Lucent Technologies

Bell Labs Innovations

WaveStar™ AM 1 Add/Drop Multiplexer

User Guide

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Warranty

For warranty information refer to the "Standard Warranty" section.

Product Support

For a list of product support telephone numbers and/or web sites refer to the "Product Support" section.

This document was developed for the Lucent Technologies Optical Networking Group (ONG) by the Customer Training and Information Products (CTIP) organization.

WaveStar™ AM 1 User Guide

About This Document

Intended Audience

The WaveStar™ AM 1 Add/Drop Multiplexer User Guide is written primarily for end users responsible for installation, operations, and maintenance of the WaveStar™ AM 1. In addition, others needing specific information about the features, operations, and engineering of the WaveStar™ AM 1 may find the information in this User Guide useful.

Reason for Issue

This User Guide, Issue 1, provides technical, installation, and operational instructions for the WaveStar™ AM 1. It has been issued for Release 1.0.

Before Installing Product

It is recommended that the user read through Section I of this document *before* installing the WaveStar™ AM 1 Multiplexer.

User Guide Overview

This User Guide is divided into two sections:

- Section I contains information on the following:

    - System Description

    - Safety Instructions

    - Installation Instructions

    - Synchronization and Timing

    - Transmission Protection

    - Operations

    - Troubleshooting

    - Product Support

- Section II contains information and instructions on provisioning the equipment, transmission, protection and timing of the WaveStar™ AM 1 using ITM-CIT software.

SECTION I

System Description

The WaveStar™ AM 1 is an SDH STM-1 Add/Drop Multiplexer optimized to provide various 2 Mbit/s and 34 Mbit/s services to business customers. The WaveStar™ AM 1 is an STM-1 Multiplexer able to multiplex plesiochronous tributary signals into a 155 Mbit/s STM-1 optical aggregate signal.

In the Access Network, the WaveStar™ AM 1 can be installed at the customer premises for fiber-to-the-business applications, enabling various ring or linear configurations. Other applications include LAN-to-LAN traffic on campus networks or WANs.

Features

Key features of the WaveStar™ AM 1 include the following:

- Basic sixteen 2.048 Mbit/s interface ports
- Optional sixteen additional 2.048 Mbit/s interface ports
    - G.703 E1 physical interface
    - G.704/G.706 E1 interface

        OR

- Optional two additional 34.368 Mbit/s interface ports
    - G.703 E3 physical interface
- Local software downloading
- Remote software downloading
- Performance Monitoring
- Dual fiber working
- Transmission protection: SNC/N, 1+1 MSP
- Simple and rapid installation
- Space-efficient for installations within environmentally controlled street cabinets or on customer premises
- Supported by the user-friendly Integrated Transmission Management (ITM-SC, ITM-CIT) network management systems
- Optional AC/DC converter
- Optional DC/DC converter
- Optional battery backup
- Optional 120 ohm to 75 ohm adapter.

Hardware Description

The WaveStar™ AM 1 is a compact and cost-effective STM-1 multi-plexer designed to be installed at the customer's premises for fiber-to-the-business applications. Its space-efficient design allows for wall-mounting within controlled environment locations (e.g. interior closet). At 250 x 375 x 33 mm (H x W x D),[*] the basic lockable wall-mounted unit contains the following:

- ■ WaveStar™ AM 1 main board assembly

- ■ Two STM-1 optical line interface pair (transmit/receive) with type SC connectors

- ■ Sixteen 2.048 Mbit/s electrical tributary interfaces with RJ45 jacks suitable for symmetrical twisted pair cables with an impedance of 120 Ω

- ■ F-interface (RJ45) for the Craft Interface Terminal (ITM-CIT)

- ■ LAN Q-Interface (LAN-10baseT) Ethernet

- ■ Timing output for 2 Mbit/s synchronization (SYNC-OUT)

- ■ Dual Power Feed via a protected terminal block (Note: To be powered only by Safety Extra Low Voltage (SELV) -48 VDC or -60 VDC sources.)

- ■ Two LEDs (Red, Green) to indicate the status of the unit

- ■ Four Miscellaneous Discrete Input (MDI) ports

- ■ Four Miscellaneous Discrete Output (MDO) ports

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[*] The depth of the unit (D) increases to 55 mm with either option card.

Hardware Illustration

The figure below is an illustration of the basic WaveStar™ AM 1
lockable wall-mounted unit. The table following Figure 1 explains
the input/output port and interface designations.
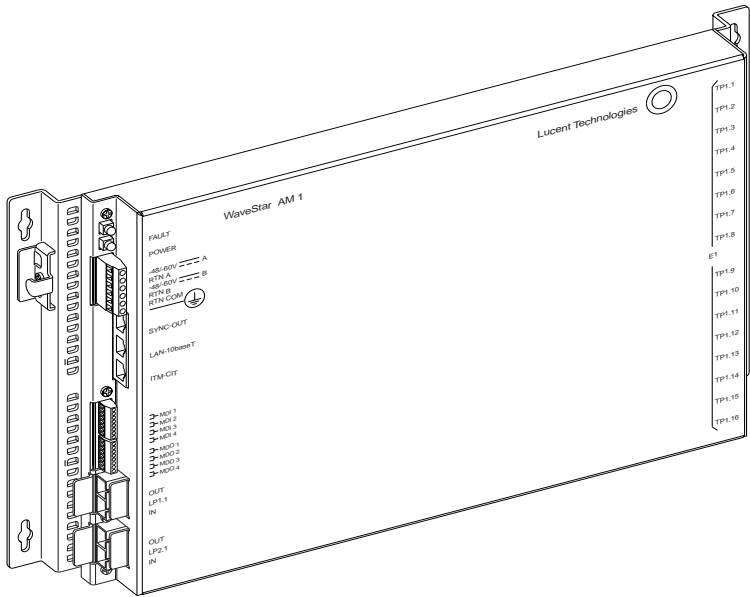
Figure 1.   WaveStar™ AM 1 Add/Drop Multiplexer

Table 1.   WaveStar™ AM 1 Port and Interface Designations

Table 1 describes the WaveStar™ AM 1's designations pictured in
Figure 1. Also listed are designations for the E1 and E3 option
cards (not shown). All pinouts are looking *into* the connectors.

AM 1 Designation	Description	Physical Description	Pinout
<OUT> <LP1.1> <IN>	STM-1 Optical Output & Input for Line Port 1	SC Connector	
<OUT> <LP2.1> <IN>	STM-1 Optical Output & Input for Line Port 2	SC Connector	
E1 PORTS <TP1.1—TP1.16> With option E1s <TP2.1—TP2.16>	2.048 Mbit/s E1 Inputs and Outputs	RJ45 connectors wired per RJ48C standard with metal shell for grounding	1 = TX-R 2 = TX-T 4 = RX-R 5 = RX-T 3, 6–8 = NC (See NOTE 2)
E3 PORTS With optional E3s <TP1.1—TP1.2>	34.368 Mbit/s E3 Inputs and Outputs	DIN 1.6/5.6 coaxial connectors	
<SYNC-OUT>	2048 kHz Timing Output (station clock output)	RJ45 connector with metal shell for grounding — 120 ohm symmetrical	1 = R1 (XMT-) 2 = T1 (XMT+) 3, 8 = NC (See NOTE 3)
<LAN-10baseT>	LAN-Q Interface Ethernet access port	RJ45 connector with metal shell for grounding	1 = P (XMT) 2 = N (XMT) 3 = P (RCV) 6 = N (RCV) 4, 5, 7, 8 = NC

AM 1 Designation	Description	Physical Description	Pinout
\<ITM-CIT\>	Craft Interface Terminal	RJ45 connector with metal shell for grounding	1, 8 = NC 2 = DSRi (CTS) 3 = GRD 4 = TXD 5 = RXD 6 = DSRo (RTS) 7 = DTR
\<MDI(1-4)\>	Miscellaneous Discreet Input pairs	Part of 8 Terminal screw down block	1 = 1 2 = 1 RTN 3 = 2 4 = 2 RTN 5 =3 6 = 3 RTN 7 = 4 8 = 4 RTN
\<MDO(1-4)\>	Miscellaneous Discreet Output pairs	Part of 8 Terminal screw down block Note: MDO1's contacts will close upon power failure	1 = 1 2 = 1 RTN 3 = 2 4 = 2 RTN 5 =3 6 = 3 RTN 7 = 4 8 = 4 RTN
\<-48/-60V— A\> \<-48/-60V— B\>	-48 and -60 Volt Input Power	Part of 6 Terminal screw down power block	1 = -48/-60V (A) 3 = -48/-60V (B)
\<RTN A\> \<RTN B\> \<RTN COM\>	Input Power Returns	Part of 6 Terminal screw down power block	2 = RTN (A) 4 = RTN (B) 5 = RTN (COM)
< ⏚ >	Chassis ground for bonding to the office ground	Part of 6 Terminal screw down power block	6 = Frame Ground

AM 1 Designation	Description	Physical Description	Pinout
\<POWER\>	Green LED indicates 3.3 volts is present in the AM 1	Green LED	
\<FAULT\>	Red LED indicating a hardware/software fault. LED flashes when incoming signal is missing or MS-AIS.	Red LED	

NOTES:

1. The figure below shows the RJ-45 connector pinout designations for the operational interfaces. The same pinouts apply to the E1 connections.

2. Transmit (TX) implies E1 signal transmitted from the AM 1 to other E1 terminal equipment. (See also Note 3.)
   Receive (RX) implies E1 signal received by the AM 1 from other E1 terminal equipment. (See also Note 3.)

3. R1 = Station Clock Ouptut Negative
   R2 = Station Clock Ouptut Positive
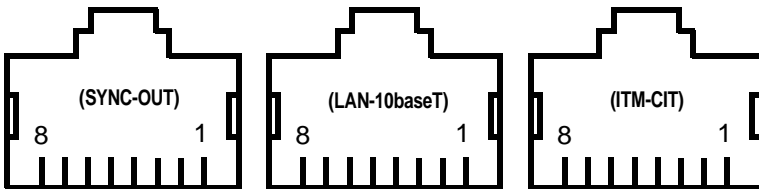
Technical Specifications

Optical Interface

- A 155.52 Mbit/s G.957/S-1.1 short-haul optical interface with an attenuation range from 0 to 12 dB (1×10^{-10} BER sensitivity) at an operating wavelength of 1310 nm.

- Mean launch power of -8 dBm max, -15 dBm min

- Minimum receiver sensitivity (BER $\leq 1\times10^{-10}$) of -28 dBm

- The STM-1 optical access is via SC-type connectors.

Tributary Interface

- Interface at 2.048 Mbit/s $\pm$ 50 ppm, HDB3 coded and conforming to G.703, asynchronously mapped via VC-12 in TU-12.

- The 2 Mbit/s electrical interface access is via a RJ45 connector suitable for symmetrical twisted pair cables with an impedance of 120 Ω.

- Interface at 34.368 Mbit/s, $\pm$ 20 ppm, clear channel HDB3 coded and conforming to G.703, asynchronously mapped via VC-3 in TU-3.

- The 34.368 Mbit/s electrical interface access is via a coaxial DIN 1.6/5.6 type connector.

Supervision Interfaces

- F-interface for Craft Interface Terminal (ITM-CIT) via RJ45 connector. The interface conforms to V.10/RS-232.

- LAN Q-Interface (LAN-10baseT) via RJ45 connector.

Synchronization

- Timing according to ITU-T G.813, SDH equipment slave clock (SEC), option 1. Supports locked, hold-over, and free-running (accuracy of $\pm$ 4.6 ppm) modes.

- Support of SSM byte.

Mapping

The WaveStar™ AM 1 supports mapping schemes for each VC12 and VC3 created and terminated in the system in accordance with ITU-T G.707:

- E1: The WaveStar™ AM 1 supports an AU4 <-> VC4 <-> TUG3 <-> TUG2 <-> TU12 <-> VC12 mapping scheme for each VC12 created and terminated in the system.

- E3: The WaveStar™ AM 1 supports an AU4 <-> VC4 <-> TUG3 <-> TU3 <-> VC3 mapping scheme for each VC3 created and terminated in the system.

Power Specifications

- Input Voltage, -48/-60 VDC. To be powered only by Safety Extra Low Voltage (SELV) -48 VDC or -60 VDC sources.

- Power consumption, less than 25 watts for basic unit, less than 50 watts with either option card

- External 90-264V (47-63 Hz) AC/DC converter (optional)

- External -24 to -48V DC/DC converter (optional)

- -48 VDC battery backup (optional)

- The system supports the grounding philosophy according to ETSI Requirements 300 253 (battery return connected to ground).

Equipment Dimensions

- Dimensions (H x W x D) 250 x 375 x 33 mm with basic unit (excluding mounting brackets)

- Dimensions (H x W x D) 250 x 375 x 55 mm with either option card assembly (excluding mounting brackets)

- Weight less than 5 Kg with either option card assembly

Environmental Conditions

- Compliant with ETSI 300 019 Class 3.3.

- ETSI EMC - The system meets the requirements of EN 300 386-2 for equipment installed in locations other than telecom centers

- The system operates with convection cooling.

Performance Monitoring

- Performance monitoring is in accordance with ITU-T G.826 and G.784.

- The following four parameters are available to estimate the error performance of a path: SES, ES, BBE, and UAS

Safety Instructions

IMPORTANT SAFETY INSTRUCTIONS

READ AND UNDERSTAND ALL INSTRUCTIONS

⚠ *The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying this product.*

When installing, operating, or maintaining this equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

1. *Follow all warnings and instructions marked on this product.*

2. *To be powered only by a Safety Extra Low Voltage (SELV) -48V dc or -60V dc Sources.*

3. *Disconnect up to two (2) power supply connections when removing power from the system.*

4. *This product should be only operated from the type of power source indicated on the marking label.*

5. *Connect this product only to the type of power sources recommended by Lucent Technologies. For information on the powering instructions, consult the Installation Instructions section of this User Guide.*

6.   *This equipment must be provided with a readily accessible disconnect device as part of the building installation.*

7.   *Installation must include an independent frame ground drop to building ground.*

8.   *This equipment is designed to permit the connection of the earthed conductor of the d.c. supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:*

   ■   *This equipment shall be connected directly to the d.c. supply system earthing electrode conductor, or to a bonding jumper from an earthing terminal bar or bus to which the d.c. supply system earthing electrode conductor is connected.*

   ■   *This equipment shall be located in the same immediate area (such as; adjacent cabinets, frames, bays, etc.) as any other equipment that has a connection between the earthed conductor of the same d.c. supply circuit and the earthing conductor, and also the point of earthing of the d.c. system. The d.c. system shall not be earthed elsewhere.*

   ■   *The d.c. supply source is to be located within the same premises as this equipment.*

   ■   *Switching or disconnecting devices shall not be in the earthed circuit conductor between the d.c. source and the point of connection of the earthing electrode conductor.*

9.   *For information on proper mounting instructions, consult the Installation Instructions section of this User Guide.*

10.   *Install only equipment identified in this User Guide. Use of other equipment may result in improper connection of circuitry leading to fire or injury to persons.*

11. *The telecommunication interfaces should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection, as applicable.*

12. *Do not use this product near water, for example, in a wet basement.*

13. *Do not place this product on an unstable cart, stand or table. The product may fall, causing serious damage to the product.*

14. *Use caution when installing or modifying telecommunications lines.*

15. *Never install telecommunications wiring during a lightning storm.*

16. *Never install telecommunications connections in wet locations.*

17. *Never touch uninsulated telecommunications wires or terminals unless the telecommunications line has been disconnected at the network interface.*

18. *Never touch uninsulated wiring or terminals carrying direct current or ringing current, or leave this wiring exposed. Protect and tape uninsulated wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.*

19. *Never push objects of any kind into this product through slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquids of any kind on the product.*

20. *To reduce the risk of an electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.*

21. *The WaveStar™ AM 1 hardware module contains an FDA/CDRH Class I/IEC Class 1 single-mode laser product that is an enclosed lightwave transmission system. Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precautions must be observed because of the potential for eye damage:*

- *Do not disconnect any lightwave cable or splice and stare into the optical connectors terminating the cables.*

- *Lightwave/lightguide operations should not be performed by a technician who has not satisfactorily completed an approved training course.*

- *Do not use optical instruments such as an eye loupe to view a fiber or unterminated connector.*

- *More information about laser safety can be found in this User Guide.*

SAVE THESE INSTRUCTIONS

WICHTIGE
SICHERHEITSANWEISUNGEN

BITTE ALLE ANWEISUNGEN SORGFÄLTIG DURCHLESEN

Nebenstehendes Symbol, ein Ausrufezeichen in einem Dreieck, weist den Benutzer darauf hin, daß sich unter den Unterlagen des Produktes bedeutende Betriebs- und Wartungsanweisungen befinden.

Bei Installation, Betrieb oder Wartung des vorliegenden Gerätes sollten immer grundlegende Sicherheitsanweisungen befolgt werden, um das Risiko eines Feuers, eines elektrischen Schocks oder anderer Verletzungen zu vermindern. Hierzu zählen vor allem:

1. *Bitte alle auf diesem Produkt angegebenen Gefahrenhinweise und Anleitungen befolgen.*

2. *Das Gerät darf nur von einer 48V GS-Sicherheits-Kleinspannung (SELV) oder einer 60V Sicherheitsstromspannung gespeist werden.*

3. *Bis zu 2 Speiseleitungen spannungsfrei machen, wenn das System ausgeschaltet wird.*

4. *Das Gerät nur an die Art von Stromspannung anschließen, die auf dem Produktschild angegeben ist.*

5. *Produkt nur an die von Lucent Technologies empfohlene Art der Stromversorgung anschließen. Nähere Auskünfte über die Netzstromanleitungen finden sich im Abschnitt Installierungsanweisungen des vorliegenden Benutzerhandbuchs.*

6. *Das Gerät muß mit einem leicht zugänglichen Trennschalter als Teil der Stromversorgung des Gebäudes ausgerüstet sein.*

7. *Die Installation muß eine unabhängige Schutzerdungsleitung vorweisen.*

8. *Das Gerät erlaubt den Anschluß des Erdleiters des GS-Versorgungskreises an den Erdungsleiter des Gerätes. Um diesen Anschluß herzustellen, müssen alle nachfolgenden Bedingungen erfüllt sein:*

    ■   *Das Gerät muß direkt an den Erdleiter des GS-Versorgungskreises oder den Potentialausgleichsleiter einer Erdungsschiene oder -sammelschiene, mit der der Erdleiter des GS-Versorgungskreises verbunden ist, angeschlossen werden.*

    ■   *Das Gerät muß sich in dem gleichen Bereich (wie z.B. in der Nähe elektrischer Schränke, Gehäuse, Schaltanlagen, usw.) wie jedes andere Gerät befinden, das einen Anschluß des Erdleiters des gleichen GS-Versorgungskreis bzw. einer Erdungsstelle des GS-Netzes an den Erdungsleiter aufweist. Das GS-Netz darf nicht anderswo geerdet sein.*

    ■   *Die GS-Spannungsquelle muß sich in dem gleichen Gebäude wie das Gerät befinden.*

    ■   *Zwischen der GS-Spannungsquelle und der Anschlußstelle des Erdungsleiter dürfen keine Schalt- und Trennvorrichtungen im Erdleiter installiert sein.*

9. *Anleitungen zur sachgemäßen Installation finden sich im Kapitel Installationsanleitungen des beiliegenden Bedienungshandbuchs.*

10. *Nur Ausrüstungsgegenstände installieren, die in beiliegendem Bedienungshandbuch angegeben sind. Die Verwendung anderer Gegenstände kann unsachgemäße Anschlüsse und Verbindungen zur Folge haben und somit zu Feuer und Verletzungen führen.*

11. *Die Telekommunikationsschnittstellen sollten nicht aus dem Gebäude herausführen, es sei denn sie sind an Telekommunikationsgeräte angeschlossen, die je nach Gerät mit primären und sekundären Schutzvorrichtungen ausgerüstet sind.*

12. *Das Produkt nicht in der Nähe von Wasser, z.B. in einem feuchten Kellergeschoß, verwenden.*

13. *Das Produkt nicht auf einen unstabilen Wagen, Stand oder Tisch legen. Es kann herunterfallen und ernsthaft beschädigt werden.*

14. *Vorsicht walten lassen, wenn Telekommunikationsleitungen installiert oder umverlegt werden.*

15. *Telekommunikationsleitungen niemals bei Blitz oder Unwetter installieren.*

16. *Telekommunikationsleitungen niemals an feuchten Plätzen installieren.*

17. *Niemals blanke Enden oder Anschlüsse von Telekommunikationsleitungen berühren, es sei denn die Leitungen wurden vorher an der Netzschnittstelle abmontiert.*

18. *Niemals blanke Enden oder Anschlüsse berühren , die unter Gleich- oder Rufstrom stehen, oder diese Enden frei und offen lassen. Enden und Anschlüsse mit Isolierband abdichten, um das Risiko eines Feuers, eines elektrischen Schocks oder anderer Verletzungen zu vermeiden.*

19. *Niemals irgendwelche Gegenstände durch die Schlitze in das Gerät stecken, da sie unter Strom stehende Enden berühren oder Teile kurzschließen und somit die Gefahr*

eines Feuers oder eines elektrischen Schocks auslösen könnten. Niemals irgendwelche Flüssigkeiten über dem Gerät verschütten.

20. *Um das Risiko eines elektrischen Schocks zu vermindern, dieses Produkt nicht auseinandermontieren. Die Wartung sollte nur von Fachpersonal vorgenommen werden. Das Offenlegen und Entfernen von Deckeln und/oder Leiterplatten kann zum Kontakt mit gefährlichen Spannungen führen oder andere Gefahren nach sich ziehen. Nicht ordnungsgemäßes Zusammenmontieren kann elektrische Schocks zur Folge haben, wenn das Gerät später benutzt wird.*

21. *Das WaveStar TM 1 Hardwaremodul enthält ein Monomode-Laserprodukt der FDA/CDRH Klasse I/IEC Klasse I, welches ein gekapselter Lichtwellenleiter ist. In der Regel sind Lichtwellenleiter vollständig umhüllt. Um Risiken einer Augenverletzung vorzubeugen, sollten jedoch folgende Vorsichtsmaßnahmen getroffen werden:*

   ■ *Lichtwellenleiterkabel nicht abmontieren oder spleißen und die Steckverbindungen am Ende der Kabel genau betrachten.*

   ■ *Arbeiten mit Lichtwellenleiter sollten nur von Fachpersonal vorgenommen werden, das eine Qualifizierung auf diesem Gebiet vorweisen kann.*

   ■ *Keine optischen Instrumente wie z.B. eine Lupe benutzen, um eine Glasfaser oder eine blanke Steckverbindung genauer zu betrachten.*

   ■ *Genauere Auskünfte über Sicherheitsanweisungen für den Umgang mit Laserprodukten finden sich im Bedienungshandbuch.*

ANWEISUNGEN BITTE AUFBEWAHREN

Laser Safety Information

General Laser Information

Lightwave/lightguide systems, their associated test sets, and similar operating systems use semiconductor laser transmitters that emit infrared (IR) light at wavelengths between approximately 800 and 1600 nanometers. The emitted light is above the red end of the visible spectrum, which is normally not visible to the human eye. Although radiant energy at near-IR wavelengths is officially designated invisible, some people can see the shorter wavelength energy even at power levels several orders of magnitude below any that have been shown to cause injury to the eye.

Conventional lasers can produce an intense beam of monochromatic light. The term "monochromaticity" means a single wavelength output of pure color that may be visible or invisible to the eye. A conventional laser produces a small-size beam of light, and because the beam size is small the power density (also called irradiance) is very high. Consequently, lasers and laser products are subject to federal and applicable state regulations as well international standards for their safe operation.

A conventional laser beam expands very little over distance, or is said to be very well collimated. Thus, conventional laser irradiance remains relatively constant over distance. However, lasers used in lightwave systems have a large beam divergence, typically 10 to 20 degrees. Here, irradiance obeys the inverse square law (doubling the distance reduces the irradiance by a factor of 4) and rapidly decreases over distance.

Lasers and Eye Damage

The optical energy emitted by laser and high-radiance LEDs in the 400 to 1400 nm range may cause eye damage if absorbed by the retina. When a beam of light enters the eye, the eye magnifies and focuses the energy on the retina, magnifying the irradiance. The

irradiance of the energy that reaches the retina is approximately 10^5 or 100,000 times more than at the cornea and, if sufficiently intense, may cause retinal burn.

The damage mechanism at the wavelengths used in telecommunications is thermal in origin, i.e., damage caused by heating. Therefore, a specific amount of energy is required for a definite time to heat an area of retinal tissue. Damage to the retina occurs only when one looks at the light sufficiently long that the product of the retinal irradiance and the viewing time exceeds the damage threshold. Optical energies above 1400 nm cause corneal and skin burns but do not affect the retina. The thresholds for injury at wavelengths greater than 1400 nm are significantly higher than for wavelengths in the retinal hazard region.

Classification of Lasers

Manufacturers of lasers and laser products in the U.S. are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes: I, II, IIa, IIIa, IIIb, or IV. The International Electro-technical Commission is an international standards body that writes laser safety standards under IEC-60825. Classification schemes are similar with Classes divided into Classes 1, 2, 3A, 3B, and 4. Lasers are classified according to the accessible emission limits and their potential for causing injury. Lightwave systems are generally classified as Class I/1, because, under normal operating conditions, all energized laser transmitting circuit packs are terminated on optical fibers which enclose the laser energy with the fiber sheath forming a protective housing. Also, covers are typically in place over the circuit pack shelves. The circuit packs themselves, however, may be FDA/CDRH Class I, or IIIb, or IEC Class 1, 3A, or 3B.

Lightwave Safety Precautions

In its normal operating mode, a lightwave system is totally enclosed and presents no risk of eye injury. It is a Class I/1 system under the IEC and FDA classifications.

The lightguide cables that interconnect various components of a lightwave system can disconnect or break, and may expose people to lightwave emission. Also, certain measures and maintenance procedures may expose the technician to emission from the semi-conductor laser during installation and servicing. Unlike more famil-iar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power density) decreases rap-idly with distance. The greater the distance, the less energy will enter the eye, and the less potential risk for eye injury. Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 5 to 6 inches (13 to 15.5 cm) normally will not cause eye injury provided the power in the fiber is less than a few milliwatts at the shorter wavelengths and a few tens of milli-watts at the longer wavelengths. However, damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.

CAUTION:

Use of controls, adjustments and procedures other than those specified herein may result in hazardous laser radia-tion exposure.

Safety Precautions for Enclosed Systems

Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precautions shall be observed:

1. Because of the potential for eye damage, technicians should not stare into optical connectors or broken fibers.

2. Under no circumstances shall lightwave/lightguide operations be performed by a technician before satisfactorily completing an approved training course.

3. Since viewing lightwave emission directly in excess of Class I/1 limits with an optical instrument such as an eye loupe greatly increases the risk of eye damage, technicians shall be trained never to use optical instruments to view a fiber or unterminated connector.

> **WARNING:**
>
> ***Unterminated optical connectors may emit laser radiation. Avoid direct exposure to the beam. Do not view this beam with optical instruments***

Safety Precautions for Unenclosed Systems

During service, maintenance, or restoration, a lightwave transmission system is considered unenclosed. Under these conditions, follow these practices:

1. Only authorized, trained personnel shall be permitted to do service, maintenance, and restoration. Avoid exposing the eye to emissions from unterminated, energized optical connectors at close distances. Laser modules associated with the optical ports of laser circuit packs are typically recessed, which limits the exposure distance. Optical port shutters and Automatic Power Reduction (APR) are engineering controls options that can be used when emissions are in excess of Class I/1 limits. However, technicians removing or replacing laser circuit packs should not stare or look directly into the optical port with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments such as Find-R-Scopes are not considered magnifying lenses or optical instruments.)

2. Only authorized, trained personnel shall use the lightwave test equipment during installation or servicing since this equipment contains semiconductor lasers. (Some examples of lightguide test equipment are Optical Time Domain Reflectometers [OTDRs], Hand-Held Loss Test Sets, and Feature Finders.)

3. Under no circumstances shall any personnel scan a fiber with an optical test set without verifying that all lightwave sources on the fiber are turned off.

4. All unauthorized personnel shall be excluded from the immediate area of lightwave transmission systems during installation and service.

Consult ANSI Z136.2 American National Standard for Safe Use of Lasers in the U.S. or outside the U.S., IEC-60825, Part 2 for guidance on the safe use of optical fiber optic communication systems in the workplace.

Optical Characteristics of the WaveStar™ AM 1 Apparatus Unit

1. Wavelength: 1310 nm
2. Output Power: 0.159 mW
3. Fiber Type: Single Mode (SM)
4. Classification: FDA Class I/IEC Class 1
5. Optical Source: Laser Diode
6. Optical Connector: SC

Installation Instructions

Environmental Considerations

When deciding where the WaveStar™ AM 1 is to be located consider the following environmental requirements:

1. The WaveStar™ AM 1 must not be exposed either to solar radiation/direct sunlight or to heat radiation. It should be located to allow for convection cooling.

2. The WaveStar™ AM 1 should be installed in a temperature environment not colder than -5° C or warmer than 45° C (23° F to 113° F).

3. The WaveStar™ AM 1 should be installed in a temperature environment with a relative humidity range of between 5% and 90%.

Wall Mounting the Unit

To wall mount the WaveStar™ AM 1 on a flat, vertical surface do the following:

1. After deciding where the unit is to be mounted, hold it against the wall, align it vertically, and mark the location of the four mounting holes in the corner tabs of the mounting brackets. After marking the holes, re-check the alignment. After verifying the correct location, drill the holes.

2. Secure the unit to the wall with four M4 screws (not supplied) and any hardware necessary for the type of wall surface.

Rack Mounting the Unit

To rack mount the WaveStar™ AM 1 do the following:

1. Adjust the mounting brackets for the width of the frame. Note that the brackets may be attached to the rear of the base assembly at different points to account for varying frame widths.

2. Secure the unit to the frame with the appropriate hardware.

Connecting Power

Note: Measure the voltage of the power supply (-48 to -60 VDC) *before* connecting to the AM 1 unit. *Do not apply power until all connections have been secured and verified.*

The power and independent frame ground shall be connected to the locations identified on the unit. STRANDED 18 AWG (0.82 mm^2) wire with proper insulation can be used (only *stranded* wire shall be used). The ends of the wires which are to terminate in the -48V/-60V, RTN, and GRD (⏚) locations shall be stripped back 6 mm [0.25 in]. After installing the wires into the terminal block, the terminal block screws shall be torqued between 0.55 to 0.80 Nm [5 to 7 lbs-in]. The wires shall then be strain relieved as shown in Figure 2. Note that a single power feed for a wall mount application is shown. Strain relief for rack mounting should be performed using a similar method.
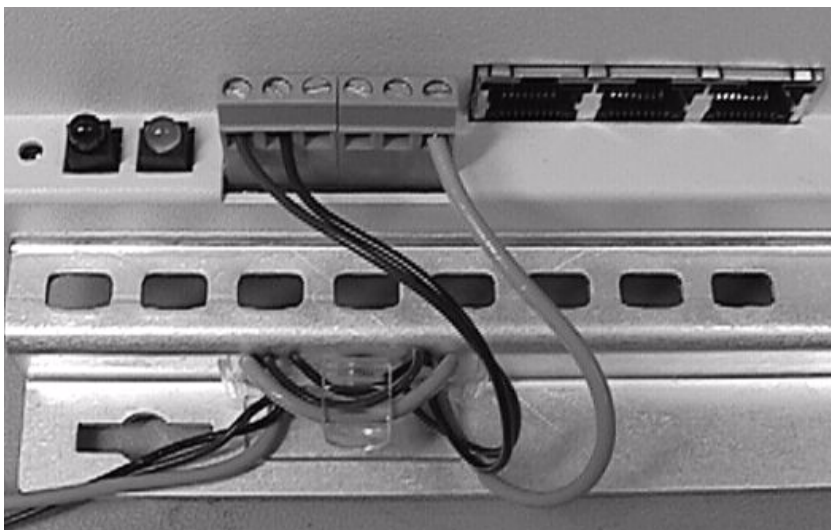
Figure 2.   Cable Bracket Power Wiring — Single Power Feed

Grounding Option

When it is required to interconnect earth ground (⏚) to RTN, a jumper wire can be added externally between positions 5 and 6 (the bottom two positions) of the terminal block (see Figure 2). The jumper shall be 18 AWG (0.82 mm^2) stranded wire. A 25 mm [1 in long] wire shall be used, the ends stripped 6 mm [0.25 in]. Bend the jumper into a "U" shape and install in positions 5 and 6 of the terminal block with a screw torque of 0.55 to 0.80 Nm [5 to 7 lbs-in].

Powering from AC/DC Converters

When powering the WaveStar™ AM 1 with the optional AC-to-DC converter, you must connect a jumper wire between the RTN COM and the earth ground (⏚). Failure to do so may allow the -48V input to float and affect the operation of the unit. See the GROUNDING OPTION above.

Powering from DC/DC Converters

When powering the WaveStar™ AM 1 with the optional DC-to-DC converter, you must connect a jumper wire between the RTN COM and the earth ground (⏚). Failure to do so may allow the -48V input to float and affect the operation of the unit. See the GROUNDING OPTION above. *NOTE: The optional DC-to-DC converter must be powered by a Safety Extra Low Voltage (SELV) -48V dc Source.*

Connecting STM-1 Fibers

The routing of the fibers away from the WaveStar™ AM 1 should be in accordance with the specifications for the selected fiber. Care should be taken not to exceed the bending radius when placing the fiber (nominal minimum 10cm bending radius). Exceeding the recommended radius may cause distortion and poor signal quality. Cables should be strain relieved to prevent any force from being exerted on the connectors.

Clean all connections, as required, before attaching.

Connecting E1 Tributaries

The routing of the E1 tributaries should be in accordance with the recommended practices of the cable selected. Cables should be strain relieved to prevent any force from being exerted on the connectors.

Connecting E3 Tributaries (optional)

The routing of the E3 tributaries should be in accordance with the recommended practices of the cable selected. Cables should be strain relieved to prevent any force from being exerted on the connectors.

MDI/MDO Connections

Prepare the MDI/MDO (Miscellaneous Discreet Input / Miscellaneous Discreet Output) connections by stripping the wires back 5 mm [0.2 in]. Install the wires and then torque the MDI/MDO terminal block screws to 0.2 Nm (1.7 lb-in).

Wire size range:

- Nominal 0.5 mm^2
- Solid 0.03 to 1.00 mm^2 (17 AWG)
- Stranded 0.03 to 0.75 mm^2 (18 AWG)

Synchronization and Timing

The WaveStar™ AM 1 complies with the synchronization require-
ments as specified in ITU-T Recommendation G.813, option 1.

Synchronization

A synchronization reference for the WaveStar™ AM 1 can be
extracted from one of the following sources:

- Either one of the STM-1 line inputs
- One of the 2 Mbit/s data inputs.

Note: When used as a timing reference, the 2 Mbit/s data input
must comply with the wander tolerance, jitter tolerance, and fre-
quency offset (< 4.6 ppm) requirements specified in ITU-T Recom-
mendation G.813, option 1.

SYNC-OUT

- The external synchronization port (SYNC-OUT) can be
  locked to the input signal selected for synchronization or to
  the internal clock. SYNC-OUT provides 2048 kHz according
  to ITU-T G.703.

Terminal Configuration

When connecting two WaveStar™ AM 1s directly together (optically
back-to-back, not through an SDH network) in a 1+1 MSP terminal
configuration, the following recommendations should be followed in
order to ensure proper synchronization:

a. Using ITM-CIT software, provision one of the AM 1s as
   locked to either reference: one of the 155.52 Mbit/s STM-1
   inputs or one of the 2.048 Mbit/s inputs.

b. If the first AM 1 is locked to one of the 155.52 Mbit/s STM-1
   inputs, provision the second AM 1 as free-running.

c. If the first AM 1 is locked to one of the 2.048 Mbit/s inputs, provision the second AM 1 as locked to the 155.52 Mbit/s input.

Timing Modes

Timing of the WaveStar™ AM 1 can be referenced to either one of the two 155.52 Mbit/s optical STM-1 input lines, or any one of the 2.048 Mbit/s E1 input tributaries. The WaveStar™ AM 1 provides one external reference clock output (SYNC-OUT) at 2.048 Mhz.

The WaveStar™ AM 1 can operate in the following modes:

- Locked: Referenced to a suitable input signal such as one of the STM-1 inputs or one of the 2 Mbit/s data inputs. (Note that the timing circuitry will not accept a reference input from an external office station clock input.)

- Hold-Over: Operates from the stored frequency data of the last available input reference.

- Free Running: The internal time-base oscillator is selected ($\pm$ 4.6 ppm).

Transmission Protection

SNC/N Protection

General VC-12/VC-3 SNC/N protection (non-revertive):

In an add/drop ring configuration, the system allows the set up of a non-intrusively monitored subnetwork connection protection scheme between any incoming TU-12 or TU-3 from the east line interface, and any TU-12 or TU-3 from the west line interface. A protection switch will occur based on "path signal fail," TIM, UNEQ, or DEG conditions. The threshold is user-settable for DEG. Only non-revertive operation is possible and manual and forced switching commands are supported.

1+1 MSP Protection

1+1 MSP protection in terminal applications:

In terminal applications between two WaveStar™ AM 1s, a 1+1 MSP protection relation can be set up by the user. Switching can either be revertive or non-revertive, uni-directional or bi-directional.

Operations

Note: The following information describes the WaveStar™ AM 1's operations features. To implement these features refer to **SECTION II** of this guide. **SECTION II** provides information and instructions on provisioning the equipment, transmission, protection and timing using the PC-based ITM-CIT software.

Operations include the following:

- Operations Interfaces
- Maintenance supervision
- System alarm indicators
- Software maintenance
- Maintenance testing
- Performance monitoring
- Self-diagnostics and recovery
- 4 MDI, 4 MDO contacts

Operations Interfaces and Administration

The WaveStar™ AM 1 has been configured for remote and local operations management via the Lucent Technologies' Integrated Management Network (ITM) management systems. Remote management can be via the STM-1 DCC and the ITM-SC software (ITM-SC can also be connected locally). Local and remote (remote to other NEs in the same network only) communications are via ITM-CIT. Local connections are via an RJ45 connector mounted on the WaveStar™ AM 1 unit and the PC-based ITM-CIT software.

Management access features include:

- Simultaneous access by the ITM-SC and local workstations

■ Remote access to other NEs in the same network via ITM-CIT

■ Network element level security via three password controlled authorization levels: ADMIN, CONFIGURE, and VIEW.

Maintenance Supervision

Transmission and equipment fault supervision is monitored remotely and/or locally via the ITM-SC, and locally via LEDs on the unit and via ITM-CIT. The local ITM-CIT may also be used to remotely access other NEs in the network.

Alarm and port termination monitoring features include:

■ Physical port provisioning of STM-1, E1, and E3 in three different modes: automatic (AUTO), monitored (MON), or non-monitored (NMON).

■ VC path termination point provisioning in either the MON or NMON mode

■ Alarm severity levels of PROMPT, DEFERRED, and INFORMATION provisionable for each alarm type

■ User can assign an alarm message and severity to each MDI (Miscellaneous Discrete Input).

Failure reporting features:

■ Alarm messages are reported via ITM-CIT and ITM-SC. These messages identify failures and provide information useful for correcting faults and clearing alarms.

■ Alarm forwarding to the remote management system is supported via ITM-SC (LAN-10baseT) and to the local workstation via the F-interface (ITM-CIT).

■ The NE can store the 500 most recent alarm events and can be accessed by either the local or remote monitoring stations.

■ Failures are reported as defined in G.783 and ETS 300417.

System Alarm Indicators

The WaveStar™ AM 1 supports two LEDs which provide the following maintenance information:

- 1 Green LED to indicate power

- 1 Red LED to indicate unit fault or signal failure

  (See the following TROUBLESHOOTING section)

Software Maintenance

Software maintenance includes the following:

- Non-service affecting software download via ITM-SC (remotely) and ITM-CIT (locally)

- Database upload/download from the ITM-SC

- In-service database reprovisioning available via the local workstation running ITM-CIT

Maintenance Testing

E1 loopbacks are available for circuit testing during maintenance operations

Performance Monitoring

Provisioning and retrieval of performance monitoring parameters are derived from the overhead bytes (SOH, POH of each VC) and are in accordance with ITU-T Recommendations G.874 and G.826. This is accomplished via ITM-SC and ITM-CIT. Performance thresholds counts are user settable.

- The following four parameters are available to estimate the error performance of a path: SES, ES, BBE, and UAS

    - SES: number of Severely Errored Seconds in the received signal

    - ES: number of Errored Seconds in the received signal

    - BBE: number of Background Block Errors in the received signal

    - UAS: number of UnAvailable Seconds in the received signal.

- Monitoring can be done on the incoming STM-1 optical inter-faces of the WaveStar™ AM 1 unit

- Monitoring can be done on any incoming VC-4, VC-3 or VC-12 terminating in the unit

- Performance monitoring data is stored in one current and sixteen recent 15 minute registers, and one current and one recent 24 hour registers

- Threshold reports are generated when user-settable performance parameters are exceeded during 15 minute and 24 hour periods

Self-Diagnostics and Recovery

The WaveStar™ AM 1 supports the following diagnostics and recovery features:

- The WaveStar™ AM 1 continuously runs self-diagnostic tests to monitor the health of the transmission system

- The WaveStar™ AM 1 auto-recovers after a power failure

- The WaveStar™ AM 1 will auto-recover from a database failure by requesting the backup database be downloaded from the ITM-SC.

Miscellaneous Discrete Inputs & Outputs

The WaveStar™ AM 1 provides four miscellaneous discrete inputs (MDIs) that can be used to read external devices assigned by the customer. Examples are monitoring temperature, humidity, open doors, etc.

The WaveStar™ AM 1 provides four miscellaneous discrete outputs (MDOs) that can be used to drive external devices assigned by the customer. Examples are signaling devices, temperature conditioning, etc.

Note that MDO#1 has been assigned to indicate a power failure (normally open contacts will close), MDO#2-4 are unassigned.

LEDs Normal Operation

The WaveStar™ AM 1 is equipped with two LEDs indicating the following conditions:

- When no LEDs are lit it is an indiction that there is no power.

- When the green LED (POWER) is ON it indicates the unit is receiving power

- When both LEDs are ON it indicates that the unit is receiving power and there may be a problem with the unit (see Troubleshooting).

- When the FAULT LED is FLASHING it indicates a problem with the incoming signal (see Troubleshooting).

Software Upgrades

Software upgrades may be executed remotely via the DCC using ITM-SC software. They may also be done locally via the PC-based ITM-CIT.

New software releases will be downloaded into a separate storage area of the WaveStar™ AM 1. Then, at the customers designated time, this new software will be activated as the "working" software and the unit will remain "in-service" with no disruption to traffic. However, all communication with the AM 1 will be suspended during this activation process.

Troubleshooting

The following Troubleshooting Table presents symptoms, possible causes, and corrective action on problems with the WaveStar™ AM 1 Add/Drop Multiplexer. For further information refer to the Alarm Messages and Maintenance (AMM) manual.

Table 2. Troubleshooting Table

Symptom	Possible cause	Corrective action
Both LEDs are OFF	Power loss or out-of-range	Check power. -48 to -60 VDC
	Power polarity reversed	Check polarity. Reverse power connections
FAULT LED is ON	Unit is booting.	Allow one minute for the unit to boot before the FAULT LED goes OFF.
	Unit is faulty	Reboot the unit by disconnecting and reconnecting the power. If the LED still does not go OFF, replace the unit.
	MIB is empty, Node not created.	Login with ITM-CIT and create node.
FAULT LED is FLASHING	Loss of incoming optical signal (only if 'MON') or electrical signal, or the unit is receiving MS-AIS	Clean fiber connections and recheck for incoming signal. Optical power must be ≥ -28 dBm. Measure the input signals coming into the unit. Check the remote Network Element for alarms.

Symptom	Possible cause	Corrective action
Remote equipment at the HOST indicates a degraded incoming optical signal or LOS	Bent or broken fiber, dirty optical contacts	Clean the optical contacts. Check the optical signal. Check fiber routing and/or exceeding the fiber bending radius.
	AM 1 laser fault or signal out-of-range.	Clean the optical contacts. Check the optical signal. If out-of-range, replace unit.
Equipment connected to a 2 Mbit/s port indicates errors or LOS	Damaged cable or contact	Check cabling with an ohm meter. Disconnect the AM 1 unit from the network and loop the outgoing optical signal back to the input. Check for error free transmission through the 2 Mbit/s port. If errors occur replace the unit.
	Wrong cable impedance causing reflections	Check cable impedance
Intermittent or bursty errors on optical line	Possible timing loop problem	Ensure that in point-to-point configuration one AM 1 is provisioned as free-running. (see Timing and Synchronization)

Connector and Fiber Cleaning

Clean connectors by blowing any lint or dust from inside the connectors using compressed air held at least 8 cm (3 inches) away.

Clean optical fiber-end face and sides of connector with lint-free, optical quality tissue moistened with isopropyl alcohol. Carefully wipe fiber-end face and sides again with clean, dry, lint-free optical quality tissue.

Power Supply

The WaveStar™ AM 1 must be supplied with an input voltage of -48 or -60 VDC. Power consumption is less than 25 watts with the basic unit, less than 50 watts with either option card.

Product Support

Technical Assistance

Many of our customers have established their own technical support procedures. These procedures usually involve escalation within their own companies. However, some issues may require additional assistance from Lucent Technologies.

Lucent Technologies has been and continues to be committed to providing excellence in technical customer support for its products and services. Therefore, we provide a hierarchical support structure ready and available to solve any WaveStar™ AM 1 technical issue.

When additional technical assistance is needed, use the appropriate contact information in the following table. (Note that accessing a Lucent Technologies' web site may require the assistance of Lucent personnel.)

Table 3.   WaveStar™ AM 1 Technical Support Contacts

Customer Location	Initial Lucent Technologies Contact Location
International	URL address of Lucent homepage: http://www.lucent.com
	URL address of CTS homepage: http://hzswww.nl.lucent.com/cts/ (May require assistance of Lucent personnel.)
Peoples Republic of China	Lucent Technologies China, Beijing (86) 10 6522 5566 ext. 4046 Lucent Technologies China, Guangzhou (86) 20 8331 1600 ext. 328 Lucent Technologies China, Shanghai (86) 21 6470 5858

Warranty

Warranty, support, and trouble escalation procedures have been established on a per country basis. Contact your Lucent Technologies account representative for details.

Discontinued Availability

Lucent Technologies reserves the right to notify the customer in advance of the intention to Discontinue the Availability (DA) of a product. Lucent Technologies also reserves the right to offer a Technical Support Contract (TSC) to make repair and technical support services available for an additional period of time after a product has been discontinued. All TSC services will be at a specified price dependent on the terms and conditions of the contract.

The rights and obligations of Lucent Technologies and the customer shall neither be assigned nor delegated without prior written consent of the other party, except that Lucent Technologies may assign its obligations to any of its affiliates or non-Lucent Technologies contractors without further consent by the customer.

Standard Repair

If Lucent Technologies determines that a product is not defective or is in conformance, the customer shall pay Lucent Technologies the costs of handling, inspecting, testing, and transporting the product and, if applicable, travel and related expenses.

Repair Interval

Lucent Technologies repair locations set their own standards for return intervals. On average, the minimum time to return repairs to the customer is 14 days from the receipt of the product by the repair location. The maximum time to return repairs to the customer can range from 50 to 180 days.

Out-Of-Warranty Provisions

For any activity associated with repair or replacement of hardware
and/or software systems that is determined by Lucent Technologies
to be out of warranty, materials an labor will be billed at Lucent
Technologies list price (time-and-materials plus additional incurred
expenses), or in accordance with a separate Technical Support
Contract.

International Repair and Service

The customer or the customer's in-country representative should
send a description of the material to be returned for repair or ser-
vice including the quantity, comcodes, and serial numbers (if avail-
able) to the Lucent Technologies' Charlotte Service Center.

After the Charlotte Service Center receives the repair information,
they will assign an order number and fax an Authorization To Repair
Form to the customer or the customer's in-country representative.

The material can then be consigned and shipped to:

Lucent Technologies

Charlotte Service Center

6701-A Northpark Blvd.

Charlotte, NC 28216 USA

Attn: International Repair

Notify: Hipage Co. (704) 357-3050

After the material has been shipped, the following information
should be faxed to the Charlotte Service Center:

- Customer's return address
- Customer contact name, telephone number, and fax number
- Value of material

- Identification of any hazardous equipment or material

- Shipping information including the date of shipment, air way-bill, carrier name, flight number, number of cartons, and weight of material

When the material arrives at the Charlotte Service Center, it is entered into the Repair, Service, and Return database for tracking purposes, to verify shipment and quantities, and to determine the appropriate repair location. The material is then shipped to the appropriate repair location.

The repair locations will repair the material and then ship it back to the Charlotte Service Center. If it is determined that an item is not repairable and the item is under factory warranty, a replacement will be sent. If the item is out of factory warranty, the customer will advise their Country Desk Representative if they would like to order a replacement.

The Charlotte Service Center will prepare the paperwork for exporting the material, and ship the material to the customer. When available, the Charlotte Service Center will fax the shipping information to the customer or the customer's in-country representative.

Upon receipt of the material, the customer or the customer's in-country representative should send the Charlotte Service Center the order numbers of the material received and the date the material was received. The Charlotte Service Center will then close the order on the Repair, Service, and Return database.

SECTION II

This section contains information and instructions on provisioning the equipment, transmission, protection and timing of the Wave-Star™ AM 1 using ITM-CIT software. ***It is assumed that the user of this guide is conversant with the use of ITM-CIT and the WaveStar™ AM 1.***

Equipment Provisioning

Intended use

This subsection provides all procedures needed to provision the equipment of a WaveStar™ AM 1 network element when using the ITM-CIT.

Isolated State

Arriving from the factory, the WaveStar™ AM 1 is in the "isolated state." No DCC communication is possible and it is not possible to get an association with the ITM-SC as long as the network element is in the isolated state. To enable an association with the ITM-SC this isolated state must be removed. The isolated state is removed if the Area ID is changed from 0000 to any other value.

Creating a Node

Purpose

Creating a node provides the basic information necessary to place an NE into service.

Prerequisites

Before starting to create a node make certain:

- the name, address, and location of the node are known.

- the type of units physically present in the NE are known.

Precaution

For the *WaveStar*™ AM 1, the only slot which may be assigned by the user is TS2.

Any mistake in provisioning the slots will result in a failure when attempting to create the node. When a mistake has been made, after clicking **Finish**, the error message "Slot configuration conflict" appears. The node creation has failed, and the entire node creation process must be begun anew.

Windows for Creating a Node

Windows to Use

The following windows are used in creating a node.

- Node Creation

- *Node Creation - Provisioned Slots* Node Details

- Node Details

The *Node Creation - Parameters* window is used in creating a node. It allows entry of the basic node details.

The *Node Creation - Provisioned Slots* window is to provision units in a node that is being created.

The *Node Details* window is used in confirming the MIB.

Figure 3.   Node Creation
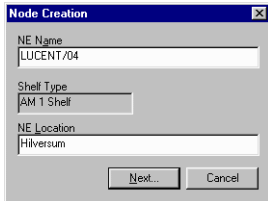
Figure 4.   Node Creation - **Provisioned Slots**
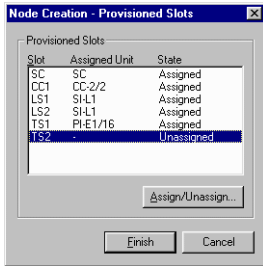
Figure 5.   Node Details
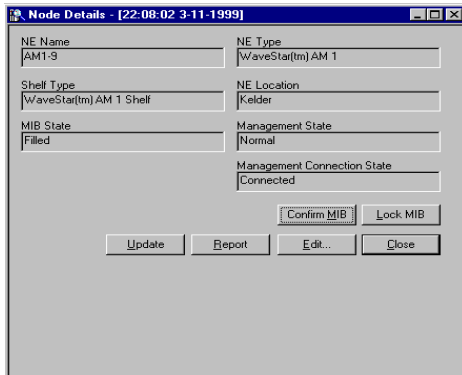
Parameters for Creating a Node

NE Type

The type of NE is indicated.

NE Name

The network element's name is listed. The name must be unique across management domains. If the NE is not managed by the ITM-NM, then the name may be up to 20 characters in length. If the NE will be managed by the ITM-NM, then the name must be 3 to 10 characters long with the last three characters a slash and two digits. Only **A-Z**, **0-9**, _, **/**, and **-** are permitted for network elements managed by the ITM-NM. An example of an ITM-NM compatible name is LONDON/02.

NE Location

The location of the network element is given. The location may have up to 20 uppercase or lowercase characters, digits, and spaces.

Shelf Type

Indicates the shelf type. There is only one possibility per network element, and this parameter is read only. For the *WaveStar*™ ADM 16/1, the displayed value **9TAD** means the high density shelf is in use. The shelf for the *WaveStar*™ AM 1 is **AM1 Shelf**.

Slot

The slot position is given here.

Assigned Unit

The type of unit provisioned in the listed slot is shown.

State

Displays the status of the listed slot. The different slot states are
given in the table below.

Slot State	Description
Assigned	Slot is assigned.
Unassigned	Slot is unassigned.
Auto	Slot is provisioned but waiting for unit. Once the provisioned unit is present, the slot state will automatically change to *Assigned*.

Operation

When assigning units, an operation must be chosen. The choices
are detailed in the following table.

Slot State	Description
Assigned	Assigns the unit to the slot.
Unassigned	The slot is configured to be empty. The NE will not expect any unit to be present in this slot.
Auto	Automatically assigns the unit to the slot once the NE establishes the presence of a unit of the correct type. Until this time, the slot acts as unassigned.

Main Unit

The unit provisioned or to be provisioned in the selected slot.

Upper/Lower Interface

The interfaces directly associated with the displayed *Main Unit*.

Create a Node

Procedure

Follow these steps to create a network element.

1. Select **Management -> Node Creation - Parameters**.

    Result: The *Node Creation - Parameters* window appears.

2. Enter the **NE Name** and **NE Location**.

    Result: The network element name and location appear, respectively, in the fields **NE Name** and **NE Location**.

3. Using the pull-down menu select the correct **NE Type**.

4. Click **Next**.

    Result: The window *Node Creation - Provisioned Slots* appears.

5. Complete the procedure "Provision Slots."

    Important! For the *WaveStar*™ AM 1, the only slot which may be user assigned is TS2.

    Result: The slots of the NE are properly assigned.

6. Complete the procedure "Confirm the MIB".

    Result: The MIB is now confirmed, and after reestablishing the connection between the NE and the ITM-CIT, the MIB status in the window *Node Details* should be **Filled**.

7. When an association with the ITM-SC must be made make sure the network element is not in the isolated state (this is the state it is in arriving from the factory). Select **Manage- ment -> Overlay Comms Network -> DCN** to view if the network element is in the isolated state. If the net- work element is in the isolated state, this can be changed by setting the area address from 0000 to any other value.

Provisioning Slots

Purpose

Use this procedure to provision the slots of a network element.

Prerequisites

Before provisioning the network element slot configuration it is assumed that the new configuration of the NE is known. This includes the exact types of units to be provisioned and the corre- sponding slot positions for these units.

Precautions

For the *WaveStar*™ AM 1, the only slot which may be user assigned is TS2.

An assigned unit may be changed without changing the slot state. In other words, it is possible to change the unit while maintaining the status "Assigned" or "Auto."

Windows for Provisioning Slots

Windows to Use

The following windows are used in viewing slot configurations:

■ Node Creation - Provision Slots

- ■ Provisioned NE Components

- ■ Assign NE Units to Slot

When initially provisioning the node, the *Node Creation - Provision Slots* window is used in provisioning the slots.

Figure 6.   Node Creation - Provisioned Slots
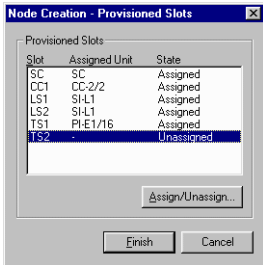
The *Provisioned NE Components* window is used in provisioning an already existing node.

Figure 7.   Provisioned NE Components
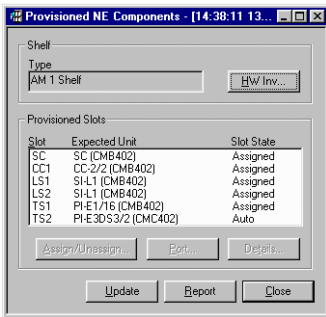
Whether creating a node or reprovisioning an existing NE, the window *Assign NE Units to Slot* is used to assign units to particular slots.

Figure 8.   Assign NE Units to Slot
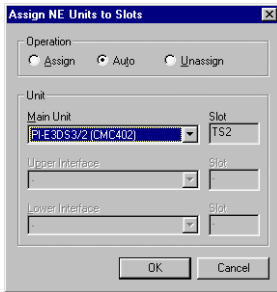
Parameters for Provisioning Slots

Shelf Type

Indicates the shelf type. This parameter is read only.

Slot

The slot position is given here.

Assigned Unit

The type of unit provisioned in the listed slot is shown.

State

Displays the status of the listed slot. The different slot states are given in the table below.

Slot State	Description
Assigned	Slot is assigned.
Unassigned	Slot is unassigned.
Auto	Slot is provisioned but waiting for unit. Once the provisioned unit is present, the slot state will automatically change to *Assigned*.

Operation

When assigning units, an operation must be chosen. The choices are detailed in the following table.

Slot State	Description
Assigned	Assigns the unit to the slot.
Unassigned	The slot is configured to be empty. The NE will not expect any unit to be present in this slot.
Auto	Automatically assigns the unit to the slot once the NE establishes the presence of a unit of the correct type. Until this time, the slot acts as unassigned.

Main Unit

The unit provisioned or to be provisioned in the selected slot.

Upper/Lower Interface

The interfaces directly associated with the displayed **`Main Unit`**.

Provision Slots

Procedure

Follow these steps to provision the slots of an NE. This includes both assigning and unassigning units.

> **Important!** For the *WaveStar*™ AM 1, the only slot which may be user assigned is TS2.

1. If provisioning units during node creation, then go to step 2. For existing NEs, select **`Provisioning -> Equipment -> Provisioned NE Components`**.

    Result: The *Provisioned NE Components* window appears.

2. Select the slot TS2 from the list in the window, and click **`Assign/Unassign`**.

    Result: The *Assign NE Units to Slot* window appears with information concerning the selected slot and its associated slots.

3. Select the desired operation from the selections at the top of the window.

    Result: The correct operation is selected.

4. If assigning units, use the pull-down menu for **`Main Unit`** and select the correct unit corresponding to the displayed slot.

    Result: The correct unit appears as the new **`Main Unit`**.

5.   Click **OK**.

   Result: The desired operation for this slot is performed, and the window *Provisioned NE Components* again appears.

   Important!   When assigning units during node creation, instead of the *Provisioned NE Components* window, the window *Node Creation - Provision Slots* will reappear.

6.   If creating a node, then click **Finish**. Otherwise, click **Close**.

   Result: The window *Provisioned NE Components* (or in the case of node creation, *Node Creation - Provision Slots*) disappears.

Confirming the MIB

Purpose

To make any provisioning changes a part of the Management Information Base (MIB).

Precautions

Performing an MIB confirm will cause the NE to reset. A new login, after waiting several minutes for the reset to take place, will have to be performed.

Confirming the MIB for an existing NE can result in traffic disruptions.

Window for Confirming the MIB

Window to use

The *Node Details* window is used to confirm an MIB.

Figure 9.   Node Details
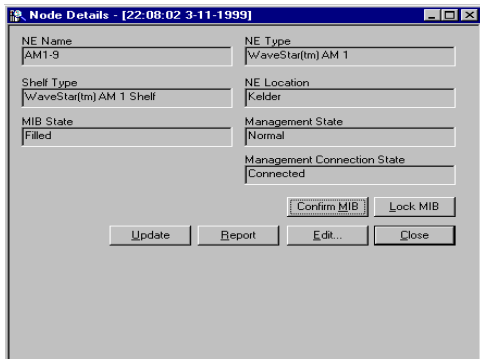
Parameters for Confirming the MIB

NE Type

The type of NE is indicated.

NE Name

The network element's name is listed. The name must be unique across management domains. If the NE is not managed by the ITM-NM, then the name may be up to 20 characters in length. If the NE will be managed by the ITM-NM, then the name must be 3 to 10 characters long with the last three characters a slash and two digits. Only **A-Z**, **0-9**, _, **/**, and **-** are permitted for network elements managed by the ITM-NM. An example of an ITM-NM compatible name is LONDON/02.

NE Location

The location of the network element is given. The location may
have up to 20 uppercase or lowercase characters, digits, and
spaces.

Shelf Type

Indicates the shelf type. This parameter is read only. The displayed
value **9TAD** means the high density shelf is in use.

MIB State

The status of the MIB is indicated. The possible values are given in
the table below.

MIB State	Description
Empty	An empty system controller (SC) has been inserted or the MIB was cleared after starting an MIB download by the management system. If the MIB State is empty, the management system can proceed with the MIB download.
Filled	The NE possesses a valid MIB, which has been confirmed.
Filled Unknown	The NE has a MIB, however, it is of unknown validity. This can occur, for instance, if one SC is replaced by another SC having a MIB.
Filled Not Confirmed	The NE has a MIB, however, it has not yet been confirmed by the ITM-CIT or ITM-SC. The procedure "Confirm the MIB" gives the steps necessary to confirm the MIB. Once confirmed the state will become **Filled**.

MIB State	Description
Waiting for Upload	This state is only possible when the NE is managed by the ITM-SC. After confirmation of the MIB, the NE performs a reset and loses its association with the ITM-SC. When the NE restarts, the MIB State becomes **Waiting for Upload**. When the ITM-SC reassociates with the NE and detects this MIB state, an MIB upload is performed, and the state will then become **Filled**.

Management State

The state of the association with the ITM-SC is displayed. The possible states are given in the following table.

Management State	Description
Normal	*Normal* will be displayed whenever management operations have been completed. In other words, the ITM-SC has completed the MIB upload, MIB download, MIB resynchronization, or reevaluation of fault status. The state can also be *Normal* when the association between the ITM-SC and the ITM-CIT has been lost.
Uploading	The ITM-SC is performing an MIB upload.
Resyncing	If the MIB of the NE and the MIB image on the ITM-SC are out of synchronization, then the ITM-SC invokes a resynchronization. The management state shows the progress of the this operation. If executed properly, it should display, in order: *Normal*, *Resyncing*, *Normal*, *ReEvaluatingFaultStatus*, *Normal*.
ReEvaluating FaultStatus	After a resynchronization, the ITM-SC initiates a reevaluate fault status operation.

Management State	Description
Downloading	A MIB download has been started by the ITM-SC. The management state is set to *Normal* during the downloading process. If the MIB download is in progress when a loss of association occurs, then the management state will remain *Downloading*.

Confirm the MIB

Procedure

Follow these steps to confirm the MIB of a network element.

1. Select **Management -> Node Details**.

   Result: The *Node Details* window appears. This window allows confirmation of a network element MIB.

2. To confirm the MIB, click **Confirm MIB**.

   Result: A confirmation window appears warning that confirming the MIB will result in a system reset and that MIB confirmation can potentially affect traffic.

⚠ **CAUTION:**
Confirming the MIB will result in an NE reset. The current login session will be terminated. Also, while overwriting the older MIB, traffic can be affected.

3. Click **Yes**.

    Result: The operation will be started. Confirming the
    MIB should take several minutes. During this time, the
    connection between the ITM-CIT and the NE will be
    lost. To reestablish this connection, a login must once
    again be performed after waiting for the operation to
    complete.

4. Login again.

5. Select **Management -> Node Details**.

    Result: The *Node Details* window appears. In this
    window, the MIB state can be viewed. It should now be
    Filled.

6. Click Close.

    Result: The *Node Details* window disappears.

Viewing NE Slot Information

Purpose

Use this procedure to view how the slots of a provisioned network
element are configured.

Windows for Viewing NE Slot Information

Windows to UseWindows to Use

The following windows are used in viewing slot configurations:

- ■ Provisioned NE Components

- ■ Provisioned NE Slot Information

The *Provisioned NE Components* window is used for viewing an overview of the units in a network element.

Figure 10.   Provisioned NE Components
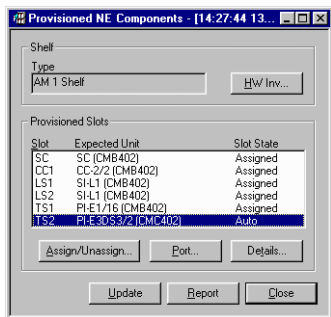
The *Provisioned NE Slot Information* window shows all relevant information for a particular slot in an NE.

Figure 11.   Provisioned NE Slot Information

Parameters for Viewing NE Slot Information

Shelf Type

Indicates the shelf type. This parameter is read only.

Slot

The slot position is given here.

Actual Unit

The unit physically present in the selected slot.

Expected Unit

The type of unit provisioned in the listed slot is shown.
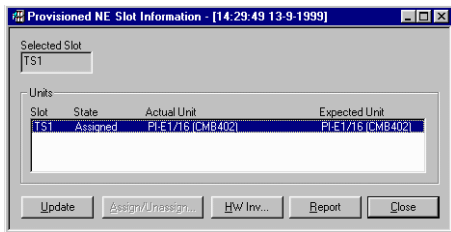
Slot State

Displays the status of the listed slot. The different slot states are given in the table below.

Slot State	Description
Assigned	Slot is assigned.
Unassigned	Slot is unassigned.
Auto	Slot is provisioned but waiting for unit. Once the provisioned unit is present, the slot state will automatically change to *Assigned*.

Protection

Equipment protection is not applicable for the *WaveStar*™ AM 1. Consequently, no information will be displayed.

Service (Protection) State

Since equipment protection is not applicable for the *WaveStar*™ AM 1 no information will be displayed.

Operation

When assigning units, an operation must be chosen. The choices are detailed in the following table.

Slot State	Description
Assigned	Assigns the unit to the slot.
Unassigned	The slot is configured to be empty. The NE will not expect any unit to be present in this slot.
Auto	Automatically assigns the unit to the slot once the NE establishes the presence of a unit of the correct type. Until this time, the slot acts as unassigned.

Selected Slot

Indicates the slot selected.

Protection Function

This field is greyed out for the *WaveStar*™ AM 1.

Function

Describes if the unit is the main unit or the upper or lower interface associated with this main unit.

View NE Slot Information

Procedure

Follow these steps to view the configuration of slots in a provisioned network element.

1. Select ***Provisioning -> Equipment -> Provi-
    sioned NE Components***.

    Result: The *Provisioned NE Components* window
    appears.

2. Select a slot from the list ***Provisioned Slots***.

3. Click **Details**.

    Result: The *Provisioned NE Slot Information* window
    appears with the information for the selected slot.

4. Click **Close**.

    Result: The *Provisioned NE Slot Information* window
    disappears.

5. Click **Close**.

    Result: The *Provisioned NE Components* window
    disappears.

Viewing Hardware Inventory

Purpose

Viewing the hardware inventory allows the user to see all provi-
sioned NE components, along with all of the units' relevant numeric
codes.

Windows for Viewing Hardware Inventory

Windows to Use

The following windows are used in viewing hardware inventory for
the shelf or the slots.

■   Provisioned NE Components

■   Provisioned NE Slot Information

■   Provisioned NE Hardware Inventory

From the window *Provisioned NE Components*, the hardware infor-
mation for the shelf can be accessed.

Figure 12.   Provisioned NE Components
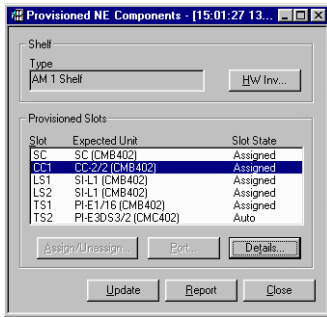
The window *Provisioned NE Slot Information* shows provisioning
information for the selected slot.

Figure 13.   Provisioned NE Slot Information
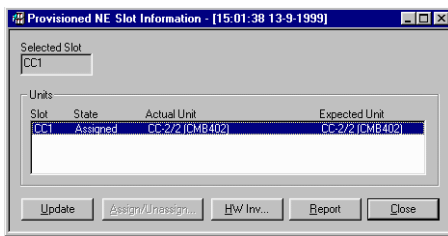
The *Provisioned NE Hardware Inventory* window is used to view the hardware inventory for either the shelf or the selected slot.

Figure 14.   Provisioned NE Hardware Inventory

Figure 15.   Provisioned Hardware Inventory (shelf)
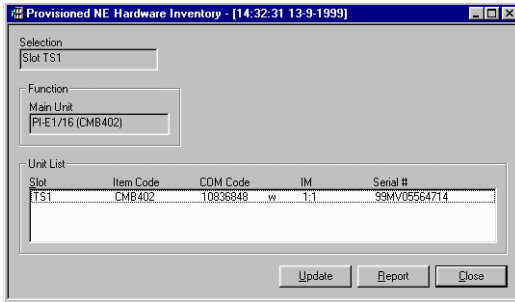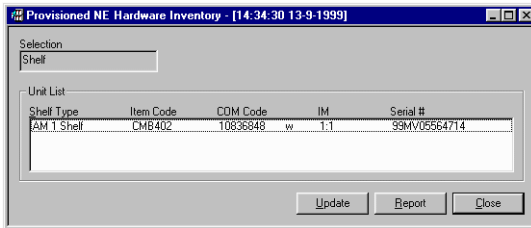

Parameters for Viewing Hardware Inventory

Shelf Type

Displays the shelf type. Only displayed when viewing hardware information for a shelf.

Slot

The slot position is given here. Only displayed when viewing hardware information for a slot.

Main Unit

The unit located in the selected slot. Only displayed when viewing hardware information for a slot.

Upper/Lower Interface

Displays the interfaces directly associated with the **Main Unit**. Only displayed when viewing hardware information for a slot.

Item Code

The special alphanumeric code associated with the desired unit.

Comcode

The nine character identifier for the hardware component selected.

IM

Indicates the interchangeability marker. This is a code indicating the ability of a component to function in the place of another, different type of component.

Serial

Shows the serial number of the displayed component.

View Hardware Inventory - Shelf

Procedure

Follow these steps to view the hardware inventory for the shelf of an NE.

1. To view details concerning the shelf, select ***Provision-
    ing -> Equipment -> Provisioned NE Compo-
    nents***.

    Result: The *Provisioned NE Components* window
    appears.

2. Click **HW Inv**.

    Result: The *Provisioned NE Hardware Inventory*
    window appears with relevant information concerning
    the shelf.

3. Click **Close**.

    Result: The *Provisioned NE Hardware Inventory*
    window disappears.

4. Click **Close**.

    Result: The *Provisioned NE Components* window
    disappears.

View Hardware Inventory - Slot

Procedure

Follow these steps to view the hardware inventory for an NE sub-
rack slot.

1. To view hardware details concerning a slot, select ***Provi-
    sioning -> Equipment -> Provisioned NE
    Components***.

    Result: The *Provisioned NE Components* window
    appears.

2. Select a slot from the list ***Provisioned Slots***.

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3. Click **Details**.

   Result: The *Provisioned NE Slot Information* window appears with the information for the selected slot.

4. Click **HW Inv**.

   Result: The *Provisioned NE Hardware Inventory* window appears with relevant information concerning this slot.

5. Click **Close**.

   Result: The *Provisioned NE Hardware Inventory* window disappears.

6. Click **Close**.

   Result: The *Provisioned NE Components* window disappears.

Viewing and Editing Node Details

Purpose

This procedure allows the node details to be viewed, and one element, namely the node location, to be edited.

Prerequisites

Before editing node details, be certain to have the new location for the NE.

Precautions

Only one parameter, the location, can be changed by the user. To change other node details, the MIB must be discarded and a new node created.

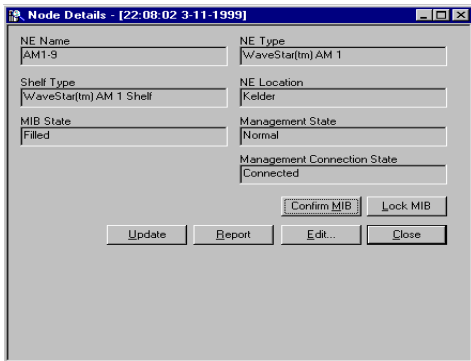## Windows for Viewing and Editing Node Details

Windows to Use

The following windows are used in viewing editing the node details.
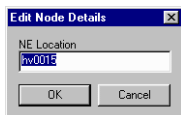
- Node Details
- Edit Node Details

The *Node Details* window is used to view the general information for the network element.

Figure 16. Node Details

The *Edit Node Details* window is used to change the location of the NE.

Figure 17.   Edit Node Details

Parameters for Viewing and Editing Node Details

NE Type

The type of NE is indicated.

NE Name

The network element's name is listed. The name must be unique across management domains. If the NE is not managed by the ITM-NM, then the name may be up to 20 characters in length. If the NE will be managed by the ITM-NM, then the name must be 3 to 10 characters long with the last three characters a slash and two digits. Only *A-Z*, *0-9*, _, /, and - are permitted for network elements managed by the ITM-NM. An example of an ITM-NM compatible name is LONDON/02.

NE Location

The location of the network element is given. The location may have up to 20 uppercase or lowercase characters, digits, and spaces.

Shelf Type

Indicates the shelf type. This parameter is read only. The displayed value *9TAD* means the high density shelf is in use.

MIB State

The status of the MIB is indicated. The possible values are given in the table below.

MIB State	Description
Empty	An empty system controller (SC) has been inserted or the MIB was cleared after starting an MIB download by the management system. If the MIB State is empty, the management system can proceed with the MIB download.
Filled	The NE possesses a valid MIB, which has been confirmed.
Filled Unknown	The NE has a MIB, however, it is of unknown validity. This can occur, for instance, if one SC is replaced by another SC having a MIB.
Filled Not Confirmed	The NE has a MIB, however, it has not yet been confirmed by the ITM-CIT or ITM-SC. The procedure "Confirm the MIB" gives the steps necessary to confirm the MIB. Once confirmed the state will become *Filled*.
Waiting for Upload	This state is only possible when the NE is managed by the ITM-SC. After confirmation of the MIB, the NE performs a reset and loses its association with the ITM-SC. When the NE restarts, the MIB State becomes *Waiting for Upload*. When the ITM-SC reassociates with the NE and detects this MIB state, an MIB upload is performed, and the state will then become *Filled*.

Management State

The state of the association with the ITM-SC is displayed. The possible states are given in the following table.

Management State	Description
Normal	**Normal** will be displayed whenever management operations have been completed. In other words, the ITM-SC has completed the MIB upload, MIB download, MIB resynchronization, or reevaluation of fault status. The state can also be **Normal** when the association between the ITM-SC and the ITM-CIT has been lost.
Uploading	The ITM-SC is performing an MIB upload.
Resyncing	If the MIB of the NE and the MIB image on the ITM-SC are out of synchronization, then the ITM-SC invokes a resynchronization. The management state shows the progress of the this operation. If executed properly, it should display, in order: **Normal**, **Resyncing**, **Normal**, **ReEvaluatingFaultStatus**, **Normal**.
ReEvaluating FaultStatus	After a resynchronization, the ITM-SC initiates a reevaluate fault status operation.

Management State	Description
Downloading	A MIB download has been started by the ITM-SC. The management state is set to **Normal** during the downloading process. If the MIB download is in progress when a loss of association occurs, then the management state will remain **Downloading**.

View and Edit Node Details

Procedure

Follow these steps to change the location of the NE.

1. Select **Management -> Node Details**.

    Result: The *Node Details* window appears.

2. To change the **NE Location**, continue with step 3. Otherwise, go to step 6.

3. Click **Edit**.

    Result: The *Edit Node Details* window appears.

4. Enter the new **NE Location**.

    Result: The correct location now appears in the area provided.

5. Click **OK**.

    Result: The new **NE Location** is entered, and the window *Edit Node Details* disappears.

6.   Click **Close**.

Result: The *Node Details* window disappears.

Viewing and Editing MDI Information

Purpose

Use this procedure to view and edit MDI names and statuses.

Prerequisites

The WaveStar™ AM 1 contains 4 MDIs.

Also, the miscellaneous discrete input must be connected to the NE.

Precautions

The following precautions should be noted.

-   The MDI name can be no longer than 26 characters.

-   There are four MDIs that may be provisioned for an NE.

-   The user should select names for the Miscellaneous Discrete Inputs that are both well-chosen and unique.

Windows for Viewing and Editing MDI Information

Windows to Use

Use the following windows to view and edit MDI information:

-   Provisioned MDI
-   Edit Provisioned MDI

Use the *Provisioned MDI* window to view MDI information.

Figure 18.   Provisioned MDI

Use the *Edit Provisioned MDI* windows to edit MDI information.

Figure 19.   Edit Provisioned MDI

Parameters for Viewing and Editing MDI Information

Id

The number associated with the MDI.

Name

Indicates the name of the MDI.

View and Edit MDI Information

Procedure

Follow these steps to view and edit MDI names.

1. Select **`Provisioning -> Equipment -> MDI`**.

   Result: The *Provisioned MDI* window appears.

2. Select an MDI from the list under **`ID`** and **`Name`**.

   Result: The appropriate MDI is selected.

3. Click **`Edit`**.

   Result: The *Edit Provisioned MDI* window is displayed. The current name of the selected MDI is displayed on the name line of this window.

4. Enter the **`Name`** (max. 26 characters).

5. Click **`OK`**.

   Result: The new MDI name is entered and the *Edit Provisioned MDI* window is closed.

6. Click **`Close`**.

   Result: The *Provisioned MDI* window disappears.

Viewing and Editing MDO Information

Purpose

Use this procedure to view and edit MDO names and statuses.

Prerequisites

The WaveStar™ AM 1 contains 4 MDOs.

The miscellaneous discrete output must be connected to the NE.

Precautions

This procedure is only applicable for the *WaveStar*™ AM 1.

The following precautions should be noted.

■ The MDO name can be no longer than 26 characters.

■ The user should select names for the Miscellaneous Discrete Outputs that are both well-chosen and unique.

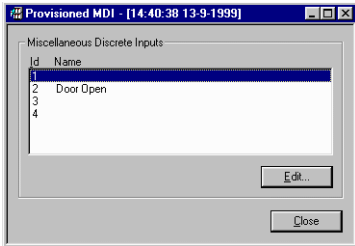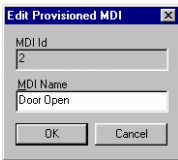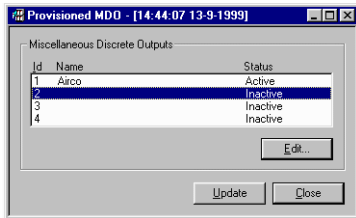## Windows for Viewing and Editing MDO Information

Windows to Use

The following windows are used to view and edit the MDO information.

■ Provisioned MDO

■ Edit Provisioned MDO

Use the *Provisioned MDO* window to view the MDO information.

Figure 20.   Provisioned MDO

Use the *Edit Provisioned MDO* window to edit the MDO information.

Figure 21.   Edit Provisioned MDO

Parameters for Viewing and Editing MDO Information

Id

The number associated with the MDO.

Name

Indicates the name of the MDO.

Status

Indicates the status of the MDO. The possible values are `Active` and `Inactive`.

View and Edit MDO Information

Procedure

Follow these steps to view and edit MDO names and statuses.

1.   Select `Provisioning -> Equipment -> MDO`.

   Result: The *Provisioned MDO* window appears.

2. Select an MDO from the list under **ID** and **Name**.

    Result: The appropriate MDO is selected.

3. Click **Edit**.

    Result: The *Edit Provisioned MDO* window is displayed. The current name of the selected MDO is displayed on the name line of this window.

4. Enter or change the **Name** (max. 26 characters).

5. Set the **Status** of the MDO to **Active** (closed loop) or **Inactive** (open loop).

    Result: The field **Status** is defined.

6. Click **OK**.

    Result: The new MDO name is entered, and the *Edit Provisioned MDO* window is closed.

7. Click **Close**.

    Result: The *Provisioned MDO* window disappears.

Transmission Provisioning

Intended use

This subsection describes setting up traffic on VC-3 and/or VC-12 level in a network with *WaveStar*™ AM 1 network elements.

The following tasks can be performed:

Task	Purpose
Provision *Cross Connections*	set up the transmission path.
Provision *TUG Structure*	enables making cross connections on VC-12 or VC-3 level.
Port Provisioning	configures testing and monitoring of physical input/output signals.
Provision *Termination Points*	configures testing and monitoring of signals at the logical ports.
Path Trace Provisioning	test the established path.
Provision *Signal Degrade Thresholds*	define the values at which the signal is considered of degraded quality.

Provision Cross Connections

Purpose

To provide traffic over the network, cross connections must be provisioned in the network elements. With the *WaveStar*™ AM 1, the cross connection settings can be modified if the traffic demand changes. The following changes can be made:

■ Add a cross connection

■ Modify an existing cross connection

■ Delete a cross connection.

Prerequisites

Before *adding* a cross connection and, if desired, its protection be sure to have information regarding the design of the transmission path.

Before *deleting* a cross connection and/or its protection be sure to have information regarding the soon to-be-removed cross connection. For instance:

■ Does the cross connection to be removed still carry traffic?

■ Is the cross connection protected?

Precautions

When provisioning an SNC protected cross connection, the **From** and **Protection** termination points should be associated with the line ports. The **To** termination point should be associated with a connection point of a tributary port.

Precautions for *deleting* cross connections or *removing* their protection are:

■ Deleting or changing a cross connection may be traffic affecting.

■ Removing the protection of the cross connection degrades the transmission path. The transmission path is no longer protected. A failure in the signal results in loss of traffic.

Parameters for Provisioning Cross Connections

Introduction

With the *WaveStar*™ AM 1 cross connections can be added, modified, or deleted. The parameters listed here are used to make these changes.

Capacity

The capacity of the cross connection: This can be VC-3 or VC-12.

Cross Connection Type

The following types of cross connections are possible:

■ **Standard**: an unprotected cross connection
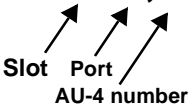
■ **SNC**: a cross connection with SNC protection.

Termination Points (TP)

The cross connections are made between termination points. The **From**, **To**, and **Protection** columns are used to select these termination points. The **Protection** area is greyed out if **Standard** is selected as **Cross Connection Type**.

■ For unprotected cross connections it makes no difference which TP is selected in the **From** and which TP is selected in the **To** list.

■ For protected cross connections the tributary TP must always be in the **To** area. The TP used for protection is always selected in the **Protection** area.

The termination point is selected by the **`Slot`** and **`Port`** where the termination point belongs to. The **`AU4#`** is always 1 because the line ports carry a single STM-1 signal.

Example: **LP1.1,1**

Slot   **Port**
AU-4 number

Fixed

The cross connection is fixed by the network element hardware. These cross connections can not be modified.

Directionality

For the *WaveStar*™ AM 1 the Directionality is always **`Bi`**, since only bidirectional cross connections can be made.

Windows for Cross Connection Information and Selection

Introduction

The following windows are used for selecting and displaying cross connections:

- ■ the *Cross Connection Filter* window is used to select the filter criteria for the cross connections.

- ■ the *Cross Connection List* window is used to list the cross connections selected by the filter criteria.

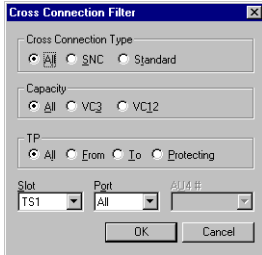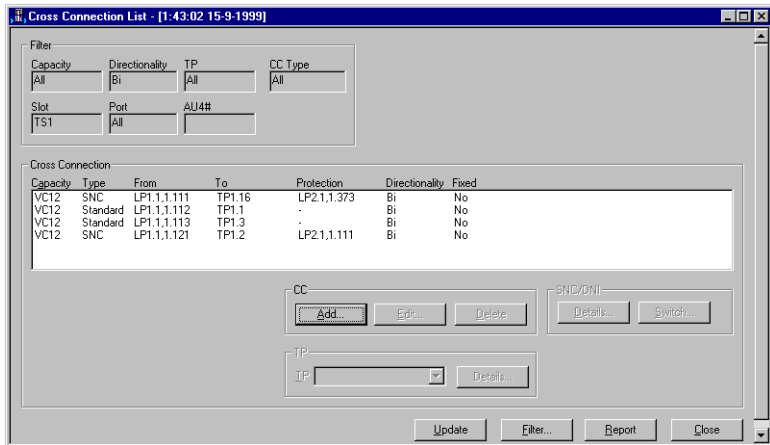**Figure 22.   Cross Connection Filter**

Figure 23.   Cross Connection List

Windows for Provisioning Cross Connections

Introduction

These windows can be used by the *WaveStar*™ AM 1 network elements.

■ the *Add Cross Connection* window is used to add new cross connections

■ the *Edit Cross Connections* window is used to modify protection on existing cross connections
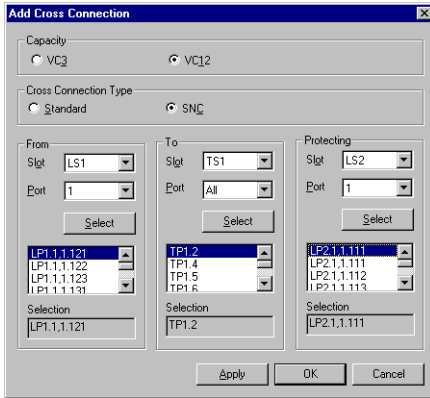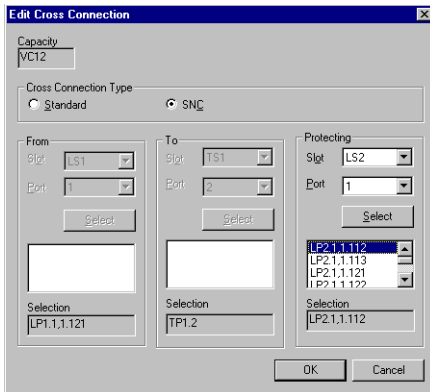
Figure 24.   Add Cross Connections

Figure 25.   Edit Cross Connections

Procedure to Add Cross Connections

Procedure

Use the following procedure to add a cross connection in the *Wave-Star*™ AM 1 network element.

1. To make a cross connection first determine the following:

    ■   What is the capacity of the cross connection? VC-12 or VC-3?

    ■   Is the TUG Structure provisioned in such a way that the capacity can be selected? The procedure to check and change the TUG Structure is described in the section "Provision TUG Structure."

    ■   Does the cross connection require SNC protection or is it unprotected (Standard)?

    ■   Between which termination points (TP) is the cross connection made and which termination point is used for the SNC protection path.

2. Select **Provisioning -> Transport -> Cross Connection**.

    Result: The *Cross Connection Filter* window and the *Cross Connection Selection List* window appear at the same time.

3. Select the filter criteria in the *Cross Connection Filter* window and select **OK**.

    Result: All available cross connections that meet the selected filter criteria are listed in the *Cross Connection Selection List* window. The filter criteria are displayed in the **filter** area.

4. Select **Add** in the **CC** area.

    Result: The *Add Cross Connection* window appears.

5. Select the **Capacity** and **Cross Connection Type.**
    Select the **Slot** and **Port** and click **select** for each ter-
    mination point in the **From**, **To** and **Protection** fields.

    ■   For unprotected cross connections it makes no differ-
        ence which TP is selected in the **From** and which TP
        is selected in the **To** list.

    ■   For protected cross connections the tributary TP must
        always be in the **To** area. The TP used for protection
        is always selected in the **Protection** area.

    Result: A list of available termination points appears for
    each termination point.

If not all available termination points appear check if the TUG struc-
ture is provisioned to make the cross connections on the desired
level. Change the TUG Structure if necessary. The procedure to
change the TUG Structure is described in the section "Provision
TUG structure."

6. Select one TP in each field and select **Apply**. Select **OK** if
    no other cross connections are to be made.

    Result: The TPs appear in the Selection boxes. The
    cross connection between the selected TPs is made. If
    OK was selected the *Add Cross Connection* window
    closes and the new cross connections appear in the list
    of the *Cross Connection List* window.

Procedure to Modify Existing Cross Connections

Introduction

Use the following procedure to modify protection for an existing cross connection in the *WaveStar*™ AM 1 network element.

1. To modify an existing cross connection, first determine the following points about the cross connection to be modified and determine what must be changed.

    ■   Does the cross connection require SNC protection or is it unprotected (Standard)?

    ■   Between which termination points (TP) is the cross connection made and which termination point is used for the SNC protection path.

2. Select **Provisioning -> Transport -> Cross Connection**.

    Result: The *Cross Connection Filter* window appears.

3. Select the filter criteria and select **OK**.

    Result: The *Cross Connection Selection List* window appears with all available cross connections that meet the selected filter criteria. The filter criteria are displayed in the **filter** area of the *Cross Connection Selection List* window.

4. Select the cross connection to be modified from the list and select **Edit** in the **CC** area.

    Result: The *Edit Cross Connection* window appears. All fields are filled in according to the selected cross connection.

5. Change, if necessary, the **`Cross Connection Type`** and select the **`Slot`**, **`Port`**, and **`AU4#`** . Click **`Select`** for each termination point in the **`From`**, **`To`**, and **`Protection`** fields.

    ■   For unprotected cross connections it makes no difference which TP is selected in the **`From`** and which TP is selected in the **`To`** list.

    ■   For protected cross connections the tributary TP must always be in the **`To`** area. The TP used for protection is always selected in the **`Protection`** area.

    Result: A list of available termination points appears, including the termination points of the selected cross connection.

6. Select one TP in each field and select **`OK`**.

    Result: The TPs appear in the Selection boxes. The cross connection between the selected TPs is made. The *Edit Cross Connection* window closes and the modified cross connection appears in the list of the *Cross Connection List* window.

Procedure to Delete an Existing Cross Connection

Introduction

Use the following procedure to delete an existing cross connection in the *WaveStar*™ AM 1 network element.

1. Select **`Provisioning -> Transport -> Cross Connection`**.

    Result: The *Cross Connection Filter* window appears.

2. Select the filter criteria and select **OK**.

    Result: The *Cross Connection Selection List* window appears with all available cross connections that meet the selected filter criteria. The filter criteria are displayed in the **filter** area of the *Cross Connection Selection List* window.

3. Select the cross connection to be deleted from the list and select **Delete** in the **CC** area.

    Result: A confirmation window appears.

4. Click **Yes** to confirm the removal of the cross connection.

    Result: The cross connection is removed. The cross connection disappears from the list in the *Cross Connection List* window.

Provision TUG Structure

Purpose

The purpose of checking or changing the TUG structure of a VC-4 signal is to make it possible to create a path of a certain capacity (for example VC-3 or VC-12 capacity).

Prerequisites

The TUG Structure can only be changed if the changing part is not involved in a cross connection.

For the *WaveStar*™ AM 1 the TUG structure can only be provisioned in the VC-4 termination points of the line ports. The default setting is all TU-12s. Therefore it makes sense to change the TUG structure to TU-3s if 34 Mbit/s units are provisioned.

Parameters for Provisioning TUG Structure

Introduction

The *WaveStar*™ AM 1 can have 2 Mbit/s and 34 Mbit/s ports. Therefore cross connections can be made at VC-3 or VC-12 level. The default setting of the TUG structure is all TU-12s. If the *Wave-Star*™ AM 1 does not have any 34 Mbit/s ports it makes no sense to change the TUG structure. The *WaveStar*™ AM 1 can not cross connect unstructured VC-4s, therefor it is not possible to uncheck the TUG Structured TP box.

Usage

Each VC-12 or VC-3 involved in a cross connection is displayed as a filled box. **Source** and **Sink** always have the same TUG structures. The filling of the boxes may be different.

■ **Source**: The TUG structure of the VC-4 signal in the source direction of the selected TP.

■ **Sink**: The TUG structure of the VC-4 signal in the sink direction of the selected TP. TUG2

TUG Structured TP

If the box is checked the VC-4 is substructured and can be divided into TU-12s and/or TU-3s. If the box is not checked the VC-4 is unstructured.

TUG3

For each TUG-3 there is a box. If the box is checked the TUG-3 is substructured into 7 TUG-3s and each TUG-2 is substructured into 3 TU-12s

TUG2

Each checked TUG2 box represents a TUG-2 substructured into 3 TU-12s. This part can not be edited, only by changing the above TUG-3 box.

TU3 Only

Defines a substructure of only TU-3s

Full TU12

Defines a substructure of only TU-12s

Windows for Provisioning the TUG Structure

Windows To Use

The following windows are used to provision the TUG Structure:

- the *Termination Point Filter* window is used to select the filter criteria for the termination point list.

- the *Termination Point List* window is used to select the termination point.

- the *TUG Structure and Usage* window displays the TUG structure of the selected VC-4.

- the *Edit TUG Structure* window is used to modify the TUG structure of the selected VC-4.
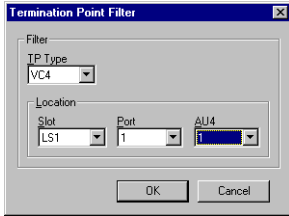
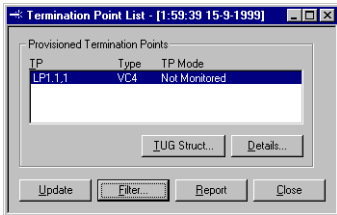**Figure 26.   Termination Point Filter**

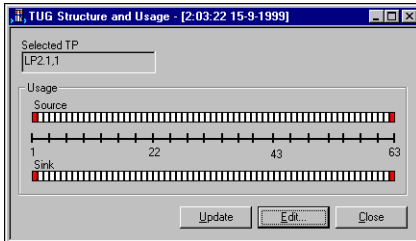**Figure 27.   Termination Point List**

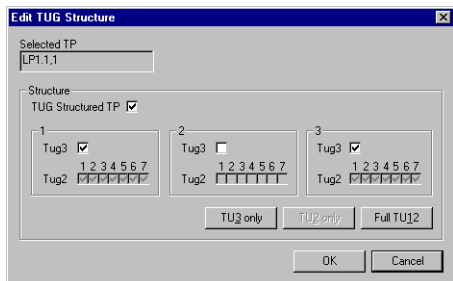**Figure 28.   TUG Structure and Usage**

Figure 29.   Edit TUG Structure

Procedure for Provisioning the TUG Structure

Introduction

The *WaveStar*™ AM 1 can have 2 Mbit/s and 34 Mbit/s ports. Therefor cross connections can be made at VC-3 or VC-12 level. The default setting of the TUG structure is all TU-12s. If the *Wave-Star*™ AM 1 does not have any 34 Mbit/s ports it makes no sense to change the TUG structure. The *WaveStar*™ AM 1 can not cross connect unstructured VC-4s, therefor it is not possible to uncheck the TUG Structured TP box.

1. Select **Provisioning -> Transport -> Termination Point**.

   Result: The *Termination Point Filter* window and the *Termination Point List* window appear at the same time.

2. Fill in VC-4 in the **TP Type** box. Fill in LS1 or LS2 in the **slot** area and 1 in the **port** and **AU4** area. Click **OK**.

   Result: The *Termination Point List* window shows lists the selected termination point.

3. Select the termination point and click **TUG Struct**.

    Result: The *TUG Structure and Usage* window appears
    and displays the TUG structure of the selected
    termination point

4. Click **Edit**.

    Result: The *Edit TUG Structure* window appears.

5. Change the TUG structure by clicking the check boxes or by
    clicking **TU3 only** or **Full TU12**. Click *OK*.

    Result: The modified TUG structure is displayed in the
    TUG Structure and Usage window.

Port Provisioning

Purpose

The purpose of port provisioning is to get an overview of all the
physical ports of the network element and to change the settings of
these ports. The provisioning of timing ports is described in the
chapter "Provisioning Timing" of this guide.

Prerequisites

Before starting to modify NE ports it is assumed that:

■   information about which port on which unit needs to be mod-
    ified is available

■   There is no traffic on the ports that you want to test with a
    loopback.

Precautions

Take care that loopbacks are disabled for normal operations. No normal traffic is possible when a loopback (inloop/outloop) is enabled.

Parameters for Port Provisioning

Introduction

For each port type there is a special window to provision the ports. The *WaveStar*™ AM 1 has two STM-1 line ports and 16 2Mbit/s ports on the first tributary unit. If a second tributary unit is installed this can have 16 additional 2Mbit/s ports or 2 34Mbit/s ports.

The following table shows for which port types the parameters are valid.

Parameters	2 Mbit/s	34 Mbit/s	STM-1
Physical Interface Type	-	-	x
Port Mode	x	x	x
Port Mode Time	x	x	x
Loopback State	x	-	-
Degraded Signal Threshold	-	-	x

Port

The name of the physical ports consist of two parts separated by a dot. The first part is related to the slot name, the second part is the port number within that slot.

 Example: LP2.1, TP5.3

Type

The **Type** indicates the type of signal for which the port is an interface point.

 Example: 2 Mbit/s, 34 Mbit/s, STM-1.

Physical Interface Type

STM-1 ports can be **Optical** or **Electrical**.

Port Mode

The **Port Mode** controls whether input signals should be monitored or not. The following values can be set.

Value	Description
Monitored	The port is configured to provide service and the port signal is monitored.
Auto	The port is configured not to provide service yet. Use this mode when the signal source in the remote NE is not operational yet. As soon as the NE establishes the continuous presence of a fault-free signal for a certain period (**Port Mode Time**), the port automatically changes to **Monitored**.
Not Monitored	The port is configured not to monitor the port signal on the port. No alarms are generated for this port. If there still is a signal present on the not monitored port it is possible to receive a **Not Expected Input Signal (NES)** alarm. The alarm status of **NES** must then be provisioned **Reported**.

Port Mode Time

The time in minutes during which a fault-free signal must be received continuously before the **Port Mode** switches from **Auto** to **Monitored**.. The default is 10 minutes.

The **Port Mode Time** can be set from 0-30 minutes and the default is 10 minutes.

Loopback State

Loopbacks are used to test the physical ports.

- **No Loop** is set for normal use of the physical port. The port is not looped back for testing

- An **Inloop** is a loopback that routes an input signal, received at the physical port, directly back to its corresponding output without altering the signal format. The inloop can be used to test the connectors. Only one inloop can be provisioned at the same time.

Degraded SIgnal Threshold

Indicates the number of errors (EB: Errored Blocks) that can occur during the given period. If this number is exceeded and the **Port Mode** is set to **Monitored**, a signal degrade alarm is generated. A choice can be made between 2 thresholds. The section "Provision Degraded Signal Thresholds" describes the setting of these thresholds.

Windows for Port Information and Port Selection

Windows To Use

The following windows are used to select the correct port and to get information about the ports of a certain slot or of the network element.

■   The *Provisioned NE Port filter* window is used to filter which
    ports are listed.

■   The *Provisioned NE Port Information List* window gives a list
    of all ports selected in the *Provisioned NE Port filter* window.
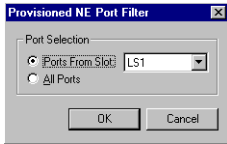
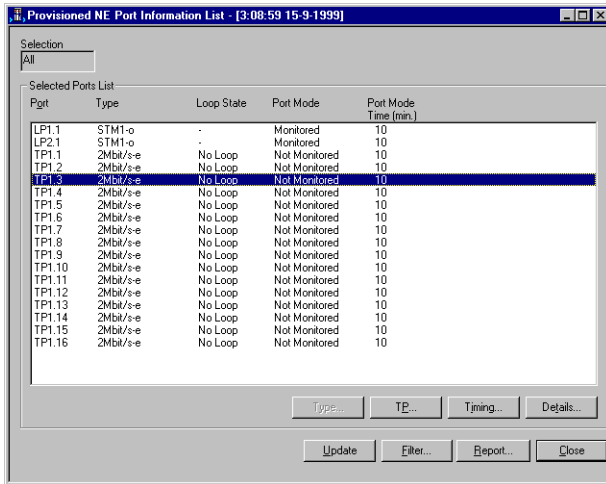**Figure 30.   Provisioned NE Port Filter**

Figure 31.   Provisioned NE Port Information List

Windows for Provisioning 2 Mbit/s Ports

Windows To Use

The following windows are used to provision a 2 Mbit/s port:

- the *2 Mbit/s Port Information* window

- the *Edit 2 Mbit/s Port Information* window
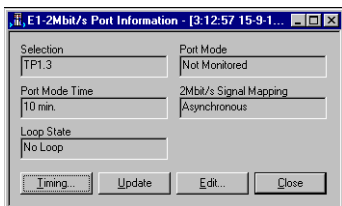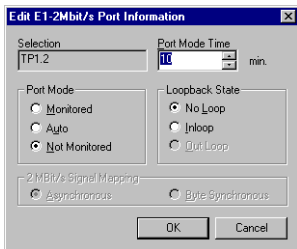
Figure 32.   2 Mbit/s Port Information

Figure 33.   Edit 2 Mbit/s Port Information

Windows for Provisioning 34 Mbit/s Ports

Windows To Use

The following windows are used to provision a 34 Mbit/s port for the *WaveStar*™ AM 1:

■   the *34 Mbit/s Port Information* window

■   the *Edit 34 Mbit/s Port Information* window
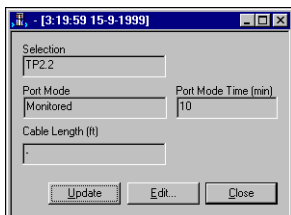
Figure 34.   34 Mbit/s Port Information
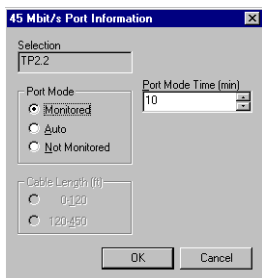

Figure 35.   Edit 34 Mbit/s Port Information

Windows for Provisioning STM-1 Ports

Windows To Use

The following windows are used to provision a STM-1 port:

■   the *STM-1 Port Information* window

■   the *Edit STM-1Port Information* window
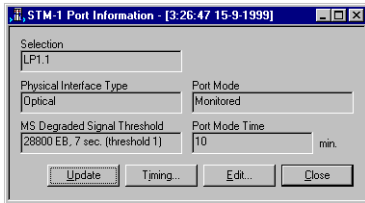
Figure 36.   STM-1 Port Information

Figure 37.   Edit STM-1 Port Information
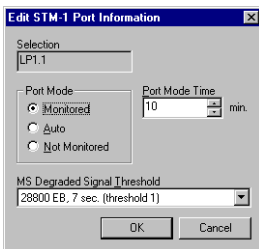
Procedure for Port Provisioning

Introduction

The following procedure describes how a port can be provisioned. Each port type has a different window, but the procedure is the same for all port types.

1. Select **Provisioning -> Transport -> Ports.** The *Provisioned NE Port Selection* is displayed. Chose:

    ■   **All Ports** to list all available ports

    ■   **Ports from Slot** to restrict the amount of data to be uploaded from the NE. Only the available ports from the selected slot are listed.

2. Click **OK**.

    Result: The *Provisioned NE Port Information List*
    window appears with a list of ports.

3. Select one of the ports in the *Provisioned NE Port Informa-
    tion List* window and click **details**.

    Result: Depending on the **Type** of the selected port, a
    Port Information window appears. There is a separate
    Port Information window for each type of port

4. Click **edit** and the *Edit Port Information* window appears.
    There is also a separate *Edit Port Information* window for
    each type of port. Change the port parameters and click **OK**.

    Result: The edit window closes and the information
    window appears with the new information.

Provisioning Termination Points

Purpose

The termination points enable the user to set or view parameters
derived from data stored in the overhead bytes of the signals.

Precautions

If the Trace Identifier Mismatch detection (TIM) is enabled, traffic
will be lost when a mistake in the trace string is made. Upon mis-
match Alarm Indication Signal (AIS) is inserted in the downstream
signal and Remote Defect Indicator (RDI) is inserted in the
upstream signal.

Parameters for Provisioning Termination Points

Introduction

The following Termination Points can be provisioned:

■   *WaveStar*™ AM 1: VC-12, VC-3, VC-4, TU-12, TU-3 and AU-4.
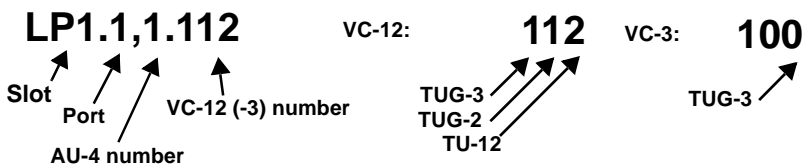
Selected TP

The name of the selected termination point.

The termination point is selected by the **Slot** and **Port** where the termination point belongs to. The **AU4#** is always 1 because the line ports carry STM-1 signals.

The name of the termination points consist of the physical port name (slot name and port number) followed by the AU-4 number and for low order signals, the VC number (VC-12 or VC-3). The VC number consists of:

■   the number of the TUG-3 inside the VC-4

■   the number of the TUG-2 inside the TUG-3

■   the TU-12 number inside the TUG-2.

Example:

LP1.1,1.112   VC-12:   **112**   VC-3:   **100**

Slot
Port   VC-12 (-3) number   TUG-3
                                          TUG-2   TUG-3
AU-4 number   TU-12

TP Type

The termination point type indicates where the signal is terminated.

Example: VC-12, VC-3, TU-3, AU-4

TP Mode

Indicates whether the signal on the termination point will be monitored.

When **Monitored** alarms are generated related to the selected termination point. When **Not Monitored** no alarms are generated for the selected termination point.

J0/J1/J2 Trail Trace Identifier

This area is used to provision a path trace. Provisioning a path trace is described in the section "Path Trace Provisioning."

Signal Label

The signal label is part of the path overhead of a VC-n signal and indicates what type of signal is carried by the container.

 Example: Unequipped, asynchronous, TUG structure, ATM

- **Signal Label Accepted (HEX., Description)** is the signal label of the received signal

- **Signal Label Transmit (HEX., Description)** is the signal label of the transmitted signal

Windows for Provisioning Termination Points

Windows To Use

The following windows are used to provision termination points:

- the *Termination Point Filter* window is used to select the termination point type and location

- the *Termination Point List* window is used to select the termination point

- ■ the *Provisioned Termination point Information* window is used to display the information of a termination point

- ■ the *Edit Provisioned Termination point Information* window is used to edit the termination point information.
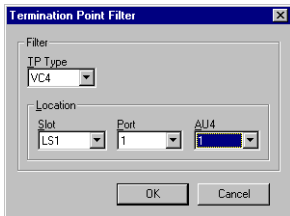
Figure 38.   Termination Point Filter
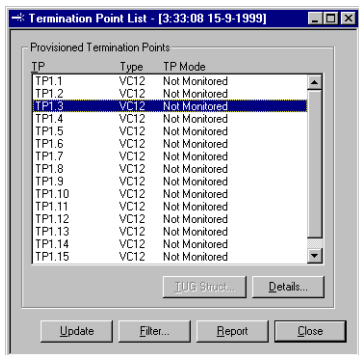

Figure 39.   Termination Point List

Figure 40.   Provisioned Termination Point Information
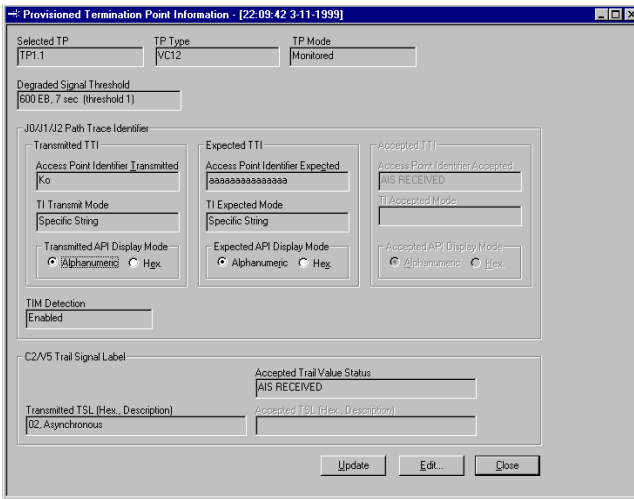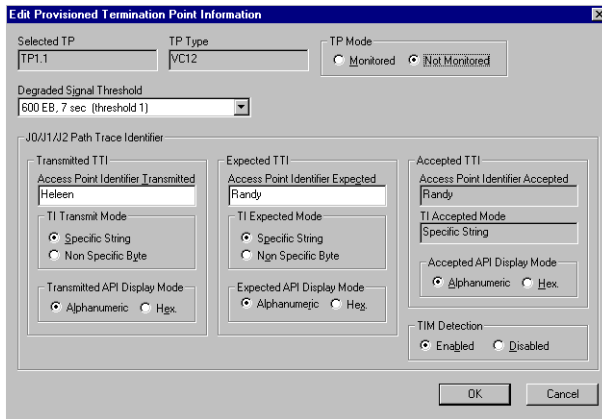

Figure 41.   Edit Provisioned Termination Point Information

Procedure for Provisioning Termination Points

Procedure

Follow this procedure to provision termination points. The following termination point types can be provisioned:

■ *WaveStar*™ AM 1: VC-12, VC-3, VC-4, TU-12, TU-3 and AU-4.

1. Select **Provisioning -> Transport -> Termination Point**.

    Result: The *Termination Point Filter* window appears.

2. Select the type of the termination point to be provisioned and fill in its location. Click **OK**.

    Result: The *Termination Point List* window appears with a list of termination points.

3. Select the termination point from the list and click **Details**.

    Result: The *Provisioned Termination Point Information* window appears with information about the selected termination point.

4. Click **Edit**.

    Result: The *Edit Provisioned Termination Point Information* window appears.

5. Fill in the changes and click **OK**.

    Result: The changes are displayed in the *Provisioned Termination Point Information* window.

Path Trace Provisioning

Purpose

The purpose of provisioning a path trace is to make sure the traffic is not delivered to the wrong destination.

Prerequisites

Before provisioning a path trace determine the following:

- In which termination point is the path trace inserted and in which termination points is it monitored?
- Which label is used as path trace?

Precautions

If the Trace Identifier Mismatch (TIM) detection is enabled, traffic will be lost when a mistake in the trace string is made. Upon mismatch, an Alarm Indication Signal (AIS) is inserted in the downstream signal and Remote Defect Indicator (RDI) is inserted in the upstream signal

Parameters for Path Trace Provisioning

Introduction

To make sure the traffic is not delivered to the wrong destination, a path trace can be set. A label (TTI), for example a word, is inserted in the path overhead. To check if the path is correctly provisioned, the received path trace is compared with the expected value. For the *WaveStar*™ AM 1 a path trace can be set on the VC-12, VC-3 and VC-4 signals.

Figure 42.   Example of a Path Trace

Accepted TTI = Expected TTI: Path is correct
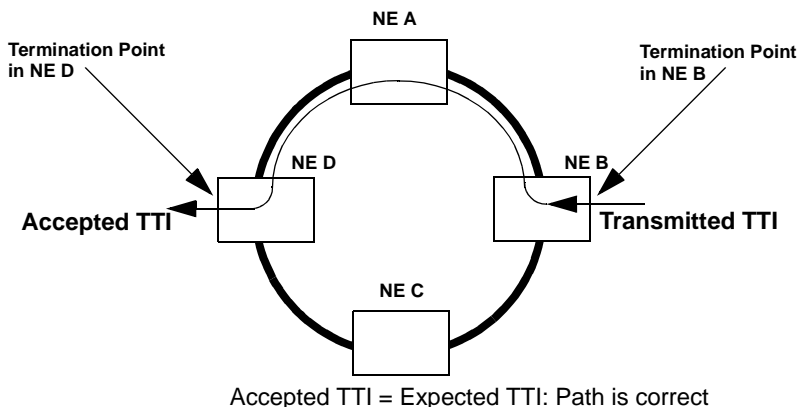
J0/J1/J2 Trail Trace Identifier

The Trail Trace Identifier (TTI) is inserted in the path overhead. For STM-N signals the J0 byte in the RSOH is used, for VC-4/VC-3 signals byte J1 is used and for VC-12 signals byte J2 is used. For the TTI a 16 byte frame is composed which includes one CRC-7 byte for error detection. Therefor the TTI can be 15 bytes long (15 characters or 30 hexadecimal digits). The **J0/J1/J2 Trail Trace Identifier** area is divided into 3 subsections:

- ■ **Transmitted TTI**: The TTI inserted in the path overhead is sent to the other side of the path.

- ■ **Expected TTI**: The TTI expected from the other side of the path.

- ■ **Accepted TTI**: The TTI actually received.

TI Mode

The TI mode can have the following values:

- ■ *Specific String*: The TTI is a string with maximum length of 15 bytes. This string is identified in the Access Point Identifier (API). In *Alphanumeric* mode any alphanumeric character can be used, in *HEX* mode only 00 .. 7F can be used.

- ■ *Non Specific Byte*: The Trace Identifier matches if it is any constant byte value within the range 00 .. FF. If the byte value is not constant, Trace Identifier Mismatch is assumed. No check between Accepted TTI and Expected TTI is performed.

API

The Access Point Identifier (API) is the label that is inserted in the path overhead. This is not valid if the *TI Mode* is set to *Non Specific Byte*.

API Display Mode

As long as the characters forming the API are alphanumeric characters, it is possible to toggle between *HEX* and *Alphanumeric* mode. The accepted API displays non-alphanumeric characters as question marks in the *Alphanumeric* mode.

TIM Detection

TIM is Trace Identifier Mismatch comparison between the expected and accepted TTI. If this is enabled and the TTIs do not match, a `Path Trace Identifier Mismatch` alarm is raised.

⚠ WARNING:
If the Trace Identifier Mismatch (TIM) detection is enabled, traffic will be lost when a mistake in the trace string is made. Upon mismatch, an Alarm Indication Signal (AIS) is inserted in the downstream signal and Remote Defect Indicator (RDI) is inserted in the upstream signal

Windows used for Path Trace Provisioning

Windows To Use

The following windows are used to provision a path trace:

- the *Provisioned Termination point Information* window is used to display the information of a termination point. The information about the path trace is displayed in the **J0/J1/J2 Trail Trace Identifier** area

- the *Edit Provisioned Termination Point Information* window is used to edit the termination point information. The path trace settings can be entered in the **J0/J1/J2 Trail Trace Identifier** area

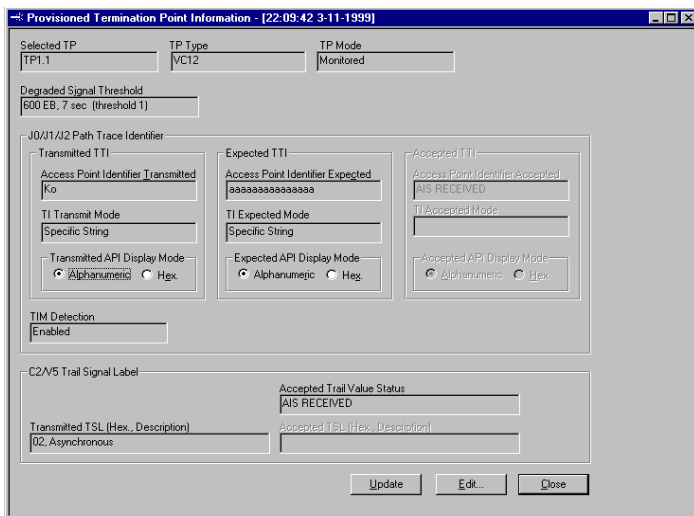**Figure 43.   Provisioned Termination Point Information**

Figure 44.   Edit Provisioned Termination Point Information
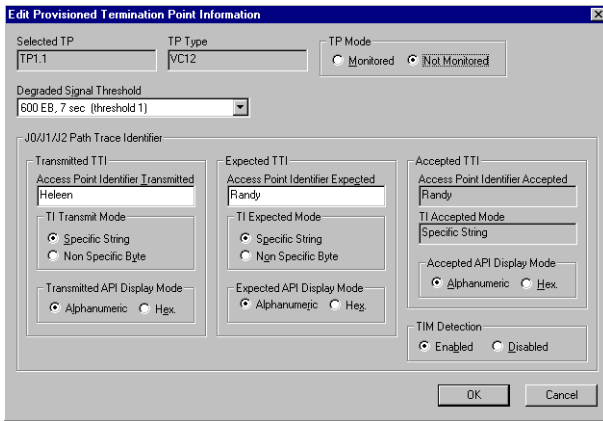
Procedure to Provision a Path Trace

Introduction

Use the following procedure to provision a path trace. For the *WaveStar*™ AM 1 a path trace can be set on the VC-12, VC-3, and VC-4 signals.

1. Determine where the termination points of the path are located. If a specific string (API) is used determine the content of the label.

2. Select **Provisioning -> Transport -> Termination Point**.

    Result: The *Termination Point Filter* window appears.

3. Select the type of the termination point for which the path trace must be provisioned and fill in its location. Click **OK**.

    Result: The *Termination Point List* window appears with a list of termination points.

4. Select the termination point from the list and click **Details**.

    Result: The *Provisioned Termination Point Information* window appears with information about the selected termination point. The information about the path trace is displayed in the **J0/J1/J2 Trail Trace Identifier** area.

5. Click **Edit**.

    Result: The *Edit Provisioned Termination Point Information* window appears.

6. Fill in the label used to be transmitted as path trace and/or the label that is expected to be received. If no label is used select Non Specific Byte. Check if the accepted path trace is the same as the expected path trace and enable or disable the TIM detection if necessary. Click **OK**.

⚠️ **WARNING:**
If the Trace Identifier Mismatch (TIM) detection is enabled, traffic will be lost when a mistake in the trace string is made. Upon mismatch, an Alarm Indication Signal (AIS) is inserted in the downstream signal and Remote Defect Indicator (RDI) is inserted in the upstream signal

    Result: The path trace is provisioned and displayed in the *Provisioned Termination Point Information* window. If the expected TTI equals the accepted TTI, the transmission path is well provisioned.

Provision Degraded Signal Thresholds

Purpose

The purpose of provisioning degraded signal thresholds is to define how many errors a signal may have before it is considered degraded. A degraded signal causes a **Moderate Block Error Rate** alarm. On VC-3 or VC-12 level, a degraded signal can cause an SNC protection switch.

Prerequisites

The threshold values (number of errored blocks and number of seconds) must be known.

Precautions

Changing the values of the Signal Degrade Thresholds can degrade the transmission path. Depending on these values alarms are generated and SNC protection switches are made.

Parameters for Provisioning Degraded Signal Thresholds

Introduction

A Degraded signal is a signal with more Errored Blocks (EB) per second than the defined **EB Count** value during a period of consecutive seconds defined in **Duration (sec)**. A degraded signal causes a **Moderate Block Error Rate** alarm. On VC-3 or VC-12 level, a degraded signal causes an SNC protection switch.

Degraded Signal Thresholds

Two Thresholds can be defined for each signal level to declare a signal degraded. The thresholds are called **Threshold 1** and **Threshold 2**. A choice between these two thresholds can be made in the *Edit STM-1 Port Information* window for the STM-1 signal and in the *Edit Provisioned Termination Point* window for the VC-4, VC-3, and VC-12 signal.

Signal Level

The signal levels on which the degraded signal thresholds can be set are **STM-1**, **VC-4**, **VC-3**, or **VC-12**.

EB Count

In the termination points the signal is terminated and a Bit Interleaved Parity (BIP) check is performed on the received data. The result of this BIP check is compared to the values in the B or V5 bytes in the overhead of the signal. When there is a difference an errored block is detected. The EB Count value determines how many Errored Blocks (EB) are allowed per second, before the second is declared a bad second.

The following table shows the range for the values for each signal type.

Signal Type	Range
STM-1	*1..192000*
VC4, VC3	*1..8000*
VC12	*1..2000*

Duration (sec)

The number of consecutive bad seconds to declare a signal degraded.

Windows used for Provisioning Degraded Signal Thresholds

Windows To Use

The following windows are used to modify the degraded signal thresholds.

- ■ the *Provisioned NE Degraded Signal Thresholds Information* window.

- ■ the *Edit Provisioned NE Degraded Signal Thresholds* window

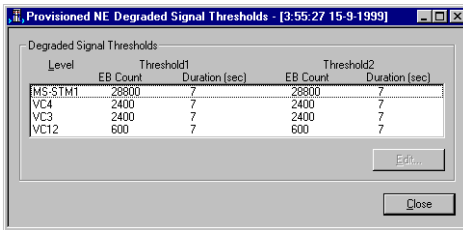**Figure 45. Provisioned NE Degraded Signal Thresholds Information**
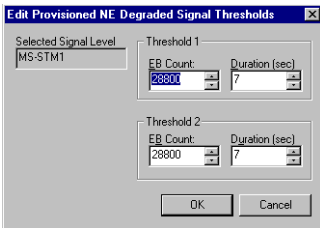

Figure 46. Edit Provisioned NE Degraded Signal Thresholds

Procedure to Change the Threshold for a Signal

Introduction

This procedure describes how the threshold for a specific signal can be changed. A choice can be made between two threshold values. Changing the values of these two thresholds is described in the "Procedure to Change the Threshold Values."

1. The following table shows the windows in which the the degraded signal values for the different signals are displayed. The Actions column shows how to get to these windows

Signal Level	Actions	Result
STM-1	• **Provisioning -> Transport -> Port** • Select filter criteria and click **OK** • select the STM-1 port and click **Details**	The *STM-1 Port Information* window appears
VC-12/ VC-3	• **Provisioning -> Transport -> Termination Point** • Select filter criteria and click **OK** • Select a VC-12, VC-3, or VC-4 termination point and click **Details**	The *Provisioned Termination Point Information* window appears

2. Click **Edit**.

   Result: The corresponding edit window appears

3. In the Degraded Signal Threshold box make a choice between Threshold 1 and Threshold 2 and click **OK.**

   Result: The new Threshold is set and its values are displayed in the corresponding information windows.

Transmission Protection

Intended use

The following subjects are part of transmission protection:

- Sub Network Connection protection protects a specific trans-mission path in a ring. (SNC)

- Multiplex Section protection protects the transmission path in a point-to-point connection. (MSP)

View SNC Protection

Purpose

To view the SNC connectivity information in the selected network.

Parameters for Viewing SNC Protection

Capacity box

This selection allows the user to filter on particular cross connect capacities. Values are: All, VC-3, and VC-12.

Slot

For All and VC-12 level the value is either TS1 or TS2. For VC-3 the Slot selection is greyed out.

Port

To select one of the available ports. For VC-12, the values are 1..16 or All. For VC-3, the possible values are 1..3

AU4#

This is not applicable for the *WaveStar*™ AM 1.

Filter box

Shows the corresponding selected filter settings made in SNC Protected TP Filter window.

Protected Cross Connections

List of TPs and their capacity of selected pairs from protected TP, working TP, protection TP, and active TP.

Selected pair

List of TPs of selected pairs from working, protecting and active reference.

Switch Mode

The Switch Mode indicates the mode of protection switching. For the WaveStar™ AM 1, the values is always Non Revertive.

Hold off Time

Identifies the delay, before a protection switch occurs, when a fault is detected on an in-service resource.

Switch State

The Switch State displays the last switch request. Descriptions and values are:

Description	Values
No change is made to the current state of the protection switch	*No Request*
Working becomes or remains active. The traffic is carried and will stay on the working regardless of the state of that leg.	*Forced to Working*
The traffic is carried and will stay on the working leg until a failure takes place.	*Manual to Working*
Protection becomes or remains active. The traffic is carried and will stay on the protection regardless of the state of that leg.	*Forced to Protection*
The traffic is carried and will stay on the protection leg until a failure takes place.	*Manual to Protection*
The signal has failed, and consequently a protection switch has been made.	*Signal Failed*
The signal has been declared degraded, and a protection switch has been made.	*Signal Degraded*

Windows for Viewing SNC Protection

Windows to Use

The windows to use for viewing SNC protection are:

- ■ SNC Protected TP Filter.

- ■ Provisioned NE SNC Protection Information.

- ■ Details Provisioned NE SNC Protection Information.
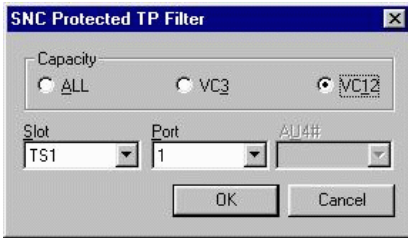
Figure 47.   SNC Protected TP Filter
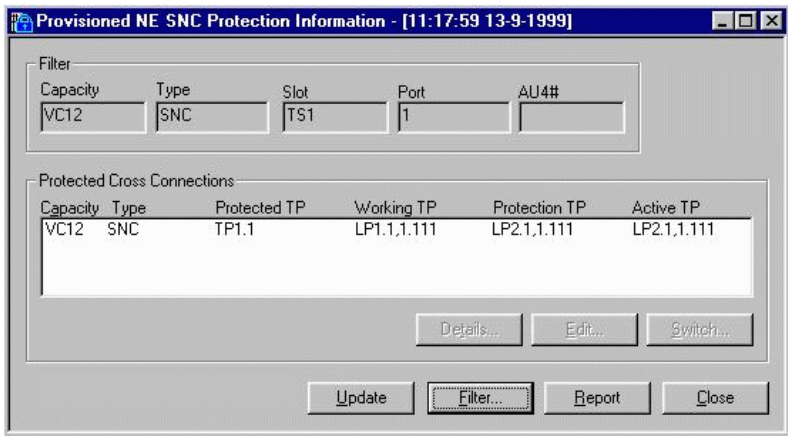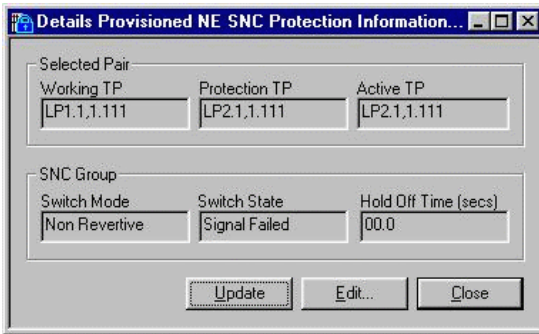

Figure 48.   Provisioned NE SNC Protection Information

**Figure 49. Details Provisioned NE SNC Protection
               Information**

View SNC Protection

Procedure

Follow these steps to view SNC protection information:

1. Select **`Protection -> Transmission -> SNC`**.

    Result: The *SNC Protected TP Filter* window is
    displayed.

2. Make a selection and click **`OK.`**

    Result: The *Provisioned NE SNC Protection
    Information* window is displayed.

3. Make a selection from the list and click **`Details`**.

    Result: The *Details Provisioned NE SNC Protection
    Information* window is displayed.

4.   Click **Close** to exit.

Result: The window closes.

Edit SNC Protection

Purpose

To change the hold off time for individual paths on VC-3 or VC-12 level.

Prerequisites

An SNC path should have been provisioned.

Parameters for Editing SNC Protection

Hold Off Time

Provides the delay between the moment that the signal fail or degrade condition is set, and the start of the execution of the switch-over. The default value is 0.0 seconds. Possible values are in the range 0.0 .. 10.0.

Windows for Editing SNC Protection

Windows to Use

The windows to use for editing SNC protection are:

- ■   SNC Protected TP Filter.

- ■   Provisioned NE SNC Protection Information.

- ■   Edit Provisioned NE SNC Protection Information.
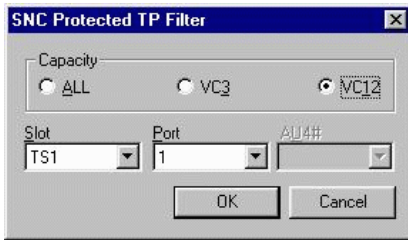
Figure 50.   SNC Protected TP Filter

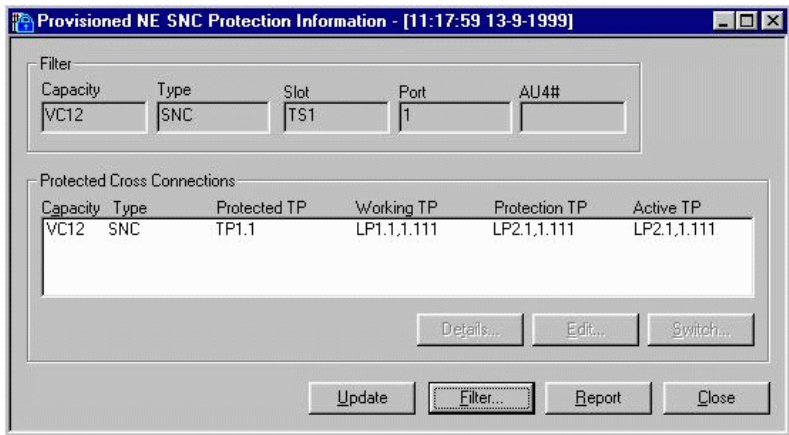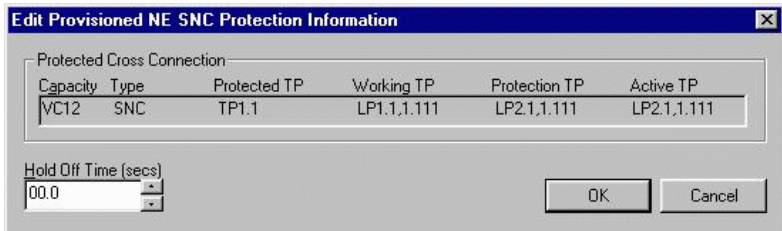**Figure 51.   Provisioned NE SNC Protection Information**

Figure 52.   Edit Provisioned NE SNC Protection Information

Edit SNC Protection

Procedure

Follow these steps to edit SNC protection:

1. Select **Protection -> Transmission -> SNC**.

    Result: The *SNC Protected TP Filter* window is displayed.

2. Make a selection and click **OK.**

    Result: The *Provisioned NE SNC Protection Information* window is displayed.

3. Make a selection from the list and click **Edit**.

    Result: The *Edit Provisioned NE SNC Protection Information* window is displayed.

4. Make a selection for the **Hold Off Time** with usage of the above parameter information and click **OK**.

    Result: The edit window closes and the information window is again displayed.

5. Click **Close** to exit.

    Result: The window closes.

Switch SNC Protection

Purpose

To switch protection for individual paths on VC-3 or VC-12 level.

Precautions

A protection switch is always traffic affecting.

Prerequisites

An SNC path should have been provisioned.

Parameters for Switching SNC Protection

Switch Request

The Switch Request descriptions and values are:

Description	Values
Executing Clear on a line will undo only the previous switch request that are initiated on that specific line.	`Clear`
Will switch the traffic to the working regardless of the state of that leg. This will override a hardware protection switch. This is canceled with the clear command.	`Forced to Working`
Will switch the traffic to the protection regardless of the state of that leg. This will override a hardware protection switch. This is canceled with the clear command.	`Forced to Protection`
Will switch traffic to the working only when that working is error free and is not servicing an equal or higher priority request. An internal or a forced protection switch will override.	`Manual to Working`

Description	Values
Will switch traffic to the protection only when that protection is error free and is not servicing an equal or higher priority request. An internal or a forced protection switch will override.	*Manual to Protection*

Windows for Switching SNC Protection

Windows to Use

The windows to use for switching SNC protection are:

- SNC Protected TP Filter.

- Provisioned NE SNC Protection Information.

- Switch Provisioned NE SNC Protection Information.

Figure 53.   SNC Protected TP Filter
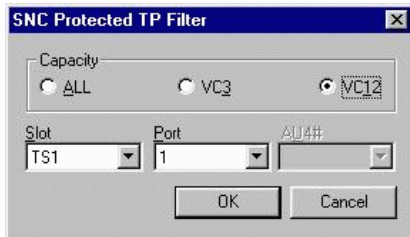
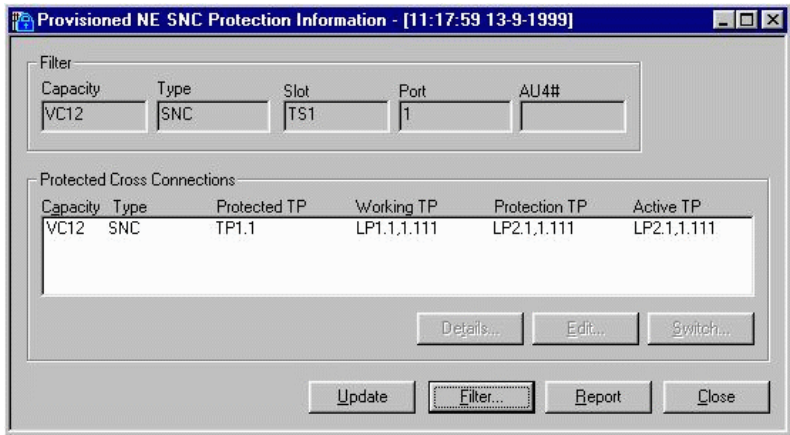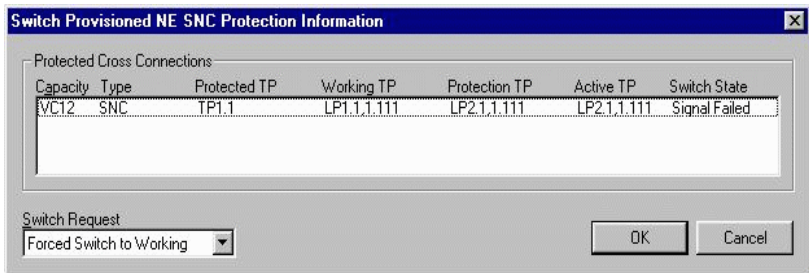**Figure 54.   Provisioned NE SNC Protection Information**

**Figure 55.   Switch Provisioned NE SNC Protection
                Information**

Switching SNC Protection

Procedure

Follow these steps to switch lines:

1. Select **Protection -> Transmission -> SNC**.

   Result: The *SNC Protected TP Filter* window is displayed.

2. Make a selection and click **OK.**

   Result: The *Provisioned NE SNC Protection Information* window is displayed.

3. Make a selection from the list and click **Switch**.

   Result: The *Switch Provisioned NE SNC Protection Information* window is displayed.

4. Make a selection for the **Switch Request** with usage of the above parameter information and click **OK**.

   Result: The switch window closes and the information window is re-displayed.

5. Click **Close** to exit.

   Result: The window closes.

View and Edit MSP Protection

Purpose

To set protection for individual paths on a piont-to-point connection.

Precautions

If the ports are assigned as a physical timing reference with a single logical timing reference, then these ports are no longer available for MSP protection.

Prerequisites

Prerequisites are:

■ MSP pair must be present physically set up on the Near End and Far End Network Elements. In other words, the fiber pairs connected on both Network Elements.

Parameters for Viewing and Editing MSP Protection

Working Section

Displays the group of sections defined as working.

Protection Section

Displays the group of sections defined as protection.

Active Section

Displays which section is carrying traffic.

Switch State

Displays the current switch state of the protection pair.

Selected Pair

Displays the selected sections and indicates the alarm status at the working/protection port. This can be Error Free, Failed or Degraded.

Communication Mode

Displays whether the protection is Uni-Directional or Bi-Directional. In the case of failure in the Uni-Directional mode the receive side switches. In the Bi-Directional mode both sides are switched. When the Uni-Directional mode is displayed the Far End selection is greyed out.

Switch Mode

Switch Mode displays whether the protection is Revertive or Non-Revertive. In the case of failure with Revertive mode the traffic switches to the protected line and switches back when the failure is solved. In the Non-Revertive mode the traffic switches to the protected line and remains even when the failure is solved.

Switch State

Displays the switch state for MSP.

Description	Values
No change is made to the current state of the protection switch	*No Request*
Switch request which conditionally switches service to the working line. In case a failure is detected an automatic switch will take place to the protected line.	*Manual Switch to Working*
Switch request which conditionally switches service to the protecting line. In case a failure is detected an automatic switch will take place to the working line.	*Manual Switch to Protection*
Switch request which enforces switching service to the working line. It prevents automatic switching to the protecting line even in case a failure is detected.	*Forced Switch to Working*
Switch request which enforces switching service to the protecting line. It prevents automatic switching to the working line even in case a failure is detected.	*Forced Switch to Protection*

WTR (Wait to Restore)

If MSP mode is ETSI, then WTR is the wait to restore time after the
failure on the protected unit has cleared. The possible values are
displayed in minutes; the range of these values is between 0 and
60.

Near End

Displays the service reference at the Near/Far end. This can be
Working, Protection or Unclear. Also the APS transmitted code is
displayed.

Windows for Viewing and Editing MSP Protection

Windows to Use

The windows to use for viewing and editing MSP protection are:

- ■ Provisioned NE MSP Protection.

- ■ Details MSP.
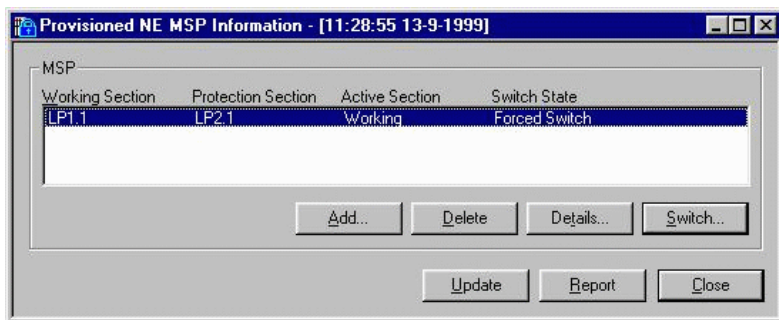
- ■ Edit MSP.

Figure 56.   Provisioned NE MSP Protection

View and Edit MSP Protection

Procedure

Follow these steps to view or edit MSP protection:

1. Select **Protection -> Transmission -> MSP**.

   Result: The *Provisioned NE MSP Information* window is displayed.

2. Make a selection and click **Details.**

   Result: The *Details MSP* window is displayed.

3. View the information. To change the information click **Edit**.

   Result: The *Edit MSP* window is displayed.

4. Make a selection for the **WtR Time** and click **OK**.

   Result: The edit window closes and the information window is re-displayed.

5. Click **Close** to exit.

   Result: The window closes.

Switch MSP Protection

Purpose

To perform a switch on a transmission signal in a point-to-point connection. In executing this request, the signal will be switched to the protection.

Precautions

A protected switch is always traffic affecting.

Prerequisites

An MSP protection pair should have been provisioned.

Parameters for Switching MSP Protection

Working Section

Displays the group of sections defined as working.

Protection Section

Displays the group of sections defined as protection.

Active Section

Displays which section is carrying traffic.

Switch State

Displays the current switch state of the protection pair.

Selected Pair

Displays the selected sections and indicates the alarm status at the
working/protection port. This can be Error Free, Failed or
Degraded.

Switch Request

Displays the switch request for MSP.

Description	Values
Switch request which conditionally switches service to the working TP. In case a failure is detected an automatic switch will take place to the protected TP.	*Manual Switch to Working*
Switch request which conditionally switches service to the protecting TP. In case a failure is detected an automatic switch will take place to the working TP.	*Manual Switch to Protection*
Switch request which enforces switching service to the working TP. It prevents automatic switching to the protecting TP even in case a failure is detected.	*Forced Switch to Working*
Switch request which enforces switching service to the protecting TP. It prevents automatic switching to the working TP even in case a failure is detected.	*Forced Switch to Protection*
Lock out the MSP protection group. This means that no further protection switches will take place.	*Lockout*

Windows for Switching MSP Protection

Windows to Use

The windows to use for viewing and editing MSP protection are:

■ Provisioned NE MSP Protection.

■ Switch MSP.

Figure 59. Provisioned NE MSP Protection
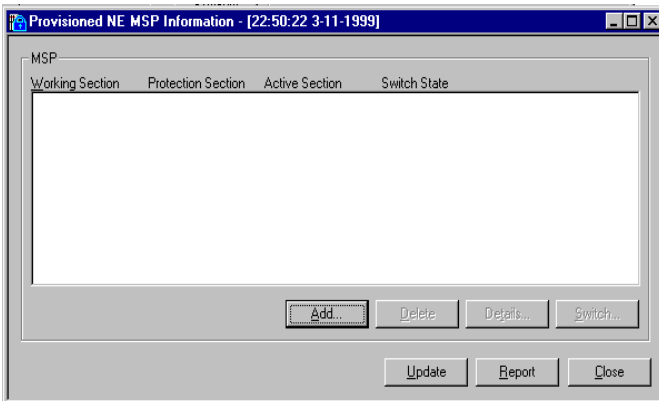
Figure 60. Switch MSP
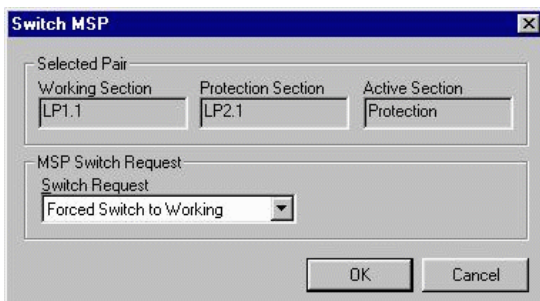
Switch MSP Protection

Procedure

Follow these steps to switch MSP protection:

1. Select **Protection -> Transmission -> MSP**.

   Result: The *Provisioned NE MSP Information* window is displayed.

2. Make a selection and click **Switch.**

   Result: The *Switch MSP* window is displayed.

3. View the information. To change the switch request click the pull down menu, select a request and click **OK**.

   Result: The previous window is displayed.

4. Click **Close** to exit.

   Result: The window closes.

Add MSP Protection

Purpose

To set protection on a point-to-point connection.

Precautions

If the physical timing reference of the ports to be MSP protected are assigned to a single logical timing references then these ports are no longer available for MSP protection.

Prerequisites

MSP pair must be present physically set up on the Near End and Far End Network Elements. In other words, a MSP card inserted and fiber pairs connected on both Network Elements.

Parameters for Adding MSP Protection

Working Section

Displays the group of sections defined as working.

Protection Section

Displays the group of sections defined as protection.

Active Section

Displays which section is carrying traffic.

Switch State

Displays the current switch state of the protection pair.

MSP Pair Selection

Working section port shows the available ports that can be MSP protected. Protection section port will be filled in with the associated protection port once the working section has been selected.

Communication Mode

Communication Mode displays whether the protection is Uni-Dirctional or Bi-Dirctional. In the case of failure with Uni-Dirctional mode the receive side switches. In the Bi-Dirctional mode both sides are switched. When the Uni-Dirctional mode is displayed the Far End selection are greyed out.

Switch Mode

Switch Mode displays whether the protection is Revertive or Non-Revertive. In the case of failure with Revertive mode the traffic switches to the protected line and switches back when the failure is solved. In the Non-Revertive mode the traffic switches to the protected line and remains even when the failure is solved.

MSP Mode

Displays the MSP protocol to be used. For the WaveStar™ AM 1, the only value possible is ETSI.

WTR Time

WTR (Wait to restore). WTR is the wait to restore time after the failure on the protected unit has cleared. Possible values are 0..60 minutes.

Windows for Adding MSP Protection

Windows to Use

The windows to use for adding MSP protection are:

- Provisioned NE MSP Protection.
- Add MSP.

Figure 61.   Provisioned NE MSP Protection
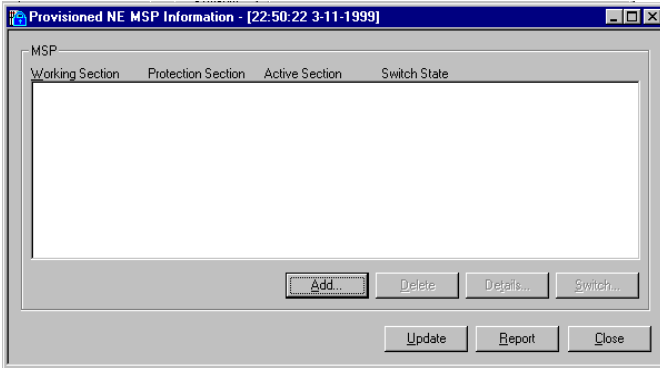
Figure 62.   Add MSP
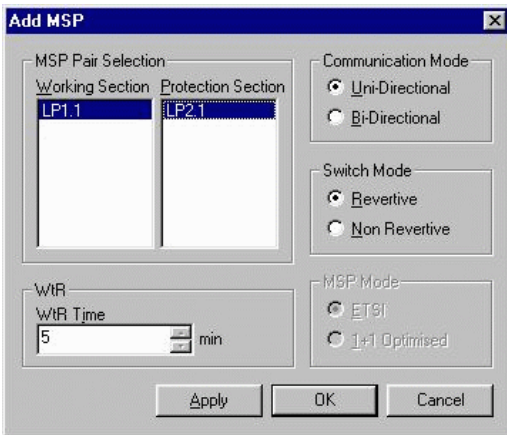
Add MSP Protection

Procedure

Follow these steps to Add MSP protection:

1. Select **Protection -> Transmission -> MSP**.

   Result: The *Provisioned NE MSP Information* window is displayed.

2. Make a selection and click **Add.**

   Result: The *Add MSP* window is displayed.

3. View the information. To change the information fill in the values with te information above and click **OK**.

   Result: The previous window is displayed.

4. Click **Close** to exit.

   Result: The window closes.

Timing Provisioning

Provision Timing Sources

Purpose

The purpose of provisioning timing sources is to provide timing sources with a defined quality levels (QL), and to assign physical timing references to the logical timing sources used for synchronizion in the network element.

Prerequisites

Before starting these procedures, make sure that a network element synchronization plan is available.

Precautions

Pay attention to the following items:

- ■ An MSP transmission protection pair is considered as a single timing reference. Thus in the case of MSP on the lines, only one line port is available as a timing reference.

- ■ Incorrect settings for worker/protection references and quality level-provisioning can cause a timing loop.

Parameters to Provision Timing Sources

Introduction

The procedure for provisioning timing sources defines the timing sources for network element synchronization.

The diagram below gives an overview of the relationship between the physical timing references and the logical timing sources. The physical timing references are indicated on the left side, the logical timing sources on the right side. Physical references can be assigned to the timing sources, therefore parameters are used. The parameters are indicated in the functional diagram. The arrows pointing towards the block indicate the parameters that can be pro-visioned. The arrows that point away from the block indicate read only parameters. The dotted arrows indicate that arrows apply to more references or sources.

Functional Diagram

Figure 63.   A diagram of the timing source functionality
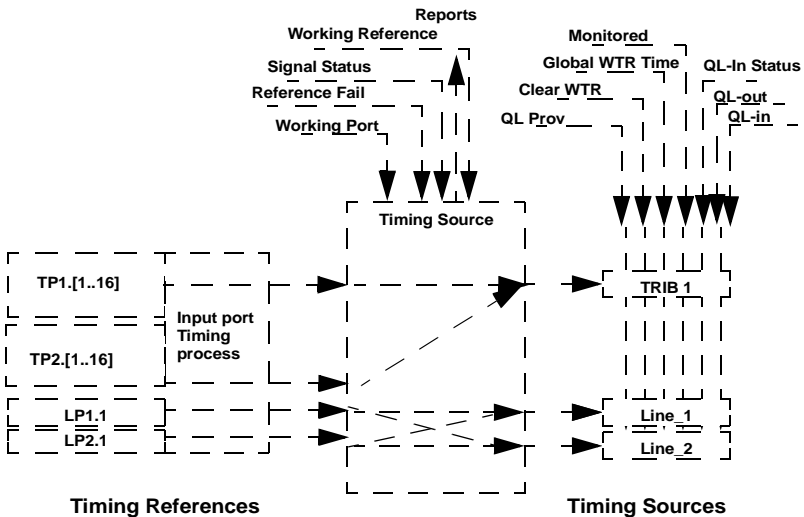
Clear WTR

The "Clear Wait-to-Restore" command (**Clear WTR**) resets the wait to restore timer and the signal status will revert to normal.

Monitored

The user can enable or disable the option for monitoring a timing source. If a timing source is monitored, the timing source will forward the **Reference Fail** and **Reference Unequipped** alarms to the management system when applicable.

Monitored can have the values *Yes* or *No.*

QL-in

When the quality level is read from the S1-byte from the timing references, it is reflected in the *QL-in* parameter. This parameter can have all of the defined quality level values. See subsection "Timing Quality Levels."

QL-in status

The user can view the status of the incoming quality level (*QL-in Status*) for each timing source. The possible values are:.

QL-in status	Description
Valid	The received quality level is in the valid range.
Invalid	The received quality level falls outside the valid range or is unstable.
Not Supported	The corresponding input port does not provide S1-byte extraction.
Not applicable	No reference is assigned to the timing source, or the assigned signal experiences a reference fail.

QL-out

The **QL-out** parameter indicates the actual quality level value of the timing source that is used by the system timing block and the station clock output block. The **QL-out** value, is the quality level that enters the system timing and station clock output blocks. When **QL-Prov** is **AUTO**, **QL-out** equals **QL-in**. When **QL-Prov** is not **AUTO**, **QL-out** equals **QL-Prov**..

QL-Prov

The quality level of timing references can be provisioned by the user. The provisioned quality level is called **QL-Prov.** In case of a timing reference without an S1-byte, **QL-Prov** allows the user to provision a quality level. When a timing reference does have an S1-byte (**QL-in** can be read by the system), this value can be over-ruled by **QL-Prov**.

Reference fail

When the incoming signal cannot provide a timing reference, the timing reference is considered to fail. **Reference Fail** can take the values **Yes** or **No**.

Signal status

The signal status is received in the timing sources block and for-warded to the system timing block and the station clock output tim-ing block. The possible values are:

Signal Status	Description
Not Connected	No reference is assigned to the timing source.
Failed	A timing link fail is declared for the assigned timing link.

Signal Status	Description
Wait to Restore	The assigned reference signal will be available again when the Wait to Restore timer has expired.
Normal	The logical timing source is assigned to a valid timing reference.

Timing Source

Physical timing references can be assigned to logical timing sources. Once a timing reference is assigned to a timing source, no other reference can be assigned to the same source.

Transmission Protected

Transmission Protected indicates whether the timing reference is MSP-protected for transmission. This is only possible for the *WaveStar*™ AM1, because this multiplexer supports MSP. The values for *Transmission Protected* are *Yes* and *No*.

Global Wait to Restore Time

In case of a failure the system switches to a valid reference. When the failure is no longer present, the system switches back, after a certain waiting period (the switching is revertive). This waiting period is called the Global Wait-to-Restore Time. It can range from *0* minutes to *60* minutes. The signal status will become *Wait to Restore*.

The Global Wait to Restore Time setting holds for all the timing in the network element. For the Timing Sources, for the System Timing, and for the Station Clock Output Timing.

Working Port / W Port for WaveStar™ AM1

The worker ports that can be assigned to the timing sources:

Timing Source	Possible Timing References
Line_1	LP1.1, LP2.1
Line_2	LP1.1, LP2.1
TRIB_1	TP1.1 .. TP2.16

Working Reference

Working Reference indicates the actual reference that is used for the selected timing source. Since the *WaveStar*™ AM 1 does not offer a protection for the timing reference, the **Working Reference** equals the **Working Port** as it is provisioned.

Windows to Provision Timing Sources

Windows to Use

The windows to use to provision the timing sources for a network element are:

- Provisioned NE Timing Source Information
- Detailed Timing Source Information
- Assign Timing Reference to Timing Source
- Edit Provisioned Timing Source Information
- Edit Global Wait to Restore Time

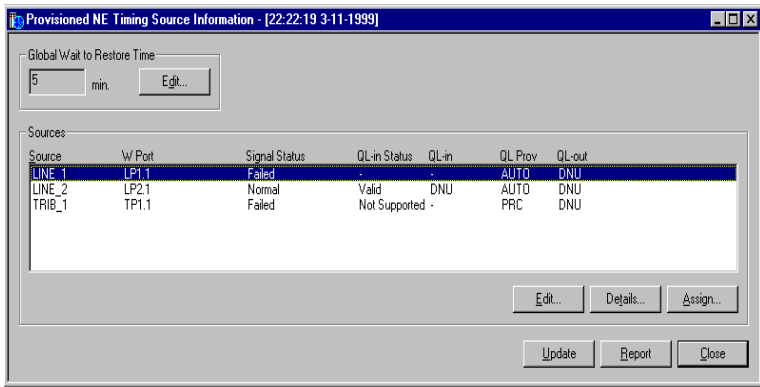**Figure 64.   Provisioned NE Timing Source Information**
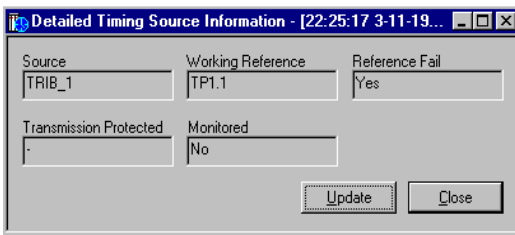

Figure 65.   Detailed Timing Source Information

Figure 66.   Assign Timing Reference to Timing Source
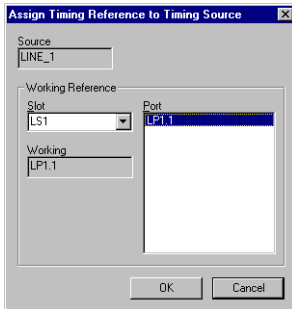
Figure 67.   Edit Provisioned Timing Source Information
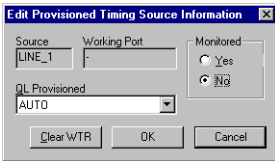
Figure 68.   Edit Global Wait To Restore Time

Provision Timing Sources

Assign Working Reference to Timing Source

To assign a (working) timing reference to a timing source follow this procedure:

1. Select *Provisioning --> Timing --> Timing Sources*

   Result: The *Provisioned NE Timing Source Information* window appears.

2. Select a source that must be edited from the list and click **Assign.**

   Result: The *Assign Timing Reference to Timing Source* window appears.

3. Select a slot (or a '-') from the list under Working Reference.

   Result: A list of all possible ports (or a '-') appears for the selected slot.

4. Select a port (or a '-') from the list for the Working Reference

    Result: The Working Reference for the timing source is selected (in case a port is selected) or the Working Reference for the timing source is unassigned (in case '-' is selected).

5. Click **OK** to confirm the current settings.

    Result: The *Assign Timing Reference to Timing Source* window is closed and data is sent to the network element.

Set QL Prov, Monitored, Clear Wait to Restore

To set the quality level for an incoming (SDH) timing reference, clear the Global Wait To Restore Time or set the Monitored state of the timing reference follow this procedure:

1. Select **Provisioning --> Timing --> Timing Sources**

    Result: The *Provisioned NE Timing Source Information* window appears.

2. Select a source that must be edited from the list and click **Edit** in the **Sources** field.

    Result: The *Edit Provisioned Timing Source Information* window appears.

3. Select **AUTO** or a QL value from the list for **QL Provisioned**.

    Result: A value is set for **QL provisioned**.

4. Select **Yes** or **No** for **Monitored**.

    Result: The monitoring of the reference of the timing source is set.

5. In case the **Signal Status** of the timing source is **Wait To Restore**. and it must be reset, click **Clear WTR**.

    Result: The **Signal Status** of the timing source changes from **Wait to Restore** into the actual Signal Status of the timing source.

6. Click **OK** to confirm the current settings

    Result: The *Edit Provisioned Timing Source Information* window disappears and data is sent to the network element.

7. Click **Close**.

    Result: The *Provisioned NE Timing Source Information* window disappears.

View the Timing Source Status

To view the status of a timing source follow this procedure:

1. Select **Provisioning --> Timing --> Timing Sources**

    Result: The *Provisioned NE Timing Source Information* window appears.

2. Select a source to be viewed from the list and click **Details**.

    Result: The *Detailed Timing Sources Information* window appears.

3. Click **Update**.

   Result: The *Detailed Timing Sources Information* window is filled with the actual parameter settings for the timing source indicated in the **Source** field.

4. Check the status of the timing source

5. Click **Close** to close the window.

   Result: The *Detailed Timing Sources Information* window disappears.

6. Click **Close**.

   Result: The *Provisioned NE Timing Source Information* window disappears.

Edit Global Wait to Restore Time

To change the Global Wait to Restore Time follow this procedure:

1. Select **Provisioning --> Timing --> Timing Sources**

   Result: The *Provisioned NE Timing Source Information* window appears.

2. Click **Edit** in the Global Wait To Restore field.

   Result: The *Edit Global Wait To Restore Time* window appears.

3. Set the **Global Wait To Restore Time**

4. Click **OK** to confirm the current setting.

    Result: The Global Wait To Restore timer is set for the timing in the network element, and the *Edit Global Wait To Restore Time* window disappears.

5. Click **Close**.

    Result: The *Provisioned NE Timing Source Information* window disappears.

Provision System Timing

Purpose

The purpose of "Provision System Timing" is to lock the network element synchronization and outgoing timing signals to a timing source with the highest quality level.

Prerequisites

Before starting this procedure, make sure that:

■   The "Provision Timing Source" procedure is completed.

■   The network element synchronization plan must be available.

Precautions

Pay attention to the following items:

■   When used, do not forget to clear the lockout condition after maintenance.

Parameters to Provision System Timing

Introduction

The system timing functional block in the network element is responsible for:

- Selecting the timing sources to synchronize the system.

- Selecting the timing mode for the system

- Translating the quality level into the S1-byte of the outgoing signal.

The different parameters that can be set in the system timing functionality are indicated in the figure below.

Functional Diagram

Figure 69.   A Functional Diagram of the System Timing Functionality
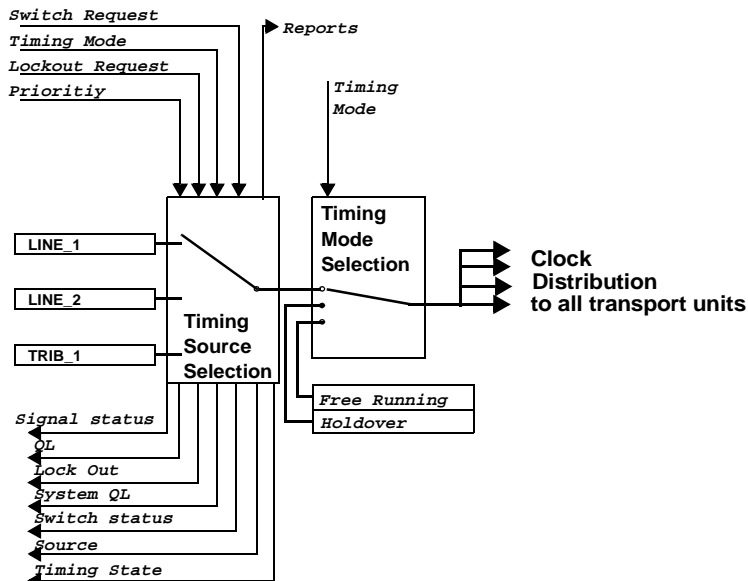
Active System Timing Source

The **`Active Timing Source`** indicates the timing source currently used to synchronize the system, together with the Switch Status of the source and the latest issued Switch Request.

Lock out

The user can disable a specific timing source that enters the timing source selection without changing the priority settings. If a timing source is locked out, it will not take part in the timing source selection.

Whether a timing source is locked out is indicated by the Lockout parameter. The possible values for the Lockout parameter are: **`Yes`** and **`No.`**

Lock Out Request

The **`Lock out`** state can be changed with the **`Lock Out Request`** parameter. This can be set to **`Yes`** or **`No`**.

The **`Lock Out Request`** is for maintenance purposes. A Timing Source, which has a priority value assigned to it, can be temporarily locked out. When the Timing Source is already disabled, a **`Lock Out Request`** is rejected. A **`Lockout Request`** is set to **`No`** automatically when the Timing Source is disabled.

When **`Priority = Disable`** the **`Lock Out Request`** field is greyed out.

> **Important!**   When a timing source is locked out, the network element is in the Abnormal State.

Priority

The priority can be set for each timing source. For a network element with **`N`** timing sources provisioned, the priority can have values from **`1`** to **`N`**.

The **`Priority`** parameter can also have the value **`Disabled`**. A disabled timing source will not be taken into account in the Timing Source Selection for the system timing.

> **Important!**   Make sure not to provision identical
> Priority values to multiple timing sources.

QL

The quality level of a timing source, that is used for automatic timing mode selection is indicated in the *Provisioned NE System Timing Information* window. This QL is identical to the QL-out as described in "Parameters to Provision Timing Sources."

QL Mode

The QL-mode parameter allows to disable or enable the use of the S1-byte in the algoritm to select the active timing reference. The possible values for **`QL-mode`** are **`Enabled`** and **`Disabled.`**

When QL Mode is enabled, the system will choose the timing source with the best quality level. In case of multiple timing sources with all the best quality level, the timing source with the lowest priority value is selected.

Switch request

Switch requests, for *WaveStar*™ AM1, are shown in the table, together with their description and priority.

Priority	Switch Request	Description
	No Request	This is the default value. The system timing is operating under normal conditions.

Priority	Switch Request	Description
1	*Clear Switch*	Replaces the status by the normal status (in case of a previous switch).
2	*Forced Switch*	Unconditional switch, issued by the user, even if this is service degrading.
3	Internal protection switch (This is not a switch initiated by the user.)	The active reference has failed, and an internal switch request has been issued.
4	*Manual Switch*	A conditional switch, which is issued by the user. The switch will not be performed if it is service degrading.

Switch status

This parameter indicates the latest switch request. The possible values of this parameter are listed in the table below.

Value	Description
No Request	No switch request has been issued.
Forced Switch	A forced switch has been made to a timing source as indicated by the user. The forced switch will always be performed by the system except in cases where a lockout command has been issued or if the new timing source has been disabled.

Value	Description
Manual Switch	A manual switch has been made a timing source as indicated by the user. The manual switch will only be performed by the system if a higher priority switch has not taken place and if the new timing source is functioning.

Signal status

The signal status is received in the timing sources block and forwarded to the system timing block and the station clock output timing block. The possible values are:

Signal Status	Description
Not Connected	No reference is assigned to the timing source.
Failed	A timing link fail is declared for the assigned timing link.
Wait to Restore	The assigned reference signal will be available again when the Wait to Restore timer has expired.
Normal	The logical timing source is assigned to a valid timing reference.

System QL

This parameter shows the quality level value of the timing signal used to clock the system.

Timing Mode

This parameter is used to set one of the three timing modes: *Locked*, *Holdover*, and *Free Running*.

Timing State

If, while operating in the **`Locked`** mode, the incoming reference becomes unacceptable, the timing mode selector switches to **`Holdover`**. This is reflected in the **`Timing State`** parameter. When the system stays in the locked mode, the timing status remains **`Normal`**.

In the **`Free running`** or **`Holdover`** modes, the **`Timing State`** is always displayed as **`Normal`**.

Windows to Provision System Timing

Windows to Use

The windows to use for the Timing Source Provisioning are:

- ■ Provisioned NE System Timing Information
- ■ Edit Automatic Selection Criterions for NE System Timing
- ■ Switch Request for NE System Timing
- ■ Select Timing Mode
- ■ Edit QL Mode

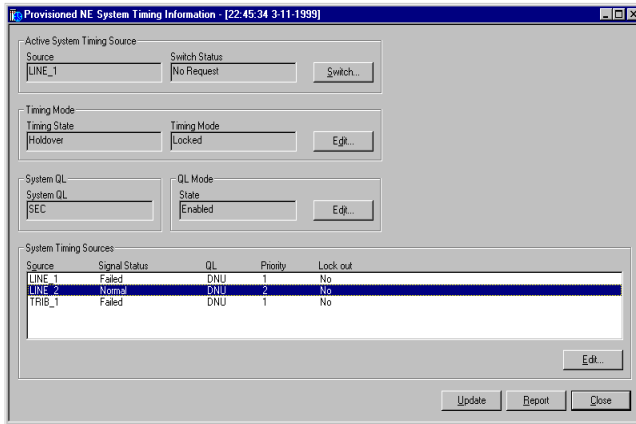**Figure 70.   Provisioned NE System Timing Information**

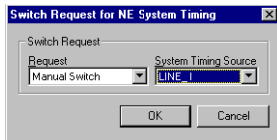**Figure 71.   Switch Request for NE System Timing**
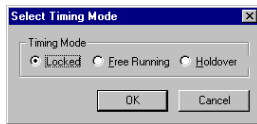

Figure 72.   Select Timing Mode
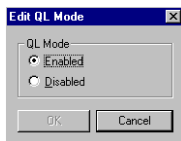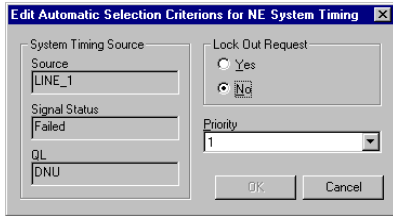

Figure 73.   Edit QL Mode

Figure 74.   Edit Auto Selection Criteria, NE System Timing

Provision System Timing

Set Priority and Lock out

To set the priority or the lockout for a timing source follow this procedure:

1. Select **Provisioning --> Timing --> System Timing**.

    Result: The *Provisioned NE System Timing Information* window appears.

2. Select a source to edit from the list and click **Edit** in the System Timing Sources field.

    Result: The *Edit Automatic Selection Criterions* window appears.

3. Set **Priority** or **Lock Out Request**.

4. Click **OK** to confirm the current settings.

    Result: The *Edit Automatic Selection Criterions* window disappears.

5. To provision another Timing Source go to step 2, otherwise go to step 6.

6.   Click **Close**.

     Result: The *Provisioned NE System Timing Information* window disappears.

Set Timing Mode and QL Mode

To set the Timing Mode and the QL Mode for a timing source follow this procedure:

1.   Select **Provisioning --> Timing --> System Timing**.

     Result: The *Provisioned NE System Timing Information* window appears.

2.   Click **Edit** in the System QL field**.**

     Result: The *Edit QL Mode* window appears.

3.   Set the **QL Mode**. to **Enabled** or **Disabled**.

4.   Click **OK** to confirm the current settings.

     Result: The *Edit QL Mode* window disappears.

5.   Click **Edit** in the Timing Mode field.

     Result: The *Edit Timing Mode* window appears.

6.   Set the **Timing Mode** to **Free Running**, **Holdover**, or **Locked**.

7.   Click **OK** to confirm the current settings.

     Result: The *Edit Timing Mode* window disappears.

8. Click **Close**

    Result: The *Provisioned NE System Timing Information* window disappears.

Switch Active Timing Source

To switch the timing source that is used as the active timing source follow this procedure:

1. Select **Provisioning --> Timing --> System Timing.**

    Result: The *Provisioned NE System Timing Information* window appears.

2. Click **Switch** in the Active Timing Source field**.**

    Result: The *Switch Request for NE System Timing* window appears.

3. Select a request from the Request list. If a Manual Switch or a Forced Switch is required, select also a timing source to switch to from the System Timing Source list.

4. Click **OK** to confirm the current settings and send the request to the network element.

    Result: Depending on the System state and the request, the switch will be automatically successful or an error message will be displayed. The *Switch Request for NE System Timing window* disappears.

5. Click **Close**

    Result: The *Provisioned NE System Timing Information* window disappears.

Provision Station Clock Output

Purpose

The purpose of this procedure is to specify the timing source to be used as a reference for the station clock output signals.

Prerequisites

Before starting this procedure, make sure that:

- The "Provision Timing Source" procedure is completed
- The network timing plan is available

## Parameters to Provision Station Clock Output

Introduction

The station clock output functional block in the network element is responsible for selecting the timing source for the station clock output.

The different parameters in the station clock output timing block are indicated graphically in the figure below.

Functional Diagram

A functional diagram of the station clock output functionality
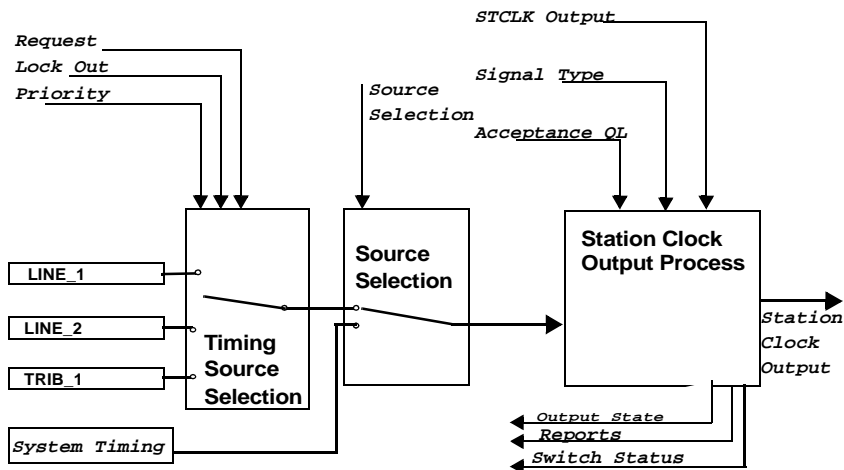
Acceptance QL

The user can provision an **Acceptance QL**, applicable to all station clock output ports (if more than one). This quality level is the minimal quality level value that is accepted by the station clock output process. If the quality level of the signal for the station clock output falls below the **Acceptance QL**, the network element "squelches" the station clock output signal.

Active System Timing Source

The **Active Timing Source** indicates the timing source currently used to synchronize the system, together with the Switch Status of the source and the latest issued Switch Request.

Lock Out Request

The **Lock Out** state can be changed with the **Lock Out Request** parameter. This can be set to **Yes** or **No**.

The **Lock Out Request** is for maintenance purposes. A Timing Source, which has a priority value assigned to it, can be temporarily locked out. When the Timing Source is already disabled, a **Lock Out Request** is rejected. A **Lockout Request** is set to **No** automatically when the Timing Source is disabled.

When **Priority = Disable** the **Lock Out Request** field is greyed out.

> **Important!**   When a timing source is locked out, the network element is in the Abnormal State.

Lock Out

The user can disable a specific timing source that enters the timing source selection without changing the priority settings. If a timing source is locked out, it will not take part in the timing source selection.

Whether a timing source is locked out is indicated by the Lock out parameter. The possible values for the Lock out parameter are: **Yes** and **No.**

Output State

The user can view the **Output State** of the signal generated by the station clock output(s). Possible values are **Normal**, **Disabled**, and **Unacceptable**.

- ■ **Normal:**   indicates that the output in not disabled and has a quality level above the **Acceptance QL**

- ■ **Disabled:**   indicates that the station clock output is disabled

- ■ **Unacceptable:** indicates a quality level below the **Acceptance QL**, or a signal status is failed.

Priority

The priority can be set for each timing source. For a network element with **N** timing sources provisioned, the priorities can have values from **1** to **N**.

The **Priority** parameter can also have the value **Disabled**. A disabled timing source will not be taken into account in the Timing Source Selection for the system timing.

> **Important!** Make sure not to provision identical priority values to multiple timing sources.

Signal Type

The **Signal Type** for the station clock outputs is always 2 MHz.

Source Selection

The station clock output timing can be derived from one of the system clock processes or from the independent station clock output timing **Source Reference Selector**. This is provisioned by the user. Two options are available:

■   System Timing

■   Independent Station Clock Timing.

STCLK Output

The user can enable or disable the **Station Clock Output**. If it is disabled it forwards no signal at all and can not be used.

Switch Request

Switch requests for *WaveStar*™ AM1 are shown in the following table together with their description and priority.

Priority	Switch Request	Description
	No Request	This is the default value. The system timing is operating under normal conditions.
1	**Clear Switch**	Replaces the status by the normal status (in case of a previous switch).
2	**Forced Switch**	Unconditional switch, issued by the user, even if this is service degrading.
3	Internal protec-tion switch (This is not a switch initiated by the user.)	The active reference has failed, and an internal switch request has been issued.
4	**Manual Switch**	A conditional switch, which is issued by the user. The switch will not be performed if it is service degrading.

Switch Status

This parameter indicates the latest switch request. The possible values of this parameter are listed in the table below.

Value	Description
No Request	No switch request has been issued.
Forced Switch	A forced switch has been made to a timing source as indicated by the user. The forced switch will always be performed by the system.
Manual Switch	A manual switch has been made a timing source as indicated by the user. The manual switch will only be performed by the system when it is possible without affecting the service.

Windows to Provision Station Clock Output

Windows to Use

The windows to use to provision the station clock output are:

- Provisioned NE Station Clock Output Timing Information
- Edit Automatic Selection Criterions for NE STCLK Output Timing
- Edit Acceptance QL for NE STCLK Output Timing
- Switch Request and Source Selection
- Edit Station Clock Output Values

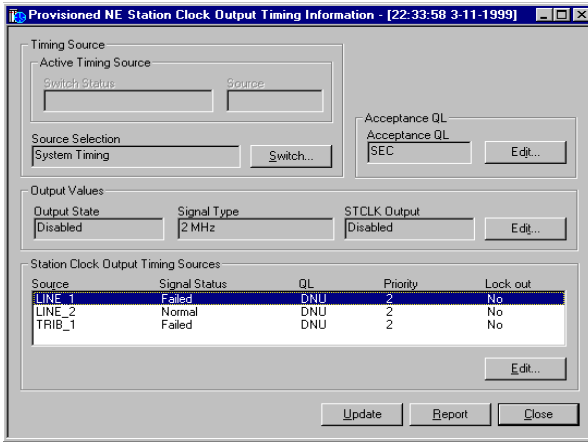**Figure 75.   Provisioned NE Station Clock Output Timing Information**

Figure 76.   Edit Auto Selection Criteria for NE STCLK Output Timing
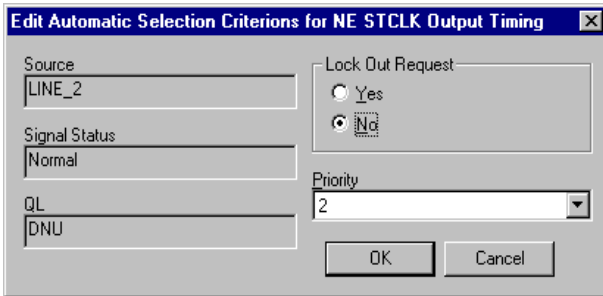
**Figure 77.   Edit Acceptance QL for NE Station Clock
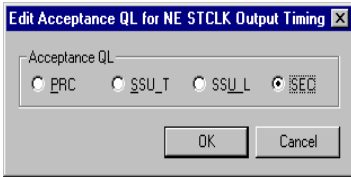   Output Timing**

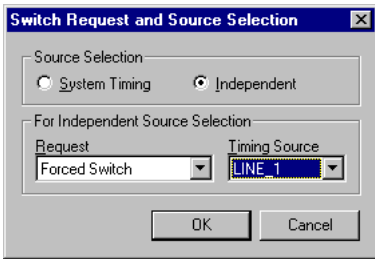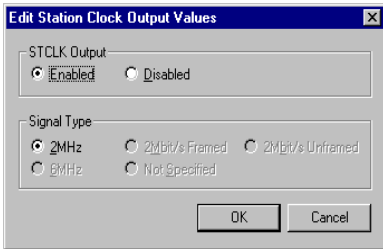**Figure 78.   Switch Request and Source Selection**

Figure 79.   Edit Station Clock Output Values

Provision Station Clock Output

Set Priority and Lock out

To set the priority or the lockout for a timing source follow this procedure:

1. Select **Provisioning --> Timing --> Output Timing.**

    Result: The *Provisioned NE Station Clock Output Timing Information* window appears.

2. Select a source to edit from the list and click **Edit** in the Station Clock Output Timing Sources field**.**

    Result: The *Edit Automatic Selection Criterions for Station Clock Output Timing* window appears.

3. Set **Priority** or **Lock Out Request**.

    Important!   Setting the priorities has only effect if source selection is set to **Independent**.

    Important!   Make sure not to use the same priority value for multiple timing sources, unless explicitly required by the timing plan.

4. Click **OK** to confirm the current settings.

    Result: The *Edit Automatic Selection Criterions for Station Clock Output Timing* window disappears.

5. To provision another Timing Source go to step 2, otherwise go to step 6.

6.   Click **Close**

   Result: The *Provisioned NE Station Clock Output Timing Information* window disappears.

Switch Active Timing Source

To switch the timing source that is used as the active timing source for station clock output timing, follow this procedure:

1.   Select **Provisioning --> Timing --> System Timing.**

   Result: The *Provisioned NE System Timing Information* window appears.

2.   Click **Switch** in the Active Timing Source field**.**

   Result: The *Switch Request and NE Source Selection* window appears.

3.   Select a request from the Request list. If a Manual Switch or a Forced Switch is required, select also a timing source to switch to from the Timing Source list.

4.   Click **OK** to confirm the current settings and send the request to the network element.

   Result: Depending on the System state and the request, the switch will be automatically successful or an error message will be displayed. The *Switch Request and NE Source Selection* disappears.

5.   Click **Close**

   Result: The   *Provisioned NE System Timing Information* window disappears.

Set Station Clock Output Values

To enable the use of the Station Clock Output, follow this procedure:

1. Select **Provisioning --> Timing --> Output Timing.**

   Result: The *Provisioned NE Station Clock Output Timing Information* window appears.

2. Click **Edit** in the Output Values field**.**

   Result: The *Edit Station Clock Output Values* window appears.

3. Select **Enabled** to enable the use of the station clock output, or select **Disabled** to disable the use of the station clock output.

   Important! The *WaveStar*™ AM 1 supports only the **2 MHz** station clock output. Other options are greyed out for *WaveStar*™ AM 1.

4. Click **OK** to confirm the current settings and send the request to the network element.

   Result: The *Edit Station Clock Output Values* disappears.

5. Click **Close**

   Result: The *Provisioned NE Station Clock Output Timing Information* window disappears.

Edit Acceptance QL

When the quality level of the signal for the station clock output falls below the Acceptance QL, the station clock output is squelched. To set the Acceptance QL follow this procedure:

1. Select **Provisioning --> Timing --> Output Timing.**

   Result: The *Provisioned NE Station Clock Output Timing Information* window appears.

2. Click **Edit** in the Acceptance QL field**.**

   Result: The *Edit Acceptance QL for NE STCLK Output Timing* window appears.

3. Select the Acceptance QL.

4. Click **OK** to confirm the current settings and send the setting to the network element.

   Result: The *Edit Acceptance QL for NE STCLK Output Timing* disappears.

5. Click **Close**

   Result: The *Provisioned NE Station Clock Output Timing Information* window disappears.

Provision Output Port Timing

Purpose

The purpose of output port timing provisioning is to provision the timing properties for the 2 Mbit/s output ports and the station clock output ports.

Precautions

Pay attention to the following:

■ Use of retiming on the 2 Mbit/s tributary ports can affect the data integrity of the 2 Mbit/s signal.

Parameters to Provision Output Port Timing

Introduction

The 2 Mbit/s transmission ports are managed by a number of parameters, which are related to timing. These parameters are shown in the functional diagram below.

Functional Diagram

Figure 80.   The Functional Diagram of the Output Port Timing Functionality
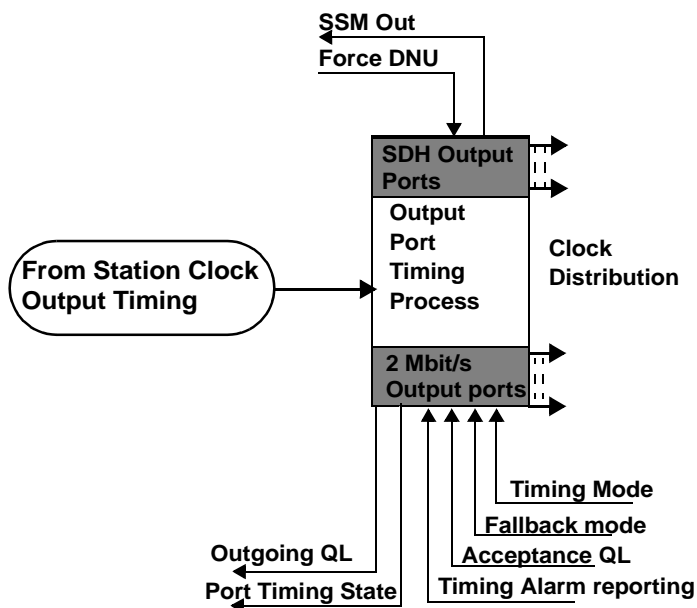
Acceptance QL

For each individual 2 Mbit/s tributary output port in the **Re-timed** mode, an **Acceptance QL** can be provisioned.

If the **System QL** (in case of system timing) or the **QL-out** (in case of independent timing) falls below the **Acceptance QL**, the timing will go into the **Fallback** mode.

Fallback Mode

If a 2 Mbit/s port is operating in the **Re-timed** mode and if the **QL Mode** is enabled, the output is automatically switched to the provisioned **Fallback** mode, if the quality level of the system timing drops below the **Acceptance QL**.

The three **Fallback** modes are:

- **Re-timed AIS**: A Re-timed AIS is sent out.
- **Self-timed**: The signal is sent out from the port in the **Self-timed** mode.
- **None**: no Fallback applies.

Force DNU

Force DNU allows to force an S1 byte value: **DNU** into an outgoing signal. The Force DNU option can be switched on by selecting **Force**. It can be switched off by selecting **Do Not Force**.

> **Important!** When an outgoing signal is forced to carry DNU, this signal cannot be used for synchronization by another network element.

Outgoing QL

Outgoing QL indicates the quality level that is sent out on a given transmission output port which supports S1-byte quality level information carriage.

SSM Out

SSM Out displays the current S1 byte value that is sent out from the selected port.

Timing Mode

The timing mode of each individual 2 Mbit/s tributary output port can be set to the **Self-Timed** or **Re-Timed** mode:

- In the **Self-Timed** mode the 2 Mbit/s signal is extracted from the container contents of the VC-12.

- In the **Re-Timed** mode, the timing of the 2 Mbit/s output signal is derived from the network element system timing; the 2 Mbit/s signal is routed through the elastic buffer.

Timing Alarm Reporting

When the **Timing State** of a 2 Mbit/s tributary output port is **Fallback**, a defect is declared. The reporting of this **Timing Alarm** can be **Enabled** or **Disabled** for each individual 2 Mbit/s tributary output port. This is done with the **Timing Alarm Report** parameter.

Timing State

The **Port Timing State** of each individual 2 Mbit/s tributary output port can be viewed. The **Timing State** can have two values:

- **Normal**: The port operates as specified in the timing mode

- **Fallback**: The timing mode has fallen back as specified in the **Fallback Mode** parameter.

Windows to Provision Output Port Timing

Windows to Use

The windows to use for the Output Port Timing are:

- ■ Port Timing Information
- ■ Edit Port Timing Information
- ■ 2 MBit/s Port Retiming Information.
- ■ Edit 2 MBit/s Port Retiming Information.
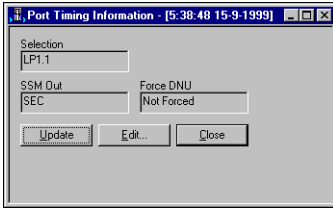
Figure 81.   Port Timing Information
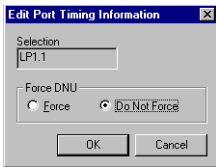

Figure 82.   Edit Port Timing Information

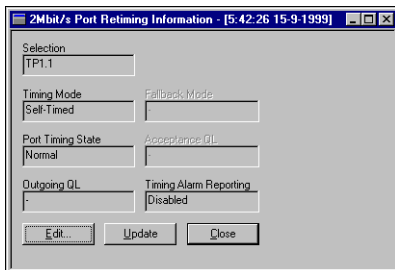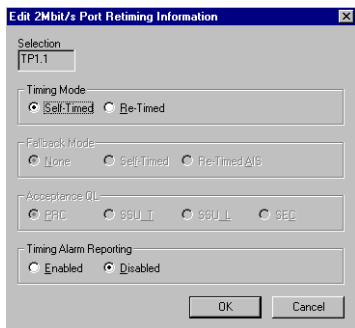**Figure 83.   2 Mbit/s Port Retiming Information**

Figure 84.   Edit 2 Mbit/s Port Retiming Information

Provision Output Port Timing

Provision 2 Mbit/s Output Port Timing

To set the parameters for the physical 2 Mbit/s output port follow this procedure:

1. Select *Provisioning --> Transport --> Ports*.

    Result: The *Provisioned NE Port Information List* window appears.

2.   Select a 2 Mbit/s port from this list and click **Timing**.

     Result: The *2 Mbit/s Port Retiming Information* window
     appears.

3.   Click **Edit**.

     Result: The *Edit 2 Mbit/s Port Retiming Information*
     window appears.

4.   Set the **Timing Mode**. In case of a re-timed value, set also
     the **Fallback Mode** and the **Acceptance QL** values.

5.   Set the **Timing Alarm Reporting** values.

6.   Click **OK** to confirm the current settings.

     Result: Depending on the chosen values a warning
     message can appear. The *Edit 2 Mbit/s Port Retiming
     Information* window disappears.

7.   Click **OK**.

     Result: The *2 Mbit/s Port Retiming Information*
     window disappears.

8.   To set another 2 Mbit/s port go to step 2, else go to step 9.

9.   Click **Close**.

     Result: The *Provisioned NE Port Information List*
     window disappears.

Provision STM-1 Output Port Timing

To set the parameters for the physical STM-1 output ports follow this procedure:

1. Select **Provisioning --> Transport --> Ports**.

    Result: The *Provisioned NE Port Information List* window appears.

2. Select an STM-N port from this list and click **Timing**.

    Result: The *Port Timing Information* window appears.

3. Click **Edit**.

    Result: The *Edit Port Timing Information* window appears.

4. Set the **Force DNU** value.

5. Click **OK** to confirm the current settings.

    Result: Depending on the chosen values a warning message can appear. The *Edit Port Timing Information* window disappears.

6. Click **OK**.

    Result: The *Port Timing Information* window disappears.

7. To set another STM-1 port go to step 2, else go to step 8.

8. Click **Close**.

    Result: The *Provisioned NE Port Information List* window disappears.