

**Lucent Technologies**  
Bell Labs Innovations



## **WaveStar® SNMS**

Provisioning Guide for WaveStar® TDM 10G  
(STM-64)

365-371-524  
CC109149807  
Issue a  
October 2001



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365-371-524 Issue a October 2001

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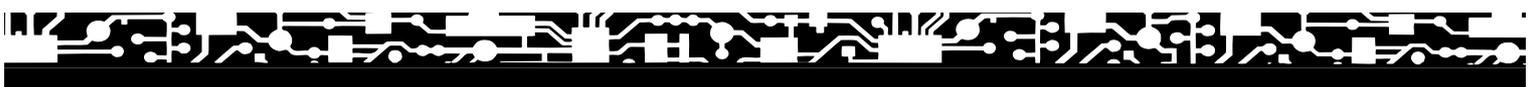
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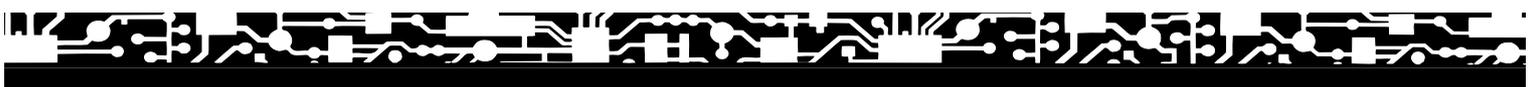
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# About this information product

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- Purpose** This Provisioning Guide provides operations, administration and maintenance information about the WaveStar® TDM 10G (STM-64).
- Reason for reissue** The present release (Issue a) is the first version of this manual.
- Safety labels** The present manual contains basic safety instructions which have to be strictly observed when handling the equipment and systems described.
- Strictly observe the warnings and safety instructions before carrying out work of any kind on the equipment and systems described.
- All safety instructions include a signal word that classifies the danger and a text block that contains descriptions of the type and cause of the danger, the consequences of ignoring the safety instruction and the measures that can be taken to minimize the danger. In some safety instructions, a warning symbol is placed underneath the signal word.
- Example:



## **DANGER**

*Arcing on removing or inserting a live power supply plug.*

*Arcing can cause burns to the hands and damage to the eyes. Ensure that the line circuit-breaker on the fuse panel is in the "OFF" position before removing or inserting the power supply plug.*

### **Classification of hazards**

There are three classes of hazards. They are designated using the head words "Danger", "Warning" and "Caution". Their meaning is as follows:

- ***Danger***  
is used to mark safety warnings which, if not followed, will certainly or with a very high degree of probability result in death or extremely serious injury.
- ***Warning***  
is used to mark safety warnings which, if not followed, can lead to serious injury or permanent damage to the health of an individual or to property.
- ***Caution***  
is used to mark safety warnings which, if not followed, can lead to injury or property damage - including financial losses due to extensive operational impairment.

### **Warning symbols**

The examples below show the warning symbols used.



## **DANGER**

*Example of a general warning about a danger.*



## **DANGER**

*Example of a warning about laser radiation.*



## DANGER

*Warning about devices sensitive to electrostatic discharge (ESD)*

The safety instructions for the classes “Danger”, “Warning” and “Caution” always have a warning symbol, the “Important” and “Notice” safety instructions can, but do not always have a warning symbol.

**Conventions used** These conventions are used in this document:

### Numbering

The chapters of this document are numbered consecutively. The page numbering restarts at “1” in each chapter. To facilitate identifying pages in different chapters, the page numbers are prefixed with the chapter number. For example, page 2-3 is the third page in chapter 2.

### Cross-references

Cross-reference conventions are identical with those used for numbering, i.e. the first number in a reference to a particular page refers to the corresponding chapter.

### Keyword blocks

This document contains so-called keyword blocks to facilitate the location of specific text passages. The keyword blocks are placed to the left of the main text and indicate the contents of a paragraph or group of paragraphs.

### Typographical conventions

Special typographical conventions apply to elements of the graphical user interface (GUI), file names and system path information, keyboard entries, alarm messages etc.

- Elements of the graphical user interface (GUI)  
These are examples of text that appears on a graphical user interface (GUI), such as menu options, window titles or push-button:
  - *Provision..., Delete, Apply, Close, OK* (push-button)
  - *Provision Timing/Sync* (window title)
  - *View Equipment Details...* (menu option)
  - *Administration → Security → User Provisioning...* (path for invoking a window)
- File names and system path information

These are examples of file names and system path information:

- *setup.exe*
- *C:\Program Files\Lucent Technologies*

- Keyboard entries

These are examples of keyboard entries:

- **F1, Esc X, Alt-F, Ctrl-D, Ctrl-Alt-Del** (simple keyboard entries)  
A hyphen between two keys means that both keys have to be pressed simultaneously. Otherwise, a single key has to be pressed, or several keys have to be pressed in sequence.
- `copy abc xyz` (command)  
A complete command has to be entered.

- Alarms and error messages

These are examples of alarms and error messages:

- Loss of Signal
- Circuit Pack Failure
- HP-UNEQ, MS-AIS, LOS, LOF
- Not enough disk space available

### Abbreviations

Abbreviations used in this document can be found in the “Glossary” unless it can be assumed that the reader is familiar with the abbreviation.

### Related documentation

This section briefly describes the documents that are included in the WaveStar® TDM 10G documentation set.

- Installation Manual  
The WaveStar® TDM 10G (STM-64) Installation Manual is a step-by-step guide to system installation and setup. It also includes information needed for pre-installation site planning and post-installation acceptance testing.
- Applications, Planning, and Ordering Guide  
The WaveStar® TDM 10G (STM-64) Applications, Planning, and Ordering Guide (APOG) is for use by network planners, analysts and managers. It is also for use by the Lucent Account Team. It presents a detailed overview of the system, describes its applications, gives planning requirements, engineering rules, ordering information, and technical specifications.
- User Operations Guide

The WaveStar® TDM 10G (STM-64) User Operations Guide provides step-by-step information for use in daily system operations. The manual demonstrates how to perform system provisioning, operations, and administrative tasks by use of WaveStar® CIT.

- **Alarm Messages and Trouble Clearing Guide**  
The WaveStar® TDM 10G (STM-64) Alarm Messages and Trouble Clearing Guide gives detailed information on each possible alarm message. Furthermore, it provides procedures for routine maintenance, troubleshooting, diagnostics, and component replacement.
- **TL1 Reference Manual**  
The WaveStar® TDM 10G (STM-64) TL1 Reference Manual serves as a reference for all TL1 commands which can be used to operate the network element. The manual also gives an introduction to the concept of the TL1 commands and instructs how to use them.
- **WaveStar® SNMS Provisioning Guide for WaveStar® TDM 10G (STM-64)**  
The WaveStar® SNMS Provisioning Guide for WaveStar® TDM 10G (STM-64) gives instructions on how to perform system provisioning, operations, and administrative tasks by use of WaveStar® SNMS.

The following table lists the documents included in the WaveStar® TDM 10G documentation set.

<b>Document Number</b>	<b>Title</b>
109149773 (365-371-521)	WaveStar® TDM 10G (STM-64) Applications, Planning, and Ordering Guide
109149781 (365-371-522)	WaveStar® TDM 10G (STM-64) User Operations Guide
109149799 (365-371-523)	WaveStar® TDM 10G (STM-64) Alarm Messages and Trouble Clearing Guide
109149823 (365-371-525)	WaveStar® TDM 10G (STM-64) Installation Manual
109149831(365-371- 526)	WaveStar® TDM 10G (STM-64) TL1 Reference Manual
109149807 (365-371-524)	WaveStar® SNMS Provisioning Guide for WaveStar® TDM 10G (STM-64))
109149856	CD-ROM Documentation WaveStar® TDM 10G (STM-64) (all manuals on one CD-ROM)

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# 1 Management communication setup

## Overview

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**Purpose** This chapter describes how network elements are added to the management of SNMS and how they are modified or deleted.

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□

## Add a Network Element—OSI Communications

---

**When to use** Use this procedure to add an NE to WaveStar SNMS host.

All other NEs in your network which are connected to this NE are automatically added to the SNMS.

**Related information** For related information, see Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to add an OSI-connected NE.

---

- 1 Select **Administration** → **Network** → **Network Elements** from the main menu bar on the Map window.

**Result:**

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

---

- 2 Click on the **Add** button. The **Add an NE - General Information** panel is displayed.

---

- 3 Enter the NE’s **Target Identifier** (TID). A TID can be 1-20 alphanumeric characters. Hyphens, slashes (“/”), and periods are allowed. This field is required.

---

- 4 Enter the NE’s **Alias**. An alias can be 1-20 alphanumeric characters. Uppercase and lowercase letters are allowed. Spaces are allowed. This field is optional.

---

- 5 Select **TDM 10G STM-64** as the **NE Type**.

---

- 6 Select the NE’s **time zone** by clicking the appropriate radio button, e.g. for Germany select **Other** and enter **1.00**. If **Other** is selected, enter the time difference, in hours and minutes, between the NE time and Greenwich Mean Time (GMT). Specify the time difference, “+” (plus) or “-” (minus), up to five characters. Valid values are -11.0 to 13.00 (the plus “+” is implied). Default value: **Same as Host**.

---

- 7 Under **Communicate via** click the **OSI** radio button.

- .....
- 8 Click on the **NE Communications Details (OSI)** tab. And enter the NEs **Controller #1 NSAP**.

.....

  - 9 Click on the **NE Communications Details (OSI)#2** tab. Keep the default values.

.....

  - 10 Click on the **NE Security** tab. The **NE Security** panel is displayed.

.....

  - 11 Enter the **primary NE login** and **password** for the NE being added. The login and password can be 1-10 characters.

.....

  - 12 Re-enter the primary NE password, in the **Re-enter Password** field, for checking.

.....

  - 13 Enter the **backup login** and **password** for the NE. The backup login and password can be 1-10 characters.

.....

  - 14 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **NE Security** panel of the **Add/Modify NE** window.

**Result:**

A message in the status bar is displayed, indicating that the NE is being added to WaveStar SNMS.

Please note that an OSI-connected NE can be added via a DSA (Directory Services Agent) if it is available.

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



## Add a Network Element—TCP/IP Communications

---

**When to use** Use this procedure to add an NE with a direct TCP/IP interface to WaveStar SNMS host. NEs with a “pure” direct TCP/IP interface can be set up to communicate directly via TCP/IP with the WaveStar SNMS host or through a TCP/IP-connected NE serving as a Gateway Network Element (GNE) for the other NEs in a ring. To provide support in the event of a communications failure, a backup GNE can be assigned to a subnetwork to allow switchover to another GNE.

All other NEs in your network which are connected to this NE are automatically added to the SNMS.

**Related information** For related information, see Chapter 8, “Management communication setup concepts”.

**Before you begin** Before you begin this task, if you are adding a TCP/IP-connected NE as a GNE, the following must be established:

- The GNE’s Target Identifier (TID)
- A valid NE login/password, and a valid backup NE login/password
- The GNE’s IP address
- The number of associations for exchanging messages between the GNE and the other NEs in a ring

Before adding a TCP/IP GNE, you must first create a compatible subnetwork to which it can be assigned.

**Instructions** Complete the following steps to add a TCP/IP-connected NE.

---

- 1 Select **Administration** → **Network** → **Network Elements** from the main menu bar on the Map window.

**Result:**

The **Manage NEs** window is displayed, showing the current list of NEs in your Target Group.

---

- 2 Click on the **Add** button. The **Add an NE - General Information** panel is displayed.
- 

- 3 Enter the NE’s **Target Identifier** (TID). A TID can be 1-20 alphanumeric characters. Hyphens, slashes (“/”), and periods are allowed. This field is required.

.....

**4** Enter the NE's **Alias**. An alias can be 1-40 alphanumeric characters. Uppercase and lowercase letters are allowed. Spaces are allowed. This field is optional.

.....

**5** Select **TDM 10G STM-64** as the **NE Type**.

.....

**6** Select the NE's **time zone** by clicking the appropriate radio button, e.g. for Germany select **Other** and enter **1.00**. If **Other** is selected, enter the time difference, in hours and minutes, between the NE time and Greenwich Mean Time (GMT). Specify the time difference, "+" (plus) or "-" (minus), up to five characters. Valid values are -11.0 to 13.00 (the plus "+" is implied). Default value: **Same as Host**.

.....

**7** In the **Communicate Via** field:

<b>IF ...</b>	<b>CLICK ...</b>
The NE is communicating with the WaveStar SNMS host via a GNE	the <b>GNE</b> radio button. Go to Step 8.
The NE is communicating directly with the WaveStar SNMS host via TCP/IP	the <b>TCP/IP</b> radio button. Go to Step 9.

.....

**8** If you selected the **Communicate Via GNE** option in Step 7, click on the **NE Communications Detail (GNE)** panel. Select a GNE from the list on the panel. Skip to Step 15.

.....

**9** If you selected the **Communicate Via TCP/IP** option in Step 7, click on the **NE Communications Details (TCP/IP)** tab. The **NE Communications Details (TCP/IP)** panel is displayed. This panel is used to enter information about the interface between this GNE, the WaveStar SNMS host and the other NEs in the subnetwork.

.....

**10** The Communication Type defaults to TL1 Only. The other options are currently not available.

.....

**11** Click on the down arrow to the right of the **Choose a Subnetwork** field to display a list of subnetworks, and select a compatible subnetwork. This field is required.

.....

- .....
- 12** Enter the NE's IP address. The IP address field is divided into four 3-character fields separated by periods.
- .....
- 13** Choose the number of associations for the NE type. This field is required.
- .....
- 14** Click on the **FTP/FTAM Gateway Settings** tab. The **FTP/FTAM Gateway Settings** panel is displayed.
- .....
- 15**
- | <b>IF ...</b>   | <b>THEN ...</b>  |
|---|--|
| you want to use the FTAM/FTP Gateway for Backup/Restore and S/W Download        | click on the the <b>FTAM/FTP Gateway for Backup/Restore and S/W Download</b> radio button. |
| you do not want to use the FTAM/FTP Gateway for Backup/Restore and S/W Download | click on the the <b>None</b> radio button.   |
- .....
- 16** Click on the **NE Security** tab. The **NE Security** panel is displayed.
- .....
- 17** Enter the **primary NE login** and **password** for the NE being added. The login and password can be 1-10 characters.
- .....
- 18** Re-enter the primary NE password, in the **Re-enter Password** field, for checking.
- .....
- 19** Enter the **backup login** and **password** for the NE. The backup login and password can be 1-10 characters.
- .....
- 20** Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **NE Security** panel of the **Add/Modify NE** window.

**Result:**

A message in the status bar is displayed, indicating that the NE is being added to WaveStar SNMS.

21

**IF ...**

You are adding a GNE and the system prompts whether DNO should be run at this time to update the WaveStar SNMS database with complete information about the newly added NE.

You are not adding a GNE

**THEN ...**

Choose Yes to run DNO or No to not perform DNO at this time. Important! If you are adding more GNEs to the same subnetwork, choose No to not perform DNO at this time. A DNO should not be performed until all GNEs in the same subnetwork have been added. So new RNEs discovered automatically by WaveStar SNMS via a newly added GNE can be reassigned to another GNE in the same subnetwork, if necessary.

No DNO prompt is displayed.

**Result:**

A message in the status bar is displayed, indicating that the NE is being added to WaveStar SNMS.

END OF STEPS



## Modify a Network Element

---

**When to use** Use this procedure to modify an NE.

**Related information** For related information, see Chapter 8, “Management communication setup concepts”.

**Before you begin** Before you begin this task, be aware that the **TID** and **Communicate Via** fields cannot be modified. To perform this task, access the Map window.

**Instructions** Complete the following steps to modify an NE.

---

- 1 Select **Administration** → **Network** → **Network Elements** from the main menu bar on the Map window.

**Result:**

The **Network Element Manager** window is displayed, showing the current list of NEs in your Target Group.

---

- 2 Choose the NE to be modified and click the **Modify** button.

**Result:**

The **Add/Modify a Network Element - General Information** panel is displayed.

---

- 3 Click on the tab of the appropriate panel, and change the NE field(s), as needed.
- 

- 4 Click the **Apply** button to activate your choices, or click the **OK** button to activate your choices and close the **Add/Modify a Network Element** window.

**Result:**

A message in the status bar is displayed, indicating that the NE is being modified.

END OF STEPS

---



## Delete a Network Element

---

**When to use** Use this procedure to delete an NE.

**Before you begin** Before you begin this task, make sure that if the NE is assigned to an aggregate, that you remove it from the aggregate before deleting it. When an NE is deleted, all information related to that NE is immediately removed from the WaveStar SNMS database. Associated trails may also be deleted. Any trail that is deleted as a result of deleting an NE is also removed from any open window that shows the deleted trail (like the Map window pane and the Trail Manager).

To perform this task, access the Map window.

**Instructions** Complete the following steps to delete an NE.

---

- 1 Select **Administration** → **Network** → **Network Elements** from the main menu bar on the Map window.

**Result:**

The **Network Element Manager** window is displayed, showing the current list of NEs in your Target Group.

---

- 2 Choose the NE to be deleted and click the **Delete** button.
- 

- 3 Click the **OK** button.

**Result:**

A pop-up window is displayed, asking if you really want to delete the chosen NE.

---

- 4 Choose **Yes**.

**Result:**

A message in the status bar is displayed, indicating that the NE is being deleted.

END OF STEPS

---



## Configuring the basic DCN parameters for an NE

---

- When to use** Use this procedure to configure the basic DCN parameters for a network element. Configuring the basic DCN parameters includes:
- Enabling/Disabling the Intraoffice LAN (IAO-LAN),
  - Modifying a node's area address (the area address is the configurable part of the NSAP address),
  - Specifying the node's intermediate system (IS) characteristics,
  - Setting the CLNP PDU lifetime.

**Related information** For related information, please refer to Chapter 8, "Management communication setup concepts".

**Instructions** Complete the following steps to configure the basic DCN parameters for an NE.

---

- 1 Select the desired NE in the Map pane and then select **Administration** → **Network** → **DCC** from the main menu.

**Result:**

The **DCC Provisioning** window opens.

---

- 2 Select in the Network Element Explorer part of the window the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the basic DCN parameters and press **Configure**.

**Result:**

By default the **LAN Mgmt** is displayed in the window.

---

- 3 If desired, change the value for the LAN Router Priority next to **LAN Router Priority**. The possible values range from 1 to 127.

This is the priority of the router connected to the LAN. A higher number has priority over a lower one. From all routers connected to the LAN, the router with the highest priority is selected as the Designated router. The designated Router takes care of routing of packets in the Q-LAN.

---

- 4 You may now enable or disable the LAN access to the external LAN (IAO-LAN for the high speed part) and/or the internal LAN of the main shelf via **External LAN Channel** and **Internal LAN Channel**.

**Important!** The attempt to disable the LAN access to the IAO-LAN for the low-speed part of the main shelf is rejected by the NE because the current association between the WaveStar® SNMS and the NE would be lost in that case, and only remote associations via DCC would be possible.

.....

**5** If desired, change the value for the **Internal Max Link Metric** parameter. The possible values range from 1 to 63.

.....

**6** If desired, change the value for the **External Max Link Metric** parameter. The possible values range from 1 to 63.

.....

**7** If you have made any changes in the **LAN Mgmt** tab click **Apply** to confirm your changes.

.....

**8** Select the **Network Layer** tab.

.....

**9** Check the actual setting of the area address in the **NSAP** segment and change it if desired.

.....

**10** If desired, change the value for the **CLNP PDU Lifetime**. The possible values range from 2 to 255 hops.

.....

**11** Specify the node's IS routing capability by means of the **Routing Capability** check boxes in the **Intermediate System** group box depending on whether the node shall act as a **Level 1** or **Level 1&2** router.

.....

**12** If desired, change the value for the node's ISCT next to **Intermediate System Config Timer**. The possible values range from 10 to 1000 seconds in one-second intervals.

.....

**13** If you have made any changes in the **Network Layer** tab click **Apply**.

END OF STEPS



## Supporting information for “Configuring the basic DCN parameters for an NE”

---

### Network elements and nodes

A distinction has to be made between network elements and nodes. Network elements can be identified by their target identifier (TID), i.e. their NE name (“NE name” and “TID” are used synonymously throughout this WaveStar® SNMS Provisioning Guide), whereas a node is identified by its Network Service Access Point (NSAP) address. Each NSAP address within a network constitutes a node which can individually be addressed.

### The DCC Provisioning window

The **LAN Management**, the **Transport Layer** and the **Network Layer** tabs of the **Data Communications** window are relevant to perform this task.

### The LAN Management tab

The **LAN Management** tab of the **Data Communications** window makes it possible to enable or disable the LAN access to the internal LAN, the so-called Operations Network (ON), and to the external LAN (Intraoffice LAN (IAO-LAN)) for a selected DCC controller (ADJCTL/DCCEI circuit pack). The LAN access is enabled in the basic configuration. The **LAN Management** tab also offers the opportunity to modify the LAN Router Priority and the Max Link Metric parameters for both LAN types.

### Elements of the LAN Management tab

The elements of the **Lan Managment** tab and their meaning are listed in the following table. If applicable, the permitted value range as well as the default settings of the parameters are given.

Window element	Meaning	Value range	Default setting
<b>LAN Router Priority (127)</b>	Indicates the priority of the router connected to the LAN. A higher number has priority over a lower one.  From all routers connected to the LAN, the router with the highest priority is selected as the Designated router.  The designated Router takes care of routing of packets in the Q-LAN.	0- 127	64

Window element	Meaning	Value range	Default setting
Internal Max Link Metric		1 to 63	14
External Max Link Metric		1 to 63	14

**The Network Layer tab** The **Network Layer** tab of the **DCC Provisioning** window provides information on the actual network layer configuration and offers the opportunity to modify the NE’s area address and to specify the NE’s IS characteristics and the CLNP PDU lifetime.

**Elements of the Network Layer tab** The elements of the **Network Layer** tab and their meaning are listed in the following table. If applicable, the permitted value range as well as the default settings of the parameters are given.

Window element	Meaning	Value range	Default setting
NSAP	The complete area address in hexadecimal representation	dependent on the actual setting of the configurable NSAP address fields	read-only;
Modify...	Click this button to invoke a configuration window for the <b>Primary Area Address</b> .		
Intermediate System Routing Capability	The node’s IS routing capability	<b>Level 1</b> <b>Level 1&amp;2</b> <b>Level 1&amp;2 w/Partition repair</b>	<b>Level 1</b>

Notes on the table:

- Intermediate systems periodically generate IS Hellos (ISHs). The interval between two ISHs is determined by the Intermediate System Configuration Timer (ISCT).
- The CLNP PDU lifetime specifies the maximum number of hops permitted for a PDU. If this PDU lifetime control parameter is exceeded, the PDU will not be forwarded further. A direct transmission link between two nodes is referred to as a hop.



## Provision DCC Configuration

---

**When to use** Use this procedure to provision the internal and external LAN port settings and protocol properties for the different management layers of the OSI stack for DCC channels on the selected NE's DCC circuit pack(s). The DCC channels are designated overhead bits on SONET/SDH optical ports. These overhead bits can be used by the customer (or NE) as low bandwidth communication channels to the remote NE that terminates the optical fiber. The DCC circuit pack in a shelf controls all DCC channels for fibers terminated by that shelf.

The various areas of the DCC configuration that can be provisioned are:

- **LAN Management**—The LAN interface provides a higher bandwidth communications path to the element management system. The LAN capability is contained within the Data Link layer of the OSI model. Functions that can be provisioned include enabling/disabling of the internal and external LAN interfaces of the DCC circuit pack in an I/O shelf.
- **Network Layer**—The Network Layer provides the means to transmit data across a network regardless of network type, topology, or services offered by the underlying network. The Connectionless Network Service (CLNS) and its corresponding Connectionless Network Protocol (CLNP) provides the following services and functions at the Network Layer: Network Addresses, Quality of Service (QoS) parameters, Error Notification, Segmentation of messages, routing, and relaying of messages through intermediate systems. The Network Service Access Point (NSAP) Address is the access point where the Network Layer services are available to network service users.
- **Transport Layer**—The Transport Layer provides the means to transmit data reliably between end NEs across a communications facility. The Transport Layer provides transparent transfer of data between the session entities.
- **TCP/IP**—The network layer provided for TCP/IP network is strictly a connectionless service. The IP only transfers datagrams on a best effort basis. The Internet Protocol (IP) provides the functions necessary for delivering datagrams from a source to a destination over an interconnected system of networks.
- **TARP**—The TID Resolution Protocol (TARP) is used where there is a need to translate the TID of TL1 messages to the CLNP address (NSAP) of the NE. TARP allows NEs to translate between the TID and NSAP by automatically exchanging mapping information with other NEs.

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Before you begin** Before you begin this task, if you are performing a LAN reset using this procedure, the LAN interface on the DCC circuit pack must be enabled. Enabling and disabling of internal and external LAN interfaces can only be done on a DCC circuit pack on the I/O shelf, not the Main shelf or System Controller shelf.

**Instructions** Complete the following steps to provision LAN port parameters and protocol properties of the DCC channels.

.....

**1** Select the desired NE on the Map window.

.....

**2** From the main menu bar on the Map Window select **Administration** → **Network** → **DCC**.

**Result:**

The DCC Provisioning window for the selected NE is displayed.

.....

**3** In the Network Element explorer portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller (ADJCTL) circuit pack is displayed.

.....

**4** Select the DCC Controller circuit pack.

**Result:**

The **Configure** button at the bottom of the Network Element explorer portion of the window is enabled.

.....

**5** Click the Configure button.

**Result:**

The provisioning panels of the DCC Provisioning window are displayed:

- **LAN Mgmt**
- **Network Layer**
- **Transport Layer**
- **TCP/IP**

- **TARP Provisioning**
- **TARP Maj (Manual Adjacency)**

---

6 Click on the LAN Mgmt panel tab.

**Result:**

The LAN Mgmt provisioning window panel is displayed.

---

7

---

**TO ...**

Reset the LAN interface controller card

Provision other LAN properties

**DO THIS ...**

Click the RESET button next to the Reset LAN field. A pop-up warning dialog window is displayed, warning that resetting the LAN may cause loss of communication between the EMS or between the NE(s) and asks if you want to do it anyway. Choose **Yes** to reset the LAN or **No** to cancel the operation.

Skip this step. Go to Step 9.

---

8

---

**TO ...**

Enable the external LAN

Disable the external LAN

**DO THIS ...**

Click the down arrow next to the **EXTERNAL LAN CHANNEL** field to display a drop-down list and select **Enabled**.

Click the down arrow next to the **EXTERNAL LAN CHANNEL** field to display a drop-down list and select **Disabled**.

---

9

---

**TO ...**

Enable the internal LAN

**DO THIS ...**

Click the down arrow next to the **INTERNAL LAN CHANNEL** field to display a drop-down list and select **Enabled**.

---

**TO ...**

Disable the internal LAN

**DO THIS ...****CAUTION**

*If the internal LAN is disabled, all external management communications with the NE may be lost.*

**Click the down arrow next to the INTERNAL LAN CHANNEL field to display a drop-down list and select Disabled.**

10 Provision the other LAN parameters.

11 Click the **Network Layer** panel tab.

**Result:**

The Network Layer panel is displayed. This panel shows the current NSAP and the other Network Layer parameters:

- **CLNP PDU LIFETIME HOPS (2-255)**
- **Intermediate System Configuration Timer**

12 Provision the Network Layer parameters, as needed.

13 Click the **Transport Layer** panel tab.

**Result:**

The **Transport Layer** panel is displayed. The Transport Layer parameters are:

- **Window Timer**—the maximum time to wait before transmitting window information
- **Transport Credit - PDUs**—the maximum number of outstanding/unacknowledged transport of PDUs allowed

14 Provision the **Transport Layer** parameters, as needed.

15 Click the **TCP/IP** panel tab.

**Result:**

The **TCP/IP** panel is displayed. The TCP/IP parameters are:

- **IP Address**
- **Default Router Address**
- **IP Subnet Mask**

**16** Provision the **TCP/IP** parameters, as needed.

**17** Click the **TARP Provisioning** panel tab.

**Result:**

The **TARP Provisioning** panel is displayed.

**18** Provision the **TARP** parameters, as needed.

**19** Click the **TARP MAJ (Manual Adjacency)** panel tab.

**Result:**

The **TARP MAJ (Manual Adjacency)** panel is displayed.

<b>20</b>	<b>TO ...</b>	<b>DO THIS ...</b>
	Modify the current adjacent NE	Select the current existing manual adjacency radio button and click the down arrow to the right of this field to display a drop-down list. Select the <b>NSAP address</b> of the current adjacent NE. Click the <b>Modify Adjacency</b> button. Enter the NSAP address of the new adjacent NE in the <b>Enter New Value for selected adjacency</b> field.
	Delete the current adjacent NE	Select the current existing manual adjacency radio button and click the down arrow to the right of this field to display a drop-down list. Select the <b>NSAP address</b> of the current adjacent NE. Click the <b>Delete Adjacency</b> button. Click the <b>Apply</b> button. Do not click Apply if you have not provisioned all DCC parameters for this window..

- 
- 21** If you have provisioned all the DCC channel parameters, click the **Apply** button.

**Result:**

A pop-up dialog window is displayed, informing you that this action may cause loss of communication with the NE(s) and asks if you want to continue. Choose **Yes** to process the request or **No** to cancel the change.

---

- 22** Choose **Yes** to process the changes for the NE.
- 

- 23** Click the **Close** button to close the window.

END OF STEPS

---



## Configuring data communication channels for multiplex section (DCC-M)

---

**When to use** Use this procedure to modify existing DCC terminations for the multiplex section.

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to modify an existing DCC termination.

---

- 1 Select the desired NE in the Map pane and then select **Administration** → **Network** → **DCC Terminations** from the main menu.

**Result:**

The **DCC Terminations** window opens.

---

- 2 Select in the Network Element Explorer part of the window the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the DCC Terminations and press **Configure**.

**Result:**

The **Multiplex Section** (Multiplex tab) is displayed in the window.

---

- 3 Select the **Port AID** for which you want to modify the DCC terminations.

**Result:**

The values for this Port AID are displayed in the window.

---

- 4 Enable or disable the **DCC Termination**.

**Important!** Disabling a previously enabled DCC at an NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent alarms from the remote NE.

---

- 5 Next to **LAPD Role** choose **USER-SIDE** or **NETWORK-SIDE**.

**Important!** The LAPD Role setting must be different at both ends of a DCC link. Otherwise, an alarm (either “User-Network Side RSect Failure” or “User-Network Side MSect Failure”) will be generated.

---

**6** Press **Apply** to make your changes take effect.

END OF STEPS

---



## Supporting information for” Configuring data communication channels for multiplex section (DCC-M)”

---

### **Preconditions for enabling a DCC**

You are permitted to enable a DCC if all of the following preconditions are fulfilled:

- The corresponding optical interface port is provisioned (configured) or at least pre-provisioned.
- The type of DCC (either DCC-R or DCC-M) is supported on the corresponding optical interface.
- The DCC is not yet enabled.
- There are LAPD channels available. Please refer to “Max. number of active DCC links” (1-23) below.

### **Max. number of active DCC links**

The maximum number of simultaneously supported LAPD channels per DCC controller is 32. Each DCC controller thus can support up to 32 active DCC links. Upon circuit pack insertion, DCCs will automatically be enabled and a LAPD channel assigned as long as LAPD channels are available.

### **Preconditions for disabling a DCC**

You should disable a DCC only if *all* of the following preconditions are fulfilled:

- The DCC is currently enabled.
- The DCC is currently not needed for MS-SPRing management.
- The DCC is not the only management connection to remote NEs.

□

## Configuring data communication channels for regenerator section (DCC-R)

---

**When to use** Use this procedure to modify existing DCC terminations for the regenerator section.

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to modify an existing DCC termination.

---

- 1 Select the desired NE in the Map pane and then select **Administration** → **Network** → **DCC Terminations** from the main menu.

**Result:**

The **DCC Terminations** window opens.

---

- 2 Select in the Network Element Explorer part of the window the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the DCC Terminations and press **Configure**.

**Result:**

By default the **Multiplex Section** tab is displayed in the window.

---

- 3 Click on the **Regenerator Section** tab and select the **Port AID** for which you want to modify the DCC terminations.

**Result:**

The values for this Port AID are displayed in the window.

---

- 4 Enable or disable the **DCC Termination**.

**Important!** Disabling a previously enabled DCC at an NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent alarms from the remote NE.

---

- 5 Next to **LAPD Role** choose the **USER-SIDE** or **NETWORK-SIDE**.

**Important!** The **LAPD Role** setting must be different at both ends of a DCC link. Otherwise, an alarm (either “User-Network Side RSection Failure” or “User-Network Side MSection Failure”) will be generated.

---

**6** Press **Apply** to make your changes take effect.

END OF STEPS

---



## Supporting information for “Configuring data communication channels for regenerator section (DCC-R)”

---

### **Preconditions for enabling a DCC**

You are permitted to enable a DCC if all of the following preconditions are fulfilled:

- The corresponding optical interface port is provisioned (configured) or at least pre-provisioned.
- The type of DCC (either DCC-R or DCC-M) is supported on the corresponding optical interface.
- The DCC is not yet enabled.
- There are LAPD channels available. Please refer to “Max. number of active DCC links” (1-23) below.

### **Preconditions for disabling a DCC**

You should disable a DCC only if *all* of the following preconditions are fulfilled:

- The DCC is currently enabled.
- The DCC is currently not needed for MS-SPRing management.
- The DCC is not the only management connection to remote NEs.

□

## Configuring the TARP parameters for an NE

---

**When to use** Use this procedure to

- enable or disable the TARP propagation functionality,
- enable or disable the TARP responder functionality, or to
- set the TARP loop detection buffer (LDB) entry timer and flush timer

for a selected node.

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to configure the TARP parameters for an NE:

---

- 1 Select the desired NE in the Map pane and then select **Administration** → **Network** → **DCC** from the main menu.

**Result:**

The **DCC Provisioning** window opens.

---

- 2 Select in the Network Element Explorer part of the window the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the basic DCN parameters and press **Configure**.

**Result:**

The **LAN Mgmt** tab is displayed in the window.

---

- 3 Select the **TARP Provisioning** tab.
- 

- 4 Enable or disable the TARP responder functionality according to your needs by selecting the corresponding value next to **TARP Responder Function**. The TARP responder functionality is enabled by default.

**Important!** It is recommended to have the TARP responder functionality enabled for the low-speed part of the main shelf.

- .....
- 5** Enable or disable the TARP clipping functionality according to your needs by selecting the corresponding value next to **TARP Clipping Function**
- .....
- 6** Set the **TARP Clipping Limit** to the desired value. The possible values are from 10 to 2550.
- .....
- 7** Set the **TARP Clipping Interval**. The possible values are from 1 to 255.
- .....
- 8** Enable or disable the TARP propagation functionality according to your needs by selecting the corresponding value next to **TARP Propagation Function**. The TARP propagation functionality is enabled by default.
- Important!** It is recommended to have the TARP propagation functionality enabled for the low-speed part of the main shelf.
- .....
- 9** Set the **Loop Detect Entry Time**. The possible values are from 1 to 10minutes.
- .....
- 10** Set the **Loop Detect Buffer Flush Time**. The possible values are from 1 to 1440 minutes.
- .....
- 11** Enable or disable the **TARP Originator Function** by selecting the corresponding value next to the **TARP Originator Function**.
- .....
- 12** Press **Apply** to make your changes take effect.
- END OF STEPS
- .....



## Supporting information for” Configuring the TARP parameters for an NE”

---

- TARP functionality** The WaveStar® SNMS supports the TARP originator functionality which cannot be disabled. The related timers (T1, T2, T3 and T4) are permanently preset according to the Telcordia Technologies (formerly Bellcore) GR-253 standard.
- LDB entry timer** The LDB entry timer determines the time interval in minutes during which a previously processed and again received TARP PDU will be discarded. Possible values are 1 to 10 minutes, the default value is 5 minutes.
- LDB flush timer** The LDB flush timer serves to periodically re-initialize the loop detection buffer. Possible values are 1 to 1440 minutes (24 hours), the default value is 5 minutes.

□

## Assigning TARP manual adjacencies

---

**When to use** Use this procedure to manually assign adjacent nodes that support TARP (“TARP manual adjacencies”) by entering their Network Entity Title (NET).

Two TARP manual adjacencies can be created for one DCC.

The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (NET).

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to assign TARP manual adjacencies:

---

- 1 Select the desired NE in the Map pane and then select **Administration** → **Network** → **DCC** from the main menu.

**Result:**

The **DCC Provisioning** window opens.

---

- 2 Select in the Network Element Explorer part of the window the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the basic DCN parameters and press **Configure**.

**Result:**

The **LAN Mgmt** tab is displayed in the window.

---

- 3 Select the **TARP MAJ** tab.
- 

- 4 Depending on whether you want to assign a new, modify or delete an existing TARP manual adjacency:

**If you want to ...**

add a manual adjacency, there must be an empty **Current Adjacency1** and 2.

modify an existing manual adjacency,

**then ...**

click on **Enter new manual adjacency** and enter the new NET in this field.

select the adjacency you want to modify via the option menu **Select an existing manual adjacency** and press **Modify Adjacency**.

---

**If you want to ...**

delete an existing manual adjacency,

**then ...**

select the adjacency you want to delete via the option menu **Select an existing manual adjacency** and press **Delete Adjacency**.

---

**5** Press **Apply** to make your changes take effect.

END OF STEPS

---



## View DCC terminations

---

**When to use** Use this procedure to view details about the optical ports provisioned as DCC termination points. The result of this procedure is a window panel showing, for each DCC port:

- The port AID
- The port type—working or protection
- The DCC channel type—Multiplex section or regenerator section
- The protection type
- The operational status of the DCC channel
- The LAPD role—Network side or User side

**Related information** For related information, please refer to Chapter 8, “Management communication setup concepts”.

**Instructions** Complete the following steps to view details about the optical ports provisioned as DCC termination points.

---

- 1 Select **Administration** → **Network** → **DCC Terminations** from the main menu bar on the Map window.

**Result:**

The **DCC Terminations** window for the selected NE is displayed.

---

- 2 In the Network Element explorer portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller (ADJCTL) circuit pack is displayed.
- 

- 3 Select the DCC Controller circuit pack.

**Result:**

The **Configure** button at the bottom of the Network Element explorer portion of the window is enabled.

---

- 4 Click the **View** button.

**Result:**

The View DCC Terminations window panel is displayed. This panel shows in table row format, for each optical port provisioned as a DCC termination point:

- The port AID
- The port type—working or protection
- The DCC channel type—Multiplex section or regenerator section
- The protection type
- The operational status of the DCC channel
- The LAPD role—Network side or User side

END OF STEPS

---



## Provision an IP Gateway Network Element (for IP Tunneling)

---

- When to use** Use this procedure to provision an IP Gateway for IP tunneling. The IP Gateway NE:
- creates and hold entries in the TCP/IP subnetwork application context map. This map lists the IP addresses or host names of operations systems (OSs) and maps them to an OS application service/context (such as TL1 MAINTENANCE, TL1 MEMORY ADMINISTRATION) and allows these OS application services to be forwarded over a TCP/IP LAN connection through the IP Gateway NE to the OSI network of NEs to IP-connected managed devices in an IP subnetwork.
  - To support the above function, the IP Gateway NE function is enabled on the selected IP Gateway NE, to allow pure TCP/IP to OSI conversion.

The IP Gateway NE has an IP router entity with an additional port configured on the IP router entity (set up on the DCC controller circuit pack) to add the tunneling capability. In effect, the OSI subnetwork is provisioned with IP routing tables and set up to function as an IP subnetwork.

- Before you begin** Before you begin this task, make sure that the selected NE has a Dual Stack configuration (can handle OSI and TCP/IP traffic) and has the IP Tunneling capability enabled.

This function can only be accessed by the WaveStar® SNMS administrator.

- Instructions** Complete the following steps to select and provision the IP Gateway NE.
- 

- 1 Select **Administration** → **Communications** → **IP Gateway/Tunneling** from the main menu bar on the Map window.

**Result:**

The **IP Gateway/Tunneling** window for the selected NE is displayed.

---

- 2 In the Network Element explorer portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller (ADJCTL) circuit pack is displayed.

- 
- 3** Select the DCC Controller circuit pack.

**Result:**

The **Provision** button at the bottom of the Network Element explorer portion of the window is enabled.

- 
- 4** Click the **Provision** button.

**Result:**

The two provisioning panels of the IP Tunneling window are displayed:

- **IP Gateway**
- **IP Tunnel**

- 
- 5** Click on the **IP Gateway** panel tab.

**Result:**

The IP Gateway provisioning window panel is displayed.

The IP Gateway provisioning window panel is divided into two provisioning sections:

- **IP Parameters**—this consists of a display area showing the current OS IP host addresses and Application Context IDs in the OS Application Context Map, with two functional buttons which allow you to add and delete entries in the Application Context Map. There are also two radio buttons for enabling or disabling the IP Gateway functionality on the selected NE.
- **Tap Properties**—this is the area for entering the TT-TD port numbers for allowing IP tunneling of encapsulated IP packets to IP-connected managed devices via the OSI network. You can enter a separate port number to access by each coding method: Length Value Encoding, Raw Encoding, Telnet Encoding.

- 
- 6**

TO...	DO THIS...
Add an entry to the TCP/IP subnetwork Application Context Map	Click the <b>Add</b> button next to the <b>Application Context Map</b> display. A secondary <b>Add an IP</b> window is displayed. Enter the OS host's IP address and Application Context ID (examples are TL1 MAINTENANCE and TL1 MEMORY ADMINISTRATION). Click the <b>Apply</b> button to apply your entries and leave the window open or click the <b>OK</b> button to apply your entries and close the window.
Delete an entry in the TCP/IP subnetwork <b>Application Context Map</b>	Select a line entry in the display area showing current IP entries/Application Context IDs and click the <b>Delete</b> button to the right of the display area. The selected entry is deleted.

7

TO...	CLICK...
Enable the <b>TCP/IP Gateway</b> function for the selected NE	The <b>Enabled</b> radio button to the right of the <b>TCP/IP Gateway</b> label.
Disable the IP Gateway function for the selected NE	The <b>Disabled</b> radio button to the right of the <b>TCP/IP Gateway</b> label.

8

TO...	DO THIS...
Enter the T-TD LENGTH VALUE PORT	Enter the port number in the <b>T-TD Length Value Port</b> field.
Enter the T-TD RAW PORT	Enter the port number in the <b>T-TD Raw Port</b> field.
Enter the T-TD Telnet Port	Enter the port number in the <b>T-TD Telnet Port</b> field. Important! Click the <b>Retrieve</b> button to retrieve previously stored values for each field.

9 Click the **Apply** button to apply your selections.

**Result:**

The IP Gateway NE is provisioned for IP tunneling.

END OF STEPS



## Supporting information for “Provision an IP Gateway Network Element (for IP Tunneling)”

**Elements of the TCP/IP Gateway tab** The elements of the **TCP/IP Gateway** tab and their meaning are listed in the following table. If applicable, the permitted value range as well as the default settings of the parameters are given.

Window element	Meaning	Value range
<b>TCP/IP Gateway Control</b>	This parameter enables or disables TCP/IP to OSI conversion for the selected NE.	Enable, Disable Default: Disable
<b>TCP/IP Gateway Host List</b>		
<b>Host Name</b>	IP address of the host.	1 to 24 alphanumeric characters. Optional.
<b>Host Type</b>	Application Context Identifier.	Possible values <ul style="list-style-type: none"> <li>• Maintenance OS (TL1MAINTENANCE)</li> <li>• Memory Administration OS (TL1MEMORYADMIN)</li> <li>• Test OS (TL1TEST)</li> <li>• Other OS (TL1OTHER1)</li> <li>• Peer Communications OS (TL1PEERCOM) (Default)</li> </ul>
<b>Encoding Mode Port Numbers</b>		
<b>T-TD Length Value Port</b>	Sets the Port Number over which the T-TD function is accessible using the length value Encoding method.	0..65535. (Default: 3081)
<b>T-TD Raw Port</b>	Sets the Port Number over which the T-TD function is accessible using the raw-mode encoding.	0..65535. (Default: 3082)
<b>T-TD Telnet Port</b>	Sets the Port Number over which the T-TD function is accessible using the Telnet encoding mode.	0..65535. (Default: 3083)

□

## Provision IP Tunnel Parameters

---

**When to use** Use this procedure to set the tunnel-related parameters for each NE associated with the IP tunnel. This function allows you to enable or disable whether the selected NE has the IP tunneling feature enabled and selection of Tunnel Automated Provisioning (TAP) properties for the participating NEs.

**Before you begin** Before you begin this task, make sure that the selected NE has a Dual Stack configuration (can handle OSI and TCP/IP traffic) and has the IP Tunneling capability enabled.

This function can only be accessed by the WaveStar® SNMS administrator.

**Instructions** Complete the following steps to select and provision the IP Gateway NE.

---

- 1 Select **Administration** → **Communications** → **IP Gateway/Tunneling** from the main menu bar on the Map window.

**Result:**

The **IP Gateway/Tunneling** window for the selected NE is displayed.

---

- 2 In the Network Element explorer portion of the window, expand the equipment hierarchy by clicking on the plus (+) sign next to each component level until the desired DCC Controller (ADJCTL) circuit pack is displayed.
- 

- 3 Select the DCC Controller circuit pack.

**Result:**

The **Provision** button at the bottom of the Network Element explorer portion of the window is enabled.

---

- 4 Click the **Provision** button.

**Result:**

The two provisioning panels of the IP Tunneling window are displayed:

- **IP Gateway**
- **IP Tunnel**

- 
- 5 Click on the **IP Tunnel** panel tab.

**Result:**

The **IP Tunneling provisioning** window panel is displayed.

---

- 6 Click the **Edit** button in the IP Parameters portion of the window panel.

**Result:**

A secondary **IP Tunnel Provisioning parameters** window is displayed.

This window is divided into two main parts:

- **IP Parameters**
  - **Tap Properties**
- 

7

**TO...**

Enable the **IP Tunneling** function for the selected NE

Disable the **IP Tunneling** function for the selected NE

**CLICK...**

The **Enabled** radio button to the right of the **IP Tunnel Status** label.

The **Disabled** radio button to the right of the **IP Tunnel Status** label.

---

8

**TO...**

Advertise the IP routing table information to other Dual Stack with Tunneling (DSwT) NEs to insert into their own IP route tables

Disallow advertising of the IP routing table information

**DO THIS...**

Click the **Enabled** radio button to the right of the **Tap Advertise** label.

Click the **Disabled** radio button to the right of the **Tap Advertise** label.

---

9

**TO...**

Enable learning of the IP routing table information by the selected NE

**DO THIS...**

Click the **Enabled** radio button to the right of the **Tap Learn** label.

---

- 
- |  | <b>TO...</b>  | <b>DO THIS...</b>  |
|--|---|--|
|  | Disable learning of the IP routing table information by the selected NE | Click the <b>Disabled</b> radio button to the right of the <b>Tap Learn</b> label. |
- 
- 10**
- |  | <b>TO...</b>                                       | <b>DO THIS...</b>   |
|--|--|---|
|  | Enter the <b>TAP Group</b> to which the NE belongs | Enter the <b>TAP Group</b> information in the <b>Tap Group</b> field. |
- 
- 11** Click the **Apply** button to apply your selections and leave the window open or click the **OK** button to apply your selections and close the window.
- Result:**
- The IP tunnel parameters for the selected NE are provisioned.
- END OF STEPS
- 
-

## Supporting information for “Provision IP Tunnel Parameters”

---

**Elements of the *IP Tunnel* tab** The elements of the **IP tunnel** tab and their meaning are listed in the following table. If applicable, the permitted value range as well as the default settings of the parameters are given.

Window element	Meaning	Value range
<b>IP Tunneling</b>		
<b>IP Tunnel Status</b>	This parameter enables or disables IP tunneling.	Enable Disable Default: Disable
<b>Local Owner</b> route list (only the fields <b>TAP Advertise</b> and <b>TAP Cost</b> can be edited)		
<b>Dest. IP</b>	Destination IP address.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>Dest. Mask</b>	Destination mask.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>Next Hop Port</b>	For each route Id: type of next hop port.	<b>LAN</b> <b>CLNP Tunnel</b>
<b>Next Hop Address</b>	For each route Id: address of the next hop.	Values : <ul style="list-style-type: none"> <li>• IP Address,</li> <li>• NSAP Address,</li> </ul>
<b>TAP Advertise</b>	Indicates whether the route should be advertised (individual advertising).	<b>Yes</b> <b>No</b>
<b>TAP Cost</b>	Cost of the route.	0...65535.
<b>Manual Owner</b> route list ( all fields can be edited, entries can be added and deleted).		
<b>Dest. IP</b>	Destination IP address.	4 dot-separated decimal numbers ranging from 0 to 255.
<b>Dest. Mask</b>	Destination mask.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>Next Hop Port</b>	For each route Id: type of next hop port.	<b>LAN</b> <b>CLNP Tunnel</b>
<b>Next Hop Address</b>	For each route Id: address of the next hop.	Values : <ul style="list-style-type: none"> <li>• IP Address,</li> <li>• NSAP Address,</li> </ul>
<b>TAP Advertise</b>	Indicates whether the route should be advertised (individual advertising).	<b>Yes</b> <b>No</b>

<b>Window element</b>	<b>Meaning</b>	<b>Value range</b>
<b>TAP Cost</b>	Cost of the route.	0...65535.
<b>IP Default Router Address</b>	This is the 32 bit IPv4 router address. The format is a dotted decimal notation. This parameter must be provisioned prior to the enabling the TCP/IP Bridge function.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>TAP Owner</b> route list (read only)		
<b>Dest. IP</b>	Destination IP address.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>Dest. Mask</b>	Destination mask.	4 dot-separated decimal numbers ranging from 0 to 255. No default.
<b>Next Hop Port</b>	For each route Id: type of next hop port.	<b>LAN</b> <b>CLNP Tunnel</b>
<b>Next Hop Address</b>	For each route Id: address of the next hop.	Values : <ul style="list-style-type: none"> <li>• IP Address,</li> <li>• NSAP Address,</li> </ul>
<b>TAP Advertise</b>	Indicates whether the route should be advertised (individual advertising).	<b>Yes</b> <b>No</b>
<b>TAP Cost</b>	Cost of the route.	0...65535.
<b>TAP Properties</b>		
<b>TAP Advertise</b>	This parameter allows the user to globally enable or disable the advertising of the routes marked to be advertised (the parameter overrules all the individual TAP Advertise as displayed in the Route List).	<b>Enable</b> <b>Disable</b>
<b>TAP Learn</b>	This parameter controls the learning status for the auto provisioning protocol.	<b>Enable</b> <b>Disable</b>
<b>TAP Group</b>	Defines the TAP Group to which the system belongs.	0...65535

□



# 2 Equipment provisioning

## Overview

---

**Purpose** This chapter contains procedures for provisioning the equipment.

### Contents

---

Establish WaveStar Equipment	<a href="#">2-2</a>
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## Establish WaveStar Equipment

---

**When to use** Use this procedure to establish WaveStar® TDM 10G (STM-64) equipment. In the WaveStar® TDM 10G (STM-64), bays, shelves, and circuit packs can be added and removed.

**Related information** For related information, see Chapter 9, “Equipment provisioning concepts”.

**Instructions** Complete the following steps to establish WaveStar equipment.

---

- 1 From the main menu bar on the Map window, select **Configuration** → **Establish**.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Select an NE from the list by double-clicking on it.
- 

- 3 Click on **OK** button.

**Result:**

The **Create/Provision Equipment** window for the selected NE is displayed.

- 
- 4 Select one of the three radio buttons near the top left of the window establish equipment for a Bay, Shelf, or Circuit Pack.
- **Bay**—When you select this radio button, the Explorer section (just below the radio buttons) contains the AID of all bays that have not yet been established. You can choose a bay to establish.
  - **Shelf** —When you select this radio button, the Explorer section (just below the radio buttons) contains the AID of all bays that have not yet been established and the corresponding shelf AIDs for those bays. It also contains the AID of each bay that does not have all shelves established in it, and the AID of the shelf or shelves that are not established. You can choose a shelf to establish.
  - **Circuit Pack**—When you select this radio button, the Explorer section (just below the radio buttons) contains the AID of existing bays and existing shelves. Under the shelves are displayed only those slots for which no circuit pack has been established. Within the slot is displayed the type of circuit packs that are legal types for that slot AID. You can choose a circuit pack type within the slot.
- 

- 5 Once you have selected a radio button, use the mouse to select an AID to establish from the displayed information in the Explorer section. Selecting the AID or circuit pack enables the **Get Parameters** button.
- 

- 6 Click on the **Get Parameters** button.

**Result:**

The right hand portion of the panel is populated with the current values for provisionable parameters. Additional parameter information may have to be entered before the equipment is established. The correct parameter labels are displayed and are populated with their default values, which are updatable.

---

- 7 Click the **Apply** button.

**Result:**

The equipment is established. If there is a problem with the request to establish equipment, a pop-up error message is displayed, indicating the nature of the problem.

END OF STEPS

---

**SWIF circuit pack**

When the type of circuit pack being provisioned on a Universal I/O shelf is a SWIF circuit pack, the BSW Port Identifier must be provisioned in such a manner that no two SWIF circuit pack pairs both have the same identifier. SWIF circuit packs are paired based on their slot AIDs. Each pair of circuit packs share a single BSW Port ID, so if there is already circuit pack in one slot of the slot pair, then the other circuit pack should have the same BSW Port ID defaulted in the provisioning window.

**First circuit pack**

When the circuit pack being provisioned is the first one in the current slot pair, the list of possible values for the BSW Port Identifier parameter includes only those values that are not already assigned to a slot pair. When the circuit pack being provisioned is the second one in the current slot pair, the list of possible values includes only the value already chosen for the first circuit pack provisioned in the slot pair.

**I/O shelves**

When provisioning I/O shelves, the list of possible values for the ON Cable Pair parameter is a list of only those values that are not currently assigned to another shelf in this BWM.

□

## Remove WaveStar Equipment

---

**When to use** Use this procedure to remove WaveStar NE equipment. In the WaveStar® TDM 10G (STM-64), bays, shelves, and circuit packs can be added and removed.

**Related information** For related information, see Chapter 9, “Equipment provisioning concepts”.

**Instructions** Complete the following steps to remove WaveStar equipment.

---

- 1 From the main menu bar on the Map window, select **Configuration** → **Remove**.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE in the list to select it and click the **OK** button.

**Result:**

The **Remove Equipment** window is displayed. This window allows you to choose existing equipment from the explorer tree and to remove that equipment provisioning from the network element.

---

- 3 To remove the undesired equipment, first select it with the mouse.
    - select a circuit pack, or
    - select an empty bay or shelf.
- 

- 4 After selecting the undesired equipment with the mouse, click the **Remove** button.

**Result:**

If the removal is allowed, the system displays a confirmation window to which you should reply **Yes**.

If you try to remove a bay/shelf that is not empty, the system displays a message window explaining that the bay/shelf is not empty and cannot be removed. You must first empty the bay/shelf before removing it.

END OF STEPS

---



## View NE Equipment

---

**When to use** Use this procedure to display and view NE equipment on the **Equipment Configuration** window.

**Related information** For related information, see Chapter 9, “Equipment provisioning concepts”.

**Instructions** Complete the following steps to display and view various NE equipment components on the **Equipment View** window.

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Equipment** from the main menu bar on the Map window.

**Result:**

This displays the **Equipment View** window, containing equipment information for the selected NE.

---

**3** The Equipment View window allows you to view and/or “drill down” through a network element to view its various constituent parts via the graphical representation (the network element view panel), or to select a component (shelf, bay, slot) for viewing via the hierarchical representation (the network explorer panel). In addition, you can access certain features via a pop-up menu that is available in both panels.

END OF STEPS

---

## Navigational conventions

### View Panel

- **Single Left Click** – selects the component both here and in the explorer.
- **Double Left Click**– shows the contents of the component in the view panel, and indicates that it is selected. Shows the component as selected in the explorer and its subtending components (if there are any).
- **Single Right Click** – indicates that the component is selected, and shows the pop-up menu.

### Explorer List Item

- **Single Left Click** – selects the explorer component and the view component. If the component selected has contents, it shows the content in the view panel. Does not show/hide subtending explorer components.
- **Double Left Click** – same as single left click on explorer list item, but does show/hide subtending components in the explorer.
- **Single Right Click** – indicates that the component is selected, and shows the pop-up menu.

### Explorer plus or minus sign

- **Single Left Click** – shows/hides subtending components.

□

## View NE Equipment Details

---

**When to use** Use this procedure to view details of a single component inside a network element.

**Related information** For related information, see Chapter 9, “Equipment provisioning concepts”.

**Instructions** Complete the following steps to display NE equipment details.

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Equipment** from the main menu bar on the Map window.

**Result:**

This displays the **Equipment View** window, containing equipment information for the selected NE.

---

**3** In the NE Explorer part of the **Equipment View** window, right click on the component for which you want to display equipment details.

---

**4** On the sub-menu displayed when you right clicked, select **Equipment Details**.

**Result:**

This displays the **Equipment Details** window, containing the requested information.

Right clicking on the desired component in the Equipment View window also displays a sub-menu from which Equipment Details can be selected. If the component selected for details is a populated slot (with a circuit pack installed) then details for both the slot and circuit pack are displayed in Equipment Details.

END OF STEPS

---



## View NE Equipment Lists

---

**When to use** Use this procedure to access the list of a given component's subtending equipment. When you request an equipment item from either the drop-down or pop-up menu, WaveStar SNMS provides a list of equipment for the selected item and its subtending equipment. The lists can be saved and printed.

**Related information** For related information, see Chapter 9, "Equipment provisioning concepts".

**Instructions** Complete the following steps to view NE equipment lists.

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Equipment** from the main menu bar on the Map window.

**Result:**

This displays the **Equipment View** window, containing equipment information for the selected NE.

---

**3** Select **View** → **Equipment List** from the menu bar.

**Result:**

This displays the equipment list for the selected component. The list contains information about the NE equipment, at the level you requested. The information is textual and listed in name/value pairs.

Right clicking on the desired component in the Equipment View window also displays a sub-menu from which Equipment List can be selected. If the component selected for listing is a populated slot (with a circuit pack installed) then information for both the slot and circuit pack are displayed in the Equipment List.

END OF STEPS

---



## Perform Cut-Through Commands

---

**When to use** Use this procedure to initiate a TL1 cut-through session from the Map window and perform enhanced cut-through commands via the Cut-Through window.

**Related information** For related information, see “Cut-Through commands” (9-28).

**Before you begin** Before you begin this task, you must have already displayed the Map window and determined the NE for which you want to initiate a cut-through session.

**Instructions** Complete the following steps to initiate and perform cut-through.

---

- 1 Position the mouse pointer over the NE to which a cut-through is required, press the menu mouse button and select **Cut-Through** from the pop-up menu or select **Configuration** → **Cut-Through** in the main menu of the **Map** window.

**Result:**

The **Cut-Through** window and the **Cut-Through Output** window are displayed. (If the NE is unavailable for any reason, a message identifying the cause of the error is displayed in a pop-up window.)

---

- 2 At the **Cut-Through** window, type the appropriate TL1 command into the **Cut-Through Command** field. If desired, select the displayed Command by double-clicking on the command and the desired AID from the list by single-clicking on it to save typing time. See your NE documentation for detailed command information. (You can select the **Clear Command Area** button any time to clear the **Cut-Through Command** field and start over.)

The AID list for an NE displayed in the AID scroll list may not be complete. You may have to select a similar AID from the list to populate the **Cut-Through Command** field and then manually edit the AID to make it the correct one.

---

- 3 After completing your entry in the **Cut-Through Command** field, select the **Send Command Now** button.

**Result:**

The command is echoed to the **Cut-Through Output** window and the command output appears there.

END OF STEPS

---

## Build TL1 Commands

---

**When to use** Use this procedure to create a TL1 command file to assist in performing maintenance and provisioning activities on one or more NEs (such as download of standard configuration), without having to manually enter a set of TL1 command strings. This feature both reduces the amount of manual entry needed to create TL1 command strings and allows for the reuse, at a later time, of the commands built on the same NE or other NEs of the same type.

**Related information** For related information, see “Building TL1 commands” (9-28).

**Before you begin** Before you begin this task, you must have already determined the TL1 commands you wish to build.

**Instructions** Complete the following steps to build TL1 commands.

---

- 1 On the Map window, select **File** → **TL1 Macro Scripts** → **TL1 Macro Builder** from the main menu bar.

**Result:**

This displays the **Macro Builder/Broadcaster** window.

---

- 2 Select the **Macro Builder** tab if it is not already selected. TL1 command files can only be built for one NE type at a time, so first specify the NE type by clicking the down arrow adjacent to the **NE Type** field (directly below the **Manage TL1 Macro Files** heading) and select an NE.
  - 3 Next type the appropriate TL1 command(s) into the **Macro File Commands** area at the lower left of the window. Press the **Return** key between commands, typing each new command on the next available line in the **Macro File Commands** area. If desired, select from the displayed **Command List** by double-clicking on the command and from the **AID List** by single-clicking on the AID to save typing time. To enter multiple commands from the **Command List**, click on the end of a command string and press the **Return** key before entering the next command. This will access the next available command line. See your NE documentation for detailed TL1 command information.
  - 4 When you have completed your macro file commands, select **Save/Save As**.
-

**Result:**

This displays the **Save As** window.

---

- 5 In the **Save As** window, save the contents of the **Macro File Command** lines as a new macro file (by typing the new macro file name into the **Save As** field) or to an existing macro file name, overwriting the contents of the file (by selecting one from the displayed list). Don't forget to use the radio buttons to indicate whether the file should be **Accessible by all** or **Accessible by owner** only.
- 
- 6 The following list shows how to use remaining items on the **TL1 Macro Builder** window:
- **Clear Command(s)** – click this button to clear the current entries in the Macro File Command area.
  - **Owner** – displays the macro file owner's login ID.
  - **File Properties** – indicates whether the displayed macro file is **Accessible By All** or **Accessible by Owner Only**. This value can be changed (by owners) via the **Save As** screen, which is displayed by clicking the **Save/Save As** button.
  - **Put Into Command Area** – select this button to put the contents of the selected macro file into the command line text area.
  - **View Macro** – use this button to view the contents of the selected macro file.
  - **Delete Macro** – click this button to delete the selected macro file (for owners only).

END OF STEPS

---



## Broadcast TL1 Commands

---

**When to use** The broadcast TL1 commands feature allows you to perform maintenance and provisioning activities (such as download of standard configuration) on one or more NEs, utilizing the TL1 command files created by the TL1 macro builder feature, and broadcasting those files to multiple NEs of the same type. This feature saves you time by performing similar tasks on multiple NEs in one step, and by reducing the manual entry required in the creation of TL1 command strings.

**Related information** For related information, see “Broadcasting TL1 commands to NEs” (9-28).

**Before you begin** Before you begin this task, you must have already determined the TL1 commands you wish to broadcast, or know the name of the TL1 macro file you are going to use.

**Instructions** Complete the following steps to broadcast TL1 commands.

---

- 1 On the Map window, select **File** → **TL1 Macro Scripts** → **TL1 Macro Broadcaster** from the main menu bar.

**Result:**

This displays the **Macro Builder/Broadcaster** window.

---

- 2 Specify the NE type for the broadcast; select **All NEs**, **NEs by Type**, or **NEs by TID** from the **Where to Broadcast** block at the top middle of the **Broadcaster** window. Specify the parameters of the broadcast further by highlighting NEs in the **Available Network Elements** list (on the left side of the window) and clicking the single right arrow (>) to move them to the **Chosen Network Elements** list (on the right side). The NEs placed in the **Chosen Network Elements** list on the right will be the ones to receive the broadcast. You can use the double arrows (>>, <<) to move all current choices between the two lists.)
- 3 Next type the name of the macro file (to be broadcast to the NEs selected in the **Chosen Network Element** list) into the field in the **Macro File to Broadcast** block (or simply select a macro file from the displayed list by double clicking on it).

- 
- 4 Select the **Broadcast Macro** button to ask the system to perform the broadcast. The following list shows how to use the remaining buttons on the Broadcaster window:
- **View Macro**- use this button to view the macro file, which you may want to do before executing it.
  - **Abort Broadcast**- use this button to stop the execution of the TL1 commands at any time while the broadcast window is active. When this button is chosen, the system stops sending out the next command in the macro file to the NE(s) currently being broadcast to. Once the abort is completed, the system displays a message.
  - **Close**- click this button any time before clicking the Broadcast Macro button to remove the Broadcast window from your screen.

END OF STEPS

---



## Set NE Date/Time Synchronization

---

**When to use** Use this procedure to manually initiate date/time synchronization for a single NE, a group of NEs, an aggregate, or all NEs under WaveStar SNMS control.

**Related information** For related information, see “Ways to perform date/time synchronization” (9-33).

**Before you begin** Before you begin this task, you must take into account whether the NE(s) being set with the date/time synchronization feature are located in the same or a different time zone as the WaveStar SNMS host. You can also select to have WaveStar SNMS automatically make adjustments for Daylight Savings Time (Spring Forward) and standard time (Fall Back) before doing date/time synchronization for the selected NE(s).

**Instructions** Complete the following steps to manually perform date/time synchronization.

---

- 1 Select **Configuration** → **Date/Time Synchronization** → **Manual** from the main menu bar on the Map window.

**Result:**

The **Choose an NE/Aggregate** window is displayed.

---

- 2 Click the **NEs** radio button to display a list of NEs or click the **Aggregates** radio button to display a list of aggregates.

**Result:**

A list of NEs or aggregates is displayed.

---

- 3 Double-click on the NE or aggregate to select it for date/time synchronization. To perform date/time synchronization on all NEs, scroll to the top of the **Choose an NE/ Aggregate** window and double-click on the word **ALL** in the list. Click the **OK** button.

**Result:**

The **Date and Time Synchronization** window is displayed.

---

- 4 Click the **OK** button to initiate date/time synchronization for the NE(s) or aggregate.

**Result:**

Date/Time synchronization is initiated. A pop-up window is displayed, showing the status of the date/time synchronization.

The status is as follows:

- **Completed** – date/time synchronization is completed for the selected NE(s) or aggregate.
- **Incompleted** – The command to perform date/time synchronization may be completed but the time difference between the host and NE is greater than the drift threshold set.

END OF STEPS

---



## Enable/Disable Fall Back and Spring Forward

---

**When to use** Use this procedure to enable or disable the Spring Forward (Daylight Savings Time) and Fall Back (standard time) feature to make automatic time adjustments in date/time synchronization for the selected NE(s)/aggregate(s).

**Related information** For related information, see “Standard time and daylight savings time” (9-33).

**Instructions** Complete the following steps to enable or disable the Spring Forward/Fall Back time adjustment feature.

---

**1** Select one or more NEs/aggregates from the Map window or select no NEs/aggregates to use this feature for all NEs in your Target group.

---

**2** Select **Configuration** → **Date/Time Synchronization** → **Spring/Fall Change** from the main menu bar on the Map window. If you have not yet selected the NE(s)/aggregate(s), the **Choose an NE/Aggregate** window is displayed. Select the NE(s)/aggregate(s) on which to use the Spring Forward/ Fall Back feature and click the **OK** button.

**Result:**

The **Fall Back and Spring Forward Active Status of NEs** window is displayed.

---

**3** If you want to enable the Spring Forward/Fall Back feature for the selected NE(s) click the **Enable FB/SF for above NEs** button. If you want to disable the Spring Forward/Fall Back feature for the selected NE(s) click the **Disable FB/SF for above NEs** button.

---

**4** Click the **OK** button to activate your choices.

**Result:**

If Daylight Savings Time is already in effect for an NE, and you disable Spring Forward/Fall Back for an NE, requiring a date/time synchronization, a pop-up window is displayed, asking if you want to automatically initiate date/time synchronization for the NE(s). Choose **Yes** to initiate automatic date/time synchronization for the NE or **No** to skip date/time synchronization for the NE.

END OF STEPS

---







# 3 Topology management

## Overview

---

**Purpose** This chapter contains procedures for adding, modifying and deleting trails and aggregates.

### Contents

---

Add an Aggregate	<a href="#">3-2</a>
Modify an Aggregate	<a href="#">3-4</a>
Delete an Aggregate	<a href="#">3-5</a>
Add a Trail	<a href="#">3-7</a>
Delete a Trail	<a href="#">3-9</a>



## Add an Aggregate

---

**When to use** Use this procedure to add an aggregate. An aggregate is a collection of related NEs/aggregates that are grouped and named for purposes of streamlining network monitoring and resynchronization. A new aggregate is created by providing a unique aggregate name and alias and adding NEs or other aggregates to it.

**Related information** For related information, see “Aggregates” (14-25).

**Before you begin** Before you begin this task, identify which NEs and/or aggregates you want associate with the aggregate being created.

**Instructions** Complete the following steps to create a new aggregate.

---

- 1 Select **Administration** → **Network** → **Aggregates** → **Add** from the main menu bar on the Map window.

**Result:**

The **Add an Aggregate** window is displayed.

---

- 2 Fill in the following fields, as needed:

- **Aggregate Name** – This is the aggregate name. The Aggregate name can be 1-20 alphanumeric characters. Dashes are allowed. This field is required. The Aggregate name must be unique.
  - **Aggregate Alias** – This is the aggregate alias (alternate label). The Aggregate alias can be 1-20 alphanumeric characters. Dashes are allowed. This field is optional.
- 

- 3 Click the **OK** button.

**Result:**

The **Status Dialog** box is displayed and indicates that a new aggregate has been created. When a new aggregate is created, it is automatically placed into the TOP layer of the Map view. Any NE or aggregate that is placed into the aggregate is removed from the TOP layer.

The icon for the new aggregate is displayed in the current Map view and the subnetwork explorer, and is automatically selected.

- 
- 4 To add NEs and/or aggregates to the newly created aggregate drag the NE or aggregate icon into the parent (owner) aggregate.

END OF STEPS

---

### **Moving an NE or aggregate out of an aggregate**

An NE or aggregate can be moved out of the current parent aggregate into the top Map view by choosing ***Return to Top*** in the NE/aggregate's pop-up menu.



## Modify an Aggregate

---

**When to use** Use this procedure to change an aggregate's alias.

**Related information** For related information, see "Aggregates" (14-25).

**Before you begin** Before you begin this task, identify the aggregate to be modified. Be aware that the aggregate name for the Top Level Aggregate (TOP), which is the default parent of all member NEs in the network, cannot be changed.

**Instructions** Complete the following steps to change the aggregate alias.

---

- 1 Select the aggregate to be modified from the Map window or subnetwork explorer and choose **Administration** → **Network** → **Aggregates** → **Modify Alias** from the main menu bar on the Map window.

**Result:**

The **Modify an Aggregate** window is displayed with the current aggregate name and/or alias.

---

- 2 Change the aggregate alias, as desired and click the **OK** button.

**Result:**

The **Status Dialog** box is displayed, indicating that the changes to the aggregate are being made by WaveStar SNMS.

END OF STEPS

---

### Selecting the aggregate from a list

If no aggregates were chosen from the Map window or Subnetwork Explorer in Step 1, the **Choose an NE/Aggregate** window is displayed for selection of the aggregate to be modified. Select the aggregate to be modified and click the **OK** button.



## Delete an Aggregate

---

**When to use** Use this procedure to delete an aggregate from WaveStar SNMS.

**Related information** For related information, see “Aggregates” (14-25).

**Before you begin** Before you begin this task, be aware that NEs/aggregates that are members of the aggregate being deleted must be reassigned to another aggregate or to the TOP aggregate level by choosing **Return to Top** in the NE/aggregate’s pop-up menu.

**Instructions** Complete the following steps to delete an aggregate.

---

- 1 Select **Administration** → **Network** → **Aggregates** → **Delete** from the main menu bar on the Map window.

**Result:**

The **Choose an Aggregate Aggregate/Delete** window is displayed.

---

- 2 Select the aggregate to be deleted and click the **OK** button.

**Result:**

The **Re-Assign an Aggregate** window is displayed.

---

- 3 Choose an aggregate from the list to which you want to reassign any member NEs/aggregates. You may also choose **Return to TOP** to return the NE(s) to the TOP Level Aggregate, which includes all NEs.
- 

- 4 Click the **OK** button.

**Result:**

The **Status Dialog** window is displayed, indicating that the aggregate is being deleted.

END OF STEPS

---

**Distributing aggregates to other aggregates**

If you are not moving the majority of NEs to a single aggregate, it is recommended that you select the TOP Level Aggregate and modify those aggregates that take the NEs from the deleted aggregate.

□

## Add a Trail

---

- When to use** Use this procedure to manually add a trail between two NEs. Trails between identical Lucent Technologies NEs may be autodiscovered by the DNO feature and do not have to be manually added. Manually added trails may also be manually deleted.
- DCN connection** Trails have to be added manually only if the DCC is not working on the respective connection.
- Related information** For related information, see “Trails” (14-27).
- Before you begin** Before you begin this task, verify that the NEs at either end of the trail are compatible for the connection and that the AIDs at both ends of the trail are using compatible software releases. DNO has to be performed on the NEs at either end of the trail before manually adding a trail.
- When you are adding a trail between an NE managed by WaveStar SNMS and a non-managed device (such as a DDM-2000), the AID(s) may not be available for the non-managed device, and, subsequently, will not be displayed in the AID list on the *Add a Trail* window. The trail can still be added between the managed and non-managed NE.
- To perform this task, access the Map window.
- Instructions** Complete the following steps to manually add a trail.
- 
- 1 Select **Administration** → **Network** → **Trails** from the main menu bar on the Map window.
 

**Result:**

The **Trail Manager** window is displayed, showing the current list of user-defined trails between NEs.

---
  - 2 Click the **Add** button.
 

**Result:**

The **Add a Trail** window is displayed.

This window consists of:

    - **Alias** field
    - **From TID** and **To TID** scroll lists for both NEs
    - **From AID** and **To AID** explorers for both NEs

The Trail Termination Point (TTP) for either end of the trail consists of the NE's TID and AID.

---

- 3** Select the first NE's TID from the **From TID** list.

**Result:**

The corresponding AIDs for the first NE's TID are displayed in the **From AID** explorer.

---

- 4** Select the second NE's TID from the **To TID** list.

**Result:**

The corresponding AIDs for the second NE's TID are displayed in the **To AID** explorer.

If the TID chosen is for a non-managed device, the associated AID list is empty and disabled. The trail can still be added between the managed NE and non-managed device.

---

- 5** Select a valid AID for the first NE's TID from the **From AID** explorer.
- 

- 6** Select a valid AID for the second NE's TID from the **To AID** explorer.
- 

- 7** Click the **Apply** button to create the trail, or click the **OK** button to create the trail and close the window.

END OF STEPS

---



## Delete a Trail

---

**When to use** Use this procedure to manually delete a trail between two NEs. Automatically discovered trails are deleted automatically if one of the NEs at either end is deleted.

**Related information** For related information, see “Trails” (14-27).

**Before you begin** Before you begin this task, be aware that if you delete a trail, it is removed from the trail list in any open windows, including the Trail Manager window. The deleted trail is also removed from all open Map windows. Be aware that autodiscovered trails cannot be deleted. To perform this task, access the Map window.

**Instructions** Complete the following steps to manually delete a trail.

---

- 1 Select **Administration** → **Network** → **Trails** from the main menu bar on the Map window.

**Result:**

The **Trail Manager** window is displayed, showing the current list of user-defined trails between NEs.

---

- 2 Select a trail to be deleted.
- 

- 3 Click the **Delete** button.

**Result:**

A pop-up window is displayed, asking if you really want to delete the trail.

---

- 4 Choose **Yes** to delete the trail.

**Result:**

The **Status Dialog** window is displayed, indicating that the trail is being deleted.

END OF STEPS

---







# 4 Timing provisioning

## Overview

---

**Purpose** This chapter describes the procedures which have to be performed for the configuration of the system timing of the WaveStar® TDM 10G (STM-64).

### Contents

---

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□

## Viewing the timing configuration

---

**When to use** Use this procedure to view the configuration of the external timing input and output ports, the timing reference and the system timing.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts” and “Parameters of the “ViewSync” and “ConfigSync” windows” (10-8).

**Instructions** Complete the following steps to query the data of the timing configuration:

---

- 1 Select the NE in the Map pane portion of the Map window.

---

- 2 Select **Configuration** → **Synchronization** → **View...** from the main menu bar on the Map window.

**Result:**

This displays the **Ext Timing I/P Ports** tab of the **ViewSync** window, containing synchronization information for the selected NE. The corresponding parameters are described in “The Ext Timing I/P Ports tab” (10-8).

---

- 3 Click on the tab **Ext Timing O/P Ports** to query the data on the timing output port. The corresponding parameters are described in “The External Timing Output Ports tab” (10-8).

---

- 4 Click on the **Timing Reference** tab to query the data on the configured timing reference source. The corresponding parameters are described in “The Timing Reference tab” (10-10).

---

- 5 Click on the **System Timing** tab to query the data on the internal SDH Equipment Clock (SEC). The corresponding parameters are described in “The System Timing tab” (10-11).

---

- 6 Click on **Close** to quit the window.

END OF STEPS

---

### **Refresh of values**

The displayed parameters can be newly retrieved from the NE by pressing the **Refresh** button in the **View** screen.



## Configuring the external timing input ports

---

**When to use** Use this procedure to configure the external timing input ports.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts”, “The Ext Timing I/P Ports tab” (10-8).

**Before you begin** Prior to performing this task, you must connect the external timing input ports to an external timing source.

**Instructions** Complete the following steps to configure the external timing input ports:

---

**1** Select the desired NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

**Result:**

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE. The corresponding parameters are described in “The Ext Timing I/P Ports tab” (10-8).

---

**3** Select the **Ext. Timing Port AID** from the option menu. The following values are possible:

- **EXTTMG0**
  - **EXTTMG1**
- 

**4** Select the **Timing Input Format** from the option menu. Select the format according to the format of the external clock source. The following values are possible:

- **2 MHz** (initial value)
  - **2 Mbit – framed**
  - **2 Mbit – unframed**
- 

**5** Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

**Result:**

If you have clicked on **Close**, the **ConfigSync** window closes.  
If you have clicked on **Apply**, the window remains open and you can select another tab.

END OF STEPS

---



## Configuring the external timing output ports

---

**When to use** Use this procedure to configure the external timing output ports.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts”, “The External Timing Output Ports tab” (10-8).

**Before you begin** Prior to performing this task, you must connect the external timing output ports to an external timing network.

**Instructions** Complete the following steps to configure the external timing output ports:

---

**1** Select the desired NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

**Result:**

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE.

---

**3** Select the **Ext Timing O/P Ports** tab of the **ConfigSync** window.

---

**4** Select the **Ext. Timing Output Port AID** from the option menu.

---

**5** Select the **Timing Output Format** from the option menu. Select the format according to the format which is required for the external network. The following values are possible:

- **2 MHz** (initial value)
  - **2 Mbit - framed**  
For framed 2 Mbit/s signals, the generation and evaluation of timing marker information on the timing quality is supported as per ITU-T Rec. G.703. If you want to use the timing marker, select **2 Mbit - framed**.
  - **2 Mbit - unframed**
- 

**6** Enable the use of the external outputs in the option menu **Derived Output Timing Enable** by clicking on **Enable**.

---

Please note that there is only one timing output signal derived from the system clock or line signals which is forwarded in parallel to the two output ports which are physically available.

---

- 7 Select the timing output source from the option menu **Derived Output Timing Source** from which the external timing signal is derived.

The following values are possible:

- **TLS** (Timing Link Switch)  
The external timing signal is derived from one of the timing references. The currently active timing reference is selected in this case.
  - **SETG**  
The external timing signal is derived from the system clock.
- 

- 8 Set the parameter **Sync Msg Force DUS Enable**. Via this parameter you can define whether DNU is consistently transmitted from the timing output ports.

The following values are possible:

- **Enable**
  - **Disable**
- 

- 9 Set the parameter **AIS/QL Mode** to **AISMODE** or **QLMODE**.
- 

- 10 Set the parameter **Timing Regen Loop Enable** in order to avoid timing loops between the timing output ports and one or both of the timing inputs through a Stand-Alone Synchronization Equipment (SASE) Office Clock. This might happen, if the NE forwards timing to the SASE and at the same time receives a timing signal via one or both of the external timing input ports. If additionally the system clock is in the Locked Mode and derived from an external timing signal, DNU is forwarded to the timing outputs.

The following values are possible:

- **DISABLE**  
The Regenerator Loop functionality is disabled. Timing loops are not considered.
- **EXTREF1**

If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg0 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.

- **EXTREF2**

If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg1 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.

- **BOTH**

The Regenerator Loop functionality is applied to both external timing inputs.

- 
- 11 Select the impedance of the external timing output from the option menu **Timing Port Impedance**.

The following values are possible:

- **120 ohms**
- **75 ohms**

- 
- 12 Set the parameter **Loop Delay**. This parameter defines the delay during which DNU is transmitted from the timing outputs after the Regenerator Loop conditions are no longer present. You can select a value between **0** and **60** seconds.

- 
- 13 Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

**Result:**

If you have clicked on **Close** the **ConfigSync** window closes. If you have clicked on **Apply**, the window remains open and you can select another tab.

END OF STEPS



## Configuring the timing references

---

**When to use** Use this procedure to configure the timing references.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts”, “The Timing Reference tab” (10-10).

**Instructions** Complete the following steps to configure the timing references:

---

**1** Select the desired NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

**Result:**

This displays the **Ext Timing I/P Ports** tab of the **ConfigSync** window, containing synchronization information for the selected NE.

---

**3** Select the **Timing Reference** tab of the **ConfigSync** window.

---

**4** Select the timing reference which you wish to configure in the drop-down list box **Timing Reference**. You can select the external timing signals **EXTREF1** or **EXTREF2** or an SDH signal via **LINE1**,..., **LINE6**.

---

**5** Select the port AID in the drop-down menu **Port AID**.

IF	THEN
the selected timing reference shall not be used,	select <b>NOT-CONNECTED</b>
the selected timing reference is <b>EXTREF1</b>	select <b>EXTTMG0</b>
the selected timing reference is <b>EXTREF2</b>	select <b>EXTTMG1</b>
the selected timing reference is from <b>LINE1</b> to <b>LINE6</b> and you want to assign a new SDH signal as timing reference,	select <b>NOT-CONNECTED</b> first in order to disable the currently assigned SDH port, and then select the new SDH.

- 
- 6** Select in the drop-down menu **System Timing Reference Priority** the priority of the selected timing reference. The values can be
- **DISABLE** (initial value)
  - **1, ..., 8**

Make sure that all configured timing references have different priorities assigned.

**Result:**

A priority list is created for the configured timing reference signals. Initially the signal with the highest quality level is used as timing reference signal. If it fails, the system switches to the signal with the next lower quality level. If there are several timing references with the same quality level, they are used according to the priority list. If all possible timing reference signals fail, the timing generator enters the holdover mode.

- 
- 7** Select the timing quality belonging to the timing reference in the drop-down menu **Provisioned QL**. For **LINE1** to **LINE6** select **AUTO**. This means that the timing marker is evaluated. For **EXTREF1** and **EXTREF2** assign the actual quality level of the external timing source.

**Result:**

The timing references are now used in the order of their quality level.

- 
- 8** Apply the changes by clicking on **Apply**. If you wish to discard the changes click on **Close**.

- 
- 9** Repeat Step 4 to Step 8 until all timing references are configured. Click on **OK** to close the window.

END OF STEPS



## Configuring the system timing

---

**When to use** Use this procedure to configure the system timing.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts”, “The System Timing tab” (10-11).

**Instructions** Complete the following steps to configure the system timing:

---

**1** Select the desired NE in the Map pane portion of the Map window.

---

**2** Select **Configuration** → **Synchronization** → **Configure...** from the main menu bar on the Map window.

**Result:**

This displays the **ConfigSync** window, containing synchronization information for the selected NE.

---

**3** Select the **System Timing** tab of the **ConfigSync** window.

---

**4** Select the clock mode in the option menu **Provisioned Clock Mode**. You can select the following values:

- **Free Running** (The system is synchronized to the internal oscillator.)
- **Locked** (The system is synchronized to a timing reference signal.)

During normal operation in a network, the timing generator should be locked to a timing reference signal as far as available. Normally the free-running mode is used directly after the system start.

---

**5** Enable or disable the use of the timing marker for the system timing option menu **System SSM Mode**. This means that the selection of timing reference for the system timing is either determined only by the provisioned priority list or by the quality level given by the timing marker (SSM, Synchronization Status Message) and secondly by the priority list.

The values can be

- **ENABLED**
- **DISABLED**

---

6 Type the wait-to-restore time in the group box **Timing Reference Wait To Restore**. Click on the respective radio button. The values can be:

- **0** (initial value)
- **20SEC**
- **1MIN ... 60MIN**
- **99** (infinite)

The wait-to-restore time is the wait which is made before every single switching from one timing reference to another.

---

7 Select the ASAP for the system timing with the option menu **System Timing ASAP**.

---

8 Select the **Acceptance QL** from the option menu. The values can be:

- **PRC**
- **SSUT**
- **SSUL**
- **SEC**

---

9 Apply the changes by clicking on **Apply**. If you wish to discard the changes, click on **Close**.

**Result:**

If you have clicked on **Close**, the **ConfigSync** window closes.  
If you have clicked on **Apply**, the window remains open and you can select another tab.

END OF STEPS

---



## Forced Switching of the timing generator to the holdover mode

---

**When to use** Use this procedure to switch the timing generator to the holdover mode.

**Related information** For related information, see Chapter 10, “Timing provisioning concepts”.

**Instructions** Complete the following steps to change the clock mode:

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

**Result:**

This displays the **OperateSync** window.

---

**3** Set the option menu **Sync Switch Modifier** to **System Clock Mode Switch**.

---

**4** Select the switch command via the option menu **Switch Type**. You can select the following value via an option menu:

- **Forced Switch**

The **Forced Switch** command causes the system clock to be switched to the holdover mode regardless of the state of the timing references.

The mode switch is not carried out when the clock is provisioned for the free running mode.

---

**5** Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

**Important!** After a switch to holdover or a clear mode switch, it takes the system about 7 minutes to stabilize the holdover filter. So don't do any further timing action during these 7 minutes.

END OF STEPS

---



## Switching of the timing reference

---

**When to use** Use this procedure to switch between different timing reference signals and to apply certain switch requests to a selected reference:

- Forced Switch
- Manual Switch
- Lockout Switch
- Clear Wait to Restore

**Related information** For related information see Chapter 10, “Timing provisioning concepts”, “Configuring the timing references” (4-9).

**Before you begin** Prior to performing this task,

- Configure the timing references sources for the system via **Configuration** → **Synchronization** → **Configure...** (cf. “Configuring the timing references” (4-9)).
- verify that the timing generator is in the locked mode via **Configuration** → **Synchronization** → **View...** (cf. “Viewing the timing configuration” (4-2))

Please note that the switch requests are only applicable if the timing generator is locked to a timing reference source. When the system is provisioned to the free running mode, all present requests are cleared.

**Instructions** Complete the following steps to switch to another timing reference:

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

**Result:**

This displays the **OperateSync** window.

---

**3** Set the option menu **Sync Switch Modifier** to **Timing Reference Switch**.

---

**4** Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**

causes the system to be switched to the selected timing references regardless of the state of the timing reference. Only if a release synchronization switch or a Lockout command is present the Forced Switch is denied. A Forced Switch remains active until it is removed by a release synchronization switch or a Lockout command.

- **Manual Switch**  
causes the system to be switched to the selected timing reference only if that timing reference is working fault free and no other external request is present.
- **Lockout Switch**  
allows manual selection of individual references, or manual disabling of individual references.
- **Clear Wait to Restore**  
the wait to restore period will be terminated. The signal status will return to normal.

---

5 Select the timing reference source to which you want to perform a switch request in the option menu **Destination**. This can be:

- **EXTREF1, EXTREF2**
- **LINE1 to LINE6**

---

6 Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

**Important!** After a timing reference switch, it takes the system about 7 minutes to stabilize the holdover filter. So don't do any further timing action during these 7 minutes.

END OF STEPS



## Switching of the system clock

---

**When to use** Use this procedure to switch the system clock.

**Related information** For related information see Chapter 10, “Timing provisioning concepts”.

**Instructions** Complete the following steps to switch the system clock:

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

**Result:**

This displays the **OperateSync** window.

---

**3** Set the option menu **Sync Switch Modifier** to **System Clock Mode Switch**.

---

**4** Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**  
causes the system clock to be switched.
- 

**5** Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

---



## Switching of the external timing output

---

**When to use** Use this procedure to switch the external timing outputs. The following switch requests are possible:

- Forced Switch
- Manual Switch
- Lockout Switch

**Related information** For related information see Chapter 10, “Timing provisioning concepts”.

**Instructions** Complete the following steps to switch an external timing output:

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Fault** → **Synchronization** → **Operate...** from the main menu bar on the Map window.

**Result:**

This displays the **OperateSync** window.

---

**3** Set the option menu **Sync Switch Modifier** to **External Timing Output Switch**.

---

**4** Select the switch request you want to perform in the option menu **Switch Type**. The following switch requests are possible:

- **Forced Switch**  
causes the system to be switched to the selected timing references regardless of the state of the timing reference. Only if a release a synchronization switch or a Lockout command is present the Forced Switch is denied. A Forced Switch remains active until it is removed by a release a synchronization switch or a Lockout command.
- **Manual Switch**  
causes the system to be switched to the selected timing reference only if that timing reference is working fault free and no other external request is present.
- **Lockout Switch**  
allows manual selection of individual references, or manual disabling of individual references.

- 
- 5 Select the timing reference source to which you want to perform a switch request in the option menu *Destination*. This can be:
- **LINE1** to **LINE6**
- 
- 6 Apply the changes by clicking on **Operate**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

---



## Releasing a synchronization switch

---

**When to use** Use this procedure to release switch requests of the

- Timing Reference
- System Clock Mode
- External Timing Output

The release switch request clears any lockout or forced switch request.

**Related information** For related information see Chapter 10, “Timing provisioning concepts”.

**Instructions** Complete the following steps to release a switch:

---

**1** Select the NE in the Map pane portion of the Map window.

---

**2** Select **Fault** → **Synchronization** → **Release...** from the main menu bar on the Map window.

**Result:**

This displays the **ReleaseSync** window.

---

**3**

If you want to release the switch of the	set the Switch Modifier to	and the Destination to
Timing Reference	Timing Reference Switch	EXTREF1, EXTREF2, LINE1,..., LINE6
System Clock Mode	System Clock Mode Switch	—
External Timing Output	External Timing Output Switch	—

---

**4** Apply the changes by clicking on **Release**. If you wish to discard the changes, click on **Cancel**.

END OF STEPS

---







# 5 Traffic provisioning

## Overview

---

**Purpose** This chapter contains procedures for traffic provisioning.

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---

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---

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## Port provisioning

---

**When to use** Use this procedure to provision a port.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”.

**Instructions** Complete the following steps to provision a port.

---

**1** Select the NE on the Map window for which the ports shall be provisioned.

---

**2** Select **Configuration** → **Provision...** from the menu in the Map window.

**Result:**

The **Provisioning** window is displayed.

---

**3** Expand the structure in the Network Element Explorer by pressing the “+” signs until the port to be provisioned is displayed.

---

**4** Select the STM port or VC tributary and press **Provision**.

**Result:**

The port parameters are displayed on the provisioning side of the **Provisioning** window.

---

**5** Make the settings as desired and press **Apply**.

**Result:**

The port is configured with the new settings.

**Reference:**

“STM port parameter description” (11-34), “Provisioning (VC-3) Parameters” (11-37), “Substructuring In- and Output-Signals” (5-4).

END OF STEPS

---



## Substructuring In- and Output–Signals

---

**When to use** Use this procedure to substructure in- and output–signals.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Port provisioning” (5-3).

**Instructions** Complete the following steps to substructure in- and output–signals.

---

**1** Select the NE on the Map window for which the ports shall be provisioned.

---

**2** Select **Configuration** → **Provision...** from the menu in the Map window.

**Result:**

The **Provisioning** window is displayed.

---

**3** Expand the structure in the Network Element Explorer by pressing the “+” signs until the port to be provisioned is displayed.

---

**4** Select the STM port and press **Provision**.

**Result:**

The port parameters are displayed on the provisioning side of the **Provisioning** window.

---

**5** Press the **Details** button next to the **Tributary Input Signal Rate** or **Tributary Unequipped Output Signal Rate** field

**Result:**

The **Provisioning Inputsig** or **Provisioning Unequipsig** window opens.

---

**6** Select the signal to be substructured in the list in the upper part of the window. The current signal structure is shown in the **Values** column. The values **416c**, **44c**, **4** and **3** stand for VC4–16C, VC4–4C, VC4 and VC3 respectively.

**Result:**

The buttons for setting the signal structure (**3**, **4**, **4-4c**, **VC4-16C**) become active. Dark buttons correspond to the currently set structure.

---

- 7** Structure the signal by means of the buttons **3**, **4**, **4-4c** and **VC4-16C**. Press **Apply** to confirm your settings.

**Result:**

The **Value** column displays the new structure.

---

- 8** Repeat step 6 and 7 to structure the whole signal as desired. Press **Ok** when you are done. (When you press **Cancel** the settings are lost.)

**Result:**

The window is closed and the new settings are displayed in the **Provisioning** window.

---

- 9** Repeat the procedure beginning at step 5 so that Tributary Input Signal Rate and Tributary Unequipped Output Signal Rate are structured identically. Then press **Apply** in the **Provisioning** window.

**Result:**

The port is configured with the new settings.

**Reference:**

“STM port parameter description” (11-34), “Provisioning (VC-3) Parameters” (11-37).

END OF STEPS

---



## Enter/exit maintenance condition

---

**When to use** Use this procedure to enter or exit the maintenance condition for an NE.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”.

**Instructions** Complete the following steps to enter or exit the maintenance condition for an NE.

---

**1** Select the NE on the Map window.

---

**2** Select **Configuration** → **Provision...** from the menu in the Map window.

**Result:**

The **Provisioning** window is displayed.

---

**3** Select the NE name on top of the Network Element Explorer and press **Provision**.

**Result:**

The NE parameters are displayed on the provisioning side of the **Provisioning** window.

---

**4** Switch **Maintenance Condition** to **Y** (yes) to enter or to **N** (no) to exit the maintenance condition by means of the drop down list and press **Apply**.

**Result:**

The maintenance condition for the NE is configured with the new settings.

END OF STEPS

---



## View NE Cross-Connections –Textual

---

**When to use** Use this procedure to view a textual version list of existing cross-connections.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Instructions** Complete the following steps to display a textual version list of existing cross-connections.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

You also can do a right mouse click on the NE to display a pop-up menu, from which you can select **Cross Connection** and proceed with Step 3.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 In the explorer area of the **Cross-Connection** window, use your mouse to select the system, a bay, a shelf, a circuit pack, or a port group for which you want to see the cross-connections.
- 

- 4 Select **View** → **List Cross-Connections** from the main menu of the **Cross-Connection** window.

**Result:**

This displays the **Cross-Connection List** window.

---

- 5 If desired, select another element from the explorer area of the **Cross-Connections** window to change the information in the **Cross-Connection List** window for the new selection. Also if desired, select a row in the list and then click the **Delete** or **Modify**

button to display the windows used to delete and modify cross-connections, respectively.

END OF STEPS

---



## Add a Single NE Cross-Connection

---

**When to use** Use this procedure to add new NE cross-connections.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Several ways to access the Cross-Connection window** There are several ways to access the Cross-Connection window besides the method described in this procedure. Other ways to access the Cross-Connection window:

- **From the Map Main Menu**  
Choose the network element to work with in the Map and then **Configuration** → **Cross Connection** from the main menu.
- **Equipment View Window Menu**  
Choose **Configuration** → **Cross Connection** from the main menu.
- **Equipment View Pop-Up Menu**  
Right click over the equipment whose cross connection window is to be displayed and choose **Cross Connection** from the popup menu.

**Instructions** Complete the following steps to add a single new cross-connection.

---

- 1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button and choose **Cross Connection** from the pop-up menu.

**Result:**

The **Cross-Connect** window is displayed.

---

- 2 Position the mouse cursor on the NE’s TID displayed in the left portion of the window below the Network Element Explorer heading. Press the left mouse button twice to highlight the TID.

**Result:**

The explorer tree is expanded to show the bay(s) below the TID. (You can also expand any item in the Network Element Explorer by clicking the plus (+) sign next to the item. To collapse the item, click the minus (-) sign next to it.)

- 
- 3 Position the mouse cursor on the bay displayed in the explorer tree. Press the select (left) mouse button twice to highlight the bay and expand the explorer tree to show the shelves beneath the bay.

---

  - 4 Position the mouse cursor on the shelf displayed in the explorer tree. Press the select (left) mouse button twice to highlight the shelf and expand the explorer tree to show the circuit packs beneath the shelf.

---

  - 5 Position the mouse cursor on the circuit pack displayed in the explorer tree. Press the select (left) mouse button twice to highlight the circuit pack and expand the explorer tree to show the port groups beneath the circuit pack.

---

  - 6 Repeat steps 3–5 for all bays, shelves, and ports that need to be displayed.

---

  - 7 Expand and display the associated port tributary in the Main View of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port group in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list. (It is recommended to position the source tributary block on the left).
- Position the mouse cursor on the port group in the explorer, click and hold the select (left) mouse button and drag the selected port into the left portion of the Main View of the Cross-Connect window. The tributary block for the selected port is displayed in the Main View.

To remove a tributary block from the Main View, position the mouse cursor on the tributary block, click the right mouse button and select **Clear**. The tributary block is cleared from the Main View.

If necessary, click the up/down and left/right arrow keys located next to the tributary blocks displayed to scroll and locate the tributary you want to use. When you position the cursor on a tributary block, the status bar indicates the tributary address and whether the tributary is available to be used as a source or destination.

- 
- 8 Select the destination port tributary and place it on the right side of the Main View of the window.
- 

- 9 Move the mouse cursor to the source tributary block on the left side of the window and click the select (left) mouse button to select the source tributary for the cross-connection.

**Result:**

The available cross-connection type buttons are enabled at the top toolbar portion of the window above the Main View and Network Element Explorer. If a specific type of cross-connection is not possible for the source tributary selected, these cross-connection type buttons are greyed out.

---

- 10 Select the cross-connection type by clicking on the appropriate cross-connection type button at the top portion of the window.

**Result:**

The color of the selected source tributary block changes to green.

---

- 11 Select the destination port tributary block.

**Result:**

The **Create Cross-Connection Attributes** window is displayed.

---

- 12 Set the attributes of the cross-connection depending on the cross-connection type and press **OK**.

**Result:**

The line of the newly created cross-connection momentarily changes to orange. When the cross-connection has been established, the lines and arrows of the created cross-connection change color from orange to black and then to blue, indicating that the cross-connection has been made

**Reference:**

“1-Way Cross-Connection Parameters” (11-10), “2-Way Cross-Connection Parameters” (11-10), “1-Way PP Cross-Connection Parameters” (11-11).

END OF STEPS

---



## Add a Roll Cross-Connection

---

**When to use** Use this procedure to add a roll cross-connection. A roll refers to the operation of moving the input of an existing leg of a one-way or two-way point-to-point cross-connection from the current input tributary to a new input tributary, while leaving the output tributary unchanged.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Before you begin** Before you begin this task, determine the existing cross-connection for which you want to create a roll cross-connection.

**Instructions** Complete the following steps to roll a cross-connection.

---

- 1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button and choose **Cross Connection** from the pop-up menu.

**Result:**

The **Cross-Connection** window is displayed.

---

- 2 Expand the elements in the Network Element Explorer until you see the end points of the cross-connection you want to roll and drag the port groups to the main view of the **Cross-Connection** window.
- 

- 3 Click with the right mouse button on the existing cross-connection for the roll and select the desired connection from the popup menu.

**Result:**

The selected cross-connection line is highlighted. The source changes its color to green and the sink to magenta.

---

- 4 Click the **Roll** button in the toolbar.

**Result:**

The confirmation dialog box asks you to select a new source.

---

- 5 Click the **OK** button and then select a new source.

---

**6** Choose **Yes**.

**Result:**

The cross-connection is rolled to the new source tributary.

END OF STEPS

---



## Add an NE Multi-Cast Cross-Connection

---

**When to use** Use this procedure to add a new multi-cast cross-connection. This is accomplished via the Add a Multi-Cast Cross-Connection window, which allows you to choose the number of destination AIDs for a multi-cast cross-connection.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Instructions** Complete the following steps to add a new multi-cast cross-connection.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 Expand an item in the explorer tree (using the mouse) and locate the port group that contains the tributaries/ports to display in the main view area.

- 4 Right click to see the pop-up menu and select a port area from the menu.

**Result:**

The port group is expanded to display the tributaries/ports.

---

- 5 Single click on a high speed line or low speed address at the appropriate signal rate for the new multi-cast cross-connection.
- 

- 6 Choose the multi-cast button from the group of cross-connection buttons at the top of the **Cross-Connections** window (if tooltips help

is enabled, positioning the mouse pointer over the button will indicate the correct button).

**Result:**

This displays the **Add a Multi-Cast Cross-Connection** window.

- 
- 7** In the **Total Number of Destinations in this NE** field on the **Add a Multi-Cast Cross-Connection** window, enter the number of drops to be included in the cross-connection.

- 
- 8** In the main view area of the **Cross-Connections** window, click on each port/tributary that is to be a drop for the new multi-cast cross-connection. Notice that as each drop is specified, it is added to the **Chosen Destinations** area of the **Add a Multi-Cast Cross-Connection** window. (If necessary, you can remove a previously selected AID from the **Chosen Destinations** area by selecting it with the mouse and then clicking the nearby **Remove AID** button.) After you have specified the last drop, click the **Done** button.

**Result:**

The system asks you to specify additional information for the cross connection, if any is needed. Specifically, for the purposes of a multi-cast cross-connection, a destination TID must be present for each and every destination that you specified. To get this information the system displays the **Additional Cross-Connection Information** window.

- 
- 9** Type the additional requested information into this window and click **OK**.

**Result:**

The system displays the **Cross-Connection Confirmation** window.

**Reference:**

“1-Way Cross-Connection Parameters” (11-10).

- 
- 10** Click the **OK** button to send the new cross-connection command to the NE.

END OF STEPS



## Delete NE Cross-Connections – Graphical

---

**When to use** Use this procedure to delete a selected cross-connection using the graphical representation.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Instructions** Complete the following steps to delete a cross-connection.

---

- 1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button. Choose **Cross Connection** from the pop-up menu.

**Result:**

The **Cross-Connection** window is displayed.

---

- 2 Double-click on the TID of the NE in the Network Element Explorer portion of the window (or click the plus sign next to the NE TID) to expand and show the bay, shelf, slot, circuit pack, and port that contains the cross-connection to be deleted. If the equipment hierarchy is not expanded to show all components down to port level, double-click on the bay, shelf, slot, and circuit pack in successive order until the explorer tree expands to show the desired port.
- 

- 3 Position the mouse cursor on the port in the explorer tree and click the left mouse button to select it.

**Result:**

The port is highlighted in the explorer.

---

- 4 Click the right mouse button to display a drop-down list and select the position to place the associated tributaries in the Main View of the **Cross-Connection** window. The other way to do this is to click and hold the left mouse button and drag the port into the left, right, or bottom position to display the associated tributaries in the Main View.

**Result:**

The window shows any existing cross-connections for the port. (If the cross-connection is not displayed, click the Show/Hide toolbar button to show the cross-connection. If there are multiple cross-connections, position the mouse cursor over one of the cross-connections and click the right mouse button to display a

listing of the existing cross-connections. Then select the desired cross-connection.)

---

- 5 On the **Cross-Connection** window, position the mouse cursor on the line that represents the cross-connection and click the right mouse button.

**Result:**

The line of the selected cross-connection becomes thicker and the color is black. If you want to delete a two-way cross-connection, each leg of the two-way cross-connection must be deleted, one at a time.

---

- 6 Click the **Delete** button on the **Cross-Connection** window toolbar.

**Result:**

If a two-way cross-connection has been selected for deletion, a **Multiple Leg Cross Connection Deletion** window is displayed. Choose the two-way cross-connection or either one-way cross-connection comprising the two-way cross-connection and click the **OK** button. If a one-way cross-connection or another type has been selected for deletion, this window is not displayed. The system displays a confirmation window.

---

- 7 Select **Yes** in the confirmation window to delete the cross-connection.

END OF STEPS

---



## Delete an NE Cross-Connection – Textual

---

**When to use** Use this procedure to delete a selected cross-connection using the Cross-Connections List window, which lists the cross-connections textually rather than graphically.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Denied deletion request** The following three scenarios will cause a cross-connection deletion request to be denied:

- a request to remove a red-lined cross-connection
- a request to remove a cross-connection from a tributary used in a loop-back cross-connection
- a request to remove a cross-connection from a tributary used in a test access connection.

**Instructions** Complete the following steps to delete an NE cross-connection.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 In the explorer area of the Cross-Connection window, select the system, a bay, a shelf, a circuit pack, or a port group where the cross-connection resides.
- 

- 4 Select **View** → **List Cross-Connections** the main menu of the **Cross-Connection** window.

**Result:**

This displays the **Cross-Connection List** window, which displays all cross-connections on the selected item.

---

- 
- 5 Select the cross-connection to be deleted and click the **Delete** button.

**Result:**

The system displays a confirmation window.

---

- 6 If you are certain you want to delete the cross-connection indicated for deletion in the cross-connection window, click the **Yes** button.

**Result:**

The system deletes the indicated cross-connection. Upon successful deletion of a cross-connection, all reference to that cross-connection, in any window in the GUI, is removed.

END OF STEPS

---



## Modify NE Cross-Connections – Graphical

---

**When to use** Use this procedure to modify cross-connections graphically via the Cross-Connections window.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Instructions** Complete the following steps to modify cross-connections graphically via the Cross-Connections window.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 Expand the elements in the Network element explorer until you see the end points of the cross-connection you want to modify and drag the port groups to the main view of the **Cross-Connection** window.
- 

- 4 Click with the right mouse button on the existing cross-connection to be modified and select the desired connection from the popup menu.

**Result:**

The selected cross-connection line is highlighted. The source changes its color to green and the sink to magenta.

---

- 5 Click the **Modify** button on the toolbar or select **Configuration** → **Cross-Connections** → **Modify** from the menu bar.

**Result:**

This displays the **Additional Cross-Connection Information** window, with the current information for the selected cross-connection.

---

- 
- 6** Type the required changes into the displayed window and click the **Done** button.

**Result:**

This displays the **Cross-Connection Confirmation** window.

**Reference:**

“1-Way Cross-Connection Parameters” (11-10), “2-Way Cross-Connection Parameters” (11-10), “1-Way PP Cross-Connection Parameters” (11-11), “Multicast Cross-Connection Parameters” (11-11).

- 
- 7** Make sure you have entered the desired changes and then click the **Yes** button.

**Result:**

The system modifies the selected cross-connection per the entered changes.

END OF STEPS

---



## Modify NE Cross-Connections – Textual

---

**When to use** Use this procedure to modify cross-connections textually via the **Cross-Connections List** window.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Instructions** Complete the following steps to modify cross-connections.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 In the explorer area of the **Cross-Connection** window, use your mouse to select the system, a bay, a shelf, a circuit pack, or a port group where the cross-connection to be modified resides.
- 

- 4 Select **View** → **List Cross-Connections** from the main menu of the **Cross-Connection** window.

**Result:**

This displays the **Cross-Connection List** window.

---

- 5 Choose a cross-connection to modify and select **Modify**.

**Result:**

This displays the **Additional Cross-Connection Information** window, with the current information for the selected cross-connection.

---

- 6 Type the required changes into the displayed window and click the **Done** button.
-

**Result:**

This displays the **Cross-Connection Confirmation** window.

**Reference:**

“1-Way Cross-Connection Parameters” (11-10), “2-Way Cross-Connection Parameters” (11-10), “1-Way PP Cross-Connection Parameters” (11-11), “Multicast Cross-Connection Parameters” (11-11).

---

- 7 Make sure you have entered the desired changes and then click the **Yes** button.

**Result:**

The system modifies the selected cross-connection per the entered changes.

END OF STEPS

---



## Convert NE Cross Connections

---

**When to use** Use this procedure to convert cross-connections via the **Cross-Connection** window.

**Related information** For related information, see “Converting cross connections” (11-9), .

**Instructions** Complete the following steps to convert cross-connections.

---

- 1 Select **Configuration** → **Cross-Connection** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **Cross-Connection** window.

---

- 3 In the explorer area of the **Cross-Connection** window, use your mouse to select the system, a bay, a shelf, a circuit pack, or a port group where the cross-connection to be converted resides.
- 

- 4 Expand and display the associated port tributaries the Main View of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port group in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list. (It is recommended to position the source tributary block on the left).
- Position the mouse cursor on the port group in the explorer, click and hold the select (left) mouse button and drag the selected port into the left portion of the Main View of the Cross-Connect window. The tributary block for the selected port is displayed in the Main View.

To remove a tributary block from the Main View, position the mouse cursor on the tributary block, click the right mouse button and select **Clear**. The tributary block is cleared from the Main View.

If necessary, click the up/down and left/right arrow keys located next to the tributary blocks displayed to scroll and locate the tributary you want to use.

**Result:**

The tributaries and the respective cross connection will be displayed in the Main View.

- 
- 5 Select the cross connection you want to convert.

**Result:**

The **Convert** button will be enabled

- 
- 6 The next window, that will be shown after clicking the **Convert** button depends on the type of the chosen cross connection

---

**If you want to convert a    Then ...**

...

one-way cross connection  
to a one-way path  
protected cross  
connection

a window pops up to ask you to select the second source tributary. Confirm by clicking **OK**. Select the second source tributary and the **Convert Cross Connect Attributes** windows pops up. In this window the following parameters can be set: NEWLOCA, XCAPPL, XCNUM, PPGNAME; PPBV.  
Click on **OK** to confirm  
The **Cross Connection Confirmation** window pops up.

one-way cross connection  
to a one-way adjunct  
cross connection

a window pops up to ask you to select the second source tributary. Confirm by clicking **OK**. Select the second source tributary and the **Convert Cross Connect Attributes** windows pops up. In this window the following parameters can be set: NEWLOCA, XCAPPL, XCNUM.  
Click **OK** to confirm  
The **Cross Connection Confirmation** window pops up.

If you want to convert a	Then ...
...	
a leg of a two-way cross connection	<p>the <b>Convert Leg of a Multiple Cross Connect</b> window pops up where you can chose the desired leg. Confirm by clicking <b>OK</b>.</p> <p>Next a window pops up to ask you to select the second source tributary. Confirm by clicking <b>OK</b>.</p> <p>Select the second source tributary and the <b>Convert Cross Connect Attributes</b> windows pops up. In this window the following parameters can be set: NEWLOCA, XCAPPL, XCNUM, PGNAME; PPBV.</p> <p>Click on <b>OK</b> to confirm.</p> <p>The <b>Cross Connection Confirmation</b> window pops up.</p>
a one-way path protected to a one-way point-to point	<p>The <b>Convert Cross Connect Attributes</b> windows pops up. In this window the following parameters can be set: XCAPPL, XCNUM.</p> <p>Click on <b>OK</b> to confirm</p> <p>A warning window pops up, to inform you, that this conversion may be service affecting and asks you, if you want to continue.</p> <p>Click <b>OK</b> to confirm.</p> <p>The <b>Cross Connection Confirmation</b> window pops up.</p>
one-way adjunct cross connection to a one-way cross connection	<p>The <b>Convert Cross Connect Attributes</b> windows pops up. In this window the following parameters can be set: XCAPPL, XCNUM.</p> <p>Click on <b>OK</b> to confirm</p> <p>A warning window pops up, to inform you, that this conversion may be service affecting and asks you, if you want to continue.</p> <p>Click <b>OK</b> to confirm.</p> <p>The <b>Cross Connection Confirmation</b> window pops up.</p>

- 7 Click on **Yes** in the **Cross Connection Confirmation** to convert the cross connection

END OF STEPS



## Create a Local NPPA/NUT configuration

---

**When to use** Use this procedure to create a Local NPPA/NUT configuration for a local NE in an 2-fiber MS-SPRing protected ring. The Local NPPA/NUT configuration defines which working timeslots shall be (temporarily ) not protected or, which protection timeslots shall be (temporarily) not preempted by the MS-SPRing, respectively.

**Related information** For related information, see:

- “2-fiber MS-SPRing with Non-preemptible Unprotected Traffic (NUT)” (11-30)

**Before you begin** Prior to performing this procedure you must have a detailed knowledge on the cross-connections switched within the ring. You must know in detail the priority of the traffic in each timeslot. Also a 2-fiber MS-SPRing must have been created.

**Instructions** Complete the following steps to create a Local NPPA/NUT configuration.

---

- 1 Select **Configuration** → **NPPA/NUT Provisioning** from the main menu bar on the Map window.

**Result:**

This displays the **Choose an NE** window.

---

- 2 Choose the network element you want to work with by double clicking on it in the **Choose an NE** window and then clicking the **OK** button.

**Result:**

This displays the **NPPA/NUT Management** window.

The **NPPA/NUT Management** window shows the existing 2–fiber MS-SPRing protection groups with the NE TID and the PG AID (rate).

---

- 3 Choose a NE TID from the explorer and click the **Provision** button.

**Result:**

This displays the **NPPA/NUT Timeslot Provisioning** window.

In the upper panel this window displays the ring map of the selected protection group.

---

- 
- 4 Select the **Timeslot Provisioning Rate** of the concatenated group of timeslots for which the **Protection Attribute** is valid.

The possible values are

- **VC3**
  - **VC4**
  - **VC4-4C**
  - **VC4-16C**
- 

- 5 Select the **Timeslot Number**.

Possible values are:

- for VC-3: **1...96**
  - for VC-4:<**3n+1**> (n = 0...31)
  - for VC-4-4c: <**12n+1**> (n = 0...7)
  - for VC-4-16c: <**48n+1**> (n = 0...1)
- 

- 6 Select a slot from a working timeslot to be protected, unprotected or temporary unprotected by clicking the respective button.

- **Protect**
- **UnProtect**
- **T UnProtect**

The value for the corresponding protection timeslot is set automatically.

**Result:**

The following message window pops up

You have chosen to change the status of timeslot(s) / affected timeslot range (*for more than one timeslot*) to Protected/Unprotected/Temporary Unprotected on protection group "PG AID". This may affect timeslots on the ring. Do you wish to continue?"

---

- 7 Click the **OK** button to send the changes to the NE

**Result:**

If the operation was successful the message **Operation completed** is displayed in the Status bar.

Otherwise the message **Operation failed** will be displayed

END OF STEPS

---



## Add NE Protection Groups

---

**When to use** Use this procedure to add a port protection group to an NE.  
An SNCP cannot be created with this procedure.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-23), “Multiplex section protection” (11-24), “2-Fiber MS-SPRing” (11-26), “Protection configurations” (11-32).

**Instructions** Complete the following steps to create protection groups on the **Protection Provisioning** window.

---

- 1 Select **Configuration** → **Protection Groups** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE to select it and click the **OK** button.

**Result:**

The **Protection Provisioning Manager** window is displayed for the selected NE.

---

- 3 Single-click on the protection group type to select it and click the **Add** button.

**Result:**

The **Add Protection Group** wizard window to select a transmission interface (rate) is displayed.

**Reference:**

“1+1 Protection Group Parameters” (11-14), “MS-SPRing Protection Group Parameters” (11-15).

---

- 4 Select the rate by clicking on the appropriate radio button and click the **Next** button.

**Result:**

The **Add Protection Group** wizard window to identify the protection group and select the member ports is displayed.

- 
- 5 If this is 2-Fiber BLSR/MSPRing protection group, a **Protection Group Name** field is displayed. Enter the protection group name (this field is optional).
- 

- 6 Click the down arrow next to the **Bay-Shelf** field to display a drop-down list of bays and shelves. Select the bay/shelf for the port protection group.

**Result:**

The bay and shelf selected becomes part of the **Protection Group ID** displayed on the window and is later used to identify the protection group. The **Protection Group (PG) ID** (identifier) is derived from the information you provide. The format for the PG AID is {BayAID}{ShelfAID}{Entity Type Qualifier}{Protection Group AID}, where the {Entity Type Qualifier} is: T - 2 Fiber, O - 1+1 Optical

---

- 7 Enter the **Protection Group (PG) AID** number(00-99) in the field next to the **PG AID** label. This number is used to uniquely identify a protection group of the same type provisioned on the same shelf. This field is required.
- 

- 8 In the portion of the window labelled **Current Value** and **New Value**, select the member ports for the protection group. Depending on the protection group type chosen, the member ports may be labelled **East/West** (2-Fiber BLSR/MSSPRing), **Working/Protection** (1+1 Optical, 1xN Electrical). The system enforces that the ports selected are on the same shelf and the same transmission rate you selected. Mixing of SONET and SDH rates is not allowed by the system. (At any point on this window, you can click the **Back** button to go back to the previous wizard window to change the rate for the protection group. However, if you do this, the current selections you have made on this wizard window to identify the protection group and select the member ports will be removed.)
- 

- 9 To select the first port, click the down arrow under the **New Value** column to display a list of available ports for the selected bay/shelf. Click on a port in the displayed drop-down list.
- 

- 10 To select the next port, click the down arrow under the **New Value** column to display a list of available ports for the selected bay/shelf.
-

The system only displays a list of ports that are on the same bay/shelf as the first (reference) port chosen and the rate chosen on the previous wizard window. The system enforces that the working and protection ports are the same rate.

---

- 11 After selecting the member ports, click the **Next** button.

**Result:**

A window is displayed, informing you that the protection group is in the process of being created for the network element. When the process is finished, the text in the window informs you that the protection group has been successfully created in the network element.

---

- 12 To view or modify any additional attributes for the protection group, click the **Next** button. If you are finished at this point, click the **Finish** button and skip the next step.
- 

- 13 If you clicked the *Next* button on the previous window to change attributes, the **Enter Protection Group Attributes** window is displayed. The **Wait to Restore** field is used to select the amount of time (seconds) to wait before switching back to the working port when it becomes available again. Click the down arrow next to this field to display a list of choices. Click on the choice in the list to select it. If you are finished changing the protection group attribute(s), click the **Next** button.

Please note that the change of the Wait to Restore time has no effect in the current software release.

**Result:**

A window is displayed, indicating whether you changed any attributes and asking if you would like to view the protection group (members, attributes, identifier).

---

- 14 Click the **Next** button to view the protection group created, or click the **Finish** button.

**Result:**

After clicking the **Finish** button, a status window is displayed showing whether the protection group was successfully created. If it was not successfully created, this is indicated on the status window. If the protection group was not successfully created, it may be that the protection group already exists or another

---

problem with the NE or selections made. Click the **Refresh** button to clear the status window or click the **Close** button to close it.

END OF STEPS

---



## View NE Protection Groups

---

**When to use** Use this procedure to select an NE's port protection group and view all member ports and current attribute settings.

**Related information** For related information, see Chapter 11, "Traffic provisioning concepts", "Protection mechanisms" (11-23), "Multiplex section protection" (11-24), "2-Fiber MS-SPRing" (11-26), "Protection configurations" (11-32).

**Instructions** Complete the following steps to display protection groups on the Protection Provisioning window.

---

- 1 Select **Configuration** → **Protection Groups** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE to select it. Click the **OK** button.

**Result:**

The **Protection Provisioning Manager** for the selected NE is displayed.

---

- 3 In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

**Result:**

The explorer expands to show the existing protection groups under the type selected.

---

- 4 Select the protection group to be viewed by clicking on its protection group AID in the explorer tree. Click the **View** button.

**Result:**

The **View Protection Group** window for the selected protection group is displayed. This window shows the Protection Group Type, protection group (PG) AID, member ports and their value (assignment), and the current setting of some provisionable attributes.

- 
- 5 Click the **OK** button to close the window. The **Protection Provisioning Manager** window remains on the screen. Click the **Close** button to close this window.

END OF STEPS

---



## Modify NE Protection Groups

---

**When to use** Use this procedure to modify NE protection groups. WaveStar SNMS allows you to change any attributes associated with the protection group.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-23), “Multiplex section protection” (11-24), “2-Fiber MS-SPRing” (11-26), “Protection configurations” (11-32).

**Instructions** Perform the following steps to modify a protection group.

---

- 1 Select **Configuration** → **Protection Groups** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE to select it. Click the **OK** button.

**Result:**

The **Protection Provisioning Manager** for the selected NE is displayed.

---

- 3 In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

**Result:**

The explorer expands to show the existing protection groups under the type selected.

---

- 4 Select the protection group to be modified by clicking on its protection group AID in the explorer tree. Click the **Modify** button.

**Result:**

The **Protection Group** wizard window for the selected NE and protection group is displayed. The top of this window shows the Protection Group Type, Protection Group (PG) AID, and bay/shelf of the protection group (all of which cannot be modified).

- 
- 5** Change the **Wait to Restore** time or the **Protection Group Name** if desired and press the **Next** button.

**Result:**

A confirmation window pops up where you have to confirm your changes.

- 
- 6** Press **Yes** to confirm the changes.

**Result:**

The protection group parameters are changed.

END OF STEPS



## Delete NE Protection Groups

---

**When to use** Use this procedure to delete an existing port protection groups from an NE. Deleting a protection group removes all member ports from the group.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-23), “Multiplex section protection” (11-24), “2-Fiber MS-SPRing” (11-26), “Protection configurations” (11-32).

**Instructions** Complete the following steps to delete protection groups on the **Protection Provisioning** window.

---

- 1 Select **Configuration** → **Protection Groups** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE to select it. Click the **OK** button.

**Result:**

The **Protection Provisioning Manager** for the selected NE is displayed.

---

- 3 In the explorer portion of the window, click on the plus (+) sign next to the protection group type under which is the protection group you want to view.

**Result:**

The explorer expands to show the existing protection groups under the type selected.

---

- 4 Select the protection group ID of the port protection group to be deleted by single-clicking on it. Click the **Delete** button.

**Result:**

A pop-up window is displayed, asking if you really want to remove the port protection group.

---

- 5 Choose **Yes** to remove the protection group.

**Result:**

A status window is displayed, showing the progress of the deletion. If the deletion is successfully completed, the status is shown as “Completed” on the status window.

END OF STEPS

---



## Add a Path-Protected Cross-Connection

---

- When to use** Use this procedure to create a path-protected cross-connection. This type of cross-connection can be used in Bidirectional Line-Switched Ring (BLSR)/Dual Node Interconnection (DNI) and Unidirectional Path-Switched Ring (UPSR)/ Subnetwork Connection Protection (SNCP) topologies.
- For Dual Ring Interworking(DRI)/DNI applications, the path-protected cross-connection comprises one add and one through cross-connection with a working and protection leg.
- For UPSR/SNCP applications, a 1-way path-protected cross-connection is created at the drop node, consisting of two drop cross-connections with a working and protection leg.
- This type of cross-connection can be assigned to a Path Protection Group Name, which allows all cross-connections with the same Path Protection Group Name to be retrieved in a single request to the NE. This is a 1-26 character name that can consist of, for example, a combination of both input port AIDs.
- The path protection behavior between the working and protection legs of the cross-connection can be defined as non-revertive with no hold-off time (the initial setting for UPSR/SNCP applications) or revertive with a hold-off time enabled (the initial setting for DRI/DNI applications).
- Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-23), “Multiplex section protection” (11-24), “2-Fiber MS-SPRing” (11-26), “Protection configurations” (11-32).
- Instructions** Complete the following steps to add a path-protected cross-connection.
- 

- 1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the menu (right) menu mouse button. Choose **Cross Connection** from the pop-up menu. (If you choose **Configuration** → **Cross Connection** from the main menu bar on the Map window, the **Choose an NE** window is displayed. Double-click on the NE in the window list and click the **OK** button.)

**Result:**

The **Cross-Connection** window for the selected NE is displayed.

The equipment hierarchy in the Network Element Explorer portion of the window is automatically expanded to the slot (circuit pack) level for the NE.

You can expand any item in the Network Element Explorer by clicking the plus (+) sign next to the item. To collapse the item, click the minus (-) sign next to it. If items in the explorer are partially obscured, place the mouse cursor on the pane edge between the right side of the explorer and Main View, click and hold the left mouse button, and drag the edge to the right until the explorer items can be seen clearly.

- 
- 2 Position the mouse cursor on the plus (+) sign next to each slot in the explorer portion of the window, then click and expand the equipment hierarchy until all ports for the cross-connection are shown.

**Result:**

All ports for the cross-connection are shown.

- 
- 3 Expand and display the desired source port tributary in the Main View of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list (left, right, top, or bottom) or
- Position the mouse cursor on the port in the explorer, click and hold the select (left) mouse button and drag the selected port into the left, right, top, or bottom portion of the Main View of the **Cross-Connect** window.

**Result:**

The tributary block for the selected port is displayed in the Main View.

To remove a tributary block from the Main View, position the mouse cursor on the tributary block and click the left mouse button. Then click the right mouse button. A single option, **Clear**, is displayed in a pop-up window. Move the mouse cursor over the word **Clear** in the pop-up window to select it. The tributary block is cleared from the Main View.

- 
- 4 Select and display the destination port tributary in the Main View, using one of the methods described in step 3.

When you position the cursor on a tributary block, the status bar indicates the tributary address and whether the tributary is available to be used as a source or destination, or both.

**Result:**

The destination port tributary is displayed in the Main View.

---

- 5 Select and display the secondary destination port tributary (to be used initially for the protection leg of the cross-connection) in the Main View, using one of the methods described in step 3.

**Result:**

The second destination port tributary is displayed in the Main View.

---

- 6 Select the tributary to be used for the working output/destination leg of the cross-connection.

**Result:**

The color of the selected tributary changes to magenta.

---

- 7 Click on the cross-connection type toolbar button, **One Way PP** (for One Way Path-Protected).

If you are not sure which button is the **One way PP** cross-connection type toolbar button, move the mouse cursor across each cross-connection type toolbar button until the label **One Way PP** is displayed in the status bar in the bottom portion of the window. A tooltip help bubble with the label **One Way PP** will also be displayed.

**Result:**

The color of the selected source/input tributary changes to green.

---

- 8 Position the cursor on the tributary to be used as the destination tributary and click the left mouse button to select it.
- 

- 9 Select the tributary to be used for the protection/secondary source leg of the cross-connection.
-

**Result:**

The color of the selected protection/secondary tributary block changes to brown.

A pop-up **Cross-Connections Attributes** window is displayed. This window is used to specify the attributes of the path-protected cross-connection.

---

**10** Select values for the following fields as needed:

- **LOCA** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the source node for this cross-connection. The field defaults to the current NE.
- **LOCZ** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the destination node for this cross-connection. The field defaults to the current NE.
- **LOCA2** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the secondary destination node (for DRI/DNI application of the path-protected cross-connection). The field defaults to the current NE.
- **OMODE** – click the down arrow next to this field to display a drop-down list of options for the Output Mode for this cross-connection.
- **XCAPPL**(Application) – click the down arrow next to this field to display a drop-down list of choices for the application (type) of cross-connection. Select 1-Way Path-Protected as the application.
- **XCNUM**(Cross-Connection Number) – this field is pre-populated with a Cross-Connection number (it functions as a drop-down list; you can click the down arrow to display and select the number). The Cross-Connection Number is used to associate all atomic cross-connections that are created from the same associated legs and leg-pairs so information can be retrieved from the NE together. This Cross-Connection number can be used to modify and delete associated legs of one or more cross-connections with the same number on the **List Cross-Connections** window at one time. The **List Cross-Connections** window can be accessed by clicking the **List Cross-Connections** toolbar button on the **Cross-Connection** window toolbar.

- **PPGNAME** (Path Protection Group Name) – this is an optional field for entering a 1-26 character Path Protection Group Name that identifies a path protection group for the path-protected cross-connection. All cross-connections associated with a Path Protection Group Name can be retrieved in a single request to the NE.
- **PPBV** (Path Protection Behavior) – click the down arrow next to this field to display a list of choices for the Path Protection Behavior between the working and protection legs of the cross-connection. The choices are: **NN** (Non-Revertive with No Holdoff Time) and **RH** (Revertive with a Holdoff Time Enabled).

- 
- 11 Click the **OK** button to activate your attribute choices in the **Attributes** window.

**Result:**

A pop-up confirmation window is displayed.

- 
- 12 Choose **Yes**.

**Result:**

The lines and arrows of the newly created cross-connection are momentarily displayed in orange. When the cross-connection has been established, the lines and arrows of the cross-connection change to black and the tributary blocks change to blue, indicating that they are cross-connected.

The protection leg of the cross-connection is represented by a dashed line.

The path-protected cross-connection is represented on the Main View as a cross-connection with multiple legs.

END OF STEPS



## Add an Adjunct Path-Protected Cross-Connection

---

**When to use** Use this procedure to add an adjunct path-protected cross-connection. An adjunct path-protected cross-connection is created by using the same input tributary as an existing path-protected cross-connection with a different output tributary. Adjunct path-protected cross-connections are used only for Unidirectional Path-Switched Ring (UPSR)/Subnetwork Connection Protection (SNCP) NE ring topologies. There must be an existing path-protected cross-connection from which to form an adjunct path-protected cross-connection. The adjunct path-protected cross-connection is not assigned to a separate path protection group as the existing path-protected cross-connection.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection mechanisms” (11-23), “Multiplex section protection” (11-24), “2-Fiber MS-SPRing” (11-26), “Protection configurations” (11-32).

**Before you begin** Before you begin this task, determine if there is an existing path-protected cross-connection for which an adjunct path-protected cross-connection can be added.

**Instructions** Complete the following steps to add an adjunct path-protected cross-connection.

---

- 1 Position the mouse cursor on the NE in the Map pane portion of the Map window and click the (right) menu mouse button. Choose **Cross Connection** from the pop-up menu. (If you choose **Configuration** → **Cross Connection** from the main menu bar on the Map window, the **Choose an NE** window is displayed. Double-click on the NE in the window list and click the **OK** button.)

**Result:**

The **Cross-Connection** window for the selected NE is displayed.

The equipment hierarchy in the Network Element Explorer portion of the window is automatically expanded to the slot (circuit pack) level for the NE.

You can expand any item in the Network Element Explorer by clicking the plus (+) sign next to the item. To collapse the item, click the minus (-) sign next to it. If items in the explorer are partially obscured, place the mouse cursor on the pane edge between the right side of the explorer and Main View, click and

hold the left mouse button, and drag the edge to the right until the explorer items can be seen clearly.

---

- 2 Position the mouse cursor on the plus (+) sign next to each slot in the explorer portion of the window, then click and expand the equipment hierarchy until all ports for the cross-connection are shown.

**Result:**

All ports for the cross-connection are shown.

---

- 3 Locate the tributary pair on the NE that have the path-protected cross-connection to which the adjunct path-protected cross-connection is being added.

There are two ways to do this:

- One method of locating existing cross-connections on the NE is by clicking on the NE's TID at the top level of the equipment hierarchy in the Network Element explorer, then clicking the **List Cross Connections** toolbar button on the **Cross-Connection** window toolbar (which is identified by a message in the Status bar) or
- by tooltips help (when you position the mouse cursor on the correct button).

**Result:**

The **List Cross Connections** window for the entire NE is displayed.

The first time you choose to list all cross-connections for the NE, a pop-up window may be displayed, advising you that the listing of all cross-connections for the NE may take a long time and asks if you want to proceed. Choose **Yes** to display the **List Cross Connections** window.

The tributary of the path-protected cross-connection's working leg has a type of "1WAYPSW" in the Type field of the **List Cross Connections** display.

---

- 4 Expand and display the source, destination, and secondary destination tributaries for the path-protected cross-connection in the Main View of the **Cross-Connect** window.

There are two ways to do this:

- Position the mouse cursor on the port in the explorer to be expanded and click the menu (right) mouse button to display a drop-down menu of positions. Select the position for the tributary block from the drop-down menu list (left, right, top, or bottom).
- Position the mouse cursor on the port in the explorer, click and hold the select (left) mouse button and drag the selected port into the left, right, top, or bottom portion of the Main View of the **Cross-Connect** window.

**Result:**

The tributary block for the selected port is displayed in the Main View.

The lines and arrows of the existing path-protected cross-connection are displayed in the Main View.

---

- 5 Position the mouse cursor on the working leg of the existing path-protected cross-connection closest to the input (source) tributary block.

**Result:**

The color of the input (source) tributary block changes to green, the lines of the working legs of the cross-connection become thicker, and the One Way Adjunct cross-connection type button is enabled.

---

- 6 Click on the **One Way Adjunct cross-connection type** button on the toolbar.

**Result:**

A message is displayed in the status bar, Please select destination for One Way Adjunct cross-connection.

---

- 7 Select the destination tributary for the adjunct cross-connection.

**Result:**

The color of the selected destination tributary changes from yellow to brown, and the **Cross-Connection Attributes** window is displayed. The Attributes window is used to specify the attributes of the path-protected cross-connection.

---

- 
- 8** Select values for the following fields as needed:
- **LOCA** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the source node for this cross-connection. The field defaults to the current NE.
  - **LOCZ** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the destination node for this cross-connection. The field defaults to the current NE.
  - **LOCA2** – click the down arrow next to this field to display a drop-down list of NEs and select the NE to be used as the secondary destination node (for DRI/DNI application of the path-protected cross-connection). The field defaults to the current NE.
  - **OMODE** – click the down arrow next to this field to display a drop-down list of options for the Output Mode for this cross-connection.
  - **XCAPPL**(Application) – click the down arrow next to this field to display a drop-down list of choices for the application (type) of cross-connection. Select 1-Way Path-Protected as the application.
  - **XCNUM**(Cross-Connection Number) – this field is pre-populated with a Cross-Connection number (it functions as a drop-down list; you can click the down arrow to display and select the number). The Cross-Connection Number is used to associate all atomic cross-connections that are created from the same associated legs and leg-pairs so information can be retrieved from the NE together. This Cross-Connection number can be used to modify and delete associated legs of one or more cross-connections with the same number on the **List Cross-Connections** window at one time. The **List Cross-Connections** window can be accessed by clicking the **List Cross-Connections** toolbar button on the **Cross-Connection** window toolbar.
- 
- 9** Click the **OK** button to activate your attribute choices in the **Attributes** window.

**Result:**

A pop-up confirmation window is displayed.

---

**10** Choose **Yes**.

**Result:**

The lines and arrows of the newly created cross-connection are momentarily displayed in orange. When the cross-connection has been established, the lines and arrows of the cross-connection change to black and the tributary blocks change to blue, indicating that they are cross-connected.

END OF STEPS

---



## Manually Initiate DNO

---

**When to use** Use this procedure to manually initiate DNO for one or more NEs or an aggregate. You can specify that all information be included in the DNO update, or just port, cross-connection, port protection group, subnetwork, NE parameters, or equipment information.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Dynamic Network Operations” (11-18).

**Instructions** Complete the following steps to manually initiate DNO.

---

- 1
 

	<b>If you are performing DNO...</b>	<b>then select...</b>
	on a single NE, group of NEs, or aggregate	one or more NEs or an aggregate.
	on a single bay or shelf	the bay or shelf on the Network Element Explorer

---
- 2 Access the DNO function (as appropriate) through:
  - **Configuration** → **DNO** on the main menu bar of the Map window. The **Choose an NE/Aggregate** window is displayed. Double-click on the NE(s)/aggregate(s) for which you want to perform DNO. Click the **OK** button.
  - The NE’s or aggregate’s pop-up menu – position the mouse cursor over the NE/aggregate icon on the Map pane or Subnetwork Explorer, and click the menu (right) mouse button. A pop-up menu is displayed. Select **DNO** from the pop-up menu.
  - The **Equipment View** window (for the chosen NE/ aggregate) – Select **Configuration** from the main menu. A sub-menu is displayed. Select **DNO** from the sub-menu.
  - The **Cross-Connection** window (for the chosen NE/ aggregate) – select **Configuration** from the main menu. A sub-menu is displayed. Select **DNO** from the sub-menu.

**Result:**

The **Manual DNO** window is displayed. If the DNO channel is down, a message is displayed in the status bar of the window, indicating that you cannot perform a DNO at this time. Click the **Close** button to close the window.

- 
- 3**      **If you are initiating DNO for...**      **then click on the radio button labeled...**
- |                        |   |
|------------------------|---|
| all configuration data | <b>All Information.</b> If you choose <b>All Information</b> for a bay or shelf, WaveStar SNMS performs DNO for ports, port protection groups, cross-connections, and equipment.  |
| a selected data type   | <p><b>Only the following...</b> and choose one of the following data types:</p> <ul style="list-style-type: none"> <li>• Port Parameters</li> <li>• Cross Connections/ Reservations</li> <li>• Port Protection Group</li> <li>• NE Parameters</li> <li>• Equipment</li> <li>• Subnetwork</li> <li>• Optical Associations</li> </ul> <p>For a single bay or shelf, DNO can be performed for just Port Parameters, Cross-Connections, or Equipment.</p> <p>When you perform DNO the first time on an NE, the system does database synchronization on all data types, even if you choose only one data type.</p> |
- 

- 4**      Click the **Apply** button to initiate DNO and select the next data type for update, or click the **OK** button to initiate DNO and close the window.

**Result:**

The DNO process is started.

To obtain DNO status for an NE before or after initiating DNO, click on the **GetStatus** button.

When the DNO is completed, a message is displayed on the window's status bar, indicating whether the DNO is successful or if there are any errors.

For certain NE types, such as the BWM and OLS 400G, DNO command requests for some data may result in DENY messages but the DNO process will continue, resulting in a "COMPLETED" status even though all data has not been updated in the database. In this case, your system administrator

may have to check the ERRORLOG file in the \$oamlog directory to check the NE responses to the DNO process.

If DNO cannot be performed for the selected NE(s), the system issues a message.

If you choose to perform DNO on all NEs in your Target Group, or for an NCC with the DSA function enabled, a pop-up window is displayed, informing you that the DNO process may take a long time and affect system performance. You can choose to perform DNO or stop the process. Choose **Yes** to perform DNO anyway or **No** to stop the DNO process.

END OF STEPS

---







# 6 Traffic maintenance

## Overview

---

**Purpose** This chapter contains procedures for traffic maintenance.

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---

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□

## Add a Loopback Cross-Connection

---

**When to use** Use this procedure to add a loopback cross-connection to an NE's port tributary. A loopback cross-connection is created from an input tributary to the output of the same tributary for testing purposes.

**Related information** For related information, see Chapter 11, "Traffic provisioning concepts", "Cross connection loopbacks" (12-7), "Near-side facility loopbacks" (12-9), "Far-side facility loopbacks" (12-11).

**Before you begin** Before you begin this task, you need to identify the port tributary in the NE for which the loopback cross-connection will be created for testing purposes. Information about the port tributary, including the rate and AID, can be found by displaying the **Cross-Connection** window for the NE, and expanding the equipment hierarchy in the Network Element explorer portion of the Cross-Connection until the desired port tributary is shown in the Network Element Explorer.

Be aware that WaveStar SNMS denies requests to add a cross-connection to a tributary that is currently in loopback. To see if a particular tributary is currently in loopback, open the **Cross-Connection** window for the NE, click the NE's TID in the Network Element explorer portion of the **Cross-Connection** window, and then click the **List Cross Connections** button on the **Cross-Connection** window toolbar. The **Cross-Connections List** window is displayed. A port tributary is displayed with a cross-connect type of "LPBK" on the **Cross-Connections List** window if it is in loopback.

When a loopback is removed from a tributary, any pre-existing cross-connections on the tributary are automatically re-established in the NE.

**Instructions** Complete the following steps to add a loopback cross-connection to a port tributary in an NE for testing purposes.

---

- 1 Display the **Cross-Connection** window for the selected NE and obtain the AID of the port tributary to be put in loopback by expanding the Network Element explorer on the **Cross-Connection** window and "drilling down" the equipment hierarchy until the port tributary is found.

The **Cross-Connection** window can remain open while you access the Manage Loopbacks window to actually add the loopback to the port tributary.

**Result:**

The required port tributary is displayed.

- 
- 2 If the **Cross-Connection** window is open, the NE is already chosen. Otherwise, click on the NE icon in the Map pane portion of the Map window to select it or select no NE at this point.

- 
- 3 Go to the Map window and choose **TestManagement** → **Loopbacks** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1 or step 2, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

**Result:**

The **Loopback** window is displayed

- 
- 4 Enter an **AID** for the **Loopback** you want to create.

- 
- 5 Click the **Create** button.

**Result:**

A secondary **Loopback** window is displayed.

- 
- 6 Fill in the following fields:
- **Access Identifier** – using the Subnetwork Explorer right-click on the AID that you want. The AID is then entered in the AID field automatically.
  - **Loopback Type** – click the down arrow next to this field to display a list of choices. The choices are: **Cross-Connect Loopback**, **Far-side Facility Loopback** and **Near-side Facility Loopback** (cf. “Cross connection loopbacks” (12-7), “Near-side facility loopbacks” (12-9), “Far-side facility loopbacks” (12-11)).
  - **Rate** – click the down arrow next to this field to display a drop-down list of choices and select the rate of the port tributary to be placed in loopback.
  - **Action** – click the down arrow next to this field to display a list of choices. The choices are: **Operate Loopback** or **Forced Loopback**.

**Reference:**

“Loopback Parameters” (12-13).

- 
- 7 Click the **Create** button to activate your choices, or click the **OK** button to activate your choices and close the window.

**Result:**

A pop-up dialog window is displayed, informing you that the loopback being created may affect service and asking if you want to proceed.

- 
- 8 Choose **Yes**.

**Result:**

The newly created loopback cross-connection for the selected port tributary is displayed on the *Manage Loopback* window.

If part of the AID is obscured in the display portion of the window, position the mouse cursor on the pane edge between the Network Element Explorer and the display portion of the window, which displays a double-arrow cursor. Click and hold the left mouse button and drag the cursor to the left or right until the complete display of the loopback details is visible. You can also use the left/right scrollbar buttons at the bottom of the display portion to maneuver the display to the left or right.

- 
- 9 Repeat steps 5-7 to create more loopback cross-connections on additional port tributaries, or click the **Close** button to close the window.

END OF STEPS



## View Loopback Cross-Connections

---

**When to use** Use this procedure to view loopback cross-connections in an NE.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Before you begin** Before you begin this task, determine the existing cross-connection for which you want to view a loopback cross-connection.

**Instructions** Complete the following steps to view loopback cross-connections.

---

**1** Select an NE in the Map pane portion of the Map window or select no NE at this point.

---

**2** Go to the Map window and choose **TestManagement** → **Loopbacks** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

**Result:**

The **Loopback** window is displayed

---

**3** Click the plus (+) sign next to each level of the equipment hierarchy shown in the Network Element explorer portion of the window until the display expands down the shelf level.

---

**4** Select the desired shelf in the explorer.

**Result:**

The **List** button, located at the bottom of the Network Element Explorer portion of the window, is enabled.

---

**5** Click the **List** button.

**Result:**

The loopback cross-connections created for the selected piece of equipment are displayed.

Use the left/right scroll buttons located at the bottom of the *loopback cross-connections* display to move the display left or right to view all data.

---

**Reference:**

“Loopback Parameters” (12-13).

END OF STEPS

---



## Delete a Loopback Cross-Connection

---

**When to use** Use this procedure to delete a loopback cross-connection. After a cross-connect loopback is deleted on a port tributary, any other cross-connections defined for that tributary are automatically re-established in the NE.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Cross-Connections” (11-2).

**Before you begin** Before you begin this task, you need to identify the port tributary in the NE from which the loopback cross-connection will be deleted. Information about the port tributary, including the rate and AID, can be found by displaying the **Cross-Connection** window for the NE, and expanding the equipment hierarchy in the Network Element explorer portion of the Cross-Connection until the desired port tributary is shown in the Network Element Explorer.

To see if a particular tributary is currently in loopback, open the **Cross-Connection** window for the NE, click the NE’s TID in the Network Element explorer portion of the **Cross-Connection** window, and then click the **List Cross Connections** button on the **Cross-Connection** window toolbar. The **Cross-Connections List** window is displayed. A port tributary is displayed with a cross-connect type of “LPBK” on the **Cross-Connections List** window if it is in loopback.

**Instructions** Complete the following steps to delete a loopback cross-connection.

---

- 1 Select an NE in the Map pane portion of the Map window or Select no NE at this point.

---

- 2 Go to the Map window and choose **TestManagement** → **Loopbacks** on the Map window menu bar. If the NE for setting up the loopback was not already chosen in step 1 or step 2, the **Choose an NE** window is displayed. To choose the NE from this window, double-click on the NE in the list and click the **OK** button.

**Result:**

The **Manage Loopbacks** window is displayed

- 
- 3** Click the plus (+) sign next to each level of the equipment hierarchy shown in the Network Element explorer portion of the window until the display expands down the shelf level.
- 

- 4** Select the desired shelf in the explorer.

**Result:**

The **List** button, located at the bottom of the Network Element Explorer portion of the window, is enabled.

---

- 5** Click the **List** button.

**Result:**

The loopback cross-connections created for the selected piece of equipment are displayed.

Use the left/right scroll buttons located at the bottom of the loopback cross-connections display to move the display left or right to view all data.

---

- 6** Double-click on the loopback cross-connection in the display portion of the window to select it for deletion.

**Result:**

The **Delete** button is enabled.

---

- 7** Click the **Delete** button.

**Result:**

A pop-up question dialog window is displayed, informing you that deletion of the selected loopback cross-connect may affect service and asking if you want to continue with the deletion.

---

- 8** Choose **Yes** to delete the loopback cross-connection.

**Result:**

The deleted loopback cross-connection is removed from the display.

---

- 9** Click the **Close** button to close the window.

END OF STEPS

---



## Operate Protection Switch (from the Manage Protection Groups Window)

---

**When to use** Use this procedure to provision a protection switch, for a specified protection group, from the **Manage Protection Groups** window.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection Switch Management” (11-17), “Equipment Protection Switch (Timing Pack Equ.) Parameters” (12-6), “MS-SPRing Switch Parameters” (11-28), “Switch Fabric Pack Equipment Parameters” (12-6), “1+1 Protection Group Parameters” (11-14).

**Before you begin** Before you begin this task, identify the type of protection group and type of protection switch you want to provision. To perform this task, access the Map window.

**Instructions** Complete the following steps to create protection groups on the **Protection Provisioning** window.

---

- 1 Select **Configuration** → **Protection Groups** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE to select it and click the **OK** button.

**Result:**

The **Protection Provisioning Manager** window is displayed for the selected NE. The **Protection Provisioning Manager** window has an explorer that shows the available protection group types and port protection groups created for each type.

To display existing protection groups for a protection group type, click the plus (+) sign next to the protection group type. The explorer expands the list to show existing protection groups for a type, if any. If there are no existing protection groups for a given type, the explorer tree shows “No protection Groups”. To collapse the listing, click the minus (-) sign next to the protection group type.

The window also has a series of buttons:

- **Add** – click this button to add a new protection group.
- **Modify** – click this button to modify an existing protection group.
- **Delete** – click this button to delete an existing protection group.
- **View** – click this button to view the member ports and attributes of an existing protection group.
- **Operate Switch** – click this button to bring up the Operate Protection Switch window to provision a protection switch for the selected protection group.
- **Close** – click this button to close the Protection Provisioning Manager window.
- **Help** – click this button to display online help for this window.

- 
- 3 Click the plus (+) sign next to the protection group type to expand and see the protection groups set up for the selected protection group type.

- 
- 4 Select the protection group to be provisioned for a protection switch by single-clicking on it in the explorer portion of the window, under the selected protection group type.

**Result:**

The buttons for actions that can be performed for the selected protection group are enabled. For example, if you cannot add or change the member entities of the selected protection group type or delete the protection group itself, the **Add**, **Modify**, or **Delete** buttons remain disabled.

- 
- 5 Click the **Operate Switch** button.

**Result:**

The **Operate Protection Switch** window for the selected protection group is displayed. The fields shown on the **Operate Protection Switch** window will vary, based on the Protection Group Type selected.

The fields common to all Protection Group Types are:

- **Protection Group Type** – this is a display-only field that shows the selected Protection Group Type.
- **PG AID** – this is a display-only field that shows the Protection Group AID of the selected protection group.
- **Switch Request** – this is a display-only field that shows the last message prompting a protection switch. If there is no current message, this field indicates that there has been No Request (“NR”).
- **Switch Command** – this field allows you to select the command for provisioning the type of protection switch to be performed. Click the down arrow next to the field to display a drop-down list of commands.

The list of commands displayed depends on the selected Protection Group Type. Possible choices from the command list are:

- **CLEAR**
- **LOCKOUT**
- **FRCED** (Forced)
- **MAN** (Manual)
- **CLEARFRCD** (Clear Forced)

The list of available commands is also based on the current switch status and the priority of the switch request. For example, if the current switch status for the protection group is “Forced Switch”, then the system does not allow a manual switch.

Switch priorities for WaveStar TDM NEs, in descending order, are: CLEAR, LOCKOUT, FRCD, MAN

- 
- 6 Select the switch command from the drop-down list of commands.
- 

- 7 Select the destination of the entity that should be active after operation of the protection switch.

For the Protection Group Type shown in the example in the previous steps of this procedure (Switch Fabric Pack Equipment), the entity selected is a circuit pack, with a circuit pack ID. The **Active Unit** field in this example indicates the ID of the circuit pack currently active.

For the example shown (Switch Fabric Pack Equipment), click the down arrow next to the **Destination Entity** field to display a drop-down list of choices. In this case, the list contains the list of

slots. Choose the slot to become active after the switch is operated if both circuit packs are being switched to protection.

To choose an individual circuit pack in the slot to be switched, click the down arrow next to the **Destination Entity** field to display a drop-down list of choices and choose the AID of the circuit pack being switched to protection.

This field should be chosen instead of the **Destination Entity** field if you are switching an individual circuit pack on the shelf to protection.

If the entities to be switched are ports, the version of the **Operate Switch** window displayed is different:

Identifying fields for this Protection Group Type (display-only) are:

- **Protection Group Type**
- **Protection Group Ring ID (RID)**
- **Protection Group AID**

The fields displayed to select the destination entity (port) for this type of protection group are:

- **Destination Entity** – click the down arrow next to this field to display a drop-down list and select the entity that is being switched to protection, if both working or protection ports are being switched to protection. The choices are WKG (Working) or PROTN (Protection).
- **Destination Side** – click the down arrow next to this field to display a drop-down list and select the port side that is being switched to protection. The choices are east, west, or both.
- **Destination Entity AID** – click the down arrow next to this field to display a drop-down list and select the individual port AID of a working or protection group to be switched to protection.
- **Switch Type** – click the down arrow next to this field to display a drop-down list and select the NE configuration involved in the protection switch. The choices are span or ring.

- 
- 8 To review the details of the protection group affected by the switch, click the **Details** button.

**Result:**

A second window is displayed, showing the Protection Group Type, Protection Group Ring ID (if applicable), and Protection Group AID. To close this details window, click the **Close** button.

- 
- 9** After your choices are made, click the **Apply** button to initiate the switch request and leave the **Operate Switch** window open, or click the **OK** button to initiate the switch request and close the window.

**Result:**

A status window is displayed, showing the results of the request. If it is completed successfully, the status is shown as “Completed”. If the request fails for some reason, the status of the request is shown as “Failed”.

END OF STEPS

---



## Operate Protection Switch (from the Protection Switch Status Management window)

---

**When to use** Use this procedure to provision a protection switch for a selected protection group type and protection switch message related to that protection group type, from the **Protection Status Management** window.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “Protection Switch Management” (11-17), “Equipment Protection Switch (Timing Pack Equ.) Parameters” (12-6), “MS-SPRing Switch Parameters” (11-28), “Switch Fabric Pack Equipment Parameters” (12-6), “1+1 Protection Group Parameters” (11-14).

**Instructions** Complete the following steps to provision a protection switch for a given protection group type and protection switch message.

---

- 1 Choose **Configuration** → **Protection Switch** from the main menu bar of the Map window.

**Result:**

The **Choose an NE/Aggregate** window is displayed.

---

- 2 Click the **Network Elements** radio button to obtain a list of NEs. Click the **Aggregates** radio button to obtain a list of aggregates. For the purposes of this function, click the **Network Elements** radio button to obtain a list of NEs.

Once the list criteria is selected (Network Elements or Aggregates), you can use the Filtering/Sorting option to filter and limit the list to only the named items that you want (for details on how to use the Filter/Sort option, see “Sorting Tables” (14-45)).

---

- 3 Double-click on the NE in the list to select it and click the **OK** button.

**Result:**

The **Choose Protection Type** window is displayed showing the available protection types to select.

---

- 4 From the available valid protection types, choose the protection type(s) to be displayed in the **Protection Switching Status** window

by positioning the mouse cursor in the box and clicking the select (left) mouse button to select the box.

**Result:**

A checkbox is placed in the box and the **OK** button is enabled.

---

- 5 Click the **OK** button.

**Result:**

The **Protection Switching Status** window is displayed, showing protection switch status messages (if any), for the selected protection group type(s).

Use the left/right scroll bar buttons located at the bottom of the display area of this window to scroll left or right, to see the complete status message.

---

- 6 Once you have located the protection group type and message for which you want to provision a protection switch, click on the message in the display portion of the window to select it.
- 

- 7 Click the **Operate Switch** button.

**Result:**

The **Operate Protection Switch** window for the selected protection group type and message is displayed. The fields shown on the **Operate Protection Switch** window will vary, based on the Protection Group Type selected.

Identifying fields for this Protection Group Type (display-only) shown on the window are:

- Protection Group Type
- Protection Group Ring ID (RID)
- Protection Group AID

The fields common to all Protection Group Types are:

- **Protection Group Type** – this is a display-only field that shows the selected Protection Group Type.
  - **PG AID** – this is a display-only field that shows the Protection Group AID of the selected protection group.
  - **Switch Request** – this is a display-only field that shows the last message prompting a protection switch. If there is no current message, this field indicates that there has been No Request (“NR”).
-

- **Switch Command** – this field allows you to select the command for provisioning the type of protection switch to be performed. Click the down arrow next to the field to display a drop-down list of commands. The list of commands displayed depends on the selected Protection Group Type. Possible choices from the command list are:

- **CLEAR**
- **LOCKOUT**
- **FRCED** (Forced)
- **MAN** (Manual)
- **CLEARFRCD** (Clear Forced)

The list of available commands is also based on the current switch status and the priority of the switch request. For example, if the current switch status for the protection group is “Forced Switch”, then the system does not allow a manual switch.

Switch priorities for WaveStar TDM NEs, in descending order, are: CLEAR, LOCKOUT, FRCD, MAN

- 
- 8 Select the switch command from the drop-down list of commands.
- 

- 9 Select the destination of the entity that should be active after operation of the protection switch.

The fields displayed to select the destination entity (port) for this type of protection group are:

- **Destination Entity** – click the down arrow next to this field to display a drop-down list and select the entity that is being switched to protection, if both working or protection ports are being switched to protection. The choices are WKG (Working) or PROTN (Protection).
- **Destination Side** – click the down arrow next to this field to display a drop-down list and select the port side that is being switched to protection. The choices are east, west, or both.
- **Destination Entity AID** – click the down arrow next to this field to display a drop-down list and select the individual port AID of a working or protection group to be switched to protection.
- **Switch Type** – click the down arrow next to this field to display a drop-down list and select the NE configuration involved in the protection switch. The choices are span or ring.

- 
- 10** To review the details of the protection group affected by the switch, click the **Details** button.

**Result:**

A second window is displayed, showing the Protection Group Type, Protection Group Ring ID (if applicable), and Protection Group AID. To close this details window, click the **Close** button.

- 
- 11** After your choices are made, click the **Apply** button to initiate the switch request and leave the **Operate Switch** window open, or click the **OK** button to initiate the switch request and close the window.

**Result:**

A status window is displayed, showing the results of the request. If it is completed successfully, the status is shown as “Completed”. If the request fails for some reason, the status of the request is shown as “Failed”.

END OF STEPS



## Display Protection Switching Status

---

**When to use** para

**Instructions** Complete the following steps to display protection switching status.

---

- 1 From the main menu bar of the Map window, select **Configuration** → **Protection Switch**.

**Result:**

This displays the **Choose an NE/Aggregate** window.

---

- 2 Choose either Network Elements or Aggregates.

A Filtering/Sorting option is also available to the user by clicking on the Filter/Sort button. After setting the parameters for this option, click the **Apply** button to enter your data and then click the **OK** button to return to the **Choose an NE/Aggregate** window.

---

- 3 Double click on the desired selection from the list and click the **OK** button.

**Result:**

The **Choose Protection Type** window is displayed showing the available protection types to select.

---

- 4 From the available valid protection types, choose the protection type(s) to be displayed in the **Protection Switching Status** window and click the **OK** button.

**Result:**

The **Protection Switching Status** window is displayed with the correct information as indicated by the user.

---

- 5 When you have finished viewing the data, click on the **Close** button.

END OF STEPS

---



## Enable/Disable the PM Feature

---

**When to use** Use this procedure to globally enable or disable the Performance Monitoring (PM) data collection feature for all supported NEs. When the PM data collection feature is turned on, WaveStar SNMS periodically collects PM data from each NE that has PM data collection activated. When the PM feature is globally disabled, PM data is not collected from any NE.

**Related information** For related information, see Chapter 11, “Traffic provisioning concepts”, “NE PM Management Parameters” (12-5).

**Before you begin** Before you begin this task, access the Map window.

**Instructions** Complete the following steps to globally enable or disable the PM feature.

---

- 1 Select **Performance** → **Global PM Management** from the main menu bar on the Map window.

**Result:**

The **Global PM Data Administration** window is displayed.

---

- |   |   |   |  |
|---|---|---|--|
| 2   | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top; padding-right: 20px;"> <b>If you want to...</b><br/><br/>           enable the PM feature<br/><br/><br/><br/><br/><br/><br/><br/><br/><br/>           disable the PM feature         </td> <td style="width: 50%; vertical-align: top;"> <b>click on the Collect PM Data box...</b><br/><br/>           to place a check there and select the retention period for 15-minute and 1-day PM data reports. To select the retention period, move the slider bar for each report type. You can set the retention period from 1 to 30 days for each report type. The number displayed to the right of each slider bar shows the setting selected. Click the <b>Retrieve</b> button to display the current system default retention periods.<br/><br/><br/><br/><br/><br/><br/><br/><br/><br/>           to remove the check or leave the box blank.         </td> </tr> </table> | <b>If you want to...</b><br><br>enable the PM feature<br><br><br><br><br><br><br><br><br><br>disable the PM feature | <b>click on the Collect PM Data box...</b><br><br>to place a check there and select the retention period for 15-minute and 1-day PM data reports. To select the retention period, move the slider bar for each report type. You can set the retention period from 1 to 30 days for each report type. The number displayed to the right of each slider bar shows the setting selected. Click the <b>Retrieve</b> button to display the current system default retention periods.<br><br><br><br><br><br><br><br><br><br>to remove the check or leave the box blank. |
| <b>If you want to...</b><br><br>enable the PM feature<br><br><br><br><br><br><br><br><br><br>disable the PM feature | <b>click on the Collect PM Data box...</b><br><br>to place a check there and select the retention period for 15-minute and 1-day PM data reports. To select the retention period, move the slider bar for each report type. You can set the retention period from 1 to 30 days for each report type. The number displayed to the right of each slider bar shows the setting selected. Click the <b>Retrieve</b> button to display the current system default retention periods.<br><br><br><br><br><br><br><br><br><br>to remove the check or leave the box blank.  |   |  |
- 

- 3 Click the **Apply** button to activate your choices.

END OF STEPS

---



## Enable/Disable PM Data Collection

---

**When to use** Use this procedure to enable or disable PM data collection for the specified NE and, if PM data collection is enabled, select the PM reporting interval.

**Related information** For related information, see Chapter 12, “Traffic maintenance concepts”.

**Before you begin** Before you begin this task, be aware that NE PM data collection will not be performed until the PM feature is globally enabled. Be aware that PM data collection is suspended during an alarm storm. WaveStar SNMS resumes PM data collection after the alarm storm has subsided.

**Instructions** Complete the following steps to enable collection of the selected PM data types or disable PM data collection for the entire NE.

---

- 1 Select **Performance** → **NE PM Management** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE in the list to select it and click the **OK** button or

Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance** → **NE PM Management**.

**Result:**

The **NE PM Data Administration** window shows the **EMS PM Data Settings** panel.

**Reference:**

“Global PM Management Parameters” (12-5).

---

- 3
 

If you want to...	then...
collect PM data for the selected PM data type in 15-minute intervals	check the <b>Enable 15 Minute PM data collection</b> for this NE box.

<b>If you want to...</b>	<b>then...</b>
collect PM data for the selected PM data type in 1-day intervals	check the <b>Enable 1-Day PM data collection</b> for this NE box.
collect both 15- minute and daily PM data for the PM data type	check both boxes.
collect no PM data (disable PM data collection for the NE)	click both boxes to remove the checks, or leave both boxes blank.
collect PM data from all data types	click the <b>All Facility Types in This NE</b> radio button.
collect PM data specified from a certain AID	click on <b>PM Data Collection Per AID Mode</b>
collect PM data from one or more types	click the <b>Only these facility types</b> radio button and then check the data types for PM data.
enable/ disable PM data collection for the NE	click the <b>Apply</b> button to activate your choices.

.....  
**END OF STEPS**  
 .....

If you select **All Facility Types in This NE**, but the NE has no facility type PM data collecting may be impeded.



## Administer PM Data

---

**When to use** Use this procedure to display analog and/or digital PM data parameters for the selected NE interface.

**Related information** For related information, see Chapter 12, “Traffic maintenance concepts”.

**Before you begin** Be aware that the PM feature must be globally enabled and the selected NE must have PM data collection activated for one or more PM data types.

PM threshold values must be set by issuing TL1 commands via the Cut-Through window.

**Instructions** Complete the following steps to display PM parameters for the selected NE interface.

---

- 1 Select **Performance** → **NE PM Management** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double-click on the NE in the list to select it and click the **OK** button or

Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance** → **NE PM Management**.

**Result:**

The **NE PM Data Administration** window shows the **EMS PM Data Settings** panel.

**Reference:**

“NE PM Management Parameters” (12-5).

---

- 3 Click the **Apply** button to activate your choices.

**Result:**

A pop-up question dialog window is displayed, informing you that changing the PM parameter values may affect service, and asks if you want to modify the values. Choose *Yes* to initiate the PM data parameter changes.

END OF STEPS

---

## View PM Data

---

**When to use** Use this procedure to view the PM data collected by WaveStar SNMS. You can choose to view either current data from the NE(s) or historical data stored in the WaveStar SNMS database, as well as for what facility type, and whether to show 15-minute or 1-day PM data. The data selected for viewing is shown in table format, sorted and filtered according to your choices.

**Related information** For related information, see Chapter 12, “Traffic maintenance concepts”, “NE PM Management Parameters” (12-5).

**Before you begin** Before you begin this task, the PM feature must be globally enabled and the selected NE must have PM data collection activated for one or more PM data types.

**Instructions** Complete the following steps to view PM data for a specified NE.

---

- 1 Select **Performance** → **View PM Data** from the menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Select an NE and click the **OK** button or  
Select an NE on the Map or Subnetwork Explorer, right-click on the NE to bring up a pop-up menu, select **Performance Management** → **View PM Data**.

**Result:**

The **View PM Data** window is displayed.

---

- 3 Choose to show either current data or historical data by clicking on the appropriate radio button. If you chose historical data, choose the date and time of the data by using the date and time (if you choose 15-minute data, in hours) spinner fields.

If you configured the data retention period on the **Global PM Data Administration** window for less than 30 days, you can only view the data files that fall within the selected data retention period.

- 
- 4 Choose one of the NE facility types for viewing by clicking on the appropriate radio button.

---

  - 5 Choose to show 15-minute or 1-day PM data by clicking on the appropriate radio button.

---

  - 6 Click the **OK** button.

**Result:**

The **PM Data** window is displayed, showing the selected PM data in table format. To save the contents of the table to a file on the local system, click the **Save** button.

END OF STEPS

---





# 7 Software upgrade

## Overview

---

**Purpose** This chapter provides information for carrying out tasks regarding the network element software.

### Contents

---

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## Transfer NE Software

---

**When to use** Use this procedure to transfer an NE software release from a Digital Access Tape (DAT) or CD-ROM onto the WaveStar SNMS host for eventual downloading to an NE.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “Software transfer via removable media” (13-10).

**Before you begin** Before you begin this task, the DAT must be physically mounted (if the file source is tape) or the CD-ROM must be physically loaded and the file system mounted on the WaveStar SNMS host (if the file source is CD-ROM). If you are transferring the NE software from CD-ROM, a special setup procedure must be performed for the WaveStar SNMS host prior to doing the transfer; this procedure is explained as part of the task. To perform this task, access the Map window.

**Instructions** Complete the following steps to transfer NE software to WaveStar SNMS.

---

- 1 If you are transferring NE software form CD-ROM, then a special setup procedure must be performed by the WaveStar SNMS administrator once prior to the NE software transfer. If you are transferring NE software form DAT, continue with the next step.

---

- 2 Before transferring a software release, you may want to see what software releases are already stored in WaveStar SNMS for the NE type, using the View Software Release Descriptive Information function.

---

- 3 Select **Configuration** → **Software Management** → **Import Software to the EMS**.
 

**Result:**

The **NE Type Selection for NE Software Transfer** window is displayed.

---
- 4 Choose **CD** or **Tape** for the media that you want to search for the software release.

- 
- 5 Select **TDM 10G (STM-64)** from the **NE Type** list or type the NE type in the text field and click the **OK** button.

**Result:**

The system begins a search for the software release on the tape or CD. The **NE Type Selection for NE Software Transfer** window is displayed. If the search is successful, a pop-up confirmation window is displayed, indicating that the software release was found on the tape or CD and asks if you want to continue with the transfer.

- 
- 6 Click the **OK** button to start the software transfer.

END OF STEPS

---



## Setting Up the WaveStar SNMS Host for Transferring NE Software from CD-ROM

---

**When to use** Before NE software can be transferred from CD-ROM onto the WaveStar SNMS host machine, the WaveStar SNMS system administrator must do the following once while configuring the WaveStar SNMS host or installing the host software.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “Software transfer via removable media” (13-10).

**Instructions** Perform the following steps to set Up the WaveStar SNMS host for transferring NE software from CD-ROM

---

- 1 Log into the WaveStar SNMS host machine as *root*.

---

- 2 As root, use the following command to find the hardware path to the CD-ROM drive: `i oscan -fn -C di sk`

---

- 3 In the output locate the line that contains the hardware path to the CD-ROM drive.  
The hardware path could be, for example, `/dev/dsk/c4t2d0`.

---

- 4 Do a symbolic link between the above hardware path and `/dev/cdrom` using the following command as root (replace the *c4t2d0* by your hardware path): `ln -s /dev/dsk/c4t2d0 /dev/cdrom`  
E N D O F S T E P S

---

### Success or failure

If the Software Transfer function performed through the GUI is successful, the file system for the CD-ROM drive will be mounted each time the CD-ROM is physically loaded into the drive.

The CD-ROM drive may fail to mount because

- The CD is not physically loaded into the drive.
- The file system for the CD-ROM drive failed to be mounted.

In the latter case, log in as root (if not already logged in) and issue a mount command (replace the **c4t2d0** by your hardware path):

```
/etc/mount /dev/dsk/c4t2d0/SD_CDR0M
```

To remove the CD-ROM, issue the following command (replace the **c4t2d0** by your hardware path): `/etc/unmount`

```
/dev/dsk/c4t2d0/SD_CDR0M
```

□

## View NE Software

---

**When to use** This procedure is used to see what software releases are already stored in WaveStar SNMS for an NE type.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “NE software generic information” (13-7).

**Instructions** Perform the following steps.

---

- 1 Select **Configuration** → **Software Management** → **View Software Release Descriptive Information**.

**Result:**

The **NE Type Selection for Viewing Descriptive Files** is displayed.

---

- 2 Select **TDM 10G (STM-64)** from the **NE Type** list or type the NE type in the text field.
- 

- 3 Click the **OK** button.

**Result:**

A description of all the software releases stored in WaveStar SNMS for the selected NE type is displayed.

END OF STEPS

---



## Download NE Software

---

**When to use** Use this procedure to download a selected software release to a specific NE.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “NE software download” (13-11).

**Before you begin** Before you begin this task, you must first access the Map window. The software release to be downloaded to the NE must be transferred to WaveStar SNMS from CD-ROM or tape.

**Instructions** Complete the following steps to download software to an NE.

---

- 1 Select **Configuration** → **Software Management** → **Download Software To NE**. from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Select an NE by double-clicking on the NE’s TID and click the **OK** button.

**Result:**

The **Software Download to NE** window is displayed.

---

- 3 Select a software release from the **Releases Available** list and click the **Apply** button. (You can abort the software download at this point, if necessary, by clicking the **Abort** button. A pop-up window is displayed, asking if you really want to abort the download. Choose **Yes** to abort the download or **No** to continue it.)

**Result:**

The system verifies that the software release is not the same or older than the version currently running on the NE and is supported by WaveStar SNMS. If there is a problem with the selected release, a pop-up information window is displayed, asking if you want to continue with the software download.

---

- 4 Choose **Yes** to perform the software download anyway or **No** to cancel the software download.

**Result:**

A pop-up message window is displayed, informing you that the download may take a certain amount of time and asks if you want to proceed with the software download.

---

- 5** Choose **Yes** to continue with the software download. (If you choose **No** the software download is cancelled.)

**Result:**

The software download is initiated. The status bar shows when the software download has been completed.

---

END OF STEPS

---



## Activate NE Software

---

**When to use** Use this procedure to activate software that has previously been transferred via software download or software copy.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “NE software activate” (13-13).

**Before you begin** Be aware that the NE Software Activate function provides the set of allowable NEs for activation and only allows the user to select from among those choices. Be aware that you may lose the NE visibility on the Map window for some time as the NE reboots during this process. To perform this task, access the Map window.

**Instructions** Complete the following steps to activate software that has previously been transferred via software download or software copy.

---

**1** Select the desired network element(s) in the WaveStar SNMS map window.

---

**2** Select **Configuration** → **Software Management** → **Activate NE Software**.

**Result:**

This displays the **Activate Software** window populated with the selected NE(s) and their currently active software release.

---

**3** Select one or more NE(s) and click **Get Standby Release** to retrieve the standby release number of the selected NE(s). You can also click on **Remove From List** to remove the chosen NE from the list.

---

**4** Click on **OK** to initiate the activation of the new release.

**Result:**

EMS verifies that the NE release version that has been requested for activation, is higher than the release version that is currently running on the NE, and also if the selected release is supported by the EMS. A warning box appears if there is a problem with the selected software release. Once verified, a dialog box confirms the software release number and NE.

- 
- 5** Click on **Yes** to continue with the activation if the information is correct, or click on **No** to return to the Activate Software window.

END OF STEPS

---



## Delete NE Software

---

**When to use** Use this procedure to delete a specific executable software release for an NE type from WaveStar SNMS.

**Related information** For related information, see Chapter 13, “Software upgrade concepts”, “NE software delete” (13-14).

**Before you begin** Before you begin this task, access the Map window. The software to be deleted must be transferred to the WaveStar SNMS from CD-ROM or tape.

**Important!** When software is deleted from the system, it is not recoverable. The only way to get the software back into the system is to reload it from a tape. Make sure that you want to delete the software release before executing the following procedure.

**Instructions** Complete the following steps to delete a specific software release for the NE type.

---

- 1 Select **Configuration** → **Software Management** → **Delete Software From the EMS** from the main menu.

**Result:**

The Delete NE Software window displayed.

---

- 2 Select **TDM 10G (STM-64)** from the **Select NE Type** list.

**Result:**

The **Delete Software** list shows the available software releases for the selected NE type.

---

- 3 Select the software release to be deleted from the **Delete Software** list by double-clicking on it and click the **Delete** button.

**Result:**

A confirmation window is displayed, asking if you want to proceed with the deletion.

---

- 4 Choose **Yes** to perform the software deletion or **No** to cancel the software deletion

END OF STEPS

---



## Back Up NE Data

---

**When to use** Use this procedure to back up an NE's provisioning data. The provisioning data includes port parameters and cross-connections.

**Related information** For related information, see Chapter 13, "Software upgrade concepts", "NE data backup" (13-15).

**Before you begin** Before you begin this task, determine the NE for which you want to perform a backup. Ensure that there are no alarms present on the NE. You must access the Map window to perform this function.

**Instructions** Complete the following steps to perform an NE backup.

---

- 1 Select **Configuration** → **Software Management** → **Backup** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double click on the desired NE and click the **OK** button.

**Result:**

A pop-up window is displayed, indicating how long the backup process will take and asking if you want to proceed with the backup.

---

- 3 Choose **Yes** to perform the NE backup or **No** to cancel the NE backup

END OF STEPS

---



## Restore NE Data

---

**When to use** Use this procedure to restore NE provisioning data from a specified backup file. You can specify the type of provisioning data to be restored. You have the option of performing a Regular Restore or an Intelligent Restore. A Regular Restore restores all backup data from the selected NE file, including the default settings. For an Intelligent Restore, the system compares each parameter setting from the backup file against its default value. If the current setting matches the default value, that parameter is excluded from the restore. If all parameters on a given command issued during the restore request matches the defaults, that command is skipped during the restore process. Only parameters that do not currently have default settings are set, thus reducing the amount of time it takes to restore the NE's backup data.

**Related information** For related information, see Chapter 13, "Software upgrade concepts", "NE data restore" (13-17).

**Before you begin** Before you begin this task, determine the NE to which you want to restore data. You must access the Map window to perform this function.

**Instructions** Complete the following steps to restore an NE's backup data.

---

- 1 Select **Configuration** → **Software Management** → **Restore** → **Regular Restore** or **Intelligent Restore** from the main menu bar on the Map window.

**Result:**

The **Choose an NE** window is displayed.

---

- 2 Double click on the desired NE and click the **OK** button.

**Result:**

The **Restore – Select Backup File** window is displayed.

---

- 3 Select a backup file for restoral. To look at a description of the backup data contained in the file before restoring it, click the **View Descriptive Files** button.
- 

- 4 Click the **OK** button.

**Result:**

The restore process is started. As part of the restore process, the system performs several validation checks, comparing the software release, equipment, and switch settable parameters in the backup file with the current NE values. If there are discrepancies, a pop-up window is displayed with an error message asking if you want to continue with the restore.

---

- 5 Choose **Yes** to perform the NE restore anyway or **No** to cancel the NE restore.
- 

- 6 If you respond **Yes** to perform the restore anyway the system continues with the restore.

**Result:**

A pop-up message window is displayed, informing you that the restore may take a long time and asking if you want to proceed with the restore.

---

- 7 Choose **Yes** to perform the NE restore or **No** to cancel the NE restore

**Result:**

If you respond **Yes** to perform the restore the restore is initiated. The system informs you of the restore's progress with a status message. When the restore is completed, an information window appears that notifies you of the completion. If the restore fails, an error message is displayed in a pop-up window, indicating the source of the problem.

END OF STEPS

---





# 8 Management communication setup concepts

## Overview

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**Purpose** This chapter deals with the basic theoretical background of Data Communication Networks (DCNs) and provides DCN configuration guidelines for WaveStar® TDM 10G (STM-64) systems.

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## Basic DCN principles

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**Overview** This subsection serves as an entry point, it describes the basic DCN principles. The following subsection describes common DCN configurations. DCN configuration guidelines for WaveStar® products, NSAP address formats and other related information are provided thereafter.

### Purpose of a Data Communication Network

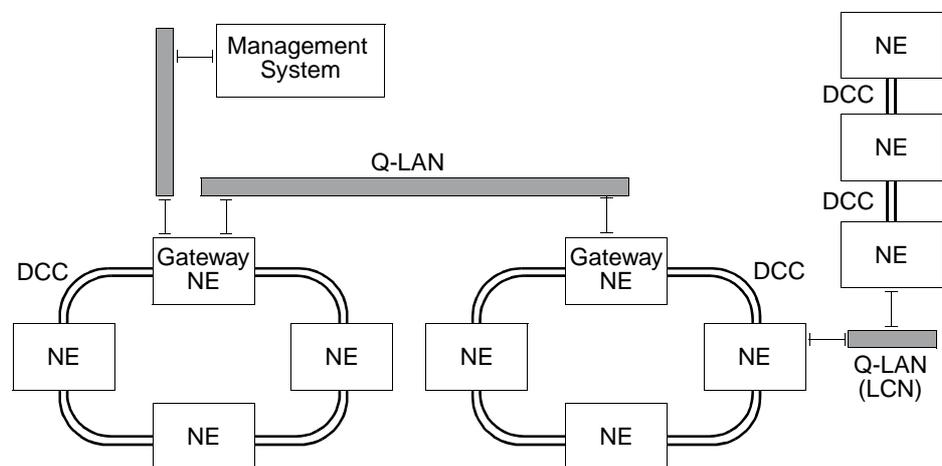
A Data Communication Network (DCN) is used for the exchange of management data. This section provides an overview of the Data Communication Network and describes the type of communication between the nodes in the network and the used protocols.

### SDH management network

The SDH management network is an overlay network of the transmission network. A management system and the network elements together are the nodes of this network. The Q-LAN and Data Communication Channels (DCCs; cf. “Data Communication Channels” (8-19)) provide the physical connection between the nodes.

### DCN physical components

The following figure illustrates an OSI-DCN. The illustration only gives the physical components and connections in the DCN, it does not give the logical configuration.



The illustration of the OSI-DCN consists of 2 Q-LANs and a number of Data Communication Channels (DCCs) in an SDH transmission network (point-to-point configuration and two ring configurations shown), with a management system (Element Management System (EMS) or Craft Terminal) connected to it. The management system is connected to the transmission network via gateway network elements (GNEs) and the Q-LAN. The network elements are connected to each other by DCCs.

In the case where there is no DCC connectivity between nodes (see the right part of the illustration), a Local Communication Network (LCN) can be used to connect the nodes to each other.

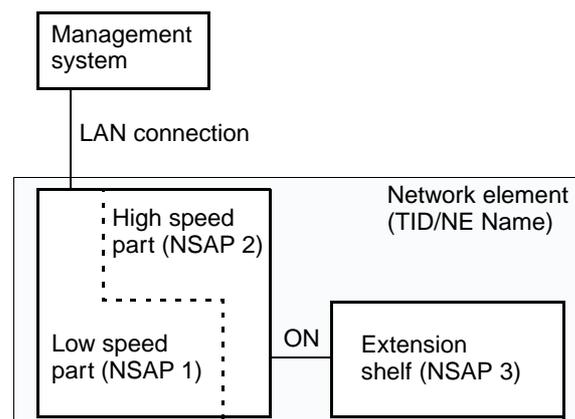
### “NE” versus “Node”

A distinction has to be made between network elements and nodes. Network elements can be identified by their target identifier (TID), i.e. their NE name, whereas a node is identified by its Network Service Access Point (NSAP) address. Each NSAP address within a network constitutes a node which can individually be addressed.

**Important!** “NE name” and “TID” are used synonymously throughout this Provisioning Guide. A WaveStar® TDM 10G (STM-64) network element has exactly one TID but up to three NSAP addresses.

### Example Distinction between NE and node:

A WaveStar® TDM 10G (STM-64) network element consisting of a main shelf (with high speed part and low speed part) and an extension shelf comprises three nodes since each single part of the NE has its own DCC controller (ADJCTL/DCC32EI), i.e. its own NSAP address.



### DCN protocols

The Protocols used in the DCN between the nodes include:

- Media access protocols:
  - Ethernet on the Q-LAN
  - LAPD on the DCCs
- OSI network routing protocol (DCN wide)
 

The OSI network routing protocol (OSI-DCN) is used for routing management data between nodes in the DCN.

- ISO-OSI network protocols** The network protocols used between nodes are the ISO-OSI network protocols:
- Connectionless Network Service/Connectionless Network Protocol (CLNS/CLNP) acc. to ISO 8473,
  - ES-IS routing protocol acc. to ISO 9542,
  - IS-IS routing protocol acc. to ISO 10589.
- According to these protocols a node in the network can behave as an end system (ES) or as an intermediate system (IS, sometimes also called a router).
- End systems** Nodes behaving as end systems perform no forwarding of data packets. They communicate with each other on an end-to-end basis via intermediate systems.
- End systems (ESs) periodically generate ES Hellos (ESHs) to announce their presence. These ESHs are received and recorded by neighboring intermediate systems. The interval between two ESHs is determined by the End System Configuration Timer (ESCT).
- Intermediate systems** Intermediate systems (ISs) are used for routing data between nodes and networks or parts of a network. The end system to intermediate system protocol (ES-IS protocol) is responsible for the exchange of data between an end system and an intermediate system. A network element can act both as an end system as well as an intermediate system. However, a management system, for example, can only act as an end system.
- Comparable to ESs, ISs periodically generate IS Hellos (ISHs). The interval between two ISHs is determined by the Intermediate System Configuration Timer (ISCT).
- ES - IS protocol** The end system to intermediate system protocol (ES-IS protocol) provides information to ISs on the existence of ESs within an area. This information is sent periodically to the ISs via a broadcast mechanism. The ES-IS protocol permits ESs to discover the existence and reachability of ISs and vice versa. Furthermore, the ES-IS protocol provides information to ISs supporting the computation of the shortest path first (SPF) algorithm. WaveStar® products make use of the ES-IS protocol acc. to ISO 9542.

- IS - IS protocol** The intermediate system to intermediate system protocol (IS-IS protocol) is used between intermediate systems in the DCN. The IS-IS protocol maintains the IS Routing Information Base (RIB). The information in the RIB is used by the SPF algorithm for the routing of management data packets in the DCN by the intermediate systems. WaveStar® products make use of the IS-IS protocol acc. to ISO 10589.
- Routing information base and LSPs** Each Routing Information Base comprises a number of routing tables containing information on NSAP addresses of nodes in the network and ports of the IS through which these nodes can be reached.
- Intermediate systems exchange routing information regularly with one another as part of the IS-IS protocol by the use of Link State PDUs (Link State Protocol Data Units, LSPs). A Link State PDU contains information about the node itself, about its neighboring ES nodes, and about its neighboring IS nodes.
- LSPs exchanged within a level 1 area are called L1-LSPs, LSPs exchanged across level 2 areas are called L2-LSPs.
- OSI routing map and OSI neighbor map** The *OSI Routing Map* and the *OSI Neighbor Map* information that can be retrieved by using the WaveStar® SNMS is derived from a node's internal routing tables and the LSP databases. The LSP database contents are equal in all nodes within an area (distributed database concept).
- Please note that when a DCC controller (ADJCTL/DCC32EI) is restarted then the LSP databases and the internal routing tables may temporarily contain inconsistent information. As a consequence, the information displayed in the *OSI Routing Map* and the *OSI Neighbor Map* may also be inconsistent. After the DCC controller restart has finished Link State PDUs are exchanged to resynchronise the databases.
- Management protocol: TL1** The management of WaveStar® products is based on the use of the Transaction Language 1 (TL1, defined by Telcordia Technologies, formerly Bellcore, standards) on the OSI application layer.
- Please also refer to the WaveStar® TDM 10G (STM-64) *TL1 Reference Manual*.

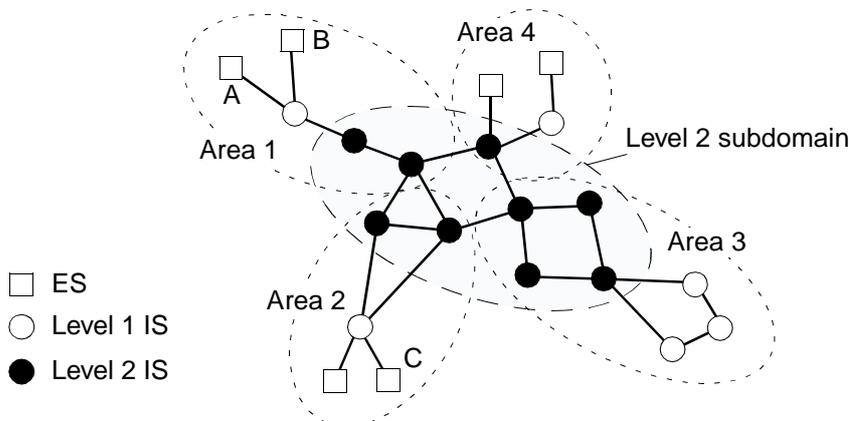
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## DCN configurations

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<b>Hierarchical routing</b>	Hierarchical routing is used for large networks when the number of NSAP entries in the RIB databases of the intermediate systems becomes too large. When this happens, it causes an exponential increase of exchanged LSPs between intermediate systems. This in turn causes the performance of the DCN to decrease due to the computation of the shortest path first (SPF) algorithm.
<b>Definition of hierarchical routing</b>	In hierarchical routing, the addressing domain of the DCN is divided into a number of areas. Each area is assigned a unique area identifier. The value of the area identifier of the NSAP address of each node is set according to which area a node belongs to (cf. "NSAP address format" (8-15)).
<b>Level 1 IS and level 2 IS</b>	Each area contains a number of end systems as well as level 1 and level 2 intermediate systems. level 1 intermediate systems (level 1 ISs) provide interconnectivity between nodes in an area. level 2 intermediate systems (level 2 ISs) provide interconnectivity between areas.
<b>Level 2 subdomain</b>	The adjacent set of level 2 ISs is also referred to as the level 2 subdomain. All areas in a network are connected via the level 2 subdomain
<b>Area-divisioning of a DCN</b>	<p>Divisioning is configuring the DCN in such a way that the exchange of LSPs between intermediate systems is limited.</p> <p>When networks are divisioned into areas, the RIB databases in the systems are much smaller and hence the routing overhead is significantly reduced. Intermediate systems in an area only exchange information (L1-LSPs) on nodes with other systems in their own area. Information on other areas is exchanged by level 2 ISs only and maintained by the level 2 ISs of the area.</p> <p>In this way, the load of management data in the network is strongly reduced, while keeping the dynamic re-routing capabilities of intermediate systems in case of failures intact. It is important to notice that although the DCN is divided into areas, ES-ES communication between all nodes in the DCN is still possible.</p>
<b>Area-divisioning of a DCN illustration</b>	The following figure illustrates how a network can be divisioned into areas, connected by level 2 ISs. Each area has at least one level 2 IS

assigned and can have a number of level 1 intermediate systems and end systems.



### Divisioning at network protocol level

Divisioning of the DCN is usually done at the network protocol level. Communication between intermediate systems is disabled or enabled using different techniques, but this does not necessarily have to affect the physical DCN topology. The SDH transmission network should in general not be affected by DCN engineering.

### Example: Routing of management data

Suppose a node “A” wants to send messages to another node. If this node is in the same area (determined by means of the area identifier of the node’s NSAP address), the messages from “A” to this particular node (“B” in “Area-divisioning of a DCN illustration” (8-7)) are routed directly using a level 1 intermediate system.

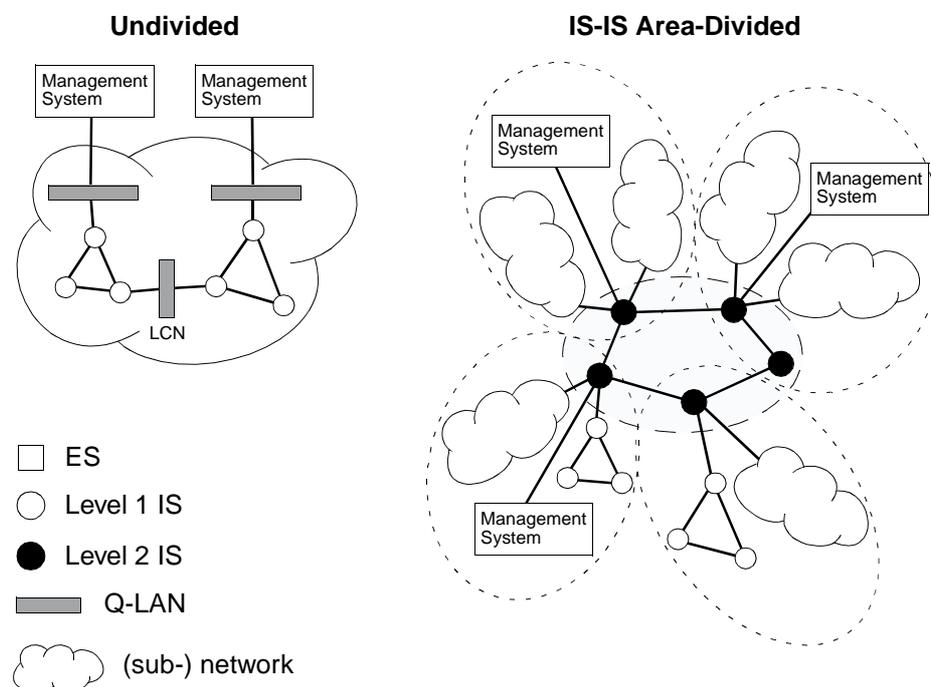
Alternatively, if the desired destination is in a different area (“C” in “Area-divisioning of a DCN illustration” (8-7)), the messages are sent to a second, higher level (level 2) intermediate system. This level 2 IS routes the messages coming from node “A” to other level 2 ISs until they reach a level 2 intermediate system attached to the destination area of “C”. From there the messages are routed to “C” within the area using one or more level 1 ISs.

### Types of OSI-DCN networks

In general the OSI-DCN network can be classified in two types:

- Undivided DCN, or
- IS-IS area-divided DCN.

These two types of OSI-DCN network are illustrated in the following figure.



### Undivided DCN

An undivided DCN consists of a single area. There is no division between the nodes on network protocol level. All nodes in the network and especially the intermediate systems can exchange routing information with each other. Although a network element can only be managed by one management system at a time, the IS-IS protocol is running between all nodes in the network. This leads to the exchange of LSPs between all intermediate systems in the network.

### IS-IS area-divided DCN

The divisioning of the DCN into areas can be accomplished by introducing level 2 intermediate systems (cf. “Area-divisioning of a DCN” (8-6)).

Advantages of areas

Among others, areas have the following advantages:

- Management systems can be connected to any point in the DCN. As a rule, management systems should be connected to the backbone of the DCN, i.e. to a level 2 intermediate system in the center of their management domain, to prevent them from being overloaded with too much data in the case of a failure resulting in re-routing data traffic.
- The exchange of data is still possible between *all* nodes in the DCN (cf. “Example: Routing of management data” (8-7)).

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## DCN configuration guidelines

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**Background information** Please refer to “Basic DCN principles” (8-2) and to “DCN configurations” (8-6). These two sections provide theoretical background information on data communication networks.

- Guidelines** Please observe the following engineering guidelines when configuring a DCN with WaveStar® TDM 10G (STM-64) systems involved:
- A maximum of 50 nodes (i.e. NSAP addresses) is supported in an area.  
Notice that a WaveStar® TDM 10G (STM-64) network element may *comprise up to three nodes* (please refer to ““NE” versus “Node”” (8-3)).
  - A maximum of 50 areas is supported in a subnetwork.
  - All nodes in an area must have the same area address (cf. “ISO-DCC NSAP address format” (8-15)).
  - All nodes in an area must have DCC connectivity *within the area* to all other nodes in the same area.
  - At least one level 2 IS is required per area in area-divided DCNs for communication across area boundaries. Two level 2 ISs are recommended in each area for DCC communications redundancy to/from each area.
  - All level 2 ISs must have DCC connectivity, either directly or indirectly via other level 2 ISs, to all other level 2 ISs in the subnetwork to form a single level 2 subdomain that provides connectivity to all areas.
  - To distribute the load of management data in a subnetwork, it is recommended, when feasible, but not required that:
    - all area sizes be approximately the same,
    - and the number of level 2 ISs be about the same as the average area size.

For example, a perfectly balanced subnetwork of 200 nodes would include 20 nodes per area in each of 10 areas and 20 level 2 ISs in the level 2 subdomain (two level 2 ISs per area).

**Related information** Please refer to “NSAP address format” (8-15) and to “Data Communication Channels” (8-19) for further information.

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## DCN protocols and services

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### Overview

WaveStar® TDM 10G (STM-64) network elements support the exchange of management information over DCC, OSI LAN, or TCP/IP. This network operations capability uses the section DCC bytes in the SDH overhead of the optical signals. *WaveStar®* CIT dialogues and OS messages are transmitted in these DCC bytes.

The WaveStar® TDM 10G (STM-64) OS interface is accessed through one of the 10BaseT Ethernet IAO LAN rear panel connectors. The WaveStar® TDM 10G (STM-64) interface supports Transaction Language 1 (TL1) for commands/messages, and File Transfer and Access Management (FTAM) for software downloads and provisionable data backup and restore.

The WaveStar® TDM 10G (STM-64) OS interfaces supported include the following:

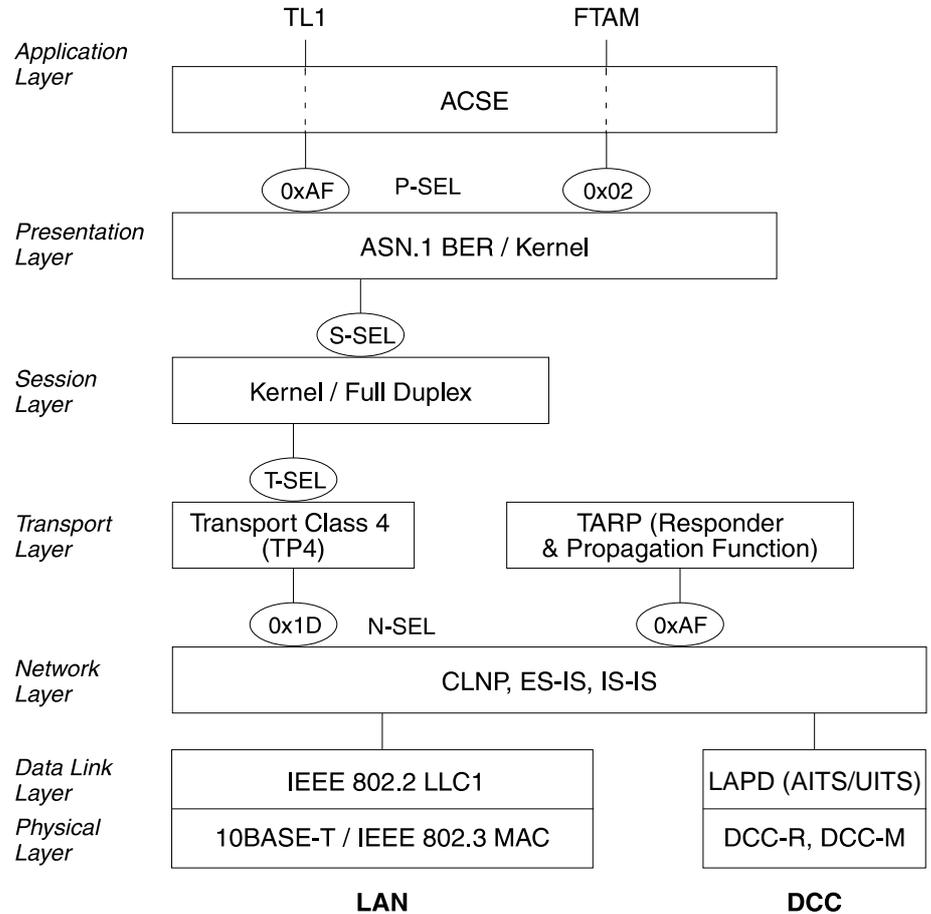
- OSI LAN/WAN
- TL1 TCP/IP (using the internal gateway function)
- FTP/FTAM (for software download, etc.)

### Standard 7-layer OSI stack

WaveStar® TDM 10G (STM-64) network elements support the exchange of management information over the standard 7-layer OSI protocol stack over Local Area Networks (LAN) and over Data Communication Channels (DCC) acc. to the Telcordia Technologies (formerly Bellcore) GR-253 standard.

**Protocols and services**

The following figure shows how WaveStar® TDM 10G (STM-64) network elements support the protocols and services.



**FTAM** File Transfer, Access and Management (FTAM), defined by ISO 8571, is an Application Service Element (ASE). FTAM facilitates file transfer and allows file manipulation across a network. The FTAM protocol is used for WaveStar® TDM 10G (STM-64) software management purposes, such as software download, backup or restoration.

**IAO LAN access**

The IAO LAN serves two main purposes:

- It provides a standard means of connecting a network element to a central office (CO) data communications network (DCN) to provide OS access
- It provides an alternate path for data communications channel (DCC) communications to travel within a subnetwork.

The WaveStar® TDM 10G (STM-64) IAO LAN is internally connected to the DCC subnetwork so that operations messages on the IAO LAN can be seamlessly delivered to a remote network element by the DCC and vice-versa (DCC to IAO LAN).

### Internal IAO LAN hub

The system supports an internal 4-port 10BaseT Ethernet IAO LAN hub (located on the ADJCTL/DCCEI circuit pack in each shelf). The WaveStar® TDM 2.5G/10G (2-Fiber) 10BaseT Ethernet IAO LAN backplane connectors and the *WaveStar* CIT port on the user panel are all connected to this internal hub. The internal LAN hub supports direct connection of the *WaveStar* CIT (or NCC or SNMS) without requiring an external LAN hub.

### Daisy chain

The internal IAO LAN hub also supports daisy-chaining of multiple WaveStar® TDM 10G (STM-64) shelves, for example, in the same bay. A daisy-chain connection is similar to a null-modem connection. Reference is made to a 10BaseT connection where there is no hub. In this connection, the receive pair on one end of the cable is connected to the transmit pair on the opposite end. Conversely, the transmit pair on one end is connected to the receive pair on the opposite end.

**Important!** A daisy-chain connection can only be repeated five times. A preferred connection would go through an external office LAN hub.

### TL1 over TCP/IP

A TL1 TCP/IP gateway may be used to connect multiple collocated WaveStar® TDM 10G (STM-64) systems to a remote OS equipped to communicate through a TCP/IP WAN. Since the OS communicates through TCP/IP, a gateway is required to provide a mapping between TCP/IP and OSI. That gateway function is included as a feature of the WaveStar® TDM 10G (STM-64) system.

The gateway is provisioned to provide a TL1 TCP/IP gateway between TCP/IP and OSI. This process is bidirectional, mapping messages originating in the OS to the proper NE NSAP, as well as mapping messages originating in the NE to the proper OS IP address and returning them to the OS.

This interface supports TL1 messages only.

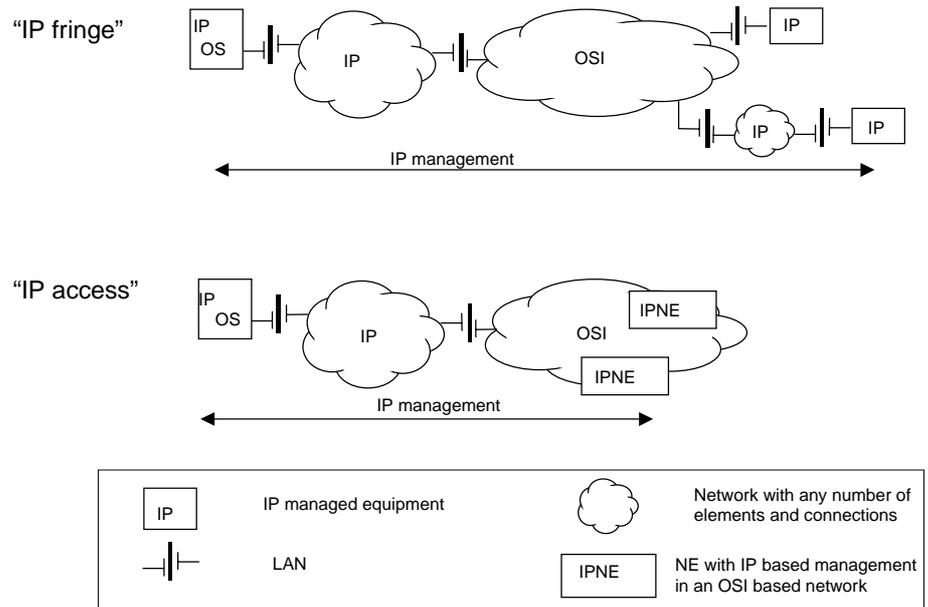
### IP tunneling

The IP tunneling feature provides a way to

- manage IP managed devices (e.g. SNMP) through the OSI based DCN network (called "IP fringe"),
- manage NEs in an OSI based DCN via an IP based access network, using IP based protocols like FTP and SNMP (called "IP access").

In both cases it is necessary to transport IP messages through an OSI based network.

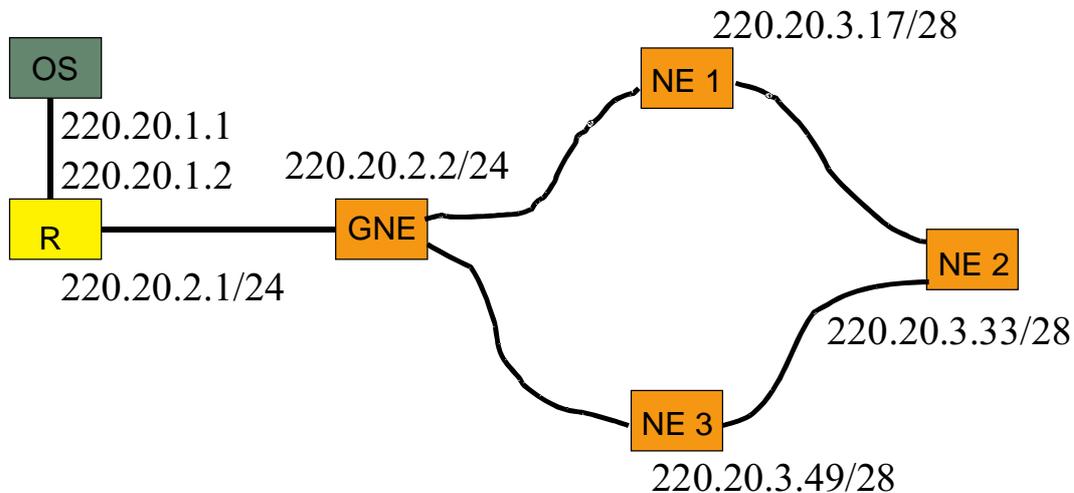
The figure below shows the "IP fringe" and "IP access" topologies:



A (bidirectional) tunnel can be seen as a set of two static routing entries in nodes of the OSI network. The term tunnel may be misleading because it is often associated with connections which must be set up in advance. In this case, only some routing information needs to be provisioned and no communication between two systems is needed to set up the "tunnel" between them. To avoid confusion, it is better to speak of encapsulation and to think of the OSI network as an NBMA (non broadcast multiple access) subnetwork within the IP network. The NEs need to be configured with one IP address on the LAN side, connected to the IP subnet with the IP NE or the IP NEs. The LAN can be used for both OSI and IP traffic. The same ethernet address will be used for both protocols.

In the figure below, a simple example of an "IP access" network is given. OS is the operations system (IP based), R is an IP router, GNE

is a Gateway Network Element (any NE supporting IP tunneling can fulfill this role)



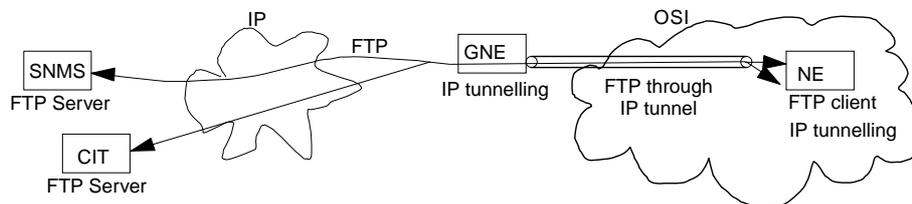
**IP tunneling for FTP access**

WaveStar® TDM 10G (STM-64) supports IP Tunneling as a means of enabling file transfers from TCP/IP networks across the OSI network to terminating NEs. The tunneling encapsulates the TCP/IP message and protocol in an OSI envelope. The receiving unit can then regain the TCP/IP protocol as well as the message.

File transfer between manager and NE is used for two purposes:

- Software download, to upgrade the software of a network element.
- Configuration backup and restore, to make copies of the configuration of an NE so that the status can be restored after a crash.

The following figure illustrates the IP tunneling for FTP access.



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## NSAP address format

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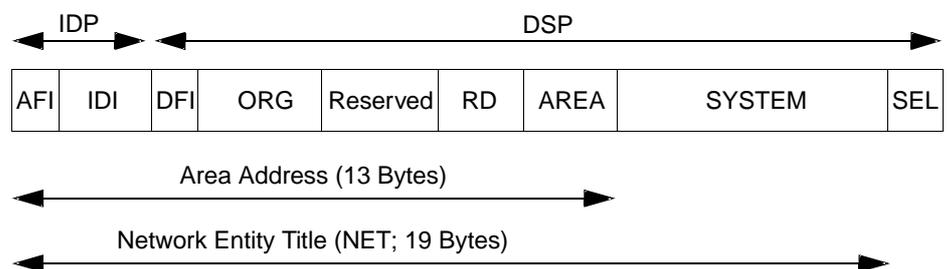
**Related information** Please refer to “Basic DCN principles” (8-2) and to “DCN configurations” (8-6). These two sections provide theoretical background information on Data Communication Networks.

For related task oriented procedures, please refer to Chapter 1, “Management communication setup”.

**NSAP address** The Network Service Access Point (NSAP) address is used by the network protocol for location information. The NSAP address of a node is its DCN wide identifier which uniquely identifies the node in the network.

**ISO-DCC NSAP address format** Although different NSAP formats exist, preferably all nodes in a network should use the same address structure. The WaveStar® TDM 10G (STM-64) supports the 20-byte ISO Data Country Code (DCC) NSAP address format in accordance with ISO 8348.

The structure of the ISO-DCC NSAP address format is shown in the following figure.



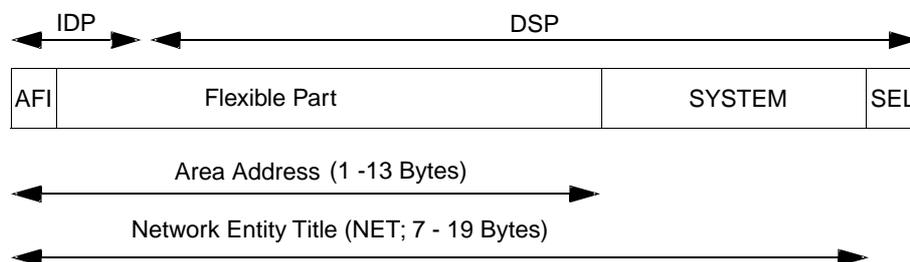
The NSAP address consists of the Initial Domain Part (IDP) and the Domain Specific Part (DSP).

The first 13 bytes (“AFI” to “AREA” fields) of the NSAP address make up the area address.

The meaning of the individual fields of the ISO-DCC NSAP address is explained in “NSAP address fields” (8-16).

**Flexible NSAP address format** Alternatively to the ISO-DCC NSAP address format the flexible NSAP address format can be used.

The structure of the flexible NSAP address format is shown in the following figure.



The flexible NSAP address format has an Area Address part consisting of the AFI part and a flexible part of 12 bytes length (the contents of this part can carry). Notice that the flexible NSAP address format can be used to derive the other formats.

**NSAP address fields**

The following table lists the NSAP address fields and describes their meaning.

Field	Meaning	Description
<i>Initial Domain Part (IDP):</i>		
AFI	Authority and Format Identifier specifying the NSAP address format.	The predefined value is 0x39 (hex.), indicating that the ISO Data Country Code (ISO-DCC) is the address format.  This field is configurable.
IDI	Initial Domain Identifier specifying the country code.	The predefined value is 0x840F (hex.).  This field is configurable.
<i>Domain Specific Part (DSP):</i>		
DFI	DSP Format Identifier specifying the DSP format.	The predefined value is 0x80 (hex.).  This field is configurable.
ORG	Organization identifier (or Operator identifier) representing the Network Service Provider (NSP).	The predefined value is 0x000000 (hex.).  This field is configurable.
Reserved	Reserved portion of the NSAP.	The predefined value is 0x0000 (hex.).  This field is configurable.

Field	Meaning	Description
RD	Routing Domain	The predefined value is 0x0000 (hex.). This field is configurable.
AREA	Area identifier indicating the routing area to which a node belongs (cf. “Hierarchical routing” (8-6)).	The predefined value is 0x0000 (hex.). This field is configurable.
SYSTEM	System identifier representing the node. The IEEE 802.3 MAC address, stored on the DCC controller (ADJCTL/DCCEI circuit pack) during the manufacturing process, is used as the system identifier.	The system identifier is the field that makes the NSAP address unique throughout the DCN. This field is <i>not configurable</i> . When a new DCC controller is inserted, then the system identifier, and so the NSAP address, automatically changes.
SEL	The selector field is used to direct the Protocol Data Units (PDUs) to the correct destination making use of the CLNP network layer service.	The predefined value is: <ul style="list-style-type: none"> <li>• 0x1D (hex.) for PDUs to be processed via the OSI stack</li> <li>• 0xAF (hex.) for PDUs to be processed via the TID Address Resolution Protocol (TARP cf. “Name-to-address translation” (8-26)).</li> </ul> This field is <i>not configurable</i> .

**Network entity title** The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (NET; cf. “ISO-DCC NSAP address format” (8-15)).

**DCC controller reset** All parameters related to DCC communication including all fields of the NSAP address are retained over a DCC controller reset. All parameters are kept in non-volatile memory.

**Configuring the NSAP address** You can configure the NSAP address on each active DCC controller individually.

**Important!** Changing the NSAP address causes the DCC controller to be restarted, thus causing momentary loss of communication with the system via that circuit pack.

**Additional information** For information on how to change the configurable fields of the network element's NSAP address, please refer to "Modify a Network Element" (1-9).

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## Data Communication Channels

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### Exchange of network management information

Network management information can be exchanged between SDH network elements via Data Communication Channels (DCCs) using the D1-D12 Section Overhead (SOH) bytes of the first STM-1 frame within an STM transmission signal.

This makes it possible to set up a Data Communication Network (DCN; cf. “Basic DCN principles” (8-2)) which uses SDH connections for exchanging network management data.

Please note that all nodes in an area must have DCC connectivity *within the area* to all other nodes in the same area (cf. “DCN configuration guidelines” (8-9)).

The DCC uses OSI protocols. IP traffic is carried on the DCC by encapsulating it in CLNP PDUs.

### DCC-R (Section DCC)

The Regenerator Section Data Communication Channel (DCC-R or Section DCC) makes use of the RSOH bytes D1-D3 thus providing a transmission channel with a capacity of 192 kbit/s. The DCC-R is automatically set as the default DCC for provisioned (configured) or pre-provisioned optical interface ports.

### DCC-M (Line DCC)

The Multiplex Section Data Communication Channel (DCC-M or Line DCC) uses the MSOH bytes D4-D12 thus providing a transmission channel with a capacity of 576 kbit/s.

### Supported Data Communication Channels

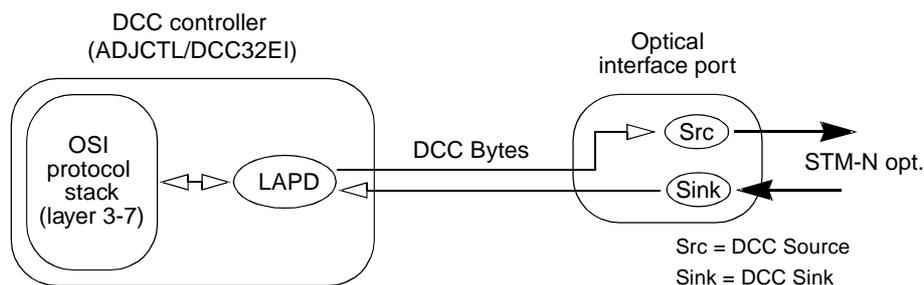
The Data Communication Channels are supported for the following optical interfaces:

- STM-1
- STM-4
- STM-16
- STM-64

### Termination of Data Communication Channels

The WaveStar® TDM 10G (STM-64) system supports the 7-layer OSI protocol stack over the DCC links which terminate on the DCC controller (ADJCTL/DCC32EI). The ADJCTL/DCC32EI circuit pack provides the source and sink of the DCC bytes to and from the active DCC links via LAPD devices. The LAPD protocol acc. to ITU-T Rec. Q.921 is used. You can define DCC links by assigning DCC terminations to optical interface ports.

The following figure illustrates the functional principle.



### Max. number of active DCC links

The maximum number of simultaneously supported LAPD channels per DCC controller is 32. Each DCC controller thus can support up to 32 active DCC links. Upon circuit pack insertion, DCCs will automatically be enabled and a LAPD channel assigned as long as LAPD channels are available.

### DCC provisioned state

A Data Communication Channel (either DCC-R or DCC-M) can be in one of the following provisioned states:

- **Enabled**
  - The corresponding DCC bytes are associated to an optical interface port.
  - The DCC is assigned a LAPD channel.
- **Disabled**
  - The corresponding DCC bytes are no longer associated to an optical interface port.
  - The DCC is no longer accessed by a LAPD channel.

The provisioned state of a DCC as well as the LAPD channel assignments are persistent over a DCC controller or NE reset.

### No DCC protection switching!

The WaveStar® TDM 10G (STM-64) system does not support DCC protection switching. However, the system allows for protection switching of the DCC overhead bytes with the optical interfaces on which they reside. If no protection of the optical interface is provisioned, then the DCC bytes are unprotected as well.

### Mandatory DCC access for MS-SPRing

When an MS-SPRing protection group is created and the MS-SPRing management mode is “automatic discovery”, then two DCCs must be **enabled** (one for the east and one for the west port), and each of the DCCs must be assigned a LAPD channel; otherwise the creation of the MS-SPRing protection group will fail due to insufficient resources (LAPD channels).

**Important!** The following has to be observed:

1. Data Communication Channels used for MS-SPRing management cannot be disabled as long as the MS-SPRing protection group exists and the MS-SPRing management mode is “automatic discovery”.
2. If the neighboring node in an SDH MS-SPRing is an ADM-16/1, then you must enable the DCC-M on the side connected to the ADM-16/1.

### **Enabling of DCCs**

A Data Communication Channel can be enabled in either of the following ways, always provided that the required number of LAPD channels is available:

- Automatically upon circuit pack initialization  
When a port unit is initialized (e.g. after circuit pack insertion) the DCC-R will be enabled for each port provided that the required number of LAPD channels is available.
- Automatically upon creation of a protection group
- Manually by user provisioning  
Please refer to “Modify a Network Element” (1-9).

A DCC will be successfully enabled if an LAPD channel exists that

- can be assigned to this DCC in the unprotected mode, or
- can be shared with this DCC in a protected mode.  
A DCC channel with its own LAPD channel when in the unprotected mode, can share its LAPD channel when in the 1+1, 1:1 or 1:N protection mode.

### **DCC pre-provisioning**

A DCC can be pre-provisioned to be enabled for a provisioned or pre-provisioned optical interface port even if the DCC controller or port is not physically equipped.

### **Disabling of DCCs**

A Data Communication Channel can be disabled in either of the following ways:

- Automatically when an optical interface port is de-provisioned  
When an optical interface port is provisioned to be removed (de-provisioned), then all enabled DCCs will be disabled, and the corresponding LAPD channels will be released.
- Manually by user provisioning  
Please refer to “Modify a Network Element” (1-9).

**Important!** Disabling a previously enabled DCC at a local NE needs to be coordinated with disabling the same DCC at the opposite end of

the DCC link (remote NE) to avoid persistent communications alarms from the remote NE.

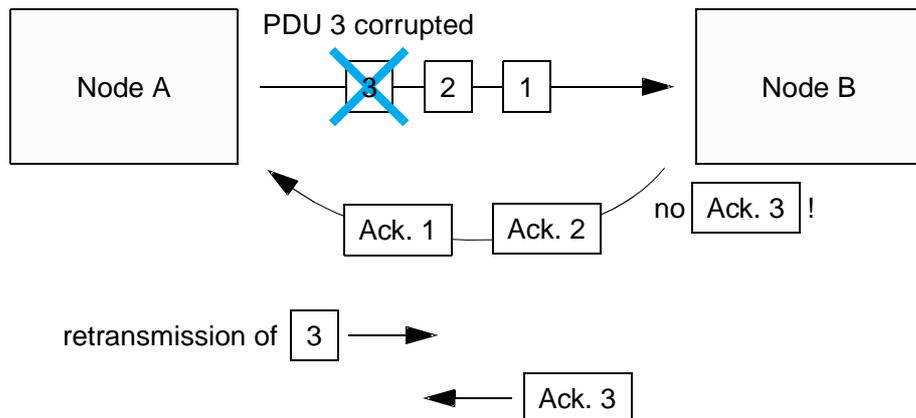
- LAPD mode** The LAPD protocol, which controls communication between the network elements, operates in either of the following modes:
- **Network Side**  
The LAPD is assigned as Network. This mode is according to the standards and will interoperate successfully with other LAPDs operating in user\_side mode.
  - **User Side**  
The LAPD is assigned as User. This mode is according to the standards and will interoperate successfully with other LAPDs operating in network\_side mode.

**Important!** The DCCs work according to the master/slave principle, i.e. the LAPD modes of two interconnected SDH ports must be set different. A corresponding “User-Network Side Failure” alarm will be generated if the LAPD mode is the same at both ends of a DCC.

- AIMS and UITS supported** WaveStar® TDM 10G (STM-64) network elements support the Acknowledged Information Transfer Service (AIMS) and the Unacknowledged Information Transfer Service (UITS) as the basis for the LAPD protocol with the AIMS mode being the default mode of operation.

- AIMS and UITS functional principles** In the LAPD protocol, all PDUs are sent with a checksum to verify that the data was not corrupted in transmission over the DCC link. If a PDU is received with a bad checksum, it is not acknowledged and will be resent:
- In the **Unacknowledged Information Transfer Service** (UITS) corrupted PDUs are ignored and no further actions taken. Upper layers of the OSI stack are responsible for recovery actions.
  - In the **Acknowledged Information Transfer Service** (AIMS) PDUs are numbered and transmitted sequentially, and acknowledgement PDUs are sent back from the receiver to the sender. If a PDU is lost, that is, if the sender gets no acknowledgement, the PDU is retransmitted.

The following figure illustrates the functional principle of the AITS.



**Routing metric** The shortest path first (SPF) algorithm calculates the preferred route between two nodes based on the cost of a route. The cost of a route is described by a single dimensionless routing metric.

The WaveStar® TDM 10G (STM-64) system makes use of the default routing metric as defined in ISO 10589.

□

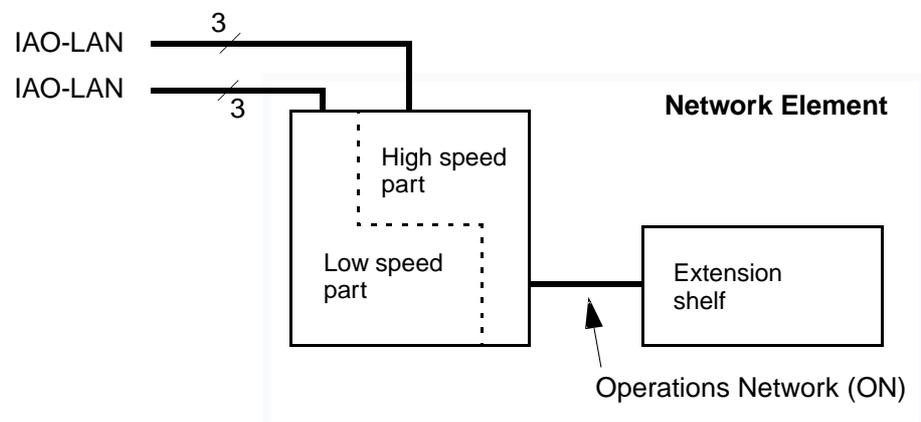
## LAN access

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**Internal LAN** Individual parts of a WaveStar® TDM 10G (STM-64) network element are interconnected via an internal LAN, the so-called Operations Network (ON), for the purpose of exchanging management information.

**External LAN access** Both the low-speed part and the high-speed part of the main shelf facilitate the access to an external LAN, the so-called Intraoffice LAN (IAO-LAN), by means of three 10-BaseT Ethernet interfaces on 4-wire RJ-45 connectors.

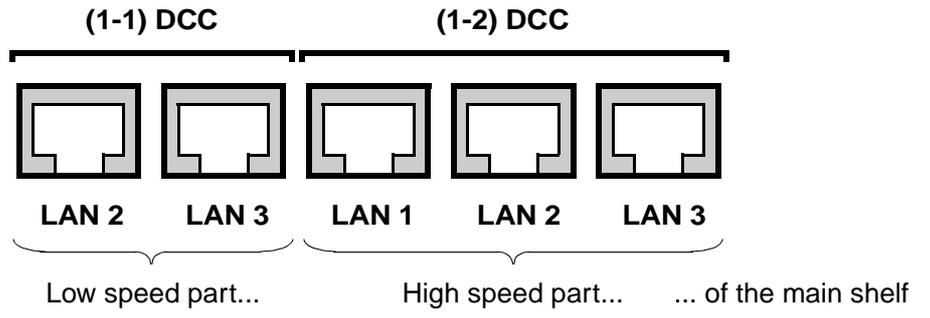
The following figure illustrates the WaveStar® TDM 10G (STM-64) LAN connections.



**Intraoffice LAN** The Intraoffice LAN (IAO LAN) is an IEEE 802.3 CSMA/CD (Carrier Sense Multiple Access with Collision Detection) type LAN at a data rate of 10 Mbit/s and a baseband signalling type. It is used to connect other NEs in the same office which do not have optical connectivity to the WaveStar® TDM 10G (STM-64) network, or to connect management systems.

**LAN connectors** The RJ-45 LAN connectors are located on the User Panel (connector labelled "CIT"; this is the LAN 1 interface of the low speed part of the main shelf) and on the LAN I/O-Panel at the rear.

The following figure illustrates the LAN I/O-panel.



## Name-to-address translation

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**Overview** The communication between WaveStar® TDM 10G (STM-64) network elements and their management systems, such as the WaveStar® SNMS, is established by using TL1 command messages.

A TL1 message addresses a network element by its “name”, also referred to as its target identifier (TID), whereas nodes within an OSI network are identified by their NSAP address. Hence a name-to-address translation becomes necessary.

**TARP** The TID Address Resolution Protocol (TARP) acc. to Telcordia Technologies (formerly Bellcore) GR-253 standard provides a means to perform the TID to NSAP address translation dynamically by means of TARP Protocol Data Units (TARP PDUs), originating from an end system such as the WaveStar® SNMS.

Three basic TARP functionalities can be distinguished:

- TARP originator functionality
- TARP propagation functionality
- TARP responder functionality

**TARP originator functionality** The TARP originator functionality means the ability to spontaneously originate a TARP PDU type 1, 2 or 5 query (cf. “Types of TARP PDUs” (8-27)) and broadcast it over the OSI network.

**TARP propagation functionality** The TARP propagation functionality means the ability to evaluate a received TARP PDU type 1, 2 or 5 query and to further broadcast it over the OSI network if the requested TID or NSAP address does not match the NE’s TID or NSAP address, and if the requested TID or NSAP address could not be found in the TARP Data Cache (TDC; cf. “TARP data cache” (8-27)).

A TARP propagator decrements the lifetime of a received TARP PDU by one and broadcasts the modified PDU to all of its network neighbors (with the exception of the previous PDU sender). When the TARP PDU lifetime becomes zero, then no further propagation takes place.

**TARP responder functionality.** The TARP responder functionality means the ability to respond to a TARP PDU type 1, 2 or 5 query via a type 3 response (cf. “Types of TARP PDUs” (8-27)).

**Types of TARP PDUs** The following table shows the five defined types of TARP PDUs.

Type	Characteristic	Description
1	Query	Given an NE name (TID), the corresponding NSAP address is requested (restricted to IS-IS level-1 area).
2	Query	Given an NE name (TID), the corresponding NSAP address is requested (IS-IS level-1 and 2 areas).
3	Response	Response to a TARP Query.
4	Autonomous notification	Autonomous notification of a TID or NSAP address change, or a reset indication.
5	Query	Given an NSAP address, the corresponding NE name (TID) is requested.

#### **Supported TARP functionality**

The WaveStar® SNMS supports the TARP originator functionality which is permanently enabled. WaveStar® TDM 10G (STM-64) network elements support the TARP propagation and TARP responder functionalities. These functionalities can be either enabled or disabled.

#### **Network services/protocols**

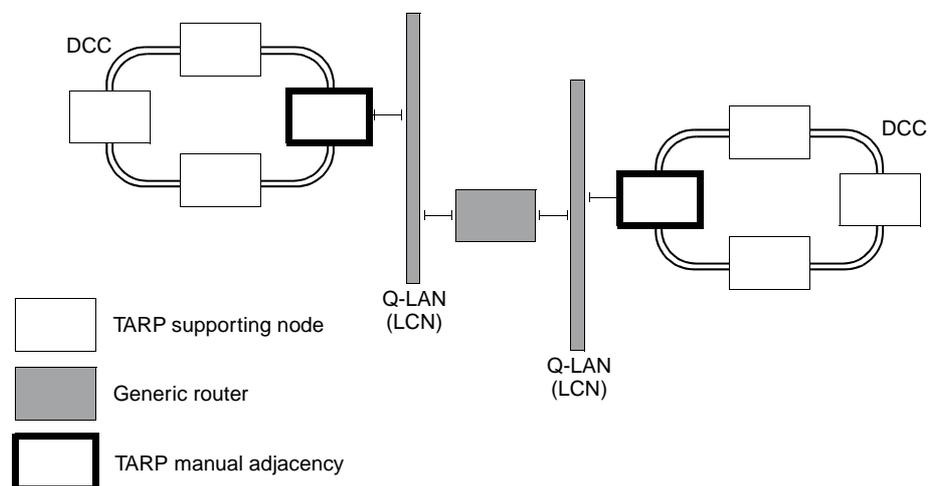
TARP depends on the network layer services and protocols provided by the Connectionless Network Service/Connectionless Network Protocol (CLNS/CLNP) and the ES-IS and IS-IS routing protocols (cf. “ISO-OSI network protocols” (8-4)) to obtain information about the network neighbors of an NE.

#### **TARP data cache**

A local database, the TARP Data Cache (TDC), is used in each NE to store information on the NE’s adjacencies, i.e. its direct neighbors in the network. Hence an NE may be able to respond to a TARP query, even if the requested TID or NSAP address does not match the NE’s own TID or NSAP address. Thus, the network performance can be enhanced.

**TARP manual adjacencies**

By using TARP manual adjacencies it is possible to route TARP PDUs over subnetworks which do not support the TARP functionality. However, a precondition is that the nodes within the non-TARP subnetwork are “generic routers”. A TARP manual adjacency is simply the Network Entity Title (NET; cf. “Network entity title” (8-17)) of a node that supports TARP.

**Loop detection**

WaveStar® TDM 10G (STM-64) nodes provide a loop detection mechanism to prevent a repeated processing of previously processed TARP PDUs. A loop detection buffer (LDB) in conjunction with an LDB entry timer and an LDB flush timer is used for this purpose. A previously processed and again received TARP PDU is discarded.

**Configuration of TARP parameters**

For information on the configuration of TARP parameters, please refer to the following procedures:

- “Configuring the TARP parameters for an NE” (1-27),
- “Assigning TARP manual adjacencies” (1-30).

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## NE name administration

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**Definition** **NE Name (TID)** The NE name, also referred to as the NE's target identifier (TID), is an alphanumeric string of up to 20 characters, used to uniquely identify a network element within the network. "NE name" and "TID" are used synonymously throughout this Provisioning Guide.

- Configuration rules** The following NE name configuration rules must be observed:
- The following characters are allowed in an NE name:
    - Upper case letters ('A' .. 'Z'),
    - Lower case letters ('a' .. 'z'),
    - Digits ('0' .. '9'),
    - Hyphen ("-").
  - Each NE name must be unique within the network.
  - Each NE name must be maximally 20 characters in length.
  - The NE name may contain segments separated by hyphens ("-"), but each segment must begin with a letter.

**Important!** NE names are case insensitive.

**Examples:**

The following are examples for valid and invalid NE names.

- "NE-A1", "CHICAGO7" or "NY-B3-C5" are valid NE names.
- "NE-01", "CHICAGO-7" or "NY-3-5" are invalid NE names.

**Changing the NE name** For information on how to change the NE name, please refer to "Modify a Network Element" (1-9).

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# 9 Equipment provisioning concepts

## Overview

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**Purpose** This chapter gives you an overview of the hardware components of the WaveStar® TDM 10G (STM-64) which have to be configured.

### Contents

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## Equipment provisioning and autoprovisioning

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### What does equipment provisioning mean?

Equipment provisioning is the pre-configuration of network element components before protection groups and cross-connections can be defined.

Provisioning can take place for the first time after the installation of the equipment (initial provisioning) or when re-configuration of the WaveStar® TDM 10G (STM-64) in an existing SDH network is necessary.

The following components have to be provisioned initially:

- System (optional)
- Shelves
- Slots/circuit packs
- Optical and electrical ports
- Tributaries

Equipment provisioning can be carried out with the WaveStar® CIT. The configuration data is placed in the NE and stored in a non-volatile memory (NVM) on the PCMCIA card.

### Autoprovisioning

Some of the components are autoprovisioned. This means some system parameters are assigned automatically after installation and system start. These are:

- Bay 1
- The low-speed shelf
- System control circuit packs
- Synchronization circuit packs
- Switch circuit packs
- Synchronization default mode (free running)
- Synchronization equipment protection (if two timing circuit packs are available)
- DCC default modes: LAPD role is User-Side for all ports, DCC<sub>R</sub> (Section DCC) is enabled, DCC<sub>M</sub> (Line DCC) is disabled
- All mandatory circuit packs in a shelf and all circuit packs which are already plugged-in during system start.

A modification of the autoprovisioned parameters is possible.

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## Provisioning of new components

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**Overview** You can add new components to an existing system. This can be necessary during reconfiguration or after installation. The following components can be added:

- Bays (additionally to Bay 1; Bay 1 is autoprovisioned)
- Shelves
- Circuit packs
- Protection groups

**Parameters** Already while creating a component you can define some parameters of the respective component:

- Bay  
A new Bay with a selectable *AID* (*1...99*) can be created.
- Shelf  
A new Shelf (Extension Shelf) can be created. The following parameters can be provisioned:
  - *Shelf AID: 1-3*
  - *ON Cable Identifier: 1..4*  
The ON Cable Identifier is the controller address of a shelf for the connection to the low-speed shelf which contains the main controller for the whole network element. For the high-speed shelf it is always *1*. For the extension shelf it should be *2*.
  - shelf type (2.5or 10G)
  - ASAP (only default)
- Circuit Pack  
New circuit packs can be established. The circuit pack types can be selected. In the following chapter “Main shelf configuration” (9-7) and “Extension shelf configuration” (9-13) the slot distribution for the main shelves and the extension shelf is described. In the selection window for new circuit packs only the circuit packs which are suitable for the respective slot can be selected.
- Protection Group  
All entities which are necessary for the creation of a new protection group can be selected. They can be part of the following protection types:
  - 1+1 MSP
  - 2-Fiber MS-SPRing

For further information on the protections, please refer to  
“Protection mechanisms” (11-23).



## Exchangeability of circuit packs

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**Overview** You can physically exchange the line and tributary circuit packs with different application codes (LEY), if they are functionally compatible, as far as the feature sets are concerned (transmission rate, FEC-Type).  
The provisioned connections will be restored without deprovisioning or reprovisioning of the circuit pack and all its traffic. Thus service interruptions are minimized.

**Full exchangeability** Full exchangeability allows exchanging port units with different port attributes (but same line rate and same number of ports).  
It includes exchanging direct-optics and non-direct-optics of the same (line) rate.

**Exchangeability table** The following table gives an overview over the exchangeable circuit packs. Only the packs of the same Exchangeability Group can be exchanged.

Circuit Pack		Application Code	Exch. Group	Comments
Name	Qualifier			
OC192/STM64 (10 Gbit/s)	1.5SR1	LEY67	1	40km (SH)=DA!
	1.5IR1	LEY69	1	60km (SH) 1.5u EIR (with ADP)
	1.5IRS1	LEY97	1	60km (SH) 1.5u IR (with PIN)
	WDM [nnnn]	LEY201-240	1	OLS400G-40 colors
OC48/STM16 (2.5 Gbit/s)	POU [nnnn]	LEY284-299	1	16×OLS_passive optics
	1.3LR1	LEY7	2	51km (LH); +LEY307=CR(M)
	1.3SR1	LEY182	2	VSR; 2km (intra-office)
	1.5LR1	LEY8	2	80km (LH); +LEY308=CR(M)
	DWDM [01-16]	LEY50-65	2	OLS40/80G-16 colors
	WDM [nnnn]	LEY101-180	2	OLS400G-80 colors 1.5u
	POU [nnnn]	LEY80-95	2	16× OLS_passive optics
OC12/STM4 (622 Mbit/s)	1.3SR2	LEY14	3	IR/SR-2 port 15km (SH)
	1.3LR2	LEY13	3	2 port, 51km (LH)
	1.5LR2	LEY190	3	2 port, 80km (LH)

OC3/STM1 (155Mbit/s)	1.3SR4	LEY16	4	4 port; 15km (SH)
	1.3LR4	LEY15	4	4 port; 51km (LH)
	1.3SR8	LEY23	8	IR/SR-8 port 15km (SH)
	4	LEY44	5	STM1E (4 ports, electrical)
	4	LEY40	5	STM1EE4 (never E4)
OBA-10G Booster	1.5LR1	SEN3	6	25mm; 80km (LH)
OBPA-10G Booster + Amplifier	1.5VR1	SEN4	9	25mm; 120km (VLH)

SH/LH = Short/long Haul

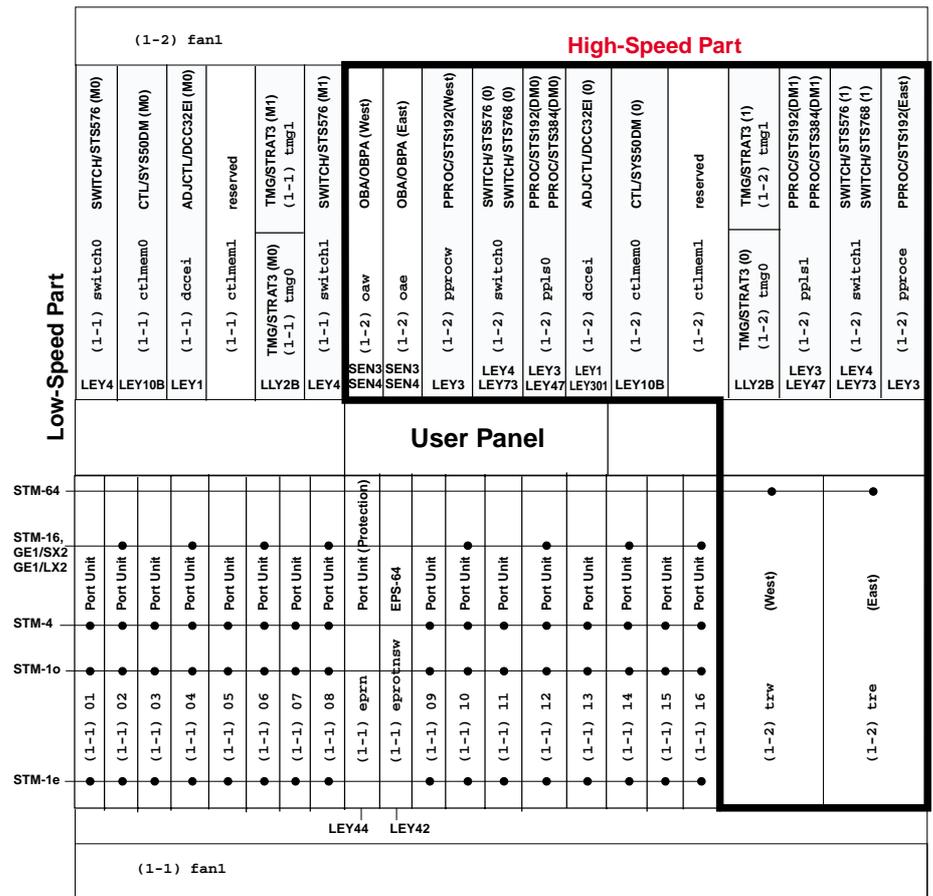
DA = Discontinued Availability

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# Main shelf configuration

**Overview** This chapter describes the configuration of the main shelf of the WaveStar® TDM 10G (STM-64).

**Layout (front view)** The following figure depicts the WaveStar® TDM 10G Main Shelf plug-in units and circuit pack slots (front view), including the 16 slots used for STM-1(o), STM-1(e), STM-4, STM-16, GE1/SX2 or GE1/LX2 (Gigabit Ethernet) tributary port units. The minimum required circuit packs are highlighted..



Explanation of the switching and PPROC circuit pack designation extensions:

- (DM0): Delay Management, main
- (DM1): Delay Management, protection
- (0): Second stage switch (high speed part), main
- (1): Second stage switch (high speed part), protection
- (M0): First stage switch (low speed part), main
- (M1): First stage switch (low speed part), protection

**NOTE:** For configurations with 2 or 3 Expansion Shelves the SWITCH/STS576 (0/1) circuit packs in high-speed part of the main shelf and also the corresponding PPROC/STS192 (DM0/1) circuit packs have to be replaced by the SWITCH/STS768 and PPROC/STS384 circuit packs.

The following table lists all possible tributary port units.

Port unit with	Apparatus Code	Description
STM-64	LEY69	OC192/STM64/1.5IR1
	LEY97	OC192/STM64/1.5IRS1
	LEY201–240	OC192/STM64/WDM9580–9190
	LEY284–299	OC192/STM64/POU9590–9210
STM-16	LEY7	OC48/STM16/1.3LR1
	LEY307	OC48/STM16/1.3LR1
	LEY8	OC48/STM16/1.5LR1
	LEY308	OC48/STM16/1.5LR1
	LEY50–65	OC48/STM16/DWDM01–16
	LEY101–180	OC48/STM16/WDM9585–9190
	LEY182	OC48/STM16/1.3SR1
GE1/SX2	LEY309	1 Gigabit Ethernet
GE1/LX2	LEY310	1 Gigabit Ethernet
STM-4	LEY13	OC12/STM4/1.3LR2
	LEY14	OC12/STM4/1.3SR2
	LEY190	OC12/STM4/1.5LR2
STM-1o	LEY15	OC3/STM1/1.3LR4
	LEY16	OC3/STM1/1.3SR4
	LEY23	OC3/STM1/1.3SR8
STM-1e	LEY44	STM1E/4

### Circuit pack slot equipage

The following table shows the relation between slot designations and required circuit packs used in the Main Shelf of the WaveStar® TDM 10G. The slots designations in the low speed part of the shelf begin with the string “(1-1)”, the high speed part of the shelf is referred to as “(1-2)”.

Slot designation	Slot equipage
<i>(1-1) 01 to (1-1) 16</i>	Any mix of transmission interface circuit packs (optical and electrical):
STM1e:	<ul style="list-style-type: none"> <li>• STM-1(e) port units (STM1E/4, STM1EE4/4)</li> </ul>
LEY40	<ul style="list-style-type: none"> <li>• STM-1(o) port units (STM1)</li> </ul>
STM1o:	<ul style="list-style-type: none"> <li>• STM-4 port units (STM4)</li> </ul>
LEY16, 23	<ul style="list-style-type: none"> <li>• STM-16 port units (STM16), incl. 16 colours DWDM interfaces.</li> </ul>
STM4:	<ul style="list-style-type: none"> <li>• 1 Gigabit Ethernet interface (GE1/SX).</li> </ul>
LEY13, 14, 190	Each of the STM-16 port units as well as the 1 Gigabit Ethernet circuit pack GE1/SX (LEY 309) requires two slots. Allowed slots are: 02, 04, 06, 08, 10, 12, 14, 16.
STM16:	If the slot (1-1)16 is configured for an optical port unit (STM-1(o), STM-4 or STM-16), no 1:N equipment protection of the STM-1(e) port units is possible.
LEY7, 8, 101-180, 182, 307, 308	If 1:N equipment protection of the STM-1(e) port units is configured, slot (1-1)16 must be left empty.
<i>(1-2) trw</i>	STM-64 port units (STM64), incl. 56 colours DWDM interfaces. Depending on the distance, different STM-64 port units are required (see table above).
<i>(1-2) tre</i>	
LEY67, 69, 97, 201-240, 284-299	
<i>(1-1) eprn</i>	Electrical protection. Equipped with an STM1E/4 circuit pack to protect STM1E/4 port units. This slot can also be left empty if no protection is required.
LEY44	
<i>(1-1) eprotsw</i>	Electrical protection switch. Equipped with an EPS-64 protection switching circuit pack to provide the 1:N switching function for protected STM1E/4 port units. This slot can also be left empty, if no protection is required.
LEY42	
<i>(1-1) switch0</i>	Fabric switch 0. The SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. This switch is paired with fabric (1-1) switch 1 in a 1+1 non-revertive protection mode configuration.
LEY4	

Slot designation	Slot equipage
(1-1) <i>ctlmem0</i> LEY10B	Controller for the system including non-volatile memory. The CTL/SYS50DM circuit pack in this slot is the working controller for the low speed part of the shelf and additionally the system controller for the whole shelf.
(1-1) <i>dccei</i> LEY1	Adjunct controller, DCC and external interface. The ADJCTL/DCC32EI circuit pack in this slot terminates up to 32 data communications channels and interfaces them to the shelf 10Base-T LAN.
(1-1) <i>ctlmem1</i>	The slot is left empty for the current release of WaveStar® TDM 10G.
(1-1) <i>switch1</i> LEY4	Fabric switch 1. The SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. This switch is paired with fabric (1-1) switch 0 in a 1+1 non-revertive protection mode configuration.
(1-1) <i>tmg1</i> (1-1) <i>tmg0</i> LLY2	Two half-height Stratum 3 timing generator circuit packs are located one above the other in this slot. They are the master TMGs in the shelf (and also for the Expansion Shelf). When WaveStar® TDM 10G is initially powered on after shipment from the factory, the lower TMG/STRAT3 is the active circuit pack and the upper TMG/STRAT3 is the standby circuit pack. However, both circuit packs are of equal level and protection switching is non-revertive, so there is no default configuration.
(1-2) <i>oaw</i> (1-2) <i>oae</i> SEN3 or SEN4	OBAs or OBPA's (depending on the optical distance, see table above).
(1-2) <i>pprocw</i> LEY3	The PPROC/STS192 circuit pack in this slot supports the STM64 port unit function assigned to the western aggregate port. The CP is responsible for pointer processing and synchronisation to the system clock and for POH monitoring.
(1-2) <i>switch0</i> LEY4	Fabric switch 0. A SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. A SWITCH/STS768 circuit pack in this slot can make cross-connections for 256 STM-1 equivalent circuits. This switch is paired with fabric (1-2) switch 1 in a 1+1 non-revertive protection mode configuration.

Slot designation	Slot equipage
(1-2) <i>ppls0</i> LEY3	The PPROC/STS192 or PPROC/STS384 circuit pack in this slot provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-1) sw. 0).
(1-2) <i>ctlmem0</i> LEY10B	The CTL/SYS50DM circuit pack in this slot is the working shelf controller for the high speed part. The system controller for the whole shelf is located in slot (1-1) <i>ctlmem0</i> .
(1-2) <i>dccei</i> LEY1	Adjunct controller, DCC and external interface. The ADJCTL/DCC32EI circuit pack in this slot terminates up to 32 data communications channels and interfaces them to the shelf 10Base-T LAN. If Orderwire support is required, use LEY301 instead.
(1-2) <i>ctlmem1</i>	The slot is left empty for the current release of WaveStar® TDM 10G.
(1-2) <i>switch1</i> LEY4	Fabric switch 1. A SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. A SWITCH/STS768 circuit pack in this slot can make cross-connections for 256 STM-1 equivalent circuits. This switch is paired with fabric (1-2) switch 0 in a 1+1 non-revertive protection mode configuration.
(1-2) <i>tmg1</i> (1-2) <i>tmg0</i> LLY2	Two half-height Stratum 3 timing generator circuit packs are located one above the other in this slot. They are slave TMGs. Their function is to distribute the system clock from the active master TMG to the circuit packs in the high speed part of the shelf or to the Expansion Shelf. When WaveStar® TDM 10G is initially powered on after shipment from the factory, the lower TMG/STRAT3 is the active circuit pack and the upper TMG/STRAT3 is the standby circuit pack. However, both circuit packs are of equal level and protection switching is non-revertive, so there is no default configuration.
(1-2) <i>ppls1</i> LEY3	The PPROC/STS192 or PPROC/STS384 circuit pack in this slot provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-2) sw. 1).

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**Slot designation**

*(1-2) pproce*  
LEY3

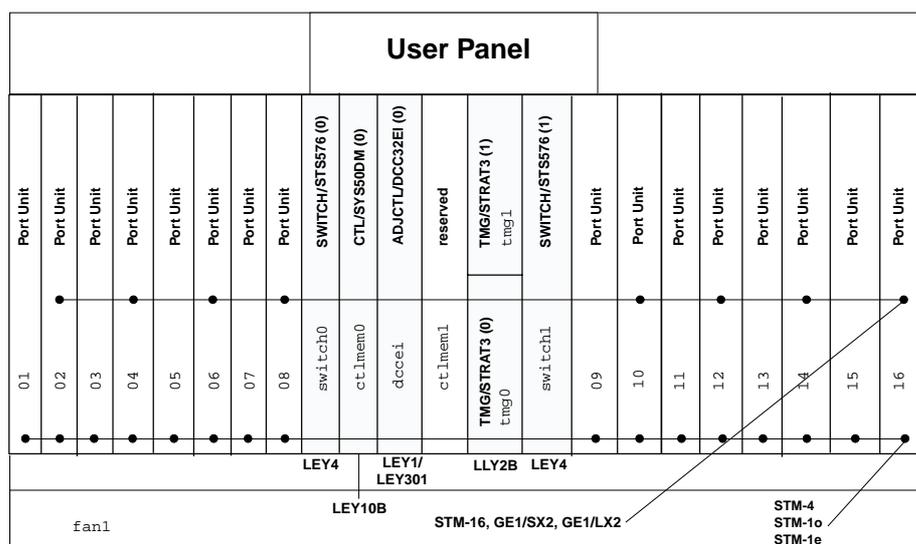
**Slot equipage**

The PPROC/STS192 circuit pack in this slot supports the STM64 port unit function assigned to the eastern aggregate port. The CP is responsible for pointer processing and synchronisation to the system clock and for POH monitoring.

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## Extension shelf configuration

**Layout (front view)** The following figure depicts the WaveStar® TDM 10G Extension Shelf plug-in units and circuit pack slots (front view), including the 16 slots used for STM-1(o), STM-1(e), STM-4, STM-16, GE1/SX2 or GE1/LX2 (Gigabit Ethernet) tributary port units. The minimum required circuit packs are highlighted.



The following table lists all possible tributary port units.

Port unit with	Apparatus Code	Description
STM-16	LEY7	OC48/STM16/1.3LR1
	LEY307	OC48/STM16/1.3LR1
	LEY8	OC48/STM16/1.5LR1
	LEY308	OC48/STM16/1.5LR1
	LEY50–65	OC48/STM16/DWDM01–16
	LEY101–180	OC48/STM16/WDM9585–9190
	LEY182	OC48/STM16/1.3SR1
GE1/SX2	LEY309	1 Gigabit Ethernet
GE1/LX2	LEY310	1 Gigabit Ethernet
STM-4	LEY13	OC12/STM4/1.3LR2
	LEY14	OC12/STM4/1.3SR2
	LEY190	OC12/STM4/1.5LR2

Port unit with	Apparatus Code	Description
STM-1o	LEY15	OC3/STM1/1.3LR4
	LEY16	OC3/STM1/1.3SR4
	LEY23	OC3/STM1/1.3SR8
STM-1e	LEY44	STM1E/4

**Circuit pack slot equipage**

The following table identifies the circuit packs used in the WaveStar® TDM 10G.

Slot designation	Slot equipage
<i>01 to 16</i>	Any mix of transmission interface circuit packs:
STM1e:	<ul style="list-style-type: none"> <li>• STM-1(e) port units (STM1EE4/4)</li> </ul>
LEY40	<ul style="list-style-type: none"> <li>• STM-1(o) port units (STM1)</li> </ul>
STM1o:	<ul style="list-style-type: none"> <li>• STM-4 port units (STM4)</li> </ul>
LEY16	<ul style="list-style-type: none"> <li>• STM-16 port units (STM16).</li> </ul>
STM4:	Each of the STM-16 port units as well as the 1 Gigabit Ethernet circuit pack GE1/SX (LEY309) requires two slots. Allowed slots are: 02, 04, 06, 08, 10, 12, 14, 16.
LEY13, 14, 190	
STM16:	
LEY7, 8, 101–180, 182, 307, 308	
<i>switch0</i>	Fabric switch 0. A SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. A SWITCH/STS768 circuit pack in this slot can make cross-connections for 256 STM-1 equivalent circuits. This switch is paired with fabric switch 1 in a 1+1 non-revertive protection mode configuration.
LEY4	
<i>ctlmem0</i>	The CTL/SYS50DM circuit pack in this slot is the working controller for the shelf. It can be used for CIT and EMS connections. Furthermore it collects all alarms and signals them on the User Panel and the office alarm interface.
LEY10B	

Slot designation	Slot equipage
<i>dccei</i> LEY1	Adjunct controller, DCC and external interface. The ADJCTL/DCC32EI circuit pack in this slot terminates up to 32 data communications channels and interfaces them to the shelf 10Base-T LAN. If Orderwire support is required, use LEY301 instead.
<i>ctlmem1</i>	The slot is left empty for the current release of WaveStar® TDM 10G.
<i>tmg1, tmg0</i> LLY2	Two half-height Stratum 3 timing generator circuit packs are located one above the other in this slot. They are slave TMGs. Their function is to distribute the system clock from the active master TMG (Main Shelf) to the circuit packs in the Expansion Shelf. When WaveStar® TDM 10G is initially powered on after shipment from the factory, the lower TMG/STRAT3 is the active circuit pack and the upper TMG/STRAT3 is the standby circuit pack. However, both circuit packs are of equal level and protection switching is non-revertive, so there is no default configuration.
<i>switch1</i> LEY4	Fabric switch 1. A SWITCH/STS576 circuit pack in this slot can make cross-connections for 192 STM-1 equivalent circuits. A SWITCH/STS768 circuit pack in this slot can make cross-connections for 256 STM-1 equivalent circuits. This switch is paired with fabric switch 0 in a 1+1 non-revertive protection mode configuration.

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## Overview of access identifiers

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**Overview** Access identifiers (AIDs) are used for addressing particular components within a WaveStar® TDM 10G (STM-64) system, like a shelf, circuit pack, slot or port, for example. An AID is case insensitive, but AID values are usually given in lower case.

**Hierarchical structure** AIDs are hierarchically structured. The following table provides an overview of the general AID structure by presenting some examples.

Entity	Format	Example
Network element	bay (synonym for "rack")	1
Shelf	bay-shelf	1-1
Protection group	bay-shelf-protectiongroup	1-1-t01
Slot	bay-shelf-##-slot	1-1-##-01
Circuit pack	bay-shelf-##-slot-CP	1-1-##-01-cp
Port	bay-shelf-##-slot-port	1-1-##-01-1
Tributary	bay-shelf-##-slot-port-trib	1-1-##-01-1-1

The network element entity refers to a logical unit which can be composed of up to three shelves, high-speed shelf, low-speed shelf and optional extension shelf. The extension shelf is physically located in a different rack.

The “#” character serves as a placeholder if a particular AID field cannot be specified, instead of leaving the field empty (see “General AID structure” (9-16) below).

**General AID structure** The general AID structure is based on the assumption that there exists a hierarchy associated with the system entities in the order of bay, shelf, protection group, line/side, slot, port/circuit pack and tributary. Therefore, the general structure consists of these entities separated by “-”:

- *bay-shelf-protection group-line/side-slot-port/circuit pack-tributary*

Some entities such as the system itself fall out of this hierarchy and are handled separately.

An AID may not exceed 20 characters in length (including “-”).

**Simple and compound AIDs**

Access identifiers can be distinguished into simple and compound AIDs. For example, “system”, “extref1”, “line1” or “exttmg0\_out” are simple AIDs. Compound AIDs follow the general AID structure given in the previous paragraph.

Please refer to “Overview of AIDs” (9-17) for an overview of WaveStar® TDM 10G (STM-64) AIDs.

**The “all” AID entry**

Access identifiers allow for the specification of a range of entities by using the term **all**. The **all** AID entry may be used in the bay, shelf, slot, port, and tributary fields. It can neither be used in the protection group field nor in the side/line field.

**Important!** If **all** is used in the bay and/or shelf AID fields, it cannot be used in any other AID fields.

**Overview of AIDs**

The following table gives an overview of the access identifiers defined for WaveStar® TDM 10G (STM-64). If there are several values possible for an entry, they are given in curly braces ( { } ).

<b>Entity</b>	<b>Access Identifier</b>
<i>System</i>	
system	system
system switch group	esysswitchgrp
<i>Bay</i>	
Bay with Main Shelf and optionally one Extension Shelf	1
I/O Bay	2
<i>Shelf</i>	
Main Shelf (low speed part)	1-1
Main Shelf (high speed part)	1-2
Extension Shelf	{1..2}-{1..3}
<i>Protection Group</i>	
1+1 Facility Protection Group	{1..2}-{1..3}-o{01..99, all}
1:N Facility Protection Group	{1..2}-{1..3}-n{01..99, all}
2-fiber MS-SPRing Facility Protection Group	{1..2}-{1..3}-t{01..99, all}
1+1 Timing Equipment Protection Group	{1..2}-{1..3}-etmggrp

<b>Entity</b>	<b>Access Identifier</b>
1+1 DCC Equipment Protection Group (DCC and DCCEI)	{1..2}-{1..3}-edccgrp
1:N Equipment Protection Group (STM1EE4)	{1..2}-{1..3}-stm1ee4grp
1+1 ctlmem Group	{1..2}-{1..3}-esysctlgrp
<b>Side/Line</b>	
2-fiber MS-SPRing Facility Protection Group East/West Side	{1..2}-{1..3}-t{01..99}-{e,w} <i>Note:</i> {e,w} stands for east or west side.
<b>Slot</b>	
All slots of a specified shelf	{1..2}-{1..3}-##-all
Main Shelf - low speed part port card slot	1-1-##-{01..16}
Main Shelf - low speed part stm1(e) slot	1-1-##-{01..16}
Main Shelf - low speed part OC-3/STM-1 slot	1-1-##-{01..16}
Main Shelf - low speed part OC-12/STM-4 slot	1-1-##-{01..16}
Main Shelf - low speed part OC-48/STM-16 slot	1-1-##-{02, 04, 06, 08, ..14, 16}
Main Shelf - low speed part electrical protection pack slot	1-1-##-eprn
Main Shelf - low speed part electrical protection switch pack slot	1-1-##-eprotsw
Main Shelf - low speed part (576) switch0 slot	1-1-##-switch0
Main Shelf - low speed part ctlmem0 slot (for shelf controller)	1-1-##-ctlmem0
Main Shelf - low speed part dccei slot	1-1-##-dccei

<b>Entity</b>	<b>Access Identifier</b>
Main Shelf - low speed part ctlmem1 slot (for shelf controller)	1-1-#-#-ctlmem1
Main Shelf - low speed part tmg0 slot	1-1-#-#-tmg0
Main Shelf - low speed part tmg1 slot	1-1-#-#-tmg1
Main Shelf - low speed part (576) switch1 slot	1-1-#-#-switch1
Main Shelf - low speed part Gigabit Ethernet slot	1-1-#-#-{02,04,06,08,...14,16}
Main Shelf - high speed part trw slot	1-2-#-#-trw
Main Shelf - high speed part tre slot	1-2-#-#-tre
Main Shelf - high speed part oaw slot	1-2-#-#-oaw
Main Shelf - high speed part oae slot	1-2-#-#-oae
Main Shelf - high speed part pprocw slot	1-2-#-#-pprocw
Main Shelf - high speed part switch 0 slot	1-2-#-#-switch0
Main Shelf - high speed part pproc 0 slot	1-2-#-#-pproc0
Main Shelf - high speed part dccei slot	1-2-#-#-dccei
Main Shelf - high speed part ctlmem 0 slot	1-2-#-#-ctlmem0
Main Shelf - high speed part ctlmem 1 slot	1-2-#-#-ctlmem1
Main Shelf - high speed part tmg0 slot	1-2-#-#-tmg0
Main Shelf - high speed part tmg1 slot	1-2-#-#-tmg1

<b>Entity</b>	<b>Access Identifier</b>
Main Shelf - high speed part pproc 1 slot	1-2-#-#-pproc1
Main Shelf - high speed part switch 1 slot	1-2-#-#-switch1
Main Shelf - high speed part pproce slot	1-2-#-#-pproce
Extension Shelf Port unit slot	{1..2}-{1..3}-#-#{01-16}
Extension Shelf stm1(e) slot	{1..2}-{1..3}-#-#{01..06, 11-16}
Extension Shelf OC-3/STM-1 slot	{1..2}-{1..3}-#-#{01..16}
Extension Shelf OC-48/STM-16 slot	{1..2}-{1..3}-#-#{02, 04, 06, 08, ..14, 16}
Extension Shelf (576) switch0 slot	{1..2}-{1..3}-#-#-switch0
Extension Shelf ctlmem0 slot (for shelf controller)	{1..2}-{1..3}-#-#-ctlmem0
Extension Shelf dccei slot	{1..2}-{1..3}-#-#-dccei
Extension Shelf ctlmem1 slot (for shelf controller)	{1..2}-{1..3}-#-#-ctlmem1
Extension Shelf tmg0 slot	{1..2}-{1..3}-#-#-tmg0
Extension Shelf tmg1 slot	{1..2}-{1..3}-#-#-tmg1
Extension Shelf (576) switch1 slot	{1..2}-{1..3}-#-#-switch1
Extension Shelf Gigabit Ethernet	1-3-#-#-#{01-16}{2-4}-{1-3}-#-#-#{02, 04,06,08,...14,16}
<b>Port</b>	
All the ports on a shelf	{1..2}-{1..3}-#-#-all-all
STM1(e) port	{1..2}-{1..3}-#-#-#{01..16}-{1..4, all}

Entity	Access Identifier
OC-3/STM-1(o) port	{1..2}-{1..3}-#-#{01..16}-{1..4,all}
OC-12/STM-4 port	{1..2}-{1..3}-#-#{01..16}-{1..2,all}
OC-48/STM-16 port	{1..2}-{1..3}-#-#{02, 04, 06, 08, ..14, 16}-{1,all}
OC-192/STM-64 port	{1..2}-{1..3}-#-#{tre,trw}-{1,all}
Electrical Port (unprotected)	{1..2}-{1..3}-#-#{01..16}-{1..4,all}
Optical Port (unprotected)	{1..2}-{1..3}-u-#{01..16}-{1..4,all}
1+1 Port (Port in a 1+1 facility protection group)	{1..2}-{1..3}-o{01..99}-{w,p}-{01..16}-{1..4,all} {1..2}-{1..3}-o{01..99}-{w,p}-#-# {1..2}-{1..3}-#-#{01..16}-{1..4,all}
	<b>Note:</b> {w,p} stands for working or protection side.
1:N Port (Port in a 1:N facility protection group)	{1..2}-{1..3}-n{01..99}-{1-n,p}-{01..16}-{1..4,all} {1..2}-{1..3}-n{01..99}-{1-n,p}-#-# {1..2}-{1..3}-#-#{01..16}-{1..4,all}
	<b>Note:</b> The 'n' in '1-n' is the number of lines in the 1:N protection group. When a port is added to a protection group, it is assigned a line number. 'p' stands for protection.
STM-16 2-fiber MS-SPRing port (Port in a 2-fiber MS-SPRing facility protection group)	{1..2}-{1..3}-t{01..99}-{e,w}-{02, 04, 06, 08, ..14, 16}-{1,all} {1..2}-{1..3}-t{01..99}-{e,w}-#-# {1..2}-{1..3}-#-#{02, 04, 06, 08,...14, 16}-{1,all}
	<b>Note:</b> {e,w} stands for east or west side.

Entity	Access Identifier
STM-64 2-fiber MS-SPRing port (Port in a 2-fiber MS-SPRing facility protection group)	{1..2}-{1..3}-t{01..99}-{e,w}-{tre, trw}-{1,all} {1..2}-{1..3}-t{01..99}-{e,w}-#-# {1..2}-{1..3}-#-#-{tre,trw}-{1,all}
	<b>Note:</b> {e,w} stands for east or west side.
Generic Gigabit Ethernet port	1-{1,3}-#-#{02,04,06,08,...14,16}- {1-2,all} {2-4}-{1-3}-#-#{02,04,06, 08,...14,16}-{1-2,all}
Generic Gigabit Ethernet port (VCG group)	1-{1,3}-#-#{02,04,06,08,...14,16}- v{1-2,all} {2-4}-{1-3}-#-#{02,04, 06,08,...14,16}-v{1-2,all}
<b>Tributary</b>	
All the tributaries on all the ports on all the slots	{1..2}-{1..3}-#-#-all-all-all
STM1(e) tributary	{1..2}-{1..3}-#-#{01..16}-{1..4, all}-{1..3,all}
OC-3/STM-1(o) tributary	{1..2}-{1..3}-#-#{01..16}-{1..4, all}-{1..3,all}
OC-12/STM-4 tributary	{1..2}-{1..3}-#-#{01..16}-{1..2, all}-{1..12,all}
OC-48/STM-16 tributary	{1..2}-{1..3}-#-#{02, 04, 06, 08,...14, 16}-{1,all}-{1..48,all}
OC-192/STM-64 tributary	{1..2}-{1..3}-#-#{tre,trw}-{1,all}- {1..192,all}
Electrical tributary	{1..2}-{1..3}-#-#{01..16}-{1..4, all}-{1..48,all}
Unprotected optical tributary	<del>{1..2}</del> - <del>{1..3}</del> -u-#{01..16}-{1..4,all}- {1..48,all}
1+1 Optical tributary	<del>{1..2}</del> - <del>{1..3}</del> -o{01..99}-{w,p}- {01..16}-{1..4,all}-{1..48,all} {1..2}-{1..3}-o{01..99}-{w,p}-#-#- {1..48,all} {1..2}-{1..3}-#-#{01..16}-{1..4, all}-{1..48,all}
	<b>Note:</b> {w,p} stands for working or protection side.

Entity	Access Identifier
1:N Electrical and optical tributary	<p><math>\{1..2\}-\{1..3\}-n\{01..99\}-\{1..n, p\}-\{01..16\}-\{1..4,all\}-\{1..48,all\}</math></p> <p><math>\{1..2\}-\{1..3\}-n\{01..99\}-\{1..n, p\}-\#\#\{1..48,all\}</math></p> <p><math>\{1..2\}-\{1..3\}-\#\#\{01..16\}-\{1..4, all\}-\{1..48,all\}</math></p> <p><b>Note:</b> The ‘n’ in ‘1-n’ is the number of lines in the 1:N protection group. When a port is added to a protection group, it is assigned a line number. ‘p’ stands for protection.</p>
Generic Gigabit Ethernet port VCG tributary	<p><math>1-\{1,3\}-\#\#\{02,04,06,08,...14,16\}-v\{1-2,all\}-\{1-24,all\}</math></p> <p><math>\{2-4\}-\{1-3\}-\#\#\{02,04,06,08,...14, 16\}-v\{1-2,all\}-\{1-24,all\}</math></p>
STM-16 2-fiber MS-SPRing tributary	<p><math>\{1..2\}-\{1..3\}-t\{01..99\}-\{e,w\}-\{02, 04, 06, 08,...14, 16\}-\{1,all\}-\{1..48, all\}</math></p> <p><math>\{1..2\}-\{1..3\}-t\{01..99\}-\{e,w\}-\#\#\{1..48,all\}</math></p> <p><math>\{1..2\}-\{1..3\}-\#\#\{02, 04, 06, 08,...14, 16\}-\{1,all\}-\{1..48,all\}</math></p> <p><b>Note:</b> {e,w} stands for east or west side.</p>
STM-64 2-fiber MS-SPRing tributary	<p><math>\{1..2\}-\{1..3\}-t\{01..99\}-\{e,w\}-\{tre, trw\}-\{1,all\}-\{1..192,all\}</math></p> <p><math>\{1..2\}-\{1..3\}-t\{01..99\}-\{e,w\}-\#\#\{1..192,all\}</math></p> <p><math>\{1..2\}-\{1..3\}-\#\#\{tre,trw\}-\{1,all\}-\{1..192,all\}</math></p> <p><b>Note:</b> {e,w} stands for east or west side.</p>
<b>Fans</b>	
Main Shelf Fan (low speed part)	1-1-fan1
Main Shelf Fan (high speed part)	1-2-fan1
Extension Shelf Fan	$\{1..2\}-\{1..3\}-fan1$
<b>External Timing References</b>	

<b>Entity</b>	<b>Access Identifier</b>
External Timing reference 1	extref1
External Timing reference 2	extref2
External Line Timing reference 1	line1
External Line Timing reference 2	line2
External Line Timing reference 3	line3
External Line Timing reference 4	line4
External Line Timing reference 5	line5
External Line Timing reference 6	line6
<b><i>Timing Ports</i></b>	
External Timing Input Port 0	exttmg0
External Timing Input Port 1	exttmg1
External Timing Output Port 0	exttmg0_out
External Timing Output Port 1	exttmg1_out
<b><i>Miscellaneous Discrete Inputs and Outputs</i></b>	
Miscellaneous Discrete Input	misc_in{1..8}, misc_inall
Miscellaneous Discrete Output	misc_out{1..8}, misc_inall

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## Shelf provisioning

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**Introduction** Shelf provisioning allows the user to configure parameters associated with a specific shelf.

**Parameters** The following parameters can be viewed:

- *Shelf AID*
- *ON Cable Identifier*

The ON Cable Identifier is the Controller Address of a shelf for the connection to the low-speed shelf which contains the main controller for the whole network element. For the high-speed shelf it is always 1. For the extension shelf it should be 2.

The following parameter can be set:

- *Alarm Severity Assignment Profile.*

An Alarm Severity Assignment Profile (ASAP) is a list of alarms that can occur in an NE and which have each an alarm severity assigned. Several ASAPs for different functional categories are predefined for the WaveStar® TDM 10G system.

For the current release only the default Alarm Severity Assignment Profile is available.



## Slot/circuit pack provisioning

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**Slot provisioning** Slot provisioning allows the user to configure parameters associated with a specific slot. This is a pre-provisioning measure for a future upgrade of the system.

**Parameter** The *Alarm Severity Assignment Profile* can be selected.  
For the current release only the default Alarm Severity Assignment Profile is available.

**Circuit pack provisioning** Currently, no parameters concerning circuit pack provisioning can be set. For future releases, Alarm Severity Assignment Profile (ASAP) settings will be possible.

**Parameters** The following parameters can be set:

- Equipment Alarm Severity Assignment Profile
- System Event Alarm Severity Assignment Profile.

**ASAPs** An Alarm Severity Assignment Profile (ASAP) is a list of alarms that can occur in an NE and which have each an alarm severity assigned. Several ASAPs for different functional categories are predefined for the WaveStar® TDM 10G system.

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## Port and tributary provisioning

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**Introduction** Lucent Technologies NEs can change the state of ports without issuing a rept-dbchg message. WaveStar SNMS therefore cannot detect these changes. To ensure that you receive an accurate list of available Access Identifiers (AIDs) when selecting ports to provision, first do a manual DNO (see “Manually Initiate DNO” (5-49)) for the NE or NEs that you plan to provision.

**Port aliases on GUI** WaveStar® SNMS has an option which allows you to specify whether port AIDs or port labels/aliases are used to represent ports on GUI windows, such as in explorer lists on the Cross-Connection or Provisioning windows. The port label/alias values must be unique for all ports within an NE.

**Cross-connections and the port provisioning list** When cross-connections are added or deleted, the AID list in the port provisioning window is not updated automatically. To ensure that the AID list information is accurate, perform a manual DNO (see “Manually Initiate DNO” (5-49)) on the NEs that have had cross-connections added or deleted prior to any port provisioning.

**Port configuration discovery** There is generally a fixed relationship between circuit packs and their number and type of ports. Upon discovery of an NE, for ports of a fixed type, WaveStar® SNMS may automatically retrieve an NE’s current set of ports and their type, or it may automatically retrieve an NE’s current equipment and derive the set of ports and their type. (This is the automatic discovery portion of DNO.) Deriving the port information from the equipment is the preferred method. Regardless of the method of obtaining the information, the system maintains the ports and their type in its configuration management database.

For NEs managed via TL1, obtaining the port information directly from the NE is done via TL1 RTRV-rrcommands (where rr represents the various port types). For NEs managed using CMISE, the NE’s current port configuration is obtained via CMISE M-GET commands. The responses to these commands include the NE’s current ports and their attributes.

**Port configuration provisioning** WaveStar® SNMS provides a GUI-based function to enable you to select an NE and port or tributary, and view the current values of that port’s or tributary’s attributes.

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## Cut-Through commands

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**Introduction** In order for the user to execute NE native commands that may not be explicitly supported by a particular release of WaveStar SNMS, a cut-through capability has been developed. In addition, with the command builder and broadcaster, TL1 cut-through gives the user powerful capabilities. See “Perform Cut-Through Commands” (2-10), “Build TL1 Commands” (2-11), “Broadcast TL1 Commands” (2-13).

Two additional points to remember

- WaveStar SNMS allows the user access to only the NEs and associated commands defined by the Target and Command groups for which the user is validated.
- Not all TL1 commands displayed in the Cut-Through window can be executed. The capability to execute commands depends on the subnetwork equipment.

**TL1 commands** Instructions about actual TL1 commands can be found in *WaveStar® TDM 10G (STM-64) TL1 Reference Manual*.

**Initiating an NE cut-through session** The NE Cut-Through window allows you to access and communicate with an NE, using the TL1 command set. You can submit TL1 cut-through commands to the NE directly. (For specific NE command information, see the appropriate NE documentation.)

**Building TL1 commands** The TL1 macro builder allows you to create a TL1 command file to assist in performing maintenance and provisioning activities on one or more NEs (such as download of standard configuration), without having to manually enter a set of TL1 command strings. This feature both reduces the amount of manual entry needed to create TL1 command strings and allows for the reuse, at a later time, of the commands built on the same NE or other NEs of the same type.

**Broadcasting TL1 commands to NEs** The broadcasting TL1 commands feature allows you to perform maintenance and provisioning activities (such as download of standard configuration) on one or more NEs, utilizing the TL1 command files created by the TL1 macro builder feature, and broadcasting those files to multiple NEs of the same type. This feature saves you time by performing similar tasks on multiple NEs in one step, and by reducing the manual entry required in the creation of TL1 command strings.

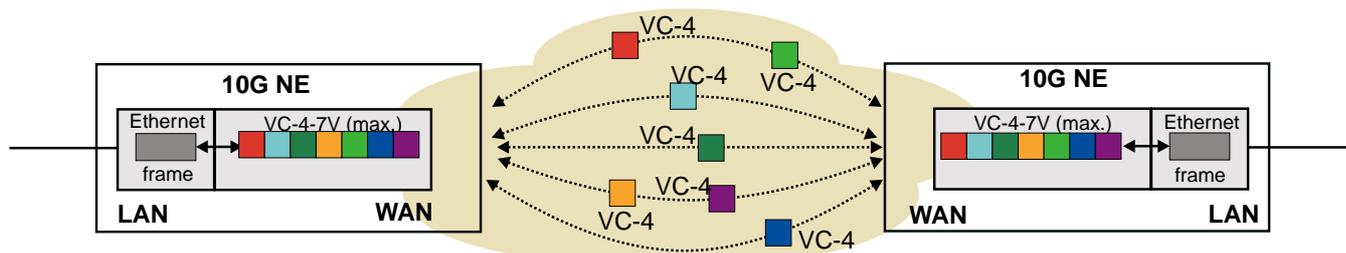
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## Gigabit Ethernet (GE1/SX2) Interface

**Introduction** WaveStar® TDM 10G supports a Gigabit Ethernet (GE1/SX2) interface. The GE1/SX2 interface conforms to the standards outlined in IEEE 802.3, and supports the 1000BASE-SX protocol.

**Capabilities** The GE1/SX2 interface supported by the WaveStar® TDM 10G allows you to transport GE1/SX2 signals over SDH networks by encapsulating Ethernet packets in virtually concatenated VCs. The GE1/SX2 interface supports point-to-point connectivity. Each GE1/SX2 port unit offers two 1000BASE-SX Ethernet LAN ports. Each port supports two bidirectional, Ethernet lines (one transmit and one receive). Each line can be associated with a WAN link. The capacity per Gigabit Ethernet line is user provisionable to a maximum of 7 VC-4s. All connections to the 1000BASE-SX ethernet interface on the GE1/SX2 port unit require Dual SC Connectors.

**Virtual Concatenation** VC-4 concatenation can be used for the transport of payloads that do not fit efficiently into the standard set of virtual containers. Two methods for concatenation are defined, contiguous and virtual concatenation. Both methods provide concatenated bandwidth of X times Container-N at the path termination. The difference is the transport between the path termination. Contiguous concatenation maintains the contiguous bandwidth throughout the whole transport. It requires concatenation functionality at each network element. Virtual concatenation breaks the contiguous bandwidth into individual VCs, transports these VCs and recombines them to a contiguous functionality only at the path termination equipment i.e. the GE1/SX2 Gigabit Ethernet port unit.



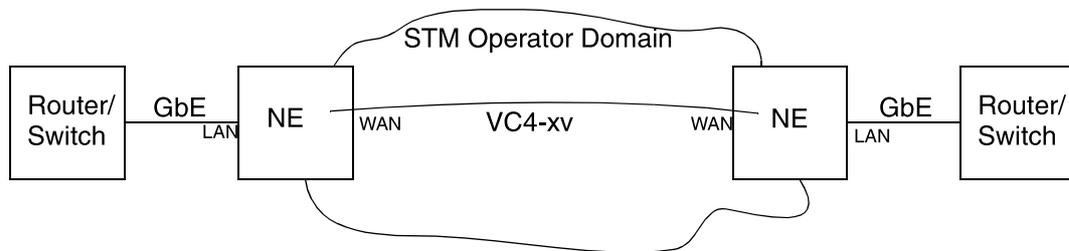
The H4 POH byte is used for the sequence and multiframe indication specific for virtual concatenation.

Due to different propagation delay of the VC-4s a differential delay will occur between the individual VC-4s. This differential delay has to be compensated and the individual VC-4s have to be realigned for

access to the contiguous payload area. The realignment process covers at least a differential delay of 125  $\mu$ s.

**Point-to-point connectivity**

The following figure shows a point-to-point Gigabit Ethernet (GbE) network application. Protection of the VC-4-Xv traffic is possible via SNCP and MS-SPRing protection schemes.



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# Equipment Configuration

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**Introduction** The equipment window gives a set of hierarchically arranged equipment views. The shelf view is the lowest level view. There may also be a system view and a bay/line-up view, depending on how large and complex the NE is. The Equipment Configuration window also allows you to “drill down” into the NE equipment hierarchy.

**Unknown equipment** If WaveStar SNMS does not recognize a circuit pack on the requested shelf, the window shows that slot filled with unknown equipment. Circuit packs may not be recognized when the vendor firmware is nonstandard or when the board is a new release that is not yet supported.

**Equipment discovery and inventory maintenance** Upon discovery of an NE, WaveStar SNMS automatically retrieves an NE’s current equipment configuration and maintains this information in its database. This is the automatic discovery portion of DNO. An NE’s equipment includes any item that it is able to report; for example, bays, shelves, and circuit packs. For network elements managed via TL1, the network element’s current equipment configuration is obtained through TL1 RTRV-EQPT commands.

**Equipment graphical display** To graphically depict the varying NE types effectively, WaveStar SNMS decomposes them into different numbers of hierarchically arranged graphical displays.

**Alarm status on equipment display** WaveStar SNMS indicates whether an alarm has been generated by a bay, shelf, or slot (circuit pack) in the NE on the graphical display of equipment, and what level of alarm it is.

On the Equipment View window, a round dot is displayed on the selected piece of equipment with the color indicating the alarm state. The color of the dot indicates the level of alarm that has been issued by the selected equipment component, or if there have been no alarms issued.

The default colors for the alarm levels are:

Alarm Color (default)	Alarm Severity Level (SONET)	Alarm Severity Level (SDH)
Red	Critical	Prompt
Yellow	Major	Deferred
Cyan	Minor	
Gray	Throttled	

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Green	No Active Alarms	
Magenta	Loss of Communications	
White	Not Alarmed state	Not Alarmed state

The default Alarm display colors shown in the above table can be modified through the Preferences option of the View menu on the Map window main menu bar. For more details, see “Map preferences” (14-33).



## Date/Time Synchronization

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**Introduction** Periods of time when an NE is out of service, as during a software upgrade, can cause the NE's date/time setting to be out of sync with the WaveStar SNMS host and the other NEs in the network. Lack of date/time synchronization can create problems in determining the order in which alarms occurred on the network.

WaveStar SNMS uses the Network Time Protocol (NTP) to ensure the accuracy of its internal clock. WaveStar SNMS, in turn, provides centralized remote date/time synchronization between its internal clock and those of its managed NEs. Synchronization can be performed on a single NE, on an aggregate of NEs, or on all of the NEs in a user's Target Group. Synchronization can be performed on demand or set up on a periodic schedule using the SNMS Scheduler. The transition from standard time to daylight savings time is also supported as a user selected option.

**NE time zone** As part of the date/time synchronization feature, WaveStar SNMS can take into account whether the NE is located in a different time zone from the system host.

**Standard time and daylight savings time** You can use the Spring Forward/Fall Back option to have WaveStar SNMS automatically make time adjustments for Daylight Savings Time (Spring Forward) and standard time (Fall Back) when doing date/time synchronization for an NE, a group of NEs, an aggregate, or all NEs under system control, 20 NEs at a time or more, depending on system load. The Spring Forward/Fall Back option can be enabled or disabled, as needed. This option is enabled, by default. If the option is disabled for an NE, the NE's time is always set to standard time.

The Spring Forward/Fall Back option should be set by the system administrator.

**Ways to perform date/time synchronization** NE Date/time synchronization can be performed in three ways:

- **Scheduled** – NE date/time synchronization can be scheduled to be performed on a daily, weekly, or monthly basis. A scheduled date/time synchronization will only be done if the time difference between the NE and the system host is more than 15 seconds.
- **Automatically** – You can have the system automatically perform date/time synchronization on an NE when it is manually added or autodiscovered by the system, or when communications between the NE and the system host are lost and then regained. Automatic date/time synchronization will be performed on an NE only if the

time difference between the NE and system host is more than 15 seconds, or the drift threshold set via the Set Date/Time Synchronization Drift window. The drift threshold is the maximum time difference allowed (in seconds) between the NE and the EMS host before date/time synchronization is performed automatically. Automatic date/time synchronization can be enabled or disabled; the default is enabled.

Automatic date/time synchronization should be enabled/disabled by the WaveStar SNMS system administrator or a user with a privileged login.

- Manually – Date/time synchronization can be performed on demand for an NE, a group of NEs, an aggregate, or all NEs under system control, up to 20 NEs at a time or more, depending on system load.

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## Miscellaneous Discrete Inputs and Outputs

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**Introduction** The WaveStar® TDM 10G provides 8 input and 8 outputs which can be used for the supervision and control of external devices.

**Description** The miscellaneous discrete inputs (MDIs) and outputs (MDOs) allow the user to control and monitor equipment co-located with the WaveStar™ TDM 10G through a set of input and output relay contact closures. There are 8 miscellaneous inputs that can monitor conditions such as open doors or high temperature, and 8 miscellaneous discrete outputs to control equipment such as fans and generators. These can be set by the user.

The status of the miscellaneous discrete inputs can be configured and queried from the WaveStar™ CIT. The WaveStar® TDM 10G collects miscellaneous discrete alarms and automatically sends them to the OS.

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# 10 Timing provisioning concepts

## Overview

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**Purpose** This chapter describes the timing features WaveStar® TDM 10G (STM-64) provides.

WaveStar® TDM 10G synchronizes all incoming and outgoing signals to one timing source which is normally locked to an external reference signal. This reference signal is configurable. Various signals can be used as a timing reference signal. Furthermore WaveStar® TDM 10G provides different clock modes (see “Clock modes” (10-2)). Clock protection can also be established by using two timing generator circuit packs within one shelf.

More detailed information on the timing concept is given in the section “*Synchronization*” in the *WaveStar® TDM 10G (STM-64) Applications, Planning, and Ordering Guide, chapter 4, “Product Description”*.

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## Timing generator

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### Function of the timing generator

WaveStar® TDM 10G synchronizes all add, drop and through signals by using one timing source. The timing is ensured by the TMG/STRAT 3 circuit packs which generate one common internal clock. The master timing generator for all configurations is located in the low-speed part of the Main Shelf. The output clock signals of the slave timing generators in the high-speed part of the Main Shelf and, if any, in the Extension Shelf, are coupled to the output clock of the master.

The timing generator and the clock distribution within the network elements is described in more detail in the section “*Synchronization*” in the *WaveStar® TDM 10G (STM-64) Applications, Planning, and Ordering Guide, chapter 4, “Product Description”*.

### Clock modes

The WaveStar® TDM 10G timing generator circuit packs can run in the following clock modes:

- Free-running operation  
The active timing generator circuit pack is not locked to an external timing reference, but the standby timing generator is locked to the active one.
- Holdover mode  
The active timing generator circuit pack enters the holdover mode if all timing reference signals fail. The active timing generator keeps its internal oscillator at the point at which it was synchronized to the last known good reference signal. The standby timing generator remains locked to the active one.
- Locked mode, internal SDH Equipment Clock (SEC) locked to:
  - One of the two external netclock inputs (2048 kHz or 2048 kbit/s)
  - One STM-64 line input (choice of input is provisionable)
  - Up to six line inputs STM1, STM4, STM16 or STM64 are possible, if they are only even slots, only on first port, max. 4 lines in HS and max 4 lines in LS, not referenced from expansion shelves and only worker port of 1+1 MSP group.

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## Timing configuration

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**Querying timing configuration** The WaveStar® SNMS allows you to query the timing configuration of the WaveStar® TDM 10G (STM-64). Please refer to “Viewing the timing configuration” (4-2).

**Timing configuration** In the **Configuration** → **Synchronization** → **Configure...** menu it is possible to change the timing configuration.

This includes:

- the configuration of the external timing input ports (cf. “Configuring the external timing input ports” (4-4))
- the configuration of the external output port (cf. “Configuring the external timing output ports” (4-6))
- the selection and configuration of the timing references (cf. “Configuring the timing references” (4-9))
- the configuration of the system timing, this means the configuration of the master timing generator (cf. “Configuring the system timing” (4-11))

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## Timing quality

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**Timing marker** The timing quality of all SDH data signals is coded in the timing marker (Synchronization Status Marker, SSM) as per ITU-T Rec. G.783 and G.707. The timing marker is located in the lower four bits of the S1 byte of the STM-N signal SOH.

The bit combinations are listed in the following table. The remaining combinations are interpreted as “invalid”.

S1 Bits	Quality level
0010	Primary Reference Clock
0100	SSU Transit Node Traceable
1000	SSU Local Node Traceable
1011	SDH Equipment Clock Traceable
1111	Do not use for Synchronization (DUS)

The quality level “DUS” is inserted if AIS, LOS or LOF is detected in the incoming signal. Insertion of “DUS” in an outgoing timing signal can also be configured by the operator in order to avoid timing loops in the network.

**SSM of lower quality than the internal system clock** If the SSM of a reference clock source indicates a lower quality than the internal clock (SEC), this reference is considered to be failed and the system switches to the reference with the highest quality (above SEC), if SSM is enabled.

The selection criteria are:

- signals which are not locked out and have their priority not disabled
- signals with highest quality
- if there is more than one signal with highest quality the one with the priority is selected
- if there is more than one signal with highest priority one of those is chosen randomly.

When all assigned references are considered to be failed, the system enters the holdover mode.

**No SSM available** As long as no SSM value has been accepted and evaluated at STM-N interfaces, DUS is assumed. This also applies at the initial system start-up.

**SSM for 2048 kbit/s synchronization signals**

WaveStar® TDM 10G supports the interpretation and generation of SSM values for framed 2048 kbit/s timing input and output ports (“G.703.9 ports”). The coding conforms to ITU-T Rec. G.704. One set of the  $S_{a4}$  to  $S_{a8}$  bits can be allocated for the Synchronization Status Marker (SSM). The message set is similar to the SSM messages defined for bits 5 to 8 of the byte S1 belonging to an SDH signal.

**User operation**

You can define whether the SSM is evaluated for the selection of the timing reference from which the system timing is derived. Furthermore, you can define the quality level of the outgoing timing signal.



## Timing protection

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### **Timing reference protection switching**

During configuration of the timing references, a priority list is created for the configured timing reference signals. The signal with the highest priority is initially used as the timing reference signal. If it fails, the system switches to the signal with the next lower priority. If all possible timing reference signals fail, the timing generator enters the holdover mode.

The following signals can be used as a timing reference:

- 2 external netclock input signals (2048 kHz or 2048 kbit/s acc. to G.703)
- Up to six line inputs STM1, STM4, STM16 or STM64 are possible, if they are only even slots, only on first port, max. 4 lines in HS and max 4 lines in LS, not referenced from expansion shelves and only worker port of 1+1 MSP group.

The following alarms cause a protection switch from a G.703 2048 kbit/s signal to another timing reference signal (acc. to the priority list):

- SSF (Server Signal Fail)
  - LOS (Loss of Signal)
  - AIS (Alarm Indication Signal)
  - LOF (Loss of Frame)
  - LOM (Loss of Multiframe)
- DFF (Defect Frequency Fail)

The following alarm causes a protection switch from a G.703 2048 kHz signal to another timing reference signal (acc. to the priority list):

- Loss of Signal

The following alarms and fault criteria cause a protection switch from an SDH signal to another timing reference signal (acc. to the priority list):

- LOS
- AIS
- LOF
- LOM
- EXC (Excessive Bit Error Ratio)

**Timing equipment protection switching**

There are two timing circuit packs TMG 0 and TMG 1 in the high-speed part and two in the low-speed part of each network element. Thus there are four timing circuit packs in each main shelf. Furthermore, there are two timing circuit packs in each extension shelf.

When two timing circuit packs are present the timing is derived from one circuit pack, called the *active* timing circuit pack. The other timing circuit pack is standby. It is locked to the active clock and produces a timing signal, which is not used, unless the active timing circuit pack fails.

For the initial start-up of the system and initial provisioning of the 1+1 protection group, the default state of operation is TMG 0 as the active timing circuit pack. For the system reset after the 1+1 protection was in operation, the system restores the timing circuit pack as the active one which was active before the system reset operation.

**Wait-to-restore time**

The timing reference protection is working in a revertive mode (only if the signal after the WTR is selected highest quality and highest priority). If a timing reference is restored the system has to make a wait for a defined time (wait-to-restore time, WTR) to see whether the signal is stable, before the system switches back to it. There is no protection switch if the system clock already was on reference with the same qualification.

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## Parameters of the “ViewSync” and “ConfigSync” windows

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**Overview** The *ViewSync* and *ConfigSync* windows contain four tabs:

- *Ext Timing I/P Ports*
- *Ext Timing O/P Ports*
- *Timing Reference*
- *System Timing*

The corresponding parameters are described as follows.

**Buttons** The displayed data can be refreshed via the *Refresh* button. *Close* closes the window. The selected data can be applied via the *Apply* button and the online help can be displayed via *Help*.

**The *Ext Timing I/P Ports* tab** The following table gives an overview of the parameters in the *Ext Timing I/P Ports* tab.

Field	Possible values	Meaning
<i>External Timing Port AID</i>	<i>EXTTMG0, EXTTMG1</i>	This parameter defines the Access Identifier (AID) of the external timing input ports.
<i>Timing Input Format</i>	<i>2 MHz, 2 Mbit/s - framed, 2 Mbit/s - unframed</i>	This parameter defines the format of the incoming timing signal.
QL In - Output Timing Port	DNU, PRC, SSUT, SSUL, SEC, Invalid	This parameter displays the quality of the incoming timing signal.

**The *External Timing Output Ports* tab** The following table gives an overview of the *Ext Timing O/P Ports* tab.

Field	Possible values	Meaning
<i>Ext. Timing Output Port AID</i>	<i>exttmg0_out</i>	This field displays data on the timing output port ( <i>exttmg0_out</i> ).
<i>Timing Output Format</i>	<i>2 MHz, 2 Mbit/s - framed, 2 Mbit/s - unframed</i>	This parameter shows the signal format of the outgoing timing signal.
<i>Derived Output Timing Enable</i>	<i>ENABLE, DISABLE</i>	This parameter shows whether a timing signal is derived from the system clock and forwarded to the output port.
<i>Derived Output Timing Source</i>	<i>TLS</i>	The external timing signal is derived from one of the six line timing references
	<i>SETG</i>	The timing output is derived from the system clock

<b>Output Signal Status</b>	<b><i>NORMAL, DISABLE, UNACCEPTABLE</i></b>	This parameter describes the status of the outgoing timing signal.
<b>QL Out - Output Timing Port</b>	<b><i>DNU, PRC, SSUT, SSUL, SEC</i></b>	This parameter indicates the quality lever for the output timing port.
<b>Timing Port Impedance</b>	<b><i>75, 120</i></b>	This parameter displays the impedance of the external timing input and output ports.
<b>Sync Msg Force DUS Enable</b>	<b><i>ENABLE, DISABLE</i></b>	This parameter defines whether DUS is inserted in the outgoing timing signal.
<b>AIS/QL Mode</b>	<b><i>AISMODE, QLMODE</i></b>	AIS (AISMODE) or DNU/DUS (QLMODE) is sent when the signal quality level is below the value set.
<b>Timing Regen Loop Enable</b>		This parameter indicates that a timing loop may be present from the timing output to one or both of the timing inputs through a Stand-Alone Synchronization Equipment (SASE) Office Clock. This might happen, if the NE forwards timing to the SASE and the same time receives a timing signal via one or both of the external timing input ports. If additionally the system clock is in the Locked Mode and derived from an external timing signal, DNU is forwarded to the timing outputs.
	<b><i>DISABLE</i></b>	The Regenerator Loop functionality is disabled. Timing loops are not considered.
	<b><i>EXTREF1</i></b>	If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg0 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
	<b><i>EXTREF2</i></b>	If the quality level of the incoming framed 2 Mbit/s timing signal at the exttmg1 input is equal to the quality level of the timing signal that is transmitted to the external timing output ports, DNU is inserted for the outgoing timing signal as the NE assumes that a timing loop is present.
	<b><i>BOTH</i></b>	The Regenerator Loop functionality is applied to both external timing inputs.
<b>Loop Delay</b>	<b><i>1, 2, ... 60</i></b>	Delay during which DNU is maintained after the Regnerator Loop conditions are no longer present.

---

**Acceptance QL**                      PRC, SSUT, SSUL, SEC                      This parameter defines the quality level of the derived timing output signal below which AIS is inserted (in a framed 2 Mbit/s signal) or squelched respectively (2 MHz or unframed 2 Mbit/s signals).

**The *Timing Reference* tab**                      The *Timing Reference* tab displays data on the configured timing reference source.

**Active *Timing Reference***                      In the *System Timing Reference* group box, the *Timing Reference* information field displays the reference timing signal which is currently selected. The timing reference is an external signal to which the internal SDH Equipment Clock (SEC) is locked.

The following signals can be used as timing reference:

- 2 external net clock input signals (2048 kHz or 2048 kbit/s acc. to G.703)
- 6 reference signals derived from the incoming STM-16, STM-4 or STM-1 tributary signals or the incoming STM-64 line signals.

Thus the following values can be displayed:

- *extref1* or *extref2* for the external net clock input signals
- *line1* to *line6* for the SDH signals

**Settings**                      The table on the *Timing Reference* tab in the *ViewSync* window gives an overview of the possible settings of the timing references.

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Column	Possible values	Meaning
<i>Active</i>	—	The currently active timing reference is marked.
<i>Timing Reference</i>	<i>EXTREF1</i> , <i>EXTREF2</i>  <i>LINE1</i> , ..., <i>LINE6</i>	Logical designation of the external timing reference signals  Designation of the SDH timing reference
<i>Port AID</i>	<i>EXTTMG0</i> , <i>EXTTMG1</i>  <i>NOT-CONNECTED</i> <port AID of an SDH timing reference>	An external net clock input signal is used as timing reference  The respective timing reference source is not used The respective SDH timing reference signal is used as timing reference
<i>Reference Priority</i>	<i>DISABLE</i> (initial value),  <i>1</i> , <i>2,3</i> , ..., <i>8</i>	Configured priority of the timing reference signals

Column	Possible values	Meaning
<i>Signal Status</i>	<i>NORMAL</i>	The timing reference signal is fault-free.
	<i>FAILED</i>	The timing reference signal failed.
	<i>WAIT-TO- RESTORE</i>	The timing reference signal has been failed and is now restored. A wait is made for a defined time (wait-to-restore time) to see whether the signal is stable, before the system switches back to it.
	<i>NOT-CONNECTED</i>	The timing reference is not used.
<i>Lockout Status</i>	<i>LOCKOUT</i>	The clock protection is deactivated
	<i>NO-LOCKOUT</i>	The clock protection is activated
<i>Output Priority</i>	<i>DISABLE, 1 ... 6</i>	This parameter defines the priority according to which the reference for the timing output signal is selected. <i>DISABLE</i> indicates that the reference is not used.
<i>Timing Ref QL</i>	<i>AUTO, PRC, SSUT, SSUL, SEC</i>	This parameter shows the synchronization messaging quality level value for timing references. This is the value which is forwarded to the timing output ports.
<i>Input QL Status</i>	<i>DUS, PRC, SSUT, SSUL, SEC</i>	This shows the synchronization messaging quality level value for timing references. This is the value which is forwarded to the timing input ports.
<i>Timing Ref List</i>	<i>VALID, INVALID, NOT-SUPPORTED, NOT-APPLICABLE</i>	This parameter shows the synchronization messaging quality level status for the timing reference.
<i>Clock O/T Lockout State</i>	<i>LOCKOUT, NO-LOCKOUT</i>	This parameter shows whether a certain timing reference is locked out as reference from which the timing output signal can be derived.
<p>Only one of the timing references at a time can be selected as the active one.</p>		
<b>The System Timing tab</b>	The <i>System Timing</i> tab on the <i>ViewSync</i> window displays data on the internal SDH Equipment Clock (SEC).	
<b>Description</b>	The tab consists of three group boxes <i>Synchronization Signal</i> , <i>Clock</i> and <i>System Timing Reference</i> .	
<b>The Synchronization Signal group box</b>	The following table lists the information fields of the <i>Synchronization Signal</i> group box, the possible values and their meaning.	

Information field	Possible values	Meaning
<i>System Quality Level Status</i>	<i>PRC, SSUT, SSUL, SEC, DUS</i>	The current quality level of the system clock.

Information field	Possible values	Meaning
<i>System Timing Signal Status</i>	<i>NORMAL</i> <i>Failed</i>	The system clock works correctly. The system clock has failed.
<i>Stratum Level Status</i>	<i>SEC</i>	Timing quality of the internal equipment clock acc. to ITU-T Rec. G.813.
Acceptance QL	<i>SEC, PRC, SSUT, SSUL.</i>	This parameter defines the quality level of the derived timing output signal below which AIS is inserted (in a framed 2 Mbit/s signal) or squelched respectively (2 MHz or unframed 2-Mbit/s signals). .

**The *Clock* group box** The following table lists the information fields of the *Clock* group box, the possible values and their meaning.

Information field	Possible value	Meaning
<i>Provisioned Clock Mode</i>	<i>FREE- RUNNING</i> (initial value)	For the internal timing generator the Free Running Mode is selected. It is not locked to an external timing reference signal. The system clock is generated by an internal oscillator.
	<i>LOCKED</i>	The Locked Mode is selected. The internal timing generator is locked to an external timing reference signal.
<i>System Clock Mode Status</i>	<i>FREE-RUNNING</i> (initial value)	The internal timing generator is not locked to an external timing reference signal. The system clock is generated by an internal oscillator.
	<i>HOLDOVER</i>	The current operating system clock mode is the holdover mode. The active timing generator enters the holdover mode if all timing reference signals fail. In the holdover mode, the active timing generator keeps its internal Stratum 3 clock at the point at which it was synchronized to the last known good reference signal.
	<i>LOCKED</i>	The internal timing generator is locked to an external timing reference signal.
<i>System Clock Switch Request State</i>	<i>FORCED-HOLD-OVER</i>	A forced switch to the holdover mode has been carried out.
	<i>ALL-REFERENCES-FAILED</i>	All external timing reference signals failed.
	<i>NO-REQUEST</i>	No switch request is currently active.

Information field	Possible value	Meaning
<i>Fast Start Status</i>	<i>NORMAL</i>	Fixed value.
	<i>FAST-START</i>	This is an attribute of the timing pack hardware design. It is used when fast pull-in of the clock is necessary.
<i>Warm Up Status</i>	<i>NORMAL</i>	The timing circuit pack works normally.
	<i>WARMING-UP</i>	After a timing circuit pack has been plugged into the shelf, a warm-up period of 5 minutes has to pass before the circuit pack is operational. This is displayed via this message.

**The System Timing Reference group box** The following table lists the information fields of the *System Timing Reference* group box, the possible values and their meaning.

Information field	Possible values	Meaning
<i>System Timing ASAP</i>	<i>Default</i>	This parameter sets a timing Alarm Severity Assignment Profile (ASAP) name to which the system timing points. This is an alphanumerical string with a maximum of 24 characters
<i>System SSM Mode</i>	<i>DISABLE, ENABLE</i>	The use of SSM information is disabled or enabled. This means that the selection of timing reference for the system timing is either determined only by the provisioned priority list or by the quality level given by the SSM and secondly by the priority list.
<i>Switch Request State</i>	<i>NO-REQUEST, MANUAL, FORCED</i>	Value of the Switch Request activated by the user or initiated by the system.
<i>Timing Reference Wait To Restore</i>	<i>0, 20 Seconds, 1 Minute, 2 Minutes... 60 Minutes, infinite</i>	Selected value of the wait-to-restore time which has to pass before the system switches to another timing reference signal.
<i>Active Output Timing Reference</i>	<i>EXTREF1, EXTREF2, LINE1 ... LINE6</i>	Shows which external reference signal is used, either one of the external clock input signal or one of the SDH signals.
<i>Output Timing Reference</i>	<i>MANUAL, FORCED WAIT-TO-RESTORE, NO-REQUEST</i>	Value of the Switch Request activated by the user or initiated by the system.







# 11 Traffic provisioning concepts

## Overview

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**Purpose** This chapter provides you with information about traffic provisioning.

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# Cross-Connections

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**Introduction** WaveStar SNMS provides a graphical means of viewing and provisioning NE cross-connections via the Cross-Connection window. This window is designed to display connection termination points and cross-connections for a selected NE. This section provides information about cross-connection functionality and the Cross-Connection window.

**The Cross-Connection window** The Cross-Connection window provides the user with access to all cross-connection features. It contains an interface tailored to the large, modern cross-connection fabrics now supported by the system. The window for instructions on displaying the Cross-Connection window) consists of a menu bar, a toolbar, a status bar, a net work element explorer, and a main view. The main view area is further broken down into four (or eight) port areas. This window is used for all cross-connection operations, including viewing, adding, modifying, and deleting cross-connections.

**Toolbar** The Cross-Connection window contains a toolbar (at the upper left) that contains a series of buttons used for specifying different types of cross-connections or tributary reservations. If you are unsure of the operation that a certain toolbar button will perform, point at it with the cursor and after 2 seconds a tooltip is displayed, showing the operation of that button. This information is also displayed in the status bar.

The following graphic shows the toolbar.



The toolbar contains the following buttons (from left to right):

- 10 buttons for different types of cross-connections  
Used to initiate the creation of a cross-connection. (They are disabled until the user chooses a port.)
- Delete cross-connection  
used to delete an existing cross-connection. (It is disabled until the user chooses a cross-connection that can be deleted.)
- Modify cross-connection  
used to modify a cross-connection. (It is disabled until the user chooses a cross-connection that can be modified.)
- Reservation

Click this button after you have chosen a tributary to reserve. The system displays a pop-up window for selection of tributary parameters for the reservation. (The Reservation feature is only available for BWM NEs.)

- **Show/Hide**  
Click this button to show cross-connection lines - click it again to hide the cross-connection lines.
- **List existing cross-connection**  
If you click on the NE's TID in the explorer portion of the window, and click this button, a complete listing of all cross-connections for the NE is displayed. The listing shows the source and destination tributary AIDs, the cross-connect type, the rate, the TID of the source NE and the TID of the destination NE. Clicking on any equipment level in the explorer (such as a specific shelf or port), and then clicking this button, displays a list of cross-connections for the selected equipment in the NE.
- **Cancel**  
Click this button when you have started a cross-connection and want to terminate the operation. (This button is disabled until you select a cross-connection type.)
- **Toggle view**  
Click this button to change the number of port areas displayed in the view panel. Initially the view is set to Toggle to Four, which shows four port areas (and the contents of the pop-up menus in the explorer accommodate all eight ports). When you click the Toggle View button, the view changes to Toggle to Eight, which shows eight port areas (and the contents of the pop-up menus in the explorer accommodate four ports).

- Status bar** The status bar, at the bottom of the Cross-Connections window, provides the following information to the user:
- The source and destination AID and the cross-connection type of a selected cross-connection in the cross-connection view area.
  - The cumulative information about a cross-connection being added, as it is selected by the user.
  - Information about the status of add/delete/modify operations that have been requested.

When a port tributary is displayed in the Main View of the Cross-Connection window, and you position the mouse cursor on the tributary block, a message is displayed next to the tributary address in the status bar identifying it as a "Source" or "Destination" tributary. The "Source" and "Destination" literal displayed in the status bar is

used to indicate whether the tributary could act as a “Source” or “Destination” , or both, for additional cross-connections.

**Displaying ports**

Ports are displayed on the Cross-Connection window between the arrow buttons surrounding the main view area. Top and Bottom port areas appear between the left and right arrow buttons, while Left and Right port areas appear between the up and down arrow buttons.

Cross-connection prerequisites for some NE types may prevent the user from provisioning a cross-connection to or from a tributary only if the port unit slot containing the tributary has already been provisioned (or pre-provisioned) with information that determines the number of ports and the rate of the ports in the port unit slot.

**Display of STM-4 and STM-1**

The cross-connection window displays three STM-1 on top of one STM-4 in the following way.



When the cursor is positioned over one of the signal components the status line displays the respective AID.

**Display of STM-4, STM-1 and VC-3**

The cross-connection window displays three VC-3 on top of four STM-1 on top of one STM-4 in the following way.



When the cursor is positioned over one of the signal components the status line displays the respective AID.

**Color conventions**

Listed in the following table are the default color conventions used to represent cross connection and tributary properties. These colors may be changed through the Preferences window (see “Map preferences” (14-33)).

See the next table for color conventions for cross connection and tributary properties.

<b>Color</b>	<b>Representation</b>
Green	Tributary is selected as a source for cross-connection
Magenta	Cross connection destination(s) (shows when selected)
Red	Cross connection line whose redline property is enabled
Black dashed line	Standby cross connection
Orange	Cross connection on tributary is in the process of a pending operation (such as creation, deletion, modification).
Light yellow	Tributary which is not being used for any cross connection or reservation
Blue	Tributary which is being used for a cross connection
Dark blue	Tributary changes to this color when a cross-connection is created. Also indicates a reserved tributary.
Purple	Tributary which is a destination tributary for a cross-connection
Dark green	Tributary which is uni-directional
Grey	Tributary not available for cross-connection

A grey box is also displayed when:

- A multiple level graphic is displayed and there are cross connections at a lower rate than the highest rate in the graphic. For example, the graphic showing both STM-1 and VC-3 tributaries may have a grey STM-1 box if any of the VC-3 boxes are blue (already cross-connected in both directions).
- A multiple level graphic is displayed and for some reason the network element will not allow cross connection at a particular rate in the graphic. This will sometime occur when a specific setting in the network element is made to disable a certain rate.

For network element which allow cross-connections at multiple rates within a single tributary, for which no graphic exists (such as STM-1 and VC-3), the explorer will allow the user to drag and drop either the STM-1 tributary, or the VC-3 tributary to the View Area. In all other cases, only the bottom most level of tributaries shown in the explorer can be dragged to the View Area.

**Entering cross-connections**

The general steps for entering cross-connections on the Cross-Connection window in the GUI are as follows:

1. Find the tributaries that are to be cross connected together and display them in the view area.
2. Choose the box that represents the source tributary for the cross connection by clicking on the box. The box will turn green. The cross connection type buttons on the toolbar will become enabled, but only those that can use the tributary chosen as a source.
3. Choose a cross connection type by clicking on the button in the toolbar for that cross connection type.
4. Choose the box that represents the destination tributary for the cross connection by clicking on it. Both the source and destination boxes will now turn orange (an operation is pending on these tributaries).
5. If it is necessary to provide further information before the cross connection can be completed, an additional information (*Cross-Connect Attributes*) window is opened. It contains parameter names and lists of values for each parameter. Choose the parameter values for this cross connection and choose **OK**.
6. Confirm entry of the cross connection when the confirmation window is displayed.

The cross-connection command is now sent to the network element. When the command has completed (either correctly or with errors), the orange color is removed from the chosen tributaries. If the cross connection was created in the network element, the tributaries will turn blue. If the command failed, they will revert to their original colors.

**Cross-connection topologies**

Cross-connection topologies supported by the system include the following:

- One-way point-to-point cross-connection
- Two-way point-to-point cross-connection
- Multicast cross-connection. Also encompasses bridge cross-connections. A bridge cross-connection allows the addition of a second leg to an existing one-way point-to-point cross-connection, resulting in a 1:2 one-way cross-connection from one input tributary to two output tributaries.
- Roll cross-connection: this refers to the operation of moving the input of an existing leg of a one-way or two-way point-to-point cross-connection from the current input tributary to a new input tributary, while leaving the output unchanged.

- Path-switching and dual ring interworking cross-connections.
- Path-protected cross-connections to support Dual Node Interworking for TDM 10G (STM-64) NEs; or Unidirectional Path-Switched Ring (UPSR)/Subnetwork Connection Protection (SNCP) topologies for TDM 10G (STM-64 R2.0 or later) NEs.
- Loopback cross-connection: a cross-connect loopback is created from an input tributary to the output of the same tributary for testing purposes. A loopback cross-connection can be set up on any logical tributary, whether or not there are cross-connections to that tributary. A loopback cross-connection is a temporary cross-connect; after it is removed, any pre-existing cross-connections that were affected are automatically re-established in the NE.

The system also provides the ability to provision cross-connections at VC-4/STS-3 ports between tributaries on SDH and SONET ports.

### **Adjunct path-protected cross-connections**

WaveStar SNMS supports the establishment of adjunct path-protected cross-connections. An adjunct path-protected cross-connection is established when you create a cross-connection from the same input tributary as an existing path-protected cross-connection, so that both cross-connections have adjunct working legs, but to different output tributaries. The adjunct cross-connection differs from the existing path-protected cross-connection in that it is not established with assignment to a path protection group and depends on the existence of the path-protected cross-connection.

This combination of a path-protected cross-connection with adjunct cross-connections off the same protected input tributary to different output tributaries can serve the following applications:

- A connection between two UPSR rings (SONET) or SNCP rings (SDH). This type of connection requires path selection to drop the circuit from the first ring and bridging to add the circuit into the second ring.
- Dropping traffic at many tributary interfaces in a UPSR/SNCP ring for applications such as video distribution. The path-selected signal is dropped to multiple ports.

### **Textual display of cross-connections**

When you display a path-protected cross-connection textually, by clicking the List Cross Connections toolbar button on the Cross-Connection window, each output leg is displayed and identified as either working (PSW) or protection (PSP). When an adjunct cross-connection is displayed on the List Cross Connections window

**Compound cross-connections**

WaveStar SNMS supports the establishment of compound cross-connections between input and output tributaries in a network element, which may be needed in a network element for some network application.

To make it easier to identify an individual cross-connection's function in a compound arrangement, and to facilitate retrieval of information about cross-connections with associated legs and leg pairs, WaveStar SNMS allows you to assign a Cross-Connection Application and Cross-Connection Number to each cross-connection when it is being added.

**Cross connection application**

The Cross-Connection Application is a parameter that can be assigned to a cross-connection to identify the cross-connection type. This parameter can be modified for the cross-connection.

The following application (cross-connection types) can be optionally assigned when creating or modifying a cross-connection:

- 2-Way Point-to-Point
- 1-Way Point-to-Point
- 1-Way Path-Protected
- 1-Way Adjunct Path-Protected

**Cross connection number**

The Cross-Connection Number is a parameter that can be assigned to a cross-connection to associate all atomic cross-connections being established in one step, so the associated legs and leg-pairs with the same Cross-Connection can be retrieved and displayed together on the List Cross-Connections window. When you add a cross-connection or compound cross-connections from the same output tributary, WaveStar SNMS populates the Cross-Connection Number drop-down list for this field with a Cross-Connection Number for each of the atomic cross-connections with the same value. The number is a 9-digit number based on the AID of one of the logical output tributaries.

On the List Cross-Connection window (which is accessed by clicking the List Cross Connections toolbar button on the Cross-Connection window), if you select a leg of a cross-connection with the same Cross-Connection Number that has been assigned to associated legs in compound cross-connections, you can modify or delete all legs of compound cross-connections with the same Cross-Connection number.

**Deleting cross-connections**

WaveStar® SNMS denies the request to delete (remove) a cross-connection in the following scenarios, unless some modification is made to the cross-connection to be deleted:

1. A request to remove redlined cross-connections. The modification necessary to delete a redlined cross-connection is to change the redline status of the cross-connections.
2. A request to remove a cross-connection from a tributary also being used in a loopback cross-connection. The modification necessary to remove this type of cross-connection is to remove the loopback cross-connection.
3. A request to remove a cross-connection from a tributary used in a test access connection. The modification necessary to remove this type of cross-connection is to take the tributary out of test access mode using the proper TL1 command (see the vendor NE's documentation for the appropriate TL1 command/syntax to perform this action).
4. A request to remove a path-protected cross-connection that has an adjunct cross-connection associated with the same input tributary. In this case, the adjunct cross-connection associated with the same input tributary as the path-protected cross-connection must be deleted before the path-protected cross-connection can be deleted.

**Modifying cross-connections**

The system allows you to modify various cross-connection information, including the source TID, destination TID, cross-connection application, cross-connection number, and source NE.

The working and protection legs of a path-protected cross-connection can be modified by being switched.

For compound cross-connections from the same set of input and output tributaries, WaveStar SNMS allows you to change the cross-connection application of the cross-connection.

**Converting cross connections**

The WaveStar® SNMS allows you to convert one-way point-to-Point (or a leg of a two-way cross connection), one-way path protected or one-way adjunct cross connections.

The following cross connection types can be converted

- one-way point-to-point to one-way path protected
- one-way point-to-point to one-way adjunct
- one-way path protected to one-way point-to-point
- one-way adjunct to one-way point-to-point

The leg being converted may be either the working leg or the protecting leg of the path protected or adjunct cross-connection.

### 1-Way Cross-Connection Parameters

The following table gives an overview over the parameters in the 1-way cross-connection parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the "To" port.

### 2-Way Cross-Connection Parameters

The following table gives an overview over the parameters in the 2-way cross-connection parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.

Field	Possible values	Meaning
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.
RTNOMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The RTNOMODE refers to the “From” port.

### 1-Way PP Cross-Connection Parameters

The following table gives an overview over the parameters in the 1-way path protected parameters window.

Field	Possible values	Meaning
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location where the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location where the path exits the ring.
LOCA2	(name)	NE name of the second source location.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the “To” port.

### Multicast Cross-Connection Parameters

The following table gives an overview over the parameters in the multicast cross-connection parameters window.

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<b>Field</b>	<b>Possible values</b>	<b>Meaning</b>
LOCA	(name)	NE name of the source location. In an MS-SPRING this should be the location were the path enters the ring.
LOCZ	(name)	NE name of the sink location. In an MS-SPRING this should be the location were the path exits the ring.
OMODE	NORM, IDLE/UNEQ, AIS	If the cross-connection is not in a normal (NORM) operation mode, either IDLE/UNEQ or AIS can be inserted into the signal. The OMODE refers to the "To" port.

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## Protection Groups

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**Introduction** Protection group management can include both equipment and port protection groups. There are several types of protection strategies, including:

- 1+1 protection (where a service entity and a protection entity serve as a pair, with only one of them active at any given time)
- 1xN equipment protection (where a single protection entity is shared by multiple service entities)
- 2-fiber MS-SPRing protection (for SDH)
- Path/DRI for TDM 10G (STM-64) and 2.5G NEs
- Unprotected entities (0x1 protection)

WaveStar SNMS allows you to retrieve an NE's current protection configuration for its transmission interfaces and to configure, at NE level, the rate, member ports, and attributes of its protection groups. Protection group modifications are done per NE for its associated protection groups. WaveStar SNMS also provides the capability to select a protection group and then to provision a protection switch between the working and protection entities in that group.

**Protection group discovery** WaveStar SNMS retrieves an NE's current protection group data for transmission interfaces and stores this information in its database when DNO is performed upon discovery of the NE or update of this information is requested while performing a manual DNO on the NE. For NEs with multiple bays/shelves, such as the WaveStar BWM, DNO can be performed to update protection group data for a selected single bay or shelf.

**Provisioning protection groups** Protection groups can be added, modified, or deleted from an NE. You can also view the member ports and attributes for a protection group in an NE.

To add a new protection group for an NE, you select a protection group type from a list of available protection group types for the NE type, pick the rate of the protection group, assign a user-specified protection group ID which is associated with the selected bay and shelf, choose the members (ports) of the protection group, and provision the attributes for the group. In creating or modifying protection groups, WaveStar SNMS enforces that all members (ports) of the group are within the same shelf and bay and of the same transmission rate. When you select the first member port on the shelf, the first port becomes the reference port for the other members of the protection group and the remaining allowable choices are other ports on the same shelf.

For the optical interfaces, protection switching provides protection against both equipment and facility (line) failures. For the WaveStar NEs, one universal constraint is that all the entities, service and protection, must be within the same shelf.

### Modifying protection groups

Once a protection group has been added for member ports in an NE, you can modify the given attributes of a protection group or swap ports in certain protection group types as shown in the following table.

Protection Group Type	Swap
1+1 Optical	Working and Protection Ports
2-Fiber BLSR/MS-SPRing	East and West Ports

When modifying a protection group, the type, rate, and member ports of the group cannot be changed.

### Deleting protection groups

Deleting a protection group removes it from an NE.

### Provisioning a protection switch

A protection switch in a protection group occurs automatically when a signal failure, signal degradation, equipment failure, or similar cause prompts a switch from the working entity in a protection group to the protection entity. WaveStar SNMS also allows you to provision a protection switch on demand through a GUI-based function on the Protection Group Management window. To provision a protection switch, you specify the protection group type, protection group AID, protection switch type (command), and the destination of the entity that should be active after the protection switch is activated. In some types of protection groups (for example, 2-Fiber BLSR), the protection switch is made between the working and protection ports, while in equipment protection groups (for example, 1xN Electrical), the protection switch is made between working and protection circuit packs.

### 1+1 Protection Group Parameters

The following table gives an overview over the parameters in the 1+1 protection group parameters window.

Field	Possible values	Meaning
STM1, STM16	(via radio button)	Capacity of the 1+1 protection.
PG AID: Bay-Shelf-O	(AID)	AID of the protection group.

Field	Possible values	Meaning
Bay-Shelf	1-1, 1-2, 1-3	The bay and shelf on which the protection group is located.
Working New Value	(AID)	AID which will be the defined as the working port.
Protocol	1+1_UNI, 1+1_BIDIR, 1+1_OPT	The type of the protection either it is unidirectional (1+1_UNI) or a bidirectional or a optimized (1+1_OPT) protection. In an optimized protection the working port becomes the protecting and vice versa if a switch occurs.
Revertive Mode Enable	enable, disable	If the revertive mode is enabled, the signal is switched back to the defined working line after the interruption is over. (Not for Protocol 1+1_OPT)

### MS-SPRing Protection Group Parameters

The following table gives an overview over the parameters in the MS-SPRing protection group parameters window.

Field	Possible values	Meaning
STM64, STM16	(via radio button)	Capacity of the MS-SPRing.
Protection Group Name	(name)	Name of the protection group.
PG AID: Bay-Shelf-T	(AID)	AID of the protection group.
Bay-Shelf	1-1, 1-2, 1-3	The bay and shelf on which the protection group is located.
East New Value	(AID)	AID of the east side of the protection group.
West New Value	(AID)	AID of the west side of the protection group.

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<b>Field</b>	<b>Possible values</b>	<b>Meaning</b>
Wait to Restore	0, 1, ..., 12, 99	The time in minutes after which a signal is switched back to the working line after the interruption is over.

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## Protection Switch Management

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**Overview** WaveStar SNMS has the capability to monitor and control protection switches that can occur as a result of a fiber cut, signal degradation, equipment failure, or loss of signal, thereby provoking a switch from the working to the protection facility. Protection switches can occur automatically or be manually provisioned by the user.

Protection switch status information is generated by NEs for:

- ports involved in 1+1 optical line protection
- circuit packs involved in 1xN equipment protection
- ports involved in 2-fiber BLSR/2-fiber MSSPRing protection
- signal rates that are path protected
- optical ports involved in optical channel path protection

### **Protection switch management functions**

The protection switch management functions provided by WaveStar SNMS are:

- monitoring the messages generated by the NE in response to protection switch requests that occur automatically due to incoming signal failure, incoming signal degrade, circuit pack failure, or similar cause
- maintaining the status of protection switches in the WaveStar SNMS database based on the protection switch messages received by the system
- provisioning protection switches for a given protection group type, while viewing autonomous messages received about protection switch activity for that protection group type, from the Protection Status Management window.
- logging all autonomous and user-generated (CIT/WaveStar SNMS) protection switch requests and NE messages generated in response to switch requests. Protection switch requests and resulting messages can be viewed through the Network Notification Log.
- notifying the user of a protection switch status change (see “Display Protection Switching Status” (6-18)).
- displaying the current protection switch status for a protection type for one or more NEs on demand (see “Display Protection Switching Status” (6-18)).
- displaying the history of protection switch status changes for a protection type for one or more NEs on demand (see “Display Protection Switching Status” (6-18)).



# Dynamic Network Operations

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**Introduction** The Dynamic Network Operations (DNO) feature performs two major functions in WaveStar SNMS:

- Subnetwork discovery
- Database synchronization

**Subnetwork discovery** The DNO feature retrieves the internal configurations of NEs and external connectivity relationships. This allows the system to discover all NEs in a subnetwork as well as the trails between NEs where available. As a result, the subnetwork topology (NEs and trails) is automatically displayed on the Map window as soon as it is discovered.

When the subnetwork discovery aspect of DNO is executed on a per-NE basis, the neighbors of the target NE are also discovered. The system uses the DNO feature to query the SONET Directory Service (SDS) to discover these node types. When subnetwork discovery is initiated with the SDS, the system queries the DSA of the chosen SDS for discovering NEs, then sends commands to neighboring NEs for discovering trails.

**Database synchronization** The DNO feature synchronizes the system database with current configuration data from the NEs. The information that DNO gathers from NEs includes:

- NE parameters
- NE equipment inventory
- NE port parameters
- NE port protection groups
- NE cross-connections

As part of subnetwork discovery, the system retrieves an NE's current equipment configuration and stores this information in the system database. NE equipment data can include bays, shelves, and circuit packs.

**Ways to initiate DNO**

There are three ways that the DNO feature is initiated in the system:

- Automatically – The DNO subnetwork discovery/database synchronization process is initiated automatically when an NE is discovered or added manually to the WaveStar SNMS database.
- Manually – The DNO subnetwork discovery/database synchronization process is executed for the NE, when you request it. When you request a manual DNO for an aggregate, DNO is executed for all NEs in the aggregate.
- Scheduled – You can schedule DNO to be performed for one or more NEs on a daily, weekly, or monthly basis.

**DNO options**

You can invoke DNO to perform automatic subnetwork discovery or database synchronization for one or more of the following: NE parameters, equipment inventory, port parameters, port protection groups, cross-connections, reservations. You can also invoke DNO to perform subnetwork discovery and resynchronize the system database for all data types.

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## Cross-connection management

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**Overview** The WaveStar™ TDM 10G add/drop multiplexer is in its basic configuration a single shelf that interfaces electrical STM-1, optical STM-1 and optical STM-16 lines to an SDH-standard 2-fiber MS-SPRing protected ring. It has 16 tributary slots that support flexible optical and electrical port unit mixing. If additional capacity for tributary port units is required, the system can be expanded by an extension shelf.

**Definitions** **Port** A physical transmission interface, consisting of both an input and an output, which may be used to carry traffic between network elements. Operational differences between ports determined by port provisioning include pointer processing, fault and performance monitoring, path maintenance (e.g. Unequipped, AIS, RDI), cross-connections (supported rates), and protection switching.

**Port protection group** A user-provisioned association of optical interface ports which is used for protection in a particular type of network configuration. Two types of port protection groups are defined:

- 2-fiber MS-SPRing port protection group used for SDH 1+1 MS-SPRing
- 1+1 port protection group used for SDH 1+1 Multiplex Section Protection (MSP) The operations on a port protection group include the provisioning, control, and status of the protection switching.

**Tributary** A path-level unit of bandwidth within a port, or the signal(s) being carried in this unit of bandwidth, e.g. a VC-3 or VC-4 within an STM-N port.

**Cross-connection** A reconfigurable SDH path-level interconnection within a network element between input and output tributaries of specific ports.

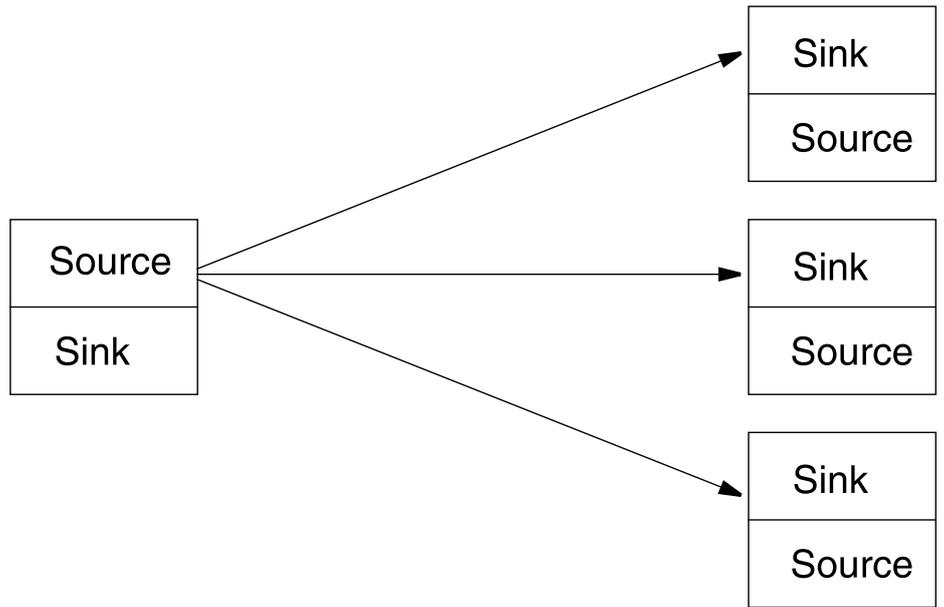
**Cross-connection leg** A one-way connection provisioned from one input tributary to one output tributary. Each leg is identified as an entity by its input and output tributaries, its cross-connection rate, and the type of cross-connection it is part of. A leg pair is a pair of cross-connection legs which are reported as a two-way connection between two tributaries.

**Cross-connection types** All meaningful cross-connection types can be reduced to three basic types:

- Unidirectional point-to-point connection



- Unidirectional point-to-multipoint connection (broadcasting/multi-casting)



- Bidirectional connection



You can provision and reconfigure cross-connections. WaveStar™ TDM 10G provides an STM-1 rate time slot assignment capability that supports the following types of cross-connection:

- 1 - way (unidirectional) point-to-point
- 2 - way (bidirectional) point-to-point

**Transmission interfaces**

WaveStar™ TDM 10G includes the following optical and electrical port units:

- Optical Interfaces

STM-64 port units are available in the 1.5  $\mu\text{m}$  wavelength (intermediate reach).

STM-16 port units are available in two wavelengths:

- 1.3  $\mu\text{m}$  wavelength (long reach)
- 1.5  $\mu\text{m}$  wavelength (long reach)

Each STM-16 port unit contains one bidirectional port.

STM-1 port units are available for 1.3  $\mu\text{m}$  wavelength (long reach).

The STM-1 port units feature four bidirectional ports per circuit pack.

- Electrical Interfaces. The electrical STM-1 port units are capable of transmitting and receiving signals at the 155 Mbit/s rate. Each port contains four independent bidirectional ports.

**Switch capacity**

The 192 x 192 switch fabric of the WaveStar™ TDM 10G supports simultaneous cross-connections from each of up to 128 source STM-1 equivalents to all of the up to 128 sink STM-1 equivalents. The cross-connections are fully non-blocking.

**Cross-connection levels**

The following cross-connection levels are supported in WaveStar™ TDM 10G:

- VC-3
- VC-4
- VC-4-4c (Concatenated VC-4)

**Output mode**

The cross-connection output mode for the: (a) destination-to-source direction, and/or (b) source-to-destination direction, is a provisionable parameter. If some of the facilities are not in place whenever the cross-connection is being established then you can provision this field as AIS or IDLE/UNEQ and an AIS or an unequipped signal will be inserted to function as a keep-alive signal.

If all of the involved facilities are in place when the cross-connection is established, the field should be provisioned as NORMAL. The end-to-end signal path is then established and the signal can be passed.

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## Protection mechanisms

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**Overview** The reliability of a transmission system can be considerably increased by means of redundant transmission routes. In the event of a transmission error, e.g. if LOS (Loss of Signal) is signalled due to a cable break, or in the event of an excessive bit error ratio, the signals can be switched to a protection line.

**Types** Network protection

The following types of protection switching can be realized:

- STM-64 and STM-16 2-fiber MS-SPRing
- STM-16 and STM-1 1+1 Multiplex Section Protection (MSP)

**Principle** Equipment Protection

An equipment protection always involves one or more plug-in units which carry traffic (*working* plug-in unit) and one or more *protection* plug-in unit(s) which will assume the function of a plug-in unit that has failed. Together they form a *protection group*.

**Types** For the following circuit packs equipment protection is supported:

- Timing Generator circuit pack (TMG): 1+1
- Cross-connect circuit pack (SWITCH/STS576 and PPROC/STS192): 1+1
- Power feed is maintained duplicated throughout the system

**Creation** The equipment protection groups are created automatically if the required circuit packs are plugged in the shelves (cf. "Protection configurations" (11-32)).

**Operation** The equipment protections operate non-revertive.

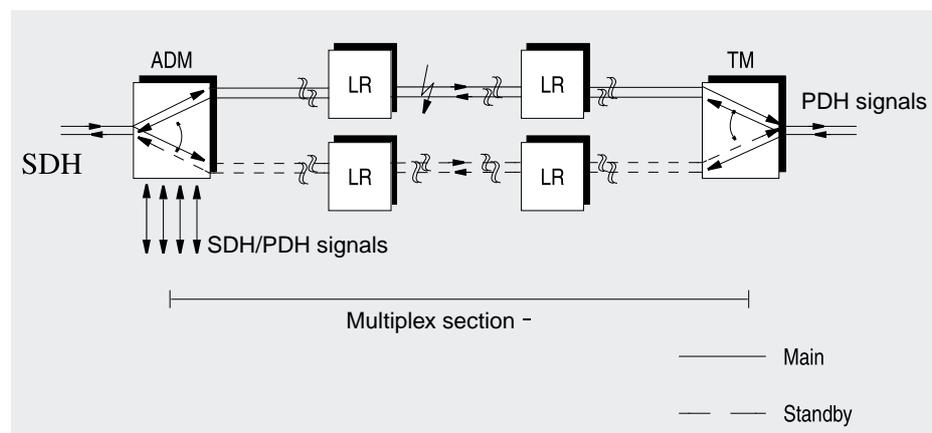
□

## Multiplex section protection

**Overview** In multiplex protection switching, the complete (physical) transmission path between two multiplexers is duplicated. This means that a separate Optical Interface Unit is connected in each multiplexer for the main (working) and standby (protection) section.

**1+1 MSP** In case of a 1+1 MSP each main line is assigned to one standby line. As for other types of protection switching the signals are duplicated in the transmit direction. In the receive direction, this type of switching either selects, depending on the signal quality, the input signals of the main section or that of the standby section for transmission. The network elements are equipped with an MSP function which carries out the selection and changeover processes. The switching activities are monitored by the K1-K2 byte protocol according to ITU-T Rec. G.783. This takes place in the receive direction on the circuit pack, which is connected to the standby section.

The following figure illustrates the schematic diagram of a 1+1 Multiplex Section Protection.



1+1 MSP is implemented in compliance with ITU-T G.841 and ETSI 300 417.

**Switching criteria** The switchover is triggered by the following switching criteria, which are generated by the MST functional block after evaluation of the SOH:

- **Signal Degrade (SD)**  
Bit error ratio (BER) in the range  $10^{-3}$  ...  $10^{-9}$
- **Loss of Signal (LOS)**
- **Loss of Frame (LOF)**
- **Multiplex Section Excessive Bit Error Ratio (MS-EXC)**

Bit error ratio  $\geq 10^{-3}$

- ***Multiplex Section Alarm Indication Signal (MS-AIS)***

**Mode of operation** In the WaveStar™ TDM 10G systems the MSP can be operated unidirectional or bidirectional and revertive or non-revertive each.

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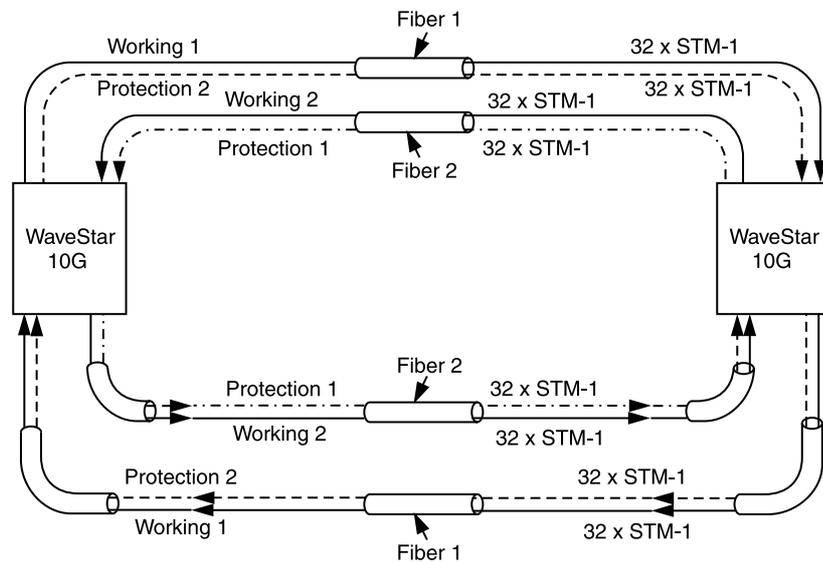
## 2-Fiber MS-SPRing

**Overview** A 2-fiber Multiplex Section - Shared Protection Ring (MS-SPRing) is a self-healing ring configuration in which traffic is bidirectional between each pair of adjacent nodes and is protected by redundant bandwidth on the bidirectional lines that interconnect the nodes in the ring. Because traffic flow is bidirectional between nodes, traffic can be added at one node and dropped at the next without traveling around the entire ring. This leaves the spans between other nodes available for additional traffic. Therefore, with many traffic patterns a bidirectional ring can carry much more traffic than the same facilities could carry if configured for a unidirectional ring. Additionally, the protection capacity can be used to provide unprotected transport for extra traffic when no failures are present.

**MS-SPRing in WaveStar® TDM 10G (STM-64)** WaveStar® TDM 10G (STM-64) provides the possibility to configure MS-SPRing for one STM-64 ring and for up to four STM-16 rings per shelf.

The STM-16 and STM-64 2-fiber MS-SPRing is compliant with ETS 300 417 and ITU-T G.841.

**Traffic capacity** The following figure shows working and protection traffic capacities in a WaveStar® TDM 10G STM-64 2-fiber MS-SPRing.



NC-2.5GAPOG-067

**Self-healing rings**

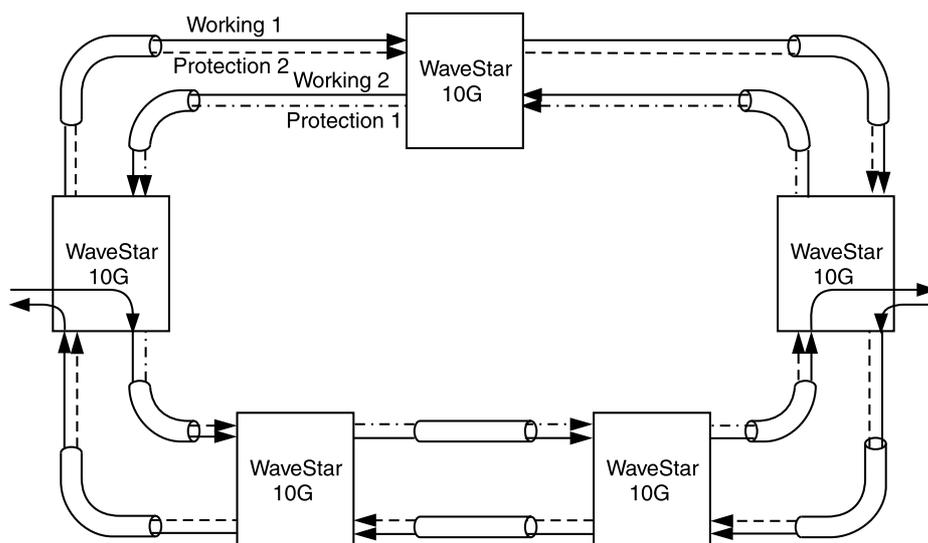
WaveStar® TDM 10G 2-fiber MS-SPRings are self healing in that transport is automatically restored after node or fiber failures. In case of STM-64 MS-SPRing, each line carries 32 STM-1 equivalent timeslots of working capacity plus 32 STM-1 equivalent timeslots of protection capacity. For STM-16 MS-SPRing, the working capacity is 8 STM-1 equivalents, the protection capacity 8 STM-1. In the event of a fiber or node failure, service is restored by switching traffic from the working capacity of the failed line to the protection capacity in the opposite direction around the ring. (See “Fiber cut example” (11-28).)

**Low-priority traffic**

Unprotected traffic can be established on the protection channels (low-priority traffic). This traffic is preempted in case of a protection switch.

**2-Fiber MS-SPRing traffic flow**

The following figure shows normal (non-protection-switched) traffic flow in a WaveStar® TDM 10G 2-fiber MS-SPRing.

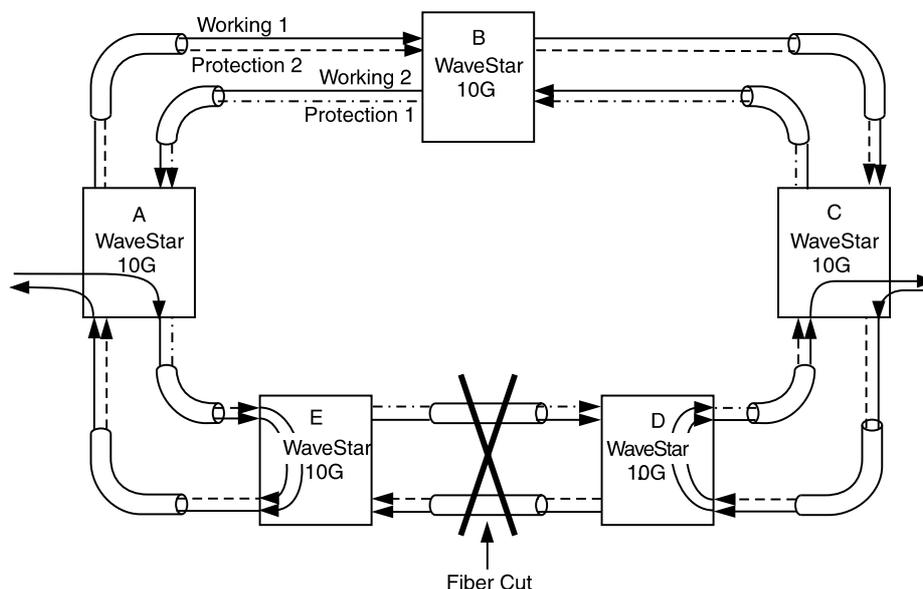


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**Protection switching**

When a line-level event triggers a protection switch, the affected nodes switch traffic on to protection capacity and transport it to its destination by looping it back the long way around the ring. (See “Fiber cut example” (11-28).) Service is reestablished on the protection capacity in less than 50 milliseconds after detection of the failure (for catastrophic failures in rings without existing protection switches or extra traffic).

**Fiber cut example** The following figure illustrates a 2-fiber MS-SPRing protection switch that results from a fiber cut.



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**Protection traffic flow** In the example (see “Fiber cut example” (11-28)), traffic going from Node A to Node C that normally passed through Node E and Node D on “working 2” capacity, is switched onto the “protection 2” capacity of the line leaving Node E in the opposite direction. The traffic loops back around the ring and reaches Node C by way of Node B. Similarly, traffic going from Node C to Node A that normally passed through Node D and Node E on “working 1” capacity is switched on to the “protection 1” capacity of the line leaving Node D in the opposite direction.

The same approach is used for a node failure. For example, if Node D were to fail, Nodes C and E would perform loopback protection switches to provide an alternate route for ring traffic.

### MS-SPRing Switch Parameters

The following table gives an overview over the parameters in the MS-SPRING switch parameters window.

Field	Possible values	Meaning
Switch Command	CLEAR, LOCKOUT, FRCD, MAN	<p>The switch commands have the following meaning</p> <ul style="list-style-type: none"> <li>• CLEAR—Clears a previous LOCKOUT or FRCD request. Allows the protection to switch automatically</li> <li>• LOCKOUT—The protection switch is disabled.</li> <li>• FRCD—A forced switch is issued even if the other line would be faulty.</li> <li>• MAN—A manual switch is issued only if the other line is error free.</li> </ul>
Destination Entity	WKG, PROTN	Entity for which the switch is issued. This is either the working (WKG) or the protecting (PROTN).
Destination Side	east, west	The transmission direction (east or west) to which the traffic shall be switched.
Destination Entity AID	AID	AID of the entity for which the switch is issued.
Switch Type	ring, span	The switch type should be set to <i>span</i> .

□

## 2-fiber MS-SPRing with Non-preemptible Unprotected Traffic (NUT)

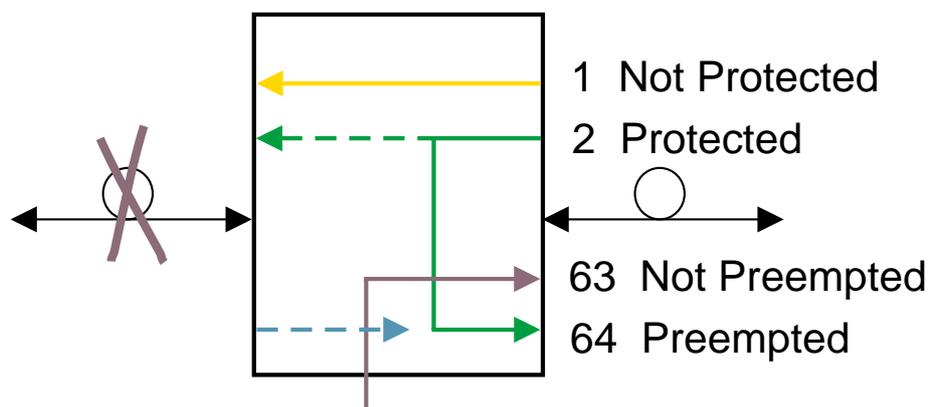
**Overview** Non-preemptible Unprotected Traffic (NUT) offers the possibility to exclude timeslots from the MS-SPRing protection.

NUT allows the operator to selectively exclude individual HO-VCs from the MS-SPRing in a flexible way. This feature extends the traffic availability and optimizes the utilization of the bandwidth.

**Low priority traffic** In a normal MS-SPRing the protection bandwidth can be used for low priority traffic, but this traffic is lost, if a protection switch is carried out. In this case the whole working bandwidth is switched to the protection bandwidth.

**Non-preemptible Unprotected Traffic** A better availability can be achieved by deciding not to access a portion of the protection bandwidth (temporary or definitely), i.e. making some of the protection timeslots inaccessible for protection purposes. The traffic in these timeslots is called *non-preemptible*. As there is a 1:1 relationship between the working and the protection timeslots, the corresponding working timeslots are thus unprotected. Traffic contained in such working timeslots is called *Non-preemptible Unprotected Traffic (NUT)*.

The following graphic illustrates the switch behaviour in an MS-SPRing protected network element.



### Protection attribute and Local NUT configuration

Each timeslot of an MS-SPRing protected optical signal gets an attribute, the *Protection Attribute*, which indicates whether a working timeslot is protected or not or whether a protected timeslot may be preempted by the MS-SPRing or not.

For working timeslots the following values are possible:

- **Protected**
- **Not Protected**
- **Temporarily Not Protected**

If a timeslot is set to **Temporarily Not Protected**, an alarm is generated in the local NE.

For protection timeslots the following values are possible:

- **Preemptible**
- **Non-Preemptible**
- **Temporarily Non-Preemptible**

As working and protection timeslots are always paired, the value of the Protection Attribute of a working timeslot determines the value of the corresponding protection timeslot.

#### **Local NUT configuration**

The *Local NUT configuration* is a table with all timeslot and their corresponding **Protection Attribute** value. It represents the provisioning made by the user *in the local node*.

#### **Operational NUT configuration**

The *Operational NUT configuration* provides the real NUT configuration *of the ring*. It contains a unique and identical set of Protection Attributes as they have to be used by the nodes. It must be identical in all nodes.

The Operational NUT configuration is created according to the following rules:

- It is autoprovisioned out of the Local NUT configurations
- It contains up to 96 entries, one per timeslot
- all default values are set to protected/preemptible
- If in any node the **Protection Attribute** of a certain timeslot is set to **Not Protected/Non-preemptible**, this will be indicated in the Operational NUT configuration and is valid for the whole ring.
- If two or more nodes have the same setting for a specific time slot (**Not Protected** or **Temporarily Not Protected**), this will only be indicated once for the node with the highest Node ID.

Modifications of the Local NUT configuration in any node are broadcasted to all other nodes in the ring via DCC. Settings which have been carried out in a certain node can only be modified from the same node. Duplicate settings from two nodes have to be changed in both nodes.

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## Protection configurations

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**Overview** This section describes the shelf configuration guidelines that have to be observed in case of the following protection mechanisms:

- 2-fiber MS-SPRing
- 1+1 MSP.

All protection mechanisms are only supported within one shelf, so it is not possible to have a circuit pack in the Main Shelf be protected by a circuit pack in the Extension Shelf.

**MS-SPRing** The MS-SPRing related STM-16 circuit pack pairs have to be plugged in to the following dedicated port unit slot pairs: 02-04, 06-08, 10-12, 14-16, 02-16, 04-14, 06-12, 08-10.

**MSP** MSP can only be established between two separate circuit packs (which are of the same type), i.e. it is not allowed to establish MSP between 2 ports on the same circuit pack. MSP between different ports on different circuit packs can be configured independently, e.g. one port of circuit pack 1 can be protected with one port of circuit pack 2 while the second port on circuit pack 1 is protected by circuit pack 3. The MSP related circuit packs are not restricted to specific slots.

For STM-16 port units, any pair combination of allowed slot positions can be applied: 02, 04, 06, 08, 10, 12, 14, 16.

For optical STM-1 port units, any pair combination of allowed slot positions can be applied: 01...16.

**Cross-connect unit protection** The SWITCH/STS576 circuit pack in slot (1-1) switch0 in the Main Shelf is paired with the circuit pack in slot (1-1) switch1 in a 1+1 non-revertive protection mode configuration.

The SWITCH/STS576 circuit pack in slot (1-2) switch0 in the Main Shelf is paired with the circuit pack in slot (1-2) switch1 in a 1+1 non-revertive protection mode configuration.

The PPROC/STS192 circuit pack in slot (1-2) ppls0 provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-1) sw. 0).

The PPROC/STS192 circuit pack in slot (1-2) ppls1 provides frame delay management between the switch functions of the low speed part of the shelf and the high speed part ((1-2) sw. 1).

The SWITCH/STS576 circuit pack in slot switch0 in the Extension Shelf is paired with the circuit pack in slot switch1 in a 1+1 non-revertive protection mode configuration.

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## Port parameters

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### STM port parameter description

The following table gives an overview over the parameters in the STM port parameters window.

Field	Possible values	Meaning
Excessive Maintenance Inhibit	TRUE, FALSE	When this parameter is set to <b>false</b> an AIS (Alarm Indication Signal) will be inserted as consequent action of the alarm EBER (Excessive Bit Error Ratio).
Optical Wavelength	1310, 1550	The wavelength of the optical signal in nm.
Optical Distance	INTRA-OFFICE, SHORT-HAUL, LONG-HAUL	The length of the optical line.
Forward Error Correction	ENABLE, DISABLE	The forward error correction can be enabled or disabled for the output. An enabled FEC allows for greater spans.
FEC Correction Enable	ENABLE, DISABLE	The forward error correction can be enabled or disabled for the input. An enabled FEC allows for greater spans.
Tributary Input Signal Rate List	signal structure is shown. e.g. 644 (= 64xVC-4), 44C(= 4xVC-4-4C), VC-4-16C	This parameter defines the VC-n signal substructure across the port's bandwidth for the input signal. For each STM-n the substructure can be selected. The substructure for the Tributary Input Signal Rate List and the Tributary Unequipped Output Signal Rate List need not be the same. For example, 64 VC-4s on the input signal and 4 VC-4-4cs on the output signal is allowed.

Field	Possible values	Meaning
Tributary Unequipped Output Signal Rate List	signal structure is shown. e.g. 644 (= 64xVC-4), 44C (= 4xVC-4-4C)	This parameter defines the VC-n signal substructure across the port's bandwidth for an output signal which does not contain real traffic. For each STM-n the substructure can be selected. The substructure for the Tributary Input Signal Rate List and the Tributary Unequipped Output Signal Rate List need not be the same. For example, 64 VC-4s on the input signal and 4 VC-4-4cs on the output signal is allowed.
FEC Type	INBAND, OUTBAND	In-band FEC yields an OSNR improvement of approx. 3 dB at a BER of $10^{-12}$ . It is primarily used to compensate insufficiencies of optical components. Out-of-band FEC yields an OSNR improvement of approx. 5 dB at a BER of $10^{-12}$ . It enables high-speed transmission more reliably and for longer distances.
Multiplex Section Degrade Threshold	-5, ..., -9	This parameter defines the threshold for the tolerable signal degradation. If the threshold is exceeded MS-DEG is signalled.
Multiplex Section DEXC Threshold	-3, ..., -5	This parameter defines the threshold for the Excessive Bit Error Ratio (EXC) related to the Multiplex Section. If the threshold is exceeded MS-EXC is signalled.

Field	Possible values	Meaning
Port Mode		The Port Mode defines whether a port causes alarms or not.
	AUTO	If a valid signal is present at the port, the Port Mode is set to MON automatically.
	MON	The port causes alarms, if necessary.
	NMON	The port does not cause alarms.
Far-end Multiplex Section PM Enable	ENABLE, DISABLE	The performance monitoring for the far-end of the multiplex section can be enabled or disabled.
PM Multiplex Section Far-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the far-end of the multiplex section. If the threshold is exceeded an alarm is raised. (Should be set to 30.)
PM Multiplex Section Near-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the near-end of the multiplex section. If the threshold is exceeded an alarm is raised. (Should be set to 30.)
PM Regenerator Section Near-end SES threshold	0, 5, ..., 50	The threshold of severely errored seconds (in %) can be set for the near-end of the regenerator section. . If the threshold is exceeded an alarm is raised. (Should be set to 30.)
RSMS TCA Profile Name	Default0, Default	The threshold crossing alert profile for the regenerator and multiplex section.

Field	Possible values	Meaning
RS/Near End Multiplex Section PM	ENABLE, DISABLE	The performance monitoring for the near-end of the regenerator section can be enabled or disabled.

**Provisioning (VC-3) Parameters**

The following table gives an overview over the parameters in the VC-3 parameters window.

Field	Possible values	Meaning
DEXC Threshold	-3, -4, -5	This parameter defines the threshold for the Excessive Bit Error Ratio (EBER). If the threshold is exceeded Signal Fail (SF) is signalled.
Path degrade threshold	-5, ..., -9	This parameter defines the threshold for the signal degrade condition.
Path Trace J1 Read Format	1, 15, 16, 64	(Setting not supported by the current NE release.)
Path Trace (J1)	(number)	(Setting not supported by the current NE release.)
Tributary Monitoring Mode	NMON, MON	If set to MON an alarm is caused, if necessary. If NMON is set, no alarms are caused by the tributary.

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# 12 Traffic maintenance concepts

## Overview

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**Purpose** This chapter provides you with information about traffic maintenance regarding performance monitoring and measurements.

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## Performance monitoring background

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**Performance Monitoring** Performance Monitoring provides the user with the facility to systematically track the quality of a particular transport entity. This is done by means of continuous collection and analysis by of the data derived from defined measurement points.

**Definitions** The following definitions explain expressions which are important for the performance monitoring.

**Anomaly** An anomaly is a discrepancy between the actual and the desired characteristic of a system component.

**Defect** A defect is the limited interruption of the ability of a system component to perform a required function.

**Block** A block is a set of consecutive bits associated with the path/section. Each bit belongs to one and only one block. Consecutive bits may not be contiguous in time.

**Errored block** An errored block is a block in which one or more bits are in error.

**Errored second** An errored second (for in-service measurements) is a one-second interval with one or more errored blocks or at least one anomaly.

**Severely errored second** A severely errored second (for in-service measurements) is a one-second interval which contains a configurable amount of errored blocks (default: 30 %) or at least one defect

**Background block error** An errored block not occurring as part of a severely errored second is a background block error.

**Unavailable seconds** Unavailable seconds determine the period of time during which a path is in the unavailable state. A period of unavailable time begins at the onset of ten consecutive severely errored second events. These ten seconds are considered to be part of unavailable time. A new period of available time begins at the onset of ten consecutive non severely errored second events. These ten seconds are considered to be part of available time.

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## Performance measurements

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### Basic Measurement Parameters

The following definitions explain expressions which are important for the performance monitoring.

Near-end parameters, related to the receive direction:

- Near-End Errored Seconds (N-ES)
- Near-End Severely Errored Seconds (N-SES)
- Near-End Unavailable Seconds (N-UAS)
- Near-End Background Block Errors (N-BBE)

The following basic parameters are used for the performance monitoring:

Far-end parameters, related to the transmit direction:

- Far-End Errored Seconds (F-ES)
- Far-End Severely Errored Seconds (F-SES)
- Far-End Unavailable Seconds (F-UAS)
- Far-End Background Block Errors (F-BBE)

### Enabling Performance Measurement Points

Performance measurement points can be enabled via the Element Manager WaveStar® SNMS and via the WaveStar® CIT.

### Supported Counter Types

The following table gives an overview which performance monitoring counter type can be configured for certain termination points. As no path termination is done within the WaveStar™ TDM 10G (STM-64) network element, an intermediate higher-order path performance monitoring is implemented on VC-3, VC-4, VC-4-4c and VC-4-16c level.

Counter Type	Multiplex Section	Regenerator Section	HO VC Intermediate Path
N-ES	X	X	X
N-SES	X	X	X
N-UAS	X	X	X
N-BBE	X	X	X
F-ES	X	–	X
F-SES	X	–	X
F-UAS	X	–	X

Counter Type	Multiplex Section	Regenerator Section	HO VC Intermediate Path
F-BBE	X	–	X

**Data Storage** All the data is stored in the current bin. The managed NE has a current data register (current bin) for 15 minutes and 24 hours. Once a termination point for measurements has been configured, you are able to get a snapshot view of the data gathered at any time (default).

**Data Retrieval** Performance Data can be polled via the WaveStar® SNMS and via the WaveStar® CIT.

**Historic Bins** The network element keeps a store of the historic 15 minute and 24 hour bins as shown in the following table.

Interval	Number of historic bins	Total storage time
15 minute	32	8 hours
24 hours	1	1 day

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## Performance management parameters

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### Global PM Management Parameters

The following table gives an overview over the parameters in the global performance management parameters window.

Field	Possible values	Meaning
Collect PM Data	(checked, not checked)	Switch on or off the collection of PM data by SNMS.
For 15 minute Reports: (1 to 30 days)	1, ..., 30 (slider)	Number of days for which 15 minute reports are collected.
For 1 day Reports: (1 to 30 days)	1, ..., 30 (slider)	Number of days for which 1 day reports are collected.

### NE PM Management Parameters

The following table gives an overview over the parameters in the NE performance management parameters window.

Field	Possible values	Meaning
Enable 15 minute PM data collection for this NE	(checked, not checked)	The 15 minute PM data collection for this NE is enabled or disabled.
Enable 1 day PM data collection for this NE	(checked, not checked)	The 1 day PM data collection for this NE is enabled or disabled.
All facility types in this NE	on, off (radio button)	The performance data from all facility types in this NE are collected.
Only these facility types	on, off (radio button)	The performance data from the below checked facility types in this NE are collected.
STM-64, STM-16, STM-1, STM-1E, VC3, VC4, VC4-4C, VC4-16C	(checked, not checked)	Only data from the here checked facility types are collected, if <b>Only these facility types</b> is selected.



## Equipment protection switch parameters

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### Equipment Protection Switch (Timing Pack Equ.) Parameters

The following table gives an overview over the parameters in the global performance management equipment protection switch parameters for timing pack equipment window.

Field	Possible values	Meaning
Switch Command	CLEARFRCD, FRCD, MAN	A previous forced protection switch can be cleared (CLEARFRCD) or a manual (MAN) or forced (FRCD) switch can be issued.
Destination Entity	0, 1	Entity for which the switch is issued.
Destination Entity AID	(AID)	AID of the entity for which the switch is issued.

### Switch Fabric Pack Equipment Parameters

The following table gives an overview over the parameters in the switch fabric pack equipment parameters window.

Field	Possible values	Meaning
Switch Command	CLEARFRCD, FRCD, MAN	The switch commands have the following meaning <ul style="list-style-type: none"> <li>• CLEARFRCD—Clears a previous FRCD request. Allows the protection to switch automatically</li> <li>• FRCD—A forced switch is issued even if the other line would be faulty.</li> <li>• MAN—A manual switch is issued only if the other line is error free.</li> </ul>
Destination Entity	0, 1	Entity for which the switch is issued.
Destination Entity AID	AID	AID of the entity for which the switch is issued.

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## Cross connection loopbacks

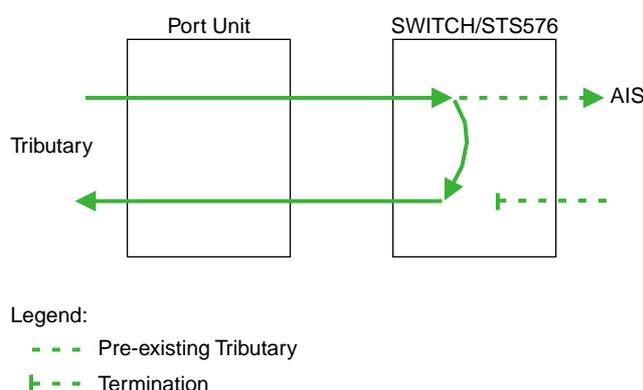
### Purpose of cross connection loopbacks

Cross connection loopbacks (also referred to as “XC loopbacks”) make it possible to loop an input tributary back to the output of the same tributary. The selected input tributary is looped back in the switch unit (SWITCH/STS576 circuit pack).

Cross connection loopbacks can be used for testing purposes.

### Functional principle

The following schematical diagram depicts the functional principle of cross connection loopbacks.



A cross connection loopback can be regarded as a temporary cross connection of indeterminate duration. If a cross connection already exists on the selected tributary, an alarm indication signal (AIS) is inserted downstream during the loopback. If a cross connection exists in the opposite direction, the signal is terminated during the loopback. When the cross connection loopback is released, any cross connections that were affected by the loopback are automatically re-established and the insertion of AIS is brought to a termination.

Active cross connection loopbacks are indicated via the ABN LED on the user panel.

### Permitted signal levels

Cross connection loopbacks can be performed on any tributary regardless of whether there exists a cross connection for the selected tributary or not.

The permitted signal level of the tributary to be looped back depends on the respective port unit, possible signal levels are:

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STM-1 port units (opt. VC-3 or VC-4 or electr.)

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STM-4 port units	VC-3, VC-4 or VC-4-4C
STM-16 port units	VC-3, VC-4, VC-4-4C or VC-4-16C
STM-64 port units	VC-3, VC-4, VC-4-4C or VC-4-16C

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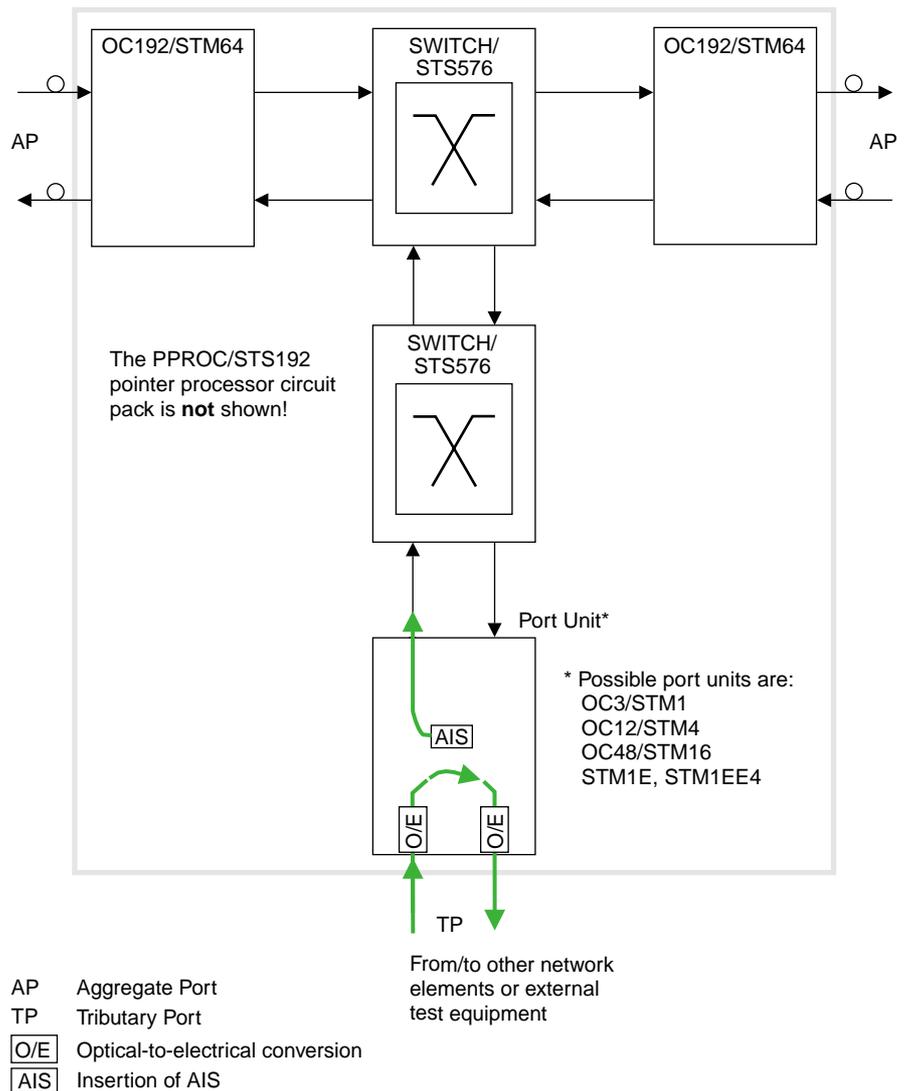
# Near-side facility loopbacks

**Purpose of near-side facility loopbacks**

Near-side facility loopbacks can be used to test the correct cabling between two network elements including the involved port unit's physical interfaces.

**Functional principle**

The following schematical diagram depicts the functional principle of near-side facility loopbacks. For simplification, only one tributary port unit is shown.



The incoming signal at the port unit input is, where appropriate after optical-to-electrical conversion, entirely looped back to the port unit output.

**Non-transparent and complete**

Near-side facility loopbacks are non-transparent and complete. “Non-transparent” means that the signal transmitted downstream is different from the signal looped back. “Complete” means that the signal is not changed before it is looped back. AIS is inserted in the downstream direction after the near-side facility loopback.

**Supported port unit types**

Near-side facility loopbacks are supported on all optical or electrical tributary port units (STM1E, STM1EE4, OC3/STM1, OC12/STM4, OC48/STM16) but *not* on OC192/STM64 aggregate port units.

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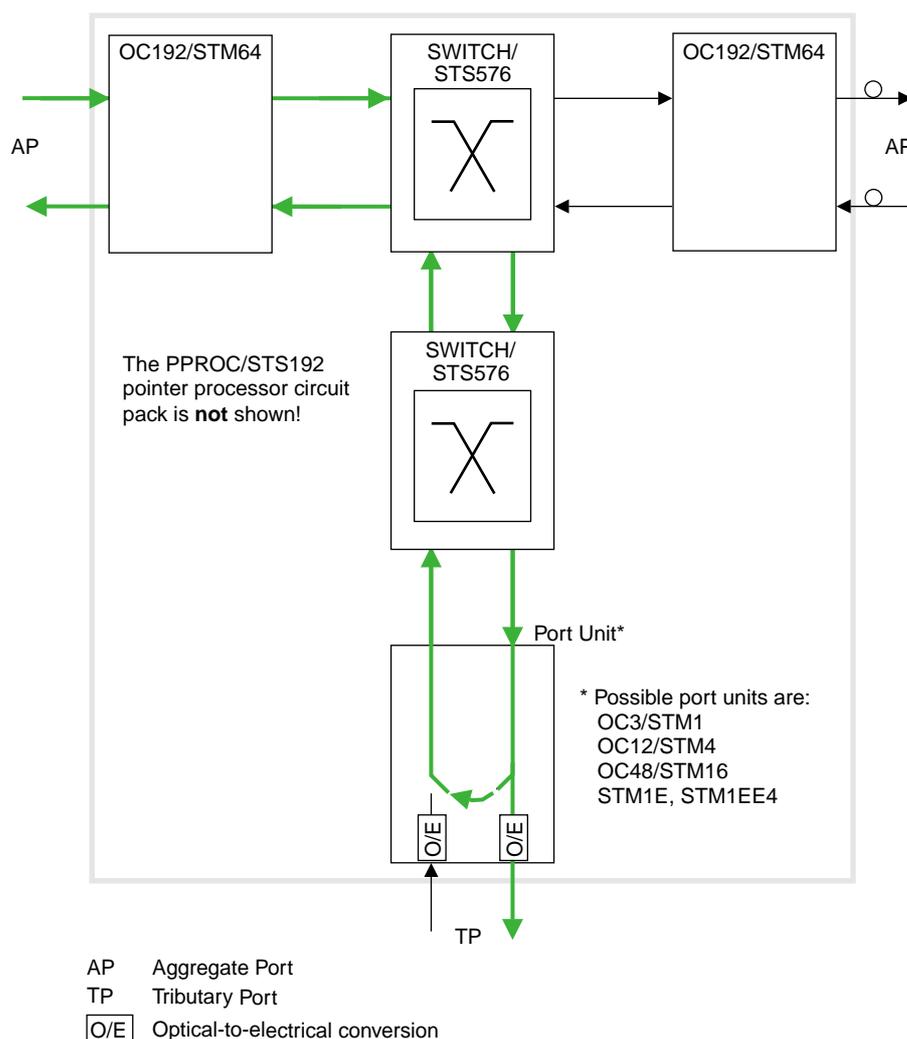
## Far-side facility loopbacks

### Purpose of far-side facility loopbacks

Far-side facility loopbacks can be used to test paths through a network element.

### Functional principle

The following schematical diagram depicts the functional principle of far-side facility loopbacks. For simplification, only one tributary port unit is shown.



The electrical transmission signal at the port unit output, on both electrical and optical port units, is looped back to the corresponding port unit input with passing through as many equipment components as possible.

**Transparent and complete**

Far-side facility loopbacks are transparent and complete.

“Transparent” means that the signal is both looped back and continued in the original direction. “Complete” means that the signal is not changed before it is looped back.

**Supported port unit types**

Far-side facility loopbacks are supported on all optical or electrical tributary port units (STM1E, STM1EE4, OC3/STM1, OC12/STM4, OC48/STM16) but *not* on OC192/STM64 aggregate port units.

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## Loopback parameters

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**Loopback Parameters** The following table gives an overview over the parameters in the loopback parameters window.

Field	Possible values	Meaning
Access Identifier	(AID)	AID for which the loopback shall be operated.
Loopback Type	Cross-Connect Loopback, Near-side Facility Loopback, Far-side Facility Loopback	Type of the loopback
Rate	VC4, VC3, VC4-4C, VC4-16C, STM-1, STM-1E, STM-4, STM-16, STM-64	Signal rate at which the loopback operates.
Action	Operate Loopback, Force Loopback	A loopback can be operated in a normal way or being forced.

□





# 13 Software upgrade concepts

## Overview

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**Purpose** This chapter provides background information on features relating to the NE Software Management.

### Contents

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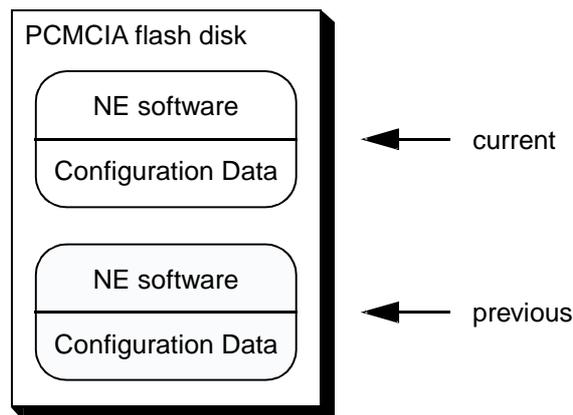
## NE memory concept

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**Overview** The WaveStar® TDM 10G (STM-64) system is equipped with volatile working memory and non-volatile memory (NVM). WaveStar® TDM 10G (STM-64) systems make use of a PCMCIA card (“flash disk”) as a nonvolatile memory.

**PCMCIA flash disk** The PCMCIA flash disk is used to store the currently active and a previous version of the executable NE software and configuration data. The PCMCIA flash disk is inserted into the PCMCIA slot of the CTL/SYS50DM system controller. The “previous” store area is the one into which data can be downloaded using the SNMS network management system or the WaveStar® CIT. Activating (“installing”) a newly downloaded software version changes the current/previous assignment automatically.

The following figure illustrates the partitioning of the PCMCIA flash disk.



**Preparing a PCMCIA flash disk** When initially delivered, the PCMCIA card is empty. WaveStar® CIT can be used to copy the initial software generic from CD-ROM to the PCMCIA card.

□

## Software download

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**Definition** **Software download** is the process of transferring a software generic from a remote entity to a target NE's memory. The remote entity may be a network management system or a CIT. The download process is responsible for establishing the association between the source of the software generic and the target NE and ensuring the integrity of the data during the transfer. The download procedure uses bulk transfer to move an uninterpreted binary file into an NE.

**Types of software download** Depending on the state of the network element, there are two possible types of software download:

- Initial software download
- Software download for upgrade purposes.

**Initial software download** Typically, when a software generic is installed for the first time, it is necessary for a craft person to be present on site to monitor the installation. The on-site installation is supported via removable storage media (PCMCIA card) associated with WaveStar® CIT.

The software is initially delivered to the customer via CD-ROM. The PCMCIA card is initially empty. The software generic has to be copied from the CD-ROM to the empty PCMCIA card via WaveStar® CIT. Afterwards, the PCMCIA card is being inserted into the NE.

**Software download for upgrade purposes** After a software generic is initially installed on-site, its future releases may be downloaded remotely from a centralized location supported by a configuration management application. Remote downloading of software generics not only minimizes dispatching of technicians, but also provides tighter coordination and synchronization among the activation of these software generics across multiple NEs.

Upgrading a software generic in the NE

- causes no disruption to customer services
- causes no disruption to operations support, such as performance monitoring and protection switching
- does not alter any of its existing option settings, e.g., performance monitoring parameters
- requires no re-entry of site-dependent data (e.g., provisioned parameters) into the service database of the NE.

Before accepting the loading of a software generic, the NE verifies a match between its type and the type specified in the software generic control information.

The download time for a software generic to the non-volatile memory (NVM) of the NE from SNMS connected indirectly via a LAN network is approx. 1 hour, via DCC approx. 2 hours.

After completion of the software download, there are now two versions of the software on the NE, the currently active version and the newly downloaded version which has replaced the former backup version.

After a software generic has successfully been loaded onto the NE, the NE waits for an activation or apply command.

□

## Software activation

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**Definition** **Activation** is the process of actually interpreting and unpacking the binary program or data that was loaded in the non-volatile memory (PCMCIA card) by a previous download operation, and copying the constituent data items to their designated locations within the NE.

**Concept** Software activation is initiated by the user who sends a software-activate command to the NE.

The NE activates the software by transferring it from the non-volatile memory (PCMCIA card) into working memory.

The NE automatically verifies the new software application and commits the new software application if the tests were successful, or backs out of the software installation to the previous software in case of unsuccessful test results.

□

## Configuration backup and restoration

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- Definition**    **Configuration backup and restoration** To recover from loss of NE data because of human error, power failure, NE design flaws, software bugs etc, the system provides a backup and restoration capability.
- Backup**        The backup operation deals with saving an image of the current data and program of an NE in a non-volatile storage area in a remote file store. The remote location could be a network management system or a CIT (e.g. on-demand backup).
- Restore**        In the restoration process the backup data is copied back into the working memory. After the binary image is loaded the OS sends the incremental changes to the NE. The NE verifies a match between the destination of the binary image against its TID before accepting a restoration file. All command processing is suspended during restoration.
- No impact on service**    The backup and restore operation does not interfere with or interrupt the service.

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## NE software generic information

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- General** Via SNMS you can retrieve the current software version ID. Software updates, or patches, are identified and included in the current version, if appropriate.
- Software version numbering** The version number of a software generic (e.g., new, point, or patch) is identified by a numeric scheme by which a new release and its subsequent point and patch releases can unambiguously be identified and related. Each field in the version numbering has two digits.
- As an example of version numbering, x.y.z, which signifies the z patch release to the y point release associated with the x release, corresponds to the successive edits for the first release.

□

## Software Management

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**Introduction** The WaveStar SNMS Software Management feature provides a set of functions that automates the process of transferring NE software from Digital Access Tape (DAT) or CD-ROM to the WaveStar SNMS host machine, and downloading, activating, and copying software to NEs. The Software Management functions assist you in doing a generic software upgrade of a given NE type in the network by providing the ability to download NE software to NEs. The Software Management features also provides backup and restore functions to protect against NE data loss. Software management functions can be performed on demand or scheduled to be performed at a later time.

**Software management functions** The following functions are provided for executables:

- NE Software Transfer
- NE Software Download
- NE Software Activate
- NE Software Delete

The following functions are provided for data:

- NE Software Backup
- NE Software Restore

The following function is provided for Software Release Information:

- View software release descriptive information

**Ways to perform software management functions** Some of the Software Management functions can be performed either on-demand or scheduled. Scheduled tasks are set up to be performed once or periodically at a certain time. As with other scheduled tasks, you can specify the number of times to retry a failed or incomplete Software Management activity, as well as the time interval between attempts.

The following table indicates how the various Software Management functions can be performed.

Software Management Function	On-Demand	Scheduled
NE Software Transfer	x	
NE Software Download	x	x
NE Software Copy	x	x
NE Software Activate	x	x
NE Software Delete	x	

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<b>Software Management Function</b>	<b>On-Demand</b>	<b>Scheduled</b>
NE Software Backup	x	x
NE Software Restore	x	



## Software transfer via removable media

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**DAT and CD-ROM** For file transfer from Digital Access Tape (DAT), the WaveStar SNMS hosts are configured so that all the user has to do is physically mount the tape and then use the WaveStar SNMS application to transfer the files to the WaveStar SNMS file system. For file transfer from CD-ROM, the user must both physically load the CD-ROM and use UNIX utilities to mount the file system for the CD-ROM. Once the CD-ROM has been inserted and mounted, a user can use the EMS GUI application to transfer the files from the CD-ROM to the EMS file system.

**Other tools** It is also possible to use other commonly available tools and applications to get software files into the EMS file system (for example, use file transfer software, such as File Transfer Protocol (FTP), to transfer software to WaveStar SNMS over a network).

**Viewing descriptive information for an NE software release** Prior to transferring a new software release or after the software transfer, WaveStar SNMS provides a function for viewing descriptive information for all software releases that are currently maintained on the WaveStar SNMS host machine for a given NE type.

**Maximum number of software releases on WaveStar SNMS host** The maximum number of software releases for a given NE type than can reside on the WaveStar SNMS host machine varies with the host type.

The following table shows the maximum number of NE software release copies by host type.

Host Type	Number of NE Software Release Copies Per NE Type
K580	3
K460	3
K360	2
K380	3

If the host limit is exceeded, and you attempt to transfer a new software release, WaveStar SNMS informs you of this and instructs you to delete at least one of the existing software releases. You can use the NE Software Delete function to do this (see “Delete NE Software” (7-11)).

□

## NE software download

### Software Download function

The Software Download function allows you to download a specific software release from the WaveStar SNMS host to a specified NE. Software downloads are done by specifying the NE type and the software release to download. Software downloads are performed by WaveStar SNMS via an IAO-LAN interface using File Transfer Access Method (FTAM) protocol.

### Verifying software downloads

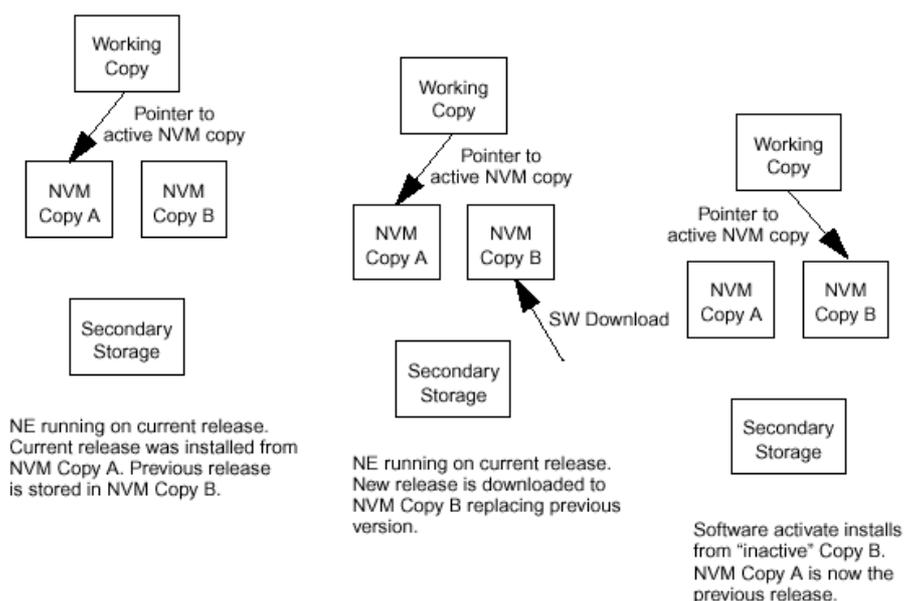
When a software download is performed WaveStar SNMS checks if the release identified for the download is older than or the same version currently running on the NE, or if it is a release that is not supported by WaveStar SNMS. If any of these conditions occur, WaveStar SNMS informs you of this, and asks if you want to proceed with the software download anyway. You have the option of continuing with the software download or cancelling it. WaveStar SNMS informs you of the status of the download. If the software download fails for some reason, WaveStar SNMS issues an error message.

### Maximum number of software downloads

The number of simultaneous software downloads allowed by WaveStar SNMS is 4.

### The WaveStar NE Software Download Process

The following figure illustrates the software download/activation process for WaveStar NEs



When software is downloaded from WaveStar SNMS to a WaveStar NE, it replaces the non-working copy in the NE's Non-Volatile Memory (NVM). When you perform a software download and click the Apply button on the Software Download to NE window, the currently non-working release is activated and becomes the active version. The software release that it replaces in working memory remains in the NVM and becomes the previous software version.

□

## NE software activate

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- Software Activate function** The Software Activate function allows you to activate a specific software release on an NE. When new software is downloaded to an NE, it is placed in “standby” until it is activated; it then replaces the old software.
- Software activation for the WaveStar NEs** WaveStar NEs maintain two copies of software in Non-Volatile Memory (NVM), one of which corresponds to the installed and working software and the other is typically the previous version that was replaced by the current working version. When a new version is downloaded using the Software Download function, it replaces the old version in the NE’s NVM. When a software activation is performed, the new software release is installed from the NVM and current running version becomes the standby version in NVM.
- Verifying software activations** When a software activation is performed, WaveStar SNMS checks if the software being activated is the same as the current version, older than the current version, or is currently not supported by ITM SNC. If either of these conditions exist, WaveStar SNMS informs you of this, and asks if you want to continue with the software activation anyway. You have the option of continuing with the software activation or cancelling it.
- Software activation failures** When WaveStar SNMS is unable to complete an on-demand request to activate NE software on one or more NEs because some of the NEs rejected the software activation request, WaveStar SNMS displays an error message for each failed NE request.
- Loss of communications** When WaveStar SNMS loses its connection to the NE as a result of a software activation request, and determines that the activation request was unsuccessful upon re-establishment of the connection with the NE, a failure message is logged in the Activity Log and WaveStar SNMS issues a failure message in the status bar for failed on-demand requests.

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## NE software delete

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**Software Delete function** The Software Delete function allows you to delete a specific software release from WaveStar SNMS for an NE type.

**Deleted SW not recoverable** When software is deleted from WaveStar SNMS, it is not recoverable. The only way to get the software back into WaveStar SNMS is to reload it from a tape on CD-ROM. WaveStar SNMS informs you of this prior to actually deleting the software. You have the option of continuing with the software deletion anyway or cancelling the deletion.

□

## NE data backup

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- NE Software Backup** The NE Software Backup feature lets you perform an on-demand backup of an NE's provisioning data. The provisioning data includes port parameters and cross-connections.
- Check for necessary backup** To avoid unnecessary redundant backups of NE data that has not changed since the last backup, WaveStar SNMS checks the selected NE to make sure a backup is necessary. If there is no change in the NE's configuration status since the last backup, a backup is not necessary and you are informed of this and given a choice of performing the backup anyway or cancelling it. If you choose to do a backup anyway, all data is backed up.
- Storage of backup data** NE backup data is stored in flat ASCII files with header information, including the NE type, software release, NE's TID, equipment/slot information, the ID of the user performing the backup, date/time of the backup, and the system release that created the backup.
- Simultaneous backups** The number of simultaneous NE backups (either on-demand or scheduled) that can be performed depends on the WaveStar SNMS host type.

The following table indicates the number of simultaneous backups that can be performed by host type.

Host	NE Simultaneous Backups
K580 (6 CPU)	6
K580 (4 CPU)	6
K580 (2 CPU)	6
K460	6
K360/K380	4

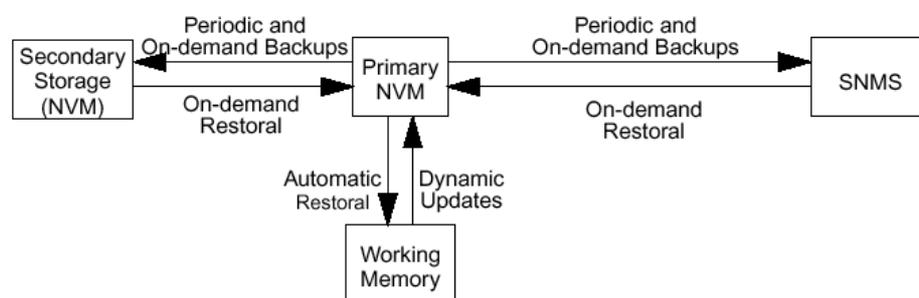
If you attempt to perform more than the maximum number of simultaneous backups than can be performed for the WaveStar SNMS host type, the new backup is not accepted and WaveStar SNMS informs you that no more backups can be performed at the current time.

### Backups/Restorals for the WaveStar NEs

Some of the WaveStar NEs and NCCs have both a primary NVM that mirrors the current working memory configuration and a local secondary storage device that provides a local memory backup and restore capability. WaveStar SNMS supplements the local memory backup and restore, by both managing the local backup and restore capability and providing additional capabilities to back up and restore NE configuration data to/from WaveStar SNMS as is done for other NE types.

### The WaveStar NEs Memory Backup and Restore Process

The following figure illustrates the basic memory backup and restoral scheme for the WaveStar NEs.



Data transfers between the NE's primary NVM and secondary storage use local file system copy functions. WaveStar SNMS allows you to choose whether to back up the NE data to WaveStar SNMS memory or the NE's local secondary storage.

### Alarms present during backups

If an on-demand NE backup is performed on an NE with alarms present, you are informed of this and given a choice of proceeding with the backup anyway or cancelling it.

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## NE data restore

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<b>NE Restore function</b>	The NE Restore function allows you to restore NE data that was backed up using the NE Backup function.
<b>Backup/Restore in progress</b>	When a backup or restore is in progress, WaveStar SNMS prevents the execution of any command that may change the settings of NE parameters until the backup or restore is completed.
<b>Backup/Restore requested</b>	When a restore is requested, WaveStar SNMS compares the NE type, software release, and equipment of the NE with the data in the selected backup file. If the NE type or software release does not match, a message is issued and you are given the option of continuing with the restore anyway.
<b>Types of NE restorals</b>	There are two types of NE restorals that can be performed: <ul style="list-style-type: none"> <li>• Regular Restore</li> <li>• Intelligent Restore</li> </ul>
<b>Regular restore</b>	A Regular Restore restores all backup data from the selected NE file, including parameters set to the default settings.
<b>Intelligent restore</b>	<p>If you select the Intelligent Restore option, WaveStar SNMS compares each parameter setting from the backup file against its default value. If the current setting matches the default value, that parameter is excluded from the restore. If all parameters on a given command issued during the restore request match the defaults, that command is skipped during the restore process. Only parameters that do not currently match the default settings are set, thus reducing the amount of time it takes to restore the NE to the backup data.</p> <p>The Intelligent Restore option is not available for NEs that use file transfer-based (FTAM) restorals, such as the OLS 400G R. 2.0 NE.</p>
<b>Restoring NE backup data</b>	The files that are created by the NE Backup function are accessible through the NE Restore function. WaveStar SNMS stores up to seven files for each NE. When seven backup files exist and another backup file is created, the oldest backup file is removed.
<b>Verifying NE restorals</b>	WaveStar SNMS keeps you informed about the status of the NE restoral in progress. If the restoral fails for some reason, WaveStar SNMS informs you of the problem via a pop-up message window.

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# 14 SNMS tutorial

## Overview

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**Purpose** This chapter provides information on the WaveStar® TDM 10G (STM-64), of SNMS and its graphical user interface. It also includes descriptions of simple basic procedures which are useful when provisioning a NE, like fault management.

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# Introduction to WaveStar® TDM 10G

## Overview

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**Purpose** This section introduces the WaveStar® TDM 10G (STM-64).

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## WaveStar® TDM 10G (STM-64) network solutions

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**Overview** The WaveStar™ 10G Time Division Multiplexer (TDM) is a global platform design supporting both the SONET product version as well as the SDH product version.

This Provisioning Guide applies to the SDH version only which is referred to as the WaveStar® TDM 10G (STM-64). For information on the SONET version please ask for the WaveStar TDM 10G (OC-192) Application, Planning and Ordering Guide.

The WaveStar® TDM 10G (STM-64) supports high-capacity, self-healing transport by means of an SDH-standard STM-64 line rate signal in an SDH-standard 2-fiber MS-SPRing protected ring. The feature set in the first release (R1.x) provides commonality with existing SDH transport products as well as an advanced set of market-proven features. The feature set will grow continuously in future releases. For planning reasons, major future features (R2.0) will also be mentioned within this Application, Planning and Ordering Guide.

- Key features** Key features of the WaveStar® TDM 10G (STM-64) include:
- STM-64 and STM-16 2-fiber MS-SPRing transmission
  - STM-1 (e1), STM-1(o), STM-4 and STM-16 interfaces
  - 1+1 Multiplex Section Protection (MSP) for optical tributary interfaces
  - 100% (64 x STM-1) add/drop capability to/from the STM-64 aggregate interfaces using any combination of available tributary interfaces
  - flexible, non-blocking VC-4 (and VC-3, VC-4-4c) granularity cross connect
  - TL1 operations interface
  - manageable by WaveStar™ SNMS element and subnetwork manager and WaveStar™ CIT

**Applications** WaveStar® TDM 10G is equipped with two STM-64 lines. It accesses the STM-64 signals with an unrestricted Time Slot Assignment (TSA) capability. Low-speed hairpin applications are supported to directly interconnect any tributary interfaces. Multiple ring applications are supported to directly interconnect added/dropped tributaries between STM-64 and STM-16 rings. The ability to support and efficiently interconnect multiple STM-16 rings and an STM-64 ring using a single Network Element provides the basis for advanced networking capabilities and potentially large cost savings.

The start-up configuration consists of a single shelf. The design is compliant to ETSI specifications.

**Differentiators** The main differentiators of the product are:

- High drop capacity
- Distributed cross-connect capabilities
- No single point of failure in the network element (DNI, Dual Node Interworking)
- Extended range of low speed interfaces
- Integrated design (supports multiple ring applications in the network element)
- Compact design (one-shelf solution)
- Flexibility in applications and protection capabilities
- Easy installation & maintenance.

These features make the WaveStar® TDM 10G (STM-64) one of the most cost-effective, future-proof and flexible network elements available on the market today.

**Configurations** Because of the modular design of the WaveStar® TDM 10G (STM-64), the system can be configured as a:

- Add/Drop Multiplexer (ADM) system working at STM-64 level in rings or linear chains

**Management** Like all network elements of Lucent Technologies SDH product portfolio the WaveStar® TDM 10G (STM-64) is managed by Lucent Technologies Integrated Transport Management (ITM) system, a user-friendly network and element level management system. A local craft terminal is available as well, the WaveStar™ Customer Interface Terminal (CIT)

**Interworking** The WaveStar® TDM 10G (STM-64) is a next-generation SDH transport system. The system can be deployed together with other Lucent Technologies SDH products e.g. WaveStar™ ADM-16/1, WaveStar™ BandWidth Manager. This makes the WaveStar® TDM 10G (STM-64) one of the main building blocks of today's and future SDH networks.

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## The WaveStar™ product family

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**Overview** Lucent Technologies offers the industry's widest range of high-quality transport systems and related services designed to provide total network solutions. Included in this offering is the WaveStar® family of products. The WaveStar® product family offers telecommunications service providers advanced services and revenue-generating capabilities.

**Family members** The WaveStar® family includes products designed to bring your networks forward into the next century.

The following table lists WaveStar® products that are currently available or under development.

WaveStar® Product	SONET	SDH
WaveStar™ BandWidth Manager	Yes	Yes
WaveStar™ 2.5G	Yes	No
WaveStar™ ADM 4/1	No	Yes
WaveStar™ ADM 16/1	No	Yes
WaveStar™ LXC-16/1	No	Yes
WaveStar™ TDM 10G	Yes	Yes
WaveStar™ TDM 40G	Yes	Yes
WaveStar™ Optical Line System (OLS) 40G	Yes	No
WaveStar™ Optical Line System (OLS) 80G	No	Yes
WaveStar™ Optical Line System (OLS) 400G	Yes	Yes
WaveStar™ DACS 4/4/1	No	Yes
WaveStar™ DVS	Yes	No
WaveStar™ Subnetwork Management System (SNMS)	Yes	Yes

**Family features** The WaveStar® product family offers customers

- SDH and/or SONET-based services
- Scalable cross-connect, multiplex and transport services
- Network consolidation and reliability
- Interoperability with other vendors' products
- Coordination of network element and element management services

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## WaveStar® TDM 10G description

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**Overview** The WaveStar® TDM 10G add/drop multiplexer is in its basic configuration a single shelf that interfaces electrical and optical STM-1, optical STM-16 Mbit/s lines to a SDH-standard 2-fiber MS-SPRing protected ring. It has 16 tributary slots that support flexible optical and electrical port unit mixing. The shelf is in accordance with Rec. ETS 300 119-4 and can be mounted in an ETSI rack.

**Transmission interfaces** WaveStar® TDM 10G includes the following optical and electrical port units.

- Optical interfaces
- Electrical interfaces

**Optical interfaces** STM-64 port units are available in the 1.5  $\mu\text{m}$  wavelength (intermediate reach).

STM-16 port units are available in two wavelengths:

- 1.3  $\mu\text{m}$  wavelength (long reach)
- 1.5  $\mu\text{m}$  wavelength (long reach)

Each STM-16 port unit contains one bidirectional port. Two STM-16 port units are necessary to terminate one STM-16 MS-SPRing protection.

STM-1 port units are available for 1.3  $\mu\text{m}$  wavelength (short reach) single-mode fiber applications. The STM-1 port units feature four bidirectional ports per circuit pack.

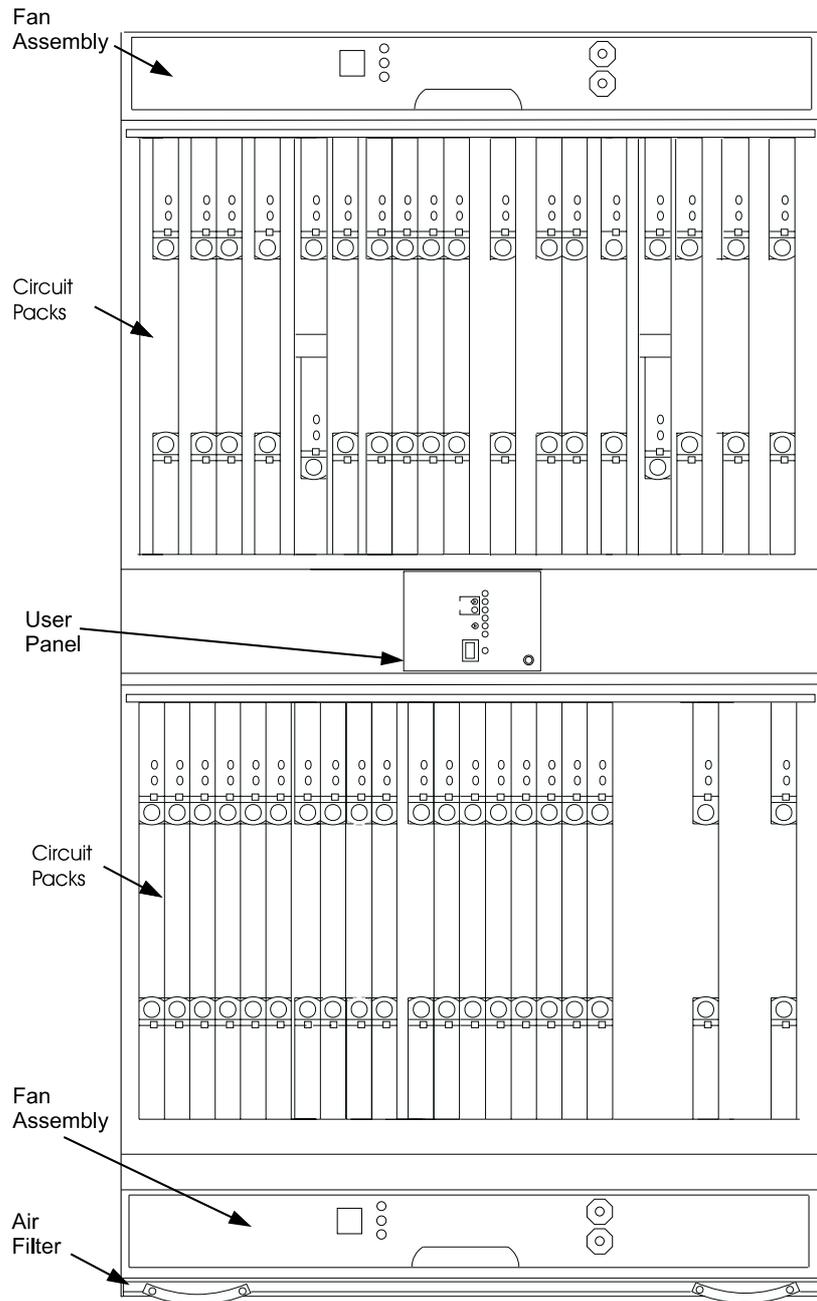
**Electrical interfaces** The electrical STM-1 port units are capable of transmitting and receiving signals at the 155 Mbit/s rate. Each port unit contains four independent bidirectional ports.

**Control and synchronization** WaveStar® TDM 10G uses a single control system and a dual synchronization system.

**Switch capacity** The 192x192 switch fabric of the WaveStar® TDM 10G supports simultaneous cross-connections from each of up to 128 input STM-1 equivalents to all of the up to 128 output STM-1 equivalents. The cross-connections are fully non-blocking and can have unlimited broadcasting within a shelf.

**WaveStar® TDM 10G main shelf**

The following figure illustrates the WaveStar® TDM 10G (STM-64) main shelf.



SDH-10GAPOG-045



# The WaveStar SNMS Graphical User Interface

## Overview

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**Purpose** This chapter provides background and introductory information about the WaveStar SNMS GUI. It includes available features and references to specific task-related instructions.

After learning the information in this chapter, the user should be able to do the following:

- Identify the mouse buttons and know how to use them to perform various GUI functions.
- Obtain their user ID and password and be able to log into the WaveStar SNMS GUI.
- Identify and use the different parts of the WaveStar SNMS Map window, including the main menu bar, the toolbar, the alarm directional button, the subnetwork explorer, and the Map pane.
- Recognize on the Map window the difference between Network Elements, aggregates, the Host, trails, and managed/non-managed devices.
- Display and use the WaveStar SNMS system help documentation.
- Use GUI lists and tables.

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## Background

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**Introduction** The WaveStar SNMS Graphical User Interface (GUI) is a Java-based, multilevel windowing environment that provides fault, provisioning, configuration, and security management functions and allows you to graphically monitor the status of the network. The WaveStar SNMS GUI is designed to be an intuitive, consistent, easy-to-use interface. Status bar messages and windows keep you informed of the outcome of an operation. The GUI offers point-and-click, menu-driven operation, as well as a cut-through interface to issue TL1 commands to connected NEs. Several types of online help are available to assist you in performing any task. The GUI runs on PCs. Once a GUI session is started, the GUI server can support multiple platform-independent GUI client connections simultaneously.

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## Using the Mouse

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**Mouse** The mouse is used to move a pointer around the screen. A mouse usually has three buttons, two of which are used to select items on the display.

**Mouse buttons** The select mouse button, which is the leftmost button on the mouse, is used to select an item in WaveStar SNMS. The terms “click” and “select” are used interchangeably throughout the WaveStar SNMS documentation. Both terms represent the following operations:

Mouse button	Description
Select mouse button	<p>The select mouse button, which is the leftmost button on the mouse, is used to select an item in WaveStar SNMS. The terms “click” and “select” are used interchangeably throughout the WaveStar SNMS documentation. Both terms represent the following operations:</p> <ul style="list-style-type: none"><li>• Activating a button, such as OK, Cancel, or Help</li><li>• Activating a menu, such as a pull-down menu on the menu bar</li><li>• Selecting an item from a menu</li><li>• Selecting an NE/aggregate symbol on the Map window</li><li>• Selecting an item from a scroll list</li><li>• Moving window focus to a text field to type an entry in the field</li></ul> <p>To do a click or select operation, position the mouse pointer over the desired list item, NE/aggregate icon, button, field, or menu, and double click the select mouse button.</p>
Menu mouse button	<p>The menu mouse button, which is the rightmost button on the mouse, is used to bring up (activate) a pop-up menu.</p> <p>To activate a pop-up menu, position the mouse pointer over the object (like an NE or aggregate icon on the Map pane or Subnetwork Explorer), and single-click the menu mouse button.</p>



## Manipulating Fields and Text

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**Entering text** The following guidelines explain how to enter text in windows that contain text fields:

- Press the **Tab** key to enter text that you have typed in a field. Pressing the **Tab** key in a text field accepts the data in the text field and moves the cursor focus to the next field that accepts input. If the cursor is positioned in the last enterable field on the window, pressing the **Tab** key moves the cursor to the first text field on the window.
- Use the **Tab** key for field-to-field navigation within a window.
- Use the **Backspace** key to delete text field input.
- You can cut and paste text between text fields and/or text areas using the standard cut and paste hot keys for Microsoft Windows and HP Vue.

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## Logging Into WaveStar SNMS

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- Start GUI** To start up an instance of the GUI on your PC or workstation, click on the desktop or menu bar icon representing the WaveStar SNMS application. When you click on this icon, a command is sent to the WaveStar SNMS host machine to start up the application. The WaveStar SNMS Login window is then displayed for logging into WaveStar SNMS. Click on the same icon/menu item to start up another instance and log into the same host. Click on a separate icon/menu item to start up a GUI instance and log into a different host.
- Log in** To log into WaveStar SNMS, you must enter a valid user ID (login) and password that you been supplied to you by your WaveStar SNMS system administrator.
- First Log-in** When you log into WaveStar SNMS for the first time with a new user login, you must change your password from the default password given for the login. A pop-up window is displayed, indicating that you must change your password before being allowed to log into WaveStar SNMS. You are given the option of continuing the session or exiting the system at this point. If you choose to continue the login session, the Change Password window is displayed, prompting you to change your password from the default password. The system validates your new password. If it is valid, the system re-displays the Login window to re-enter your user ID and your new password.
- Successful login** If the user ID and password that you entered are valid, WaveStar SNMS displays an advisory message, the Alarm Notification window and Map window are displayed.
- Unsuccessful login attempts** If you cannot log into WaveStar SNMS the first time, because you entered an invalid user login or password, the system allows you to retry a certain number of times (as defined by the system administrator) before you are denied access. You must enter a valid user ID (login) and valid password. See the Valid user ID and Valid password sections in this chapter for definitions of a valid user ID and password.

**Password expiration** Passwords must be changed after a period of time, as defined by the system administrator. If you attempt to log into WaveStar SNMS with a password that is about to expire, the system informs you of this via a pop-up window and asks if you want to change your password to log into the system immediately. If you choose to change your password at this time, the Change Password window is displayed. If you choose not to change your password at this time, but the password expiration period has not yet been reached, you can continue to log into the system. If the password has expired, and you do not change it, the login session will be terminated.

**Valid user ID** A valid User ID (login) is 1-10 alphanumeric characters in any combination. Special characters (such as ;\*&@) are not allowed.

**Valid password** A valid password is 6-10 characters. A password must include at least two uppercase and/or two lowercase letters, at least one numeric, and at least one special character (!#\$%^&\*()-+\_=?). The following special characters are not permitted (:,;).

**Alarm notification window** Once you have logged in and the GUI is running, the Alarm Notification window is displayed. The Alarm Notification window displays a running tally of the number of Critical, Major, Minor alarms, Not Alarmed (which represents Standing Condition events that require clearing), and Communication alarms for SONET, or Prompt, Deferred alarms, No Alarms (which represents Standing Condition events that require clearing), and Communication alarms for SDH. The number displayed below the box for each alarm severity increases by one whenever a new alarm of that severity occurs. You can click on any of the severity type boxes to display the Alarm List window, filtered for that severity type. If you click on the Communications alarms box, a list of NEs that are currently not communicating with the system is displayed. The Alarm List window is only displayed if there is one or more active alarms or standing condition events in the selected alarm severity category. Once displayed, the Alarm Notification window remains open during the GUI session. When a new alarm is received by WaveStar SNMS, the Alarm Notification window is brought to the forefront of the GUI display to signal the arrival of the new alarm.

**GUI application not running** If the WaveStar SNMS host is successfully contacted, but the application and/or GUI server is not functioning on the host, a pop-up message window is displayed, indicating that the WaveStar SNMS application is not currently running on the host machine.

**Multiple GUI instances** If the WaveStar SNMS host machine is successfully contacted, and the application is running, but no more GUI instances can be started by the GUI server, a pop-up warning message window is displayed, informing you that no more GUIs can be connected to the host machine, and to retry later.

**Session time out** When you do not use a GUI session for 15 minutes (or another time interval specified by the system administrator), a pop-up window is displayed, stating that the GUI session will time out in 60 seconds and asking if you want to exit WaveStar SNMS at this time. If you choose Yes or make no choice, you are automatically logged out of WaveStar SNMS. If you choose No, the GUI session keeps running and the session timeout clock is reset.

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## Logging Out of WaveStar SNMS

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**Introduction** When you log out of WaveStar SNMS, all open windows associated with the current session are closed and the GUI client/server sessions are terminated.

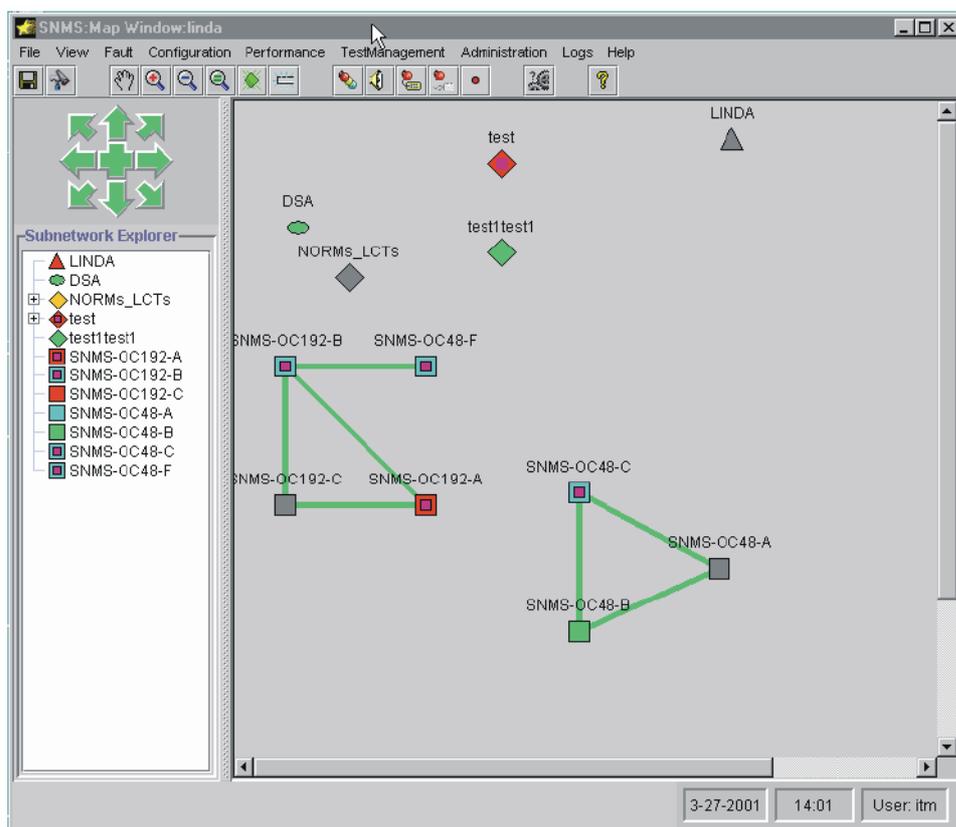
**Changes made during GUI session** If you have made changes during the GUI session to certain settings, such as user-specified preferences for the GUI or NE positions, a pop-up window is displayed, asking if you want to save the settings. Choose Yes if you want to save the settings or No if you do not want to save them.

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## The WaveStar SNMS Map Window

**Introduction** After you have logged into WaveStar SNMS, the Map window is displayed. This window provides access to all of the WaveStar SNMS functions and features.

**The Map window** The following figure shows the WaveStar SNMS Map window.



**Parts of the Map window** The Map window is divided into several different but interrelated areas.

Window area	Description
Main menu bar	It is located just below the Map window label, it provides access to all the main WaveStar SNMS functions.
Tool bar	A series of buttons just below the main menu bar that control the Map view and provide a shortcut way of accessing some of the WaveStar SNMS functions.

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<b>Window area</b>	<b>Description</b>
Status bar	A status bar—a text bar at the bottom of the window that displays messages related to system activity, the current date/time, and the User ID of the user currently logged in.
Alarm Directional button	An icon used to indicate that an alarm exists in some portion of the map that is currently not visible.
Subnetwork Explorer	An explorer tree that is used to show a textual list of the aggregates and NEs in a subnetwork, along with the subnetwork's hierarchy.
Map pane	The portion of the Map window that provides a graphical representation of the network, displaying the NEs, aggregates, and trails between them.

**The Map window menu** All of the main WaveStar SNMS functions are accessed through the main menu bar on the Map window. When you select a main functional menu (for example, Configuration), this displays an associated drop-down menu, which lists a series of related options for you to select. The following summarizes each of the main functional menu categories.

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<b>Menu</b>	<b>Description</b>
File	This menu provides access to a set of options for saving, restoring, and copying user preferences, constructing a TL1 Macro Builder File, and logging out of WaveStar SNMS.
View	This menu provides access to a set of options for setting Alarm Severity and Alarm Indications, for viewing the Trail Alarm List, for clearing the Map window status line, for viewing the Alarm Tally window, for zooming in/out of the Map view, and for setting user preferences.
Fault	This menu provides access to the set of Fault Management options for monitoring alarms and conditions in the network.

<b>Menu</b>	<b>Description</b>
Configuration	This menu provides access to the set of Configuration Management options for viewing and/or modifying Network Element, port, and line parameters.
Performance	This menu provides access to the set of options for collecting and viewing Performance Monitoring (PM) data.
TestManagement	This menu provides access to the set of functions for creating, viewing and deleting cross-connection loopbacks and testing purposes.
Administration	This menu provides access to the set of options for Security Management and Network Element administration.
Logs	This menu provides access to the set of options for viewing logs generated by WaveStar SNMS that track network and EMS performance and activity.
Help	This menu provides access to the set of online Help options.

**Map Window toolbar**

These series of buttons allow you to control the Map view and provide a quick way to access many of the frequently used GUI functions. The toolbar, from left to right, provides the following buttons.

<b>Button</b>	<b>Description</b>
Save User Preferences	Details about this function are provided in "Save Preferences / Map Positions" (14-35).
View User Preferences Window	Details about this function are provided in "Modify User Preferences" (14-33).
Turn On/Off Map Pan	Enables or disables use of the Map Pan feature to reposition the Map view.
Zoom in on the map	Zoom into a portion of the Map pane display.
Zoom out on the map	Displays an enlarged view of the portion of the Map pane display.
Reset the Zoom on the map	Resets the Map pane view.

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<b>Button</b>	<b>Description</b>
Add an Aggregate	Details about this function are provided in “Add an Aggregate” (3-2).
Clear the Status Line	Details about this function are provided in “Clearing status messages” (14-32).
Alarm Severity	Changes the severity level of active alarms displayed on the Map window. The number and the color of the balls shown on the toolbar button indicate the type and severity of alarms currently being displayed on the Map window. You can also change the alarm severity level of displayed alarms using the Preferences function. For details, see “Modify User Preferences” (14-33).
Audible Enable/Disable	Details about this function are provided in “Audible alarms” (14-28).
Global Acknowledge	Acknowledges all active alarms for an NE or aggregate. Displays a Choose an NE/Aggregate window. Double-click on the NE or aggregate in the list to select it and click the OK button. All active alarms for the selected NE or aggregate are acknowledged. For more details about this function, refer to “Alarm indication and acknowledgement” (14-50) and “Fault Management” (14-46).
Global Unacknowledge	Unacknowledges all active alarms for an NE. Displays a Choose an NE/Aggregate window. Double-click on the NE or aggregate in the list to select it and click the OK button. All active alarms for the selected NE or aggregate are unacknowledged. For more details about this function, refer to “Alarm indication and acknowledgement” (14-50) and “Fault Management” (14-46).
Transient Condition Event Browser	Displays a list of transient condition (TC) events that occur in the host’s NE network. Transient events do not require a clear message by the NE because they do not change the NE’s condition over an extended period of time. The Transient Condition Event Browser can be displayed via <b>Fault → Transient Condition Event Browser</b> .

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Button	Description
Status Dialog	Details about this function are provided in “Status window” (14-36).
Help	Brings up an online help window which explains the Map window.

**Alarm directional button**

A monitored network can be larger than can be viewed on the Map pane at any one time and alarms can occur on network objects that are not currently being displayed. The Alarm Directional button, which is located in the left-hand portion of the Map window, above the Subnetwork Explorer, shows the relative location and highest severity alarm of the area not visible. When an alarm exists, an arrow point is lit with the color of the alarm level, showing the direction to go on the Map pane to view the map item in an alarm state.



## The subnetwork explorer

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- Subnetwork explorer** The Subnetwork Explorer, located in the left-hand portion of the Map window, is a tree diagram that shows the content and hierarchical relationship of aggregates and NEs in the portion of the network currently being viewed on the Map pane.
- Improving the display of the subnetwork explorer** If the TID/alias of one or more NEs/aggregates in the Explorer is obscured, use the scroll bars below and to the right of the Explorer to view the complete TID/alias of the item. If the display of the Explorer list is still obscured by Map pane, position the mouse pointer on the window bar just to the right of the Explorer. A two-sided arrow is displayed in place of the mouse's arrow pointer. Click and hold the left (select) mouse button, and drag the two-sided arrow symbol to the right until the desired view of the Explorer is obtained. Then, release the mouse button. If the NE TID/alias listing is in complete view, the scroll bars disappear. You can adjust the display by clicking and dragging the bar between the Map pane and the Explorer to the left or right, as desired.
- Element labels** NEs and aggregates are labeled by their Target Identifier (TID), by default. The label format can be changed through the Preferences option from the View menu on the Map window menu bar.
- Selecting an item** To select an item on the Subnetwork Explorer, position the mouse pointer on the item and click the mouse select button. The selected item is highlighted.
- Expanding/collapsing an item** To expand an item (such as an aggregate) in the Subnetwork Explorer, single-click on the plus (“+”) sign next to the item. To collapse the item, single-click on the minus (“-”) sign next to the expanded item.
- Pop-Up menu** A pop-up menu of WaveStar SNMS functions for the NE or aggregate can be accessed by positioning the mouse pointer and clicking the menu mouse button.
- Map pane display** Any change on the Subnetwork Explorer, such as expansion or contraction of an aggregate, causes a corresponding change in the network display on the Map pane.



## The Map pane

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- Map pane** The Map pane displays a graphical representation of the network automatically when you log into WaveStar SNMS and the Map window is brought up.
- Map pane preferences** The system defaults for different characteristics of the Map pane display, such as NE symbol sizes, shapes, alarm colors, and NE/aggregate labels, can be changed through the Preferences option on the View menu. See “Map preferences” (14-33) for more information on changing characteristics of the Map pane display.
- Network elements** Each square on the Map pane represents an NE in your Target Group. A square is the default shape for NEs. The shape used to represent NEs can be changed through the Shapes panel on the Preferences window. By positioning the mouse pointer over a specific NE symbol on the Map pane, you can display the NE type and alias of the NE. If tooltips help is enabled via the Preferences option, the NE type and alias is displayed as a callout and in the status bar at the bottom of the Map window. If tooltips help is disabled, the NE type and alias are just displayed in the status bar on the Map window.
- Aggregates** The diamond-shaped symbols on the Map pane represent aggregates. The diamond shape is the default for aggregates; this can be changed through the Shapes panel of the Preferences window. Aggregates are collections of NEs that do not necessarily correspond to any physical connectivity or other NE attributes. An aggregate can consist of a group of related NEs, such as a subnetwork, or a group of collocated NEs that are not necessarily in the same subnetwork. An aggregate can be moved under another parent aggregate on the Map pane or Subnetwork Explorer by selecting it and then dragging it to the parent aggregate symbol.
- Non-managed devices** A non-managed device is an NE or other telecommunications entity that is part of the network of NEs that communicate with WaveStar SNMS but is not managed by the system. These NE types are treated as “non-managed devices” and appear on the Map pane display as circles (the default shape) about the same size as the squares that represent managed NEs.
- Non-managed devices that are discovered are added to the WaveStar SNMS database to complete the network map and to avoid retries by WaveStar SNMS to log into a non-managed device.
- Certain non-managed devices can only be manually added using the Add an NE window on the GUI, specifying it as a non-managed

device, when WaveStar SNMS is not communicating with the NE. You can also change the NE type to a non-managed device through the Modify an NE window. Once a non-managed device has been added, WaveStar SNMS does not attempt to log into it.

### **EMS alarm icon**

The Map window pane contains an additional square-shaped icon, labeled with the WaveStar SNMS host name, that displays the highest severity alarm present on the host. Although this icon looks similar to the NE symbols, it cannot be included in an aggregate or have trails connected to it.

The EMS Alarm icon receives alarms from various application processes and monitors the communication links between the WaveStar SNMS host and the NEs. It indicates, for example, whether a file system has exceeded capacity, whether there are remote printer problems, or whether the UNIX message queues are getting full. The icon is shown with the machine name of the host that is running the EMS application.

Like NEs and aggregates, colors are used on the EMS Alarm icon to show the current state of the application or its communications links. The default colors are the same as for NEs (see “Alarms” (14-27)). The icon shows the current highest severity alarm for the application. Alarm clearing methods used for NEs and aggregates also apply to the EMS application alarms.

### **DSA icon**

If the EMS-based DSA feature has been enabled, the upper right portion of the Map window pane contains an oval-shaped icon, below the EMS Alarm icon, that represents the Directory Services Agent (DSA) providing NE directory information to WaveStar SNMS. An oval shape is the default; it can be changed through the Shapes panel of the Preferences window. This icon is labeled “DSA”. This icon cannot be included in an aggregate or have trails connected to it.

The only pop-up menu function that is available for the DSA icon is the manual DNO feature for Subnetwork Discovery on the DSA.

Like NEs and aggregates, colors are used on the DSA icon to show the current alarm state. The default colors are the same as for NEs (see “Alarms” (14-27)). The icon shows the current highest severity alarm for the application. Alarm clearing methods used for NEs and aggregates also apply to the DSA alarms.

**Trails** The lines that run between NEs and/or aggregates represent trails. Trails are physical links between NEs or aggregates. If there is more than one trail between two NEs, the phrase “Multiple Trails” is displayed when you position the mouse cursor on the trail line in the Map pane.

**Alarms** The color of a map item symbol or trail indicates the level of the most severe active alarm.

The default alarm colors for the Map pane display are as follows.

---

<b>Alarm Color (default)</b>	<b>Alarm Severity Level (SONET)</b>	<b>Alarm Severity Level (SDH)</b>
Alarm Color (default)	Alarm Severity Level (SONET)	Alarm Severity Level (SDH)
Red	Critical	Prompt
Yellow	Major	Deferred
Cyan	Minor	
Gray	Throttled	
Green	No Active Alarms	
Magenta	Loss of Communications	
White	Not Alarmed state	Not Alarmed state

**Color of an NE** The center of an NE symbol may show a different color than the border of an NE/aggregate symbol. When more than one alarm type has occurred, the center of an NE symbol shows the highest severity alarm that has occurred and the border shows the next highest severity alarm. Communication alarms are always top priority and always color the center of the NE symbol. If alarms are being throttled for an NE, the throttled alarm color (gray) is always shown in the center of the symbol, with the color indicating the severity of the last occurring alarm shown in the border. If automatic alarm throttling is enabled, the alarm throttling color is not displayed until the alarm throttling threshold has been passed.

**White color** When the color of an NE is white on the Map window (the default color), this indicates that the NE is in a “Not Alarmed” state, or has received one or more Standing Condition (SC) events which require clearing by the NE. This can occur, for example, during an NE data restore operation (for more details, see “Restore NE Data” (7-13)). SC events which occur against the NE are counted in the alarm tallies on the Alarm Notification window. When the SC event has been cleared by the NE, the color of the NE returns to green, indicating that there are not active alarms present and the NE is communicating.

**Modify colors** The default Alarm display colors shown in the above table can be modified through the Preferences option of the View menu on the Map window main menu bar. For more details, see “Modify User Preferences” (14-33).

**Blinking NE** A flashing (blinking) NE symbol indicates that there are one or more unacknowledged alarms against that NE or aggregate. For more details see “Alarm indication and acknowledgement” (14-50).

**Audible alarms** A speaker-shaped symbol in the middle of the toolbar on the Map window indicates whether the Audible Alarm feature is enabled or disabled. This symbol has a slash through it if the Audible Alarm feature is disabled. To enable the Audible Alarms feature, click on the symbol. The slash is removed from the symbol. To disable the Audible Alarm feature, click on the symbol again. A slash appears on the speaker-shaped symbol.

The Audible Alarm feature can also be enabled or disabled by selecting Fault from the main menu bar on the Map window and then selecting Audible from the displayed sub-menu. If the Audible Alarm feature is currently enabled, selecting Audible disables the feature. If the Audible Alarm feature is currently disabled, selecting Audible enables the feature.

When the Audible Alarm feature is enabled, an audible sound is triggered each time a new alarm occurs on the network. Once triggered, the audible alarm will sound for a short time and then repeat until the alarm is cleared or it is silenced through the GUI. The sound characteristics of the audible alarm correspond to the most severe prevailing alarm condition (Critical, Major, Minor). The alarm sound interval can be changed by the WaveStar SNMS system administrator. See “Audible alarms/events” (14-55) for more details about the Audible Alarms feature.

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## Actions in the Map pane

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**Selecting one NE** To select a single NE or aggregate on the Map pane, position the mouse pointer over the NE or aggregate icon and click the select mouse button.

**Selecting NEs and aggregates** To select one or more NEs or aggregates on the Map pane:

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- 1 Position the mouse pointer over a portion of the background adjacent to the items to be selected.

---

- 2 Click the mouse select button and drag the mouse pointer. As you drag the mouse pointer, an outlined box appears over the selected area. As items in the Map pane are selected, they change color. Release the mouse select button.

**Result:**

The items are selected.

END OF STEPS

---

### **Deselect NEs and aggregates**

To deselect a selected item in the Map pane, position the mouse pointer over the item and single-click the mouse select button. To deselect a group of items, position the mouse pointer within the boxed region and single-click the mouse select button. Any item in the box that is already selected becomes deselected.

**Moving NEs and aggregates** To move a single NE or aggregate on the Map pane:

---

- 1 Position the mouse pointer over the icon to move and press and hold the select mouse button.

---

- 2 Drag the icon to the new position and release the mouse button.

END OF STEPS

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**Moving a group of NEs or aggregates**

To move a group of NEs or aggregates on the Map pane:

- 1 Select a group of NEs or aggregates by positioning the mouse pointer in an area of the background adjacent to the items, clicking the select mouse button and dragging the mouse pointer (a faint dashed box appears) to surround the items, and release the mouse select button.
- 2 Position the mouse pointer over one of the chosen icons and press and hold the select mouse button.
- 3 Drag the icons to the new position and release the mouse button.

END OF STEPS

**Expanding and collapsing aggregates**

To expand an aggregate and show its member NEs on the Map pane perform the following steps.

- 1 Select the aggregate and click the right (menu) mouse button.

**Result:**

A pop-up menu is displayed.

- 2 Select **Expand** from the displayed pop-up menu.

**Result:**

The aggregate is expanded to show the member NEs on the Map pane.

END OF STEPS

### **Collapse an aggregate**

To collapse the expanded aggregate, select one of the member NEs and double-click on it. The aggregate is collapsed and the aggregate symbol replaces the member NEs on the Map pane display.

### **Moving an NE to the TOP aggregate level**

To move an NE out of an aggregate to the TOP level (which includes all NEs):

- 1 Make sure the aggregate is expanded and then select the NE.

- 2 Once the NE is selected, click the right (menu) mouse button to display a pop-up menu. Choose **Return to TOP**.

#### **Result:**

The NE is brought to the TOP aggregate level and is taken out of the aggregate.

END OF STEPS

### **Zooming the Map view**

<b>If you want to...</b>	<b>then...</b>
make the Map pane show fewer map items in the same size space	select <b>View</b> → <b>Zoom In</b> on the main menu.
make the Map pane show more in the same size space	select <b>View</b> → <b>Zoom Out</b> on the main menu.
reset the Zoom level to zero (which is the default)	select <b>View</b> → <b>Zoom Reset</b> on the main menu.

### **Zoom buttons**

You can also zoom in, zoom out, and reset the zoom by using the Zoom In, Zoom Out, and Zoom Reset buttons on the Map window toolbar.

### **Finding a Network Element**

WaveStar SNMS assists you in locating an NE on the Map window if you cannot find it on the Map pane display or Subnetwork Explorer. To find an NE:

- 1 Select **View** → **Find an NE** from the main menu bar on the Map window.

- 
- 2 Enter the TID and/or alias of the NE and click the **OK** or **Apply** button.

**Result:**

The Map pane display is repositioned to show the NE and the NE is selected in the Map pane and Subnetwork Explorer. If more than one match is found, the item which is found first is indicated in the Subnetwork Explorer portion of the Map pane. If the NE is contained in an unexpanded aggregate, the aggregate is expanded and the NE is highlighted in the Map pane.

END OF STEPS

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**Clearing status messages**

Status messages that are displayed in the status bar on the Map window can be cleared at any time. To clear the status bar message display:

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- 1 Select **View** → **Clear Status Line** from the main menu bar on the Map window or click the **Clear Message Line** button on the Map window toolbar.

**Result:**

The message area in the status bar is cleared.

END OF STEPS

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## Map preferences

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**Overview** There are system defaults for how map items are displayed. WaveStar SNMS allows you to change certain characteristics of the Map pane display, such as NE size, NE labels, NE/aggregate shapes, and alarm colors, to suit your own needs. The appearance of Map items on the Map pane can be changed through the Preferences option on the View menu. Preferences are stored on a per-user basis.

**Modify User Preferences** Complete the following steps to modify user preferences.

---

- 1 Select **View** → **Preferences** from the main menu bar on the Map window.

**Result:**

The **View Preferences** window is displayed.

---

- 2

<b>If you want to change...</b>	<b>select the tab...</b>
NE size or thickness of trail lines between NEs	Nodes & Lines
Size, content, or alignment of map item labels	Labels
Colors associated with alarms and/or cross-connections	Colors
Shapes used to represent NEs, aggregates, EMS host, DSA, and non-managed devices on the Map window	Shapes
Alarm severity level displayed in the Map and Alarm Notification windows (Critical/Major/Minor for SONET, Prompt/Deferred for SDH)	Fault
tooltips help on/off setting	Other

---

<b>If you want to change...</b>	<b>select the tab...</b>
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date format for items on the Map window, alarm lists, and tallies	Other
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display of Bidirectional Line Switched Ring (BLSR) Protected Port Groups on the Cross-Connect View window	Other
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- 3** When the selected panel of options is displayed on the View Preferences window, change the display characteristics as needed.

To change the shape for an item in the Shapes panel, double-click on the current shape in the scroll list. A pop-up window is displayed, showing the shapes available for selection. Click on the desired shape. The changed shape is displayed next to the Map item in the scroll list.

To change the color indications for alarms and cross-connections on the Map window through the Colors panel, double-click on the item in the Colors scroll-bar list to display a palette of colors. Click on the desired color box in the palette to select it. The color selected is applied to the item.

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**4**

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<b>If you want to...</b>	<b>then click on...</b>
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save the changes made to user preferences on each panel, to be applied each time the Map window is brought up	<b>Save</b>
---	-------------

restore the saved values for the user	<b>Restore</b>
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retrieve and displays the system defaults for the preferences category, overriding the displayed settings	<b>Get Defaults</b>
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- 5** Click the **Apply** button to apply the changes to the Map window display or click the **OK** button to apply the changes to the Map window display and close the **View Preferences** window.

END OF STEPS

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**Save Preferences / Map  
Positions**

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<b>If you want to save...</b>	<b>then select...</b>
User preferences	<b>File → Save → Preferences</b>
Map item positions	<b>File → Save → Positions</b>
User preferences and Map item positions	<b>File → Save → Both</b>

**Restore Preferences / Map  
Positions**

---

<b>If you want to restore...</b>	<b>then select...</b>
User preferences	<b>File → Restore → Preferences</b>
Map item positions	<b>File → Restore → Positions</b>
User preferences and Map item positions	<b>File → Restore → Both</b>

**Copy Preferences / Map  
Positions**

Complete the following steps to copy another user's preferences and/or Map item positions.

---

**1**

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<b>If you want to copy a user's...</b>	<b>choose...</b>
Preferences	<b>File → Copy → Preferences</b>
Map item positions	<b>File → Copy → Positions</b>
Preferences and Map item positions	<b>File → Copy → Both</b>

**Result:**

The **Choose a User** window is displayed.

---

**2** Choose a user and click the **OK** button.

**Result:**

If you are copying map item positions, the new positions are applied to your Map pane display once a user is chosen. If you are copying another user's preferences, the **View Preferences** window is displayed. Make any changes as necessary to the other user's preferences before applying them. When you are finished making necessary changes, click the **OK** button.

END OF STEPS

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## Status window

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**Overview** WaveStar SNMS provides a Status window, which allows you to check on the status of on-demand functions you requested to be performed by the system, such as a manual DNO on an NE or manual addition of an NE. The status dialog window is also displayed after the completion of certain GUI functions.

The Status window can be accessed at any time, by clicking the **Status Dialog** toolbar button on the Map window toolbar, or by selecting **View** → **Status Window** from the main menu bar on the Map window.

**Status window elements** The Status window is a single table with three columns.

Column	Description
Processing	contains a text string which describes the function that is being performed.
Time	indicates the host time, in hours/minutes, that the function was requested.
Status	indicates the status of the requested function (see below).

**Possible status of a function** The status of a function is labeled as shown in the following table.

Status	Meaning
Working	A simple operation is still in progress. When the request has finished processing, the status of the operation changes to show the result, as Completed, Incomplete, or Failed.
Completed	The function has completed successfully. If it is a multi-step function, such as a backup or restore, the percentage of the function completed successfully is shown. Example: 25%
Incomplete	The function is still in the process of being completed, or the function did not complete due to non-communicating NE or another problem.
Failed	The function did not complete successfully due to some problem or error.
Aborted	The function was aborted by the user.

**Order of items** Items on the Status window are shown in the order requested, with the most recent function requested shown at the top of the list. Successfully completed items are removed from the list when you click the **Close** or **Refresh** button on the window. Click the **Close** button to close the Status window.

**Display status of a group** Many of the functions in WaveStar SNMS can be performed on a single NE or a group of NEs, including aggregates. To view the status of a function being performed on a group of NEs, double-click on the row in the Status Dialog window table that refers to the aggregate or group of NEs.



## Help options

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**Overview** WaveStar SNMS provides various types of online information to assist you in using the system's functions and features.

**Help types** The types of help available are:

Help type	Description
Tooltips help	<p>Tooltips help assists you in identifying a toolbar button on the Map window toolbar, the function of a window button, or the alias and NE type of a network element on the Map window pane.</p> <p>To identify a toolbar button, window button, or network element, position the mouse button on the item. The item is identified either by a message in the status bar or a message callout to the right of the item.</p> <p>Tooltip help can be enabled or disabled through the Preferences option accessible through either the Map window toolbar or through the View option on the main menu. See "Modify User Preferences" (14-33) for instructions on how to enable/disable tooltip help.</p>
Window help	<p>Window help provides specific information about the window's purpose or function.</p> <p>Window help is accessed by clicking the Help button on any functional window in WaveStar SNMS.</p>
Online documentation	<p>A complete version of the User Guide is available to view online through Adobe Acrobat Reader.</p> <p>An online version of the WaveStar SNMS documentation is accessed by selecting <b>Help</b> → <b>User Guide</b> from the main menu bar on the Map window.</p>
Product information	<p>General information about WaveStar SNMS, including the full product name, copyright information, the product release number, and other related information is available at any time from a pop-up window that is accessed by selecting <b>Help</b> → <b>About the EMS</b> from the main menu bar on the Map window.</p>



## Network Element Explorer

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**Introduction** The Network Element Explorer is a tool displayed on the Port Provisioning, Cross-Connections, and Equipment Configuration windows that provides a graphical, step-down, hierarchical view of the equipment to be provisioned. The Network Element Explorer consists of a tree diagram that shows the configurable hardware that comprises the Network Element, and the relationship between each hardware component.

**Using the network element explorer** The purpose of the Network Element Explorer is to graphically display the desired hardware component and then select it for provisioning purposes.

**Equipment hierarchy** The possible equipment levels that can be displayed and configured on the Network Element Explorer are as follows: TID ⇒ Lineup ⇒ Bay ⇒ Shelf ⇒ Slot ⇒ Circuit Pack ⇒ Port ⇒ Tributary

The content and relationship of equipment shown on the explorer varies by NE type. Not every NE contains every level of the hierarchy. Generally, access to a shelf provides access to circuit packs that exist on the shelf. Ports exist on circuit packs, which are placed in slots. Slots are in shelves, shelves are in bays, and bays are in NEs.

**Selecting an item** To select an equipment component on the Network Element Explorer, position the mouse pointer on the equipment component and click the mouse select button. The selected item is highlighted.

**Expanding/collapsing an equipment component level** There are the following ways of expanding or collapsing an equipment component level on the Network Element Explorer:

- A select mouse button click on the plus (“+”) or minus (“-”) sign causes the branch associated with the component level to expand (“+”) or collapse (“-”).
- A double-click on any equipment level selects it and expands to show the component parts. For example, if you double-click on a shelf in the explorer, the diagram expands to show the associated slots, by number.
- A double-click on the expanded component collapses it back to the next higher component level.

**Equipment view display** Any change on the Network Element Explorer, such as expansion or collapse of the equipment level, causes a corresponding change on the Equipment View window.

## Window Buttons

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**Types of window buttons** All of the windows in WaveStar SNMS from which you perform a function have standard buttons that work the same way regardless of the function. The following table lists the standard window buttons and their function on windows.

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Button	Function
OK	Accepts input on the window, validates the input, initiates the requested operation, and closes the window.
Apply	Accepts input on the window, validates the input, initiates the requested operation, but leaves the window open.
Cancel	Cancels the operation and dismisses the window. Any insertions or changes made during the use of the window are not saved.
Help	Accesses online help for information about a particular window, function, feature, or task.
Close	Closes the window without performing an operation.

**Greyed-out buttons** If a button is greyed out (dimmed) on a window, it means that a function is not available. In some cases, an item has to be selected or specified on the window before the dimmed button is activated.

**Exclusive choice buttons** Exclusive choice buttons in WaveStar SNMS let you choose one item or setting from a list of two or more settings. When you change an exclusive choice setting, the previous setting is automatically deactivated.

Exclusive choice buttons are also called “radio buttons” because they work like car radio preset buttons that let you change stations with the press of a button.

To change an exclusive choice setting, click the mouse select button with the pointer positioned on the button. Your choice is activated when the button is darkened.

**Push buttons** Some of the function windows in WaveStar SNMS have push buttons that are used to transfer one or more items (such as NEs) between lists on the window.

The following table shows each push button label, its name, and its purpose.

---

<b>Push Button Label</b>	<b>Push Button Name</b>	<b>Purpose</b>
>	Push Right	When this button is clicked, the selected item is transferred to the list on the right and removed from the list on the left
>>	Push All Right	When this button is clicked, all items on the corresponding list on the left are transferred to the corresponding list on the right
<	Push Left	When this button is clicked, the selected item is transferred to the list on the left and removed from the list on the right
<<	Push All Left	When this button is clicked, all the items on the corresponding list on the right are transferred to the corresponding list on the left



## Lists

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**Introduction** A majority of the WaveStar SNMS functions are performed by picking a function to perform (for example, Cut-Through) and then selecting the item (such as a specific NE) on which to perform the function, from a list of similar items.

To select an item from a list, position the mouse pointer over the item(s) and click the select mouse button. The selected item(s) is highlighted. On the type-ahead lists, it may be necessary to double-click the select mouse button to select the item and perform the operation.

WaveStar SNMS provides different methods of locating items on lists to narrow the search to only the item(s) you want. These methods are:

- Scrollable lists
- A filtering/sorting function
- A type ahead field

**Scrollable lists** When a window in WaveStar SNMS cannot display all of the information available to you, the information is presented in a scrollable list. The information that you cannot see is available by paging through the scrollable list.

**Using a scrollable list** The vertical bar on the right side of the window is the scroll bar. The scroll bar consists of an up-arrow, a down-arrow, and an elevator box between the two arrows.

The scroll bar on the window works as follows:

---

<b>If you want to...</b>	<b>then...</b>
Display the next page	click under the elevator box.
Display the next line	click on the down-arrow.
Display the previous page	click above the elevator box.
Display the previous line	click on the up-arrow.
Display the bottom of the list	drag the elevator box to the bottom of the scroll bar and release the mouse select button.
Display the top of the list	drag the elevator box to the top of the scroll bar and release the mouse select button.

You can select a single item from a scrollable list by positioning the mouse pointer over the item and clicking the mouse select button. This causes the item to become highlighted and indicates your selection.

### Filtering and sorting items

WaveStar SNMS has a filter/sort function to further narrow a list to only the item(s) you want. This function allows you to:

- Narrow a list by filtering out all items on the list that do not match all or part of the filename, NE/aggregate name, TID, or alias you supply.
- Sort a list by placing the items in ascending or descending order.

WaveStar SNMS allows you to filter and/or sort the list. Many of the scrollable list windows in WaveStar SNMS provide this function.

### Sorting items

When you click the **Filter/Sort** button on a list window, a **Filter and Sort Options** window is displayed to allow you to filter and/or sort the list according to the criteria you specify.

### Filter and Sort Options window

The Filter and Sort Options window allows for the following settings:

- **Alphanumeric/Wildcard Filter** – This is a text field for entering all or part of the name/label to narrow the list to only those items that match these criteria. An asterisk (\*) can be used as a wildcard character to match one or more characters in the name or label. Use the **Backspace** key to erase what you have entered in this field.
- **Sorting Option** buttons – These exclusive choice buttons are used to determine the sort order of the list. Click on the Ascending button to display the list in ascending order. Click on the Descending button to display the list in descending order. Click on the Not Sorted button to leave the list as it is.
- **OK** – After making your filtering/sorting choices, click on the OK button to apply your criteria to the list and close the Filter/Sort window.
- **Close** – Click on this button to close the window without applying any filtering/sort criteria to the list.
- **Apply** – After making your filtering/sorting choices, click the Apply button to apply your criteria to the list and leave the Filter and Sort Options window open.
- **Help** – Click on the Help button to obtain online help for the Filter and Sort Options window.

**Type ahead field** Many of the list windows have a “type ahead” field. This is a text field which is usually located above the first item in the list. As you start to type the item name or label in this field, the system automatically selects an item from the list that matches what you have typed. An asterisk (\*) can be used in the type ahead field as a wildcard character to match one or more characters of the item name or label. You can also enter the entire name of the item in the type ahead field to expedite the search and selection of an item on the list.

If you select an item from the list, the name of the item appears in the type ahead field. The status bar on the list window indicates whether the list has also been filtered.



## Sorting Tables

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**Introduction** Some of the data that WaveStar SNMS retrieves from its managed NEs, such as alarm data, is displayed in multi-column tables. Data is displayed in table format on many windows.

WaveStar SNMS allows you to sort and display data displayed in tables in the exact order that you need it.

**Moving and dragging table columns** To change the display order of columns in a table, position the mouse pointer on column heading, click and hold the select (left) mouse button, and drag the column to a different position in the table.

**Example: sorting a table** The following figure shows a sample **Alarm Summary** window where you may want to change the order of the alarm summary data.

The default order for data on the **Alarm Summary** window to be displayed is by Critical, Major, and Minor alarms. To change the sort order in which alarm data is displayed on this type of window, you would click on one of the column headers or select the **View** → **Sort** option for the **Alarm Summary** window. Either action brings up a **Sort** window.

**Sort window** The Sort window allows you to select three categories from the table list on which to sort. Each category consists of a drop-down list that contains all of the column names (in column order) from the table list on which to sort, and two exclusive choice radio buttons, labeled *Ascending* and *Descending*.

To sort a table, choose a column name from the **First sort by** drop-down list. The item you select becomes the primary sort key for the table list. Then, click the **Ascending** radio button next to the first drop-down list to sort the table by this item in ascending order or click the **Descending** radio button to sort by this item in descending order. Ascending order is the default.

To further sort the table data, choose an item from the first **Then Sort By** drop down list and then the second **Then Sort By** drop down list. Choose **none** from the drop down list to indicate no sort at this level. For each level, choose whether to sort the item in **Ascending** or **Descending** order. Ascending order is the default.

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# Fault Management

## Overview

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**Purpose** Fault Management monitors alarms and conditions in the subnetwork. Users can access Fault Management functions from the Main Menu, or by accessing the pop-up menu on an NE or Aggregate icon in the Map window, or on the items listed in tables or other screens. Some important Fault Management features include the alarm summary and alarm list, viewing autonomous alarms as they are received, alarm throttling, and visible alarm indicators.

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## Alarm notification

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**General** Another way WaveStar SNMS keeps you informed about current alarms is via the Alarm Notification window. This window contains information on the type and number of current alarms in the subnetwork. It remains open (unless iconified) on your screen, and comes to the front each time another alarm is tallied.

**Alarm Notification window** The Alarm Notification window contains for SDH, four buttons labeled Prompt, Deferred, No Alarm, and EMS Communications, corresponding to the types of alarms that may appear. The “No Alarm” (for SDH) represents the number of Standing Condition (SC) events that have been received which require clearing. Below each of these buttons is a number that indicates the current number of alarms/events for each category.

**Colors** When the color of an NE is white on the Map window (the default color), this indicates that the NE is in a “Not Alarmed” state, or has received one or more Standing Condition (SC) events which require clearing by the NE. When the SC event has been cleared by the NE, the color of the NE returns to green, indicating that there are no active alarms present and the NE is communicating.

**Getting more information about an alarm** To see more information about a specific alarm severity level or the event, just point to the desired severity button on the Alarm Notification window and click. The system then displays the Alarm List window, filtered by the severity type of the clicked button.



## Alarm summary

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**Alarm summary** The Alarm Summary feature provides a single-line overview of alarm information for each node and trail in an aggregate. This information is provided via the Alarm Summary window on the GUI. This window lists the NEs in your Target Group and displays the number of critical, major, and minor alarms for each NE. The alarms can be listed by severity or TID.

**Accessing the Alarm Summary** The Alarm Summary for a single NE can be accessed by selecting this NE and choosing **Fault** → **Alarm Summary** from the menu in the Map window. When no NE was selected, the Alarm Summary is shown for all NEs.

The Alarm Summary window contains the following two sections:

- ***NE/Aggregate Alarm Summary Table*** – Each line in this table provides, for the listed TID, a color code indicating the highest severity alarm for the NE/aggregate, as well as a count of the Critical, Major, and Minor alarms for SONET or Prompt and Deferred alarms for SDH, and count of Standing Condition (SC) events (shown under the “NA” category) for the NE/aggregate. For the NEs listed, you can initiate cut-throughs, access the Alarm List, define the level of alarms to be monitored/displayed, provision the NE system parameters and port, and display equipment. To access these tasks, point to an NE’s summary line with the mouse, click the left mouse button to select it, and then click the menu mouse button. A pop-up menu appears, from which you can select the desired operation.
- ***Trail Alarm Summary Table*** – This table lists a count of critical, major, and minor alarms for the AIDs that terminate the trail between two NEs. A color code indicates the highest severity alarm for the trail.

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## Alarm list

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**General** The Alarm List contains a line of various information about each active alarm in an NE. You can sort the list using various criteria, such as alarm severity and age, age alone, condition, date/time logged, and acknowledged vs. unacknowledged. You can also acknowledge or unacknowledge the alarms listed here.

**Accessing the Alarm List** The Alarm List can be accessed by pointing on an NE, pressing the right mouse button and selecting **Alarm List** from the cursor menu. If the colored region (below Critical, Major, Minor, Not Alarmed or EMS Comm) in the Alarm Notification window is selected, the Alarm List opens and alarms of this severity are shown only.

The Alarm List window provides the following data for each alarm for the selected NE:

- **Color** – a color code associated with the alarm severity
- **Alarm ID** – an identifying code for the alarm
- **TID** – the TID of the NE that originated the message or target TID that receives a command.
- **AID** – the Access Identifier, or address, of the equipment component or facility. If this is part of an SLC NBS (Narrow Band Shelf), an asterisk (\*) appears.
- **Ack** – the user ID of the user that acknowledged the alarm
- **Severity** – Critical, Major, or Minor
- **SA/NSA** – whether the problem is service affecting (SA) or non-service affecting (NSA)
- **Date/Time of OCC** – the date/time the alarm occurred
- **Date/Time of Log DateTime** – the date/time the alarm was logged by the EMS
- **Condition** – a code that indicates the type of failure or status condition
- **SLA** – the Signal Level Affected (category)



## Alarm indication and acknowledgement

---

**General** The Alarm Indicator feature graphically indicates the arrival of new alarms by flashing the impacted nodes and aggregates. If there are one or more alarms against an NE and alarm indication is enabled, that node will flash (in the color of the highest severity alarm). Likewise, if there are one or more alarms against one or more NEs in an aggregate and alarm indication is enabled, that aggregate will flash. (When all the alarms against an NE or aggregate are acknowledged it no longer flashes.) Users should acknowledge alarms for which they are responsible. (The system tags the acknowledgment so that other users will not attempt to troubleshoot the same problem.)

### **Acknowledging / unacknowledging alarms**

One or more alarms can be acknowledged or unacknowledged by selecting the alarms in the alarm list and choosing **Fault** → **Acknowledge Selected** or **Fault** → **Unacknowledge Selected**. Multiple alarms can be selected by pressing the Ctrl-key while selecting the alarm. A range of alarms can be selected by selecting the first alarm of the range as usual and pressing the Shift-key while the last alarm in the range is selected.

All alarms in the Alarm List can be acknowledged or unacknowledged at the same time by choosing **Fault** → **Acknowledge All in List** or **Fault** → **Unacknowledge All in List**.

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## Alarm details

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**General** Alarm Details are available to the user via the Alarm List window. This window contains a line of information about each active alarm in an NE or aggregate. Before acknowledging an alarm, it is a good practice to display it on the Alarm List window to check the details and make sure you want to acknowledge it. You can then perform the acknowledgement right from the Alarm List window.

**Viewing alarm details** Alarm details can be displayed by double clicking on an alarm in the Alarm List.



## Trail alarms

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- General** Trails are physical links between NEs. The system monitors all existing trails for alarm conditions.
- Discovery of trails** NEs can only automatically discover and report to WaveStar SNMS trails over which there is an active DCC. Users can, however, add trails between any pair of termination points on NEs.
- Information about trail** The following Information about trail alarms that have occurred can either be displayed on the Alarm Summary window or by selecting the trail:
- **Trail Alarm Summary** Window – this lists a count of critical, major, and minor alarms for the AIDs that terminate the trail between two NEs.
  - **Trail Alarm List** – this contains a line of information about each active alarm for the trails between two NEs. This information includes alarm severity, occurrence date/time, condition, and date/time logged.
- Displaying informations about trails** The Trail Alarm Summary window and the Tail Alarm List can be accessed by positioning the mouse over a trail, pressing the right mouse button and choosing **Trail Alarm Summary...** or **Tail Alarm List...**



## Alarm resynchronization

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- General** Alarm Resynchronization provides the ability for the system to update its alarm list, autonomous message log, and command/response log from network elements in the subnetwork whenever any outage of NE communications occurs. The system automatically resynchronizes alarms whenever the communications status with an NE changes from “down” to “up.” In addition, users can initiate resynchronization of alarms on demand.
- Resynchronizing alarms** Alarms for a single NE can be resynchronized by pointing on the NE, clicking the right mouse button and choosing **Resynchronize Alarms** from the cursor menu. Alarms for all NEs can be resynchronized by not choosing **Fault** → **Resynchronize Alarms** from the menu in the Map window while no NE is selected. This opens the Choose an NE window, where **ALL** must be selected and confirmed with **OK**.
- Disable alarm throttling** Please note, before resynchronizing alarms for an NE, the user should disable the automatic/manual alarm throttling control for the NE. Alarm resynchronization does not work unless the NE is in an unthrottled state.
- GUI and list display not cleared** The alarm resynchronization process does not clear the existing GUI display and alarm notification/list displays during the resynchronization process, but rather retains the existing alarms until the resynchronization is completed.
- The system can distinguish between:
- standing alarms that already exist in the GUI and alarm/notification list displays
  - new alarms
  - alarms that are cleared by the NE between resynchronizations.
- This allows the system to incrementally update the GUI display and alarm notification/list displays to accurately indicate the subnetwork status to the user.



## Alarm throttling

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**General** The Alarm Throttling feature enables you to limit the amount of autonomous messages and Critical autonomous messages that should be monitored for an NE.

**Recommended values** Alarm throttling can be done on demand for an NE through the Alarm Throttling option on the NE's pop-up menu or be set up to occur automatically when the number of alarms exceed a specified threshold. An alarm throttle level between zero and 3,600 per hour can be specified in the Automatic Alarm Throttling window. The recommended initial level is 100 messages per hour (and this is the default). If an NE has been enabled for alarm throttling and the number of alarms in the NE exceeds the set level, the NE is automatically put on throttled, or partial, alarm monitoring.

**Throttle alarms** The automatic throttling of alarms can be changed by choosing **Administration** → **Fault** → **Alarm Throttling...** from the menu in the Map window. Select the desired NE in the Subnetwork Explorer portion of the window and enable or disable the alarm throttling under **Set Alarm Throttling to**. Set the messages per hour either by using the slider or entering a number in the text field.

**Maintenance activity** The Alarm Throttling feature is useful during events, such as an initial network turn-up (or maintenance activity), where large numbers of messages are generated by an NE. Throttling alarm only allows alarms of a Critical priority to be displayed on the GUI, sent upstream to an OS, or retrieved via alarm queries. (Non-maintenance-related messages are not affected by alarm throttling and continue to be logged in the normal manner.)

**View only throttled alarms / all alarms** If only throttled alarms shall be viewed for one or all NEs, choose **Fault** → **Alarm Monitoring** → **Throttled**, which opens the Choose an NE window. Choose the desired NE or choose **All** if the alarm messages from all NEs should be throttled. Confirm your selection with **OK**. (If all alarm messages should be viewed again, repeat the above procedure but choose **Fault** → **Alarm Monitoring** → **All Messages**.)

**View alarm statistics** The alarm statistics for an NE can be viewed by selecting the NE and choosing **Fault** → **Alarm Monitoring** → **Statistics** from the menu in the Map window. Statistics for all NEs can be displayed when no NE is selected and **Fault** → **Alarm Monitoring** → **Statistics** and then **ALL** in the Choose an NE window is chosen.

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## Audible alarms/events

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### **Audible alarm specifications**

The audible alarm provides an alternative way to alert the user to existing alarms or standing condition (SC) events.

The following list provides an overview of audible alarm specifications:

- Audible alarms are generated at each system interface screen.
- To eliminate possible confusion, the characteristics of the audible alarm (that is, sound, duration, and interval between sounds) is common to all users of the host.
- Individual user interface users can enable or disable the audible alarm feature for their respective system user interface screens.
- The Map window contains the audible alarm symbol near the upper middle of the screen. The symbol is a speaker if the audible alarm is enabled, or a speaker with a slash through it if disabled.
- When the audible alarm is enabled, an audible alarm is initiated at the onset of each new alarm or SC event, with sound characteristics that correspond to the severity level of the most severe alarm/SC event. When there are multiple concurrent alarms or SC events of different severity levels, the sound emitted corresponds to the most severe unacknowledged prevailing alarm or SC event.
- Audible alarms last for a short duration and are repeated after a set time interval, until quieted by the user.

When you log off WaveStar SNMS and then log in again, the Audible Alarm feature is enabled. You can disable it. The audible alarm sounds are initially loaded with system default settings. These settings can be adjusted by the system administrator.

### **Enable/disable audible alarms**

The audible alarms sound can be switched on or off by choosing **Fault** → **Audible Alarms** → **Audible** or **Fault** → **Audible Alarms** → **Quiet Audible Alarms** in the Map window. Alternatively, you can click the speaker icon in the icon bar of the Map window.

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## Alarm browser

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**General** The Alarm Browser lets you view alarms and clear messages for the NEs in your Target Group as they occur. Specifically, it captures alarm, event, and clear messages that are received from NEs in your Target Group and displays them in the Browsing Alarm Audit Log window on your workstation screen.

**Activate Alarm Browser** The Alarm Browser is activated by choosing **Fault** → **Alarm Browser** in the Map window.



## Alarm filtering

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**General** Alarm filtering is the selective removal of alarm messages from being forwarded to the GUI. Alarm filtering can be applied to reduce the number of alarms forwarded to the GUI caused by intermittent failure, or to filter symptomatic alarms associated with a reported signal failure, such as those that occur during a fiber cut. All alarms that are filtered out are logged in WaveStar SNMS and can be viewed through the Alarm Browser (**Fault** → **Alarm Browser**).

### Types of Alarm Filtering

WaveStar SNMS uses three basic methods to reduce the number of alarms to be displayed:

- Aging – waiting for a pre-set time period to eliminate alarms that are caused by temporary failures (and are cleared within a time period shorter than the aging interval)
- Event-per-Time (EPT) Filtering – EPT, which is primarily an alarm reduction technique, filters transient condition (TC) events such as PM Threshold Crossing Alerts (TCAs). To forward all TC events, set the EPT count to zero. Both the time and number of TEs can be adjusted to only log TCs that exceed the expected normal level.
- Symptomatic Alarm Filtering – Symptomatic Alarm Filtering (SAF) filters out a set of pre-defined symptomatic NE alarms and standing condition (SC) events. The filtering is based on the Probable Cause (Condition Type) of the alarms and SC events received from all NEs, including the EMS-based alarms. The list of Probable Causes for SAF filtering is specified in the SAF filter parameter file, which is a UNIX flat file that can be edited using standard UNIX editing tools such as vi. Any alarm (including NE and EMS alarms) that match a Probable Cause specified in the SAF filter parameter file is filtered out. Alarms and events that are filtered out are not shown in the Map window or alarm lists. The SAF filter does not differentiate between NE types for the source of the alarms/events.

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# Glossary

**μ**

Microns

## NUMERICS

### **0x1 Line Operation**

0x1 means unprotected operation. The connection between network elements has one bidirectional line (no protection line).

### **1+1 Line Protection**

A protection architecture in which the transmitting equipment transmits a valid signal on both the working and protection lines. The receiving equipment monitors both lines. Based on performance criteria and OS control, the receiving equipment chooses one line as the active line and designates the other as the standby line.

### **1xN Equipment Protection**

1xN protection pertains to N number of circuit pack/port units protected by one circuit pack or port unit. When a protection switch occurs, the working signals are routed from the failed pack to the protection pack. When the fault clears, the signals revert to the working port unit.

### **12NC (12-digit Numerical Code)**

Used to uniquely identify an item or product. The first ten digits uniquely identify an item. The eleventh digit is used to specify the particular variant of an item. The twelfth digit is used for the revision issue. Items with the first eleven digits the same, are functionally equal and may be exchanged.

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## **A ABN**

Abnormal (condition)

### **ABS (Absent)**

Used to indicate that a given circuit pack is not installed.

## **AC**

Alternating Current

### **ACO (Alarm Cut-Off)**

A button on the user panel used to silence audible alarms.

**ACT (Active)**

Used to indicate that a circuit pack or module is in-service and currently providing service functions.

**ADM (Add/Drop Multiplexer)**

The term for a synchronous network element capable of combining signals of different rates and having those signals added to or dropped from the stream.

**AEL**

Accessible Emission Limits

**Agent**

Performs operations on managed objects and issues events on behalf of these managed objects. All SDH managed objects will support at least an agent. Control of distant agents is possible via local "Managers".

**AGNE**

Alarm Gateway Network Element

**AID (Access Identifier)**

A technical specification for explicitly naming entities (both physical and logical) of an NE using a grammar comprised of ASCII text, keywords, and grammar rules.

**AIS (Alarm Indication Signal)**

A code transmitted downstream in a digital network that indicates that an upstream failure has been detected and alarmed if the upstream alarm has not been suppressed.

**AIMS**

Acknowledged Information Transfer Service: Confirmed mode of operation of the LAPD protocol.

**Alarm**

Visible or audible signal indicating that an equipment failure or significant event/condition has occurred.

**Alarm Correlation**

The search for a directly-reported alarm that can account for a given symptomatic condition.

**Alarm Severity**

An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

**Alarm Suppression**

Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

**Alarm Throttling**

A feature that automatically or manually suppresses autonomous messages that are not priority alarms.

**Aligning**

Indicating the head of a virtual container by means of a pointer, for example, creating an Administrative Unit (AU) or a Tributary Unit (TU).

**AMI (Alternate Mark Inversion)**

A line code that employs a ternary signal to convert binary digits, in which successive binary ones are represented by signal elements that are normally of alternative positive and negative polarity but equal in amplitude and in which binary zeros are represented by signal elements that have zero amplitude.

**Anomaly**

A difference between the actual and desired operation of a function.

**ANSI**

American National Standards Institute

**APD**

Avalanche Photo Diode

**APS (Automatic Protection Switch)**

A protection switch that occurs automatically in response to an automatically detected fault condition.

**ASCII (American Standard Code for Information Interchange)**

A standard 7-bit code that represents letters, numbers, punctuation marks, and special characters in the interchange of data among computing and communications equipment.

**ASN.1**

Abstract Syntax Notation 1

**Assembly**

Gathering together of payload data with overhead and pointer information (an indication of the direction of the signal).

**Association**

A logical connection between manager and agent through which management information can be exchanged.

**Asynchronous**

The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

**ATM (Asynchronous Transfer Mode)**

A high-speed transmission technology characterized by high bandwidth and low delay. It utilizes a packet switching and multiplexing technique which allocates bandwidth on demand.

**Attribute**

Alarm indication level: critical, major, minor, or no alarm.

**AU (Administrative Unit)**

Carrier for TUs.

**AU PTR (Administrative Unit Pointer)**

Indicates the phase alignment of the VC-N with respect to the STM-N frame. The pointer position is fixed with respect to the STM-N frame.

**AUG**

Administrative Unit Group

**AUTO (Automatic)**

One possible state of a port or slot. When a port is in the AUTO state and a good signal is detected, the port automatically enters the IS (in-service) state. When a slot is in the AUTO state and a circuit pack is detected, the slot automatically enters the EQ (equipped) state.

**Autolock**

Action taken by the system in the event of circuit pack failure/trouble. System switches to protection and prevents a return to the working circuit pack even if the trouble clears. Multiple protection switches on a circuit pack during a short period of time cause the system to autolock the pack.

**Autonomous Message**

A message transmitted from the controlled Network Element to the SNMS which was not a response to an SNMS originated command.

**AVAIL**

Available

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**B Bandwidth**

The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

**Baud Rate**

Transmission rate of data (bits per second) on a network link.

**BER (Bit Error Rate )**

The ratio of error bits received to the total number of bits transmitted.

**Bidirectional Line**

A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

**Bidirectional Ring**

A ring in which both directions of traffic between any two nodes travel through the same network elements (although in opposite directions).

**Bidirectional Switch**

Protection switching performed in both the transmit and receive directions.

**BIP-N (Bit Interleaved Parity-N)**

A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

**Bit**

The smallest unit of information in a computer, with a value of either 0 or 1.

**Bit Error Rate Threshold**

The point at which an alarm is issued for bit errors.

**BLD OUT LG**

Build-Out Lightguide

**Bridge Cross-Connection**

The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

**Broadband Communications**

Voice, data, and/or video communications at greater than 2 Mb/s rates.

**Broadband Service Transport**

STM-1 concatenation transport over the WaveStar® TDM 10G (STM-64) for ATM applications.

**Byte**

Refers to a group of eight consecutive binary digits.

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**C C**

Container

**CC (Clear Channel)**

A digital circuit where no framing or control bits are required, thus making the full bandwidth available for communications.

**CC (Cross-Connection)**

Path-level connections between input and output tributaries or specific ports within a single NE. Cross-connections are made in a consistent way even though there are various types of ports and various types of port protection. Cross-Connections are reconfigurable interconnections between tributaries of transmission interfaces.

**Cell Relay**

Fixed-length cells. For example, ATM with 53 octets.

**CEPT**

Conférence Européenne des Administrations des Postes et des Télécommunications

**Channel**

A sub-unit of transmission capacity within a defined higher level of transmission capacity.

**Circuit**

A set of transmission channels through one or more network elements that provides transmission of signals between two points, to support a single communications path.

**CIT or WaveStar™ CIT (Customer Interface Terminal)**

The user interface terminal used by craft personnel to communicate with a network element.

**CL**

Clear

**CLEI**

Common Language Equipment Identifier

**Client**

Computer in a computer network that generally offers a user interface to a server.

**CLLI**

Common Language Location Identifier

**Closed Ring Network**

A network formed of a ring-shaped configuration of network elements. Each network element connects to two others, one on each side.

**CM (Configuration Management)**

Subsystem that configures the network and processes messages from the network.

**CMI**

Coded Mark Inversion

**CMIP**

Common Management Information Protocol. OSI standard protocol for OAM&P information exchange.

**CMISE**

Common Management Information Service Element

**CO (Central Office)**

A building where common carriers terminate customer circuits.

**Co-Resident**

A hardware configuration where two applications can be active at the same time independently on the same hardware and software platform without interfering with each others functioning.

**Collocated**

System elements that are located in the same location.

**Command Group**

An administrator-defined group that defines commands to which a user has access.

**Concatenation**

A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

**Correlation**

A process where related hard failure alarms are identified.

**CP**

Circuit Pack

**CPE**

Customer Premises Equipment

**CPU**

Central Processing Unit

**CR (Critical (alarm))**

Alarm that indicates a severe, service-affecting condition.

**CRC**

Cyclical Redundancy Check

**Cross-Connect Map**

Connection map for an SDH Network Element; contains information about how signals are connected between high speed time slots and low speed tributaries.

**Crosstalk**

An unwanted signal introduced into one transmission line from another.

**CSMA/CD**

Carrier Sense Multiple Access with Collision Detection

**CTIP**

Customer Training and Information Products

**CTS**

Customer Technical Support within Lucent Technologies

**Current Value**

The value currently assigned to a provisionable parameter.

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**D DACS/DCS**

Digital Access Cross-Connect System

**Data**

A collection of system parameters and their associated values.

**Database Administrator**

A user who administers the database of the application.

**dB**

Decibels

**DC**

Direct Current

**DCC (Data Communications Channel)**

The embedded overhead communications channel in the synchronous line, used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements in a synchronous network.

**DCE (Data Communications Equipment)**

The equipment that provides signal conversion and coding between the data terminating equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

**DCF**

Data Communications Function

**DCN**

Data Communications Network

**Default**

An operation or value that the system or application assumes, unless a user makes an explicit choice.

**Default Provisioning**

The parameter values that are preprogrammed as shipped from the factory.

**Defect**

A limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance action depending on the results of additional analysis.

**Demultiplexing**

A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

**DEMUX (Demultiplexer)**

A device that splits a combined signal into individual signals at the receiver end of transmission.

**Deprovisioning**

The inverse order of provisioning. To manually remove/delete a parameter that has (or parameters that have) previously been provisioned.

**Digital Link**

A transmission span such as a point-to-point 2 Mb/s, 34 Mb/s, 140 Mb/s, VC12, VC3 or VC4 link between controlled network elements.

**Digital Multiplexer**

Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

**Digital Section**

A transmission span such as an STM-N signal. A digital section may contain multiple digital channels.

**Disassembly**

Splitting up a signal into its constituents as payload data and overhead (an indication of the direction of a signal).

**Dispersion**

Time-broadening of a transmitted light pulse.

**Dispersion Shifted Optical Fiber**

1330/1550 nm minimum dispersion wavelength.

**Divergence**

When there is unequal amplification of incoming wavelengths, the result is a power divergence between wavelengths.

**DNI (Dual Node Ring Interworking)**

A topology in which two rings are interconnected at two nodes on each ring and operate so that inter-ring traffic is not lost in the event of a node or link failure at an interconnecting point.

**Doping**

The addition of impurities to a substance in order to attain desired properties.

**Downstream**

At or towards the destination of the considered transmission stream, for example, looking in the same direction of transmission.

**DPLL**

Digital Phase Locked Loop

**DRAM**

Dynamic Random Access Memory

**Drop and Continue**

A circuit configuration that provides redundant signal appearances at the outputs of two network elements in a ring. Can be used for Dual Node Ring Interworking (DNI) and for video distribution applications.

**Drop-Down Menu**

A menu that is displayed from a menu bar.

**DSNE (Directory Service Network Element)**

A designated Network Element that is responsible for administering a database that maps Network Elements names (node names) to addresses (node Id). There can be one DSNE per (sub)network.

**DTE (Data Terminating Equipment)**

The equipment that originates data for transmission and accepts transmitted data.

**DTMF**

Dual Tone Multifrequency

**DUS**

Do not Use for Synchronization

**DWDM (Dense Wavelength Division Multiplexing)**

Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

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**E EBER (Excessive Bit Error Rate)**

The calculated average bit error rate over a data stream.

**ECC**

Embedded Control Channel

**EEPROM**

Electrically Erasable Programmable Read-Only Memory

**EIA (Electronic Industries Association)**

A trade association of the electronic industry that establishes electrical and functional standards.

**EM (Event Management)**

Subsystem of *WaveStar* SNMS that processes and logs event reports of the network.

**EMC (Electromagnetic Compatibility)**

A measure of equipment tolerance to external electromagnetic fields.

**EMI (Electromagnetic Interference)**

High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

**EMS**

Element Management System

**Entity**

A specific piece of hardware (usually a circuit pack, slot, or module) that has been assigned a name recognized by the system.

**Entity Identifier**

The name used by the system to refer to a circuit pack, memory device, or communications link.

**EPROM**

Erasable Programmable Read-Only Memory

**EQ (Equipped)**

Status of a circuit pack or interface module that is in the system database and physically in the frame, but not yet provisioned.

**ES (Errored Seconds)**

A performance monitoring parameter. ES “type A” is a second with exactly one error; ES “type B” is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

**ESD**

Electrostatic Discharge

**ESP**

Electrostatic Protection

**Establish**

A user initiated command, at the *WaveStar* CIT, to create an entity and its associated attributes in the absence of certain hardware.

**ETSI**

European Telecommunications Standards Institute

**Event**

A significant change. Events in controlled Network Elements include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled Network Element, the controlled Network Element will generate an alarm or status message and send it to the management system.

**Event Driven**

A required characteristic of network element software system: NEs are reactive systems, primarily viewed as systems that wait for and then handle events. Events are provided by the external interface packages, the hardware resource packages, and also by the software itself.

**Externally Timed**

An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator’s frequency into approximate agreement with the synchronization reference frequency.

**Extra traffic**

Unprotected traffic that is carried over protection channels when their capacity is not used for the protection of working traffic.

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**F Fault**

Term used when a circuit pack has a hard (not temporary) fault and cannot perform its normal function.

**Fault Management**

Collecting, processing, and forwarding of autonomous messages from network elements.

**FCC**

Federal Communications Commission

**FDA/CDRH**

The Food and Drug Administration's Center for Devices and Radiological Health.

**FDDI (Fiber Distributed Data Interface)**

Fiber interface that connects computers and distributes data among them.

**FE (Far End )**

Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

**FEBE (Far-End Block Error)**

An indication returned to the transmitting node that an errored block has been detected at the receiving node. A block is a specified grouping of bits.

**FEPROM (Flash EPROM)**

A technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

**FERF (Far-End Receive Failure)**

An indication returned to a transmitting Network Element that the receiving Network Element has detected an incoming section failure. Also known as RDI.

**FIT (Failures in Time)**

Circuit pack failure rates per 10<sup>9</sup> hours as calculated using the method described in Reliability Prediction Procedure for Electronic Equipment, BellCore Method I, Issue 6, December 1997.

**Folded Rings**

Folded (collapsed) rings are rings without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

**Forced**

Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

**FR (Frame Relay)**

A form of packet switching that relies on high-quality phone lines to minimize errors. It is very good at handling high-speed, bursty data over wide area networks. The frames are variable lengths and error checking is done at the end points.

**Frame**

The smallest block of digital data being transmitted.

**Framework**

An assembly of equipment units capable of housing shelves, such as a bay framework.

**Free Running**

An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

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**G GB**

Gigabytes

**Gbit/s**

Gigabits per second

**GHz**

Gigahertz

**Global Wait to Restore Time**

Corresponds to the time to wait before switching back to the timing reference. It occurs after a timing link failure has cleared. This time applies for all timing sources in a system hence the name global. This can be between 0 and 60 minutes, in increments of one minute.

**GNE (Gateway Network Element)**

A network element that passes information between other network elements and management systems through a data communication network.

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**H Hard Failure**

An unrecoverable nonsymptomatic (primary) failure that causes signal impairment or interferes with critical network functions, such as DCC operation.

**HDB3 (High Density Bipolar 3 Code)**

Line code for 2 Mb/s transmission systems.

**HDLC (High Level Data Link Control)**

OSI reference model datalink layer protocol.

**HMI**

Human Machine Interface

**HML (Human Machine Language)**

A standard language developed by the ITU for describing the interaction between humans and

dumb terminals.

**HO**

High Order

**Holdover**

An operating condition of a clock in which its local oscillator is not locked to an external reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

**Hot Standby**

A circuit pack ready for fast, automatic placement into operation to replace an active circuit pack. It has the same signal as the service going through it, so that choice is all that is required.

**HPA (Higher Order Path Adaptation)**

Function that adapts a lower order Virtual Container to a higher order Virtual Container by processing the Tributary Unit pointer which indicates the phase of the lower order Virtual Container Path Overhead relative to the higher order Virtual Container Path Overhead and assembling/disassembling the complete higher order Virtual Container.

**HPC (Higher Order Path Connection)**

Function that provides for flexible assignment of higher order Virtual Containers within an STM-N signal.

**HPT (Higher Order Path Termination)**

Function that terminates a higher order path by generating and adding the appropriate Virtual Container Path Overhead to the relevant container at the path source and removing the Virtual Container Path Overhead and reading it at the path sink.

**HS**

High Speed

**HW**

Hardware

**Hz**

Hertz

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**I I/O**

Input/Output

**IAO LAN**

Intraoffice Local Area Network

**ID**

Identifier

**IEC**

International Electro-Technical Commission

**IEEE**

Institute of Electrical and Electronics Engineers

**IMF**

Infant Mortality Factor

**Insert**

To physically insert a circuit pack into a slot, thus causing a system initiated restoral of an entity into service and/or creation of an entity and associated attributes.

**Interface Capacity**

The total number of STM-1 equivalents (bidirectional) tributaries in all transmission interfaces with which a given transmission interface shelf can be equipped at one time. The interface capacity varies with equipage.

**Intermediate System (IS)**

A system which routes/relays management information. An SDH Network Element may be a combined intermediate and end system.

**IS (In-Service)**

A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

**IS-IS Routing**

The Network Elements in a management network, route packets (data) between each other using an IS-IS level protocol. The size of a network running IS-IS Level 1 is limited, and therefore certain mechanisms are employed to facilitate the management of larger networks.

For STATIC ROUTING, the capability exists for disabling the protocol over the LAN connections, effectively causing the management network to be partitioned into separate IS-IS Level 1 areas. In order for the network management system to communicate with a specific Network Element in one of these areas, the network management system must identify through which so-called Gateway Network Element this specific Network Element is connected to the LAN. All packets to this specific Network Element are routed directly to the Gateway Network Element by the network management system, before being re-routed (if necessary) within the Level 1 area.

For DYNAMIC ROUTING an IS-IS Level 2 routing protocol is used allowing a number of Level 1 areas to interwork. The Network Elements which connect an IS-IS area to another area are set to run the IS-IS Level 2 protocol within the Network Element and on the connection between other Network Elements. Packets can now be routed between IS-IS areas and the network management system does not have to identify the Gateway Network Elements.

**ISDN**

Integrated Services Digital Network

**ITM**

Integrated Transport Management

**ITM-NM**

Integrated Transport Management Network Module

**ITU**

International Telecommunications Union

**ITU-T**

International Telecommunications Union — Telecommunication standardization sector. Formerly known as CCITT: Comité Consultatif International Télégraphique & Téléphonique; International Telegraph and Telephone Consultative Committee.

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**J Jitter**

Short term variations of amplitude and frequency components of a digital signal from their ideal position in time.

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**K kbit/s**

Kilobits per second

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**L LAN (Local Area Network)**

A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

**LBC**

Laser Bias Current

**LBFC**

Laser Backface Currents

**LBO (Lightguide Build-Out )**

An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

**LCN**

Local Communications Network

**LED**

Light-Emitting Diode

**LH**

Long Haul

**Line**

A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive network elements. One network element

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originates the line signal; the other terminates it.

### **Line Protection**

The optical interfaces can be protected by line protection. Line protection switching protects against failures of line facilities, including the interfaces at both ends of a line, the optical fibers, and any equipment between the two ends. Line protection includes protection of equipment failures.

### **Line Timing**

Refers to a network element that derives its timing from an incoming STM-N signal.

### **Link**

The mapping between in-ports and out-ports. It specifies how components are connected to one another.

### **LO**

Low Order

### **Location**

An identifier for a specific circuit pack, interface module, interface port, or communications link.

### **Lockout of Protection**

The *WaveStar* CIT command that prevents the system from switching traffic to the protection line from a working line. If the protection line is active when a “Lockout of Protection” is entered – this command causes the working line to be selected. The protection line is then locked from any Automatic, Manual, or Forced protection switches.

### **Lockout State**

The Lockout State shall be defined for each working or protection circuit pack. The two permitted states are: None – meaning no lockout is set for the circuit pack, set meaning the circuit pack has been locked out. The values (None & Set) shall be taken independently for each working or protection circuit pack.

### **LOF (Loss of Frame)**

A failure to synchronize an incoming signal.

### **LOM**

Loss Of Multiframe

### **Loop Timing**

A special case of line timing. It applies to network elements that have only one OC-N/STM-N interface. For example, terminating nodes in a linear network are loop timed.

### **Loopback**

Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

**LOP (Loss of Pointer )**

A failure to extract good data from a signal payload.

**LOS (Loss of Signal)**

The complete absence of an incoming signal.

**Loss Budget**

Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

**LPA (Lower order Path Adaptation)**

Function that adapts a PDH signal to a synchronous network by mapping the signal into or de-mapping the signal out of a synchronous container.

**LPC (Lower Order Path Connection )**

Function that provides for flexible assignment of lower order VCs in a higher order VC.

**LPT (Lower Order Path Termination)**

Function that terminates a lower order path by generating and adding the appropriate VC POH to the relevant container at the path source and removing the VC POH and reading it at the path sink.

**LS**

Low Speed

**LTE**

Line Terminating Equipment

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**M    μm**

Micrometer

**MAF**

Management Application Function

**Maintenance Condition**

An equipment state in which some normal service functions are suspended, either because of a problem or to perform special functions (copy memory) that can not be performed while normal service is being provided.

**Management Connection**

Identifies the type of routing used (STATIC or DYNAMIC), and if STATIC is selected allows the gateway network element to be identified.

**Manager**

Capable of issuing network management operations and receiving events. The manager communicates with the agent in the controlled network element.

**Manual Switch State**

A protection group shall enter the Manual Switch State upon the initiation and successful completion of the Manual Switch command. The protection group leaves the Manual Switch state by means of the Clear or Forced Switch commands. While in the Manual Switch state the system may switch the active unit automatically if required for protection switching.

**Mapping**

The logical association of one set of values, such as addresses on one network, with quantities or values of another set, such as devices or addresses on another network.

**MB**

Megabytes

**Mbit/s**

Megabits per second

**MCF (Message Communications Function)**

Function that provides facilities for the transport and routing of Telecommunications Management Network messages to and from the Network Manager.

**MD (Mediation Device)**

Allows for exchange of management information between Operations System and Network Elements.

**MDI**

Miscellaneous Discrete Input

**MDO**

Miscellaneous Discrete Output

**MEC (Manufacturer Executable Code)**

Network Element system software in binary format that after being downloaded to one of the stores can be executed by the system controller of the network element.

**MEM**

Memory

**Mid-Span Meet**

The capability to interface between two lightwave network elements of different vendors. This applies to high-speed optical interfaces.

**MIPS**

Millions of Instructions Per Second

**Miscellaneous Discrete Interface**

Allows an operations system to control and monitor equipment collocated within a set of input and output contact closures.

**MJ (Major (alarm))**

Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

**MMI**

Man-Machine Interface

**MML**

Human-Machine Language

**MN (Minor (alarm))**

Indicates a non-service-affecting failure of equipment or facility.

**MO**

Managed Object

**MS**

Multiplexer Section

**ms**

Millisecond

**MS-SPRING (Multiplexer Section Shared Protection Ring)**

A protection method used in Add-Drop Multiplexer Network Elements.

**MSOH (Multiplexer Section OverHead)**

Part of the Section Overhead. Is accessible only at line terminals and multiplexers.

**MSP (Multiplexer Section Protection)**

Provides capability for switching a signal from a working to a protection section.

**MST (Multiplexer Section Termination)**

Function that generates the Multiplexer Section OverHead in the transmit direction and terminates the part of the Multiplexer Section overhead that is acceptable in the receive direction.

**MTBF**

Mean Time Between Failures

**MTBMA**

Mean Time Between Maintenance Activities

**MTIE**

Maximum Time Interval Error

**MTPI**

Multiplexer Timing Physical Interface

**MTS (Multiplexer Timing Source)**

Function that provides timing reference to the relevant component parts of the multiplex equipment and represents the SDH Network Element clock.

**MTTR**

Mean Time To Repair

**Multiplexer**

A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

**Multiplexing**

A procedure by which multiple lower order path layer signals are adapted into a higher order path, or the multiple higher order path layer signals are adapted into a multiplex section.

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**N NA**

Not Applicable

**NE (Network Element)**

A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

**NEBS**

Network Equipment-Building System

**NET (Network Entity Title)**

The area address together with the system identifier (SYSTEM field) of the NSAP address is called the Network Entity Title.

**nm**

Nanometer ( $10^{-9}$  meters)

**NMON (Not Monitored )**

A provisioning state for equipment that is not monitored or alarmed.

**NMS**

Network Management System

**No Request State**

This is the routine-operation quiet state in which no external command activities are occurring.

**Node**

A network element in a ring or, more generally, in any type of network. In a network element supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

**Non-Revertive Switching**

In non-revertive switching, an active and stand-by line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the stand-by line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

**Non-Synchronous**

The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

**NORM**

Normal

**NPI**

Null Pointer Indication

**NPPA (Non-Preemptible Protection Access)**

Non-preemptible protection access increases the available span capacity for traffic which does not require protection by a ring, but which cannot be preempted.

**NRZ**

Nonreturn to Zero

**NSA**

Non-Service Affecting

**NSAP Address (Network Service Access Point Address)**

Network Service Access Point Address (used in the OSI network layer 3). An automatically assigned number that uniquely identifies a Network Element for the purposes of routing DCC messages.

**NUT (Non-preemptible Unprotected Traffic)**

Traffic in 1:1 working and protecting timeslots

**NVM (Non-Volatile Memory )**

Memory that retains its stored data after power has been removed. An example of NVM would be a hard disk.

---

**O O&M**

Operation and Maintenance

**OA**

Optical Amplifier

**OAM&P**

Operations, Administration, Maintenance, and Provisioning

**OC, OC-n**

Optical Carrier

**OC-12**

Optical Carrier, Level 12 Signal (622.08 Mbit/s)

**OC-192**

Optical Carrier, Level 192 (9953.28 Mb/s) (10 Gbit/s)

**OC-3**

Optical Carrier, Level 3 Signal (155 Mbit/s)

**OC-48**

Optical Carrier, Level 48 (2488.32 Mb/s) (2.5 Gbit/s)

**OI (Operations Interworking)**

The capability to access, operate, provision, and administer remote systems through craft interface access from any site in an SDH network or from a centralized operations system.

**OLS**

Optical Line System

**OOF**

Out-of-Frame

**OOS (Out-of-Service)**

The circuit pack is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

**Open Ring Network**

A network formed of a linear chain-shaped configuration of network elements. Each network element connects to two others, one on each side, except for two network elements at the ends which are connected on only one side. A closed ring can be formed by adding a connection between the two end nodes.

**Operations Interface**

Any interface providing you with information on the system behavior or control. These include the equipment LEDs, user panel, *WaveStar* CIT, office alarms, and all telemetry interfaces.

**Operator**

A user of the system with operator-level user privileges.

**Optical Channel**

A STM-N wavelength within an optical line signal. Multiple channels, differing by 1.5  $\mu\text{m}$  in wavelength, are multiplexed into one signal.

**Optical Line Signal**

A multiplexed optical signal containing multiple wavelengths or channels.

**Original Value Provisioning**

Preprogramming of a system's original values at the factory. These values can be overridden using local or remote provisioning.

**OS (Operations System)**

A central computer-based system used to provide operations, administration, and maintenance

functions.

**OSF**

Open Software Foundation Operations System Function

**OSI (Open Systems Interconnection)**

Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

**Outage**

A disruption of service that lasts for more than 1 second.

**OW (Orderwire)**

A dedicated voice-grade line for communications between maintenance and repair personnel.

---

**P Parameter**

A variable that is given a value for a specified application. A constant, variable, or expression that is used to pass values between components.

**Parity Check**

Tests whether the number of ones (or zeros) in an array of binary bits is odd or even; used to determine that the received signal is the same as the transmitted signal.

**Pass-Through**

Paths that are cross-connected directly across an intermediate node in a network.

**Path**

A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

**Path Terminating Equipment**

Network elements in which the path overhead is terminated.

**PCB**

Printed Circuit Board

**PCM**

Pulse Code Modulation

**PDH**

Plesiochronous Digital Hierarchy

**PI**

Physical Interface

**Platform**

A family of equipment and software configurations designed to support a particular application.

**Plesiochronous Network**

A network that contains multiple subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant.

**PM (Performance Monitoring)**

Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

**PMD (Polarization Mode Dispersion)**

Output pulse broadening due to random coupling of the two polarization modes in an optical fiber.

**POH (Path Overhead)**

Informational bytes assigned to, and transported with the payload until the payload is demultiplexed. It provides for integrity of communication between the point of assembly of a virtual container and its point of disassembly.

**Pointer**

An indicator whose value defines the frame offset of a virtual container with respect to the frame reference of the transport entity on which it is supported.

**POP**

Point of Presence

**Port (also called Line)**

The physical interface, consisting of both an input and output, where an electrical or optical transmission interface is connected to the system and may be used to carry traffic between network elements. The words “port” and “line” may often be used synonymously. “Port” emphasizes the physical interface, and “line” emphasizes the interconnection. Either may be used to identify the signal being carried.

**Port State Provisioning**

A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service, and not monitored) for low-speed ports.

**POTS**

Plain Old Telephone Service

**PP**

Pointer Processing

**PRC (Primary Reference Clock)**

The main timing clock reference in SDH equipment.

**Preprovisioning**

The process by which the user specifies parameter values for an entity in advance of some of the equipment being present. These parameters are maintained only in NVM. These modifications are initiated locally or remotely by either a CIT or an OS. Preprovisioning

provides for the decoupling of manual intervention tasks (for example, install circuit packs) from those tasks associated with configuring the node to provide services (for example, specifying the entities to be cross-connected).

**PRI**

Primary

**Proactive Maintenance**

Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect.

**Protection Access**

To provision traffic to be carried by protection tributaries when the port tributaries are not being used to carry the protected working traffic.

**Protection Group Configuration**

The members of a group and their roles, for example, working protection, line number, etc.

**Protection Path**

One of two signals entering a path selector used for path protection switching or dual ring interworking. The other is the working path. The designations working and protection are provisioned by the user, whereas the terms active path and standby path indicate the current protection state.

**Protection State**

When the working unit is currently considered active by the system and that it is carrying traffic. The “active unit state” specifically refers to the receive direction of operation — since protection switching is unidirectional.

**PROTN (Protection)**

Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

**PROV (Provisioned)**

Indicating that a circuit pack is ready to perform its intended function. A provisioned circuit pack can be active (ACT), in-service (IS), standby (STBY), provisioned out-of-service (POS), or out-of-service (OOS).

**PSDN**

Public Switched Data Network

**PSTN**

Public Switched Telephone Network

**PTE**

Path Terminating Equipment

**PWR**

Power

**PWR ON**  
Power On

---

**Q Q-LAN**

Thin Ethernet LAN which connects the manager to Gateway Network Elements so that management information between Network Elements and management systems can be exchanged.

**QL (Quality Level)**

The quality of the timing signal(s) provided to clock a Network Element. The level is provided by the Synchronization Status Marker which can accompany the timing signal. If the System and Output Timing Quality Level mode is “Enabled”, and if the signal selected for the Station Clock Output has a quality level below the Acceptance Quality Level, the Network Element “squashes” the Station Clock Output Signal, which means that no signal is forwarded at all.

Possible levels are:

- PRC (Primary Reference Clock)
- SSU\_T (Synchronization Supply Unit - Transit)
- SSU\_L (Synchronization Supply Unit - Local)
- SEC (SDH Equipment Clock)
- DUS (Do not Use for Synchronization)

**QOS**

Quality of Service

---

**R RAM**

Random Access Memory

**RDI (Remote Defect Indication)**

An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure. [Previously called far-end-receive failure (FERF).]

**Reactive Maintenance**

Refers to detecting defects/failures and clearing them.

**Receive-Direction**

The direction towards the Network Element.

**Regeneration**

The process of reconstructing a digital signal to eliminate the effects of noise and distortion.

**Regenerator Loop**

Loop in a Network Element between the Station Clock Output(s) and one or both Station Clock Inputs, which can be used to dejitterize the selected timing reference in network applications.

---

**Regenerator Section Termination (RST)**

Function that generates the Regenerator Section Overhead (RSOH) in the transmit direction and terminates the RSOH in the receive direction.

**Reliability**

The ability of a software system performing its required functions under stated conditions for a stated period of time. The probability for an equipment to fulfill its function. Some of the ways in which reliability is measured are: MTBF (Mean Time Between Failures) expressed in hours; Availability =  $(MTBF)/(MTBF+MTTR)(\%)$  [where MTTR = mean time to restore]; outage in minutes per year; failures per hour; percentage of failures per 1,000 hours.

**Remote Network Element**

Any Network Element that is connected to the referenced Network Element through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the same physical location but is usually at another (remote) site.

**Restore Timer**

Counts down the time (in minutes) during which the switch waits to let the worker line recover before switching back to it. This option can be set to prevent the protection switch continually switching if a line has a continual transient fault.

**Revertive**

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the working equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur, clear, or after any external switch commands are reset. (See “Non-Revertive”.)

**Revertive Switching**

In revertive switching, there is a working and protection high-speed line, circuit pack, etc. When a protection switch occurs, the protection line, circuit pack, etc. is selected. When the fault clears, service “reverts” to the working line.

**Ring**

A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over the protection capacity.

**Route**

A series of contiguous digital sections.

**Router**

An interface between two networks. While routers are like bridges, they work differently. Routers provide more functionality than bridges. For example, they can find the best route between any two networks, even if there are several different networks in between. Routers also provide network management capabilities such as load balancing, partitioning of the network, and trouble-shooting.

**RSOH**

Regenerator Section OverHead; part of SOH

**RST**

Regenerator Section Termination

**RT**

Remote Terminal

**RTRV**

Retrieve

**RZ (Return to Zero)**

A code form having two information states (termed zero and one) and having a third state or an at-rest condition to which the signal returns during each period.

---

**S SA**

Service Affecting

**SA**

Section Adaptation

**SD**

Signal Degrade

**SDH (Synchronous Digital Hierarchy)**

A hierarchical set of digital transport structures, standardized for the transport of suitable adapted payloads over transmission networks.

**SDS**

Standard Directory Service based on ANSI recommendation T1.245

**SEC**

Secondary

**SEC**

SDH Equipment Clock

**Section**

The portion of a transmission facility, including terminating points, between a terminal network element and a line-terminating network element, or two line-terminating network elements.

**Section Adaptation**

Function that processes the AU-pointer to indicate the phase of the VC-3/4 POH relative to the STM-N SOH and assembles/disassembles the complete STM-N frame.

**Self-Healing**

A network's ability to automatically recover from the failure of one or more of its components.

**SEMF (Synchronous Equipment Management Function)**

Function that converts performance data and implementation specific hardware alarms into object-oriented messages for transmission over the DCC and/or Q-interface. It also converts object-oriented messages related to other management functions for passing across the S reference points.

**Server**

Computer in a computer network that performs dedicated main tasks which generally require sufficient performance.

**Service**

The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

**SES (Severely Errored Seconds)**

This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occurs.

**SH**

Short Haul

**Single-Ended Operations**

Provides operations support from a single location to remote Network Elements in the same SDH subnetwork. With this capability you can perform operations, administration, maintenance, and provisioning on a centralized basis. The remote Network Elements can be those that are specified for the current release.

**Site Address**

The unique address for a Network Element.

**Slot**

A physical position in a shelf designed for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

**SM (Single-Mode Fiber)**

A low-loss, long-span optical fiber typically operating at either 1310 nm, 1550 nm, or both.

**SMN**

SDH Management Network

**SNC/I**

SubNetwork Connection (protection) / Inherent monitoring

**SNC/N**

SubNetwork Connection (protection) / Non-Intrusive Monitoring

**SNR (Signal-to-Noise Ratio)**

The relative strength of signal compared to noise.

**Software Backup**

The process of saving an image of the current network element's databases, which are contained in its NVM, to a remote location. The remote location could be the *WaveStar* CIT or an OS.

**Software Download**

The process of transferring a generic (full or partial) or provisioned database from a remote entity to the target network element's memory. The remote entity may be the *WaveStar* CIT or an OS. The download procedure uses bulk transfer to move an uninterpreted binary file into the network element.

**Software ID**

Number that provides the software version information for the system.

**SOH (Section Overhead)**

Capacity added to either an AU-4 or assembly of AU-3s to create an STM-1. Contains always STM-1 framing and optionally maintenance and operational functions. SOH can be subdivided in MSOH (multiplex section overhead) and RSOH (regenerator section overhead).

**SONET (Synchronous Optical Network)**

The North American standard for the rates and formats that defines optical signals and their constituents.

**Span**

An uninterrupted bidirectional fiber section between two network elements.

**Span Growth**

A type of growth in which one wavelength is added to all lines before the next wavelength is added.

**SPE**

Synchronous Payload Envelope

**SPI**

SDH Physical Interface

**Squelch Map**

This map contains information for each cross-connection in a ring and indicates the source and destination nodes for the low-speed circuit that is part of the cross-connection. This information is used to prevent traffic misconnection in rings with isolated nodes or segments.

**SSM**

Synchronization Status Marker

**SSU\_L**

Synchronization Supply Unit — Local

**SSU\_T**

Synchronization Supply Unit — Transit

**Standby Path**

One of two signals entering a constituent path selector, the standby path is the path not currently being selected.

**State**

The state of a circuit pack indicates whether it is defective or normal (ready for normal use).

**Station Clock Input**

An external clock may be connected to a Station Clock Input.

**Status**

The indication of a short-term change in the system.

**STBY (Standby)**

The circuit pack is in service but is not providing service functions. It is ready to be used to replace a similar circuit pack either by protection or by duplex switching.

**STM**

Synchronous Transport Module (SDH)

**STM-N (Synchronous Transport Module, Level N)**

A building block information structure that supports SDH section layer connections, where N represents a multiple of 155.52 Mbit/s. Normally N=1, 4, 16, or 64.

**STS**

Synchronous Transport Signal (SONET)

**Subnetwork**

A group of interconnected/interrelated Network Elements. The most common connotation is a synchronous network in which the Network Elements have data communications channel (DCC) connectivity.

**Supervisor**

A user of the application with supervisor user privileges.

**Suppression**

A process where service-affecting alarms that have been identified as an “effect” are not displayed to a user.

**SYNC**

Synchronizer

**Synchronization Messaging**

Synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

**Synchronous**

The essential characteristic of time scales or signals such that their corresponding significant instances occur at precisely the same average rate, generally traceable to a single Stratum-1 source.

**Synchronous Network**

The synchronization of transmission systems with synchronous payloads to a master (network) clock that can be traced to a reference clock.

**Synchronous Payload**

Payloads that can be derived from a network transmission signal by removing integral numbers of bits from every frame. Therefore, no variable bit-stuffing rate adjustments are required to fit the payload in the transmission signal.

**SYSCTL**

System Controller circuit pack

**System Administrator**

A user of the computer system on which the system's OS software application can be installed.

---

**T TARP**

Target Identifiers Address Resolution Protocol

**TBD**

To Be Determined

**TCA (Threshold-Crossing Alert)**

A message type sent from a Network Element that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

**TDM (Time Division Multiplexing)**

A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

**Through (or Continue) Cross-Connection**

A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

**Through Timing**

Refers to a network element that derives its transmit timing in the east direction from a received line signal in the east direction and its transmit timing in the west direction from a received line signal in the west direction.

**THz**

Terahertz ( $10^{12}$  Hz)

**TID (Target Identifier)**

A provisionable parameter that is used to identify a particular Network Element within a network. It is a character string of up to 20 characters where the characters are letters, digits, or hyphens (-).

**TL1 (Transaction Language One)**

A subset of ITU's human-machine language.

**TMN**

Telecommunications Management Network

**TR**

Technical Requirement

**Transmit-Direction**

The direction outwards from the Network Element.

**Tributary**

A signal of a specific rate (2 Mbit/s, 34 Mbit/s, 140 Mbit/s, VC12, VC3, VC4, STM-1 or STM-4) that may be added to or dropped from a line signal.

**Tributary**

A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STM-1 tributary within an STM-N port.

**Tributary Unit Pointer**

Indicates the phase alignment of the VC with respect to the TU in which it resides. The pointer position is fixed with respect to the TU frame.

**True Wave™ Optical Fiber**

Lucent Technologies' fiber generally called non-zero dispersion-shift fiber, with a controlled amount of chromatic dispersion designed for amplified systems in the 1550/1310 nm range.

**TSA (Time Slot Assignment)**

A capability that allows any tributary in a ring to be cross-connected to any tributary in any lower-rate, non-ring interface or to the same-numbered tributary in the opposite side of the ring.

**TSI (Time Slot Interchange)**

The ability of the user to assign cross-connections between any tributaries of any lines within a Network Element. Three types of TSI can be defined: Hairpin TSI, Interring TSI (between rings), and Intraring TSI (within rings).

**TSO**

Technical Support Organization

**TTP**

Trail Termination Point

**TU (Tributary Unit)**

An information structure which provides adaptation between the lower order path layer and the higher path layer. Consists of a VC-n plus a tributary unit pointer TU PTR.

**TUG**

Tributary Unit Group

**Two-Way Point-to-Point Cross-Connection**

A two-legged interconnection, that supports two-way transmission, between two and only two tributaries.

**Two-Way Roll**

The operation which moves a two-way cross-connection between tributary i and tributary j to a two-way cross-connection between the same tributary i and a new tributary k with a single user command.

---

**U UAS (Unavailable Seconds )**

In performance monitoring, the count of seconds in which a signal is declared failed or in which 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

**UITS (Unacknowledged Information Transfer Service)**

Unconfirmed mode of LAPD operation.

**UNEQ**

Path Unequipped

**Upstream**

At or towards the source of the considered transmission stream, for example, looking in the opposite direction of transmission.

**User Privilege**

Permissions a user must perform on the computer system on which the system software runs.

**UTC (Universal Coordinated Time)**

A time-zone independent indication of an event. The local time can be calculated from the Universal Coordinated Time.

---

**V V**

Volts

**VAC**

Volts Alternating Current

**Value**

A number, text string, or other menu selection associated with a parameter.

**Variable**

An item of data named by an identifier. Each variable has a type, such as int or Object, and a scope.

**VC (Virtual Container)**

Container with path overhead.

**VDC**

Volts Direct Current

**VF**

Voice frequency

**Virtual**

Refers to artificial objects created by a computer to help the system control shared resources.

**Virtual Circuit**

A logical connection through a data communication (for example, X.25) network.

**Voice Frequency (VF) Circuit**

A 64 kilobit per second digitized signal.

**Volatile Memory**

Type of memory that is lost if electrical power is interrupted.

---

**W WAD**

Wavelength Add/Drop

**WAN (Wide Area Network )**

A communication network that uses common-carrier provided lines and covers an extended geographical area.

**Wander**

Long term variations of amplitude frequency components (below 10 Hz) of a digital signal from their ideal position in time possibly resulting in buffer problems at a receiver.

**Wavelength Interchange**

The ability to change the wavelength associated with an STM-N signal into another wavelength.

**WaveStar OLS 40G/80G/400G**

WaveStar Optical Line System 40G/80G/400G

**WDCS**

Wideband Digital Cross-Connect System

**WDM (Wavelength Division Multiplexing)**

A means of increasing the information-carrying capacity of an optical fiber by simultaneously transmitting signals at different wavelengths.

**Wideband Communications**

Voice, data, and/or video communication at digital rates from 64 kbit/s to 2 Mbit/s.

**Working**

Label attached to a physical entity. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of nonrevertive switching the label has no particular meaning.

**Working State**

The working unit is currently considered active by the system and that it is carrying traffic.

**WRT (Wait to Restore Time)**

Corresponds to the time to wait before switching back after a failure has cleared, in a revertive protection scheme. This can be between 0 and 15 minutes, in increments of one minute.

**WS**

Work Station

**WTR (Wait to Restore)**

Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

---

**X X.25**

An ITU standard defining the connection between a terminal and a public packet-switched network

**X.25 Interface/Protocol**

The ITU packet-switched interface standard for terminal access that specifies three protocol layers: physical, link, and packet for connection to a packet-switched data network.

---

**Z Zero Code Suppression**

A technique used to reduce the number of consecutive zeros in a line-coded signal (B3ZS, B8ZS).





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