET trails. With the “One-Step (Combo) Provisioning” feature in WaveStar NMS, it is possible to provision both SDH trails and PDH circuits or SONET/trails and Asynchronous circuits in a single provisioning step.

A trail is often referred as a path. A trail can be assignable or non-assignable depending on the terminating port or based on the sub-structuring of the port to carry lower order traffic. In WaveStar NMS, if one or both end ports of a trail are PDH/Asynchronous, or if one or both end ports are sub-structured to carry lower order traffic, the trail is called an “assignable” entity. If both end ports are SDH/SONET and not sub-structured to carry low order traffic, then the trail is called as an “non-assignable” entity. Certain trails, such as VC4-4c, VC4-16c and VC2, are always non-assignable. WaveStar NMS creates channels for assignable trails in order to carry the low order trails or PDH/asynchronous circuits.

Circuit/Trail Provisioning Modes

Users can provision a circuit/trail in one of the three modes - auto, manual or partial. In the “auto” mode, the WaveStar NMS shall find a route from the user specified end ports for the trail and present it to the user for approval, if requested. The routing requirements are specified in another document. In the “manual” mode, the WaveStar NMS user shall be able to select each link and a channel in the selected link along the path and WaveStar NMS shall build the layout based on the user selection(s). In the “partial” mode, the WaveStar NMS user will pick all the links along the path of the circuit/trail. The channels within the link shall be picked by WaveStar NMS.

□

Circuit provisioning concepts

Overview This section describes the provisioning concepts associated with the different circuits supported by WaveStar NMS.

One-step provisioning WaveStar NMS supports the provisioning of the following one-step or simple combo circuits:

- VC3S-672N
- VC4S-1920N
- VC3S-480N
- VC12S-30N
- TU12-VC11S-24N
- AU3S-672N

Note

Please note the following items with regards to one-step provisioning:

- One-step provisioning is an option that is selected at installation time.
- The selection of either VC12S-30N, VC3S-480N, VC3S-672N or VC4S-1920N for provisioning is a selection for 30N, 480N, 672N, or 1920N provisioning. However, one-step provisioned paths/circuits have the characteristic of the SDH (Skipped SDH) circuits/paths. As such, they possess performance monitoring, path trace identifier, fault management, and pre-plan characteristics.
- 30N, 480N, 672N, and 1920N are no longer available for provisioning to ensure the mutual exclusivity of one-step and traditional provisioning.
- If a free-format circuit ID is used, the circuit type for one-step provisioned circuits can be: VC12S-30N, VC3S-480N, VC3S-672N, VC4S-1920N, TU12-VC11S-24N, or AU3S-672N.
- A one-step provisioned path/circuit can terminate on either an SDH or PDH port. However, both ends of the path/circuit cannot be SDH.
 - In the case of an SDH termination, the ports will be derived from the STM-N link on which the circuit is riding.
 - In the case of a PDH termination, the port is the appropriate PDH port.

- A one-step provisioned circuit can cross or ride SDH links only and cannot cross or ride on PDH links.
- No PDH bridges are allowed when merging one-step provisioned paths/circuits.

Provisioning of PDH circuits

CEPT-4 (E4) : users can provision an unprotected two way or one way CEPT-4 (E4) circuit that rides on a two way or a one way VC-4 trail. Since the CEPT-4 circuit rides on a VC-4 trail, the end nodes and the originating and terminating port addresses of the CEPT-4 circuit shall be the same as VC-4 trail. In the “auto” mode, if the two ends of the CEPT-4 circuit do not coincide with the VC-4 trail terminations, then WaveStar NMS shall find a route using the C4 channels of CEPT-4 digital links or C4 channels of a VC-4 trail. No broadcast CEPT-4 circuit provisioning is allowed from WaveStar NMS. Currently, there are no parameters that are required to be set at the 140 Mb/s port(s) for the CEPT-4 circuits.

CEPT-3 (34 Mb/s): users can provision an unprotected two way or one way CEPT-3 (E3) circuit that rides on a two way or a one way VC-4 trail. Since the CEPT-3 circuit rides on a VC-3 trail, the end nodes and the originating and terminating port addresses of the CEPT-3 circuit shall be the same as VC-3 trail. In the “auto” mode, if the two ends of the CEPT-3 circuit do not coincide with the VC-3 trail terminations, then WaveStar NMS shall find a route using the C3 channels of CEPT-3 digital links or C3 channels of a VC-3 trail. Currently, there are no parameters that are required to be set at the 34 Mb/s port(s) for the CEPT-3 circuits.

DS-3 (45 Mb/s): users can provision an unprotected two way or one way DS3 (D3) circuit that rides on a two way or a one way VC-3 trail. Since the DS-3 circuit rides on a VC-3 trail, the end nodes and the originating and terminating port addresses of the DS-3 circuit shall be the same as VC-3 trail. In the “auto” mode, if the two ends of the DS-3 circuit do not coincide with the VC-3 trail terminations, then WaveStar NMS shall find a route using the D3 channels of DS-3 digital links or D3 channels of a VC-3 trail. For DS-3 circuit provisioning, the WaveStar NMS user shall be able to specify a new parameter “Frame Format” in the provisioning screen. The valid values for the Frame Format field are “cbit” and “unframed”.

CEPT-1 (2 Mb/s): users can provision an unprotected two way or one way CEPT-1 (E1) circuit that rides on a two way or a one way VC-4 trail. Since the CEPT-1 circuit rides on a VC-12 trail, the end nodes

and the originating and terminating port addresses of the CEPT-1 circuit shall be the same as VC-12 trail. In the “auto” mode, if the two ends of the CEPT-1 circuit do not coincide with the VC-12 trail terminations, then WaveStar NMS shall find a route using the C1 channels of CEPT-1 digital links or C1 channels of a VC-12 trail. The existing CEPT-1 (E1) circuit (30N) provisioning capabilities shall be extended to support AMIPLUS.

Broadcast Circuit Provisioning: broadcast circuits are provisioned in a network where one source signal needs to be sent to multiple end users, as in video broadcast. To support this capability, many network elements provide broadcast type cross-connects where one source port can be cross-connected to more than one destination port in the same network element. In WaveStar NMS, broadcast circuit provisioning is supported by provisioning first a back bone circuit from which each of the broadcast legs can be provisioned. The back bone circuit and each broadcast leg will have its own circuit ID. However, they are all linked together by a “broadcast family” name. This “broadcast family” name is used in WaveStar NMS to identify a set of circuits that derive the same source signal from a back bone. It also enables the WaveStar NMS user to be able to display the complete broadcast circuit along with the broadcast legs. A broadcast leg can be provisioned from a back bone circuit or from another broadcast leg. All broadcast circuits are non-assignable.

Circuit ID Supported formats

This section describes the circuit ID, which is a unique identifier of a circuit. At installation time, the user can select one of two formats for circuit ID: user-defined free-format or M.1400.

User-defined free-format

The user-defined free-format circuit ID has the following characteristics:

- 83 characters in length
- allowable characters include:
 - alphanumeric characters (The character string is case-sensitive and both upper- and lower-case characters are allowed.)
 - Forward slash /
 - dash -
 - underscore _

- period
- blank
- Tabs are not allowed.
- The syntax of the format is: <A Location> <Z Location> <Type>
<ID Number>

An example of a user-defined free-format circuit ID is: NY1 NY2
VC4S 0001.

M.1400-specification format

The M.1400 specification. The format consists of four sub-fields:

- The A Location of the path or circuit
- The Z Location of the path or circuit
- The Type of the path or circuit
- The Identification Number of the path or circuit.

Note that the A Location value will alphabetically precede the Z Location value by default only if the variable to swap network elements are set up at installation.

Broadcast circuit provisioning

This section discusses broadcast provisioning. The following design rules apply to broadcast circuit provisioning:

1. Backbone circuits can be Protected or Unprotected.
2. Tributary circuits can be protected or unprotected.
3. User must specify the source of transmission as either A or Z.
4. The A or Z end of your circuit is determined by the alphabetic, sub-numeric designation of the end Nodes. The A end is the Node that comes first alphabetically. If two identical alphabetic designations are used, then the A end will be the one with the lowest numerical designation following the alphabetic designation.
5. The following must be done when provisioning a broadcast circuit:
 - Specify the type of circuit as **Broadcast** for the backbone and tributary circuits.
 - Specify a Broadcast Family name to associate the various tributary circuits and associated backbone.

- Use manual route selection.
 - Manually specify both the service and protection paths.
6. Only one-way circuits are supported for Broadcast Circuits. If the network element selected can only put up a two way cross-connection, then the return path is not connected to anything. This may result in a Loss of Signal alarm that should be ignored.
 7. Broadcast Circuits cannot be:
 - Modified
 - Restored
 - Rearranged
 - Merged
 - Changed from protected to unprotected or from unprotected to protected.
 8. For the first leg (backbone), the user must specify the Path Trace Identifier (PTI). This will be applied to all subsequent circuits by the processor.
 9. The first circuit built to a customer's site must contain the backbone. If this subscriber disconnects, then the backbone and all tributaries must be disconnected. To avoid this restriction, you could build the first circuit to a location that will never be disconnected unless the entire broadcast family is disconnected.
 10. Although backbones cannot be modified or extended, they can be added to by adding additional backbones (new circuits) fed from the original backbone.

Important Note: WaveStar NMS does not support the provisioning of an unprotected broadcast circuit on an ADM4/1 STM4 network element.

Disconnecting a broadcast circuit

Before attempting to disconnect a broadcast circuit, note the following:

- A backbone circuit cannot be disconnected unless all its tributaries or other backbones it is feeding are disconnected first.
- Backbones circuits and tributaries can be disconnected in the normal manner as any other circuit.

One-way circuits With regards to provisioning, one-way circuits can be provisioned only in the manual mode through the network elements listed in Table 6-1.

Note that one-way circuits cannot be provisioned:

- Through the SLM and ADM16/1 network elements
- In a manner in which the circuit starts and stops in the same port of the same network element (loopback configuration).

Protection: With regards to protection, one-way circuits can be protected or unprotected with ring protection or 1+1 protection. One-way circuits cannot be modified from protected to unprotected, or from unprotected to protected.

Merging: With regards to merging, one-way and broadcast circuits cannot be merged.

Delete history Whenever a circuit is rearranged, the data from the previous circuit is retained in the WaveStar NMS database. A circuit that has been rearranged several times accumulates a large amount of history information. The Delete History script retains only the necessary history data associated with each circuit, and deletes all unnecessary history data from the database.

The Delete History script consists of two parts:

- A script that automatically runs once, when upgrading the database. If you need to refer to any circuits listed in the history that are not the most recent non-RS, non-RI circuits, you should print out these circuits before upgrading the database. The Delete History script will delete these circuits from the history during the upgrade.
- A daily script execution that runs immediately following each successful daily backup.

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Trail provisioning concepts

Overview This section describes the provisioning concepts associated with the different paths supported by WaveStar NMS.

VC-3 A VC-3 path can carry a clear DS3(45Mb/s) circuit or a CEPT-3. The network elements that support this path type are:

- ADM-16/1
- ADM-4/1
- LXC-16/1
- LXC-4/1
- ADM-155E
- PHASE network elements.
- WaveStar DACS (R2.0)
- DACS VI (R2.1)

Fixed Multiplexing

Only bidirectional paths and circuits can ride on a VC-4 with fixed multiplexing. The port address of the VC-3 (fixed multiplexing) is derived from a VC-4 port address and is in the form of D3/x/y/z-[1-3]. More specifically, this fixed multiplexing applies only to the WaveStar ADM16/1 and the following PHASE network elements:

- ADM-16/1
- ADM-16/4
- ADM-4/4
- TM-16/4
- TM-4/4

Ports

A VC-3 path may terminate on 45-Mb/s ports, in addition to the logical ports of an STM-n and a 34-Mb/s ports.

The Automatic Path Selection mode is applicable only to the two way VC-3 path terminating on a 45-Mb/s port.

The VC-3 path layout riding on a VC-4 and terminating on the 45 Mb/s port on either a 45 Mb/s card or 34/45-Mb/s card that has fixed multiplexing will have only one port per node.

The following are new additions to the allowed combinations of terminating ports:

- Either both ports are 45-Mb/s or one is 45-Mb/s and the other one is a logical port derived from an STM-n physical port. The AZ and ZA PTIs and PTI mismatch detection mode are applicable to a VC-3 path terminating on a 45-Mb/s port.
- A VC-3 path cannot terminate on a 45-Mb/s port at one end and a 34-Mb/s port at the other end.

Order Actions

The following order actions are available for a VC-3 path terminating on a 45-Mb/s port:

- Add
- In-effect
- Rearrange
- Restoration
- Pre-plan
- Reinstatement
- Disconnect

Channels Carried

A VC-3 path may carry either a D3 or a C3 channel, depending on the terminating ports. A D3 channel is valid for a VC-3 path only if the path terminates either on both 45-Mb/s ports or on a 45-Mb/s and on a logical port derived from an SDH physical port. A VC-3 path with D3 channel will carry a 672N circuit.

Transmission Type

The transmission type for a VC-3 path terminating on a 45-Mb/s port can be:

- One-way
- Two-way
- Broadcast

Transmission Constraints

- Only two-way transmission is supported by the WaveStar ADM16/1.
- The specific network element known capabilities, PHASE network elements that are ADM-16/4, ADM-4/4, TM-16/4, TM-4/4 do not support the one-way and broadcast VC-3 path.

Protection

A VC-3 path terminating on a 45-Mb/s port can be protected or unprotected. If the VC-3 path is protected, then all existing protection types are supported. This is limited only by the specific network element capabilities (in addition to the transmission type limitations). WaveStar DACS and DACS VI -2000 do not support protected path. Also, a switch status and switch requests are possible and are available on all ports where a 1+1 protected cross-connect exists.

Mismatch Detection Mode

The AZ and ZA PTIs and PTI mismatch detection mode are applicable to a VC-3 path terminating on a 45-Mb/s port.

VC-4 VC-4 paths ride on STM-1 Digital Links and can be provisioned between:

- SLM-4 Tributary Port and SLM-4 Tributary Port (can be used to interconnect two SLM-4 digital rings)
- SLM-4 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-4 digital ring and an SLM-16 digital ring)
- SLM-16 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-16 digital ring and an SLM-16 digital ring)
- ADM4/1 or ADM-155E Tributary Port and ADM4/1 or ADM-155E Tributary Port
- ADM4/1 or ADM-155E Tributary Port and SLM-4 Tributary Port
- ADM4/1 or ADM-155E Tributary Port and SLM-16 Tributary Port
- ADM4/1 or ADM-155E Tributary Port and DSX, EQPT, or Black Box.

VC-4 Paths can traverse SLMs.

Ring Protection

The ring protection for A VC-4 path can be as follows:

- May be ring-protected if they are either non-assignable or has only one channel.
- May not be ring-protected if they are terminating on an ADM4/1 or ADM155E.

Channel Type

VC-4 Paths can be structured or clear channel. For VC-4 Paths terminating on ADM4/1 or ADM155E multiplexers, channel type C4 should not be allowed.

VC4-4C Information to be provided.

- VC-12** VC-12 Paths ride on channels of structured VC-4 Paths and can, for example, be provisioned on VC-4 Paths between:
- SLM-4 Tributary Port and SLM-4 Tributary Port (can be used to interconnect two SLM-4 digital rings)
 - SLM-4 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-4 digital ring and an SLM-16 digital ring)
 - SLM-16 Tributary Port and SLM-16 Tributary Port (can be used to interconnect an SLM-16 digital ring and an SLM-16 digital ring)
 - ADM4/1 or ADM-155E Tributary Port and ADM4/1 or ADM-155E Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and SLM-4 Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and SLM-16 Tributary Port
 - ADM4/1 or ADM-155E Tributary Port and DSX, EQPT or Black Box.
 - VC-4 Paths can traverse any of the following:
 - SLMs
 - ADM4/1
 - ADM-155E

Ring Protection

VC-12 paths can be ring protected through the following:

- **Transmission Restriction:** for VC-4 Paths terminating on ADM4/1 or ADM-155E multiplexers, one-way transmission will not be allowed.
- **Line Switched Ring (LSR):** when a failure occurs, an LSR loops back switched lines to restore service. As an example, SLMs employ LSRs.
- **Path Switched Ring (PSR):** when a failure occurs, a new path around the ring is taken. As an example, ADM4/1 network elements employ PSRs.
- **Fixed Cross-connect:** cross-connections are pre-determined by vendor; no commands are sent from WaveStar NMS.
- **Digital Cross-Connect System (DXC):** a generic term for electronic cross-connect systems.

Y-protected paths

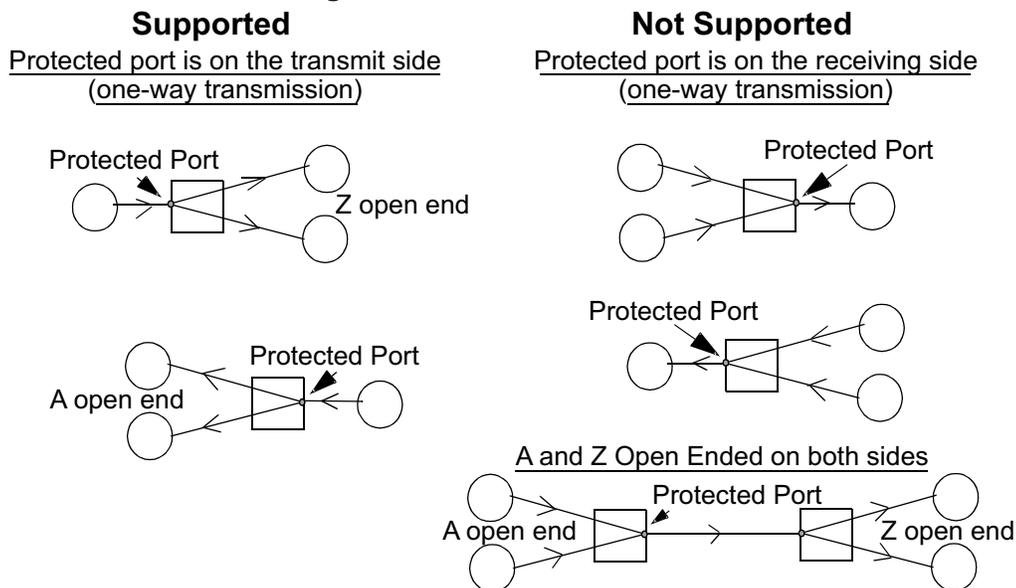
Y protection is a variation of the 1+1 protected path if a portion of the path goes beyond the WaveStar NMS-managed domain.

The Digital Link/Facility/Circuit Profile Form allows a choice between *Open A* and *Open Z* protection types. Restrictions of Y protection are:

- The open end cannot be on both the A and Z terminations of a path.
- For one way transmission, the Protected Port cannot be on the receiving side where the service and protecting paths converge.

The following figure shows an example of the supported and non-supported configurations for one-way Y protection.

Figure 4-1 Supported/Not Supported One-way Y-protection Configurations



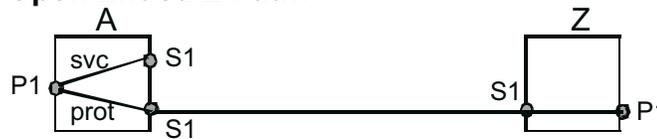
Auto routing Auto is one type of routing offered by WaveStar NMS. The following items apply to auto routing:

- If “Efficient Channel Use” has been installed, and if the ring is path switched, then when you specify the A Location and Port and the Z Location and Port, the system automatically chooses a route based on the available spare capacity between the specified points.
- If “Efficient Channel Use” has been installed, and if the ring is line switched, the system attempts to fill up lower channels around the ring before attempting to use the next channels within a segment.

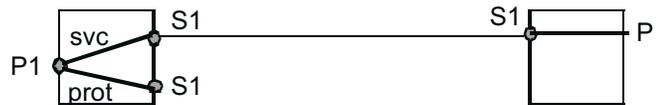
- Auto route selection does not work for Open_Ended_Z paths that are provisioned using one PDH port and two SDH ports, with one SDH port on the same network element, and the other on the second network element. Since a channel is in the protection segment and not in the service segment, the service path terminates on the single node. The workaround solutions are:
 - To reverse the protection segment to the service segment and include the channels in the service segment instead of the protection segment
 - To use manual path selection instead of auto path selection

The following figure shows an example of this solution.

Open Ended Z Path:



Workaround:



Manual routing Manual is one type of routing offered by WaveStar NMS. The following items apply to manual routing:

- In addition to specifying the A/Z Location and Port, the user must specify each link, facility, and channel on each facility along the path. Only manual route selection is allowed for one-way and broadcast paths.

Partial routing Partial is one type of routing offered by WaveStar NMS. The following items apply to partial routing:

- In addition to specifying the A/Z Location and Port, the user must specify each link along the path. The user also has an option to additionally specify a facility and a channel on each facility along the path. As a minimum, each link along the path must be specified.

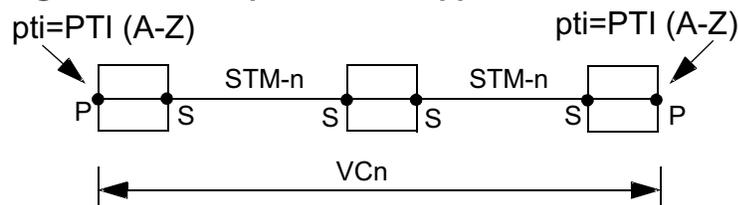
Path trace ID **Important!** SLM and ADM155C network elements only support specific string mode and not the non-specific byte mode.

With routing, the user must enter the path trace ID (PTI) for all circuit types. The user can enable or disable the PTI mismatch detection mode independently from setting the PTI to specific string or to a non-specific mode.

Path Trace ID cannot be left blank when provisioning any type of VC circuit. If the user intends to leave the Path Trace ID blank, the user must enter the word NONE (in capitals). Additionally, if the user wants to send a string of zeros as the Path Trace ID, the user must enter NULL (in capitals).

The following figure shows an example of how PTIs are applied.

Figure 4-2 Example of a PTI Application



VC4-16C (AU4-16C) WaveStar NMS supports the provisioning of VC4-16c trails using STM-N (N = 16 or 64) subject to the capabilities of the network element involved. All the network elements in the VC4-16c is “non-assignable”. The VC4-16c trail can be one way, two way or broadcast type.

Co-existence support: the system supports co-existence of VC4-16c with VC4-16c, VC4-4c, VC4 and AU3 in the same STM-N (N>16).

Mutual Exclusion: if a VC4-16c occupies part of (group of time slots) on an STM-N, the time slots occupied by the VC4-16c shall not be available for other AU3s, VC4s, VC4-4cs or VC4-16cs. For “auto or partial” provisioning, which VC4-16c to select becomes an issue only in the case of STM-N (N >16). For example there are four VC4-16cs in an STM-64. As stated in the introduction, each VC4-16c starts specific time AU4 (AU3) time slots. Therefore, in provisioning VC4-16c, the system is expected to select the first available (see reference [1]) VC4-16c. The order of selection preference is based on an ascending order of the VC4-16c starting time slots.

Transmission Direction: VC4-16c supports one-way, broadcast and two-way transmission direction, subject to and consistent with EMS/network element support. 1809: VC4-16c Protection (two-way) The provisioning of a VC4-16c shall support two-way protected or unprotected VC4-16c. 1810: VC4-16c Protection (one-way) The provisioning of a VC4-4c shall support one-way protected or unprotected VC4-4c. Merging of VC4-16c 1811: Merging VC4-16c WaveStar NMS shall support the merging VC4-16c circuits/paths. VC4-16c circuits/paths can only be merged with VC4-16c circuit/path. Rearranging VC4-16c 1811: Rearranging VC4-16c WaveStar NMS shall support rearranging VC4-16c.

Provisioning of VC4-4C trails

VC4-4c trails can be provisioned on STM-N (N = 4, 16, or 64). VC4-4c is “non-assignable”. VC-4-4c shall start at timeslot number (n) for which the MOD4(n-1) is zero. In other words, it starts only on timeslot number for which the timeslot number minus one is divisible by four. 1816: VC4-4c Protection (two-way) The provisioning of a VC4-4c shall support two-way protected or unprotected VC4-4c. 1817: VC4-4c Protection (one-way) The provisioning of a VC4-4c shall support one-way protected or unprotected VC4-4c.

Merging: WaveStar NMS supports the merging VC4-4c circuits/paths. VC4-4c circuits/paths can only be merged with VC4-4c circuit/path.

Rearranging: WaveStar NMS supports rearranging VC4-4c. Bridge and roll shall be used for rearrange involving BWM similar to that of DACS VI and WaveStar DACS.

Provisioning of AU3 trails

From the Network Map, users can provision a two way unprotected AU-3 trail either in the “auto”, “manual” or “partial” mode.

In “auto” mode, the WaveStar NMS shall find a shortest route using the V4 channels from each of the links in the path. An AU-3 path can be assignable or non-assignable based on the following criteria. If one or both end ports of the AU3 is a DS3 port, then the AU3 is channel assignable (for a non-combo trail provisioning). In this case, the AU3 shall be created with one DS3 channel. If both end ports of the AU3 are STM-n (n=1,4,16) ports with a cross-connect at the end network elements, then the AU3 is not assignable.

In the “manual” mode, the WaveStar NMS user shall be able to select each link from the Network Map that contains one or more AU3 channels from the Network Map and shall be able to bring up a

display of the Facility Channel List screen showing only the all the digital links between the two end nodes that terminate the selected link. Selecting one of the digital links shall list all the AU3 channels in the selected digital link. The user shall be able to select one of the channels from the list. The selected AU3 channel shall automatically get populated in the provisioning screen. In the case of span of control, the user should be able to select a bridge and intern select a link which allows user to select AU3 and any on of the contained channels.

In the “partial” mode, the WaveStar NMS user need to select only the digital links that are displayed in the Facility Channel List screen. The WaveStar NMS shall automatically pick an appropriate V4 channel in the selected digital link and populate it in the provisioning screen.

Transmission Direction: provisioning of a AU3 supports one-way, broadcast and two-way transmission direction, subject to and consistent with EMS/network element support.

Provisioning of VC-4 Trails

From the Network Map, the WaveStar NMS user shall be able to provision a two way unprotected VC-4 trail either in the “auto”, “manual” or “partial” mode. In the “auto” mode, the WaveStar NMS shall find a shortest route using the V4 channels from each of the links in the path. A VC-4 path can be assignable or non-assignable based on the following criteria. If one or both end ports of the VC-4 is a 140 Mb/s (E4) port, then the VC4 is channel assignable (for a non-combo trail provisioning). In this case, the VC-4 shall be created with one C4 channel. If both end ports of the VC4 are STM-n (n=1,4,16) ports with no cross-connects at the end network elements or if both end ports of the VC4 are line ports of an ADM, then the VC-4 is channel assignable. In this case the VC-4 shall be created with 63 V12, 3 V3 and 21 V2 (where the network element supports a V2 cross-connect) channels. If either of the above two cases is not satisfied, then the VC4 is non-assignable. In the “manual” mode, the WaveStar NMS user shall be able to select each link from the Network Map that contains one or more V4 channels from the Network Map and shall be able to bring up a display of the Facility Channel List screen showing only the all the digital links between the two end nodes that terminate the selected link. Selecting one of the digital links shall list all the V4 channels in the selected digital link. The user shall be able to select one of the channels from the list. The selected V4 channel shall automatically get populated in the provisioning screen. In the case of span of control, the user should be able to select a bridge and intern select a link which allows user to select V4 and any on of the contained channels.- In the “partial” mode, the WaveStar NMS user need to select only the digital links that are displayed in the Facility Channel List screen. The WaveStar NMS shall automatically pick an appropriate V4 channel in the selected digital link and populate it in the provisioning screen.

Specifying Path Trace Identifiers and Mismatch Detection Mode:

users can specify two Path Trace Identifiers (PTIs) for each VC-4 trail - one for A-Z direction and the other for Z-A direction. The PTIs can be either a specific string of upto 15 alphanumeric characters (case sensitive) or non-specific (system generated 0s or 1s). The user can also specify the Mismatch Detection Mode for each trail provisioning. The valid values for the Mismatch Detection Mode are “Enable”, “Disable” or “null” (\0). If the user specifies “Enable”, the EMS will turn on the mismatch detection mode and if the user specifies “Disable”, the EMS will turn off the mismatch detection mode. The

value of “null” (0) is used for in-effect circuit orders to instruct the EMS to leave the mismatch detection mode in its current setting.

Provisioning of VC2 trails

From the Network Map, users can provision a two way unprotected VC-2 trail either in the “auto”, “manual” or “partial” mode. In the “auto” mode, the WaveStar NMS shall find a shortest route using the V2 channels from each of the links in the path. A VC-2 trail is always non-assignable since it does not have trail termination point on a SDH port nor has a PDH port corresponding to its rate. In the “manual” mode, the WaveStar NMS user shall be able to select each link from the VC-2 provisioning view of the Network Map that shows all VC-4 trail connectivities. Selecting any VC-4 trail connectivity link that contains one or more V2 channels, the user shall be able to bring up a display of the Facility Channel List screen showing only the V2 channels in the selected VC-4 trail connectivity link. The user shall be able to select one of the channels from the list. The selected V2 channel shall automatically get populated in the provisioning screen. In the “partial” mode, the WaveStar NMS user need to select only the VC-4 trails that are displayed in the Facility Channel List screen. The WaveStar NMS shall automatically pick an appropriate V2 channel in the selected VC-4 and populate it in the provisioning screen.

Provisioning of VC3 trails

From the Network Map, users can provision a two way unprotected VC-3 trail either in the “auto”, “manual” or “partial” mode. In the “auto” mode, the WaveStar NMS shall find a shortest route using the V3 channels from each of the links in the path. In the “manual” mode, the WaveStar NMS user shall be able to select each link from the VC-3 provisioning view of the Network Map that shows all VC-4 trail connectivities. Selecting any VC-4 trail connectivity link that contains one or more V3 channels, the user shall be able to bring up a display of the Facility Channel List screen showing only the V3 channels in the selected VC-4 trail connectivity link. The user shall be able to select one of the channels from the list. The selected V3 channel shall automatically get populated in the provisioning screen. In the “partial” mode, the WaveStar NMS user need to select only the VC-4 trails that are displayed in the Facility Channel List screen. The WaveStar NMS shall automatically pick an appropriate V3 channel in the selected VC-4 and populate it in the provisioning screen.

Specifying Path Trace Identifiers and Mismatch Detection Mode:
users can specify two Path Trace Identifiers (PTIs) for each VC-3 trail - one for A-Z direction and the other for Z-A direction. In the case of

one way trails, only the PTI for A-Z direction will be applicable. The PTIs can be either a specific string of upto 15 alphanumeric characters (case sensitive) or non-specific (system generated 0s or 1s). The WaveStar NMS user shall also be able to specify the Mismatch Detection Mode for each trail provisioning. The valid values for the Mismatch Detection Mode are “Enable”, “Disable” or “null” (\0). If the user specifies “Enable”, the EMS will turn on the mismatch detection mode and if the user specifies “Disable”, the EMS will turn off the mismatch detection mode. The value of “null” (\0) is used for in-effect circuit orders to instruct the EMS to leave the mismatch detection mode in its current setting.

Provisioning of VC12 trail

From the Network Map, users can provision a two way unprotected VC-12 trail either in the “auto”, “manual” or “partial” mode. In the “auto” mode, the WaveStar NMS shall find a shortest route using the V12 channels from each of the links in the path. In the “manual” mode, the WaveStar NMS user shall be able to select each link from the VC-12 provisioning view of the Network Map that shows all VC-4 trail connectivities. Selecting any VC-4 trail connectivity link that contains one or more V12 channels, the user shall be able to bring up a display of the Facility Channel List screen showing only the V12 channels in the selected VC-4 trail connectivity link. The user shall be able to select one of the channels from the list. The selected V12 channel shall automatically get populated in the provisioning screen. In the “partial” mode, the WaveStar NMS user need to select only the VC-4 trails that are displayed in the Facility Channel List screen. The WaveStar NMS shall automatically pick an appropriate V12 channel in the selected VC-4 and populate it in the provisioning screen.

Provisioning of VC11–TU12 trails

In some network elements, such as ADM 16/1, a DS-1 (1.5 Mb/s) port can also terminate an SDH trail that can get cross-connected at the VC-12 rate. The DS-1 signal first gets adapted to a VC-11 SDH signal and then mapped to a TU-12 tributary pay load. Those trails that terminate on the DS-1 port are specially designated as VC11-TU12 trails. The circuit type for these trails is VC11-TU12. For VC11-TU12 trails, the end ports can only be a DS1 (1.5 Mb/s) port.

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AU3-AU4 adaptation feature for the WaveStar BandWidth Manager

Overview This section describes the provisioning concepts associated with the AU3-AU4 adaptation feature for the WaveStar BandWidth Manager.

Purpose The AU3-AU4 adaptation feature maps a higher order VC3 payload (AU3) at the interface of a STM1E port to a lower order VC3 payload (TUG structured), which is multiplexed into a VC4 (AU4). A STM1E port can be provisioned to carry one AU4/VC4 or three AU3 (higher order VC3) signals, in which case the AU3-AU4 adaptation is not enabled, or it can be provisioned to enable the adaptation. If the adaptation is enabled, the STM1E signal at the (external) interface will represent 3 AU3 signals, and a single AU4 (VC4) signal structured to contain 3 TU3/VC3 signals will leave the port unit (internally in the BandWidth Manager) to interface with the switching structure of the BandWidth Manager. Although the AU3-AU4 adaptation can be enabled in one direction (ingress or egress), only bidirectional TU3-AU3 type trails are supported.

In the most common application of the feature, a DS3 is mapped into a lower order VC3 at one end of the trail (e.g. in Europe), which in turn is multiplexed into a VC4. The DS3 is extracted from a higher order VC3/AU3 (STS1) at the other end of the trail (e.g. in N. America). If the DS3 within the AU3 needs to be dropped at the same BandWidth Manager, or the AU3 needs to be multiplexed into a higher level optical signal (OC3 or higher) to be transported farther, an external loop-back can be employed at the BandWidth Manager.

The adaptation feature is supported as a provisionable option on STM1E ports only, on the BandWidth Manager's STM1E universal shelf. An STM-1 signal can be looped back at a BandWidth Manager, and the AU3 signals from the STM1E port can be dropped at DS3 ports or consolidated over higher level facilities after being cross-connected through the same BandWidth Manager as AU3 signals. Note that a loop-back is external to BandWidth Manager. It should be configured in advance as a digital link and inventoried in WaveStar NMS.

- Caveats** The following caveats apply to the provisioning of TU3-AU3 trails with WaveStar NMS:
- WaveStar NMS only supports bi-directional TU3-AU3 trails.
 - WaveStar NMS only supports the manual provisioning of TU3-AU3 trails.
 - WaveStar NMS supports a digital link at STM1 rate that terminates at STM1E ports on the same BandWidth Manager at both ends. This is referred to as an external loop-back (see Figure 2). The external loop-back type STM1 digital link shall be channelized for AU3 only (no VC4), and will be used to carry 3 TU3-AU3 type trails.
 - WaveStar NMS supports asymmetric VC4 trails, where at one end the VC4 trail terminates at a network element before being cross-connected (a VC3/TU3 is cross-connected and mapped/multiplexed into the VC4), and at the other end the VC4 trail terminates after being cross-connected (e.g., at the BandWidth Manager AU4-AU3 adaptation point).
 - WaveStar NMS supports merge and protection features for TU3-AU3 trails. Only a TU3 (VC3) or an AU3 can be merged at one end of a TU3-AU3. The resulting trail will be a TU3-AU3. The merge of a TU3 and an AU3 to get a TU3-AU3 is not supported. Also, the merge of two TU3-AU3 trails is not supported.
 - WaveStar NMS does not support preplan restoration for TU3-AU3 trails.

- Protection schemes** The following protection schemes associated with a TU3-AU3 are supported:
- Ring protection on a segment of a TU3-AU3 trail. For example, in Figure 3 the STM16 and/or OC12/STM4 can be ring configurations. (The STM16 ring actually would be associated with the VC4 trail.)
 - SNCP protection associated with the VC4 trail (if supported by STM1E). (Again, this would be a characteristics of the VC4 trail and not the TU3-AU3 trail.)
 - End-to-end protection (similar to SNCP at the ends). For example, Figure 3 can represent the “working” path, and a similar segment (e.g., between the TU3 X-conn and right-most AU3 X-conn) that contains another AU4-AU3 adaptation point - in another BWM - can represent the protection path.

Verifications When the user provisions a TU3-AU3 trail, WaveStar NMS verifies the following conditions and generates the appropriate error messages if the conditions are not met:

- A TU3-AU3 trail rides on a VC4/AU4 trail for part of the connection. If no such trail exists in the TU3-AU3 path selected (designed) by the user, WaveStar NMs shall generate an error message.
- Only one of the VC4 paths on which a TU3-AU3 trail rides must terminate at one end only at a STM1E port of a BandWidth Manager and be cross-connected at the VC4/AU4 level in the same BandWidth Manager. If the selected TU3-AU3 trail rides on one or more VC4 paths but none satisfies this condition, WaveStar NMS shall generate an same error message.
- The BandWidth Manager at which a VC4 path terminates and gets converted into three AU3s, must be of release 4.0 or beyond. Otherwise, an error message will appear.

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Work order record document concepts

Overview The Work Order Record Document (WORD) describes a customer service order or an network infrastructure/engineering order and includes the end-to-end design of the circuit associated with that order. The primary use of the WORD is for circuit installation, testing, and fault tracing by technicians in the field.

Logistics The WORD document will contain order-related data and circuit layout details. The WORD can be populated for any circuit ('circuit' here is used in a generic sense as a 'link' in PRM) including topological links (digital links and optical layer links), facilities, and customer circuits.



Section IV: Optical Layers

Overview

Purpose

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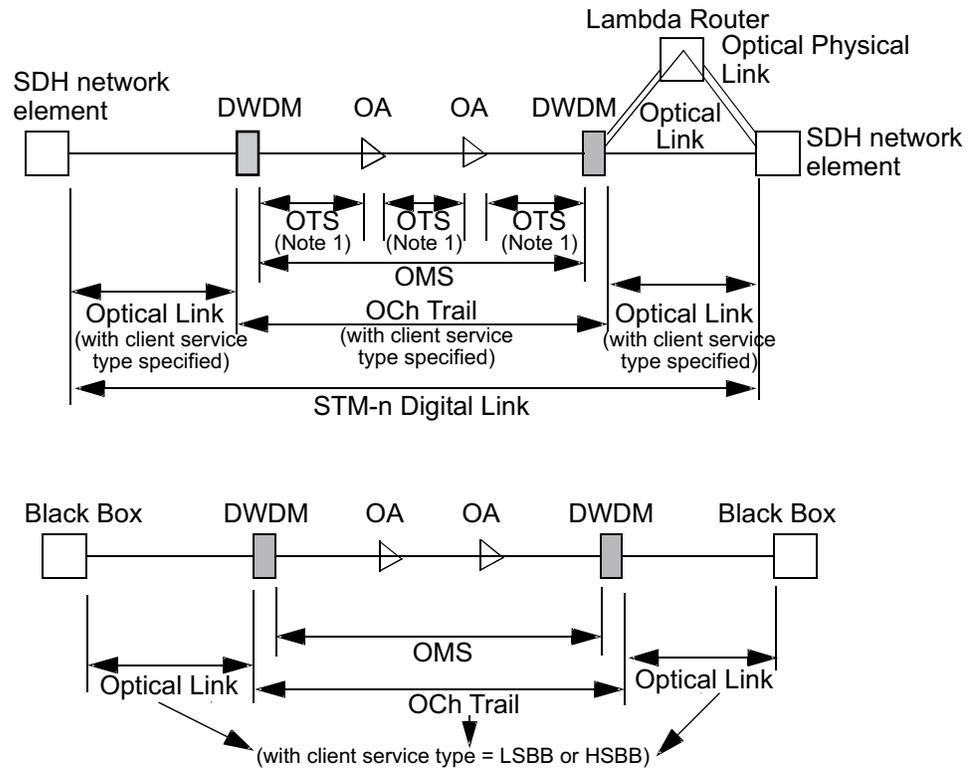


Application concepts

Overview This section describes the application concepts associated with optical layers.

Title The following figure shows the different hierarchy of optical layers for provisioning between DWDMs and SDH network elements or black boxes.

Figure 4-3 Hierarchy of Optical Layers



LEGEND:

- OTS - Optical Transmission Section (Note 1)
- OMS - Optical Multiplex Section
- OCh Trail - Optical Channel Trail
- Optical Link
- OA - Optical Amplifier
- DWDM - Dense Wave-Division Multiplexer
- SDH network element - SDH Network Element

Client Service Types for OCh Trails and Optical Links:

- STM-1
- STM-4
- STM-16
- STM-64
- Low Speed Broadband (LSBB)
- High Speed Broadband (HSBB)

□

Provisioning concepts

Overview This section describes the provisioning concepts associated with optical layers.

Terminology The following terms appear within this section.

Fixed connection: fixed connections are stored in the WaveStar NMS and used for provisioning. A fixed connection can be terminated by one or two point(s) of flexibility, the tributary side of a DWDM network element, a SDH network element or a black box. It can only be discovered. It is only visible in the 'trail/channel selection' screen. In this document, the fixed connection belongs to the OCh layer. However, it can be used at any level (VC-4, VC-12, ...) to help the provisioning process.

Paired Fixed Connection: a pair of two fixed connections that share some common channels.

OCH assignable port: an OCH assignable port terminates an OCH trail. OCH assignable ports are located either on the SDH network element, a non managed network element (Black Box/Equipment), or on the muxed port of a 10G mux card. The OCH assignable port can also be referred to as an OCH TTP.

OCH non assignable port: any intermediate port of an OCH connection.

OCH connection: an OCH connection is an end to end optical path.

OCH server: is an OCH that is used to carry other OCH connections instead of regular client types (DL, HSBB, etc.)

Point of flexibility: a port that belongs to a Lambda Router connected to a DWDM network element via a physical link.

Topological link: in the scope of the optical layer, the topological links are OMS and OL.

Provisioning order The following steps are required to provision the different layers in the Optical Layer. It is important to remember that to be able to use the Optical Layer for SDH layer provisioning, the physical connectivities between the Optical Network Elements must have been established prior to the provisioning of the optical layers from WaveStar NMS. Provisioning in WaveStar NMS is mainly to provide the inventory, display and correlation of alarms in the optical layer in addition to some validations by the EMS. The WaveStar NMS user provisions the Optical Multiplex Section (OMS) between two similar types of DWDM network elements specifying any Optical Amplifiers (OA) between them. The OMS provisioning is always treated in WaveStar NMS as a bidirectional section. If there are connectivities from the DWDM network elements to other SDH network elements or Black Boxes then the user provisions an Optical Link between them specifying “Client Service Type” (CST). Then the Optical Channel Trail is provisioned. When provisioning an Optical Channel Trail (OChTrail) the user is required to specify the client service type that the OCh trail will carry. The client service types are : V4DL, S4DL, S16DL, S64DL, OC-48, OC-192, LSBB (Low Speed Broadband) or HSBB (High Speed Broadband). If there are connectivities with SDH network elements or Black Boxes to DWDMs, the user can then provision the conventional SDH Digital Links between them. If the WaveStar NMS system finds connectivities of the two SDH ports through the optical layer, it will prompt the user to “insert Optical Layer” at the time of order completion of digital link.

OMS layer WaveStar NMS supports the provisioning of Optical Multiplex Section (OMS) between the optical line sides of two OLS400G or OLS80G DWDM network elements. The cut-through to SNMS-EMS Graphical User Interface for OLS400G and to ITM-SC for OLS80G for port selection and automatic population is provided. WaveStar NMS shall check for the same network element model type for both ends of the OMS section. For the point and click provisioning, the selection for “OMS” in the selection menu under “Configuration --> Optical Layer --> Add --> OMS” shall be enabled only if both the network elements selected are DWDM network elements of the same type (i.e. both OLS400G or both OLS80G).

The following table summarizes the interworking of DWDMs and their types/ releases for OMS provisioning.

A/Z End	Type/Rel. No.	Z/A End	Type/Rel. No.
OLS80G	End terminal or dual facing (Any release)	OLS80G	End terminal or dual facing (any release)
OLS400G (C-Band)	End terminal or ring or WAD terminal (Rel. 3.0/3.1)	OLS400G (C-Band)	End terminal or ring or WAD terminal (Rel. 3.0/3.1).
OLS400G (L-Band)	End terminal (R4.0)	OLS400G (L-Band)	End terminal (R4.0)
OLS400G (C-Band)	End terminal or ring or WAD (Type 1 and 2) terminal (Rel. 5.0 or 6.0)	OLS400G (C-Band)	End terminal or Ring or WAD (Type 1 and 2) Terminal (Rel. 5.0 or R6.0)
OLS400G (L-Band)	End terminal or ring terminal (R6.0)	OLS400G (L-Band)	End terminal or Ring terminal (R6.0)

Optical amplifiers: during provisioning of an OMS, users can add Optical Amplifiers similar to adding regenerators during digital link provisioning. The list of Optical Amplifiers that are available shall be displayed for the user to choose. The list of optical amplifiers shall contain only those that support the OMS section with the appropriate number of channels (16 or 40/80). For OMS Section between two OLS400G (C-band) DWDMs, only the C-band optical amplifiers shall be displayed for user selection. For OMS section between two OLS400G (L-band) DWDMs, only the L-band optical amplifiers shall be displayed for user selection. The order of Optical Amplifiers shall determine their sequence from left to right in the layout in the Optical Multiplex Section. It is assumed that the Optical Amplifiers are all bi-directional providing amplification of the optical signals in both directions of the fiber. As with regenerators in Digital Links, the user shall be allowed to add or delete Optical Amplifiers to the Optical Multiplex Section.

C+L band: the C+L Band OLS400G DWDMs provide more bandwidth (upto 160 wavelengths) over a single fiber. The output of C-Band and the L-Band OLS400G R6.0 DWDMs are fed in to a

CLSC (C and L band Separator and Combiner) unit that combines all the 160 wavelengths (80 from C-Band and 80 from L-Band) on a single fiber. This maximizes the output of each fiber in backbone and longhaul networks. When Repeater stations are needed in long haul applications, before each Repeater Station, the wavelengths have to be separated in to the C-band and L-band frequencies and fed in to their respective Optical Amplifiers and then re-combined for transmission again. The CLSC unit is a passive device that does not need any provisioning commands nor does it generate any alarm. However, when combining a L-band with a C-band system, a parameter has to be set in the C-band system that tells the C band system that it is working in conjunction with a L band system. This is required to adjust some power gain in the C band system. It is not expected that this parameter is set from WaveStar NMS. From SNMS and WaveStar NMS perspective, the C-band and L-band DWDMs are treated as two separate network elements. Therefore the OMS provisioning between C+L band DWDMs are treated as two separate OMS sections, one between two C-band DWDMs and the other between two L-band DWDMs with their own set of Optical Amplifiers (Regenerators). It is understood that in case of a fiber break between two C+L Band systems, WaveStar NMS will receive alarms from both C and L band DWDMs resulting in showing two OMS section failures even though in reality there is only one fiber break. The functionality of WaveStar NMS is not in any way affected by this behavior. It is the responsibility of the WaveStar NMS user to recognize this as a single failure for dispatching craft people to fix the problem.

Deleting an OMS: when the user tries to delete an OMS Section through a Delete Order, the request for deletion shall be denied if there is at least one OCh Trail (in-effect or pending) that is assigned to one of the OMS channels.

Optical link layer

The following section describes the provisioning of optical links between SDH network element or Black Box and DWDM network elements or between two DWDM network elements.

End nodes for optical link provisioning : a user can provision an optical link between: a SDH network element and a DWDM network element, a black box and a DWDM network element, two DWDM network elements (back to back OLS or in the case of OLS80G dual facing terminals or between ORS and an external DWDM network element) a SDH network element and a Lambda Router, a black box

and a Lambda Router, a Lambda Router and a DWDM network element, The WaveStar NMS shall check the model of the nodes that terminate the optical link. If the models are not correct, the provisioning request shall be rejected. The cut-through to the selected EMS graphical user interface for port selection and automatic population shall be provided.

Automatic creation of internal optical link in OLS400G through discovery: When an association exists between the output port of a n ORS (Optical Ring Switch) in a OLS400G (R6.0 onwards), that association is reported to WaveStar NMS as a link. WaveStar NMS shall create an optical link for this discovered link with a system generated ckt/trail ID and order number.

Behavior of NMS when an internal optical link is removed: if, after an internal optical link is created in WaveStar NMS with a ckt/trail ID and order number after a database synchronization, the optical link is detected to be absent from a subsequent dbsync procedure, the WaveStar NMS shall do the following: If there is no OCh trail provisioned on the internal optical link, the optical link shall be deleted from the system and all the associated records (alarm, PM, if any) shall be removed as per the existing system behavior. In addition, if the optical Fixed Connections are discovered with the internal optical link, those Fixed Connections shall be either removed or reconciled by the system. If an OCh trail is already provisioned on the internal optical link, this should be treated as improper disconnect and reported to the user. The improper disconnect notification shall be on the internal optical link.

'Client service type' in the Optical Link provisioning screen: when provisioning an optical link, depending of the end-node types, a WaveStar NMS user will have to populate a 'client service type' field in the provisioning screen. The 'client service type' will have to be populated only in the following cases: one end-node of the optical link is a black box and the other end-node is a lambda router one end-node of the optical link is a black box and the other end-node is a DWDM network element without OTU one end-node of the optical link is a lambda router and the other end-node is a DWDM network element without OTU In other words, the "Client Service Type" field shall be enabled only when both end nodes of the Optical Link are not SDH network elements. In the other cases, the 'client service type' in the optical link provisioning screen shall be disabled and

automatically populated by the system internally without explicit user input.

Optical channel connection (trail) provisioning

This section covers the handling and provisioning of OCh connections with WaveStar NMS.

An OCh trail is defined as an optical connection that is either assignable to a digital link or non-assignable. The OCh trail are of two types. The first type is an OCh trail (assignable OCh trail) that terminates on an SDH/SONET network element or a Black Box at either end in its layout (i.e. does not terminate in a Lambda Router with a cross-connect or in a DWDM network element). The second type of OCh trail (non-assignable) does not fall in to the above category of assignable OCh trail but may have a termination in a Lambda Router having a cross-connect in it.

Preplan for optical trails: WaveStar NMS provides the capability to restore/reinstate an OCh channel trail if the following conditions are met: the service path and the preplan path have the same channel type/client service type, the service path and the preplan path have different OCh trail and ride on different OMS. the service path OCh channel trail and the preplan path OCh channel trail have the same end port. The user shall be able to choose provisioning the protection OCh channel trail (i.e. the preplan path) using either through another DWDM or the same DWDM but with different OMS (only if the DWDM supports more than one set with the same wavelength). If the protection OCh channel trail runs across another DWDM, it is client of on another OMS. Note: 1) For protected service path (e.g. involving DWDM equipped with ORS), both the working and protection segments of the service OCh channel trail are using the same OMS (i.e. one fixed OCh). The preplan path can not use the same OCh trail with the service path regardless it is protected or unprotected path. 2) The cross connect between the service and preplan path for optical trail must be done via the same LambdaRouter.

WaveStar NMS shall allow the user to discover fixed connection between the following network elements:

A-end	Z-end	Preconditions
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SDH network element/black box	SDH network element/black box	At least 2 DWDM network elements between A-end and Z-end. No Lambda router between A-end and Z-end.
DWDM network element (tributary side)	DWDM network element (tributary side)	A-end different from Z-end.
Lambda router (point of flexibility)	Lambda router (point of flexibility)	A-end different from Z-end At least 2 DWDM network elements between A-end and Z-end.
Lambda router (point of flexibility)	DWDM network element	At least 1 DWDM network element between A-end and Z-end No Lambda router between A-end and Z-end
Lambda router (point of flexibility)	SDH network element/black box	At least two DWDM network elements between A-end and Z-end. No Lambda router between A-end and Z-end.



Section V: Subnets

Overview

Purpose This chapter describes subnets as they relate to WaveStar NMS provisioning.

Contents

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General provisioning concepts

Overview Subnets are groups of interconnected facilities or network elements forming a closed ring that provide service protection for WaveStar NMS if one of the facilities or network elements fail. With ring protection, there is a loss of efficiency in the utilization of facilities because bandwidth must be reserved in the protection facility to provide service restoration.

WaveStar NMS supports two broad categories of rings:

- path-switched rings (PSRs)
- line-switched rings (LSRs)

WaveStar NMS supports the following ring and ring protection features:

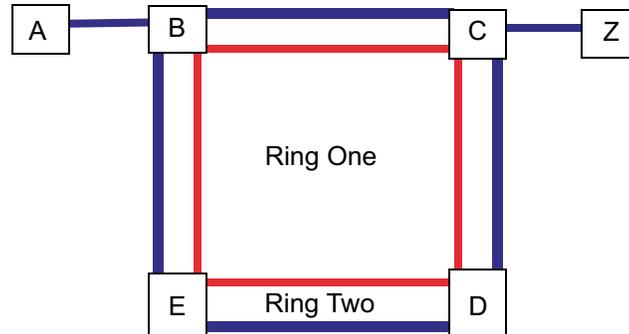
- 2- and 4-fiber PSRs and LSRs.
- The creation of line-switched rings containing two different network elements, specifically ADM16/1 and TDM10G (ADM64/4) network elements
- Allowing a single network element to belong to multiple rings. A network element that belongs to more than one ring is referred to as a multi-homed node or shared node
 - ADM16/1, ADM16/4, ADM4/1, WaveStar AM 1, LXC16/1, and LXC4/1 can be part of multiple path-switched rings.
 - WaveStar BandWidth Manager can be part of multiple line-switched rings.
- Manual ring creation of path-switched rings
- WaveStar BandWidth Manager four-fiber line switched rings (MS-SPRING)

Note: An aggregate is not automatically created when WaveStar NMS creates or discovers a ring.

Ring examples The following are examples of ways in which users can create rings.

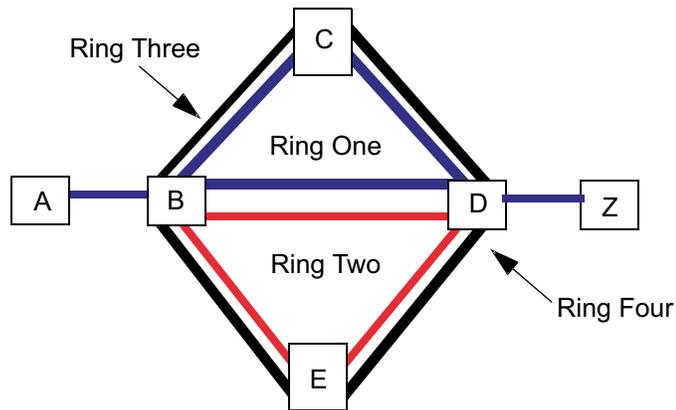
Two path switched rings sharing all nodes

The below figure illustrates two path-switched rings sharing all nodes.



Four rings formed by four nodes

The below figure shows four rings formed using the same four network elements.



- 2-fiber rings** Two-fiber MSSPRING requires only two fibers for each span of the ring. For each network element in the ring, one fiber is designated as the “East” fiber and the other as the “West” fiber. On each fiber half the channels are defined as working and the other half as protection channels. In other words, the first half of the channels in the STM-N/OC-N (channels 1 to N/2) carry protected traffic whereas the second half (channels N/2 +1 to N) provide protection. The protection channels can carry pre-emptible traffic. The traffic carried on the working (protected) channels in one fiber (“East/West”) are protected by the protection channels travelling in the opposite direction (“West/East”) of the ring.
- 4-fiber rings** 4-Fiber Ring Note that as opposed to a 2-F ring, protection in a 4-F ring is provided for the entire capacity of the link.



Subnet creation

Overview This section discusses WaveStar NMS support for both automatic and manual subnet creation.

Automatic creation WaveStar NMS can automatically create two-fiber or four-fiber rings if the following conditions are met:

Refer to Chapter 3 of this guide for information on creating and deleting rings.

1. Connectivity is established between two or more network elements.
2. The protection group of all the network elements in the group is MSSPRING.
3. Rings must consist of the same network element type. Exceptions are:
 - TDM10G
 - ADM4/1
 - ADM155E

Manual creation Manual ring creation is supported for line switched rings, path-switched rings, and homogenous black box rings (rings comprising of all black boxes).

Refer to Chapter 3 of this guide for information on creating and deleting rings.

For manual ring creation and deletion, WaveStar NMS provides the following features:

- Support of heterogeneous, homogenous and multi-homed (shared) network elements
- Selection of multiple STM-N links
- Exclusion and deselecting of STM-N links
- Automatic ring name creation
- Creation and deletion notification
- Ring manipulation

Prerequisites for Manual Creation

Before attempting to manually create a ring, be sure the following prerequisites are met:

- All nodes participating in a path switched ring have SNC/N or SNC/I capability.
- With a line switched ring, at least one black box is present and the all other network elements selected to participate in the line switched ring have line switched ring capability and would automatically create such a ring in the absence of the participating black boxes.
- A minimum of two network element or black boxes are selected for creating the ring. Note that a selection can be either explicit or implicit. For example, the selection of an STM-N link implicitly selects two network elements.
- The STM-N links connecting the participating nodes form a closed loop. If the ring to be created is an line switched ring, the protection group (if applicable) shall be identical on all nodes.
- The STM-N links forming the closed loop are of the same level (they are either all STM-1, STM-4, STM-16 or STM-64).
- The ring to be created does not already exist.
- The maximum number of nodes that can be part of a manually created path switched ring is limited only by system resources.
- You can manually delete a created path-switched ring only if there are no protected paths through it (that is, the path-switched ring does not provide protection to any path).

Within the context of WaveStar NMS, automatic ring creation is not supported for Black boxes. That is, a homogenous ring comprising of only Black boxes is not supported. Therefore, the only way a Black box can be part of a ring is if the ring is manually created. For the purpose of this section a ring (either PSR or LSR) is uniquely identified by the STM-N/OC-N link closing the loop plus all the participating network elements as well as Black boxes. Therefore, an STM-1 PSR made up of network elements A, B and C is different from an STM-16 PSR made up of the same network elements A, B and C. Any ring-forming network element that belongs to more than one ring is referred to as "shared node". In this document, the word "Node" refers to either a network element or a Black box. Here after, the word "ring" implies either a PSR or an LSR ring unless otherwise

qualified. Black boxes can be part of a ring, be it PSR or LSR. If a black box is in any ring, it is assumed that the black box supports the ring capability of the specific ring it belongs to. Ensuring capability of the black box is the WaveStar NMS user's responsibility. Black boxes are included in the inventorying of the number of nodes in a ring. For example, if a ring contains three black boxes and four network elements, the total number of nodes in the ring is counted as seven.

Prerequisites: The system shall ensure that the following conditions are met for manual ring forming:

- All Network Elements selected to participate in a PSR have SNC/N or SNC/I capability. On the other hand, if the ring to be created is a 2- or 4-fiber LSR then all network element's selected to participate in the 2- or 4-fiber LSR have 2- or 4-fiber LSR forming capability respectively. (The system is not required to verify Black box capabilities.)
- In the case of an LSR manual ring creation, at least one Black box is present and all other network elements selected to participate in the LSR (2- or 4-fiber) have LSR capability and would have automatically created an LSR in the absence of the participating Black boxes.
- At a minimum two nodes have been identified/selected for creating the ring. (Note that the selection of nodes can be either explicit or implicit. For example, selection of an STM-N/OC-N link implicitly selects two nodes.)
- The STM-N/OC-N links connecting the participating nodes form a closed loop. If the ring to be created is an LSR, the protection group (if applicable) shall be identical on all nodes.
- The STM-N/OC-N links forming the closed loop are of the same level (i.e. they are either all STM-1, STM-4, STM-16, or STM-64, OC-3, OC-12, OC-48 or OC-192).
- If the ring to be formed is a PSR, then the STM-N/OC-N forming the loop are not members of 1+1 MSP, 1X1MPS, 2-F or 4-F group.
- The ring to be created does not already exist.
- All nodes selected to participate in the desired ring are not all Black boxes. That is, the manually created ring shall not comprise of all Black boxes.

WaveStar NMS supports the forming of path switched rings for the following SDH network element at the specified STM-N rate when the manual ring forming criteria are met:

Network Element	Rate
ISM-1	STM-1
ISM-4	STM-4
PHASE ADM-16/4	STM-16
PHASE ADM-4/4	STM-4
ADM155E	STM-1
WaveStar ADM4/1STM1	STM-1
WaveStar ADM4/1STM4	STM-4
WaveStar AM1	STM-1
WaveStar AM1 + STM1	STM-1
WaveStar AM1 + STM4	STM-4
ADM 16/1 (SNCP model)	STM-1, STM-4, STM-16
ADM16/1 Compact (SNCP model)	STM-1, STM-16
TDM10G	STM-1, STM-4, STM-16, STM-64
BWM	STM-1, STM-4, STM-16, STM-64

Size Limits: there is no requirement imposing a limit on the maximum number of nodes that can be part of a manually created PSR as long as the system resources permit. However, the system shall be able to support the participation of up to sixty-five (65) nodes within a manually created PSR ring. See subsequent requirements. In the case of LSR, however, the maximum number of nodes can not exceed sixteen.

□

Line-switched rings

Overview This section discusses line-switched rings (LSR). With line switched rings, each network element recognizes all of the other network elements in the ring. Line-switched rings use one of two protocols, the standard protocol (G841) or the transoceanic protocol (TOP). Line-switched rings can be either two-fiber or four-fiber.

Advantages Line-switched rings offer users a few advantages in relation to protection and traffic management.

- Extra, unprotected traffic can be provisioned on the protection path. However, in the event of a failure, the unprotected traffic is preempted to make the channels available for line-switched protected channels.
- MS-SPRING (multiplexed-shared protocol ring) protection provides protection for two-fiber or four-fiber line-switched rings. While MS-SPRING protection is available for both two-fiber and four-fiber rings, it is assigned in a different method for these two ring types.
- Extra, unprotected traffic can be provisioned on the protection path. However, in the event of a failure in the ring, the unprotected traffic is preempted to make the channels available for line-switched protected channels.
- Automatic ring protection. When assigning channels in the ring for a path that is to be protected, you must assign the same channel all around the ring for the service traffic. If you use point and click provisioning and select ring protection, the processor will do this automatically.

Scenarios The following figures illustrate the conditions of a line switched ring before and after a line failure.

Before a Failure

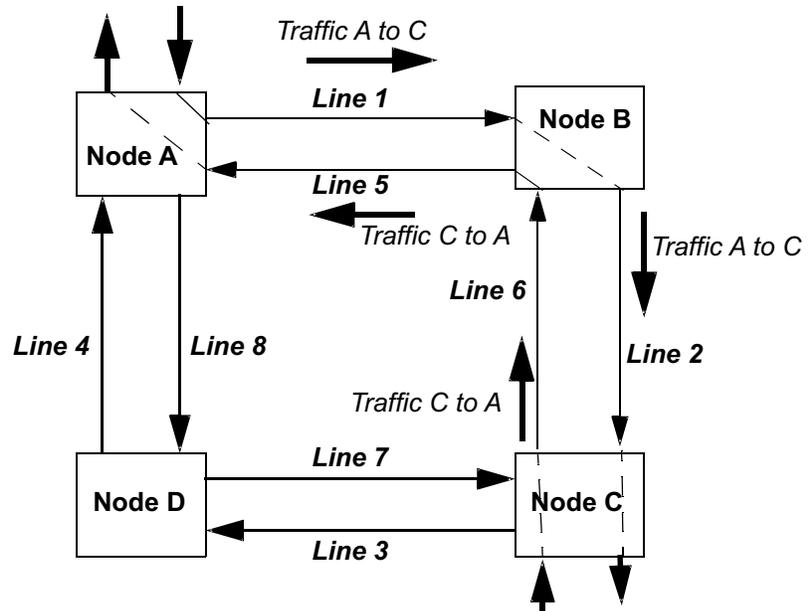
The first figure displays a two fiber line switched ring consisting of network elements and STM-16 digital links *before the failure*.

The current condition of this ring is

- The path of working traffic, transmitting from Node A to Node C, traverses lines 1 and 2.

- The path of working traffic, transmitting from Node C to Node A, traverses lines 6 and 5.

Figure 4-4 A Line Switched Ring Before Failure



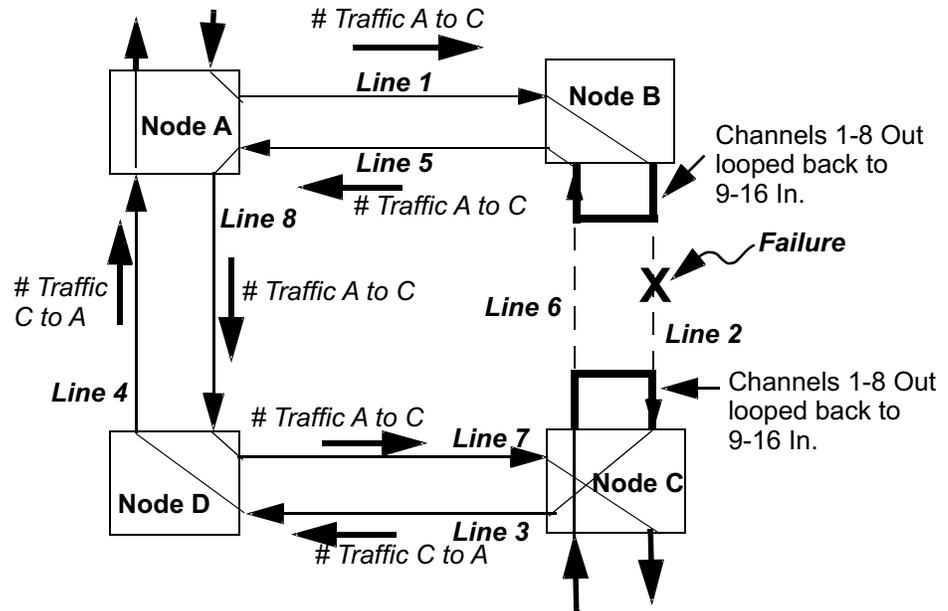
After a Failure

This figure displays the same two-fiber, STM-16 line switched ring *after* line 2 has failed. The current conditions of this ring, as a result of the line 2 failure, are

- Node B loops back channels 1-8 out towards Node C back to 9-16.
- Node C loops back channels 1-8 out towards Node B back to 9-16.
- The path of working traffic from Node A to Node C:
 - Traverses line 1 using channels 1-8
 - Loops back at the output of Node B to Node C 1-8 out to 9-16 In.
 - Traverses lines 5, 8 and 7 using channels 9-16 to reach Node C

- The path of working traffic transmitting from Node C to Node A:
 - Loops back at the output of Node C to Node B 1-8 out to 9-16 In
 - Traverses lines 3 and 4 using channels 9-16 to reach Node A.
- If line 6 also fails, nothing changes.

Figure 4-5 A Line Switched Ring After a Failure



Two-fiber rings

With a two-fiber line-switched ring (MS-SPRING), one fiber transmits and the other receives. Both transmission directions of the bidirectional connection travel through the ring in opposite directions. If the working transmit path at a given network element is clockwise, then the working receive path is *counterclockwise* and vice versa.

For protection against faults, each fiber's channels are split. The first, or top half, fibers are assigned as service paths while the second, or lower half, fibers are assigned as protection paths. Thus, the protection channels and service channels are not on the same fiber.

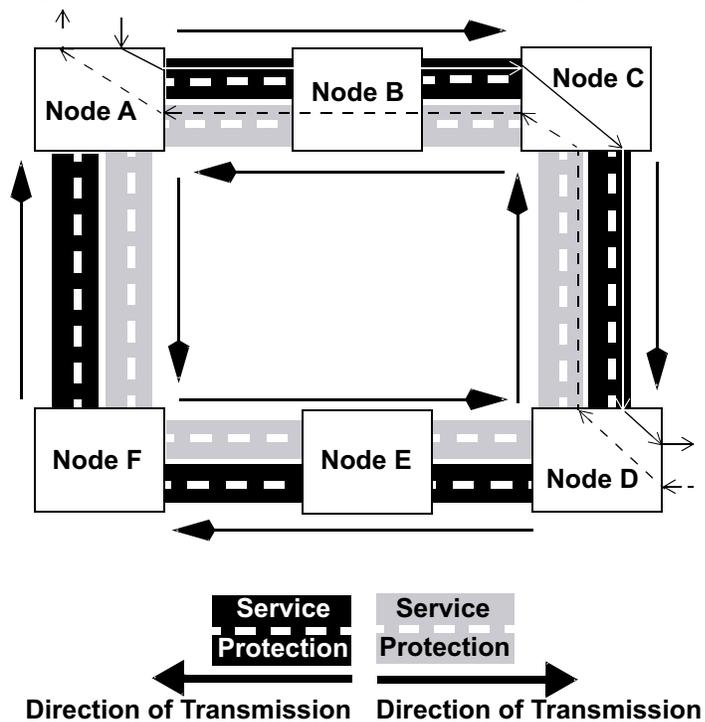
In a two-fiber ring consisting of STM-16 digital links, for example, the first fiber has channels 1-8 assigned as the service path; the second digital link meanwhile has channels 9-16 assigned as the protection path for the first fiber's 8 channels (channels 1-8).

Traffic Flow

The following figure shows the traffic flow on a two-fiber ring with MS-SPRING protection. With this figure, note that:

- The path of working traffic transmitting from Node A to Node D traverses both fibers on the service path.
- The path of protection traffic transmitting from Node D to Node A traverses both fibers on the protection path.

Figure 4-6 Two-Fiber Line Switched Ring

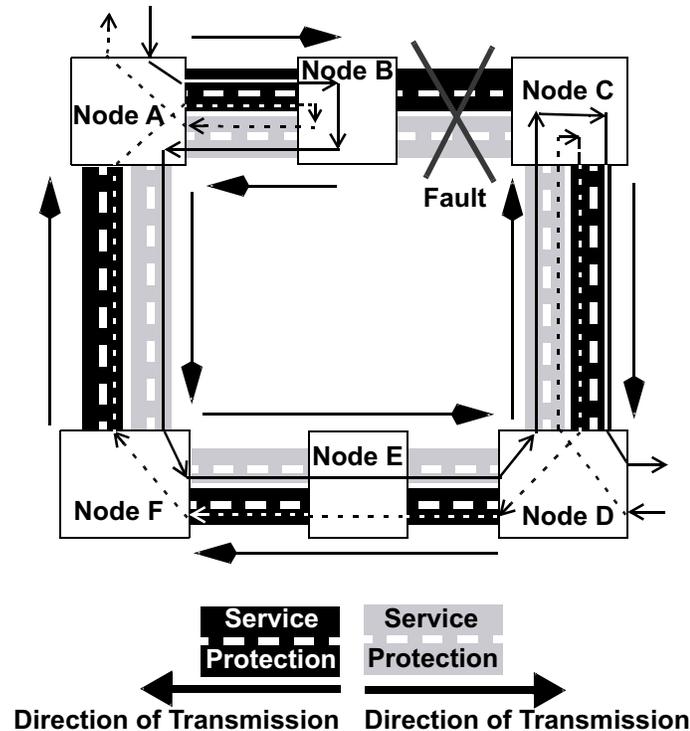


Example of a fault

The following figure shows that a fault has occurred in the paths from Node B to Node C. Note how the traffic is re-routed to bypass the

fault so that the traffic still emerges from the destination node from the expected port.

Figure 4-7 Two-Fiber Line Switched Ring with Fault



Four-fiber rings

Four-fiber rings are similar to two-fiber rings in function in that they possess transmit and receive lines. With a four-fiber ring, however, there are two pairs of transmit and receive lines on each node rather than a single pair.

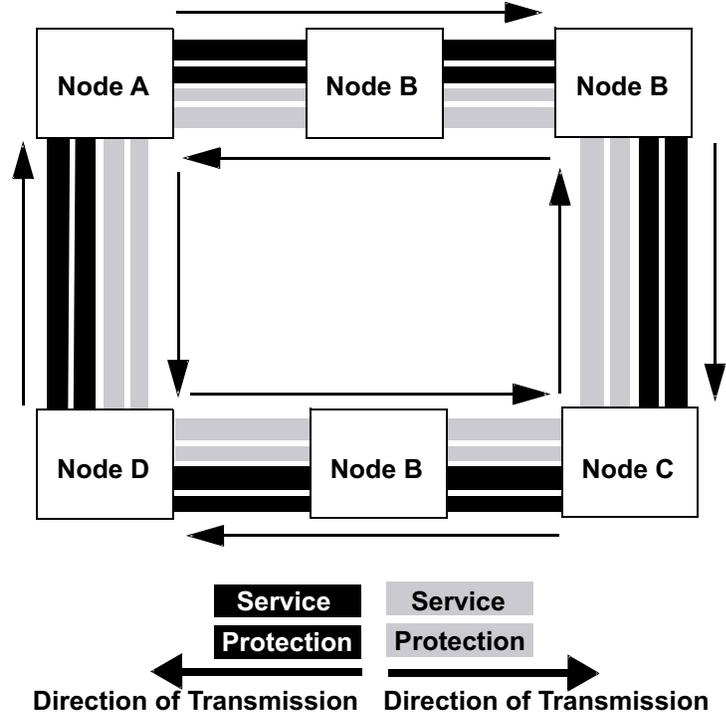
Also, the creation of a four-fiber ring is slightly different from that of a two-fiber ring in that the protection for the digital links have to be individually provisioned. It is required that the protection digital links (STM-16 or STM-64) be provisioned between the WaveStar BandWidth Manager prior to the provisioning of the working (protected) digital links (STM-16 or STM-64) in creating a four-fiber ring.

MS-SPRING protection on a four-fiber rings consists of dedicated fibers for protection and service. In a four fiber MS-SPRING ring, two fibers are dedicated for service and two digital links are dedicated for protection.

Traffic Flow

The following figure shows the traffic flow on a four-fiber ring.

Figure 4-8 Four-Fiber Ring Line Switched Ring



LSR forming network elements

The system shall form line switched rings using the following SDH network elements at the STM-N level specified when the LSR pre-requisites are met.

Network Elements	Rate	Fiber
ADM16/1 (MSSPring Model)	STM-16	2 fiber
ADM16/1 Compact (MSSPring Model)	STM-16	2 fiber
SLM16	STM-16	2 fiber
BWM	STM-16, STM-64	2 and 4 fiber
TDM10G	STM-16, STM-64	2 fiber

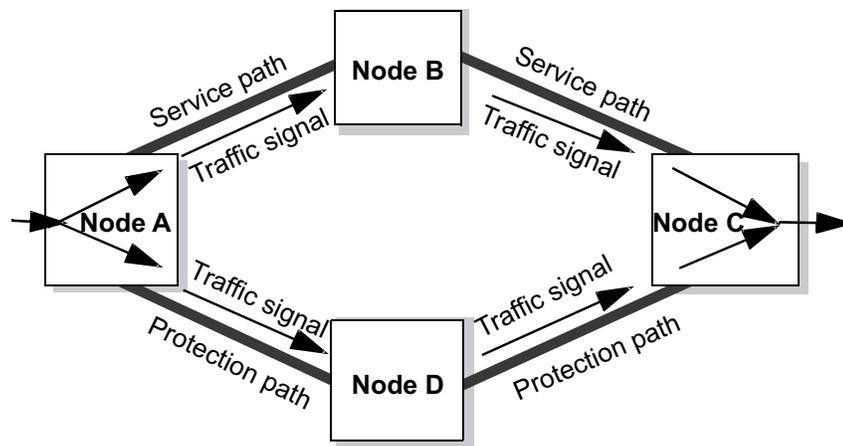
□

Path-switched rings

Overview This section discusses path-switched rings.

Figure The following figure depicts a path-switched ring. In it, the traffic signal is duplicated as it enters the ring (node A) and is sent out over both the service and protection paths. Both signals are analyzed and compared at the end ring destination (Node C). The stronger traffic signal is sent on to the next destination (out of the ring).

Figure 4-9 Path-Switched Ring



Prerequisites for Automatically Forming An SDH PSR

The system shall use the following criteria to automatically form a Path Switched Ring (PSR): a. An STM-N loop is closed. b. The loop forming STM-N digital links are of the same level. That is, the value of N (N = 1, 4, 16) in the STM-N's are identical. c. None of the loop forming STM-N are in 1+1 MSP, 1X1 MSP, 2-F, 4-F protection group. d. The connected network elements have Sub-network Connection Protection (SNCP) capability using the loop closing STM-N links. e. All the network elements in the loop can inter-work in an SNCP capacity within the context of WaveStar NMS.

Automatic PSR forming network elements

The system shall automatically form a path switched ring for the following network element at the specified STM-N rate when the PRS forming criteria are met. Only the add/drop multiplexer model of a given network element can form a PSR ring.

This table lists automatic PSR forming network elements.

Network Element	Rate
ISM-1	STM-1
ISM-4	STM-4
PHASE ADM-16/4	STM-16
PHASE ADM-4/4	STM-4
ADM155E	STM-1
WaveStar ADM4/1STM1	STM-1
ADM155E and WaveStar ADM4/1STM1	STM-1
WaveStar ADM4/1STM4	STM-4
WaveStar AM1	STM-1
WaveStar AM1+STM1	STM-1
WaveStar AM1+STM4	STM-4

Mix of network elements in automatic PSR forming

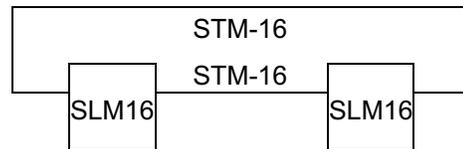
The system shall allow automatic ring forming comprising of ADM155E and WS ADM4/1STM1 at STM-1 rate when the PSR forming criteria are met.



Synchronous line multiplexer rings

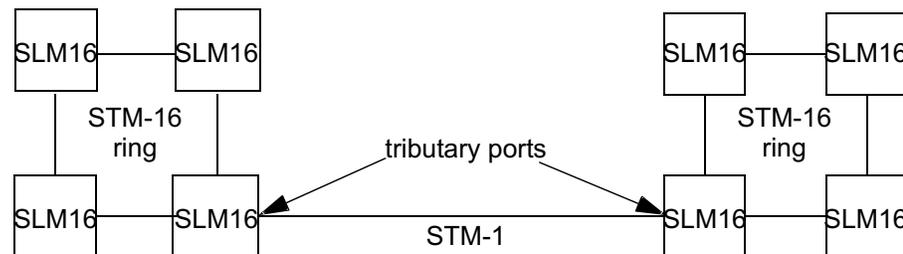
Overview This section describes Synchronous Line Multiplexer (SLM) rings. The following figure shows an SLM ring.

Figure 4-10 SLM-2000 Ring



SLM rings can be interconnected by using tributary ports. The following figure shows two SLM rings at the STM16 rate interconnected at the STM-1 rate by interconnecting their tributary ports.

Figure 4-11 SLM Rings with Interconnecting Tributary Ports



Line switching For line switching, SLM-2000 rings support the following features:

- Only channels 1-8 (VC-4 Paths) of the STM-16 lines will be assigned working traffic.
- Channels 9-16 (VC-4 Paths) are reserved for protection traffic.
- Channels 9 through 16 (VC-4 Paths), the reserved channels, are not assigned to protect any particular working channels. Thus, there is only one layout, the working circuit, and no protection layout used in line switched protection.
- Each line contains half working traffic and the other half is reserved for protection channels.
- WaveStar NMS establishes, deletes, or views SLM-2000 rings.

□

Protection protocol

Overview This section describes the protection protocols with rings. LSR ring protection protocol be either standard or Transoceanic Protocol (TOP). Ring protection protocol can not be set from WaveStar NMS. It can, however, be retrieved from the Element Management System (EMS). Upon request, the system shall display the ring protection protocol as reported to it by the EMS.

TOP protection The transoceanic protection protocol is used for very long path (when the distances between network elements are greater than 1500 km.) in which a purely multiplex section shared protection scheme results in signal delay and degradation. The delay and degradation are results of the added path owing to the fact that the switching in MSSPRING is not done right at either the source or the destination of the working traffic. In a transoceanic application, the ring switching at a network element is augmented such that the bridging from the working channels to the protections channels is performed at the source network element in the event of a failure. In current release, line switched rings formed by some network elements supports transoceanic protocol. Since rings formed by these network elements are self-discovering, other than provisioning the links between the network elements, the network manager (WaveStar NMS) need not explicitly configure the protection protocol. Therefore, no protection protocol setting by is necessary. The only requirement on WaveStar NMS is that it recognizes the protocol as reported to it by the EMS.

□

Subnet deletion

Overview This section describes subnet deletion.

Considerations **Digital Link Disconnect Criterion (Both PSR & LSR):** WaveStar NMS allows the disconnection of a digital even if the digital link is part of a ring loop as long as the ring is not providing any protection.

Effect of Digital Link Disconnect: WaveStar NMS deletes a ring if the disconnection results in the disconnection of digital link that is part of a ring forming loop.

Effect of Ring Deletion on Ring Name: if a ring is deleted, the system shall remove the ring name from the list of ring names.



Section VI: Preplan Restoration

Overview

Purpose Restoration is the process for WaveStar NMS users to reroute traffic temporarily in order to restore service in case of a network failure. WaveStar NMS manages restoration through two features: automatic protection switching and preplan restoration. This section focuses on preplan restoration.

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How WaveStar NMS manages restoration

Overview This section describes how WaveStar NMS manages restoration. In the event of a network failure, WaveStar NMS can restore service to an alternative link or path that has been reserved for restoration purposes. WaveStar NMS manages service recovery with two features:

- Automatic protection switching
- Preplan restoration

Automatic protection switching Automatic protection switching restores service to a disrupted circuit by switching the traffic to a dedicated protection route. It is triggered by an alarm and allows for only one-stage restoration. This restoration feature does not require user intervention.

Automatic protection switching requires dedicated spare capacity to be set up when service is provisioned. Mechanisms for automatic protection switching include: MSP, MS-SPRing, PSR, 1+1 SNC/P, and Y-protection. The mechanism is selected during service provisioning, depending upon the capability of a network element. In the case of failure, detected by the network element supporting the mechanism, a protection path will be selected and routed by the network element automatically.

Preplan Restoration Preplan Restoration allows users to create dedicated backups for service paths and circuits. Disrupted circuit can then be temporarily rerouted on an alternate route to restore service. The restoration process can be triggered manually or automatically by an alarm. Once the alarm situation is resolved, the restored circuit is reinstated to its original route.

Preplan restoration works best where:

1. One portion of the service circuit is within control of WaveStar NMS while the other end is outside the WaveStar NMS control and on the end customers premise
2. Customers have mixed network elements in their network
3. Restoration paths are “off-network” and must be defined by the customer.
4. Ring protection not provided in the network element.

5. Fiber cut between rings
6. More efficient usage of spare capacity is desired

Customers can use preplan restoration to establish specific predefined path(s) according to their network preference. In the event of a failure, the service will be restored to one of the predefined paths. The spare capacity is only used at the time of restoration and can be shared among different preplans for different failure scenarios.

WaveStar-NMS supports preplan restoration of all the circuit rates that are allowed under normal service provisioning below the digital link level. However, only two-way circuit types can be protected by preplan restoration. The one-way and the broadcast circuits cannot have preplan. Normally, a preplan path protects a service path with identical circuit type, including “One Step” provisioned circuits, except for FLAG application. The service facility/circuit to be protected must be in the “In-Effect” (IE) state in the network before preplan association can be invoked. One stage or three stages restoration/reinstatement process can be allowed if appropriately supported by network element/EMS.

□

Aspects of preplan restoration

Overview This section discusses the three aspects of Preplan Restoration:

- **Restoration:** a disrupted circuit is temporarily rerouted to an alternate route to restore service.
- **Reinstatement:** a restored circuit is returned to its original route.
- **Preemption:** a higher priority circuit is restored even if there is a lower or equal priority circuit already using the channel. In such a case, the lower priority circuit is disconnected and the higher priority circuit is restored. The system administrator has the option of turning preemption on or off for restoration.

Restoration Restoration is when a disrupted circuit is temporarily rerouted to an alternate route in order to restore service. The process of restoring the failed facility involves moving each affected circuit over to the preplanned route. The graphical layout for each moved circuit is updated with the new port address information.

Soft Restoration

With soft restoration, also referred to as *bridge and roll*, a *bridge* is first established and then traffic is rerouted from service to the preplan. Once the traffic is rerouted, the bridge is disconnected. Although traffic is uninterrupted, soft restoration is much slower as compared to hard restoration. Normally, WaveStar NMS shall support soft restoration/reinstatement for protected path. The exception is when cross connection performed between the protection segment of a protected path and another path (either from service to preplan path or from preplan to service path) within the same network element node, where the involving network elements support bridge and roll capabilities, WaveStar NMS shall not allow preplan soft restoration/reinstatement (bridge and roll) for protected path. Hard restoration/reinstatement (default) shall be available for restoration/reinstatement of all unprotected and protected paths.

Figure 1: With the A node and Z node supporting bridge and roll capabilities, soft restoration/reinstatement can not be applied in this scenario because either the A node or the Z node has protection segment of a protected service path and unprotected preplan path. No soft restoration/reinstatement shall be allowed for cross connection between the protection segment of a protected service path and preplan (either protected or unprotected) path from the same network

element node. Hard restoration to preplan or reinstatement to service path must be used.

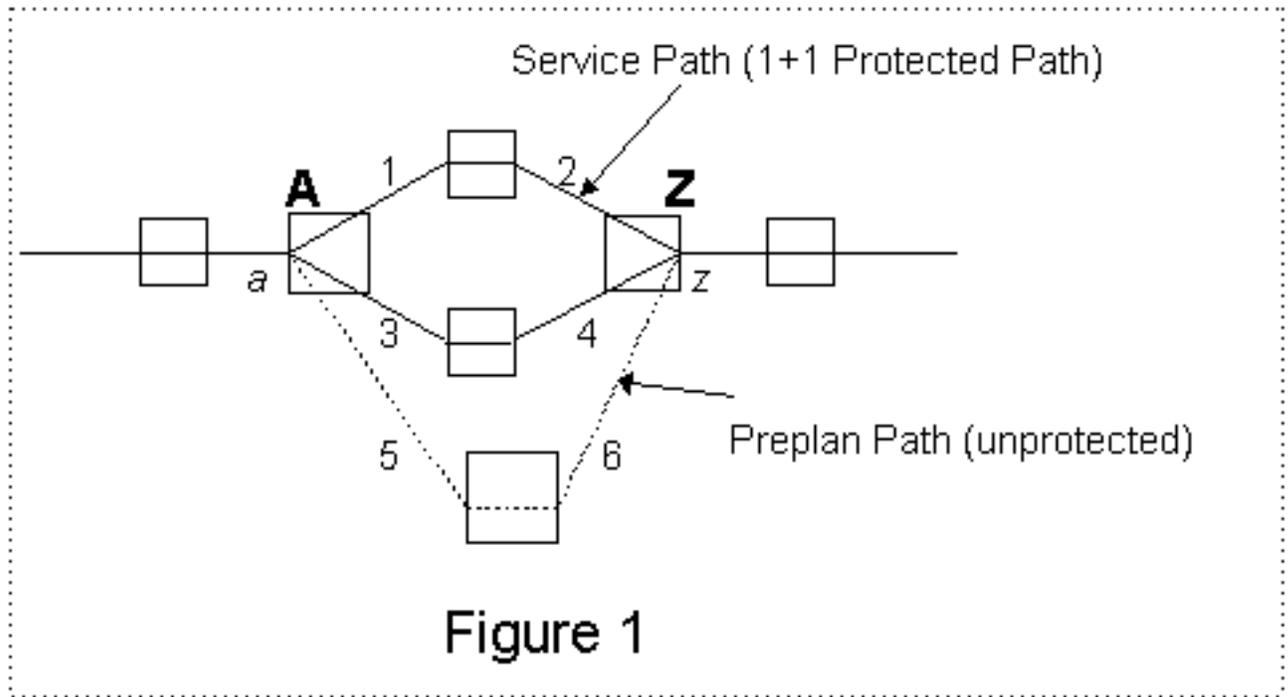
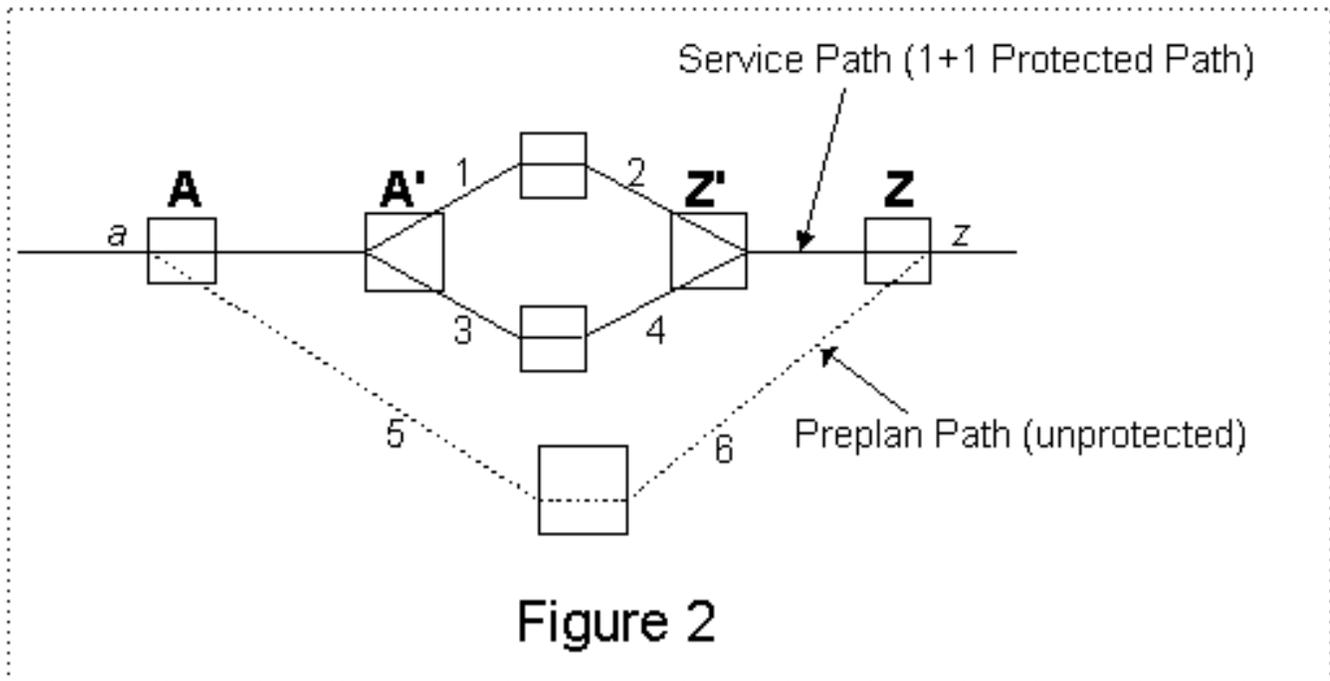


Figure 2: With the A node and Z node supporting bridge and roll capabilities, soft restoration/reinstatement can be applied in this scenario because either the A node or the Z node does not cross

connect traffic from the protection segment of a protected path to the preplan path (5-6). Hard restoration/reinstatement can also be used.



Hard restoration

With hard restoration, a network service is first disconnected on the service path, a switch is made to the preplan and then the service is connected on the preplan path. Traffic is temporarily interrupted in a hard restoration.

Triggers

A preplan form's preference and priority fields determine whether restoration is triggered.

- **Automatic** - if a service circuit is protected by multiple preplans, the preplan selection criteria is based on the highest preference level as well as the alarm status of the preplan. If the selected preplans based on the preference level have alarms or in-effect circuits on their channels, the preplan shall not be used for restoration and the next highest preference level available preplan will be tried.
- **Manual** - if a restoration fails, the user will go to the Preplan Pairs, PrePlan Plan, or Preplan Group form to execute restoration for the selected facility/circuit.

Tracking status of restoration orders

Users can track the status of restoration orders by using the Preplan Pairs form.

Hard and soft restoration for the Lambda Router

Users can choose to use either hard (default) or soft restoration for Lambda Router models 256/128 that support 1+1 SNCP protection. WaveStar NMS can support both hard and soft restoration using modify SNC operation for Lambda Routers (in lieu of bridge and roll).

Reinstatement Reinstatement is the process whereby a restored circuit is returned to its original route. Once a failure has been repaired, a reinstatement may be initiated which would move circuits from the restoration path back to the original service path.

Enabling reinstatement

Users can activate the reinstatement process from the Preplan Pairs form. From that form, users need to specify the facility to be reinstated and then select the reinstate action from the Actions pull-down menu.

Preemption Preemption is used to restore a higher-priority circuit to a circuit that is being currently used by lower or equal priority traffic.

How it works

If preemption is turned on and a facility/circuit is needed for restoration, a dialogue box appears, during restoration indicating the

preemption target (CKT/Trail ID), and requests user confirmation. After user confirmation, the lower-priority circuit on the channel is disconnected and the higher priority circuit is restored. To maximize restoration speed, WaveStar NMS does not check whether the preemption target has another preplan.

After preemption is completed, the preplan that caused the preemption must be manually re-triggered to complete the restoration process. A preemption report is available to keep track of all the preempted circuits.

Constraints

The following constraints apply to preemption:

- Preemption is not allowed on circuits carrying lower order in-effect traffic (such as a VC-4 carrying a VC-12).
- If any preplan circuit in a preplan plan (or preplan group) requires preemption, the system displays a message for that particular preplan and awaits confirmation. Preemption must be confirmed before the system can continue to process other preplans in that preplan plan (or preplan group). After the preplan plan or preplan group execution is completed, there are two options to re-trigger those circuits that have gone through preemption:
 - A preplan plan (or preplan group) can be triggered for a second restoration because the preplan, marked for restoration order, is skipped. Only the circuits with confirmed preemption are restored.
 - Individual circuits can be triggered for restoration through the preplan pairs form after preemption acknowledgement.

□

Preplan creation

Overview The preplan restoration creation process begins when the user selects a service paths/circuits to be protected and creates preplans via provisioning. The process is done off of the Service Network Map using the point and click provisioning capabilities. The user shall be able to provision a preplan path/circuit using the automatic, semi-automatic or manual route selection, similar to the process used for adding a service path/circuit except using the value 'Preplan' of Order Action for preplan. Each preplan is reserved for one specific service path/circuit of its failure condition.

Implementation Preplan restoration is implemented in three phases:

1. The user creates and implements a service circuit.
2. The user creates a preplan circuit to backup the service circuit.
3. The preplan circuit is assigned to the service circuit through the preplan pairs add form.
4. Once the process is completed, the service facility is automatically protected in the event of failure.

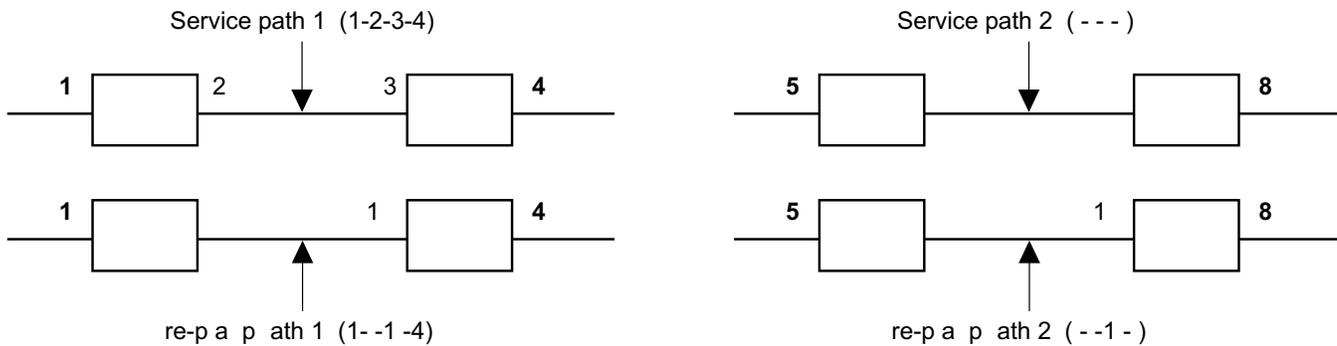
Selection The user can select a two-way service facility/circuit to be protected via the Service Network Map and create preplans at that rate (a list of available circuit types will be displayed for user to select from). The user can access the Preplan Assignment form to display the preplan circuit assignment information including corresponding channel status and preplan circuit execution mode and status for a specified circuit.

The user has the option of picking the exact channels for the preplan (manually) or allowing the system to pick the channels (automatic). If the automatic method is selected, then WaveStar NMS shall select and assign spare channels along the selected path to the preplan restoration order. If the manual method is selected, the user shall select the channels on each of the links in the preplan path. A preplan circuit shall be able to be viewed from the graphical layout similar to a regular provisioned circuit.

Using common resources

WaveStar NMS supports multiple service paths, which can be associated with their individual preplan paths using the same common channel resources. To be able to use a common channel resource, the user has to manually provision separate preplans (with different circuit ID for each preplan) for each service path with the common channel resource. Also the same digital link/channel shall be able to be used for multiple preplan paths.

Example 1: Service path 1 (1-2-3-4) associated with preplan path 1 (1-9-10-4) and service path 2 (5-6-7-8) associated with preplan path 2 (5-9-10-8). Preplan path 1 and 2 can use a common channel resource (9-10).



Possible circuit types

The following table listed all possible circuit types can be provisioned as service circuit if "One Step" provisioning is selected at installation and the corresponding preplan circuits that shall be allowed for each service circuit.

Possible circuit types of service circuit in "One Step"	Allowed circuit types of preplan in "One Step"
TU12-VC11S	TU12-VC11S, TU12-VC11S-24N
VC12S	VC12S, VC12S-30N
VC3S	VC3S, VC3S-480N, VC3S-672N
AU3S	AU3S, AU3S-672N
VC4S	VC4S, VC4S-1920N
TU12-VC11S-24N	TU12-VC11S-24N, VC12S
VC12S-30N	VC12S-30N, VC12S

VC3S-480N	VC3S-480N, VC3S
VC3S-672N	VC3S-672N, VC3S
AU3S-672N	AU3S-672N, AU3S
VC4S-1920N	VC4S-1920N, VC4S

Protected path support

A protected path can be protected by preplan path(s). The protected paths in WaveStar NMS include 1+1 protected, ring-protected and Y-protected (non-assignable only). The ring-protected paths/preplan paths involved in preplan pairs can be either SNCP (PSR) or MSSPRING (LSR). A preplan path in WaveStar NMS can be provisioned as either a protected or unprotected path. Protected service path can be protected by either unprotected or protected preplan path(s).

The same rules of association for unprotected paths will be applied to the protected paths (e.g. a preplan path shall protect a service path with identical circuit type).

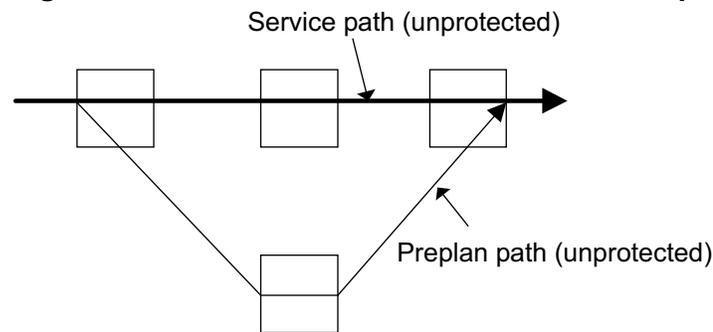
- Unprotected Service Paths:** A service path provisioned as unprotected path can have either protected path (1+1, ring protected, or Y-protected) or unprotected path as the preplan path. In other word, all the existing preplan capabilities for unprotected service path shall be expanded to allow having either protected path or unprotected path as preplan path.
- Non-Assignable Y-Protected Paths:** WaveStar NMS can support preplan association for only non-assignable Y-protected paths at any rate that the path can support.
- Protected Service Paths:** The WaveStar NMS can support preplan provisioning, association and restoration for a service path provisioned as protected path. A service path provisioned as protected path can have either unprotected or protected path as the preplan path. All the existing preplan capabilities for unprotected preplan path shall be applied to protected preplan path (e.g. preplan creation, association, preplan plan, preplan group, alarm-triggered restoration, preemption, reports). A protected path involves both working and protection segments. When a failure (e.g. alarm on paths with Disabled fault status) occurred on the working path, the traffic will be switched

automatically by the network elements to the protection path first. If the protection switching can not take place, then the traffic shall be routed to the associated preplan path manually or automatically. The manual preplan restoration for protected path remains the same as for the unprotected path.

The following examples depict some possible situations for service path provisioned as protected/unprotected having preplan path(s).

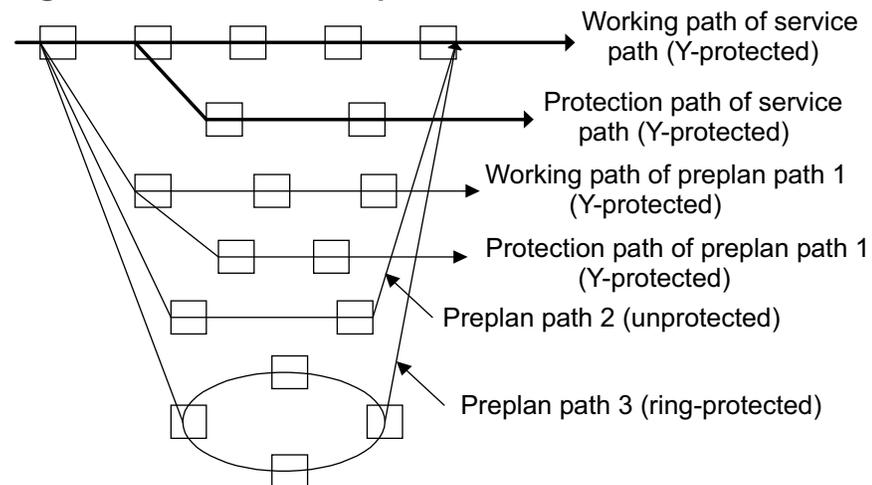
The first example illustrates how a service path, provisioned as an unprotected path, is protected by a preplan path provisioned as an unprotected path.

Figure 4-12 Service Path Provisioned as an Unprotected Path



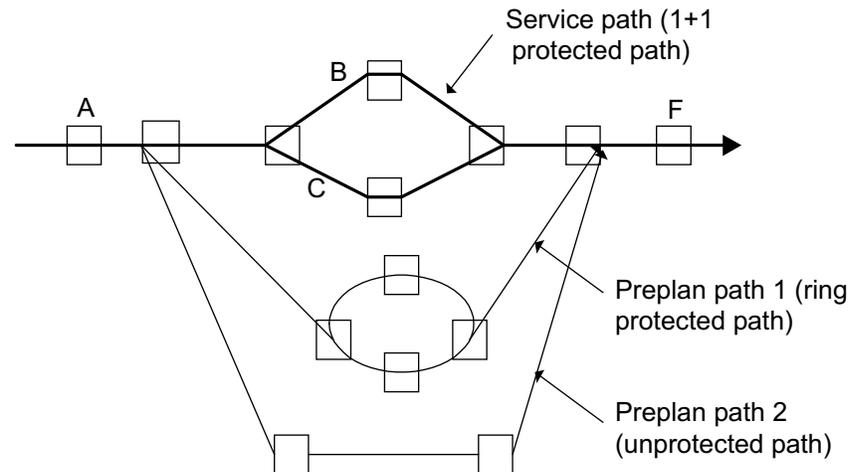
The second example shows how a service path provisioned as a Y-protected path can be protected by a preplan path provisioned as Y-protected and/or an unprotected and/or a ring-protected path.

Figure 4-13 Service Path provisioned as a Y-Protected Path



The third example depicts how service paths provisioned as 1+1 protected can be protected by a preplan path provisioned as a ring protected and/or an unprotected path.

Figure 4-14 Service paths provisioned as 1+1 Protected



Graphical layout

The graphical layout supports the same display capabilities of unprotected path for the protected path when the implementation of restoration/reinstatement process is failed.

Only the segment(s) which belong to the old order path and are not common with the new order path shall be shown in color gray. The rest segments (if any) of the old order path and the new order path shall be shown with the color indicating the current status (e.g. blue, magenta, green depending on the status).

Figure 1:When restore/reinstatement implementation from path 1-2-3-4 (old order) to path 1-5-6-4 (new order) failed, the segments C-2-D and E-3-F of the old order path will be in gray because they are not common segments with the new order path. The rest segments of the

new and old order paths are in the color(s) indicating the current status.

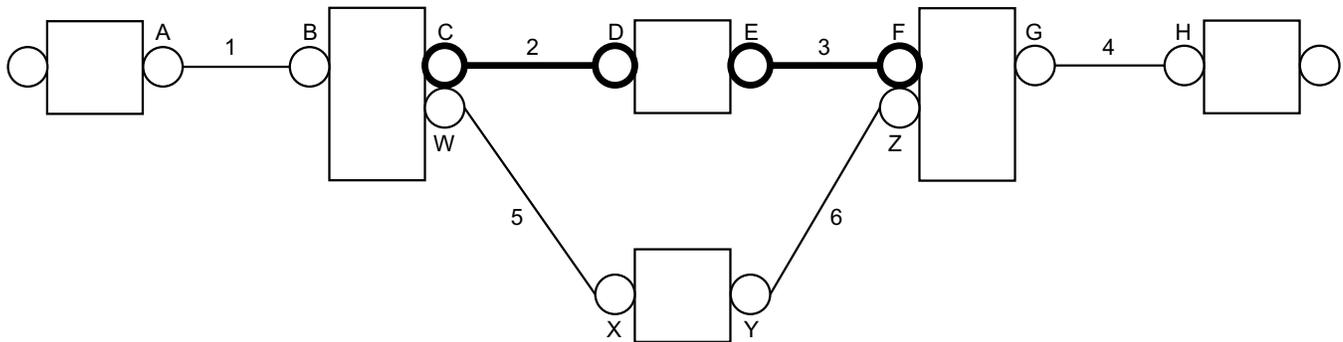
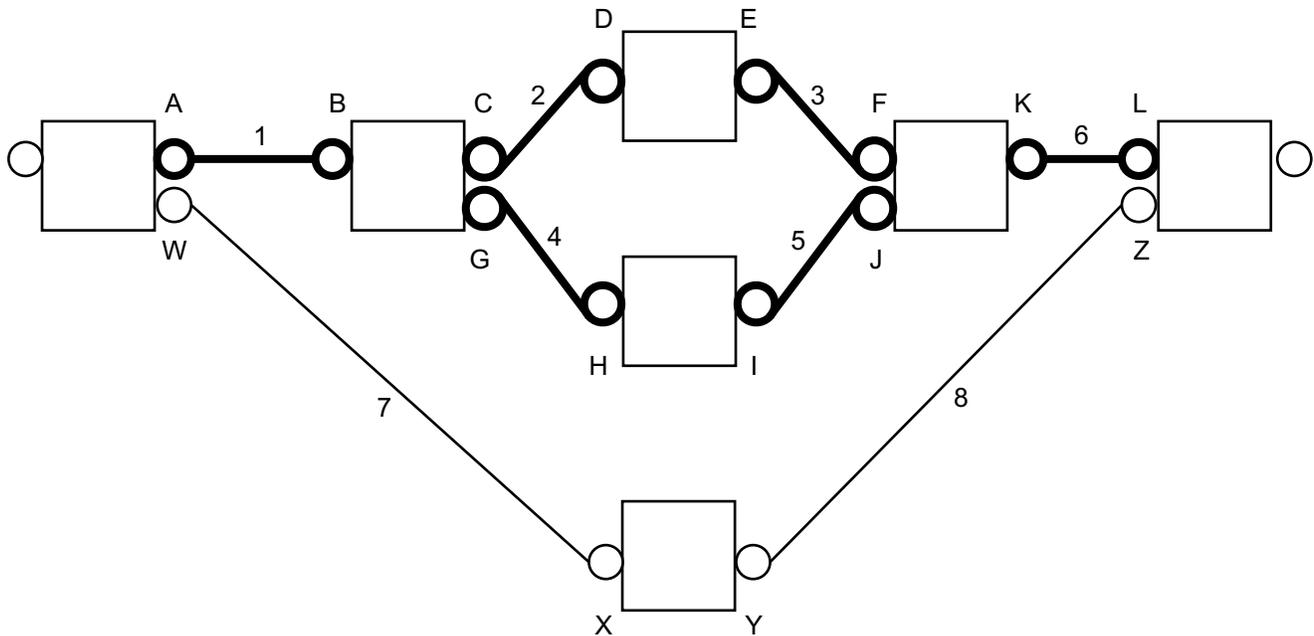


Figure 2: When restore/reinstate implementation from path 1 - 2/4 - 3/5 - 6 (old order) to path 7 - 8 (new order) failed, the whole segments of the old order path (A-1-B, C/G - 2/4 - D/H, E/I - 3/5 - F/J, K-6-L) will be in gray because no common segment with the new order path. The segments of the new order path (W-7-X, Y-8-Z) are in the color(s) indicating the current status.



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Association of a preplan to a service circuit

Introduction To protect an in-effect service circuit, a preplan circuit needs to be associated with the service circuit to be protected after it is successfully created.

The service circuit being protected must be in the In-Effect state and the preplan circuit must be in the pending step (CPL) before an association can be made. The association shall be made utilizing the Preplan Pairs Add form, from which the user shall be able to enter both the service and the preplan circuits IDs to establish the association or link preplan pairs to a preplan plan. A preplan path shall protect a service path with identical circuit type, including “One Step” provisioned circuits, except for FLAG application.

1 x N Preplans: WaveStar NMS has “1 x N” preplan restoration capability which can be set up through the environmental variable during system installation process. The “1 x N” preplan restoration means that an IE service circuit can be protected by “N” (99 less than or equal to N greater than or equal to 1) preplan circuits.

Preplans with different end nodes: WaveStar NMS can handle preplan restoration/reinstatement path with one or both end nodes that are not identical to the end nodes of the associated service path. It means the preplan path and its corresponding service path may have two common end nodes, one common end node, or two different end nodes. However, WaveStar NMS shall block the implementation of preplans with different end nodes if the end node of the service circuit contains groomed low-level paths/circuits. A non-channel assignable entity (e.g. VC-4, VC-12, VC-3, or VC-2) shall allow preplan with different end nodes (one or both). An assignable entity but no lower order paths/circuits provisioned shall allow preplan with different end nodes (one or both) at the SDH level. TUG structure VC-4 path can be preplan protected as long as the TUG structure termination points are not changed.

Preplans with different end nodes (for FLAG only): Normally, WaveStar NMS shall block the implementation of preplans with different end nodes if the end node of the service circuit contains groomed low-level paths/circuits. The check for blocking this implementation (preplan with different end nodes) shall be done during the creation of restoration order not during association. The only exception is for FLAG application. For FLAG only, preplan

restoration shall support different end nodes containing groomed low level paths/circuit of the service circuit if the preemption flag is set (turn on) for low level paths/circuits (e.g. VC-12).

Preplan path with different end ports on the same end node: For non-infrastructure paths that do not terminate at WS DACS or DACS VI, WaveStar NMS shall allow preplan restoration/reinstatement circuit within the same network element node with the service circuit but sharing one common end port. The preplan path and the associated service path can be either unprotected or protected. If either preplan path or service path is provisioned as protected path, only hard restoration/reinstatement shall be applied regardless the involving network element has bridge and roll capabilities. Soft restoration/reinstatement shall be available only when both preplan and service paths are provisioned as unprotected and the network element, where the cross connect will be performed, supporting the bridge and roll capabilities. Restoration/reinstatement shall not be allowed for the service and preplan paths have no common terminating port within the same end node.

Preplan preference level: The user can specify the preference level 1-99 (as 99 the highest preference) for each preplan circuit via the Preplan Pairs form and Preplan Pairs Add form. Preference level of each service/preplan circuit pair for the same service circuit must be unique and can be set at the same time the preplan path is established. This will allow the user to establish multiple preplans to protect similar type failures. In the automatic (alarm-triggered) restoration, the preference level shall be used as the order of selection preference. For example, the preplan with the highest preference will be implemented when a service circuit is protected by multiple preplans. If the preplan with the highest preference is not available (i.e. it has a primary alarm on its route or on its carriers) at the time of restoration, the preplan with the next highest preference when available will be selected. For automatic restoration, if no preplan available at the time of restoration for a service circuit, no restoration action will be taken and the service circuit shall be left in the failed state until manual resolution by the user. Preplan preference level is mainly for alarm-triggered restoration and for 1 x N application.

Preplan priority level: The user has the option of setting the priority (1-10, default value is set to 5 if not entered by user) of the service/preplan circuits pair via the Preplan Pairs form and Preplan Pairs Add form. The user can use priority level to determine which

service circuit has higher priority when multiple service circuits share the same preplan. If all service circuits have same priority level then the preference level will be used. The service circuit with the highest preference level will use the preplan. The priority level can be used for preemption.

Automatic triggering of next available preference level preplan restoration: If turned on, WaveStar NMS shall automatically trigger the next highest available preference level preplan if the failed service circuit can not be restored with the highest available preplan because the highest preference level preplan is already used by other circuits or is in alarmed state. The process of finding the next preference level preplan shall be continued until an associated preplan with no alarm or not in use by other service circuits is found. If no available preplan is found at the time of restoration for a service circuit, no restoration action will be taken and the service circuit shall be left in the failed state until manual resolution by the user.

Disassociation of preplans from service circuits: The user can use the Preplan Pairs Form to disassociate the service circuits from its associated preplan circuit. Each disassociation action shall disassociate one service/preplan pair at a time. For the service/preplan pair linked to a Preplan Plan and/or Group, the user needs to unlink the preplan circuits from the Preplan Plan and/or Group before disassociate preplans from service circuits. If user tries to disassociate a preplan of a Preplan Plan and/or Group without unlinking it first, an error message shall be displayed.

Modification of Preplans: The user can modify the preplan from the Graphical Layout only if it is in the LAY state and not associated with any service circuit. After association, the preplan can not be modified because it must be in the pending CPL step. If the preplan not associated with any service circuit but in the CPL state needs to be modified, the user shall be able to select Actions Æ Move Order Step Back from the preplan's Graphical Layout to bring the preplan's Order Step from CPL to LAY. Once the preplan is in the LAY state, the user shall be able to modify the preplan circuit via the Digital Link/Facility/Circuit Profile form by selecting Actions Æ Modify Æ Path from the preplan's Graphical Layout. The user shall also be able to bring the preplan's Order Step from LAY to CPL by selecting Actions Æ Move Order Step Forward from the preplan's Graphical Layout.

Cancellation of Preplans: The user can cancel a preplan circuit via the Graphical Layout if the preplan circuit is not associated with a service circuit and the preplan circuit must be in LAY state. For the preplan circuits linked to Preplan Plan and/or Group, the user needs to unlink the preplan circuits from the Preplan Plan and/or Group before cancelling preplans. If user tries to cancel a preplan of a Preplan Plan and/or Group without unlinking it first, an error message shall be displayed.

Preplan restoration on top of preplan: If turned on, the WaveStar NMS shall allow next available unalarmed preplan circuit (one of the 1 x N preplans associated with the same service circuit) for the restoration of the original service circuit if the previous preplan restoration path is alarmed after the restoration has been complete. This feature shall be for 1 x N application only and applicable for manual and automatic restorations. For example, preplan P1 (preference level 90) & P2 (preference level 80) protect a service circuit (S1). First restoration used preplan P1 and completed. Alarmed on the in effect preplan P1, restoration will execute preplan P2 if available. When a service circuit protected by only one preplan, if the preplan restored and then has alarm, the service circuit remains in alarm/failure status.

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Preplan plans and preplan groups

Introduction For a single service circuit, WaveStar NMS supports multiple preplans to be provisioned for different failure scenario in the network. For a single failure scenario, there can be many service circuits involved. For these scenarios, the user can utilize Preplan Plan or/and Preplan Group features. Preplan Plan/Group allows the user to create multiple preplans against each failure condition providing alternate route option at the time of restoration. This feature is applicable for manual restoration/reinstatement process only. Each service circuit can appear only once in each Preplan Plan/Group. For example, service circuit 1 associated with preplan circuit 1 (pair 1) and preplan circuit 2 (pair 2). The pair 1 and pair 2 can not co-exist in the same Preplan Plan/Group. Pair 1 can be in Preplan Plan/Group 1 while pair 2 is in Preplan Plan/Group 2.

Preplan plan: The user can group more than one service/preplan circuit pairs into a Preplan Plan (Plan ID). Since a Preplan Plan is intended for a particular restoration route or a specific failure scenario, a service circuit shall appear only once in a Preplan Plan. A Preplan Plan can contain a grouping of maximum 500 service/preplan circuit pairs.

Preplan group: The user can group multiple Preplan Plans into a Preplan Group (Group ID), so the preplan restorations/reinstatements can be easily tracked and implemented as a group. Since a Preplan Group is intended for a particular restoration route or a specific failure scenario, a service circuit shall appear only once in a Preplan Group. The preplan circuits in the same Preplan Group shall not have common channels. A Preplan Group can contain a grouping of maximum 500 Plan ID.

Preplan plan and preplan group restoration and reinstatement: WaveStar NMS allows the execution of the Preplan Plan or Preplan Group with some circuits that have been restored or reinstated. In this scenario, Preplan Plan or Preplan Group restoration/reinstatement shall proceed with restoration or reinstatement for the remaining circuits. Upon completion of the restoration/reinstatement, the total count of already restored or reinstated circuits included in each Preplan Plan/Group shall be indicated in the "No Action" column in the table of the Preplan Plan or Preplan Group form. For example, Preplan Plan 1 includes service/preplan circuit pairs 1, 2, 3, 4, 5 while pair #2 has been restored for an alarm situation. When executing restoration from

the Preplan Plan 1, pairs 1, 3, 4, 5 will be restored and pair 2 will be skipped (because already in REST status). After the restoration is completed, the number of pairs that have no action taken because the pair was already in the requested state shall be indicated in the No Action column in the Preplan Plan form. In this example, 1 (for pair #2) will be shown in the No Action column.



Execution concepts

- Execution of a preplan**
- Manual preplan restoration/reinstatement:** The user can go to the Preplan Pairs, Preplan Plan, or Preplan Group form to execute the restoration for the selected facility/circuit or reinstate to service circuit after repair. The user shall be required to set the “Ignore Alarm” (Yes or No), “Stage” (One Stage or Three Stages) and “Restoration/Reinstatement” (Soft or Hard) parameters whenever applicable.
- “Ignore Alarm” option for preplan restoration/reinstatement:** The user can specify the “Ignore Alarm” option via the PrePlan Parameters form. “Ignore Alarm” option allows the user to specify if the alarm status on the preplan circuit should be ignored and has two choices: ‘Yes’ and ‘No’ (default). If the selection is ‘No’ and the selected preplan based on the preference level has alarm then the preplan restoration shall fail. The only exception is when the user sets “Ignore Alarms” to ‘Yes’, then an alarmed preplan shall be used and restoration order shall be created.
- “Stage” option for preplan restoration/reinstatement:** The user can specify the “Stage” option via the PrePlan Parameters form. The “Stage” option allows the user to specify whether the ‘one stage’ or ‘three stages’ restoration/reinstatement process should be executed. If value “One Stage” is selected, then all commands will be executed automatically. If value “Three Stages” is selected, then the system stops after each step (IMP – bridge operation, IMR – roll operation) for user to send commands manually. The default setting for the “Stage” option is “One Stage” which can be set for Soft or Hard preplan restoration/reinstatement. Value “Three Stages” shall be applicable only for Soft preplan restoration/reinstatement.
- “Restoration/Reinstatement” option for preplan restoration/reinstatement:** Users can specify the Hard or Soft restoration/reinstatement via the PrePlan Parameters form at the group level, plan level or preplan circuit at the time of restoration/reinstatement. For network elements which support bridge and roll capabilities, the user shall be able to choose to use either Hard (default) or Soft restoration/reinstatement. Network elements that do not support bridge and roll capabilities shall only be able to use Hard restoration/reinstatement. If value “hard” is selected, then disconnect (for restoration)/connect (for reinstatement) commands are used for the alarmed service circuit and the cross-connect operation

shall be implemented for preplan circuit. If “soft” is selected, then bridge, roll, and disconnect commands are issued for those network elements that support this type of activity. Hard option can not be used together with “Stages” option which has value “Three Stages.”

“Preemption” option for preplan restoration/reinstatement: The user can set the “preemption” option via the Preplan Parameters form only when the preemption feature is licensed. This option has two values, Yes and No (default), to turn preemption feature on or off. If ‘Yes’ is selected then the preemption feature is turned on; otherwise, the preemption is off. Preemption feature is only for manual restoration and used to restore a higher priority circuit even when there is a lower or equal priority circuit already using the channel.

Automatic (alarm-triggered) preplan restoration: If a service circuit is protected by multiple preplans, the preplan selection criteria shall be based on the highest preference level as well as the alarm status of the preplan. If the selected preplans based on the preference level have alarms or have in-effect circuits on their channels, then the preplan shall not be used for restoration and the next highest preference level available preplan shall be tried. Alarmed triggered restoration shall not allow user to set values and configure the following defaults for restoration parameters: Ignore Alarm – No, Stages – One Stage, Restoration – Hard, Preemption - No, during WaveStar NMS installation.

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Preemption concepts

Preemption and affected circuits

If preemption (optional feature) is manually activated, then preemption may be used in the restoration process to restore a higher priority circuit even when there is a lower or equal priority circuit already using the channel. When other in-effect service circuit uses the channel of a preplan circuit, this preplan can not be used for restoration until the in-use channel is released/disconnected from the active traffic. The user will have the option of preemption feature on WaveStar NMS if licensed. Preemption is an optional feature which shall be provided as an additional option only if the preplan restoration feature is installed. Preemption feature can be used to restore a higher priority circuit even where there is a lower or equal priority circuit already using the channel. After preemption is completed, the user needs to manually re-trigger the preplan that caused the preemption.

Detection: the user can turn preemption on or off when initiating the restoration. If preemption is turned on, the user shall be notified at association if any other in-effect circuits use the selected channel. User confirmation is required before the system can continue to proceed the preemption. At the time of restoration, WaveStar NMS shall notify the user if the preplan contains a channel used by other in-effect circuit. The user shall have the ability to either terminate the restoration process or disconnect (preempt) the lower/equal priority circuit on the channel and then implement a preplan restoration with higher priority circuit. If preemption is not turned on and the channel of the selected preplan can not be used at the time of restoration, the system will terminate the restoration process. The user shall be able to use the Affected Circuits for Preplan Execution form to find out what circuit affected by the preplan. This form lists the affected service circuits or circuits have pending circuits where the pending circuits have commands been sent during the IMP state. The user shall manually disconnect or rearrange those affected circuits before the preplan can be executed.

For manual restoration: Preemption feature is applicable for manual restoration only. If preemption is needed at restoration, a dialogue box shall appear indicating the preemption target circuit and requesting user confirmation to continue. After user confirmation, the preemption process shall create a “dummy” restoration order for the preempted circuit to keep the original circuit layout for reinstatement purpose and

disconnect the target circuit. The user shall not be notified when the preemption is completed. After preemption is completed, the original preplan that causes the preemption shall be manually triggered again.

For preplan plan or group: If preemption is turned on and if any circuit in a Preplan Plan (or Group) requires preemption, the WaveStar NMS shall display a message for that specific preplan and wait for user confirmation. Once the user confirms the preemption, the system shall continue or process other preplans in the Plan (or Group). After the Plan or Group implementation is completed, the user may trigger the Plan (or Group) operation for a second time for restoration. Only the circuits of which preemption has been confirmed (not in RS state) will be restored. The user can also trigger individual circuits for restoration via the Preplan Pairs Form after the preemption is completed.



Reinstatement concepts

Reinstatement (normalization)

The reinstatement of a service circuit is a manual process. This is to ensure that the reinstatement is carried out in a way most appropriate to the customer's network operation since the reinstatement process could introduce service interruption if hard reinstatement is required. The user will be notified at the time of preplan creation that service will be disrupted on reinstatement if only hard reinstatement is supported because the restoration facility needs to be disconnected before the original service path can be re-established. The user can select hard or soft reinstatement but default is soft. The preempted circuit can not be reinstated unless the service circuit, which causes the preemption, has been reinstated. The reinstatement process shall always bring the current restoration circuit back to the original service circuit without reverting to any of the intermediate preplan restoration circuits if any.

Of circuits: If a service circuit is protected by a preplan, after the faulted service facility has been repaired, WaveStar NMS shall receive an alarm clear message and update the alarm status of the affected service facility. The user then shall be able to move the circuits from the restoration path back to the original service path. The user shall be able to initiate reinstatement using the Preplan Pairs form or Graphical Layout of the preplan circuit. Reinstatement process shall be also applicable for Preplan Plan and Preplan Group reinstatement. For the reinstatement process, the user shall specify the parameter values in Preplan Parameters form in the same way as they work for the manual restoration process. The Ignore Alarm, Stages, and Hard/Soft Reinstatement options shall also work in a similar fashion as for the manual restoration process.

Modification or deletion: The user shall be able to modify the "Start Date" and/or "Start Time" for any scheduled reinstatement or delete a scheduled reinstatement through the "Scheduled List" screen. Modifying or deleting scheduled reinstatement shall not be allowed if the circuit is already undergoing or completing manually initiated reinstatement. This capability shall be supported at the preplan circuit level only and shall not include Preplan Plan and Preplan Group levels.

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5 Digital Transmission Rates

Overview

Purpose This chapter discusses the digital transmission rates and interconnections of the circuits and digital links supported by WaveStar NMS.

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Supported digital transmission rates

Overview This section discusses the digital transmission rates supported by WaveStar NMS.

Table The following table shows the digital transmission hierarchies and rates supported by WaveStar NMS.

Table 5-1 Supported Digital Transmission Rates

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
STM-64	Digital Link	64S(10,000LN)	9,953.28	
STM-16	Digital Link	16S (2500LN)	2,488.32	
STM-4	Digital Link	4S (620LN)	622.0	
STM-1	Digital Link	1S (155LN)	155.52	
STM-0	Digital Link	0S (52LN)	51.84	
VC-4	Path	VC4S	150.336	
VC-3	Path	VC3S	48.960	
VC-12	Path	VC12S	2.240	
CEPT-4	Digital Link	E4 (140LN)	139.264	
CEPT-3	Digital Link	E3 (34LN)	34.368	
CEPT-1	Digital Link	E1 (2LN)	2.048	
CEPT-4	Facility	1920N	139.264	Similar to CEPT-4 Circuit
CEPT-3	Facility	480N	34.368	Similar to CEPT-3 Circuit
CEPT-4	Circuit	1920N	139.264	
CEPT-3	Circuit	480N	34.368	
CEPT-1	Circuit	30N	2.048	
DS3	Digital Link	45LN	44.736	
DS3	Circuit	672N	44.736	
DS1	Digital Link	1.6LN	1.544	
DS1	Circuit	24N	1.544	
LAN8	Digital Link		up to 4 VC-12s	AM 1, ADM 16/1 only

Table 5-1 Supported Digital Transmission Rates (continued)

Designation	Description	Facility Type	Transmission Rate Mb/s	Notes
LSBB			45 Mb/s to 750 Mb/s	OLS
HSBB			100 Mb/s to 2.5 Gb/s	OLS
X.21	Digital Link		2 Mb/s	AM 1, Black Boxes only

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Section II: Network Element-Specific Transmission Rates

Overview

Purpose This section discusses the interconnections supported by WaveStar NMS.

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Supported interconnections	5-6
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Supported interconnections

Overview This section describes the WaveStar NMS supported interconnections.

Digital links The supported digital links for each Lucent Technologies network element supported by WaveStar NMS are shown in the following table.

Network Element	STM-64	STM-16	STM-4	STM-1	STM-0	2.5 GB	E4	E3	E1	DS3	DS1	LAN8 ^a (TransLan)	GigaLan	X-21	PCT
ADM 155E	-	-	-	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WaveStar ADM 4/1 STM-1	-	-	-	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WaveStar ADM 4/1 STM-4	-	-	-	Y	-	-	-	Y	Y	Y	-	-	-	-	-
WaveStar ADM 16/1	-	Y	Y	Y	-	-	Y	Y	Y	Y	Y	Y	-	-	-
WaveStar ADM 16/1 Compact	-	Y	-	Y	-	-	-	-	Y	-	-	-	-	-	-
WaveStar AM 1	-	-	-	Y	-	-	-	Y	Y	Y	-	Y	-	Y	-
WaveStar AM 1 PLUS	-	-	Y	Y	-	-	-	Y	Y	Y	Y	-	-	Y	-
WaveStar TM1	-	-	-	Y	-	-	-	-	Y	-	-	-	-	-	-
WaveStar BandWidth Manager	Y	Y	Y	Y	-	-	-	-	-	Y	-	-	-	-	-
WaveStar TDM 10G	Y	Y	Y	Y	-	-	-	-	-	-	-	-	Y	-	-
WaveStar DACS (Rel. 2.1 and 3.0)	-	Y	Y	Y	-	-	-	-	-	-	-	-	-	-	-
WaveStar DACS (Rel. 2.0)	-	-	-	Y	Y	-	-	-	-	-	-	-	-	-	-
DACS VI (Rel. 2.1)	-	-	-	Y	Y	-	Y	Y	Y	-	-	-	-	-	-
Black Box	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ISM-1	-	-	-	Y	-	-	-	Y	Y	-	-	-	-	-	-
ISM-4	-	-	Y	Y	-	-	Y	Y	Y	-	-	-	-	-	-
ISM-5E	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	Y
SLM-16	-	Y	-	Y	-	-	Y	-	-	-	-	-	-	-	-
SLM-4	-	-	Y	Y	-	-	Y	-	-	-	-	-	-	-	-
PHASE ADM 16/4	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE ADM 4/4	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE LXC 16/1	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE LXC 4/1	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE TM 16/4	-	Y	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
PHASE TM 4/4	-	-	Y	Y	-	-	Y	Y	Y	Y	-	-	-	-	-
NERA Radio	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-

Digital links with MSP The supported MSP protection capabilities for SDH network elements are shown in the following table.

Network Element	STM-0	STM-1	STM-4	STM-6	STM-64
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Section II: Network Element-Specific
Transmission Rates
Supported interconnections

ADM 155E		1+1			
WaveStar ADM 4/1 STM-1		1+1			
WaveStar ADM 4/1 STM-4		1+1			
WaveStar ADM 16/1		1+1		1+1	
WaveStar ADM 16/1 Compact		1+1			
WaveStar AM 1		1+1			
WaveStar AM 1 PLUS		1+1 (Line and Trib Pairs)			
WaveStar TM 1		1+1			
WaveStar BandWidth Manager		1+1	1+1	1+1, 1x1	1x1
WaveStar TDM 10G		1+1	1+1	1+1	1+1, 1x1
WaveStar DACS (Rel. 2.1 and 3.0)		1+1	1+1	1+1	
WaveStar DACS (Rel. 2.0)	1+1	1+1			
DACS VI (Rel. 2.1)	1+1	1+1			
Black Box	1+1	1+1	1+1	1+1	1+1
ISM-1		1+1			
ISM-4			1+1		
ISM-5E		1+1			
SLM-16				1+1 (for SLM 1+1 model only)	
SLM-4			1+1 (for SLM 1+1 model only)		
PHASE ADM 16/4		1+1	1+1	1+1	
PHASE ADM 4/4		1+1	1+1		
PHASE LXC 16/1		1+1	1+1	1+1	
PHASE LXC 4/1		1+1	1+1		
PHASE TM 16/4		1+1	1+1	1+1	

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Transmission Rates
Supported interconnections

PHASE TM 4/4		1+1	1+1		
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Section III: SDH Cross-Connects

Overview

Purpose This section describes the SDH cross-connect types and rates.

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Supported SDH cross-connect types and rates	5-11
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Supported SDH cross-connect types and rates

Introduction The networks that can be managed with WaveStar NMS include a variety of SDH cross-connect types and rates.

Supported SDH cross-connect types and rates The following table lists rates at which the cross-connect types are supported for one-way (O), two-way (T), and broadcast (B) circuits by WaveStar NMS. The network element by itself may support more rates than are supported with WaveStar NMS.

The SDH cross-connect types and rates for each network element supported by WaveStar NMS are shown in the following table:

	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
ADM 155E				T	O, T, B		T	
WaveStar ADM 4/1 STM-1				T	O, T, B		T	
WaveStar ADM 4/1 STM-4				T	O, T, B		T	
WaveStar ADM 16/1			T	T	T		T	
WaveStar ADM 16/1 Compact			T	T	T		T	
WaveStar AM 1					T		T	
WaveStar AM 1 PLUS				T	T		T	
WaveStar TM 1							T (fixed)	
WaveStar BandWidth Manager		O, T, B	O, T, B	O, T, B				O, T, B
WaveStar TDM 10G		O, T, B	O, T, B	O, T, B				O, T, B

Section III: SDH Cross-Connects
Supported SDH cross-connect types and rates

	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
WaveStar DACS (managed by ITM-SC)			O, T, B	O, T, B	O, T, B		O, T, B	O, T, B
WaveStar DACS (managed by ITM-XM)				O, T, B	O, T, B		O, T, B	O, T, B
DACS VI				O, T, B	O, T, B		O, T, B	O, T, B
Black Box	O, T, B	O, T, B	O, T, B	O, T, B	O, T, B	T	O, T, B	O, T, B
ISM-1				T	O, T, B		T	
ISM-4				T	O, T, B		T	
ISM-5E							T	
SLM-16				T				
SLM-4				T (fixed)				
PHASE ADM 16/4			O, T, B	O, T, B				
PHASE ADM 4/4				O, T, B				
PHASE LXC 16/1				O, T, B	O, T, B	T	O, T, B	
PHASE LXC 4/1				O, T, B	O, T, B	T	O, T, B	
PHASE TM 16/4			O, T, B	O, T, B				
PHASE TM 4/4				O, T, B				
NERA Radio								



Section IV: SNCP Protection

Overview

Purpose This section describes the rates at which SNCP protection is supported for one-way (O), two-way (T), and broadcast (B) circuits in WaveStar NMS.

Contents

Supported SNCP protection

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Supported SNCP protection

Introduction The networks that can be managed with WaveStar NMS include a variety of SNCP protection.

List of supported SNCP protection The following table lists the rates at which SNCP protection is supported for one-way (O), two-way (T), and broadcast (B) circuits in WaveStar NMS. The network element by itself may support more rates than are supported with WaveStar NMS.

The rates at which the SNCP cross-connects are supported by WaveStar NMS are shown in the following table:

	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
ADM 155E				T	O, T, B		T	
WaveStar ADM 4/1 STM-1				T	O, T, B		T	
WaveStar ADM 4/1 STM-4				T	O, T, B		T	
WaveStar ADM 16/1			T	T	T		T	
WaveStar ADM 16/1 Compact			T	T	T		T	
WaveStar AM 1					T		T	
WaveStar AM 1 PLUS				T	T		T	
WaveStar TM 1							T (fixed)	
WaveStar BandWidth Manager		O, T, B	O, T, B	O, T, B				O, T, B
WaveStar TDM 10G		O, T, B	O, T, B	O, T, B				O, T, B

	VC4-64c	VC4-16c	VC4-4c	VC-4	VC-3	VC-2	VC-12	AU-3
WaveStar DACS (managed by ITM-SC)			O, T, B	O, T, B	O, T, B		O, T, B	O, T, B
WaveStar DACS (managed by ITM-XM)								
DACS VI				O, T, B	O, T, B		O, T, B	O, T, B
Black Box	O, T, B	O, T, B	O, T, B	O, T, B	O, T, B	T	O, T, B	O, T, B
ISM-1				T	O, T, B		T	
ISM-4				T	O, T, B		T	
ISM-5E							T	
SLM-16				T				
SLM-4				T (fixed)				
PHASE ADM 16/4			O, T, B	O, T, B				
PHASE ADM 4/4				O, T, B				
PHASE LXC 16/1				O, T, B	O, T, B	T	O, T, B	
PHASE LXC 4/1				O, T, B	O, T, B	T	O, T, B	
PHASE TM 16/4			O, T, B	O, T, B				
PHASE TM 4/4				O, T, B				
NERA Radio								





6 Network Element Port Addresses

Overview

Purpose This chapter describes the concepts associated with port addresses as they relate to WaveStar NMS.

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Section I: Introduction

Overview

Purpose

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About generic port addressing

Overview Generic port addressing allows for a single address structure across all network elements. This applies to Lucent and other vendor equipment. With WaveStar-NMS, the generic port address is commonly referred to as the *external address* or *network level address*.

Terminology The following terminology applies to the material discussed within this chapter:

- Protection Group: not visible in WaveStar NMS.
- External address: the network level address used in WaveStar NMS.
- Internal Address: the element level address, which is generally the 'native' port address used in the EMS.
- Physical port address: address of the port that physically terminates a facility.
- Logical port address: address of a logical channel riding on a higher-order system; the higher-order system is terminated on a physical port. A logical port address can also be a lower-order logical channel, riding on a higher-order logical channel, riding on a facility that terminates on a physical port.
- Virtual port address: allows users to control two line ports; one line port is the service port while the other is the protection port. Virtual port addressing is a protection scheme.
- Tributary port: generally refers to the add/drop side of a network element.
- Virtual port: terminates the two line ports in a protection scheme.

□

Address structure

Generic port address structure

The generic port address structure is as follows:

Physical Port Type / Physical Port Location / Logical Address(es)

For a lower-order logical channel riding on a higher-order logical channel, the generic port address structure is as follows:

Physical Port Type / Physical Port Location / Higher Order Logical Address - Lower Order Logical Address

Physical port types

The physical port types associated with the generic port address are as follows:

- STM-x = Sx. For example, STM-4 is S4.
- CEPT-x = Px. For example, CEPT-3 is P3.

Physical port location

The physical port location consists of: ***Shelf / Slot / Port***

If ***Slot*** contains only one port, the number one is entered for the port number.

Logical port location

The logical port location consists of:

- ***Shelf / Slot / Port /higher logical port*** - lower logical port
- ***Shelf / Slot / Port /single logical port***.

External addresses

The external addresses associated with generic port addressing may be represented through the following form: **Sx/m/n/p/h - 1**

- **x** can equal 0, 1, 4, 16, or 64.
- **m= mm**: physical shelf number
- **n=nn**: physical slot number
- **p**: physical port number
- **h**: high order logical port number
- **l**: lower order logical port number



KLM (G707) notation

Background This feature causes a different notation to be used for external port addressing. WaveStar NMS uses a “sequential” port addressing scheme to represent the lower order logical port number.

Definition The KLM (or G707) notation for external port addressing uses a tributary numbering notation to represent the “channel number” or the “lower order logical port number” of the VC-3, VC-12, and VC-2 paths.

Examples The following table provides examples of the two external port addressing schemes:

Path Type	Logical Port Type	WaveStar NMS External Port Address	K, L, M External Port Address Notation
VC-12	TU12	S1/PA5/1/2/1-31	S1/PA5/1/2/1-2.4.1
VC-12	TU12	S1/1/12/4-63	S1/1/12/4-3.7.3
VC-2	TU2	S1/1/2/4/1-20	S1/1/2/3/1-3.6.0
VC-3	TU3	S1/PA5/1/3/1-2	S1/PA5/1/3/1-2.0.0



Section II: ADM Port Addresses

Overview

Purpose This section provides conceptual information regarding the WaveStar port addresses for the both the physical and logical ports of the following network elements:

- ADM-155C
- ADM-155E
- ADM-16CMSSP
- ADM-16CSNCP
- ADM-16MSSP
- ADM-16SNCP
- ADM-41STM1
- ADM-41STM4

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Physical Line Ports

Overview This section contain information on the physical line ports (external addresses) for the ADM-4/1 and ADM-155E network elements.

ADM-4/1 The following tables list the ADM-4/1 physical line ports.

Table 6-1 STM-Digital Links

S1/m/nn/p	
m	1
nn	20 or 60
p	1
Example	There are only two possible addresses: S1/1/20/1 or S1/1/60/1

Table 6-2 VC-4 Paths

S1/m/nn/p/h	
m	1
nn	20 or 60
p	1
h	1
Example	There are only two possible addresses: S1/1/20/1/1 S1/1/60/1/1

Table 6-3 VC-3 Path Riding VC-4

S1/m/nn/p/h-l	
m	2
nn	20 or 60
p	1
h	1
l	1 to 3
Example	S1/1/20/1/1-1 S1/1/60/1/1-3

Table 6-4 VC-12 Path Riding VC-4

S1/m/nn/p/h-l	
m	1
nn	20 or 60
p	1
h	1
l	1 to 63
Example	S1/1/20/1/1-1 S1/1/60/1/1-63

Table 6-5 VC-3 Path Riding a VC-4 Path Riding STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p/h-l	
m	1
nn	1
p	1
h	1
l	1 to 3
Example	There are only three possible addresses: S1/1/GRP1/1/1-1 S1/1/GRP1/1/1-2 S1/1/GRP1/1/1-3

Table 6-6 VC-12 Path Riding VC-4 Path Riding STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p/h-l	
m	1
nn	1
p	1
h	1
l	1 to 63
Example	S1/1/GRP1/1/1-1 S1/1/GRP1/1/1-63

Table 6-7 STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p	
m	1
n	1 or 2
p	1
Example	There are two possible address: S1/1/GRP1/1 S1/1/GRP2/1

Table 6-8 VC-4 Path Riding on an STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p/h	
m	1
n	1 or 2
p	1
h	1
Example	There are two possible addresses: S1/1/GRP1/1/1 S1/1/GRP2/1/1

Table 6-9 VC-3 Path Riding VC-4 Path Riding STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p/h-l	
m	1
n	1 or 2
p	1
h	1
l	1 to 3
Example	There are only six possible addresses: S1/1/GRP1/1/1-1 S1/1/GRP1/1/1-2 S1/1/GRP1/1/1-3 S1/1/GRP2/1/1-1 S1/1/GRP2/1/1-2 S1/1/GRP2/1/1-3

Table 6-10 VC-12 Path Riding VC-4 Path Riding STM-1 Digital Link Using 1 + 1 MSP Protection

S1/m/GRPn/p/h-l	
m	1
n	1 or 2
p	1
h	1
l	1 to 63
Example	S1/1/GRP1/1/1-1 S1/1/GRP2/1/1-63

ADM-155E The following tables list the ADM-155E physical line ports.

Table 6-11 STM-1 Digital Link

S1/m/nn/p	
m	1
nn	20 or 60
p	1
Example	There are only two possible addresses: S1/1/20/1 or S1/1/60/1

Table 6-12 VC-4 Paths

S1/m/nn/p	
m	1
nn	6, 7, 16, 17
p	1
Example	S1/1/6/1 or S1/17/1

Table 6-13 VC3 Path Riding VC4

S1/m/nn/p/h	
m	1
nn	6, 16
p	1
h	1

Table 6-13 VC3 Path Riding VC4 (continued)

Example	There are only two possible addresses: S1/1/6/1/1 S1/1/16/1/1
---------	---

Table 6-14 VC12 Path Riding VC-4

S1/m/nn/p/h-l	
m	1
nn	6, 16
p	1
h	1
l	1 to 3
Example	S1/1/6/1/1-1 S1/1/16/1/1-3

Table 6-15 STM-1 Digital Link Using 1+1 MSP Protection

S1/m/nn/p/h-l	
m	1
nn	6, 16
p	1
h	1
l	1 to 63
Example	S1/1/6/1/1-1 S1/1/16/1/1-63

Table 6-16 VC-4 Path Riding VC-6

S1/GRPn/p	
n	1, 2
p	1
Example	S1/1/1 S1/2/1



Tributary Ports

Overview This section contains information about the tributary ports (physical and external addresses).

Physical ports The following tables list the physical tributary ports associated with the ADM 4/1 and 155E network elements.

Tributary ports for ADM-4/1

Table 6-17 STM-1 Digital Link

S1/m/n/p	
m	2
n	21, 31, 41, 51, 61
p	1
Example	S1/1/21/1 or S1/1/61/1

Table 6-18 VC-4 Paths

S1/m/n/p/h	
m	1
n	21, 31, 41, 51, 61
p	1
h	1
Example	S1/1/21/1/1 S1/1/61/1/1

Table 6-19 VC-3 Path Riding VC-4

S1/m/n/p/h-l	
m	1
n	21, 31, 41, 51, 61
p	1
h	1
l	1 to 3

Table 6-19 VC-3 Path Riding VC-4 (continued)

S1/m/n/p/h-l	
Example	S1/1/21/1/1-1 S1/1/61/1/1-3

Table 6-20 VC-12 Path Riding VC-4

S1/m/n/p/h-l	
m	1
n	21, 31, 41, 51, 61
p	1
h	1
l	1 to 63
Example	S1/1/21/1/1-1 S1/1/61/1/1/1-63

CEPT-1/3 Physical Tributary Ports of an ADM-4/1

Table 6-21 CEPT-3 Digital Link/Path/Circuit

P3/m/n/p	
m	1
n	21, 31, 41, 51, 61
p	1
Example	P3/1/21/1 or P3/1/61 /1

Table 6-22 CEPT-1 Digital Link/Path/Circuit

P1/m/n/pp	
m	1
n	21, 22, 31, 31, 41, 51, 52, 61, 62
pp	1 to 16
Example	P1/1/21/1 or P1/1/62/16

External addresses

The following tables list the external addresses of the tributary ports associated with the ADM 4/1 and 155E network elements.

Table 6-23 STM-1 Physical Tributary Port of an ADM-155E

S1/m/nn/p	
m	1
nn	8 thru 15
p	1
Example	S1/1/8/1 or S1/1/13/1

Table 6-24 STM-1 Logical Tributary Ports of an ADM-155E

S1/m/nn/p/h	
m	1
nn	8 thru 15
p	1
h	1
Example	S1/1/3/1/1 S1/1/13/1/1

Table 6-25 VC-3 Path Riding VC-4

S1/m/nn/p/h-l	
m	1
nn	8 thru 15
p	1
h	1
l	1 to 3
Example	S1/1/8/1/1-1 S1/1/14/1/1-3

Table 6-26 VC-12 Path Riding VC-4

S1/m/nn/p/h-l	
m	1
nn	8 thru 15
p	1

Table 6-26 VC-12 Path Riding VC-4 (continued)

h	1
l	1 to 63
Example	S1/1/21/1/1-1 S1/1/41/1/1/1-63

Table 6-27 CEPT-3 Digital Link/Path/Circuit

P3/m/nn/p	
m	1
nn	8 thru 15
p	1
Example	P3/1/8/1 or P3/1/15/3

Table 6-28 CEPT-1 Digital Link/Path/Circuit

P1/m/n/pp	
m	1
n	21, 22, 31, 31, 41, 51, 52, 61, 62
pp	1 to 16
Example	P1/1/21/1 or P1/1/62/16



Port identifiers for WaveStar ADM 16/1 network elements

Overview This section describes the port identifiers for the WaveStar ADM 16/1 network elements.

Table The following table lists the port identifiers for the WaveStar ADM 16/1 network elements.

Table 6-29 Port Identifiers for WaveStar ADM 16/1 network elements

Description	Network Element	Entity Identifier (EID)	Network Level Address
STM-16 Physical Port (Line)	WS16/1, WS16/1MSSP	LP[1,2]	S16/1/[4,16]/1 ¹
STM-16 MSP (Line)	WS16/1	LP1	S16/1/GRP1/1 ¹
STM-4 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-9]	S4/1/[5-13]/1a
STM-4 MSP (Trib)	WS16/1, WS16/1MSSP	TP[1,3,5,7]	S4/1/GRP[1-4]/1 ¹
STM-1 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4]	S1/1/[5-13]/[1-4] ¹
STM-1 MSP (Trib)	WS16/1, WS16/1MSSP	TP1.[1-4] TP3.[1-4] TP5.[1-4] TP7.[1-4]	S1/1/GRP1/[1-4] ^{1 2} S1/1/GRP2/[1-4] ^{1 2} S1/1/GRP3/[1-4] ^{1 2} S1/1/GRP4/[1-4] ^{1 2}
STM-0 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-12]	S0/1/[5-13]/[1-12] ^{1 2}
STM-0 MSP (Trib)	WS16/1, WS16/1MSSP	TP1.[1-12] TP3.[1-12] TP5.[1-12] TP7.[1-12]	S0/1/GRP1/[1-12] ^{1 2} S0/1/GRP2/[1-12] ^{1 2} S0/1/GRP3/[1-12] ^{1 2} S0/1/GRP4/[1-12] ^{1 2}
E4(140 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[2-9].[1-4]	P4/1/[6-13]/[1-4]
E3(34 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	P3/1/[5-12]/[1-4]-[1-3] ^{1 2}

Table 6-29 Port Identifiers for WaveStar ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
DS3 (45 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	D3/1/[5-12]/[1-4]-[1-3] ^{3 4}
E1(2 Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	P1/1/[5-12]/1-[1-63] ³
D1 (1.5Mb/s) Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	D1/1/[5-12]/1-[1-63]
LAN8 Physical Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-8]	LAN8/1/[5-12]/[1-8]
VC4-4c Logical Port on STM-16 Line Port	WS16/1, WS16/1MSSP	LP[1-2].1-4 LP[1-2].5-8 LP[1-2].9-12 LP[1-2].13-16	S16/1/[4,16]/1/4c1 S16/1/[4,16]/1/4c2 S16/1/[4,16]/1/4c3 S16/1/[4,16]/1/4c4
VC4-4c Logical Port on STM-16 MSP Line Port	WS16/1	LP1.1-4 LP1.5-8 LP1.9-12 LP1.13-16	S16/1/GRP1/1/4c1 S16/1/GRP1/1/4c2 S16/1/GRP1/1/4c3 S16/1/GRP1/1/4c4
VC4-4c Logical Port on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].1-4	S4/1/[5-13]/1/4c1
VC4-4c Logical Port on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].1-4	S4/1/GRP[1-4]/1/4c1
VC-4 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16]	S16/1/[4,16]/1/[1-16]
VC-4 Logical Port on STM-16 MSP (Line)	WS16/1	LP1.[1-16]	S16/1/GRP1/1/[1-16] ¹
VC4 Logical Port on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4]	S4/1/[5-13]/1/[1-4]h
VC4 Logical Port on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4]	S4/1/GRP[1-4]/1/[1-4]

Table 6-29 Port Identifiers for WaveStar ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
VC-4 Logical Port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1	S1/1/[5-13]/[1-4]/1 ¹
VC-4 Logical Port on STM-1 MSP(Trib)	WS16/1, WS16/1MSSP	TP1.[1-4].1 TP3.[1-4].1 TP5.[1-4].1 TP7.[1-4].1	S1/1/GRP1/[1-4]/1 ^{5 6} S1/1/GRP2/[1-4]/1 ^{5 6} S1/1/GRP3/[1-4]/1 ^{5 6} S1/1/GRP4/[1-4]/1 ^{5 6}
VC-4 Logical Port on STM-0 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4]	S0/1/[5-13]/[1-4]
VC-4 Logical Port on STM-0 MSP(Trib)	WS16/1, WS16/1MSSP	TP1.[1-4] TP3.[1-4] TP5.[1-4] TP7.[1-4]	S0/1/GRP1/[1-4]/1 ^{5 6} S0/1/GRP2/[1-4]/1 ^{5 6} S0/1/GRP3/[1-4]/1 ^{5 6} S0/1/GRP4/[1-4]/1 ^{5 6}
VC-4 Logical Port on PI/E12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8]	P1/1/[5-12]/1
VC-4 Logical port on PI-DS1/63 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8]	D1/1/[5-12]/1
VC-4 Logical Port on PI-E3DS3/12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-2] TP[1-8].[3-4]	P3/1/[5-12]/[1-2] D3/1/[5-12]/[3-4]
VC-4 Logical Port on PI-DS3/12 card (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-4]	D3/1/[5-12]/[1-4]
VC-4 Logical Port on P4-E4/4 card (Trib)	WS16/1, WS16/1MSSP	TP[2-9].[1-4]	P4/1/[6-13]/[1-4]
VC4 on LAN8 Tributary Port	WS16/1, WS16/1MSSP	TP[1-8]	LAN8/1/[5-12]/1
VC-3 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16].[1-3].0.0	S16/1/[4,16]/1/[1-16]-[1-3]
VC-3 Logical Port on STM-16 MSP (Line)	WS16/1	LP1.[1-16].[1-3].0.0	S16/1/GRP1/1/[1-16]-[1-3] ⁵
VC3 on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4].[1-3].0.0	S4/1/[5-13]/1/[1-4]-[1-3]

Table 6-29 Port Identifiers for WaveStar ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
VC3 on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].[1-3].0.0	S4/1/GRP[1-4]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1.[1-3].0.0	S1/1/[5-13]/[1-4]/1-[1-3]
VC-3 Logical port on STM-1 MSP (Trib)	WS16/1, WS16/1MSSP	TP1.[1-4].1.[1-3].0.0 TP3.[1-4].1.[1-3].0.0 TP5.[1-4].1.[1-3].0.0 TP7.[1-4].1.[1-3].0.0	S1/1/GRP1/[1-4]/1-[1-3] ⁵ S1/1/GRP2/[1-4]/1-[1-3] ⁵ S1/1/GRP3/[1-4]/1-[1-3] ⁵ S1/1/GRP4/[1-4]/1-[1-3] ⁵
VC-3 Logical Port on E3 port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	P3/1/[5-12]/[1-4]-[1-3] ⁴
VC-3 Logical Port on DS3 port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-12]	D3/1/[5-12]/[1-4]-[1-3] ³
VC-12 Logical Port on STM-16 (Line)	WS16/1, WS16/1MSSP	LP[1,2].[1-16].[1-3].[1-7].[1-3]	S16/1/[4,16]/1/[1-16]-[1-63]
VC-12 Logical Port on STM-16 MSP (Line)	WS16/1,	LP1.[1-16].[1-3].[1-7].[1-3]	S16/1/GRP1/1/[1-16]-[1-63]g
VC12 on STM-4 Tributary Port	WS16/1, WS16/1MSSP	TP[1-9].[1-4].[1-3].[1-7].[1-3]	S4/1/[5-13]/1/[1-4]-[1-63]
VC12 on STM-4 MSP Tributary Port	WS16/1, WS16/1MSSP	TP[1,3,5,7].[1-4].[1-3].[1-7].[1-3]	S4/1/GRP[1-4]/1/[1-4]-[1-63]
VC-12 Logical port on STM-1 (Trib)	WS16/1, WS16/1MSSP	TP[1-9].[1-4].1.[1-3].[1-7].[1-3]	S1/1/[5-13]/[1-4]/1-[1-63]
VC-12 Logical port on STM-1 MSP (Trib)	WS16/1, WS16/1MSSP	TP1.[1-4].1.[1-3].[1-7].[1-3] TP3.[1-4].1.[1-3].[1-7].[1-3] TP5.[1-4].1.[1-3].[1-7].[1-3] TP7.[1-4].1.[1-3].[1-7].[1-3]	S1/1/GRP1/[1-4]/1-[1-63] ⁵ S1/1/GRP2/[1-4]/1-[1-63] ⁵ S1/1/GRP3/[1-4]/1-[1-63] ⁵ S1/1/GRP4/[1-4]/1-[1-63] ⁵

Table 6-29 Port Identifiers for WaveStar ADM 16/1 network elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
VC-12 Logical port on E1 Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	P1/1/[5-12]/1-[1-63]
VC12 on LAN8 Tributary Port	WS16/1, WS16/1MSSP	TP[1-8].[1-8].[1-4]	LAN8/1/[5-12]/1/1-[1-32]
VC-11 Logical port on D1 Port (Trib)	WS16/1, WS16/1MSSP	TP[1-8].[1-63]	D1/1/[5-12]/1-[1-63]

Notes:

1. In general, the ITM-SC Port Selection screen should display both the physical port and GRP addresses when the parameter from ITM-NM across the F-interface is UI_PORT_LEVEL. There are, however, two exceptions which are as follows. 1) If the equipment necessary for MSP is known to be not present in the network element, then the display of the MSP Group address should be suppressed. 2) If MSP is already provisioned, then the standard port addresses (non-GRP) should be suppressed from the Port Selection screen.
2. With STM-n tributary units, the ITM-SC Port Selection screen should display the Network Level Address for each physical port, without regard to the AU3 / AU4 type configured for the port (subject to footnote 'a' above).
3. For setting of "In-use" flag for the ports in the ITM-SC Port Selection screens please refer to Port Status of Immediately Multiplexed Ports in Port Selection Screen, 8-54.
4. The definitions for EIDs and network level addresses allow for port addresses that may not be valid. A E3 (34 Mb/s) port, for example, may have port numbers ranging 1 through 6 only; a D3 port (45 Mb/s) in a mixed card may have port numbers ranging 7 to 12 only.
5. The ITM-SC Port Selection screen should display the logical GRP addresses when the corresponding STM-n digital link is provisioned with MSP. If the logical port is not derived from an MSP STM-n port, the standard port addresses (without GRP in the Network Level Address) will be displayed within the ITM-SC Port Selection screens.
6. In the case of the SA-1/4B or SI-L4.1/1 unit, the ITM-SC Port Selection screen should not display any VC-4 address for a physical port which has been configured in AU3 mode. It follows that no low-order port addresses will be displayed for a physical port which

has been configured in AU3 mode.



Port identifiers for WaveStar ADM 4/1 network elements

Overview This section describes the port identifiers for the WaveStar ADM 4/1 network elements.

Table The following table lists the port identifiers for the WaveStar ADM 4/1 network elements.

Table 6-30 Port Identifiers for WaveStar ADM 4/1 Network Elements

Description	Network Element	Entity Identifier (EID)	Network Level Address
[[MSP Group for STM-4]]	WS4/1STM4	[[LP[20,60]]]	[[S4/1/GRP[1,2]/1]]
MSP Group for STM-1	WS4/1STM1	LP[20,60]	S1/1/GRP[1,2]/1
STM-4 Physical Port (Line)	WS4/1STM4 WS4/1STM4R	LP[20,30, 50,60] LP[20,60]	S4/1/[20,30,50,60]/1 S4/1/[20,60]/1
STM-1 Physical Port (Line)	WS4/1STM1	LP[20,30, 50,60]	S1/1/[20,30,50,60]/1
STM-1 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61] TP[21,31,41,51,61]	S1/1/[21,31,41,51,61]/1 S1/1/[21,31,41,51,61]/1
CEPT-3 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	P3/1/[21,31,41,51,61]/1 P3/1/[21,31,41,51,61]/1
DS3 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	D3/1/[21,31,41,51,61]/1 D3/1/[21,31,41,51,61]/1
CEPT-1 Physical Port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,22,31,32,41,51,52,61,62].[1-16] TP[21,22,31,32,41,51,52,61,62].[1-16]	P1/1/[21,22,31,32,41,51,52,61,62]/[1-16] P1/1/[21,22,31,32,41,51,52,61,62]/[1-16]
[[VC-4 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4]]]	[[S4/1/GRP[1,2]/1/[1-4]]]
VC-4 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,30, 50,60].[1-4]	S4/1/[20,30, 50,60]/1/[1-4] ³
VC-4 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4]	S4/1/[11,22]/1/[1-4] ³
VC-4 Logical Port on STM-1 (Line MSP)	WS4/1STM1	LP[20,60].1	S1/1/GRP[1,2]/1/1 ²

Table 6-30 Port Identifiers for WaveStar ADM 4/1 Network Elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
VC-4 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,30, 50,60].1	S1/1/[20,30, 50,60]/1/1
VC-4 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1	S1/1/[11,22]/1/1
VC-4 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	S1/1/[21,31,41,51,61]/1/1 S1/1/[21,31,41,51,61]/1/1
[[VC-3 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4].[1-3].0.0]]	[[S4/1/GRP[1,2]/1/[1-4]-[1-3] ²]]
VC-3 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,60].[1-4].[1-3].0.0	S4/1/[20,60]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4].[1-3].0.0	S4/1/[11,22]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Line MSP)	WS4/1STM1	LP[20,60].1.[1-3].0.0	S1/1/GRP[1,2]/1/1-[1-3] ²
VC-3 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,60].1.[1-3].0.0	S1/1/[20,60]/1/1-[1-3]
VC-3 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1.[1-3].0.0	S1/1/[11,22]/1/1-[1-3]
VC-3 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1.[1-3].0.0 TP[21,31,41,51,61].1.[1-3].0.0	S1/1/[21,31,41,51,61]/1/1-[1-3] S1/1/[21,31,41,51,61]/1/1-[1-3]
VC-3 Logical Port on CEPT-3 Physical port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	P3/1/[21,31,41,51,61]/1 P3/1/[21,31,41,51,61]/1
VC-3 Logical Port on DS-3 Physical port (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1 TP[21,31,41,51,61].1	D3/1/[21,31,41,51,61]/1 D3/1/[21,31,41,51,61]/1
[[VC-12 Logical Port on STM-4 (Line MSP)]]	WS4/1STM4	[[LP[20,60].[1-4].[1-3].[1-7].[1-3]]]	[[S4/1/GRP[1,2]/1/[1-4]-[1-63] ²]]
VC-12 Logical Port on STM-4 (Line)	WS4/1STM4	LP[20,60].[1-4].[1-3].[1-7].[1-3]	S4/1/[20,60]/1/[1-4]-[1-63]
VC-12 Logical Port on STM-4 (Virtual)	WS4/1STM4	VP[11,22].[1-4].[1-3].[1-7].[1-3]	S4/1/[11,22]/1/[1-4]-[1-63]

Table 6-30 Port Identifiers for WaveStar ADM 4/1 Network Elements (continued)

Description	Network Element	Entity Identifier (EID)	Network Level Address
VC-12 Logical Port on STM-1 MSP (Line)	WS4/1STM1	LP[20,60].1.[1-3].[1-7].[1-3]	S1/1/GRP[1,2]/1/1-[1-63] ²
VC-12 Logical Port on STM-1 (Line)	WS4/1STM1	LP[20,60].1.[1-3].[1-7].[1-3]	S1/1/[20,60]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Virtual)	WS4/1STM1	VP[11,22].1.[1-3].[1-7].[1-3]	S1/1/[11,22]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Trib)	WS4/1STM4 WS4/1STM1	TP[21,31,41,51,61].1.[1-3].[1-7].[1-3] TP[21,31,41,51,61].1.[1-3].[1-7].[1-3]	S1/1/[21,31,41,51,61]/1/1-[1-63] S1/1/[21,31,41,51,61]/1/1-[1-63]
VC-12 Logical Port on CEPT-1 (2 Mb/s) Physical port	WS4/1STM4 WS4/1STM1	TP[21,22,31,32,41,51,52,61,62].[1-16] TP[21,22,31,32,41,51,52,61,62].[1-16]	P1/1/[21,22,31,32,41,51,52,61,62]/[1-16] P1/1/[21,22,31,32,41,51,52,61,62]/[1-16]

Notes:

1. For a STM-n physical port which is involved in MSP protection (as either the worker or protecting port), the ITM-SC Port Selection screen should display the appropriate GRP address only. For a STM-n physical port which is not involved in MSP protection, the ITM-SC Port Selection screen should display the standard port address only (non-GRP).
2. For a logical port which is derived from a STM-n MSP protection group, the ITM-SC Port Selection screen should display the logical GRP address only. For a logical port derived from a STM-n port which is not involved in MSP protection, the ITM-SC Port Selection screen should display the standard logical port address only (non-GRP).
3. The ITM-SC Port Selection screen should always display all the existing AU4 ports, not only the AU4 port available for add/drop use. The 3 AU4 which are fixed cross connected (line to line transferred) will be always tagged as in-use. The 4th AU4 (the flexible one) will be displayed with the in-use tag set depending on its in-use status.



Port identifiers for ADM-155E network elements

Overview This section describes the port identifiers for the WaveStar ADM-155E network elements.

Table The following table lists the port identifiers for the WaveStar ADM 4/1 network elements.

Table 6-31 Port Identifiers for ADM-155E Network Elements

Description	Entity Identifier (EID)	Network Level Address
MSP Group for STM-1	LP[6,16]	S1/1/GRP[1,2]/1
STM-1 Physical Port (Line)	LP[6,7,16,17]	S1/1/[6,7,16,17]/1
STM-1 Physical Port (Trib)	TP[8-15]	S1/1/[8-15]/1
CEPT-3 Physical Port (Trib)	TP[8-15].1	P3/1/[8-15]/1
DS3 Physical Port (Trib)	TP[8-15].1	D3/1/[8-15]/1
CEPT-1 Physical Port (Trib)	TP[8-15].[1-16]	P1/1/[8-15]/[1-16]
VC-4 Logical Port (Line MSP)	LP[6,16].1	S1/1/GRP[1,2]/1/1
VC-4 Logical Port (Line)	LP[6,16].1	S1/1/[6,16]/1/1
VC-4 Logical Port (Virtual)	VP[21,22].1	S1/1/[21,22]/1/1
VC-4 Logical Port on STM-1 (Trib)	TP[8-15].1	S1/1/[8-15]/1/1
VC-3 Logical Port (Line MSP)	LP[6,16].1.[1-3].0.0	S1/1/GRP[1,2]/1/1-[1-3]
VC-3 Logical Port (Line)	LP[6,16].1.[1-3].0.0	S1/1/[6,16]/1/1-[1-3]
VC-3 Logical Port (Virtual)	VP[21,22].1.[1-3].0.0	S1/1/[21,22]/1/1-[1-3]

**Table 6-31 Port Identifiers for ADM-155E Network Elements
 (continued)**

Description	Entity Identifier (EID)	Network Level Address
VC-3 Logical Port on STM-1 (Trib)	TP[8-15].1.[1-3].0.0	S1/1/[8-15]/1/1-[1-3]
VC-3 Logical Port on CEPT-3 Physical port (Trib)	TP[8-15].1	P3/1/[8-15]/1
VC-3 Logical Port on DS-3 Physical port (Trib)	TP[8-15].1	D3/1/[8-15]/1
VC-12 Logical Port (Line MSP)	LP[6,16].1.[1-3].[1-7].[1-3]	S1/1/GRP[1,2]/1/1-[1-63]
VC-12 Logical Port (Line)	LP[6,16].1.[1-3].[1-7].[1-3]	S1/1/[6,16]/1/1-[1-63]
VC-12 Logical Port (Virtual)	VP[21,22].1.[1-3].[1-7].[1-3]	S1/1/[21,22]/1/1-[1-63]
VC-12 Logical Port on STM-1 (Trib)	TP[8-15].1.[1-3].[1-7].[1-3]	S1/1/[8-15]/1/1-[1-63]
VC-12 Logical Port on CEPT-1 (2 Mb/s) Physical port	TP[8-15].[1-16]	P1/1/[8-15]/[1-16]

□

Section III: AM 1 Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of WaveStar DACS VI (Release 2.0 or later). It also discusses the correlation between the external and internal port addresses.

Contents

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Port identifiers for AM 1+ network elements	6-32



Port identifiers for AM 1 network elements

Overview This section contains port address information for the physical and logical ports usable with AM 1 network elements.

Port identifiers The following table shows the port identifier address information for AM 1 network elements.

Description		Entity Identifier (EID)	Network Level Address
STM-1 Line Port	Physical Port	LP[1-2]	S1/1/[2-3]/1
	Logical Port (AU4 and VC4 combined)	LP[1-2].1	S1/1/[2-3]/1/1
	Logical Port TU3	LP[1-2].1[1-3].0.0	S1/1/[2-3]/1/1-[1-3]
	Logical Port TU12	LP[1-2].1[1-3].[1-7].[1-3]	S1/1/[2-3]/1/1-[1-63]
STM-1 Line MSP Group	Physical Port	LP1	S1/1/GRP1/1
	Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/GRP1/1/1
	Logical Port TU3	LP1.1.[1-3].0.0	S1/1/GRP1/1/1-[1-3]
	Logical Port TU12	LP1.1.[1-3].[1-7].[1-3]	S1/1/GRP1/1/1-[1-63]
DS3 (45Mb/s) Tributary	Physical Ports	TP2.[1-2]	D3/1/5/[1-2]
	Logical Port VC3	TP2.[1-2]	D3/1/5/[1-2]
E3 (CEPT-3) (34Mb/s) Tributary	Physical Ports	TP2.[1-2]	P3/1/5/[1-2]
	Logical Port VC3	TP2.[1-2]	P3/1/5/[1-2]
CMB E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
	Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]
CMC E1 (CEPT-1) (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
	Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
X.21 Tributary (TransLAN/X.21 card)	Physical X.21 Ports (X21DL)	TP2.[1-4]	X21/1/5/[1-4]
	Logical X.21 Ports VC12	TP2.[1-4]	X21/1/5/[1-4]

TransLAN Tributary (TransLAN/X.21 card)	Physical LAN 10/100baseT Ports (LAN8DL)	LAN2.[1-2]	LAN8/1/5/[1-2]
	Logical LAN 10/100baseT ports VC12	LAN2.[1-2].[1-4]	LAN8/1/5/[1-2]/[1-4]
TransLAN+ Tributary	Physical LAN 10/100baseT Ports	LAN2.[1-4]	[[LANACC/1/5/[1-4]]]
	[[Logical LAN 10/100baseT LAN Groups]]	[[LANGRP2.n]]	[[NA]]
	Logical LAN 10/100baseT LAN Ports	LAN2.[1-4]	[[LANACC/1/5/[1-4]]]
	Logical LAN 10/100baseT WAN Ports	WAN2.[1-4]	[[LANBR/1/5/[1-4]]]
	Logical SDH Channel Ports	SDHChan2.[1-4]	[[LANBR/1/5/[1-4]]]
	Logical Ports VC3	TP2.abcd	[[LANBR/1/5/abcd]]
	Logical Ports VC12	TP2.abcd	[[LANBR/1/5/abcd]]



Port identifiers for AM 1+ network elements

Overview This section contains port address information for the physical and logical ports usable with AM 1+ network elements.

Port identifiers The following table shows the port identifier address information for AM 1 network elements.

Network Elements	Description		Entity Identifier (EID)	Network Level Address
WS_AM1PLUS_STM4	STM-4 Line Port	Physical Ports	LP [1-2]	S4/1/[2-3]/1
		Logical Port (AU4 or AU4/VC4 combined)	LP[1-2].[1-4]	S4/1/[2-3]/1/[1-4]
		Logical Port TU3	LP[1-2].[1-4].[1-3].0.0	S4/1/[2-3]/1/[1-4]-[1-3]
		Logical Port TU12	LP[1-2].[1-4].[1-3].[1-7].[1-3]	S4/1/[2-3]/1/[1-4]-[1-63]
	[[STM-4 Line MSP Group]]	[[Physical Ports]]	[[LP1]]	[[S4/1/GRP1/1]]
		[[Logical Port (AU4 or AU4/VC4 combined)]]	[[LP1.[1-4]]]	[[S4/1/GRP1/1[1-4]]]
		[[Logical Port TU3]]	[[LP1.[1-4].[1-3].0.0]]	[[S4/1/GRP1/1[1-4]-[1-3]]]
		[[Logical Port TU12]]	[[LP1.[1-4].[1-3].[1-7].[1-3]]]	[[S4/1/GRP1/1[1-4]-[1-63]]]
	STM-1 Tributary	Physical Port	TP2.[1-2]	S1/1/5/[1-2]
		Logical Port (AU4)	TP2.[1-2].1	S1/1/5/[1-2]/1

WS_AM1PLUS_STM1, WS_AM1PLUS_STM1- T	STM-1 Line Port (Line Slot 1)	Physical Ports	LP1	S1/1/2/1
		Logical Port (AU4 or AU4/VC4 combined)	LP1.1	S1/1/2/1/1
		Logical Port TU3	LP1.1.[1-3].0.0	S1/1/2/1/1-[1-3]
		Logical Port TU12	LP1.1.[1-3].[1- 7].[1-3]	S1/1/2/1/1-[1-63]
WS_AM1PLUS_ STM1	STM-1 Line Port (Line Slot 2)	Physical Ports	LP2	S1/1/3/1
		Logical Port (AU4 or AU4/VC4 combined)	LP2.1	S1/1/3/1/1
		Logical Port TU3	LP2.1.[1-3].0.0	S1/1/3/1/1-[1-3]
		Logical Port TU12	LP2.1.[1-3].[1- 7].[1-3]	S1/1/3/1/1-[1-63]
WS_AM1PLUS_ STM1	STM-1 Line MSP Group	Physical Ports	LP1	S1/1/GRP1/1
		Logical Port (AU4 or AU4/VC4 combined)	LP1.1	S1/1/GRP1/1/1
		Logical Port TU3	LP1.1.[1-3].0.0	S1/1/GRP1/1/1-[1-3]
		Logical Port TU12	LP1.1.[1-3].[1- 7].[1-3]	S1/1/GRP1/1/1-[1- 63]

Port identifiers for AM 1+ network elements

WS_AM1PLUS_STM4, WS_AM1PLUS_STM1, WS_AM1PLUS_STM1_ T	DS3 (45Mb/s) Tributary	Physical Ports	TP2.[1-2]	D3/1/5/[1-2]
		Logical Port VC3	TP2.[1-2]	D3/1/5/[1-2]
	E3 (CEPT-3) (34Mb/s) Tributary	Physical Ports	TP2.[1-2]	P3/1/5/[1-2]
		Logical Port VC3	TP2.[1-2]	P3/1/5/[1-2]
	CMB E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
		Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]
	CMC E1 (CEPT-1) (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	ISDN PRI (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/4/[1-16]
		Logical Port VC12	TP1.[1-16]	P1/1/4/[1-16]
	ISDN PRI (2Mb/s) Tributary (additional)	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	DS1 Tributary	Physical Ports	TP2.[1-16]	P1/1/5/[1-16]
		Logical Port VC12	TP2.[1-16]	P1/1/5/[1-16]
	X.21 Tributary	Physical X.21 Ports (X21DL)	TP2.[1-4]	X21/1/5/[1-4]
		Logical X.21 Ports VC12	TP2.[1-4]	X21/1/5/[1-4]

WS_AM1PLUS_STM4, WS_AM1PLUS_STM1, WS_AM1PLUS_STM1_ T	TransLAN+ Tributary	Physical LAN 10/100baseT Ports	LAN2.[1-4]	[[LANACC/1/5/[1-4]]]
		[[Logical LAN 10/100baseT LAN Groups]]	[[LANGRP2.n]]	[[NA]]
		Logical LAN 10/100baseT LAN Ports	LAN2.[1-4]	[[LANACC/1/5/[1-4]]]
		Logical LAN 10/100baseT WAN Ports	WAN2.[1-4]	[[LANBR/1/5/[1-4]]]
		Logical SDH Channel Ports	SDHChan2.[1-4]	[[LANBR/1/5/[1-4]]]
		Logical Ports VC3	TP2.abcd	[[LANBR/1/5/abcd]]
		Logical Ports VC12	TP2.abcd	[[LANBR/1/5/abcd]]



Section IV: WaveStar DACS VI Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of WaveStar DACS VI (Release 2.0 or later). It also discusses the correlation between the external and internal port addresses.

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Port address information

Overview This section contains port address information for the physical and logical ports usable with WaveStar DACS VI.

Physical ports The following tables show the address information for the physical ports usable with WaveStar DACS VI.

Table 6-32 STM-1 Digital Link

S1/mm/n/p	
mm	1 to 17
n	1 to 8
p	1
Example	S1/12/6/1
S1/mm/n/p	

Table 6-33 STM-1 Digital Link using 1 +1 MSP Protection

S1/mm/GRPn/p	
mm	1 to 17
n	1 to 4
p	1
Example	S1/12/GRP4/1

Table 6-34 CEPT-3 Digital Link

P3/mm/n/p	
mm	1 to 32
n	1 to 4 and 6 to 9
p	1
Example	P3/32/4/1

Table 6-35 CEPT-4 Digital Link

P4/mm/n/p	
P4/mm/n/p	

Table 6-35 CEPT-4 Digital Link (continued)

mm	1 to 32
n	1 and 3
p	1
Example	P4/12/3/1

Table 6-36 CEPT-1 Digital Link, CEPT-1 Circuit

P1/mm/nn/xx	
mm	1 to 32
nn	1 to 8 and 10 to 17
xx	if nn = 8 or 17, xx = 1 to 7 if nn is not 8 or 17, xx = 1 to 8
Example	P1/14/6/ 8 P1/14/8/7

The following table is specific to the PP4A subrack with TPU2DBL (also designated as TPU-2/16) slot cards.

Table 6-37 CEPT-1 Digital Link, CEPT-1 Circuit

P1/Hmm/nn/xx	
mm	1 to 17
nn	1 to 8 and 10 to 17
xx	if nn = 4, 8, 13 or 17, xx = 1 to 15 if nn is not 4, 8, 13 or 17, xx = 1 to 16
Example	P1/H17/8/15 P1/H17/7/16

The following table is specific to DACs VI with TPU2 Sub-rack

Table 6-38 CEPT-1 Digital Link, CEPT-1 Circuit

P1/mm/nn/xx	
mm	1 to 32
nn	1 to 8 and 10 to 17

Table 6-38 CEPT-1 Digital Link, CEPT-1 Circuit (continued)

xx	if nn = 8 or 17, xx = 1 to 7 if nn is not 8 or 17, xx = 1 to 8
Example	P1/14/6/ 8 P1/14/8/7

The following table is specific to the PP4A subrack with TPU2DBL (also designated as TPU-2/16) slot cards.

Table 6-39 CEPT-1 Digital Link, CEPT-1 Circuit

P1/Hmm/nn/xx	
mm	1 to 17
nn	1 to 8 and 10 to 17
xx	if nn = 4, 8, 13 or 17, xx = 1 to 15 if nn is not 4, 8, 13 or 17, xx = 1 to 16
Example	P1/H17/8/15 P1/H17/7/16

Logical ports

The following tables show the address information for the logical ports usable with WaveStar DACS VI.

Table 6-40 VC-4 Paths

S1/mm/n/p/h	
mm	1 to 17
n	1 to 8
p	1
h	1
Example	S1/12/6/1/1

Table 6-41 VC-3 Paths

S1/mm/n/p/h-l	
mm	1 to 17
n	1 to 8
p	1

Table 6-41 VC-3 Paths (continued)

h	1
l	1 to 3
Example	S1/12/6/1/1-3

Table 6-42 CEPT-1 Circuit Riding on a Channelized VC-4 Path

S1/mm/n/p/h-l	
mm	1 to 17
n	1 to 8
p	1
h	1
l	1 to 63
Example	S1/12/6/1/1-63

Table 6-43 VC-4 Path Using a 1 + 1 MSP STM-1 Digital Link

S1/mm/GRPn/p/h	
mm	1 to 17
n	1 to 4
p	1
h	1

Table 6-44 VC-3 Path Riding a VC-4 Using a 1 + 1 MSP STM-1 Digital Link

S1/mm/GRPn/p/h-l	
mm	1 to 17
n	1 to 4
p	1
h	1
l	1 to 3

**Table 6-45 VC-12 Path Riding VC-4 Path Using 1 + 1 MSP
STM-1 DL/ CEPT-1 Circuit Riding Channelized
VC-4 Path Using 1 + 1 MSP STM-1 Digital Link**

S1/mm/GRPn/p/h-l	
mm	1 to 17
n	1 to 4
p	1
h	1
l	1 to 63
Example	S1/12/GRP4/1/1-63

Table 6-46 CEPT-1 Circuit Riding on a CEPT-3 Digital Link

P3/mm/n/p/l	
mm	1 to 32
n	1 to 4 and 6 to 9
p	1
l	1 to 16 for n = 1 to 3 and 6 to 8 1 to 15 for n = 4 or 9
Example	P3/32/4/1/15

Table 6-47 CEPT-1 Circuit Riding on a CEPT-4 Digital Link

P4/mm/n/p /l	
mm	1 to 32
n	1 and 3
p	1
l	1 to 63
Example	P4/12/3/1/63



Correlation of external and internal port addresses

Overview This section discusses the correlation between external and internal port addresses for WaveStar DACS VI.

SDH correlation **Important!** If a VC-4 path uses a 1 + 1 MSP STM-1 protected digital link, *n* (in the internal addresses) can be: 1 (for GRP1), 3 (for GRP2), 5 (for GRP3), 7 (for GRP4), etc.

The following tables show the correlation between SDH physical and logical ports.

Table 6-48 SDH Physical Ports

	External Address	Internal Address
STM-1 digital link	S1 / [1-17] /1-8] / 1	LPU155-[1-17]-LPU155-[1-8]-1
1 + 1 MSP STM-1 protected digital link	S1 / [1-17] /GRP[1-4] /1	LPU155-[1-17]-LPU155-[GRP1-GRP4]

Table 6-49 SDH Logical Ports

	External Address	Internal Address
VC-4 Path	S1 / [1-17] /1-8] / 1/1	LPU155-[1-17]-LPU155-[1-8]-1
VC-4 path using 1 + 1 MSP STM-1 protected digital link	S1 / [1-17] /GRP[1-4] /1/1	LPU155-[1-17]-LPU155-[1,3,5,7]-1
VC-3 Path	S1 / [1-17] /1-8] / 1/1-[1-3]	LPU155-[1-17]-LPU155-[1-8]-1-[1-3]-1
VC-3 path using 1 + 1 MSP STM-1 protected digital link	S1 / [1-17] /GRP[1-4] /1/1-[1-3]	LPU155-[1-17]-LPU155-[1,3,5,7]-1- [1-3]-1

Addresses

Correlation of external and internal port addresses

Table 6-50 63 Logical Ports of a VC-4 Path (Facility)

External Address	Internal Address
S1/[1-17]/[1-8]/1/1-[1-63]	LPU155-[1-17]-LPUi55-[1-8]-1-[1-3]-[1-7]-[1-3]
S1/mm/n/p/h-l	LPU155-mm-LPUi55-n-1-x-y-z
Si/[1-17]/GRP[1-4]/1/1-[1-63]	LPU155-[1-17]-LPUi55-[1,3,5,7]-1-[1-3]-[1-7]-[1-3]
S1/mm/GRPn/p/h-L	LPU155-mm-LPUi55-n-1-x-y-z

Table 6-51 x, y, and z of Internal Address Derived from “l” of External Address

L	x	y	z	l	x	y	z	l	x	y	z
1	1	1	1	22	2	1	1	43	3	1	1
2	1	1	2	23	2	1	2	44	3	1	2
3	1	1	3	24	2	1	3	45	3	1	3
4	1	2	1	25	2	2	1	46	3	2	1
5	1	2	2	26	2	2	2	47	3	2	2
6	1	2	3	27	2	2	3	48	3	2	3
7	1	3	1	28	2	3	1	49	3	3	1
8	1	3	2	29	2	3	2	50	3	3	2
9	1	3	3	30	2	3	3	51	3	3	3
10	1	4	1	31	2	4	1	52	3	4	1
11	1	4	2	32	2	4	2	53	3	4	2
12	1	4	3	33	2	4	3	54	3	4	3
13	1	5	1	34	2	5	1	55	3	5	1
14	1	5	2	35	2	5	2	56	3	5	2
15	1	5	3	36	2	5	3	57	3	5	3
16	1	6	1	37	2	6	1	58	3	6	1
17	1	6	2	38	2	6	2	59	3	6	2
18	1	6	3	39	2	6	3	60	3	6	3
19	1	7	1	40	2	7	1	61	3	7	1
20	1	7	2	41	2	7	2	62	3	7	2
21	1	7	3	42	2	7	3	63	3	7	3

Correlation of external and internal port
addresses

PDH correlation The following tables show the correlation between PDH physical and logical ports.

Table 6-52 PDH Physical Ports

	External Address	Internal Address
CEPT-4 digital link CEPT-4 facility/ckt	P4/[1-32]/[1-3]/1	TPU34/140-[1-32]-TPU140MX-[1-3]-1
CEPT-3 digital link CEPT-3 facility/ckt.	P3/[1-32]/[1-4, 6-9]/1	TPU34/140-[1-32]-TPU34MX- [1-4, 6-9]-1
CEPT-1 digital link CEPT-1 facility/ckt	(DACS VI release 1.3 or 2.0 with TPU2 subrack): P1/[1-32]/[1-8, 10-17]/[1-8] (DACS VI release 2.0 with PP4A subrack with TPU2DBL [also designated as TPU-2/16] slot cards): P1/H[1-17]/[1-8, 10-17]/[1-16]	(DACS VI release 1.3 or 2.0 with TPU2 subrack): TPU2-[1-32]-TPU2-[1-8, 10-17]-[1-8] (DACS VI release 2.0 with PP4A subrack with TPU2DBL [also designated as TPU-2/16] slot cards): PP4A-[1-17]-TPU2DBL-[1-8, 10-17]-[1-16]

Table 6-53 Logical Ports of a CEPT-4 Digital Link

External Address	Internal Address
P4/[1-32]/[1,3]/1/[1-63]	TPU34/140-[1-32]-TPU140MX-[1,3]-1-[1-4].[1-4].[1-4]
P4/mm/n/p/L	TPU34/140-[1-32]-TPU140MX-[1-3]-1-x.y.z

Table 6-54 x, y, and z Internal Address Derived from “I” of External Address:

L	x	y	z	I	x	y	z	I	x	y	z
1	1	1	1	22	2	2	2	43	3	3	3
2	1	1	2	23	2	2	3	44	3	3	4
3	1	1	3	24	2	2	4	45	3	4	1
4	1	1	4	25	2	3	1	46	3	4	2
5	1	2	1	26	2	3	2	47	3	4	3
6	1	2	2	27	2	3	3	48	3	4	4
7	1	2	3	28	2	3	4	49	4	1	1
8	1	2	4	29	2	4	1	50	4	1	2
9	1	3	1	30	2	4	2	51	4	1	3

Addresses

Correlation of external and internal port addresses

Table 6-54 x, y, and z Internal Address Derived from "l" of External Address: (continued)

L	x	y	z	l	x	y	z	l	x	y	z
10	1	3	2	31	2	4	3	52	4	1	4
11	1	3	3	32	2	4	4	53	4	2	1
12	1	3	4	33	3	1	1	54	4	2	2
13	1	4	1	34	3	1	2	55	4	2	3
14	1	4	2	35	3	1	3	56	4	2	4
15	1	4	3	36	3	1	4	57	4	3	1
16	1	4	4	37	3	2	1	58	4	3	2
17	2	1	1	38	3	2	2	59	4	3	3
18	2	1	2	39	3	2	3	60	4	3	4
19	2	1	3	40	3	2	4	61	4	4	1
20	2	1	4	41	3	3	1	62	4	4	2
21	2	2	1	42	3	3	2	63	4	4	3

CEPT-3 digital link (16 logical ports)

The following tables provide information for 16 CEPT-1 circuits riding on a channelized CEPT-3 digital link.

Table 6-55 16 CEPT-1 Circuits Riding on a Channelized CEPT-3 Digital Link

External Address	Internal Address
P3/[1-32]/[1-4,6-9]/1/[1-16]	TPU34/140-[1-32]-TPU34TMX-[1-4,6-9]-1-1.[1-4].[1-4]
P3/mm/n/p /L	TPU34/140-mm-TPU34TMX-n-1-1.x.y

Table 6-56 X and Y of Internal Address Re-derived from "l" of External Address.

L	x	y
1	1	1
2	1	2
3	1	3
4	1	4
5	2	1

Correlation of external and internal port
addresses

Table 6-56 X and Y of Internal Address Re-derived from “I” of External Address. (continued)

L	x	y
6	2	2
7	2	3
8	2	4
9	3	1
10	3	2
11	3	3
12	3	4
13	4	1
14	4	2
15	4	3
16	4	4

Table 6-57 WaveStar DACS Port Address for STM-0 and STM-1 Digital Links

Port Card Type	External Address	Internal Address
STM0	S0/PB[4-19]/[1-8,11-18]/[[1-12]	PSB-[4-19]-STM0-[1-8,11-18]-[1-12]
STM0 (MSP)	S0/PB[4-19]/GRP[1-8]/[1-12]	PSB-[4-19]-STM0-MSP[1,3,5,7,11,13,15,17]-[1-12]
STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]
STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]

Table 6-58 WaveStar DACS Port Address for AU3 and VC4 Logical Ports

Logical Port	Port Card Type	External Address	Internal Address

Addresses

Correlation of external and internal port addresses

Table 6-58 WaveStar DACS Port Address for AU3 and VC4 Logical Ports (continued)

AU3	STM0	S0/PB[4-19]/[1-8,11-18]/[[1-12]/1	PSB-[4-19]-STM0-[1-8,11-18]-[1-12]-AUGI#1-AU3#1
AU3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUGI#1-AU3#[1-3]
AU3	STM0 (MSP)	S0/PB[4-19]/GRP[1-8]/[1-12]/1	PSB-[4-19]-STM0-MSP[1,3,5,7,11,13,15,17]-[1-12]-AUGI#1-AU3#1
AU3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUGI#1-AU3#[1-3]
VC4	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUGI#1-AU4
VC4	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/1	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUGI#1-AU4

Table 6-59 WaveStar DACS Network Level Port Address for VC3 and VC12

Logical Port	Port Card Type	External Address	Internal Address
VC3	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-3]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUGI#1-AU4-TUG3#[1-3]-TU3
VC3	STM1 (MSP)	S1/PA[4-19]/GRP[1-8]/[1-4]/[1-3]	PSA-[4-19]-STM1-MSP[1,3,5,7,11,13,15,17]-[1-4]-AUGI#1-AU4-TUG3#[1-3]-TU3
VC12	STM1	S1/PA[4-19]/[1-8,11-18]/[[1-4]/1-[1-63]	PSA-[4-19]-STM1-[1-8,11-18]-[1-4]-AUGI#1-AU4-TUG3#[1-3]-TUG2#[1-7]-TU12#[1-3]

Correlation of external and internal port
addresses

**Table 6-59 WaveStar DACS Network Level Port Address for
VC3 and VC12 (continued)**

VC12	STM1 (MSP)	S1/PA[4-19]/ GRP[1-8]/[1-4]/1- [1-63]	PSA-[4-19]-STM1-MSP[1, 3,5,7,11,13,15,17]-[1- 4]-AUG1#1-AU4- TUG3#[1-3]- TUG2#[1-7]-TU12#[1- 3]
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Section V: ISM Port Addresses

Overview

Purpose This section discusses the external and internal port addresses for both the physical logical and virtual ports of the ISM (Release 2.3 or later). This section also describes the correlation between external and internal port addresses.

Contents

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ISM-4 line ports

Overview This section provides the external addresses for the ISM-4 line ports.

Tables The following tables provide the external port addresses for ISM-4 line ports.

Table 6-60 STM-4 digital link of an ISM-4

S4/m/nn/p	
m	1
nn	12 or 13
p	1
Example	The two possible addresses: S4/1/12/1 and S4/1/13/1.

Table 6-61 VC-4 Path

S4/m/nn/p/h	
m	1
nn	12 or 13
p	1
h	1 to 4
Example	The eight possible addresses: S4/1/12/1/1, S4/1/12/1/2, S4/1/12/1/3, S4/1/12/1/4, S4/1/13/1, S4/1/13/2, S4/1/13/3, S4/1/13/4

Table 6-62 VC-3 Path riding a VC-4

S4/m/nn/p/h-l	
m	1
nn	12 or 13
p	1
h	1 to 4
l	1 to 3

Table 6-62 VC-3 Path riding a VC-4 (continued)

S4/m/nn/p/h-l	
Examples	S4/1/12/1/1-1 and S4/1/13/1/4-3

Table 6-63 VC-12 Path riding a VC-4

S4/m/nn/p/h-l	
m	1
nn	12 or 13
p	1
h	1 to 4
l	1 to 63
Example	S4/1/12/1/1-1 S4/1/13/1/4-63



ISM-4 virtual ports

Overview This section provides the external addresses for the ISM-4 line ports.

Tables The following tables provide the external port addresses for ISM-4 line ports.

Table 6-64 VC-4 Path virtual protection

S4/m/nn-x-y/h	
m	1
nn	10
x	1 to 4
y	1 to 4
h	1
Examples	S4/1/10-1-1/1 and S4/1/10-4-4/1

Table 6-65 VC-12 Path riding a VC-4 Path with virtual protection

S4/m/nn-x-y/h-l	
m	1
nn	10
x	1 to 4
y	1 to 4
h	1
l	1 to 63
Examples	S4/1/10-1-1/1-1 and S4/1/10-4-4/1-63



ISM-1 line ports

Overview This section provides the external addresses for the ISM-1 line ports.

Tables The following tables provide the external port addresses for ISM-1 line ports.

Table 6-66 STM-1 Digital Link

S1/m/nn/p	
m	1
nn	12 or 13
p	1
Examples	The two possible addresses: S1/1/12/1 and S1/1/13/1.

Table 6-67 VC-4 Path

S1/m/nn/p/h	
m	1
nn	12 or 13
p	1
h	1
Examples	The two possible addresses: S1/1/12/1/1 and S1/1/13/1/1.

Table 6-68 VC-3 Path riding a VC-4

S1/m/nn/p/h-l	
m	1
nn	12 or 13
p	1
h	1
l	1 to 3
Examples	S1/1/12/1/1-1 and S1/1/13/1/1-3

Table 6-69 VC-12 Path riding a VC-4

S1/m/nn/p/h-l	
m	1
nn	12 or 13
p	1
h	1
l	1 to 63
Examples	S1/1/12/1/1-1 and S1/1/13/1/1-63



STM-1 line ports of an ISM-1

Overview This section provides the external addresses for the STM-1 (1+1 MSP) physical and logical line ports of an ISM-1.

Physical line ports The following tables provide the external port addresses for the STM-1 (1+1 MSP) physical line port of an ISM-1.

Table 6-70 STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p	
m	1
n	1
p	1
Example	S1/1/GRP1/1 is the only possible address.

Logical line ports The following tables provide the external port addresses for the STM-1 (1+1 MSP) logical line port of an ISM-1.

Table 6-71 (VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection)

S1/m/GRPn/p/h	
m	1
nn	1
p	1
h	1
Example	S1/1/GRP1/1/1 is the only possible address.

Table 6-72 VC-3 Path riding a VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p/h-l	
m	1
nn	1
p	1
h	1

Table 6-72 VC-3 Path riding a VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection (continued)

l	1 to 3
Example	The three possible addresses: S1/1/GRP1/1/1-1, S1/1/GRP1/1/1-2 and S1/1/GRP1/1/1-3

Table 6-73 VC-12 Path riding a VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p/h-l	
m	1
nn	1
p	1
h	1
l	1 to 63
Examples	S1/1/GRP1/1/1-1 and S1/1/GRP1/1/1-63

□

ISM-1 and ISM-4 tributary ports external addresses

Overview This section provides information about the external addresses for the ISM-1 and ISM-4 logical and physical tributary ports.

Logical ports This section provides the external addresses for the ISM-1 and ISM-4 tributary ports (logical).

Table 6-74 VC-3 Path riding a VC-4

S1/m/n/p/h-l	
m	1
n	1 to 8
p	1
h	1
l	1 to 3
Examples	S1/1/1/1-1 and S1/1/8/1-3

Table 6-75 STM-1 digital link

S1/m/n/p	
m	1
n	1 to 8
p	1
Examples	S1/1/1/1 and S1/1/8/1

Table 6-76 VC-4 Path

S1/m/n/p/h	
m	1
n	1 to 8
p	1
h	1 to 4
Examples	S1/1/1/1/1 and S1/1/8/1/4

Table 6-77 VC-12 Path riding a VC-4

S1/m/n/p/h-l	
m	1
n	1 to 8
p	1
h	1
l	1 to 63
Examples	S1/1/1/1/1-1 and S1/1/8/1/1/1-63

Physical ports The following are the external addresses for the ISM-1/4 tributary ports (physical).

Table 6-78 CEPT-4 digital link

P4/m/n/p	
m	1
n	7 to 8
p	1
Examples	P4/1/7/1 and P4/1/8/1

Table 6-79 CEPT-3 digital link

P3/m/n/p	
m	1
n	1 to 8
p	1 to 3
Examples	P3/1/1/1 and P3/1/8/3

Table 6-80 CEPT-1 digital link

P1/m/n/pp	
m	1
n	1 to 8
pp	1 to 16
Examples	P1/1/1/1 and P1/1/8/16



ISM-5E line port external addresses

Overview This section provides information about the external addresses for the ISM-5E logical and physical line ports.

Logical line ports This section provides the external addresses for the ISM-1 and ISM-4 tributary ports (logical).

Table 6-81 VC-4 Path

S1/m/nn/p	
m	1
nn	7
p	1
h	1
Example	S1/1/6/1/1 is the only possible address

Table 6-82 VC-12 Path riding a VC-4

S1/m/nn/p/h-l	
m	1
n	7
p	1
h	1
l	1 to 63
Example	S1/1/7/1/1-1 and S1/1/7/1/1-63

Table 6-83 VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p/h	
m	1
nn	1
p	1
h	1

Table 6-83 VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection (continued)

Example	S1/1/GRP1/1/1 is the only possible address.
---------	---

Table 6-84 VC-12 Path riding a VC-4 Path riding on an STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p/h-l	
m	1
n	1
p	1
h	1
l	1 to 63
Example	S1/1/GRP1/1/1-1 S1/1/GRP1/1/1-63

Physical line ports

This section provides the external addresses for the ISM-1 and ISM-4 tributary ports (physical).

Table 6-85 STM-1 digital link

S1/m/nn/p	
m	1
nn	7
p	1
Example	S1/1/7/1 is the only possible address

Table 6-86 STM-1 digital link using 1 + 1 MSP protection

S1/m/GRPn/p	
m	1
n	1
p	1
Example	S1/1/GRP1/1 is the only possible address.

□

ISM-5E tributary ports

Overview This section provides information about the ISM-5E tributary ports.

Logical ports This section provides the external addresses for the ISM-5E logical ports.

Table 6-87 VC-12 Path riding a CEPT-1 Path riding on an PCTDL digital link using 1 + 1 MSP protection

PCT/m/n/GRPnn/l	
m	1
n	1
nn	1 to 3
l	1 to 21
Example	PCT/1/1/GRP3/21

Table 6-88 CEPT-1 Logical Port on the TPU-PCT of a ISM-5E

PCT/m/n/GRPnn/l	
m	1
n	1
nn	1 to 3
l	1 to 21
Example	PCT/1/1/GRP3/21

Physical ports This section provides the external addresses for the ISM-5E physical ports.

Table 6-89 PCTDL digital link using 1 + 1 MSP protection

PCT/m/n/GRPnn	
m	1
n	1
nn	1 to 3
Example	PCT/1/1/GRP3

□

Section VI: NERA Radio Port Addresses

Overview

Purpose This section describes the external port addresses for the physical, logical and virtual ports of the NERA radio and regenerators.

Contents

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Terminal tributary ports (electrical side) external addresses	6-64
Regenerator line ports external addresses	6-65



Terminal line ports (radio side) external addresses

Overview This section provides information about the ISM-5E tributary ports.

Tables This section provides the external addresses for the NERA terminal line ports (radio side) external addresses.

Table 6-90 STM-1 digital link of a NERA Terminal on the Radio Side

S1/m/nn/p	
m	1 - 7
nn	1
p	1
Example	s1/2/1/

Table 6-91 VC-4 Path (STM-1 logical line port of a NERA terminal on the Radio side)

S1/m/nn/p	
m	1 - 7
nn	2
p	1
h	1
Example	S1/2/2/1/1



Terminal tributary ports (electrical side) external addresses

Overview This section provides information about the NERA terminal tributary ports.

Tables This section provides the external addresses for the NERA terminal line ports (radio side) external addresses.

Table 6-92 STM-1 Physical Tributary Port of a NERA Terminal on the Electrical Side

S1/m/nn/p	
m	1 - 7
nn	2
p	1
Example	S1/1/2/1

Table 6-93 STM-1 Logical Tributary Port of a NERA Terminal on the Electrical Side (VC4)

S1/m/nn/p	
m	1 - 7
nn	1
p	1
h	1
Example	S1/3/1/1/1



Regenerator line ports external addresses

Overview This section provides information about the NERA regenerator line ports.

Tables This section provides the external addresses for the NERA regenerator line ports external addresses.

Table 6-94 STM-1 Physical Line Port of a NERA Regenerator

S1/m/nn/p	
m	1 to 16
nn	1
p	1
Example	S1/8/1/1



Section VII: OLS400G Port Addresses

Overview

Purpose This section describes the external port addresses for the physical, logical and virtual ports of the NERA radio and regenerators.

Contents

Port address mapping for WaveStar OLS400G

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Port address mapping for WaveStar OLS400G

**Port identifiers for
OLS400G
(R3.0/R3.1/R4.0/R5.0
C-Band, R4.0 L-Band**

OCH Trail or Optical Link (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address
No compatible Optics	OTU	[linenum]/ [BAY]- [SHELF]- [SLOT]-freq (port-num)	OT / [linenum]/[BAY]-[SHELF]- [SLOT]-freq (port-num)
		[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]-zzzz ([1, 2])	OT / [1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12] /zzzz ([1, 2])
Compatible Optics	OMU	EXT_[linenum]/ [BAY]- [SHELF]- [SLOT]-freq	OT/EXT_[linenum]/[BAY]- [SHELF]-[SLOT]-freq
		EXT_[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]-zzzz	OT/EXT_[1E, 2E, 1W, 2W]/[1-12]-[1-3]-[1-12]/zzzz

OMS Line Port (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address

All OLS400G models except WADs	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]
For WAD model, 2F_4CH_AD	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]

For WAD model, 2F_ 4CH_ AD2	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]
For WAD model, 4F_ 4CH_ AD	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values)	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values]

Repeater port	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop)	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop)
		[1E, 2E, 1W, 2W] / [1-12] - [1-3] - [1-12] / [1-12] - [1-3] - [1-12]	OL [40, 80]c/[1E, 2E 1W, 2W]/[1-12] - [1-3] - [1-12] / [1-12] - [1-3] - [1-12]

OCH Trail Logical Port on OMS Line (up to OLS400G R5.0)			
Description	Port Type	Entity Identifier	Network Level Address
All OLS400G models except WADs	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop) - zzzz	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) - zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz

For WAD model, 2F_ 4CH_ AD	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz
For WAD model, 2F_ 4CH_ AD2	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz

For WAD model, 4F_ 4CH_ AD	OA	[linenum]/ [BAY]- [SHELF]- [SLOT] (for Add) /[BAY]- [SHELF]- [SLOT] (for Drop) zzzz	OL[40, 80]c/[linenum]/[BAY]- [SHELF]-[SLOT] (for Add) [BAY]-[SHELF]-[SLOT] (for Drop) zzzz
		[1E, 2E, 1W, 2W] (see lookup table for Bay-Shelf-Slot values) zzzz	OL [40, 80]c/[1E, 2E 1W, 2W]/[see lookup table for Bay-Shelf-Slot values] zzzz



Section VIII: PHASE Port Addresses

Overview

Purpose This section describes the external and internal port addresses for both the physical and logical ports of the PHASE network elements. This section also discusses the correlation between the external and internal port addresses.

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Port address information

Overview This section lists the port addresses for the following PHASE network elements:

- Terminal Multiplexers:
 - TM-16/4
 - TM-4/4
- Add Drop Multiplexers:
 - ADM-16/4
 - ADM-4/4
- Digital Cross-Connect Systems:
 - LXC-16/4
 - LXC-4/4
- Line Repeaters:
 - LR-16
 - LR-4.

Address format This section describes the network-level address format for the PHASE network elements.

Note that *[]* (brackets) indicates that the selection is contained within brackets. , (comma) denotes 'or.' - (hyphen) signifies a range of numbers. Users may select only one number in the range.

Table 6-95 Network Level Address Format Example

Description	Network level address	Read as	Example
STM-16 Physical Port for a TM-16/4	S16/1/[1,2,18]/1	S16/1/1 or 2 or 18/1	S16/1/2/1
STM-16 Physical Port for an ADM-16/4	S16/1/[2-5]/1	S16/1/2,3,4, or5/1	S16/1/5/1

**Table 6-95 Network Level Address Format Example
 (continued)**

Description	Network level address	Read as	Example
VC-3 Logical Port on STM-4 (Trib)	S4/1/[3-17]/1/[1-4]-[1-3]	S4/1/3 thru 17/1/1 thru 4 - 1 thru 3	S4/1/12/1/3-2

Port addresses The following lists the valid port addresses for the PHASE network elements.

Table 6-96 PHASE network element Port Addresses

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
STM-16 Physical Port (Line)	TM16/4 (CS-17 or CS-19) ADM16/4 LR 16	LP[301,302,318] LP[302-305] LP[301,302,318]	S16/1/[1,2,18]/1 S16/1/[2-5]/1 S16/1/[1,2,18]/1
STM-16 Physical Port (Trib)	TM16/4 (CS-17 or CS-19) ADM16/4 LXC16/1 LR 16	TP[303-317] TP[306-318] GP[301-306] GP[314-318] GP[401-406] GP[414-418] LP[303-317]	S16/1/[3-17]/1 S16/1/[6-18]/1 S16/1/1-[1-6]/1 S16/1/2-[14-18]/1 S16/1/3-[1-6]/1 S16/1/4-[14-18]/1 S16/1/[3-17]/1
STM-4 Physical Port (Line)	TM4/4 (CS-17 or CS-19) ADM4/4 LR 4	LP[301-302,318-319] LP[302-305] LP[301-302,318-319]	S4/1/[1-2,18-19]/1 S4/1/[2-5]/1 S4/1/[1-2,18-19]/1

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
STM-4 Physical Port (Trib)	TM4/4	TP[303-317]	S4/1/[3-17]/1
	(CS-17 & CS-19)	TP[303-317]	S4/1/[3-17]/1
	TM16/4	TP[306-319]	S4/1/[6-19]/1
	ADM4/4	TP[306-319]	S4/1/[6-19]/1
	ADM16/4	TP[303-317]	S4/1/[3-17]/1
	LXC4/1	GP[301-306]	S4/1/1-[1-6]/1
	LXC16/1	GP[314-319]	S4/1/2-[14-19]/1
	LR 4	GP[401-406]	S4/1/3-[1-6]/1
		GP[414-419]	S4/1/4-[14-19]/1
		TP[303-317]	S4/[1/[3-17]/1
STM-1 Physical Port on TIU-4 or SIU-1 card (Trib)	TM4/4	TP[303-317].[1-4]	S1/1/[3-17]/[1-4]
	(CS-17 & CS-19)	TP[303-317].[1-4]	S1/1/[3-17]/[1-4]
	TM16/4	TP[306-319].[1-4]	S1/1/[6-19]/[1-4]
	ADM4/4	TP[306-319].[1-4]	S1/1/[6-19]/[1-4]
	ADM16/4	TP[303-317].[1-4]	S1/1/[6-19]/[1-4]
	LXC4/1	GP[301-306].[1-4]	S1/1/[6-19]/[1-4]
	LXC16/1	GP[314-319].[1-4]	S1/1/[3-17]/[1-4]
		GP[401-406].1	S1/1/1-[1-6]/[1-4]
		GP[414-419].1	S1/1/2-[14-19]/[1-4]
			S1/1/3-[1-6]/1
		S1/1/4-[14-19]/1	

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
CEPT-4 Physical Port (Trib)	TM4/4	TP[303-317].[1-4]	P4/1/[3-17]/
	(CS-17 & CS-19)	TP[303-317].[1-4]	[1-4]
	TM16/4	TP[306-319].[1-4]	P4/1/[3-17]/
	ADM4/4	TP[306-319].[1-4]	[1-4]
	ADM16/4	TP[303-317].[1-4]	P4/1/[6-19]/
	LXC4/1	GP[301-304].[1-4]	[1-4]
	LXC16/1	GP[314, 316-319].[1-4]	P4/1/[6-19]/ [1-4] P4/1/[3-17]/ [1-4] P4/1/1-[1-4]/ [1-4] P4/1/2-[14, 16-19]/[1-4]
CEPT-3 Physical Port (Trib)	TM4/4	TP[303-317].[1-2].	P3/1/[3-17]/
	(CS-17 & CS-19)	[1-3]	[1-2]-[1-3]
	TM16/4	TP[303-317].[1-2].	P3/1/[3-17]/
	ADM4/4	[1-3]	[1-2]-[1-3]
	ADM16/4	TP[306-319].[1-2].	P3/1/[6-19]/
	LXC4/1	[1-3]	[1-2]-[1-3]
	LXC16/1	TP[306-319].[1-2].	P3/1/[6-19]/ [1-2]-[1-3] TP[303-317].[1-6] GP[301-304].[1-6] GP[314, 316-319].[1-6]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
45 Mb/s Physical Port (Trib)	TM4/4 (CS-17 & CS-19)	TP[303-317].[1-2].[1-3]	D3/1/[3-17]/[1-2]-[1-3]
	TM16/4	TP[303-317].[1-2].[1-3]	D3/1/[3-17]/[1-2]-[1-3]
	ADM4/4	TP[306-319].[1-2].[1-3]	D3/1/[6-19]/[1-2]-[1-3]
	ADM16/4	TP[306-319].[1-2].[1-3]	D3/1/[6-19]/[1-2]-[1-3]
	LXC4/1	TP[306-319].[1-2].[1-6]	D3/1/[6-19]/[1-2]-[1-3]
	LXC16/1	TP[303-317].[1-6]	D3/1/[3-17]/[1-6]
		GP[301-304].[1-6] GP[314, 316-319].[1-6]	D3/1/1-[1-4]/[1-6] D3/1/2-[14, 16-19]/[1-6]
CEPT-1 Physical/Logical	TM4/4 (CS-17 & CS-19)	TP[303-317].1.[1-21]	P1/1/[3-17]/1-[1-21]
	TM16/4	TP[303-317].1.[1-21]	P1/1/[3-17]/1-[1-21]
	ADM4/4	TP[306-319].1.[1-21]	P1/1/[6-19]/1-[1-21]
	ADM16/4	TP[306-319].1.[1-21]	P1/1/[6-19]/1-[1-21]
	LXC4/1	TP[306-319].1.[1-21]	P1/1/[6-19]/1-[1-21]
	LXC16/1	TP[303-317].[1-21]	P1/1/[3-17]/[1-21]
		GP[301-304].[1-21] GP[314, 316-319].[1-21]	P1/1/1-[1-4]/[1-21] P1/1/2-[14, 16-19]/[1-21]
VC-4 Logical Port on STM-16 (Line)	TM16/4 (CS-17 or CS-19)	LP[301-302, 318].[1-16]	S16/1/[1-2, 18]/1/[1-16]
	ADM16/4	LP[302-305].[1-16]	S16/1/[2-5]/1/[1-16]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-4 Logical Port on STM-16 (Trib)	TM16/4 (CS-17 & CS-19) ADM16/4 LXC16/1	TP[303-317].[1-16] TP[306-318].[1-16] GP[301-306].[1-16] GP[314-318].[1-16] GP[401-406].[1-16] GP[414-418][1-16]	S16/1/[3-17]/1/[1-16] S16/1/[6-18]/1/[1-16] S16/1/1-[1-6]/1/[1-16] S16/1/2-[14-18]/1/[1-16] S16/1/3-[1-6]/1/[1-16] S16/1/4-[14-18]/1/[1-16]
VC-4 Logical Port on STM-4 (Line)	TM4/4 (CS-17 or CS-19) ADM4/4	LP[301-302,318-319].[1-4] LP[302-305].[1-4]	S4/1/[1-2,18-19]/1/[1-4] S4/1/[2-5]/1/[1-4]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-4 Logical Port on STM-4 (Trib)	TM4/4	TP[303-317].[1-4]	S4/1/[3-17]/1/
	(CS-17 & CS-19)	TP[303-317].[1-4]	[1-4]
	TM16/4	TP[306-319].[1-4]	S4/1/[3-17]/1/
	ADM4/4	TP[306-319].[1-4]	[1-4]
	ADM16/4	TP[303-317].[1-4]	S4/1/[6-19]/1/
	LXC4/1	GP[301-306].[1-4]	[1-4]
	LXC16/1	GP[314-319].[1-4]	S4/1/[6-19]/1/
		GP[401-406].[1-4]	[1-4]
		GP[414-419].[1-4]	S4/1/[3-17]/1/
			[1-4]
		S4/1/1-[1-6]/	
		1/[1-4]	
		S4/1/2-[14-	
		19]/1/[1-4]	
		S4/1/3-[1-6]/	
		1/[1-4]	
		S4/1/4-[14-	
		19]/1/[1-4]	

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-4 Logical Port on STM-1 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].[1-4].1 TP[303-317].[1-4].1 TP[306-319].[1-4].1 TP[306-319].[1-4].1 TP[303-317].[1-4].1 GP[301-306].[1-4].1 GP[314-319].[1-4].1 GP[401-406].1.1 GP[414-419].1.1	S1/1/[3-17]/[1-4]/1 S1/1/[3-17]/[1-4]/1 S1/1/[6-19]/[1-4]/1 S1/1/[6-19]/[1-4]/1 S1/1/[3-17]/[1-4]/1 S1/1/1-[1-6]/[1-4]/1 S1/1/2-[14-19]/[1-4]/1 S1/1/3-[1-6]/1/1 S1/1/4-[14-19]/1/1
VC-4 Logical Port on TIU-1 card (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4	TP[303-317].1 TP[303-317].1 TP[306-319].1 TP[306-319].1	P1/1/[3-17]/1 P1/1/[3-17]/1 P1/1/[6-19]/1 P1/1/[6-19]/1
VC-4 Logical Port on TIU-3 card (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4	TP[303-317].[1-2] TP[303-317].[1-2] TP[306-319].[1-2] TP[306-319].[1-2]	[P,D]3/1/[3-17]/[1-2] [P,D]3/1/[3-17]/[1-2] [P,D]3/1/[6-19]/[1-2] [P,D]3/1/[6-19]/[1-2]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-3 Logical Port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].0.0 GP[314-318].[1-16].[1-3].0.0 GP[401-406].[1-16].[1-3].0.0 GP[414-418].[1-16].[1-3].0.0	S16/1/1-[1-6]/1/[1-16]-[1-3] S16/1/2-[14-18]/1/[1-16]-[1-3] S16/1/3-[1-6]/1/[1-16]-[1-3] S16/1/4-[14-18]/1/[1-16]-[1-3]
VC-3 Logical Port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].0.0 GP[301-306].[1-4].[1-3].0.0 GP[314-319].[1-4].[1-3].0.0 GP[401-406].[1-4].[1-3].0.0 GP[414-419].[1-4].[1-3].0.0	S4/1/[3-17]/1/[1-4]-[1-3] S4/1/1-[1-6]/1/[1-4]-[1-3] S4/1/2-[14-19]/1/[1-4]-[1-3] S4/1/3-[1-6]/1/[1-4]-[1-3] S4/1/4-[14-19]/1/[1-4]-[1-3]
VC-3 Logical Port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].1.[1-3].0.0 GP[301-306].[1-4].1.[1-3].0.0 GP[314-319].[1-4].1.[1-3].0.0 GP[401-406].[1-4].1.[1-3].0.0 GP[414-419].[1-4].1.[1-3].0.0	S1/1/[3-17]/[1-4]/1-[1-3] S1/1/1-[1-6]/[1-4]/1-[1-3] S1/1/2-[1-6]/[1-4]/1-[1-3] S1/1/3-[1-6]/[1-4]/1-[1-3] S1/1/4-[1-6]/[1-4]/1-[1-3]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-3 Logical/ Physical Port on TIU-3 (Trib)	TM4/4 (CS-17 & CS-19)	TP[303-317].[1-2].[1-3]	[P,D]3/1/[3-17]/[1-2]-[1-3]
	TM16/4	TP[303-317].[1-2].[1-3]	[P,D]3/1/[3-17]/[1-2]-[1-3]
	ADM4/4	TP[306-319].[1-2].[1-3]	[P,D]3/1/[6-19]/[1-2]-[1-3]
	ADM16/4	TP[306-319].[1-2].[1-3]	[P,D]3/1/[6-19]/[1-2]-[1-3]
	LXC4/1	TP[303-317].[1-6]	[P,D]3/1/[3-17]/[1-6]
	LXC16/1	GP[301-304].[1-6]	[P,D]3/1/1-[1-4]/[1-6]
	GP[314, 316-319].[1-6]	[P,D]3/1/2-[14, 16-19]/[1-6]	
TU2 Logical port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].[1-7].0	S16/1/1-[1-6]/1/[1-16]-[1-21]
GP[314-318].[1-16].[1-3].[1-7].0	S16/1/2-[14-18]/1/[1-16]-[1-21]		
GP[401-406].[1-16].[1-3].[1-7].0	S16/1/3-[1-6]/1/[1-16]-[1-21]		
GP[414-418].[1-16].[1-3].[1-7].0	S16/1/4-[14-18]/1/[1-16]-[1-21]		

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
TU2 Logical port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].[1-7].0 GP[301-306].[1-4].[1-3].[1-7].0 GP[314-319].[1-4].[1-3].[1-7].0 GP[401-406].[1-4].[1-3].[1-7].0 GP[414-419].[1-4].[1-3].[1-7].0	S4/1/[3-17]/1/[1-4]- [1-21] S4/1/1-[1-6]/1/[1-4]- [1-21] S4/1/2-[14-19]/1/[1-4]-[1-21] S4/1/3-[1-6]/1/[1-4]-[1-21] S4/1/4-[14-19]/1/[1-4]-[1-21]
TU2 Logical port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].1.[1-3].[1-7].0 GP[301-306].[1-4].1.[1-3].[1-7].0 GP[314-319].[1-4].1.[1-3].[1-7].0 GP[401-406].1.1.[1-3].[1-7].0 GP[414-419].1.1.[1-3].[1-7].0	<i>S1/1/[3-17]/[1-4]/1-[1-21]</i> S1/1/1-[1-6]/[1-4]/1-[1-21] S1/1/2-[14-19]/[1-4]/1-[1-21] S1/1/3-[1-6]/1/1-[1-21] S1/1/4-[14-19]/1/1-[1-21]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-12 Logical port on STM-16 (Trib)	LXC16/1	GP[301-306].[1-16].[1-3].[1-7].[1-3] GP[314-318].[1-16].[1-3].[1-7].[1-3] GP[401-406].[1-16].[1-3].[1-7].[1-3] GP[414-418].[1-16].[1-3].[1-7].[1-3]	S16/1/1-[1-6]/1/[1-16]-[1-63] S16/1/2-[14-18]/1/[1-16]-[1-63] S16/1/3-[1-6]/1/[1-16]-[1-63] S16/1/4-[14-18]/1/[1-16]-[1-63]
VC-12 Logical port on STM-4 (Trib)	LXC4/1 LXC16/1	TP[303-317].[1-4].[1-3].[1-7].[1-3] GP[301-306].[1-4].[1-3].[1-7].[1-3] GP[314-319].[1-4].[1-3].[1-7].[1-3] GP[401-406].[1-4].[1-3].[1-7].[1-3] GP[414-419].[1-4].[1-3].[1-7].[1-3]	S4/1/[3-17]/1/[1-4]-[1-63] S4/1/1-[1-6]/1/[1-4]-[1-63] S4/1/2-[14-19]/1/[1-4]-[1-63] S4/1/3-[1-6]/1/[1-4]-[1-63] S4/1/4-[14-19]/1/[1-4]-[1-63]

**Table 6-96 PHASE network element Port Addresses
 (continued)**

Description	Network Element	Entity Identifier (EID)	Network Level Addresses
VC-12 Logical port on STM-1 (Trib)	LXC4/1 LXC16/1	TP[303-317].1.[1-4].1.[1-3].[1-7].[1-3] GP[301-306].1.[1-4].1.[1-3].[1-7].[1-3] GP[314-319].1.[1-4].1.[1-3].[1-7].[1-3] GP[401-406].1.[1-3].[1-7].[1-3] GP[414-419].1.[1-3].[1-7].[1-3]	S1/1/[3-17]/[1-4]/1-[1-63] S1/1/1-[1-6]/[1-4]/1-[1-63] S1/1/2-[14-19]/[1-4]/1-[1-63] S1/1/3-[1-6]/1/1-[1-63] S1/1/4-[14-19]/1/1-[1-63]
VC-12 Logical/ Physical port on TIU-1 (Trib)	TM4/4 (CS-17 & CS-19) TM16/4 ADM4/4 ADM16/4 LXC4/1 LXC16/1	TP[303-317].1.[1-21] TP[303-317].1.[1-21] TP[306-319].1.[1-21] TP[306-319].1.[1-21] TP[303-317].[1-21] GP[301-304].[1-21] GP[314, 316-319].[1-21]	P1/1/[3-17]/1-[1-21] P1/1/[3-17]/1-[1-21] P1/1/[6-19]/1-[1-21] P1/1/[6-19]/1-[1-21] P1/1/[3-17]/[1-21] P1/1/1-[1-4]/[1-21] P1/1/2-[14, 16-19]/[1-21]

Notes:

1. Port (Trib)



Section IX: SLM Port Addresses

Overview

Purpose This section describes the external and internal port addresses for both the physical and logical ports of SLM (Release 1.0 or later) network elements. This section also discusses the correlation between the external and internal port addresses.

Note SLMs may be configured in six different arrangements:

- SLM-4 0:1 Terminal Mode
- SLM-4 0:2 Terminal Mode
- SLM-4 1+ 1 Terminal Mode
- SLM-16 0:1 Terminal Mode
- SLM-16 1+1 Terminal Mode
- SLM-16 ADM (add/drop multiplexer).

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Line port external addresses

Overview The tables in this section list the external addresses of the SLM 16 and 4 line ports.

SLM-16 line ports The following tables list the external addresses of the SLM 16 line ports.

Table 6-97 STM-16 Physical Line Port of an SLM-16 Configured as 0:1 End Terminal

S16/m/nn/p	
m	1
nn	13
p	1
Example	S16/1/13/1 is the only possible address.

Table 6-98 STM-16 Logical Line Ports of an SLM-16 Configured as 0:1 End Terminal

S16/m/nn/p/h	
m	1
nn	13
p	1
h	1 to 16
Example	S16/1/13/1/1 S16/1/13/1/16

Table 6-99 STM-16 Physical Line Port of an SLM-16 Configured as 1+1 End Terminal

S16/m/GRPn/p	
m	1
n	1
p	1
Example	S16/1/GRP1/1 is the only possible address.

Table 6-100 STM-16 Logical Line Ports of an SLM-16 Configured as 1+1 End Terminal

S16/m/GRPn/p/h	
m	1
n	1
p	1
h	1 to 16
Example	S16/1/GRP1/1/1 S16/1/GRP1/1/16

Table 6-101 STM-16 Physical Line Port of an SLM-16 Configured as Add/ Drop Terminal

S16/m/n/p	
m	1
n	4 or 9
p	1
Example	S16/1/4/1 S16/1/9/1

Table 6-102 STM-16 Logical Line Ports of an SLM-16 configured as Add/ Drop Terminal

S16/m/n/p/h	
m	1
n	4 or 9
p	1
h	1 to 16
Example	S16/1/4/1/1 S16/1/9/1/16

SLM-4 line ports The tables in this section provide specific information on the external address of the SLM-4 line ports.

Table 6-103 STM-4 Physical Line Port of an SLM-4 configured as 0:1 End Terminal

S4/m/nn/p	
m	1
nn	2 or 11
p	1
Example	S4/1/2/1/1 or S4/1/11/1/4. In a 0:1 configuration nn may equal 2 or 11 but not both. The address depends on which slots the line and trib cards are in.

Table 6-104 STM-4 Logical Line Ports of an SLM-4 Configured as 0:1 End Terminal

S4/m/nn/p/h	
m	1
nn	2 or 11
p	1
h	1 to 4
Example	S4/1/2/1/1 or S4/1/11/1/4. In a 0:1 configuration nn may equal 2 or 11 but not both. The address depends on which slots the line and trib cards are in.

Table 6-105 STM-4 Physical Line Port of an SLM-4 Configured as 0:2 End Terminal

S4/m/nn/p	
m	1
nn	2 or 11
p	1
Examples	S4/1/2/1 and S4/1/11/1 are the only possible addresses.

Table 6-106 STM-4 Logical Line Ports of an SLM-4 Configured as 0:2 End Terminal

S4/m/nn/p/h	
m	1
nn	2 or 11
p	1
h	1 to 4
Examples	S4/1/2/1/1 and S4/1/11/1/4

Table 6-107 STM-4 Physical Line Port of an SLM-4 Configured as 1+1 End Terminal

S4/m/GRPn/p	
m	1
n	1
p	1
Example	S4/1/GRP1/1 is the only possible address.

Table 6-108 STM-4 Logical Line Ports of an SLM-4 Configured as 1+1 End Terminal

S4/m/GRPn/p/h	
m	1
n	1
p	1
h	1 to 4
Examples	S4/1/GRP1/1/1 and S4/1/GRP1/1/4



Tributary port external addresses

Overview The tables in this section provide specific information on the external address of SLM-16 tributary ports.

SLM-16 tributary ports The tables in this section provide specific information on the external address of SLM-16 tributary ports.

Table 6-109 STM-1 Physical Tributary Port of an SLM-16 Configured as 0:1 or 1+1 End Terminal

S1/m/nn/p	
m	1
nn	1 to 4 or 7 to 10
p	1 or 2
Examples	S1/1/1/1 and S1/1/10/2

Table 6-110 STM-1 Logical Tributary Ports of an SLM-16 Configured as 0:1 or 1+1 End Terminal

S1/m/nn/p/h	
m	1
nn	1 to 4 or 7 to 10
p	1 or 2
h	1
Examples	S1/1/1/1/1 and S1/1/10/2/1

Table 6-111 STM-1 Physical Tributary Port of an SLM-16 Configured as Add Drop Terminal

S1/m/nn/p	
m	1
nn	15 to 18 or 20 to 23
p	1 or 2
Examples	S1/1/15/1 and S1/1/23/2

Table 6-112 STM-1 Logical Tributary Ports of an SLM-16 Configured as Add Drop Terminal

S1/m/nn/p/h	
m	1
nn	15 to 18 or 20 to 23
p	1 or 2
h	1
Examples	S1/1/15/1/1 and S1/1/23/2/1

Table 6-113 STM-1 Physical Tributary Port of an SLM-16 2FAD Add Drop Terminal Configured as 1 + 1MSP

S1/m/GRP n/p	
m	1
nn	1 to 4
p	1 or 2
Examples	S1/1/GRP1/1 and S1/1/GRP4/2

Table 6-114 STM-1 Logical Tributary Ports of an SLM-16 2FAD Add/ Drop Terminal Configured as 1 + 1 MSP

S1/m/GRPn/p/h	
m	1
n	1 to 4
p	1 or 2
h	1
Examples	S1/1/GRP1/1/1 and S1/1/GRP4/2/1

Table 6-115 CEPT-4 Physical Tributary Port of an SLM-16 Configured as 0:1 or 1+1 End Terminal

P4/m/nn/p	
m	1
nn	1 to 4 or 7 to 10
p	1 or 2

Table 6-115 CEPT-4 Physical Tributary Port of an SLM-16 Configured as 0:1 or 1+1 End Terminal (continued)

Examples	P4/1/1/1 and P4/1/10/2
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Table 6-116 CEPT-4 Physical Tributary Port of an SLM-16 Configured as Add/ Drop Terminal

P4/m/nn/p	
m	1
nn	15 to 18 or 20 to 23
p	1 or 2
Examples	P4/1/15/1 and P4/1/23/2

SLM-4 tributary ports

The tables in this section provide specific information on the external addresses of the SLM-4 tributary ports.

Table 6-117 STM-1 Physical Tributary Port of an SLM-4 Configured as 0:1, 0:2 or 1+1 End Terminal

S1/m/n/p	
m	1
n	4, 5, 8 or 9
p	1 or 2
Examples	S1/1/4/1 and S1/1/9/2

Table 6-118 STM-1 Logical Tributary Ports of an SLM-16 Configured as 0:1, 0:2 or 1+1 End Terminal

S1/m/n/p/h	
m	1
n	4, 5, 8 or 9
p	1 or 2
h	1
Examples	S1/1/4/1/1 and S1/1/9/2/1

Table 6-119 CEPT-4 Physical Tributary Port of an SLM-4 Configured as 0:1, 0:2 or 1+1 End Terminal

P4/m/n/p	
m	1
n	4, 5, 8 or 9
p	1 or 2
Examples	P4/1/4/1 and P4/1/9/2



Correlation between external and internal port addresses

Overview The tables in this section contain information on the correlation between external and internal STM-16 and STM-4 port addresses.

Tables The tables in this section show the correlation between external and internal port addresses.

Note that in the following table, numbers within brackets { } represent a choice where only one number within the brackets may be used for a port address.

Table 6-120 Correlation of STM-16 and STM-4 Port Addresses

Port	Terminal Configuration	Physical /Logical	External Address	Internal Address
STM-16	0:1	Physical	S16/1/13/1	LR1.1
STM-16	0:1	VC-4 Logical	S16/1/13/1/{1-16}	LR1.1,{1-16}
STM-16	1+1	Physical	S16/1/GRP1/1	LR1.1
STM-16	1+1	VC-4 Logical	S16/1/GRP1/{1-16}	LR1.1,{1-16}
STM-16	Add/Drop	Physical	S16/1{4,9}/1	LR1.1
STM-16	Add/Drop	VC-4 Logical	S16/1{4,9}/{1-16}	LR1.1,{1-16}
STM-4	0:1	Physical	S4/1/{2 or 11}/1 *	LR{1,2}.1 *
STM-4	0:1	VC-4 Logical	S4/1/{2 or 11}/1/{1-4} **	LR{1,2}.1.{1-4} **
STM-4	0:2	Physical	S4/1/{2 or 11}/1	LR{1,2}.1
STM-4	0:2	VC-4 Logical	S4/1/{2 or 11}/1/{1-4}	LR{1,2}.1.{1-4}
STM-4	1+1	Physical	S4/1/{GRP1}/1	LR1.1
STM-4	1+1	VC-4 Logical	S4/1/{GRP1}/1/{1-4}	LR1.1,{1-4}

Table 6-121 Correlation of STM-1 and CEPT 4 Port Addresses

Port	Terminal Configuration	Physical /Logical	External Address	Internal Address
STM-1	0:1 or 1+1	Physical	S1/1/{1-4,7-10}/{1-2}	TP{1-8}.{1-2}
STM-1	0:1 or 1+1	VC-4 Logical	S1/1/{1-4,7-10}/{1-2}/1	TP{1-8}.{1-2}.1
STM-1	Add/Drop	Physical	S1/1/{15-18,20-23}/{1-2}	TP{1-8}.{1-2}
STM-1	Add/Drop	VC-4 Logical	S1/1/{15-18,20-23}/{1-2}/1	TP{1-8}.{1-2}.1

Table 6-121 Correlation of STM-1 and CEPT 4 Port Addresses (continued)

Port	Terminal Configuration	Physical /Logical	External Address	Internal Address
STM-1	Add/Drop ***	Physical	S1/1/Grp{1-4}/{1-2}	TP{1,3,5,7}.{1-2}
STM-1	Add/Drop ***	VC-4 Logical	S1/1/Grp{1-4}/{1-2}/1	TP{1,3,5,7}.{1-2}.1
CEPT-4	0:1 or 1+1	Physical	P4/1/{1-4,7-10}/{1-2}	TP{1-8}.{1-2}
CEPT-4	Add/Drop	Physical	P4/1/{15-18,20-23}/{1-2}	TP{1-8}.{1-2}
STM-1	0:1, 0:2 or 1+1	Physical	S1/1/{4,5,8,9}/{1-2}	TP{1-4}.{1-2}
STM-1	0:1, 0:2 or 1+1	VC-4 Logical	S1/1/{4,5,8,9}/{1-2}/1	TP{1-4}.{1-2}.1
CEPT-4	0:1, 0:2 or 1+1	Physical	P4/1/{4,5,8,9}/{1-2}	TP{1-4}.{1-2}

* - S4/1/2/1 or S4/1/11/1. In a 0:1 configuration only one address may be used, not both. The address depends upon which slots the line and trib cards are in. ** - S4/1/2/1/1 or S4/1/11/1/4. In a 0:1 configuration nn may equal 2 or 11, not both. The address depends upon which slots the line and trib cards are in.*** SLM - 16 **2FAD** only

□

Section X: TDM 10G Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of the TDM 10G. It also discusses the correlation between the external and internal port addresses.

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Port identifiers

Overview This section presents the port identifiers for the TDM 10G.

Table

Description	Entity Identifiers (Internal Addresses)	Network Level Address (External Address)
STM-64 Physical Port	1-2-#-#[tre, trw]-1	S64/ 1-2 - #-# - [tre, trw] - 1
VC4-16c logical port on STM-64 physical port	1-2-#-#[tre, trw]-1-[1, 49, 97, 145]	S64/ 1-2 - #-# - [tre, trw] - 1 / 16c.[1-4]
VC4-4c logical port on STM-64 physical port	1-2-#-#[tre, trw]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	S64/ 1-2 - #-# - [tre, trw] - 1/4c.[1-16]
VC4 logical port on STM-64 physical port	1-2-#-#[tre, trw]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	S64/ 1-2 - #-# - [tre, trw] - 1 / AU.[1-64].0
AU3 logical port on STM-64 physical port	1-2-#-#[tre, trw]-1-[1-192]	S64/ 1-2 - #-# - [tre, trw] - 1 / AU.[1-64].[1-3]
STM-16 Physical Port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1	S16/[1-4]-[1-3]-#-# [02, 04,06.....16]/ 1

VC4-16c logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1]	S16/[1-4]-[1-3]-#-#- [02, 04,06....16] -1/ 16c.[1]
VC-4c logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1, 13, 25, 37]	S16/[1-4]-[1-3]-#-#- [02, 04,06....16] -1/ 4c.[1-4]
VC4 logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	S16/[1-4]-[1-3]-#-#- [02, 04,06....16] -1/ AU.[1-16].0
AU3 logical port on STM-16 physical port	[1-4]-[1-3]-#-#[02, 04, 06...16]-1-[1-48]	S16/[1-4]-[1-3]-#-#- [02, 04,06....16] -1/ AU.[1-16].[1-3]
STM-4 Physical Port	[1-4]-[1-3]-#-#[01-16]- [1-2]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2]
VC4-4c logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]- [1-2]-[1]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] / 4c.[1]
VC4 logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]- [1-2]-[1, 4, 7, 10]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] AU.[1-4].0
AU3 logical port on STM-4 physical port	[1-4]-[1-3]-#-#[01-16]- [1-2]-[1-12]	S4/[1-4]-[1-3]-#-#- [01-16]-[1-2] / AU.[1-4].[1-3]
STM-1 Physical Port	[1-4]-[1-3]-#-#[01-16]- [1-8]	S1/[1-4]-[1-3]-#-#- [01-16]-[1-8]
VC4 logical port on STM-1 physical port	[1-4]-[1-3]-#-#[01-16]- [1-8]-1	S1/[1-4]-[1-3]-#-#- [01-16]-[1-2] / AU. 1.0

AU3 logical port on STM-1 physical port	[1-4]-[1-3]-#-#[01-16]-[1-8]-[1-3]	S1/[1-4]-[1-3]-#-#[01-16]-[1-8] / AU.1[1-3]
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Section XI: TM 1 Port Addresses

Overview

Purpose This section provides the port identifiers for TM 1 network elements.

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Port identifiers

Overview This section presents the port identifiers for TM 1 network elements.

Table

Description		Entity Identifier (EID)	Network Level Address
STM-1 Line Port 1	Physical Port	LP1	S1/1/2/1
	Logical Port (AU4 and VC4 combined)	LP1.1	S1/1/2/1/1
	Logical Port TU12	LP1.1.1.[1-6].[1-3]	S1/1/2/1/1-[1-16]
E1 (CEPT-1) (2Mb/s) Tributary (on-board)	Physical Ports	TP1.[1-16]	P1/1/3/[1-16]
		TP1.[1-16]	P1/1/3/[1-16]



Section XII: WaveStar DACS Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of WaveStar DACS. It also discusses the correlation between the external and internal port addresses.

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External addresses

Overview This section contains the external address information for WaveStar DACS.

Physical ports The following tables list the physical port addresses.

Table 6-122 STM-1 Digital Link

S1/PAmm/n/p	
PA (STM1)	Subrack of WaveStar DACS
mm	1 to 17
n	1 to 18
p	1
Example	S1/B12/6/1

Table 6-123 STM-0 Digital Link

S0/PBmm/n/p/h	
PB (STM0)	Subrack of WaveStar DACS
mm	1 to 17
n	1 to 18
p	1
h	1
Example	S0/B12/6/0/1

Table 6-124 STM-0 Digital Link Using 1 + 1 MSP Protection

S1/PBmm/GRPn/p	
PB (STM0)	Subrack of WaveStar DACS
mm	1 to 17
n	1 to 18
p	1
Example	S0/B12/GRP4/1

Table 6-125 STM-1 Digital Link Using 1 + 1 MSP Protection

S1/PBmm/GRPn/p	
PB (STM0)	Subrack of WaveStar DACS
mm	1 to 17
n	1 to 18
p	1
Example	S1/B12/GRP4/1

Logical ports The following tables list the logical port addresses.

Table 6-126 VC-4 - AU4 Path

S1/Bmm/n/p/h	
B	PSA subrack (WaveStar DACS)
mm	1 to 17
n	1 to 18
p	1
h	1
Example	S1/B12/6/1/1

Table 6-127 VC-3 - AU3 Path

S1/Bmm/n/p/h	
B	PSA subrack (WaveStar DACS); P PSB subrack (for <i>SO/Bmm/n/p/h</i>)
mm	1 to 17
n	1 to 18
p	1
h	1 to 3
Example	S1/B12/6/1/3

Table 6-128 VC-4 Path Using a 1+1 MSP STM-1 Digital Link

S1/Bmm/GRPn/p/h	
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Table 6-128 VC-4 Path Using a 1+1 MSP STM-1 Digital Link (continued)

B	PSA subrack (WaveStar DACS)
mm	1 to 17
n	1 to 18
p	1
h	1 to 3
Example	S1/B12/GRP4/2/3

Table 6-129 VC-3 Path Riding a VC-4 Using a 1+1 MSP STM-1 Digital Link

S1/Bmm/GRPn/p/h	
B	PSA subrack (WaveStar DACS)
mm	1 to 17
n	1 to 18
p	1
h	1 to 3
Example	S1/B12/GRP4/1/2

Table 6-130 VC-3 Path Riding a VC-4 Using a 1+1 MSP STM-1 Digital Link

S1/Bmm/GRPn/p/h	
B	PSA subrack (WaveStar DACS)
mm	1 to 17
n	1 to 18
p	1
h	1
Example	S0/B12/GRP4/1/1



Module A logical port addresses

Overview This section contains information for the WaveStar DACS Module A logical port addresses.

Obtaining The Module A logical port addresses are extensions of the physical port addresses and can be obtained from the physical port addresses by appending */#* to the physical port address (where *#* is the AU3 or AU4 channel number within the physical port).

Format The formats of the Module A logical port addresses are as follows:

- The low-speed logical port address format is: *S[0,1]/X/Y/Z/K*.
- The high-speed logical port address format is: *S[1,4,16,64]/(H)X/1/1/N*. (H is used for ModA-1 only).

Mapping When mapping a low-speed logical port to a high-speed logical port, the “X” value in the low- and high-speed addresses should be the same.

Low-speed logical port addresses

The following table lists the Module A low-speed logical port addresses for WaveStar DACS.

With this table, the logical port number *#* should be consistent with the AU3 or AU4 channel number. This number will be the **Channel & Assign** number in the Facility Channel List selection form.

- With an STM-0 unit, the logical port number is always “1.”
- With an STM-1 unit, and if the channel type is AU4, the logical port number should always be “1.”
- With an STM-1 unit, and if the channel type is AU3, the logical port number can be 1, 2, or 3.
- In the case of an STM-0 or STM-1 MSP, the low-speed logical port address should adhere to the previous bullet items except that the third subfield should contain “GRP,” as shown in the physical port external addresses.

Table 6-131 Module A Low-Speed Logical Port Addresses

Unit Type	Module A	External Address
STM0	ModA-1	S0/[0-8]/1/[1-3]/1

**Table 6-131 Module A Low-Speed Logical Port Addresses
(continued)**

Unit Type	Module A	External Address
STM1	ModA-1	S1/[0-8]/1/1/#
STM0	ModA-4	S0/[0-3]/[1-4]/[1-3]/1
STM1	ModA-4	S1/[0-3]/[1-4]/[1-3]/#
STM0	ModA-16	S0/[0-3]/[1-16]/[1-3]/1
STM1	ModA-16	S1/[0-3]/[1-16]/[1-3]/#
STM0	ModA-64	S0/[0-3]/[1-64]/[1-3]/1
STM1	ModA-64	S1/[0-3]/[1-64]/[1-3]/#

**High-speed logical port
addresses**

The following table lists the Module A high-speed logical port addresses for WaveStar DACS.

Table 6-132 Module A Low-Speed Logical Port Addresses

Unit Type	Module A	External Address
STM0	ModA-1	S0/H[0-8]/1/[1-3]/1
STM1	ModA-1	S1/H[0-8]/1/1/#
STM0	ModA-4	S0/H[0-3]/[1-4]/[1-3]/1
STM1	ModA-4	S1/H[0-3]/[1-4]/[1-3]/#
STM0	ModA-16	S0/H[0-3]/[1-16]/[1-3]/1
STM1	ModA-16	S1/H[0-3]/[1-16]/[1-3]/#
STM0	ModA-64	S0/H[0-3]/[1-64]/[1-3]/1
STM1	ModA-64	S1/H[0-3]/[1-64]/[1-3]/#

External port addresses

This section provides tables for each Module A type. For AU3 channel types, the low-speed addresses are shown for both STM0 and STM1 units.

Table 6-133 Module A AU3 Logical Port External Addresses

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-8]/1/1/1	S1/[0-8]/1/1/1	S1/H[0-8]/1/1/1
S0/[0-8]/1/2/1	S1/[0-8]/1/1/2	S1/H[0-8]/1/1/2
S0/[0-8]/1/3/1	S1/[0-8]/1/1/3	S1/H[0-8]/1/1/3

Table 6-134 Module A AU4 Logical Port Extensions

AU4 Low-Speed Logical Port Address STM0 Unit	AU4 Low-Speed Logical Port Address STM1 Unit	AU4 High-Speed Logical Port Addresses
	S1/[0-8]/1/1/1	S1/H[0-8]/1/1/1
	S1/[0-8]/1/1/1	S1/H[0-8]/1/1/1
	S1/[0-8]/1/1/1	S1/H[0-8]/1/1/1

Table 6-135 ModA-4 AU3 Logical Port External Addresses

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/1/1/1	S1/[0-3]/1/1/1	S4/H[0-3]/1/1/1
S0/[0-3]/1/2/1	S1/[0-3]/1/1/2	S4/H[0-3]/1/1/2
S0/[0-3]/1/3/1	S1/[0-3]/1/1/3	S4/H[0-3]/1/1/3
S0/[0-3]/2/1/1	S1/[0-3]/2/1/1	S4/H[0-3]/1/1/4
S0/[0-3]/2/2/1	S1/[0-3]/2/1/2	S4/H[0-3]/1/1/5
S0/[0-3]/2/3/1	S1/[0-3]/2/1/3	S4/H[0-3]/1/1/6
S0/[0-3]/3/1/1	S1/[0-3]/3/1/1	S4/H[0-3]/1/1/7
S0/[0-3]/3/2/1	S1/[0-3]/3/1/2	S4/H[0-3]/1/1/8
S0/[0-3]/3/3/1	S1/[0-3]/3/1/3	S4/H[0-3]/1/1/9
S0/[0-3]/4/1/1	S1/[0-3]/4/1/1	S4/H[0-3]/1/1/10

**Table 6-135 ModA-4 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/4/2/1	S1/[0-3]/4/1/2	S4/H[0-3]/1/1/11
S0/[0-3]/4/3/1	S1/[0-3]/4/1/3	S4/H[0-3]/1/1/12

Table 6-136 ModA-4 AU4 Logical Port External Addresses

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/1/1/1	S4/H[0-3]/1/1/1
S1/[0-3]/2/1/1	S4/H[0-3]/1/1/2
S1/[0-3]/3/1/1	S4/H[0-3]/1/1/3
S1/[0-3]/4/1/1	S4/H[0-3]/1/1/4

Table 6-137 ModA-16 AU3 Logical Port External Addresses

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/1/1/1	S1/[0-3]/1/1/1	S16/H[0-3]/1/1/1
S0/[0-3]/1/2/1	S1/[0-3]/1/1/2	S16/H[0-3]/1/1/2
S0/[0-3]/1/3/1	S1/[0-3]/1/1/3	S16/H[0-3]/1/1/3
S0/[0-3]/2/1/1	S1/[0-3]/2/1/1	S16/H[0-3]/1/1/4
S0/[0-3]/2/2/1	S1/[0-3]/2/1/2	S16/H[0-3]/1/1/5
S0/[0-3]/2/3/1	S1/[0-3]/2/1/3	S16/H[0-3]/1/1/6
S0/[0-3]/3/1/1	S1/[0-3]/3/1/1	S16/H[0-3]/1/1/7
S0/[0-3]/3/2/1	S1/[0-3]/3/1/2	S16/H[0-3]/1/1/8
S0/[0-3]/3/3/1	S1/[0-3]/3/1/3	S16/H[0-3]/1/1/9
S0/[0-3]/4/1/1	S1/[0-3]/4/1/1	S16/H[0-3]/1/1/ 10

**Table 6-137 ModA-16 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/4/2/1	S1/[0-3]/4/1/2	S16/H[0-3]/1/1/11
S0/[0-3]/4/3/1	S1/[0-3]/4/1/3	S16/H[0-3]/1/1/12
S0/[0-3]/5/1/1	S1/[0-3]/5/1/1	S16/H[0-3]/1/1/13
S0/[0-3]/5/2/1	S1/[0-3]/5/1/2	S16/H[0-3]/1/1/14
S0/[0-3]/5/3/1	S1/[0-3]/5/1/3	S16/H[0-3]/1/1/15
S0/[0-3]/6/1/1	S1/[0-3]/6/1/1	S16/H[0-3]/1/1/16
S0/[0-3]/6/2/1	S1/[0-3]/6/1/2	S16/H[0-3]/1/1/17
S0/[0-3]/6/3/1	S1/[0-3]/6/1/3	S16/H[0-3]/1/1/18
S0/[0-3]/7/1/1	S1/[0-3]/7/1/1	S16/H[0-3]/1/1/19
S0/[0-3]/7/2/1	S1/[0-3]/7/1/2	S16/H[0-3]/1/1/20
S0/[0-3]/7/3/1	S1/[0-3]/7/1/3	S16/H[0-3]/1/1/21
S0/[0-3]/8/1/1	S1/[0-3]/8/1/1	S16/H[0-3]/1/1/22
S0/[0-3]/8/2/1	S1/[0-3]/8/1/2	S16/H[0-3]/1/1/23
S0/[0-3]/8/3/1	S1/[0-3]/8/1/3	S16/H[0-3]/1/1/24
S0/[0-3]/9/1/1	S1/[0-3]/9/1/1	S16/H[0-3]/1/1/25

**Table 6-137 ModA-16 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/9/2/1	S1/[0-3]/9/1/2	S16/H[0-3]/1/1/26
S0/[0-3]/9/3/1	S1/[0-3]/9/1/3	S16/H[0-3]/1/1/27
S0/[0-3]/10/1/1	S1/[0-3]/10/1/1	S16/H[0-3]/1/1/28
S0/[0-3]/10/2/1	S1/[0-3]/10/1/2	S16/H[0-3]/1/1/29
S0/[0-3]/10/3/1	S1/[0-3]/10/1/3	S16/H[0-3]/1/1/30
S0/[0-3]/11/1/1	S1/[0-3]/11/1/1	S16/H[0-3]/1/1/31
S0/[0-3]/11/2/1	S1/[0-3]/11/1/2	S16/H[0-3]/1/1/32
S0/[0-3]/11/3/1	S1/[0-3]/11/1/3	S16/H[0-3]/1/1/33
S0/[0-3]/12/1/1	S1/[0-3]/12/1/1	S16/H[0-3]/1/1/34
S0/[0-3]/12/2/1	S1/[0-3]/12/1/2	S16/H[0-3]/1/1/35
S0/[0-3]/12/3/1	S1/[0-3]/12/1/3	S16/H[0-3]/1/1/36
S0/[0-3]/13/1/1	S1/[0-3]/13/1/1	S16/H[0-3]/1/1/37
S0/[0-3]/13/2/1	S1/[0-3]/13/1/2	S16/H[0-3]/1/1/38
S0/[0-3]/13/3/1	S1/[0-3]/13/1/3	S16/H[0-3]/1/1/39
S0/[0-3]/14/1/1	S1/[0-3]/14/1/1	S16/H[0-3]/1/1/40

**Table 6-137 ModA-16 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/14/2/1	S1/[0-3]/14/1/2	S16/H[0-3]/1/1/41
S0/[0-3]/14/3/1	S1/[0-3]/14/1/3	S16/H[0-3]/1/1/42
S0/[0-3]/15/1/1	S1/[0-3]/15/1/1	S16/H[0-3]/1/1/43
S0/[0-3]/15/2/1	S1/[0-3]/15/1/2	S16/H[0-3]/1/1/44
S0/[0-3]/15/3/1	S1/[0-3]/15/1/3	S16/H[0-3]/1/1/45
S0/[0-3]/16/1/1	S1/[0-3]/16/1/1	S16/H[0-3]/1/1/46
S0/[0-3]/16/2/1	S1/[0-3]/16/1/2	S16/H[0-3]/1/1/47
S0/[0-3]/16/3/1	S1/[0-3]/16/1/3	S16/H[0-3]/1/1/48

Table 6-138 ModA-16 AU4 Logical Port External Addresses

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/1/1/1	S16/H[0-3]/1/1/1
S1/[0-3]/2/1/1	S16/H[0-3]/1/1/2
S1/[0-3]/3/1/1	S16/H[0-3]/1/1/3
S1/[0-3]/6/1/1	S16/H[0-3]/1/1/6
S1/[0-3]/7/1/1	S16/H[0-3]/1/1/7
S1/[0-3]/8/1/1	S16/H[0-3]/1/1/8
S1/[0-3]/9/1/1	S16/H[0-3]/1/1/9
S1/[0-3]/10/1/1	S16/H[0-3]/1/1/10
S1/[0-3]/11/1/1	S16/H[0-3]/1/1/11

**Table 6-138 ModA-16 AU4 Logical Port External Addresses
(continued)**

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/12/1/1	S16/H[0-3]/1/1/12
S1/[0-3]/13/1/1	S16/H[0-3]/1/1/13
S1/[0-3]/14/1/1	S16/H[0-3]/1/1/14
S1/[0-3]/15/1/1	S16/H[0-3]/1/1/15
S1/[0-3]/16/1/1	S16/H[0-3]/1/1/16

Table 6-139 ModA-64 AU3 Logical Port External Addresses

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/1/1/1	S1/[0-3]/1/1/1	S64/H[0-3]/1/1/1
S0/[0-3]/1/2/1	S1/[0-3]/1/1/2	S64/H[0-3]/1/1/2
S0/[0-3]/1/3/1	S1/[0-3]/1/1/3	S64/H[0-3]/1/1/3
S0/[0-3]/2/1/1	S1/[0-3]/2/1/1	S64/H[0-3]/1/1/4
S0/[0-3]/2/2/1	S1/[0-3]/2/1/2	S64/H[0-3]/1/1/5
S0/[0-3]/2/3/1	S1/[0-3]/2/1/3	S64/H[0-3]/1/1/6
S0/[0-3]/3/1/1	S1/[0-3]/3/1/1	S64/H[0-3]/1/1/7
S0/[0-3]/3/2/1	S1/[0-3]/3/1/2	S64/H[0-3]/1/1/8
S0/[0-3]/3/3/1	S1/[0-3]/3/1/3	S64/H[0-3]/1/1/9
S0/[0-3]/4/1/1	S1/[0-3]/4/1/1	S64/H[0-3]/1/1/ 10
S0/[0-3]/4/2/1	S1/[0-3]/4/1/2	S64/H[0-3]/1/1/ 11
S0/[0-3]/4/3/1	S1/[0-3]/4/1/3	S64/H[0-3]/1/1/ 12
S0/[0-3]/5/1/1	S1/[0-3]/5/1/1	S64/H[0-3]/1/1/ 13
S0/[0-3]/5/2/1	S1/[0-3]/5/1/2	S64/H[0-3]/1/1/ 14

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/5/3/1	S1/[0-3]/5/1/3	S64/H[0-3]/1/1/15
S0/[0-3]/6/1/1	S1/[0-3]/6/1/1	S64/H[0-3]/1/1/16
S0/[0-3]/6/2/1	S1/[0-3]/6/1/2	S64/H[0-3]/1/1/17
S0/[0-3]/6/3/1	S1/[0-3]/6/1/3	S64/H[0-3]/1/1/18
S0/[0-3]/7/1/1	S1/[0-3]/7/1/1	S64/H[0-3]/1/1/19
S0/[0-3]/7/2/1	S1/[0-3]/7/1/2	S64/H[0-3]/1/1/20
S0/[0-3]/7/3/1	S1/[0-3]/7/1/3	S64/H[0-3]/1/1/21
S0/[0-3]/8/1/1	S1/[0-3]/8/1/1	S64/H[0-3]/1/1/22
S0/[0-3]/8/2/1	S1/[0-3]/8/1/2	S64/H[0-3]/1/1/23
S0/[0-3]/8/3/1	S1/[0-3]/8/1/3	S64/H[0-3]/1/1/24
S0/[0-3]/9/1/1	S1/[0-3]/9/1/1	S64/H[0-3]/1/1/25
S0/[0-3]/9/2/1	S1/[0-3]/9/1/2	S64/H[0-3]/1/1/26
S0/[0-3]/9/3/1	S1/[0-3]/9/1/3	S64/H[0-3]/1/1/27
S0/[0-3]/10/1/1	S1/[0-3]/10/1/1	S64/H[0-3]/1/1/28
S0/[0-3]/10/2/1	S1/[0-3]/10/1/2	S64/H[0-3]/1/1/29

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/10/3/1	S1/[0-3]/10/1/3	S64/H[0-3]/1/1/30
S0/[0-3]/11/1/1	S1/[0-3]/11/1/1	S64/H[0-3]/1/1/31
S0/[0-3]/11/2/1	S1/[0-3]/11/1/2	S64/H[0-3]/1/1/32
S0/[0-3]/11/3/1	S1/[0-3]/11/1/3	S64/H[0-3]/1/1/33
S0/[0-3]/12/1/1	S1/[0-3]/12/1/1	S64/H[0-3]/1/1/34
S0/[0-3]/12/2/1	S1/[0-3]/12/1/2	S64/H[0-3]/1/1/35
S0/[0-3]/12/3/1	S1/[0-3]/12/1/3	S64/H[0-3]/1/1/36
S0/[0-3]/13/1/1	S1/[0-3]/13/1/1	S64/H[0-3]/1/1/37
S0/[0-3]/13/2/1	S1/[0-3]/13/1/2	S64/H[0-3]/1/1/38
S0/[0-3]/13/3/1	S1/[0-3]/13/1/3	S64/H[0-3]/1/1/39
S0/[0-3]/14/1/1	S1/[0-3]/14/1/1	S64/H[0-3]/1/1/40
S0/[0-3]/14/2/1	S1/[0-3]/14/1/2	S64/H[0-3]/1/1/41
S0/[0-3]/14/3/1	S1/[0-3]/14/1/3	S64/H[0-3]/1/1/42
S0/[0-3]/15/1/1	S1/[0-3]/15/1/1	S64/H[0-3]/1/1/43
S0/[0-3]/15/2/1	S1/[0-3]/15/1/2	S64/H[0-3]/1/1/44

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/15/3/1	S1/[0-3]/15/1/3	S64/H[0-3]/1/1/45
S0/[0-3]/16/1/1	S1/[0-3]/16/1/1	S64/H[0-3]/1/1/46
S0/[0-3]/16/2/1	S1/[0-3]/16/1/2	S64/H[0-3]/1/1/47
S0/[0-3]/16/3/1	S1/[0-3]/16/1/3	S64/H[0-3]/1/1/48
S0/[0-3]/17/1/1	S1/[0-3]/17/1/1	S64/H[0-3]/1/1/49
S0/[0-3]/17/2/1	S1/[0-3]/17/1/2	S64/H[0-3]/1/1/50
S0/[0-3]/17/3/1	S1/[0-3]/17/1/3	S64/H[0-3]/1/1/51
S0/[0-3]/18/1/1	S1/[0-3]/18/1/1	S64/H[0-3]/1/1/52
S0/[0-3]/18/2/1	S1/[0-3]/18/1/2	S64/H[0-3]/1/1/53
S0/[0-3]/18/3/1	S1/[0-3]/18/1/3	S64/H[0-3]/1/1/54
S0/[0-3]/19/1/1	S1/[0-3]/19/1/1	S64/H[0-3]/1/1/55
S0/[0-3]/19/2/1	S1/[0-3]/19/1/2	S64/H[0-3]/1/1/56
S0/[0-3]/19/3/1	S1/[0-3]/19/1/3	S64/H[0-3]/1/1/57
S0/[0-3]/20/1/1	S1/[0-3]/20/1/1	S64/H[0-3]/1/1/58
S0/[0-3]/20/2/1	S1/[0-3]/20/1/2	S64/H[0-3]/1/1/59

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/20/3/1	S1/[0-3]/20/1/3	S64/H[0-3]/1/1/60
S0/[0-3]/21/1/1	S1/[0-3]/21/1/1	S64/H[0-3]/1/1/61
S0/[0-3]/21/2/1	S1/[0-3]/21/1/2	S64/H[0-3]/1/1/62
S0/[0-3]/21/3/1	S1/[0-3]/21/1/3	S64/H[0-3]/1/1/63
S0/[0-3]/22/1/1	S1/[0-3]/22/1/1	S64/H[0-3]/1/1/64
S0/[0-3]/22/2/1	S1/[0-3]/22/1/2	S64/H[0-3]/1/1/65
S0/[0-3]/22/3/1	S1/[0-3]/22/1/3	S64/H[0-3]/1/1/66
S0/[0-3]/23/1/1	S1/[0-3]/23/1/1	S64/H[0-3]/1/1/67
S0/[0-3]/23/2/1	S1/[0-3]/23/1/2	S64/H[0-3]/1/1/68
S0/[0-3]/23/3/1	S1/[0-3]/23/1/3	S64/H[0-3]/1/1/69
S0/[0-3]/24/1/1	S1/[0-3]/24/1/1	S64/H[0-3]/1/1/70
S0/[0-3]/24/2/1	S1/[0-3]/24/1/2	S64/H[0-3]/1/1/71
S0/[0-3]/24/3/1	S1/[0-3]/24/1/3	S64/H[0-3]/1/1/72
S0/[0-3]/25/1/1	S1/[0-3]/25/1/1	S64/H[0-3]/1/1/73
S0/[0-3]/25/2/1	S1/[0-3]/25/1/2	S64/H[0-3]/1/1/74

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/25/3/1	S1/[0-3]/25/1/3	S64/H[0-3]/1/1/75
S0/[0-3]/26/1/1	S1/[0-3]/26/1/1	S64/H[0-3]/1/1/76
S0/[0-3]/26/2/1	S1/[0-3]/26/1/2	S64/H[0-3]/1/1/77
S0/[0-3]/26/3/1	S1/[0-3]/26/1/3	S64/H[0-3]/1/1/78
S0/[0-3]/27/1/1	S1/[0-3]/27/1/1	S64/H[0-3]/1/1/79
S0/[0-3]/27/2/1	S1/[0-3]/27/1/2	S64/H[0-3]/1/1/80
S0/[0-3]/27/3/1	S1/[0-3]/27/1/3	S64/H[0-3]/1/1/81
S0/[0-3]/28/1/1	S1/[0-3]/28/1/1	S64/H[0-3]/1/1/82
S0/[0-3]/28/2/1	S1/[0-3]/28/1/2	S64/H[0-3]/1/1/83
S0/[0-3]/28/3/1	S1/[0-3]/28/1/3	S64/H[0-3]/1/1/84
S0/[0-3]/29/1/1	S1/[0-3]/29/1/1	S64/H[0-3]/1/1/85
S0/[0-3]/29/2/1	S1/[0-3]/29/1/2	S64/H[0-3]/1/1/86
S0/[0-3]/29/3/1	S1/[0-3]/29/1/3	S64/H[0-3]/1/1/87
S0/[0-3]/30/1/1	S1/[0-3]/30/1/1	S64/H[0-3]/1/1/88
S0/[0-3]/30/2/1	S1/[0-3]/30/1/2	S64/H[0-3]/1/1/89

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/30/3/1	S1/[0-3]/30/1/3	S64/H[0-3]/1/1/90
S0/[0-3]/31/1/1	S1/[0-3]/31/1/1	S64/H[0-3]/1/1/91
S0/[0-3]/31/2/1	S1/[0-3]/31/1/2	S64/H[0-3]/1/1/92
S0/[0-3]/31/3/1	S1/[0-3]/31/1/3	S64/H[0-3]/1/1/93
S0/[0-3]/32/1/1	S1/[0-3]/32/1/1	S64/H[0-3]/1/1/94
S0/[0-3]/32/2/1	S1/[0-3]/32/1/2	S64/H[0-3]/1/1/95
S0/[0-3]/32/3/1	S1/[0-3]/32/1/3	S64/H[0-3]/1/1/96
S0/[0-3]/33/1/1	S1/[0-3]/33/1/1	S64/H[0-3]/1/1/97
S0/[0-3]/33/2/1	S1/[0-3]/33/1/2	S64/H[0-3]/1/1/98
S0/[0-3]/33/3/1	S1/[0-3]/33/1/3	S64/H[0-3]/1/1/99
S0/[0-3]/34/1/1	S1/[0-3]/34/1/1	S64/H[0-3]/1/1/100
S0/[0-3]/34/2/1	S1/[0-3]/34/1/2	S64/H[0-3]/1/1/101
S0/[0-3]/34/3/1	S1/[0-3]/34/1/3	S64/H[0-3]/1/1/102
S0/[0-3]/35/1/1	S1/[0-3]/35/1/1	S64/H[0-3]/1/1/103
S0/[0-3]/35/2/1	S1/[0-3]/35/1/2	S64/H[0-3]/1/1/104

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/35/3/1	S1/[0-3]/35/1/3	S64/H[0-3]/1/1/ 105
S0/[0-3]/36/1/1	S1/[0-3]/36/1/1	S64/H[0-3]/1/1/ 106
S0/[0-3]/36/2/1	S1/[0-3]/36/1/2	S64/H[0-3]/1/1/ 107
S0/[0-3]/36/3/1	S1/[0-3]/36/1/3	S64/H[0-3]/1/1/ 108
S0/[0-3]/37/1/1	S1/[0-3]/37/1/1	S64/H[0-3]/1/1/ 109
S0/[0-3]/37/2/1	S1/[0-3]/37/1/2	S64/H[0-3]/1/1/ 110
S0/[0-3]/37/3/1	S1/[0-3]/37/1/3	S64/H[0-3]/1/1/ 111
S0/[0-3]/38/1/1	S1/[0-3]/38/1/1	S64/H[0-3]/1/1/ 112
S0/[0-3]/38/2/1	S1/[0-3]/38/1/2	S64/H[0-3]/1/1/ 113
S0/[0-3]/38/3/1	S1/[0-3]/38/1/3	S64/H[0-3]/1/1/ 114
S0/[0-3]/39/1/1	S1/[0-3]/39/1/1	S64/H[0-3]/1/1/ 115
S0/[0-3]/39/2/1	S1/[0-3]/39/1/2	S64/H[0-3]/1/1/ 116
S0/[0-3]/39/3/1	S1/[0-3]/39/1/3	S64/H[0-3]/1/1/ 117
S0/[0-3]/40/1/1	S1/[0-3]/40/1/1	S64/H[0-3]/1/1/ 118
S0/[0-3]/40/2/1	S1/[0-3]/40/1/2	S64/H[0-3]/1/1/ 119

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/40/3/1	S1/[0-3]/40/1/3	S64/H[0-3]/1/1/120
S0/[0-3]/41/1/1	S1/[0-3]/41/1/1	S64/H[0-3]/1/1/121
S0/[0-3]/41/2/1	S1/[0-3]/41/1/2	S64/H[0-3]/1/1/122
S0/[0-3]/41/3/1	S1/[0-3]/41/1/3	S64/H[0-3]/1/1/123
S0/[0-3]/42/1/1	S1/[0-3]/42/1/1	S64/H[0-3]/1/1/124
S0/[0-3]/42/2/1	S1/[0-3]/42/1/2	S64/H[0-3]/1/1/125
S0/[0-3]/42/3/1	S1/[0-3]/42/1/3	S64/H[0-3]/1/1/126
S0/[0-3]/43/1/1	S1/[0-3]/43/1/1	S64/H[0-3]/1/1/127
S0/[0-3]/43/2/1	S1/[0-3]/43/1/2	S64/H[0-3]/1/1/128
S0/[0-3]/43/3/1	S1/[0-3]/43/1/3	S64/H[0-3]/1/1/129
S0/[0-3]/44/1/1	S1/[0-3]/44/1/1	S64/H[0-3]/1/1/130
S0/[0-3]/44/2/1	S1/[0-3]/44/1/2	S64/H[0-3]/1/1/131
S0/[0-3]/44/3/1	S1/[0-3]/44/1/3	S64/H[0-3]/1/1/132
S0/[0-3]/45/1/1	S1/[0-3]/45/1/1	S64/H[0-3]/1/1/133
S0/[0-3]/45/2/1	S1/[0-3]/45/1/2	S64/H[0-3]/1/1/134

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/45/3/1	S1/[0-3]/45/1/3	S64/H[0-3]/1/1/ 135
S0/[0-3]/46/1/1	S1/[0-3]/46/1/1	S64/H[0-3]/1/1/ 136
S0/[0-3]/46/2/1	S1/[0-3]/46/1/2	S64/H[0-3]/1/1/ 137
S0/[0-3]/46/3/1	S1/[0-3]/46/1/3	S64/H[0-3]/1/1/ 138
S0/[0-3]/47/1/1	S1/[0-3]/47/1/1	S64/H[0-3]/1/1/ 139
S0/[0-3]/47/2/1	S1/[0-3]/47/1/2	S64/H[0-3]/1/1/ 140
S0/[0-3]/47/3/1	S1/[0-3]/47/1/3	S64/H[0-3]/1/1/ 141
S0/[0-3]/48/1/1	S1/[0-3]/48/1/1	S64/H[0-3]/1/1/ 142
S0/[0-3]/48/2/1	S1/[0-3]/48/1/2	S64/H[0-3]/1/1/ 143
S0/[0-3]/48/3/1	S1/[0-3]/48/1/3	S64/H[0-3]/1/1/ 144
S0/[0-3]/49/1/1	S1/[0-3]/49/1/1	S64/H[0-3]/1/1/ 145
S0/[0-3]/49/2/1	S1/[0-3]/49/1/2	S64/H[0-3]/1/1/ 146
S0/[0-3]/49/3/1	S1/[0-3]/49/1/3	S64/H[0-3]/1/1/ 147
S0/[0-3]/50/1/1	S1/[0-3]/50/1/1	S64/H[0-3]/1/1/ 148
S0/[0-3]/50/2/1	S1/[0-3]/50/1/2	S64/H[0-3]/1/1/ 149

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/50/3/1	S1/[0-3]/50/1/3	S64/H[0-3]/1/1/150
S0/[0-3]/51/1/1	S1/[0-3]/51/1/1	S64/H[0-3]/1/1/151
S0/[0-3]/51/2/1	S1/[0-3]/51/1/2	S64/H[0-3]/1/1/152
S0/[0-3]/51/3/1	S1/[0-3]/51/1/3	S64/H[0-3]/1/1/153
S0/[0-3]/52/1/1	S1/[0-3]/52/1/1	S64/H[0-3]/1/1/154
S0/[0-3]/52/2/1	S1/[0-3]/52/1/2	S64/H[0-3]/1/1/155
S0/[0-3]/52/3/1	S1/[0-3]/52/1/3	S64/H[0-3]/1/1/156
S0/[0-3]/53/1/1	S1/[0-3]/53/1/1	S64/H[0-3]/1/1/157
S0/[0-3]/53/2/1	S1/[0-3]/53/1/2	S64/H[0-3]/1/1/158
S0/[0-3]/53/3/1	S1/[0-3]/53/1/3	S64/H[0-3]/1/1/159
S0/[0-3]/54/1/1	S1/[0-3]/54/1/1	S64/H[0-3]/1/1/160
S0/[0-3]/54/2/1	S1/[0-3]/54/1/2	S64/H[0-3]/1/1/161
S0/[0-3]/54/3/1	S1/[0-3]/54/1/3	S64/H[0-3]/1/1/162
S0/[0-3]/55/1/1	S1/[0-3]/55/1/1	S64/H[0-3]/1/1/163
S0/[0-3]/55/2/1	S1/[0-3]/55/1/2	S64/H[0-3]/1/1/164

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/55/3/1	S1/[0-3]/55/1/3	S64/H[0-3]/1/1/165
S0/[0-3]/56/1/1	S1/[0-3]/56/1/1	S64/H[0-3]/1/1/166
S0/[0-3]/56/2/1	S1/[0-3]/56/1/2	S64/H[0-3]/1/1/167
S0/[0-3]/56/3/1	S1/[0-3]/56/1/3	S64/H[0-3]/1/1/168
S0/[0-3]/57/1/1	S1/[0-3]/57/1/1	S64/H[0-3]/1/1/169
S0/[0-3]/57/2/1	S1/[0-3]/57/1/2	S64/H[0-3]/1/1/170
S0/[0-3]/57/3/1	S1/[0-3]/57/1/3	S64/H[0-3]/1/1/171
S0/[0-3]/58/1/1	S1/[0-3]/58/1/1	S64/H[0-3]/1/1/172
S0/[0-3]/58/2/1	S1/[0-3]/58/1/2	S64/H[0-3]/1/1/173
S0/[0-3]/58/3/1	S1/[0-3]/58/1/3	S64/H[0-3]/1/1/174
S0/[0-3]/59/1/1	S1/[0-3]/59/1/1	S64/H[0-3]/1/1/175
S0/[0-3]/59/2/1	S1/[0-3]/59/1/2	S64/H[0-3]/1/1/176
S0/[0-3]/59/3/1	S1/[0-3]/59/1/3	S64/H[0-3]/1/1/177
S0/[0-3]/60/1/1	S1/[0-3]/60/1/1	S64/H[0-3]/1/1/178
S0/[0-3]/60/2/1	S1/[0-3]/60/1/2	S64/H[0-3]/1/1/179

**Table 6-139 ModA-64 AU3 Logical Port External Addresses
(continued)**

AU3 Low-Speed Logical Port Address STM0 Unit	AU3 Low-Speed Logical Port Address STM1 Unit	AU3 High-Speed Logical Port Addresses
S0/[0-3]/60/3/1	S1/[0-3]/60/1/3	S64/H[0-3]/1/1/180
S0/[0-3]/61/1/1	S1/[0-3]/61/1/1	S64/H[0-3]/1/1/181
S0/[0-3]/61/2/1	S1/[0-3]/61/1/2	S64/H[0-3]/1/1/182
S0/[0-3]/61/3/1	S1/[0-3]/61/1/3	S64/H[0-3]/1/1/183
S0/[0-3]/62/1/1	S1/[0-3]/62/1/1	S64/H[0-3]/1/1/184
S0/[0-3]/62/2/1	S1/[0-3]/62/1/2	S64/H[0-3]/1/1/185
S0/[0-3]/62/3/1	S1/[0-3]/62/1/3	S64/H[0-3]/1/1/186
S0/[0-3]/63/1/1	S1/[0-3]/63/1/1	S64/H[0-3]/1/1/187
S0/[0-3]/63/2/1	S1/[0-3]/63/1/2	S64/H[0-3]/1/1/188
S0/[0-3]/63/3/1	S1/[0-3]/63/1/3	S64/H[0-3]/1/1/189
S0/[0-3]/64/1/1	S1/[0-3]/64/1/1	S64/H[0-3]/1/1/190
S0/[0-3]/64/2/1	S1/[0-3]/64/1/2	S64/H[0-3]/1/1/191
S0/[0-3]/64/3/1	S1/[0-3]/64/1/3	S64/H[0-3]/1/1/192

Table 6-140 ModA-64 AU4 Logical Port External Addresses

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/1/1/1	S64/H[0-3]/1/1/1
S1/[0-3]/2/1/1	S64/H[0-3]/1/1/2
S1/[0-3]/3/1/1	S64/H[0-3]/1/1/3
S1/[0-3]/4/1/1	S64/H[0-3]/1/1/4
S1/[0-3]/5/1/1	S64/H[0-3]/1/1/5
S1/[0-3]/6/1/1	S64/H[0-3]/1/1/6
S1/[0-3]/7/1/1	S64/H[0-3]/1/1/7
S1/[0-3]/8/1/1	S64/H[0-3]/1/1/8
S1/[0-3]/9/1/1	S64/H[0-3]/1/1/9
S1/[0-3]/10/1/1	S64/H[0-3]/1/1/10
S1/[0-3]/11/1/1	S64/H[0-3]/1/1/11
S1/[0-3]/12/1/1	S64/H[0-3]/1/1/12
S1/[0-3]/13/1/1	S64/H[0-3]/1/1/13
S1/[0-3]/14/1/1	S64/H[0-3]/1/1/14
S1/[0-3]/15/1/1	S64/H[0-3]/1/1/15
S1/[0-3]/16/1/1	S64/H[0-3]/1/1/16
S1/[0-3]/17/1/1	S64/H[0-3]/1/1/17
S1/[0-3]/18/1/1	S64/H[0-3]/1/1/18
S1/[0-3]/19/1/1	S64/H[0-3]/1/1/19
S1/[0-3]/20/1/1	S64/H[0-3]/1/1/20
S1/[0-3]/21/1/1	S64/H[0-3]/1/1/21
S1/[0-3]/22/1/1	S64/H[0-3]/1/1/22
S1/[0-3]/23/1/1	S64/H[0-3]/1/1/23
S1/[0-3]/24/1/1	S64/H[0-3]/1/1/24
S1/[0-3]/25/1/1	S64/H[0-3]/1/1/25
S1/[0-3]/26/1/1	S64/H[0-3]/1/1/26
S1/[0-3]/27/1/1	S64/H[0-3]/1/1/27
S1/[0-3]/28/1/1	S64/H[0-3]/1/1/28

**Table 6-140 ModA-64 AU4 Logical Port External Addresses
(continued)**

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/29/1/1	S64/H[0-3]/1/1/29
S1/[0-3]/30/1/1	S64/H[0-3]/1/1/30
S1/[0-3]/31/1/1	S64/H[0-3]/1/1/31
S1/[0-3]/32/1/1	S64/H[0-3]/1/1/32
S1/[0-3]/33/1/1	S64/H[0-3]/1/1/33
S1/[0-3]/34/1/1	S64/H[0-3]/1/1/34
S1/[0-3]/35/1/1	S64/H[0-3]/1/1/35
S1/[0-3]/36/1/1	S64/H[0-3]/1/1/36
S1/[0-3]/37/1/1	S64/H[0-3]/1/1/37
S1/[0-3]/38/1/1	S64/H[0-3]/1/1/38
S1/[0-3]/39/1/1	S64/H[0-3]/1/1/39
S1/[0-3]/40/1/1	S64/H[0-3]/1/1/40
S1/[0-3]/41/1/1	S64/H[0-3]/1/1/41
S1/[0-3]/42/1/1	S64/H[0-3]/1/1/42
S1/[0-3]/43/1/1	S64/H[0-3]/1/1/43
S1/[0-3]/44/1/1	S64/H[0-3]/1/1/44
S1/[0-3]/45/1/1	S64/H[0-3]/1/1/45
S1/[0-3]/46/1/1	S64/H[0-3]/1/1/46
S1/[0-3]/47/1/1	S64/H[0-3]/1/1/47
S1/[0-3]/48/1/1	S64/H[0-3]/1/1/48
S1/[0-3]/49/1/1	S64/H[0-3]/1/1/49
S1/[0-3]/50/1/1	S64/H[0-3]/1/1/50
S1/[0-3]/51/1/1	S64/H[0-3]/1/1/51
S1/[0-3]/52/1/1	S64/H[0-3]/1/1/52
S1/[0-3]/53/1/1	S64/H[0-3]/1/1/53
S1/[0-3]/54/1/1	S64/H[0-3]/1/1/54
S1/[0-3]/55/1/1	S64/H[0-3]/1/1/55
S1/[0-3]/56/1/1	S64/H[0-3]/1/1/56

**Table 6-140 ModA-64 AU4 Logical Port External Addresses
(continued)**

AU4 Low-Speed Logical Port Address - STM1 Unit	AU4 High-Speed Logical Port Addresses
S1/[0-3]/57/1/1	S64/H[0-3]/1/1/57
S1/[0-3]/58/1/1	S64/H[0-3]/1/1/58
S1/[0-3]/59/1/1	S64/H[0-3]/1/1/59
S1/[0-3]/60/1/1	S64/H[0-3]/1/1/60
S1/[0-3]/61/1/1	S64/H[0-3]/1/1/61
S1/[0-3]/62/1/1	S64/H[0-3]/1/1/62
S1/[0-3]/63/1/1	S64/H[0-3]/1/1/63
S1/[0-3]/64/1/1	S64/H[0-3]/1/1/64

□

Section XIII: WaveStar LambdaRouter Port Addresses

Overview

Purpose This section provides conceptual information regarding the external and internal port addresses for both the physical and logical ports of the WaveStar LambdaRouter. It also discusses the correlation between the external and internal port addresses.

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Port address information

Table The following port addresses (internal and external) are applicable to the WaveStar LambdaRouter. Entries enclosed in { } are variables. Fields enclosed in [] are optional fields.

The following port identifiers are applicable to the WaveStar LambdaRouter R1.0, 256 R2.0, and 128 Release 2.0

Description	Internal Address	External Address
Optical Channel Port (Transparent Ports)	och-{1-32}-{1-32}- {1-4}	OT/och-{1-32}-{1-32}- {1-4}
Optical Link Logical Port (Transparent Ports)	och-{1-32}-{1-32}- {1-4}	OT/och-{1-32}-{1-32}- {1-4}



Section XIV: WaveStar BandWidth Manager Port Addresses

Overview

Purpose This section contains WaveStar BandWidth Manager port addresses specific to WaveStar NMS.

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Port identifiers	6-136



Port address information

Overview This section discusses the address format of the WaveStar BandWidth Manager.

Address format The format for the WaveStar BandWidth Manager addresses are:

<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>

Important! The Protection group# and the w/p are not used. Enter the # character for both of these.

External addresses This section contains the external addresses (the addresses that the user types in) for WaveStar BandWidth Manager, and the valid port configuration values.

- STM-64 Address
S64/<bay>-<Shelf>-<Protection group#>-<w/p>-TR<slot>-<port>
- STM-64 Valid Port Configuration Values
For any physical port not in a protection group:
Sn/[1-99]-[1-2]-#-#-tr[1-4]-1
For a physical port in a 1+1 protection group configuration:
Sn/[1-99]-[1-2]-#-#-tr[1-4] -1
- STM-16 Address
S16/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>
- STM-16 Valid Port Configuration Values
For any physical port not in a protection group:
Sn/[1-99]-[1-2]-#-#[01-16]-1
For a physical port in a 1+1 protection group configuration:
Sn/[1-99]-[1-2]-#-#[01-16]-1
- STM-4 Address
S4/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>
- STM-4 Valid Port Configuration Values
For any physical port not in a protection group:
Sn/[1-99]-[1-2]-#-#[01-16]-[1-2]
For a physical port in a 1+1 protection group configuration:
Sn/[1-99]-[1-2]-#-#[01-16]-[1-2]
- STM-1 Address
S1/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>
- STM-1 Valid Port Configuration Values

Port Addresses

Port address information

For any physical port not in a protection group:

Sn/[1-99]-[1-2]-#-#[01-16]-[1-4]

For a physical port in a 1+1 protection group configuration:

Sn/[1-99]-[1-2]-#-#[01-16]-[1-4]

- DS3 Address
D3/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>
- DS3 Valid Port Configuration Values
D3/[1-99]-[1-2]-#-#[01-16]-[1-8]

External addresses - V4 and AU3

The number of ports per slot may differ based on the rate. This section contains the V4 and AU3 addresses.

- V4 Address
Sm/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>/AU.[1-n].0, n=1 for STM1, n=4 for STM-4, n=16 for STM-16, n=64 for STM-64. The internal address will be as follows: <bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>-X where $X=(n-1)*3+1$
- AU3 Address
Sm/<bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>/AU.[1-j].[1-i] where j=1 for STM1, j=4 for STM-4, j=16 for STM-16, j=64 for STM-64 and i ranges from 1-3. The internal address will be as follows: <bay>-<Shelf>-<Protection group#>-<w/p>-<slot>-<port>-X, where $X=3*(j-1)+i$

□

Port identifiers

Table This table contains the port addresses (internal and external) for the WaveStar BandWidth Manager.

Description (BWM)	Entity Identifier (EID) (Internal Address)	Network Level Address (External Address)
STM-64 Physical Port	[1-99]-[1-2]-#-#-tr[1-4]-1	S64/[1-99]-[1-2]-#-#-tr[1-4]-1
VC4-16c logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 49, 97, 145]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/16c.[1-4]
VC4-4c logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/4c.[1-16]
VC4 logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].0
AU3 logical port on STM-64 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1-192]	S64/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].[1-3]
OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1
VC4-16c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 49, 97, 145]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/16c.[1-4]
VC4-4c logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 13, 25, 37, 49, 61, 73, 85, 97, 109, 121, 133, 145, 157, 169, 181]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/4c.[1-16]

Port Addresses

Port identifiers

VC4 logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67, 70, 73, 76, 79, 82, 85, 88, 91, 94, 97, 100, 103, 106, 109, 112, 115, 118, 121, 124, 127, 130, 133, 136, 139, 142, 145, 148, 151, 154, 157, 160, 163, 166, 169, 172, 175, 178, 181, 184, 187, 190]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].0
AU3 logical port on OC-192 physical port	[1-99]-[1-2]-#-#-tr[1-4]-1-[1-192]	OC192/[1-99]-[1-2]-#-#-tr[1-4]-1/AU.[1-64].[1-3]
STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1
VC4-16c logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/16c.[1]
VC4-4c logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 13, 25, 37]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/4c.[1-4]
VC4 logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].0
AU3 logical port on STM-16 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1-48]	S16/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].[1-3]
OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1
VC4-16c logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/16c.[1]
VC4-4c logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 13, 25, 37]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/4c.[1-4]
VC4 logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].0
AU3 logical port on OC-48 physical port	[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1-[1-48]	OC48/[1-99]-[1-2]-#-#-[02, 04, 06.....16]-1/AU.[1-16].[1-3]
STM-4 physical port	[1-99]-[1-2]-#-#-[01-16]-[1-2]	S4/[1-99]-[1-2]-#-#-[01-16]-[1-2]

Port Addresses

Port identifiers

VC4-4c logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/4c.[1]
VC4 logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1, 4, 7, 10]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].0
AU3 logical port on STM-4 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1-12]	S4/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].[1-3]
OC-12 Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-2]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]
VC4-4c logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]/4c.[1]
VC4 logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1, 4, 7, 10]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].0
AU3 logical port on OC-12 physical port	[1-99]-[1-2]-#-#[01-16]-[1-2]-[1-12]	OC12/[1-99]-[1-2]-#-#[01-16]-[1-2]/AU.[1-4].[1-3]
STM-1 and STM1E Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-4]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]
VC4 logical port on STM-1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.0
AU3 logical port on STM-1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1-3]	S1/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.[1-3]
OC-3 Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-4]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]
VC4 logical port on OC-3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.0
AU3 logical port on OC-3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-4]-[1-3]	OC3/[1-99]-[1-2]-#-#[01-16]-[1-4]/AU.1.[1-3]
EC1 and STS1E Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-8]	EC1/[1-99]-[1-2]-#-#[01-16]-[1-8]
DS3 Physical Port	[1-99]-[1-2]-#-#[01-16]-[1-8]	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]
AU3 logical port on DS3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]/1
AU3 logical port on EC1 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	EC1/[1-99]-[1-2]-#-#[01-16]-[1-8]/AU.1.1
T3 logical port on T3 physical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]/1
D3 riding on AU3 logical port	[1-99]-[1-2]-#-#[01-16]-[1-8]-1	D3/[1-99]-[1-2]-#-#[01-16]-[1-8]/1

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